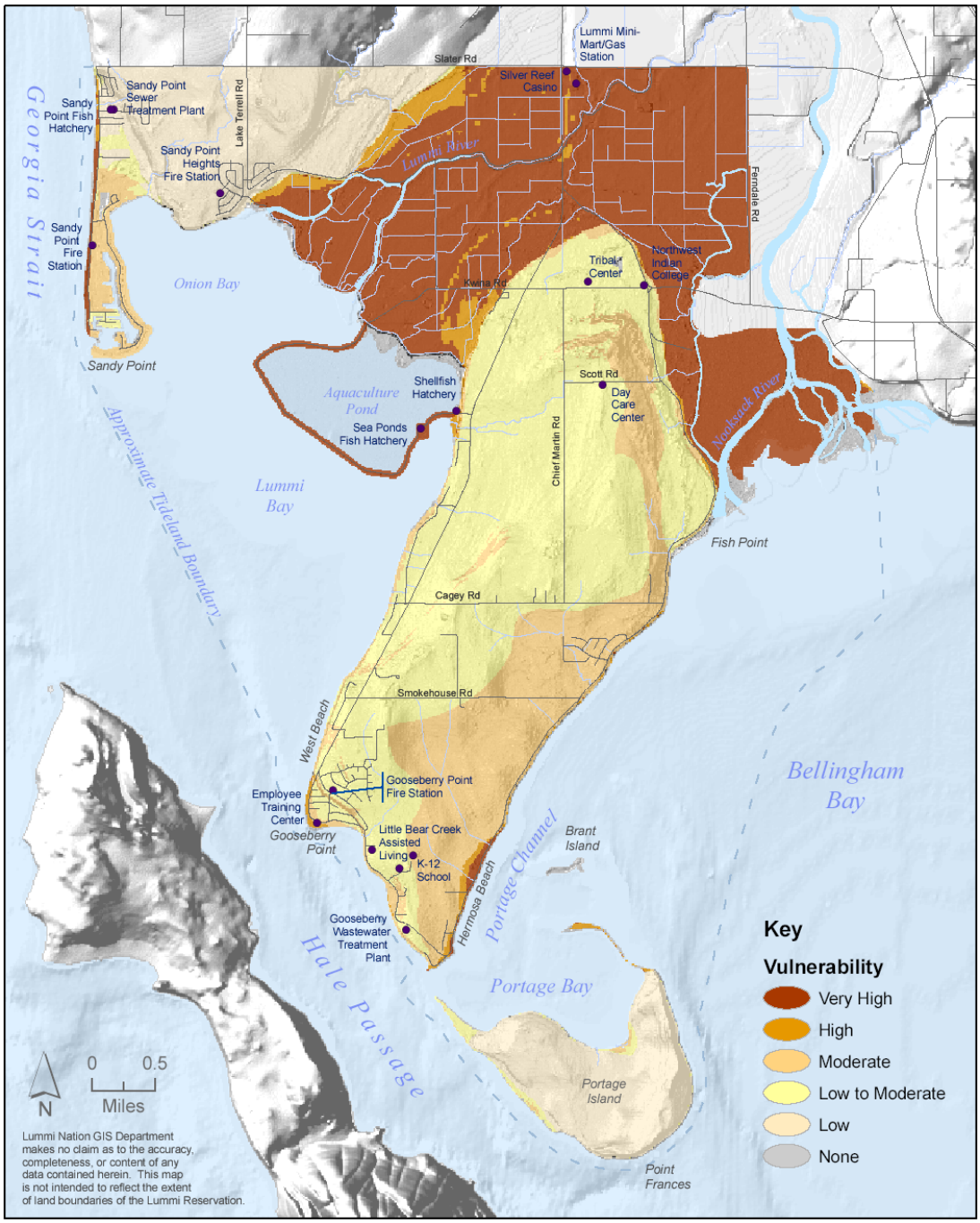
LUMMI NATION
MULTI-HAZARD MITIGATION PLAN



Water Resources Division
Lummi Natural Resources Department

March 2004
Updated April 2007

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EXECUTIVE SUMMARY

The purpose of this Lummi Nation Multi-Hazard Mitigation Plan (MHMP) is to guide current and future efforts to effectively and efficiently mitigate the impacts of natural hazards on the Lummi Indian Reservation (Reservation). It shall also guide efforts to mitigate and respond to natural hazards that are generated off of the Reservation or that cross Reservation boundaries in coordination with other agencies and jurisdictions as appropriate.

The Lummi Nation finds that natural hazards on the Reservation have a direct, serious, and substantial effect on the political integrity, economic security, health, and welfare of the Lummi Nation, its members, and all persons present on the Reservation. Further, the Lummi Nation finds that those activities that potentially increase the frequency or severity of damages from natural hazards, if left unregulated or unaddressed, will eventually cause such damages. Accordingly, the Lummi Natural Resources Department (LNR) and the Lummi Planning Department are developing the MHMP for the Reservation.

The goals of the Lummi Nation MHMP are to:

1. Reduce the threats to public health and safety posed by natural hazards;
2. Reduce the structural damages caused by natural hazards;
3. Reduce the environmental impacts of natural hazards, mitigation actions, and future development activities; and
4. Reduce the long-term costs resulting from natural hazards and their mitigation.

The objectives of the MHMP are the following:

1. Discourage new development in areas that are vulnerable to hazards or ensure that development occurs in such a way that risk is minimized;
2. Protect or alter existing development in hazardous areas to make it less susceptible to damage;
3. Ensure that the solution chosen to protect existing development is the most cost-effective available; protects or enhances cultural resources, natural resources, and sensitive terrestrial, riparian, or coastal habitats; and is consistent with applicable land use plans and regulations;
4. Ensure that the benefits of maintaining existing facilities outweigh the costs; if not, redesign facilities to make them less susceptible to damage or implement some other type of solution at the site;
5. Redesign existing projects and/or change maintenance practices to protect or enhance riparian or coastal habitats;
6. Manage floodplains, rivers, streams, and other water resources for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, finfish and shellfish harvesting, open space, recreation, water supply, cultural/traditional practices, and hydropower;
7. Improve coordination and consistency between the Lummi Nation and other jurisdictions, as appropriate, in management activities for floodplain and coastal areas;
8. Increase public awareness of natural hazards and improve appropriate preparation for and response to such hazards; and
9. Improve hazard warning and emergency response systems.

To reduce hazard damages and to achieve the MHMP goals and objectives, appropriate mitigation measures must be effectively applied. One such measure is the Land Use, Development, and Zoning Code, Title 15 of the Lummi Nation Code of Laws. Title 15 reduces hazards by ensuring that all proposed development activity on the Reservation is first reviewed for potential environmental impacts before it is authorized. The Lummi Nation Title 15A Flood Damage Prevention Code (FDPC) further addresses flood hazards on the Reservation and the Lummi Nation Coastal Zone Management Plan controls activities in the coastal zone. The Lummi Nation Building Code, Title 22 of the Lummi Nation Code of Laws, ensures that structures are constructed in a manner such that they will be safer for people during a disaster. These codes are administered by the Lummi Planning Department. To guide future land uses on the Reservation, the Planning Department is also developing a Comprehensive Plan. In addition, the Lummi Natural Resources Department administers the Water Resources Protection Code, Title 17 of the Lummi Nation Code of Laws, as part of its Comprehensive Water Resources Management Program (CWRMP). The CWRMP includes wellhead protection, storm water management, wetland management, nonpoint source pollution management, and water quality standards programs. The MHMP for the Reservation supports and complements these existing programs and activities and promotes continued involvement in off-Reservation, hazard mitigation-related activities.

Consistent with the Lummi Nation Flood Damage Reduction Plan adopted by the Lummi Indian Business Council (LIBC) in November 2001 and approved by the Federal Emergency Management Agency (FEMA) in January 2002, this MHMP recommends the following specific priorities for flood, tsunami, and volcanic lahar mitigation:

1. Protect the Nooksack and Lummi river floodplains on the Reservation and maintain access to the Lummi Peninsula by constructing a 100-year setback levee that extends along Ferndale Road from Ferndale to Kwina Slough, then along the north side of Kwina Slough to Marine Drive, and finally along Marine Drive to Lummi Shore Road (the levee should include a bridge over the Lummi River channel and box culverts or other structures to allow flow under Marine Drive);
2. Reduce the potential for flood damage along the low-lying coastal areas and concurrently reduce damage done to shoreline resources by bulkheads through the acquisition and removal or relocation of flood-prone structures currently located in the coastal velocity zones;
3. Complete the elevation of Slater Road to the 100-year flood level east of the Nooksack River including a bridge to allow floodwaters to pass downstream;
4. Protect, acquire, or relocate vulnerable structures in the coastal and riverine floodplains, outside of the velocity zone and floodway, respectively; and
5. Provide access to the Lummi Peninsula in the case of levee failure along the Nooksack River by raising Haxton Way and providing for the flow of floodwaters under Haxton Way (this could serve as an interim measure prior to construction of a 100-year setback levee).
6. Purchase flood insurance for all LIBC structures within or adjacent to the floodplain.

In addition, the following priorities are recommended for all natural hazards:

1. Establish emergency medical capability (an equipped Medic 1 unit along with paramedics and emergency medical technicians) located on the Reservation.
2. Promote the establishment and maintenance of home survival/emergency kits.
3. Pursue funding for the Lummi Nation mitigation priorities and recommendations described in this MHMP, including funding for needed staff and infrastructure.
4. Improve and sustain public education programs aimed at mitigating natural hazards.
5. Redirect and/or relocate development away from hazard areas.
6. Encourage seismic strength evaluations of schools, public infrastructure, and critical facilities on the Reservation to identify vulnerabilities and help prioritize mitigation to meet current seismic standards.
7. Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.
8. Continue to develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.
9. Continue monitoring of erosion rates along the shorelines of the Reservation.
10. Limit construction in identified landslide areas through regulation and outreach.
11. Complete the installation of tsunami warning systems and evacuation route signs in hazard areas and provide residents in the hazard areas with updated information on the tsunami hazard, including the probability of occurrence, potential size of the hazard, signs of an impending tsunami, and best route to avoid a tsunami.

This MHMP recommends the following action plan:

1. Establish a Lummi Nation division of emergency management within the Lummi Nation Police Department and hire an emergency manager.
2. Maintain the Multi-Hazard Mitigation Team composed of representatives from pertinent LIBC departments on the Reservation;
3. Continue to pursue funding for the Lummi Nation mitigation priorities and recommendations described above, including funding for needed staff and infrastructure;
4. Finalize the Comprehensive Plan that is aligned with the provisions of the Land Use, Development, and Zoning Code; the Flood Damage Prevention Code; the Building Code; the FDRP; the CZMP; the Water Resources Protection Code; other hazard-related ordinances; and the recommendations of this MHMP;
5. Coordinate hazard planning with other jurisdictions, as appropriate, and review any actions proposed for the Nooksack River and/or Lummi River watersheds that may affect flooding on the Reservation (i.e., all proposed actions);
6. Review and possibly amend the Flood Damage Prevention Code in response to an analysis of future-conditions flood levels and flood management actions implemented throughout the Nooksack River watershed;
7. Continue to pursue participation in the Community Rating System (CRS) and take appropriate actions to earn points toward discounts of flood insurance premiums for residents of the Reservation;
8. Continue to review hazard maps for accuracy and any changes in the estimated vulnerability of the Reservation;
9. Coordinate LIBC emergency response efforts with other appropriate jurisdictions and agencies; and
10. Implement a public education effort that will inform residents of the potential natural hazards on the Reservation.

Community involvement is an important element of the Lummi Nation MHMP because damage from natural hazards occurs across property and political boundaries and because community participation in developing and implementing the MHMP is necessary for the program to be successful. The three elements of the community involvement plan are (1) public education and outreach, (2) interjurisdictional coordination and cooperation, as appropriate, for activities off-Reservation that affect on-Reservation resources, and (3) working with project applicants to ensure compliance with Lummi Nation ordinances. The commissions of the LIBC help serve the public education and outreach function because the commissioners are either elected by the General Council or appointed by the LIBC, hold meetings open to the public, and are consulted on relevant mitigation projects.

The Lummi Nation Multi-Hazard Mitigation Plan was comprehensively reviewed and updated in 2007. In the three years between adoption of the original plan and this update, several of the identified mitigation activities were undertaken. These include:

- The Multi-Hazard Mitigation Team was formed in 2004 pursuant to LIBC Resolution 2004-015 and consists of the Natural Resources Department Executive Director, the Planning Department Director, the Chief of the Lummi Nation Police Department, the Safety Officer, and assigned staff from the Natural Resources and Planning departments. The team met five times between 2005 and 2007 to discuss and review progress on mitigation projects, review the Comprehensive Emergency Management Plan (CEMP) and Spill Prevention and Response Plan, and discuss the MHMP update.
- A 2005 FEMA Pre-Disaster Mitigation-Competitive grant was received for a total project cost of $5,976,843 and a 75 percent federal share of $4,482,632. The grant includes two project subgrants and one management subgrant. The two projects are:
    - The Slater Road Elevation Project. This project is the elevation of an approximately 1-mile long, frequently flooded, section of Slater Road east of the Nooksack River bridge to above the 100-year flood level. The elevation will include a 389 foot long bridge and will allow continued access to the Reservation, Lummi Island, and nearby industries through a 100-year flood event. The project will be completed in early 2009.
    - The Sandy Point Coastal Acquisition Project. This project is the acquisition and removal of up to three homes from the high velocity coastal flood zone (V zone) along the Sandy Point Peninsula.
- A 2006 Emergency Management Preparedness Assistance Grant (EMPAG) for $94,200 was received from the Washington State Emergency Management Division for the turn-key installation of two All Hazard Alert Broadcast (AHAB) tsunami warning systems to provide notification of tsunamis and other hazards to Reservation residents.
- Work was begun with Whatcom County and the Washington State Emergency Management Division to develop tsunami evacuation route maps and brochures for the Reservation.
- The Lummi Nation MHMP, the Pre-Disaster Mitigation Planning grant application, and the Pre-Disaster Mitigation project grant applications were shared with at least eight tribes including tribes in Massachusetts, Oklahoma, Idaho, Washington, and Oregon.
- The Lummi Indian Business Council adopted the Comprehensive Emergency Management Plan (CEMP) by Resolution 2006-036.

- The Natural Resources Department finalized the Lummi Nation Spill Prevention and Response Plan in 2005 and has implemented the plan through training and the purchase of spill response equipment.
- The Planning Department developed a draft Comprehensive Plan.
- The Water Resources Division began the process to join the Community Rating System (CRS) of the National Flood Insurance Program.
- The Forestry Division of the Natural Resources Department obtained equipment and training for wildland firefighting.
- The Lummi Nation's participation in the National Flood Insurance Program was improved through a Community Assistance Visit (CAV) with FEMA that closed on April 28, 2005.
- Twelve articles describing and providing updates on the mitigation projects and recommending preparedness measures such as family disaster plans and 72-hour emergency kits were published in the Lummi Nation newspaper, the Squol Quol.

The update process is described in Section 2 and included a review by the Multi-Hazard Mitigation Team of all aspects of the plan including its goals and objectives, the identified hazards, the vulnerability of the Reservation and critical facilities to these hazards, the potential losses, the capability assessment, the mitigation measures and priorities, and the plan maintenance process. The review of the hazard identification and vulnerability assessment led to the addition of one hazard (tornado), the refinements of the earthquake, tsunami, landslide, and coastal erosion maps through the addition of new information, and the reduction of risks of certain hazards through mitigation activities. The review of the mitigation measures led to the addition of recommendations to establish a division of emergency management within the Lummi Nation Police Department and to hire an emergency manager, to purchase flood insurance for LIBC structures within or adjacent to the floodplain, and to pursue FEMA elevation certificates for tribal homes in the floodplain. The review of the Plan Maintenance Process led to slight changes in the Multi-Hazard Mitigation Team's meeting, reporting, and project tracking processes.

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1. INTRODUCTION

The purpose of this Lummi Nation Multi-Hazard Mitigation Plan (MHMP) is to guide current and future efforts to effectively and efficiently mitigate the impacts of natural hazards on the Lummi Indian Reservation (Reservation). It shall also guide efforts to mitigate and respond to natural hazards that are generated off of the Reservation or that cross Reservation boundaries in coordination with other agencies and jurisdictions as appropriate. This Lummi Nation MHMP establishes goals, lists objectives necessary to achieve the goals, and identifies policies, tools, and actions that will help meet the objectives. These short- and long-term actions will reduce the potential for losses on the Reservation due to natural hazards. In short, this plan is intended to help create a disaster-resistant Reservation by reducing the threat of natural hazards to life, property, emergency response capabilities, economic stability, and infrastructure, while encouraging the protection and restoration of natural and cultural resources.

The natural hazards that have affected the Reservation in the past and will affect the Reservation in the future include floods, earthquakes, severe winter storms, coastal erosion, windstorms, wildfires, drought, and landslides. In addition, volcanic activity from Mt. Baker and a tsunami (commonly called a "tidal wave") have a low probability of occurrence, but are potentially large hazards on the Reservation. The Reservation also has a very low vulnerability to tornadoes.

To protect the political integrity, economic security, health, and welfare of the Lummi Nation, its members, and all persons present on the Reservation, it is important for the Lummi Nation to minimize threats to public health and safety and damage to property from future hazard events. In developing a policy response, it is important to recognize that floods, earthquakes, severe winter storms, windstorms, wildfires, landslides, and other such events are naturally occurring processes that will present occasional disruption to the lives of Reservation residents. Any policy must also recognize that there are many private and public structures and facilities that have been constructed through time without regard to potential natural hazards. Fortunately, there are many actions that can be taken to reduce future risk and loss including structural and non-structural projects and regulatory measures.

This MHMP is one such action to reduce future risk and losses since it evaluates risks and identifies mitigation actions and also will qualify the Lummi Nation for funding under the Pre-Disaster Mitigation Program (PDM) that is administered by the Federal Emergency Management Agency (FEMA). This program provides funding for hazard mitigation planning and for mitigation projects that are implemented before a disaster occurs. This plan may also help the Lummi Nation acquire funding under other programs, including the following:

- **Hazard Mitigation Grant Program**, which provides post-disaster funds for hazard reduction projects (e.g., elevation, relocation, or buyout of structures), administered by the Washington State Emergency Management Division (WEMD);
- **Flood Control Assistance Account Program**, which provides funds for developing flood hazard management plans, for flood damage reduction projects and studies, and for emergency flood-related projects (e.g., repair of levees); administered by the Washington State Department of Ecology (Ecology);

- **Flood Mitigation Assistance Program**, which provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods, administered by FEMA;
- **Repetitive Flood Claims Program,** which provides funds to reduce damages, primarily through acquisition and demolition or relocation, to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP);
- **Severe Repetitive Loss Program,** which provides funds to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures under the the NFIP. SRL structures are residential properties that:
    - Have at least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any ten-year period, and the cumulative amount of such claims payments exceeds $20,000; or
    - For which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any ten-year period; and
- **Emergency Management Preparedness Assistance Grant Program (EMPAG),** which provides funds to local and tribal governments, regional agencies, regional incident management teams, and private organizations to enhance statewide emergency preparedness through short term, high impact, projects. Administered by WEMD.

With this eligibility for grant programs, there is an opportunity to look to the future and work cooperatively and creatively to mitigate future damages and threats to public health and safety. This Multi-Hazard Mitigation Plan addresses the primary natural hazards that threaten the Reservation. Although many of the specific recommendations in the plan are directed at the Reservation, many will be most effective if implemented on a basin-wide basis. It is therefore intended that this plan provides solutions that other jurisdictions can use and benefit from and that can be cooperatively implemented.

Purpose/Goals

The goals of the Lummi Nation MHMP are to:

1. Reduce the threats to public health and safety posed by natural hazards;
2. Reduce structural damages caused by natural hazards;
3. Reduce the environmental impacts of natural hazards, mitigation actions, and future development activities; and
4. Reduce the long-term costs resulting from natural hazards and their mitigation.

Objectives

The objectives of the MHMP are the following:

1. Discourage new development in areas that are vulnerable to hazards or ensure that development occurs in such a way that risk is minimized;
2. Protect or alter existing development in hazardous areas to make it less susceptible to damage;
3. Ensure that the solution chosen to protect existing development is the most cost-effective available; protects or enhances cultural resources, natural resources, and

sensitive terrestrial, riparian, or coastal habitats; and is consistent with applicable land use plans and regulations;

4. Ensure that the benefits of maintaining existing facilities outweigh their costs; if not, redesign facilities to make them less susceptible to damage or implement some other type of solution at the site;
5. Redesign existing projects and/or change maintenance practices to protect or enhance riparian or coastal habitats;
6. Manage floodplains, rivers, streams, and other water resources for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, finfish and shellfish harvesting, open space, recreation, water supply, cultural/traditional practices, and hydropower;
7. Improve coordination and consistency between the Lummi Nation and other jurisdictions, as appropriate, in management activities for floodplain and coastal areas;
8. Increase public awareness of natural hazards and improve appropriate preparation for and response to such hazards; and
9. Improve hazard warning and emergency response systems.

As part of the 2007 plan update, these goals and objectives were reviewed by the Multi-Hazard Mitigation Team on January 25, 2007 and by members of the Natural Resources, Planning, and Cultural Commissions on February 28, 2007 and determined to still be valid. Based on the comments from these meetings, the goals and objectives of the Lummi Nation Spill Prevention and Response Plan were considered to ensure that they are incorporated within this plan's goals and objectives. No changes were made as the spill plan's goal to minimize the adverse effects of oil and hazardous materials spill through prevention, preparedness, and response is consistent with the mitigation strategy.

To reduce hazard damages and to achieve the MHMP goals and objectives, appropriate mitigation measures must be effectively applied. One such measure is the Land Use, Development, and Zoning Code, Title 15 of the Lummi Nation Code of Laws. Title 15 reduces hazards by ensuring that all proposed development on the Reservation is first evaluated for potential environmental impacts before it is authorized. The Lummi Nation Title 15A Flood Damage Prevention Code (FDPC) further addresses flood hazards on the Reservation, as does the Lummi Nation Flood Damage Reduction Plan (FDRP). The Lummi Nation Coastal Zone Management Plan controls activities in the coastal zone of the Reservation. The Lummi Nation Building Code, Title 22 of the Lummi Nation Code of Laws, ensures that structures are constructed in a manner such that they will be safer for people during a disaster. The Solid Waste Control and Disposal Code, Title 18 of the Lummi Nation Code of Laws, will reduce environmental damage caused by flood events. These codes are administered by the Lummi Planning Department. To guide future land uses on the Reservation, the Planning Department is also developing a Comprehensive Land Use Plan. In addition, the Lummi Natural Resources Department (LNR) administers the Water Resources Protection Code, Title 17 of the Lummi Nation Code of Laws, as part of its Comprehensive Water Resources Management Program (CWRMP). The CWRMP includes wellhead protection, storm water management, wetland management, nonpoint source pollution management, and water quality standards programs. All mitigation measures must also comply with the Cultural Resources Preservation Code, Title 40 of the Lummi Nation Code of Laws, which guides cultural resource management on the Reservation. This MHMP supports and complements these current on-Reservation programs and activities and also promotes

continued involvement in appropriate off-Reservation activities related to hazard mitigation.

To improve preparation for future hazard events, the Lummi Indian Business Council (LIBC) has adopted the Lummi Nation Comprehensive Emergency Management Plan (CEMP) for the Lummi Nation (Appendix C). In addition, the Lummi Water Resources Division (LWRD) has developed the Lummi Nation Spill Prevention and Response Plan to guide the response to spills of hazardous materials on and adjacent to the Reservation.

This MHMP provides detailed recommendations and an action plan designed to meet each objective and, ultimately, the goals of the plan. The Lummi Indian Business Council, the governing body of the Lummi Nation, passed Resolution No. 2004-015 on January 19, 2004, to formally adopt this plan. The Council passed Resolution 2007-060 on April 17, 2007 to formally adopt the first three-year update of the plan. Both resolutions are attached in Appendix A.

This Lummi Nation MHMP is divided into eight sections:

- Section 1 is this introduction.
- Section 2 describes how the MHMP was prepared and updated.
- Section 3 describes the land use, socioeconomic conditions, and physical characteristics of the Reservation.
- Section 4 presents an assessment of hazard risks on the Reservation.
- Section 5 presents the Lummi Nation mitigation strategy.
- Section 6 describes local mitigation planning coordination.
- Section 7 describes the MHMP maintenance process.
- Section 8 summarizes this report.

The references cited in this plan and the acronyms and abbreviations used in this plan follow Section 8.

2. PLANNING PROCESS

The current pre-disaster mitigation planning effort on the Lummi Reservation is intended to complement existing LIBC programs, including the Lummi Nation Flood Damage Reduction Plan (LWRD 2001a). The MHMP has been developed and updated pursuant to the requirements in the Interim Final Rule for hazard mitigation planning (44 Code of Federal Regulations [CFR], Parts 201 and 206, February 26, 2002) and the guidance in the State and Local Plan Interim Criteria Under the Disaster Mitigation Act of 2000 document (FEMA 2002a) and its associated plan review crosswalk. The Lummi Nation will continue to comply with all applicable Federal statutes and regulations in effect during periods for which it receives grant funding, in compliance with 44 CFR 13.11(c) and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

The natural hazard mitigation planning process for the Lummi Nation began with a literature review conducted by LNR staff. The Whatcom County Hazard Identification and Vulnerability Analysis (Whatcom County 2002), developed by the Whatcom County Division of Emergency Management (DEM), and the Washington State Hazard Identification and Vulnerability Assessment (WEMD 2001), developed by the Washington State Emergency Management Division (WEMD), were also reviewed for information regarding the natural hazards present on the Reservation. The State of Oregon, Clackamas County, Kitsap County, City of Redmond, and Portland Metro hazard mitigation plans (Oregon 2000a; Clackamas County 2002; Kitsap County 1999; City of Redmond 2002; and Portland Metro 1999) were reviewed for information and mitigation alternatives pertinent to the natural hazards on the Reservation. The FEMA how-to guides on mitigation planning, *Getting Started: Building Support for Mitigation Planning* (FEMA 2002b), *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA 2001a), and *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies* (FEMA 2003b), were used to guide the planning process, to help assess hazard risks and vulnerabilities, and to develop this MHMP.

The Lower Nooksack River Comprehensive Flood Hazard Management Plan (CFHMP; Whatcom County 1997a, 1999) and flood plans from other jurisdictions were reviewed previously for information and mitigation alternatives pertinent to the flood hazards on the Reservation. The Revised Preliminary Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) for the Lummi Reservation (FEMA 2003c and 2003d) were used to identify the flood-prone areas on the Reservation. A small area of known flooding along Lummi Shore Road not identified on the FIRM was also considered to be flood-prone. The recorded flood history (Whatcom County 1995a) and newspaper articles on recent flood events (LWRD 2001a) were reviewed for information on past damages and hazards. Current and future flood hazards on the Reservation were determined by identifying currently developed properties and current land uses in the flood-prone areas and by reviewing land use zoning on the Reservation. Flood hazards in potential velocity zones were made a high priority for potential flood mitigation.

For other natural hazards, pertinent literature and websites were reviewed for current information on past hazard events and hazard vulnerability. In addition, staff of the WEMD provided a Hazards-U.S. (HAZUS) analysis of the estimated potential earthquake damage on the Reservation. Coastal Geologic Services, Inc., provided an assessment of coastal erosion vulnerability and information on landslide hazards on the Reservation.

This plan builds on the development of the Lummi Nation Flood Damage Reduction Ordinance (Title 15A), the Lummi Coastal Zone Management Plan, the Lummi Reservation Comprehensive Plan, and the CWRMP; past work by the Lummi Flood Management Committee (inactive since 1997); involvement by the Lummi Nation in the planning process for the Lower Nooksack River Comprehensive Flood Hazard Management Plan (Whatcom County 1999), which is being developed by neighboring Whatcom County; and the development of the Lummi Nation Flood Damage Reduction Plan (LWRD 2001a).

Natural hazard mitigation activities currently in place were identified and evaluated for their future effectiveness. This evaluation of the effectiveness of current mitigation was compared with the assessment of natural hazards to identify which hazards required additional mitigation measures. Short- and long-term mitigation alternatives for each hazard were identified, evaluated, and prioritized. These mitigation alternatives were then used to develop an action plan to address the primary natural hazards on the Reservation.

Plan Update Process

The required three-year update of the plan was done pursuant to the requirements in the Interim Final Rule for hazard mitigation planning (44 Code of Federal Regulations [CFR], Parts 201 and 206, February 26, 2002), Part 1 of the November 2006 Multi-Hazard Mitigation Planning Guidance for Standard State Mitigation Plans, the Standard State Hazard Mitigation Plan Review Crosswalk, and the FEMA Mitigation Planning How-To Guide *Bringing the Plan to Life: Implementing the Hazard Mitigation Plan* (FEMA 2003a). The update was performed by first reviewing FEMA guidance and requirements, reviewing and organizing information collected on specific hazard knowledge and occurrences, and gathering input from the Multi-Hazard Mitigation Team (MHMT) and the relevant Lummi commissions.

The original document was then modified by updating the description of the Reservation, the natural hazard risk assessment, and the mitigation strategy. The assessment of each hazard was updated as appropriate to include new information, new hazard occurrences, input on vulnerabilities from the MHMT and commissions, and current valuation data for the loss estimates. New sources of information on hazards that were incorporated include the Final January 16, 2004 Flood Insurance Rate Maps (FEMA 2004); the January 16, 2004 Flood Insurance Study for Whatcom County (FEMA 2004a) the Washington State Enhanced Hazard Mitigation Plan (WEMD 2004), and the Whatcom County Natural Hazards Mitigation Plan (Whatcom County 2004). New data used in the GIS analyses include digital elevation models developed from Laser Imaging Detection and Ranging (LIDAR) flights, a 2007 addressed structure layer, and the 2007 Whatcom County Assessor's database. All of the vulnerability maps were revised to include current GIS base layers (e.g. parcels, structures, roads, water bodies) and the vulnerability areas for earthquakes, coastal erosion, wildfires, landslides, and tsunamis were changed in order to incorporate new information.

The Mitigation Strategy was revised by incorporating mitigation activities begun and completed since 2004, editing the recommended mitigation measures and priorities, adding new funding sources, and revising the Mitigation Action Plan to reflect progress and changes. Finally, the Plan Maintenance Process was revised based on the

experience of the MHMT. Table 2.1 summarizes the major changes made to each section of the plan.

Table 2.1 Summary of Plan Changes

Section	Changes
1. Introduction	• Edited to match changes to funding sources and goals and objectives. • Added Resolution 2007-060 adopting updated plan. • Added three new funding sources.
2. Planning Process	• Added a description of the steps taken to update the plan. • Updated the public participation process.
3. Description of the Lummi Reservation	• Described new development on the Reservation. • Updated population estimates. • Added new Lummi Nation zoning map and described major changes. • Updated emergency services information. • Added information on the casino expansions and casino and LIBC employment. • Described the in-process update to the 1999 wetlands inventory.
4. Natural Hazard Risk Assessment	• Listed new documents used for hazard information. • Added description of methodology for making loss estimates. • Added new events for each hazard. • Incorporated new hazard information into the profile and vulnerability assessment for each hazard. • Updated loss estimate tables using 2004 structure counts, 2007 assessed values, and 2006 insurance values. • Added one hazard – tornadoes. • Refined vulnerability assessments for earthquakes, tsunamis, landslides, and coastal erosion based on new information. • Incorporated any reduced risk from undertaken mitigation activities.
5. Mitigation Strategy	• Minor changes to goals and objectives. • Listed mitigation activities as they apply to each objective. • Included improvements to tribal capability such as revisions to Title 15A and adoption of the CEMP. • Listed mitigation measures undertaken since 2004. • Edited proposed mitigation measures to reflect progress on projects and include new projects. • Edited mitigation priorities based on changes to mitigation measures. • Added three funding sources. • Updated the Action Plan to include new recommendations.
6. Local Mitigation Planning Coordination	• Described how the Natural Resources and Planning Departments have provided local mitigation assistance. • Described the integration of new LIBC plans such as the Spill Prevention and Response Plan and CEMP. • Described MHMT's use of the prioritization criteria and ranking system.
7. Plan Maintenance Process	• Described the MHMT. • Compared the recommended update and monitoring processes to the followed processes and recommended changes for the next update.
8. Summary	• Minor edits.

A meeting of the Lummi Nation Multi-Hazard Mitigation Team was held on January 24, 2007 to review and discuss each section of the plan. The MHMT was formed in 2004 pursuant to LIBC Resolution 2004-015 and consists of the Natural Resources Department Executive Director, the Planning Department Director, the Chief of the Lummi Nation Police Department, the Safety Officer, and assigned staff from the Natural Resources and Planning departments. The Team meeting began with an overview of the purpose of and need for the plan and an overview of the update requirements. The Team then reviewed the implementation of the planning process since 2004 including the Team's composition and meeting schedule, public involvement, data collection

efforts, and agency coordination. The Team reviewed the Hazard Identification and Vulnerability Assessment by reviewing the events for each hazard since 2004 and reviewing the 2004 vulnerability assessment with consideration of changes in development, growth patterns, environmental conditions, and scientific information. Finally, the Team reviewed the Mitigation Strategy by verifying the goals and objectives, providing updates to the capability assessment based on new accomplishments, and editing the mitigation actions. As described below, the plan was then presented at a joint meeting of the relevant LIBC commissions and at a general meeting of the Lummi Indian Business Council for adoption by resolution.

Public Participation Process

The 2004 MHMP was reviewed by staff of the Lummi Natural Resources Department, Lummi Planning Department, and Lummi Cultural Resource Management Program, as well as by the Lummi Chief of Police, LIBC Safety Officer, and LIBC Training Officer. A Microsoft PowerPoint slide presentation (Appendix B) on the MHMP, including the proposed mitigation priorities and action plan, was developed and presented to members of the Lummi Natural Resources Commission and the LNR Executive Director and Environmental Director. Based on comments received, a revised 45-minute presentation was presented to the Lummi Natural Resources Commission, Lummi Planning Commission, Lummi Law and Justice Commission, and staff of the LIBC Cultural Resource Management Program. These groups received the MHMP Executive Summary, a list of the proposed mitigation measures in the MHMP, and the proposed MHMP action plan for review before the PowerPoint presentation. The comments received during this review process were incorporated into this final MHMP document.

Based on this review process, the Lummi Natural Resources Commission, Lummi Planning Commission, Lummi Law and Justice Commission, Lummi Natural Resources Commission Chairman, LNR Executive Director, and Lummi Planning Department Director all recommended that the LIBC adopt the MHMP. The MHMP, the MHMP Executive Summary, a list of the proposed mitigation measures, the proposed MHMP action plan, and a resolution adopting the MHMP were then presented to the LIBC for review. The LIBC, the governing body of the Lummi Nation, passed Resolution No. 2004-015 (Appendix A) on January 19, 2004, to formally adopt this MHMP.

For the 2007 update, a joint meeting of the Lummi Natural Resources Commission, Lummi Planning Commission, Lummi Law and Justice Commission, and the Lummi Cultural Commission was held on February 27, 2006 to seek the commissioners' comments for the update. The commissions of the LIBC help serve the public education and outreach function because the commissioners are either elected by the General Council or appointed by the LIBC, hold meetings open to the public, and are consulted on relevant mitigation projects. A presentation was given to the commissioners to review the original plan, explain the update requirement, seek comment on the vulnerability assessment and mitigation strategy, and seek approval of the update approach and proposed changes. Based on the recommendation of the commissioners, the updated plan was presented at a regular meeting of the Lummi Indian Business Council on April 16, 2007. The LIBC adopted the updated plan by Resolution No. 2007-060 (Appendix A).

3. DESCRIPTION OF THE LUMMI RESERVATION

The Lummi Indian Reservation is located approximately eight miles west of Bellingham, Washington, 90 miles north of Seattle, Washington, and 60 miles south of Vancouver, British Columbia, Canada.

The Reservation is located at the mouth of the Nooksack River and along the western border of Whatcom County, Washington (Figure 3.1). The Nooksack River drains a watershed of 786 square miles, flows through the Reservation near the mouth of the river, and discharges to Bellingham Bay (and partially to Lummi Bay during high flows). The Reservation is located at the southern extent of Georgia Strait and the northern extent of Puget Sound. Approximately 38 miles of highly productive marine shoreline surround the Reservation on all but the north and northeast borders. Much of the high density development to date has occurred along the marine shoreline. The Reservation includes the Nooksack and Lummi river deltas, tidelands, and forested uplands. The Reservation also features relatively low topographic relief and a temperate marine climate.

The land uses, topography, climate, hydrogeology, soils, watersheds, and surface water resources on the Reservation affect the vulnerability of the Reservation to natural hazards. This section briefly describes each of these elements. More detailed descriptions can be found in the following reports: Lummi Nation Wellhead Protection Program -- Phase I (LWRD 1997); Lummi Reservation Storm Water Management Program Technical Background Document (LWRD 1998); Lummi Indian Reservation Wetland Management Program Technical Background Document (LWRD 2000); and the Lummi Nation Nonpoint Source Assessment Report (LWRD 2001b).

3.1 LAND USE, PUBLIC SERVICES, AND SOCIOECONOMIC CONDITIONS

Like most places, land use changes on the Reservation have generally been associated with changes in vegetation types, decreases in the areas covered by vegetation, changes in natural drainage patterns, and increases in impervious surfaces. After their arrival, Euro-Americans logged, cleared, and drained forested land for agricultural, residential, and commercial development. Natural drainage patterns on the Reservation were substantially altered by the road system, agricultural drainage ditches, and dikes.

Historic, current, and projected future land uses in the Reservation watersheds and socioeconomic conditions on the Reservation are described below. Much of the information about historic land uses and socioeconomic conditions comes from the *Lummi Nation Comprehensive Environmental Land Use Plan: Background Document* (LIBC 1996).

3.1.1 Historic Land Use

Before the arrival of Euro-Americans, the Lummi people were a fishing, hunting, and gathering society. Based on the accounts of Lummi Elders, early European explorers, and early photographs of the region, before 1850 old-growth forests of massive Douglas fir, western hemlock, spruce, and western red cedar dominated what was to become the Lummi Reservation. Deciduous trees such as western big leaf maple, black cottonwood, red alder, and western paper birch were also likely present along the rivers, streams, and open areas. Understory vegetation probably included vine maple, Oregon grape,

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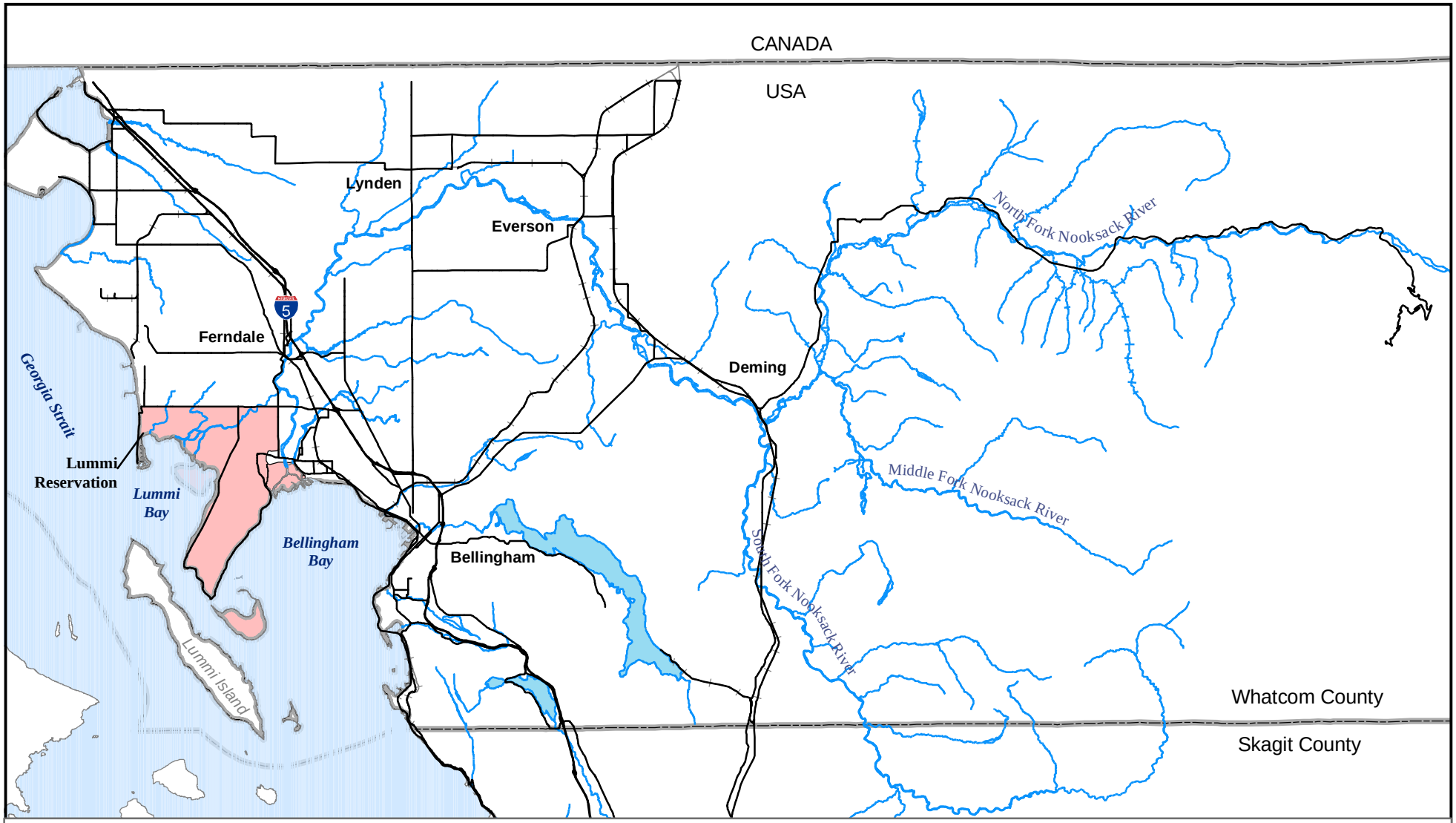

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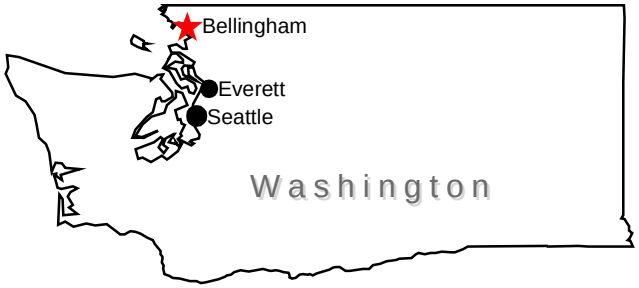

Figure 3.1 - Regional Location of the Lummi Indian Reservation

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several different willows, ocean spray, salmon berry, thimbleberry, soapberry, and many others. Wetlands, streams, and rivers supported a unique array of plants adapted to wet environments. The marine shoreline was also a unique environment, where only plants adapted to a saltwater-influenced environment thrived.

The forces that shaped vegetation patterns in the Northwest before the arrival of Euro-Americans were forest succession, fires, windstorms, ice storms, floods, and traditional use of natural vegetation by the indigenous peoples. Native American uses of vegetation included the gathering of medicinal plants, the use of willows and other shrubs for fishing, and the extensive use of western red cedar trees for many things, including clothing, baskets, buildings, and canoes. Many plants were also sources of food to complement the traditional diet of fish, shellfish, elk, and deer. Native Americans cultivated some of these plants, such as ferns, camas, and wapato, in prairies along the Nooksack River.

Similar to most areas in the lower Nooksack River watershed downstream from Everson, conversion of forestland to agricultural land occurred on the Lummi Reservation following the arrival of Euro-Americans. In 1896, approximately 1,222 acres were reportedly under cultivation on the Reservation. Along with clearing the forested land for agriculture, Euro-Americans constructed ditches, drained wetland areas, cleared logjams, diverted the Nooksack River to drain into Bellingham Bay, built a levee that cut off the Lummi River delta from the Nooksack River, and built a seawall along Lummi Bay. These changes in the natural hydrology of the Lummi Reservation changed the distribution and patterns of watercourses and of wetland- and riparian-associated plant communities. Figure 3.7 shows the extent of the agricultural drainage network on the Reservation in the Lummi and Nooksack river floodplain.

Much of the cedar on the Reservation was cut into shingle bolts and shipped to local shingle mills. The old-growth trees on Portage Island were cut down to fuel steamboats traveling the Nooksack River. One or more large fires swept through the Reservation area between 1850 and 1900. These fires destroyed nearly all of the remaining old-growth forests. Since reforestation was not practiced during the early logging period and did not begin until approximately 1980, pioneer tree species, such as alder, willows, and cottonwoods, soon replaced the conifer forests and dominated the landscape (Leckman 1990). Although there are some conifer groves and Douglas fir plantations, the 2003 inventory of Reservation forests showed that present day forests on the Reservation are largely comprised of deciduous trees, with some mixed deciduous/conifer stands (Tweedie and Holter 2002; International Forestry Consultants, Inc., 2003; see Figure 3.3).

Historically, the Nooksack River flowed (alternately or simultaneously) to both Lummi and Bellingham bays (effectively making the Lummi Peninsula an “island”). Before 1860, the Nooksack River discharged primarily into Lummi Bay by way of the present Lummi River channel, with smaller distributaries flowing into Bellingham Bay (WSDC 1960; Deardorff 1992). In 1860 a logjam blocked the Nooksack River near present-day Ferndale and diverted it to a small stream that flowed into Bellingham Bay (WSDC 1960). Since that time, considerable effort has been expended to keep the Nooksack River discharging into Bellingham Bay because of the increased commercial value of the river that resulted from its proximity to sawmills along Bellingham Bay (Deardorff 1992). Until the early 1900s, the Nooksack River was also the primary transportation corridor for Ferndale, Deming, and Lynden residents to travel to Bellingham. The stream

remaining in the old channel of the Nooksack River has been called the Lummi River or the Red River (WSDC 1960).

In the 1920s, a reclamation project was initiated both to construct a dike/seawall to keep back the sea along the shore of Lummi Bay and to construct a levee along the west side of the Nooksack River (Deardorff 1992). This project, which was started in 1926 and completed in 1934, initially resulted in the nearly complete separation of the Lummi River from the Nooksack River. However, when saltwater intrusion onto the newly reclaimed farmlands and damage to the dam at the head of the Lummi River occurred during flooding, the dam was replaced with a dam and spillway structure (Deardorff 1992). This spillway structure was also damaged over the years during high-flow conditions and was replaced in 1951 by a five-foot-diameter culvert (FEMA 2003d) that allowed flow from the Nooksack River into the Lummi River. Currently a four-foot culvert (Deardorff 1992) allows flow to the Lummi River only during relatively high-flow conditions (approximately 10,000 cfs). Levees were also constructed along the Lummi River to prevent saltwater from Lummi Bay from flowing onto adjacent farmlands during higher tides.

The dike and levee construction activities were accompanied by agricultural ditching to drain fields and wetland areas. Based on 1887-88 topographic surveys, Bortleson et al. (1980) estimated that wetlands located landward of the general saltwater shoreline in the lower Lummi River watershed have decreased from approximately 2.0 square miles (mi^2) to 0.1 mi^2 (approximately 95 percent) over the 1888-1973 period.

3.1.2 Current Land Use

As part of the Storm Water Management Program (SWMP) study (LWRD 1998), a LANDSAT satellite image from August 15, 1991, was used to estimate the extent of various land uses in the watersheds that drain to the Reservation tidelands. The Whatcom County Planning and Development Services had classified the image into different land cover types (Whatcom County is adjacent to the Reservation). The land uses in the Nooksack River basin were characterized based on information presented in the Whatcom County Comprehensive Plan (Whatcom County 1997b).

The focus of the LANDSAT image classification effort by Whatcom County was to analyze forest cover types and structure in the foothills of Whatcom County (rather than to analyze the lowlands). Urban and agricultural classifications were not field-validated to the extent of the forest cover types. Consequently, classification errors for these two cover types are apparent in the map of land cover types shown in Figure 3.2. For example, locations known to be agricultural fields were sometimes classified as urban/residential areas. Locations that had been incorrectly classified as urban/residential/industrial were generally attributed to grasses/agriculture land use, except for Portage Island. On Portage Island, this classification was interpreted to be rocks in the beach areas.

Wetland areas were not a separate land cover classification in the satellite image, but were added to the list of land covers by LNR during the SWMP study (LWRD 1998). Using wetland information derived from existing geographic information system (GIS) coverages of wetland locations, the initial extent of land cover types estimated from the LANDSAT image were adjusted (LWRD 1998) to reflect the presence of wetlands. The GIS coverages of wetland locations used in this 1997-1998 analysis were derived from

the National Wetland Inventory maps (USFWS 1987) and from wetland location maps developed by a tribal consultant (Arnett 1994).

The estimated distribution of land-cover/land-use types on the Lummi Reservation is summarized in Table 3.1, and the locations of the various land cover types are shown in Figure 3.2. As evident in Table 3.1, which excludes both the tribal tidelands and the land-cover/land-use types in the Nooksack River watershed outside the Reservation, approximately 91 percent of the Reservation lands are either agricultural, forested, or wetlands. A comprehensive inventory of Reservation wetlands conducted in 1999 (Harper 1999; LWRD 2000a) found that portions of the grass/agricultural and forest areas listed in Table 3.1 are also wetlands. The percentages in Table 3.1 do not reflect the 1999 inventory information. Figures 3.2, 3.3, and 3.9 show that much of the floodplain on the Reservation consists of grasses/agricultural land and is also classified as wetland or wetland complexes.

Table 3.1 Current land-cover/land-use types on the Lummi Reservation[1]

Land Cover/Land Use	Percent of Area[1]
Grasses/Agricultural	51.55
Deciduous Forest	25.13
Wetlands	9.79
Coniferous and Mixed Forest	4.60
Scrub-Shrub	2.87
Residential/Urban/Industrial	2.75
Fallow Fields/Exposed Soil	2.07
Water	1.20
Rock	0.04

[1] Does not include the Nooksack River watershed (off-Reservation) or tribal tidelands

Figure 3.3 presents an analysis of land use/land cover on the Reservation that is more specific than that of Figure 3.2. Figure 3.3 was derived from interpretation of aerial color photos taken in 1983; this interpretation was updated with information from black and white aerial photos taken in 1991 (Caplow 1993). Information from National Wetland Inventory maps (USFWS 1987) was also used to identify wetlands. The predominance of agriculture in the floodplain that is depicted in Figure 3.3 has not changed to this date, though a gas station/mini-mart and a casino are currently located at the southeast corner of Haxton Way and Slater Road. Because tree harvests have been very limited since 1990, the distribution of forests seen in Figure 3.3 is a relatively accurate depiction of the current composition of Reservation forests (Tweedie and Holter 2002). Moderate clearing for development and the addition of impervious surfaces has occurred since 1991, including areas for the Wex li em community building, Mackenzie housing development, the new tribal school, and the Silver Reef Hotel, Casino, and Spa. Figure 3.3 also provides a clear indication of the extensive development of the low-lying Sandy Point, Gooseberry Point, and (to a lesser degree) Hermosa Beach shorelines and of the presence of wetlands on the Sandy Point Peninsula. The primary change in land use between 2004 and 2007 was moderate clearing for development including projects by private landowners and the expansion of the Northwest Indian College. The land use classifications in Figures 3.2 and 3.3 remain the best available analysis of on-Reservation land-use types.

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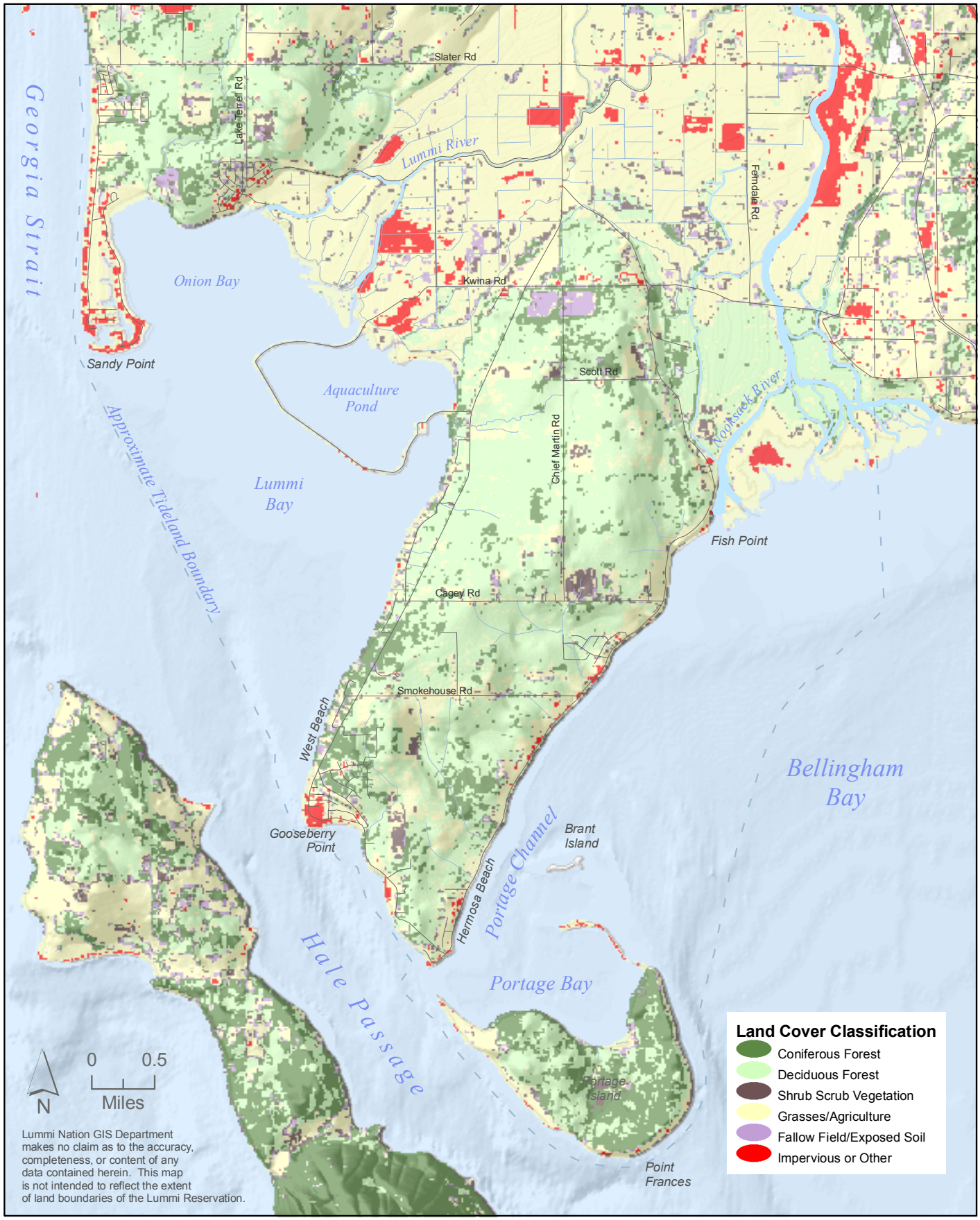

Figure 3.2 Land Cover Types of the Lummi Reservation and Environs

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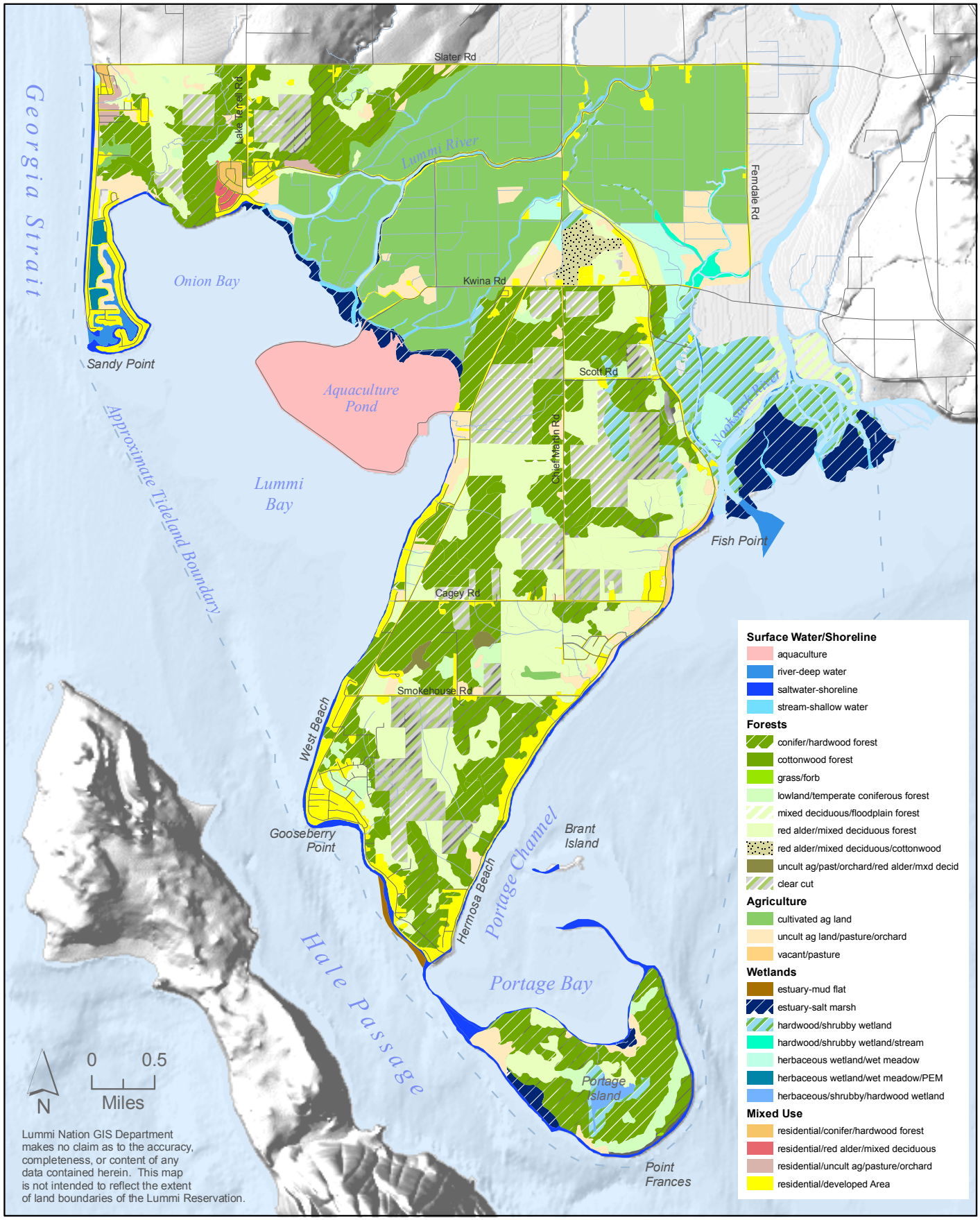

Figure 3.3 Upland Use/Land Cover on the Lummi Reservation

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Based on estimates of land cover in Whatcom County (Whatcom County 1997b), land cover/use in the Nooksack River watershed is currently generally dominated by forested areas upstream from the town of Deming and agricultural lands downstream from Deming. The agricultural lands in the lowlands were largely forested before the arrival of Euro-Americans and had been largely denuded of trees by 1925 (Pierson 1953, as cited in Smelser 1970). Population centers such as Ferndale, Lynden, Everson, and Deming are located adjacent to the Nooksack River.

The 2000 Census found 1,749 housing units on the Reservation, of which 1,455 (83.2%) were occupied year-round and 221 (12.6%) were for seasonal or occasional use. The remaining 73 (4.2%) housing units were vacant. A June 2005 report by the Lummi Nation Statistics Department (Valz, 2005) used the Lummi Nation GIS to identify 1,864 buildings classified as residential homes. Many of the more expensive homes on the Reservation are located in the coastal flood zones along the Sandy Point Peninsula, Neptune Beach, Gooseberry Point, and Hermosa Beach shorelines. Most of these houses were constructed since 1960, including significant new construction and additions in the past two decades. Relatively few homes are located in the Nooksack River floodplain; many of these are on agricultural properties and were constructed before 1950. Figure 3.4 shows the distribution of households in 1950, 1995, 2004, and 2007.

The total population of the Reservation was 4,193 in the 2000 Census, a dramatic increase from 721 in the 1960 census. In the 2000 census, 2,240 people identified themselves as American Indian alone or in combination with other races (53.4 percent of the total Reservation population). Corrected for the estimated rate of undercount (4.74 percent), the estimated actual American Indian population on the Reservation was 2,346 in the year 2000 (Northwest Economic Associates 2003). In 2005, the Reservation population was estimated to have increased to 6,590 including 2,564 enrolled tribal members, 665 people related to enrolled tribal members but not themselves enrolled, and 3,361 non-tribal members (Valz 2005).

3.1.3 Future Land Use

A 2003 study projected that the number of American Indians living on the Reservation will increase from 2,346 in 2000 to 3,767 in 2020 and to 15,451 in 2100 (Northwest Economic Associates 2003). The study cited above predicted that the Indian population on the Reservation will grow at a faster rate than the non-Indian population. Hence, the non-Indian population, 1,953 in the 2000 census, will likely be between 2,000 and 3,000 in 2020, and the total Reservation population will likely be between 5,800 and 6,800 in the year 2020 (based on the 2000 Census data and the projections in the Northwest Economic Associates study). Population estimations from the Lummi Nation Statistics Department show that the total population of the Reservation may already have reached 6,590 by 2005. The report estimates indicate that the non-Indian population may have grown 82 percent between 2000 and 2005 and the Indian population may have grown 38 percent. These population projections, planned economic and institutional growth on the Reservation, and the small percentage of tribal land that has been developed suggest that portions of presently forested or agricultural lands on the Reservation will be converted to residential, commercial, municipal, and/or industrial uses in the coming years.

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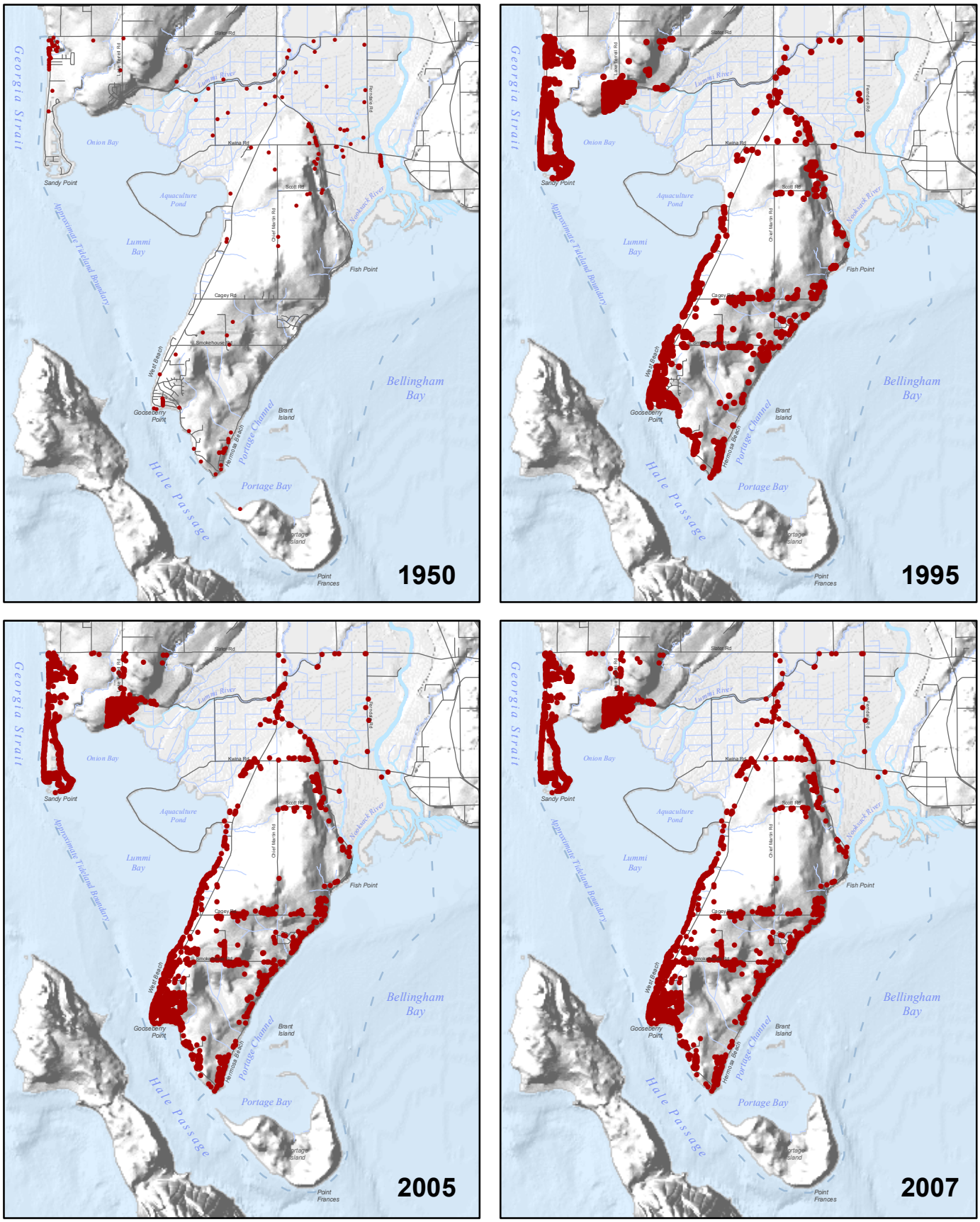

Figure 3.4 Households in the Lummi Reservation 1950 - 2007

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Similarly, future land use in the Nooksack River watershed is projected to include more residential, commercial, municipal, and industrial development to accommodate projected population increases (Whatcom County 1997b).

Future development will be guided by the Lummi Nation Title 15 Land Use, Development, and Zoning Code (LZC, first enacted January 5, 1968; last amended January 19, 2004) and the Title 15A Flood Damage Prevention Code (FDPC, adopted July 22, 1997, last amended September 12, 2005, Appendix D). Construction is regulated by the Lummi Nation Title 22 Building Code (enacted January 5, 1968; last amended January 19, 2004), which adopted the Uniform Building Code. The Zoning and Building codes were recently amended to ensure consistency with current development standards, water protection policies, and building designs. These three codes are administered by the Lummi Planning Department and enforced by the Lummi Planning Commission. These codes will limit and regulate development on the Reservation, including in the Special Flood Hazard Areas identified on the Flood Insurance Rate Map (FIRM) for the Reservation. The Lummi Coastal Zone Management Plan and the CWRMP will also guide development on the Reservation.

Figure 3.5 shows the current official zoning map of the Lummi Nation. This zoning map was revised and adopted by the LIBC in 2004 as part of the comprehensive planning effort currently underway by the Planning Department. The zoning update incorporated comments from the relevant tribal departments and commissions and from public comments received during four community meetings. In general, the amendments created more area zoned as Open Space and Residential and less as Forestry primarily by changing the zoning of Portage Island from Forestry to Open Space and by widening the area zoned Residential along roads. The new Open Space designation replaces the previous Natural designation and the Tribal Fishing zone was replaced with Marine, Residential, or Open Space zoning as appropriate. The Mixed Use designation was added and replaced the previous Industrial zone and some of the areas zoned Commercial.

The Lummi Planning Department is developing a Comprehensive Plan for the Lummi Reservation. The plan will show, in general, how land on the Reservation will be used over the next 20 years. The Comprehensive Plan will identify areas that will be developed for residential, commercial, mixed uses, industrial, and agricultural purposes, as well as showing areas that require protection (e.g., Special Flood Hazard Areas, wetlands, and aquifer recharge zones). To date, a technical background document (LIBC 1996) has been developed, public opinion surveys conducted, drafts of the Comprehensive Plan and maps developed, and focused planning workshops and meetings with commissions and community groups have occurred. The Comprehensive Plan is codified in the Lummi Nation Title 15 Land Use, Development, and Zoning Code. The revised zoning code also formalizes an environmental review process that was already largely in place pursuant to LIBC resolutions. The Comprehensive Plan, the revised zoning code, and the review process will reduce hazard damages by ensuring that land use is compatible with the landscape, that infrastructure is developed in a coordinated fashion, and that development has the overall effect of minimizing land-disturbing activities.

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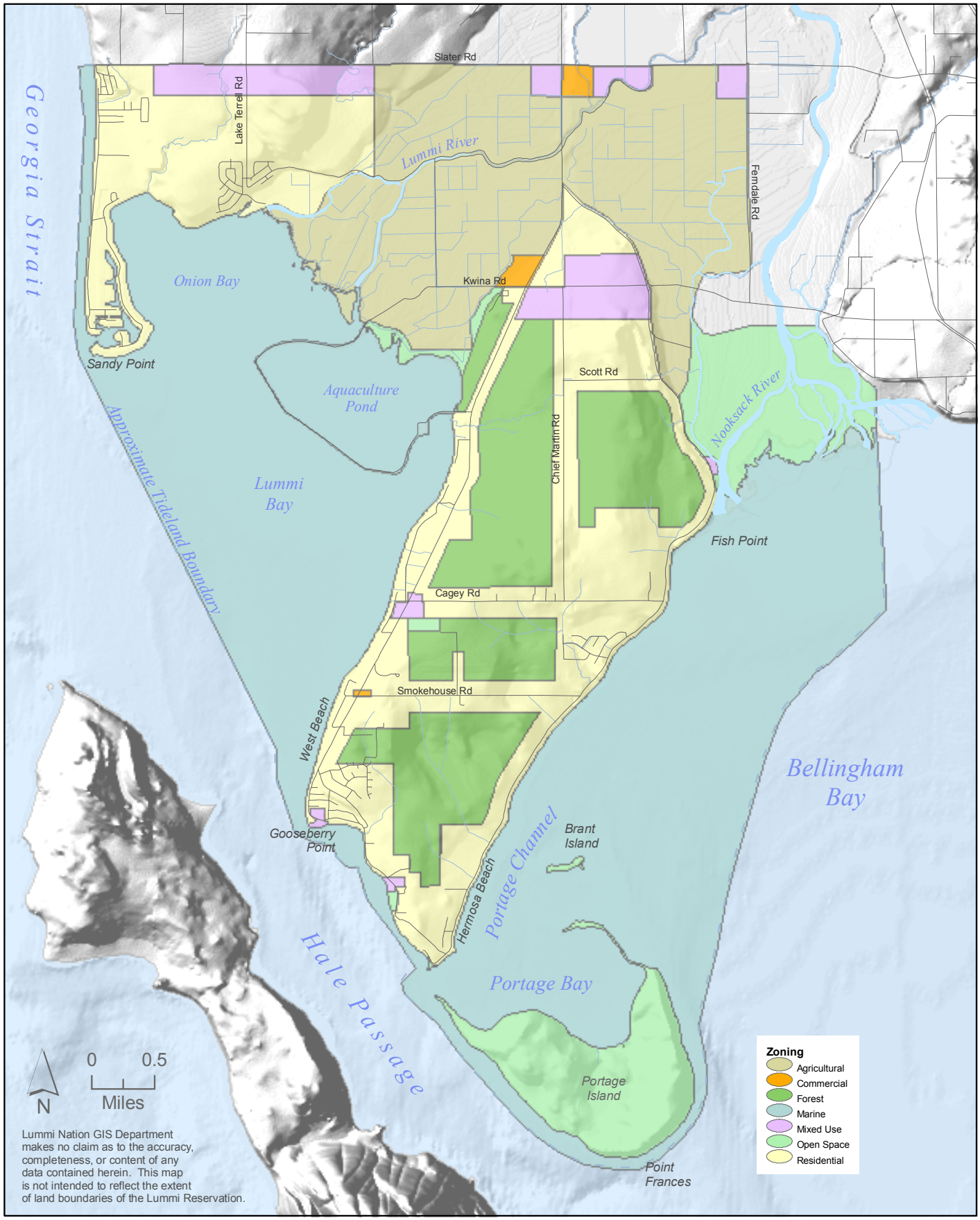

Figure 3.5 Current Land Use Zones on the Lummi Reservation

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3.1.4 Utilities

The Lummi Water District is the largest and most comprehensive water system on the Reservation. It relies primarily on Reservation ground water from public supply wells, supplemented as necessary by water purchased under contract from the City of Bellingham. Six small water systems operated by private, non-Indian water associations provide predominantly non-Indian residential areas with ground water that is withdrawn from Reservation aquifers pursuant to Washington State water rights permits. The Lummi Nation's reserved water rights pre-date and are superior to any permits or water rights acquired from the state. A number of domestic wells belonging to individuals and small groups also supply residences under both tribal and state-claimed authority (LIBC 1996). A federal lawsuit intended to resolve conflicts over competing claims to use the limited Reservation water resources is currently underway (*United States and Lummi Nation vs. Washington State Department of Ecology, et al.*, Civil Action No. C01-0047Z [U.S. District Court, Western District of Washington]).

The Lummi Sewer District operates a comprehensive, Reservation-wide, wastewater collection and treatment system that serves the majority of households on the Reservation. The sewer facilities consist of sewer collectors, sewer interceptors, 27 pump stations, and three treatment plants (Wilson, 2006; LIBC 1996). For residences not on a sewer line, the Lummi Nation Title 16 Sewer Code regulates sewage disposal for public health and safety and establishes criteria for the design, construction, alteration, and operation of on-site septic systems. The Lummi Sewer District enforces the sewer code and inspects on-site septic systems. The Sewer Code serves to minimize pollution during flood events by ensuring that appropriate sanitary sewer facilities are used by Reservation residents and that systems are operated and maintained in a manner that protects public health.

Six of the sewer pump stations are within the Lummi and Nooksack river floodplains and eight are located in areas susceptible to coastal flooding events. These pump stations have been flood-proofed to minimize their susceptibility to flood damage. Although some water and sewer lines cross the Nooksack River floodplain or the coastal flood areas, both wastewater treatment plants and all public water supply wells are outside of flood-prone areas. However, some hydraulic loading of wastewater facilities can occur during floods because of floodwater seepage into manholes in the floodplain.

Collection services for solid waste and recyclable materials are offered to the residents and businesses of the Reservation by a private company (Sanitary Services Corporation). Electricity is delivered to the Reservation by Puget Sound Energy. Natural gas is currently available only to the northern part of the Reservation (Silver Reef Casino), but may become more widely available in the future. Land line telephone service is currently provided by Verizon and Qwest.

3.1.5 Emergency Services

Three fire districts with primarily volunteer staff provide fire protection and medical aid services on the Reservation. Whatcom County Fire District 8 covers the Reservation south of the Lummi River, including the Lummi Peninsula. The main District 8 station (No. 1) is located on Bennett Drive on the outskirts of Bellingham, with an approximate response time of 7-8 minutes to the Kwina Road area (tribal offices, tribal clinic, and Northwest Indian College). It has four full-time career firefighters, including the district

fire chief, during the day and a sleeper shift of volunteers at night. District 8 Station No. 5 is located at Gooseberry Point and has a resident program of five live-in volunteers who are assigned to shifts. Both of these stations have a medical aid vehicle. District 8 Station No. 3 on Curtis Road (east of the Nooksack River) has no volunteer responders and is currently only used to store vehicles (Crawford 2003).

Whatcom County Fire District 17 provides fire protection and emergency medical services to the Sandy Point Peninsula and Sandy Point Heights/Lake Terrell Road areas in the northwest portion of the Reservation. District 17 has two stations, one on the Sandy Point Peninsula (Station No. 1 at 4332 Sucia Drive) and one at Sandy Point Heights (Station No. 2 on 3685 Prevost Way). Whatcom County Fire District 17 has a full-time career fire chief during the day and an on-call duty officer during nights and weekends. Whatcom County Fire District 17 has twenty volunteer firefighters. Both stations operate a licensed medical aid unit (Petrie 2007). Station No. 1 lies within the coastal shallow flooding zone and has had to be protected by sand bags during recent coastal flooding. Fire District 8 and 17 are supported by revenue from property taxes and Districts 7 and 8 receive direct contributions from the Lummi Nation. The LIBC provided an aid car to districts 8 and 17 in 1992 (LIBC 1996).

Whatcom County Fire District No. 7, with its main station in Ferndale, approximately two miles north of the Reservation, provides fire protection and medical aid services to the Slater Road area along the northern boundary of the Reservation, including the Silver Reef Casino and the Shell gas station. The Ferndale station has three full-time career firefighters as well as volunteer responders. The station is manned 24 hours a day. In 2003, the LIBC provided a community contribution of $21,000 to District No. 7 that was used to replace aging equipment.

The Lummi Nation Police Department provides public safety protection throughout the Reservation and works with the Federal Bureau of Investigation (FBI), the Whatcom County Sheriff's Department, and other agencies. Lummi Police has jurisdiction over all members of federally recognized tribes on the Reservation. The Whatcom County Sheriff's Department has jurisdiction when an offense is committed on the Reservation by a person who is not a member of a federally recognized tribe or if the offense is committed on fee land. The FBI investigates major crimes that are committed on trust land by members of federally recognized tribes. The Lummi Nation Police Department is responsible for enforcement of the Lummi Nation Code of Laws. It employs a police chief, one lieutenant, two sergeants, four natural resources officers, two detectives, and eight officers. All members of the force are certified by the State of Washington and the Bureau of Indian Affairs (BIA). The force has six marked patrol cars, an incident command vehicle, two detective cars, two administrative vehicles, two sports utility vehicles, and two four-wheel drive pickup trucks. The Lummi Police Department is the first responder to all emergency calls on the Reservation and is responsible for emergency services on the Reservation in the case of flood, earthquake, or other natural disasters.

Lummi Police, in cooperation with the Whatcom County Division of Emergency Management (in the county Sheriff's Department) and local fire and police agencies, is trained and prepared to respond to minor spills or releases of some hazardous materials. Small quantities of hazardous materials are known to be used and transported through the Reservation on a regular basis. The most significant operations using hazardous materials are the two oil refineries and one aluminum smelter located

just north of the Reservation. One of the main transportation routes to and from these operations is Slater Road, which follows the northern boundary of the Reservation. In response to a major hazardous material spill on the Reservation or in Reservation waters, experts from the U.S. Environmental Protection Agency (EPA) and/or the United States Coast Guard (USCG) and local industries would be called in to help control the damage. The Lummi Nation Spill Prevention and Response Plan, developed in 2005 by the Lummi Water Resources Division, further describes the spill response capabilities and responsibilities of these agencies. Through the recommendations of this plan, the Lummi Nation Natural Resources Department formed the Lummi Nation Spill Response Team for response to oil spills to Reservation waters.

3.1.6 Socioeconomic Conditions

Fishing, logging, farming, and other natural resource work has historically provided most of the jobs for Lummi tribal members. Until the 1974 Boldt Decision, Lummi tribal members were systematically precluded from the profitable salmon fishery in Puget Sound. Once the treaty fishing right was upheld by the U. S. Supreme Court, commercial fishing and fish processing began to expand on the Reservation, with increasing numbers of fishermen, fish processing, and increased overall tribal revenue from salmon fisheries. The Lummi Nation is currently the largest fishing tribe in Puget Sound. However, the recent declines in salmon stocks have dramatically altered the tribal dependence on salmon fishing as an economic mainstay. In 1985, the average Lummi fisherman made $22,796. In 1993, the average income from fishing was only $5,555. During this period, about 30 percent of the tribal work force relied on fishing for their sole source of income. Since 1993, further reductions in salmon stocks have resulted in closure of some fisheries and a further reduction in tribal fishery incomes (LIBC 1996). In recent years, the annual value of the Lummi Nation fishery has declined from a high of over $13 million in 1985 to approximately $3 million in 1999.

In addition to catching finfish and harvesting shellfish, the Lummi Nation owns and operates three fish hatchery facilities. These facilities produce millions of young salmon each year and help offset the decline of fish stocks due to loss of natural habitat and historic over-fishing. The tribe also owns an on-Reservation shellfish hatchery, producing over one billion oyster and clam seeds annually. The Lummi Reservation includes approximately 7,000 acres of tidelands, much of which is suitable for productive shellfish beds. All of these tidelands are held in trust by the United States for the exclusive use of the Lummi Nation.

The tribal commercial shellfish enterprise and the commercial, subsistence, and ceremonial harvest of shellfish by the Lummi Nation and individual members on the Reservation was severely impacted by the closure of 60 acres of tidelands in 1996 and 120 additional acres in 1997. These closures occurred in Portage Bay and were largely attributed to poor dairy waste management practices in the Nooksack River watershed (DOH 1997). Not considering the multiplier effects on the economy, the lost value of the shellfish products alone was estimated to be approximately $825,000 per year. In response to the 1996 closure, the EPA conducted compliance enforcement inspections of dairy operations in the Nooksack River watershed starting in 1997, the State of Washington passed the 1998 Dairy Nutrient Management Act (RCW 90.64), and dairy farmers developed and implemented nutrient management plans (a.k.a. farm plans). As a result of these reactions and additional compliance inspections by the Washington Department of Ecology (Ecology), water quality in the Nooksack River has improved. In

November 2003, approximately 75 percent of the previously closed shellfish beds in Portage Bay were reopened to commercial harvest. In May, 2006, the remaining closed shellfish growing areas were reclassified as “approved” for harvest.

The Lummi Casino project began in 1983 in an effort to diversify the Reservation economy. The casino operation was upgraded significantly in 1994 with the opening of the Lummi Casino at Fisherman’s Cove. The casino flourished initially, employing approximately 400 people, 65 percent of whom were Native American (LIBC 1996). However, competition and changing economic conditions resulted in the closure of the casino on August 26, 1997. With 238 workers losing their jobs, the Lummi unemployment rate grew to approximately 50 percent. A new casino opened in April 2002 at a new location (the corner of Haxton Way and Slater Road) that is closer to the Interstate 5 highway. The new casino (the Silver Reef Casino) was 28,000 square feet and employed approximately 200 people in a range of positions paying from $16,000 to $60,000 per year. The casino was expanded in 2004 to a total of 55,000 square feet with the addition of additional gaming space, a restaurant, and a 400 seat pavilion. The casino was expanded again in 2006 to 135,000 square feet with the addition of a restaurant, additional gaming space, a spa and fitness room, and six-story, 109 room hotel (NEI 2005). In 2005, after the first expansion, the casino employed 382 workers of which 274 were full-time employees and 108 were part-time employees (NEI 2005). In 2007, after the addition of the hotel and spa, the casino employs 500 people with salaries ranging from $20,000 to $70,000 (Werner 2007). Adjacent to the Silver Reef Hotel, Casino, and Spa, the LIBC operates a gas station and mini-mart.

Other employment opportunities exist at the two oil refineries and the aluminum smelter just north of the Reservation and nearby in the communities of Ferndale and Bellingham. In 2004, 40.8 percent (131) of the 321 businesses licensed to operate on the Reservation were owned by enrolled tribal members (NEI 2005). These businesses included fireworks businesses, food preparation and retail, wholesale, and trade businesses.

As of February 2006, the LIBC is the 9th largest employer in the Whatcom County area (WWU 2006) and a major employer on the Reservation today. Most of the LIBC and Northwest Indian College (NWIC) employees are tribal members. In 2003, native employees made up 70 percent of LIBC staff (55 percent enrolled Lummi) and 61 percent of NWIC staff (33 percent enrolled Lummi) (Valz 2003). The LIBC provides community, administrative, education, and health services to the tribal population in order to help achieve the tribal economic and social development goals. These goals include job creation for tribal members, income generation to fund community development programs, and diversification and stabilization of the local economy by creating alternatives to fishing. Revenue generation is needed in order for the Lummi Nation to develop economic self-sufficiency.

In 1993, 56 percent of the 2,500 working-age Lummi tribal members were unemployed, under-employed, full-time students, or no longer seeking work (LIBC 1996). Since 1993, the combined effect of the decline in the fishery and the closure of the original casino has had a substantial negative impact on the Lummi economy. The BIA reported that the unemployment rate on the Reservation in 1999 was 21 percent (BIA 1999). Table 3.2 presents the results of a survey of 2,054, over-18, enrolled tribal members conducted by the LIBC in 2003 (LIBC 2003). This survey indicates that 28 percent of adult tribal members are unemployed and up to 14 percent may be underemployed

(part-time plus seasonally employed). In 2004, 74.6 percent of enrolled Lummi tribal members in Whatcom County ages 18 through 64 were employed and 15.9 percent were unemployed (NEI 2005).

Table 3.2 Employment Status of Lummi Tribal Members, 2003[1]

Employment Status	Number in Status	Percentage of Surveyed Individuals
Employed full-time	825	40.2
Employed part-time	156	7.6
Employed seasonally	133	6.5
Self-employed	84	4.1
Retired	127	6.2
Unemployed	576	28.0
Not available for employment	153	7.4

[1]2003 Lummi Tribal Survey, LIBC Statistics Office.

3.2 TOPOGRAPHY

The Lummi Reservation is comprised of two relatively large upland areas on the mainland, a smaller upland area on Portage Island, and two distinct lowland areas (the floodplains of the Lummi and Nooksack rivers and the Sandy Point Peninsula). The maximum elevation of the northwestern upland area of the Reservation is about 220 feet above mean sea level (ft msl). The southern upland area is the Lummi Peninsula with a maximum elevation of about 180 ft msl. The maximum elevation on Portage Island is about 200 ft msl. The floodplain of the Lummi and Nooksack rivers, with an average elevation of approximately 10 ft msl, lies between the northern and southern upland areas. The Nooksack River and the Nooksack River delta are located along the northeastern extent of the Reservation. The Sandy Point Peninsula lies to the southwest of the northwestern upland. Figure 3.6 displays these geographic locations, the topography, and the major roads on the Reservation.

The upland and lowland areas of the Reservation total about 12,500 acres; the Reservation tidelands total approximately 7,000 acres. Individual tribal members or the Lummi Indian Business Council (LIBC) own approximately 75 percent of the upland area; 100 percent of the tideland areas are held in trust by the United States for the Lummi Nation.

During times of severe flooding from the Nooksack River, the Lummi Peninsula and Lummi Island (which is accessed by a ferry that lands at Gooseberry Point) are isolated from mainland service, supplies, and emergency response, resulting in a threat to human health and safety.

3.3 CLIMATE

Based on climate data collected at the Bellingham Airport, the average annual precipitation on the Reservation over the 1960-1990 “normal” period is approximately 36 inches. On average, November, December, and January are the wettest months; June, July, and August are the driest months. About 75 percent of the average annual precipitation occurs from October through April; the remaining 25 percent occurs from May through September.

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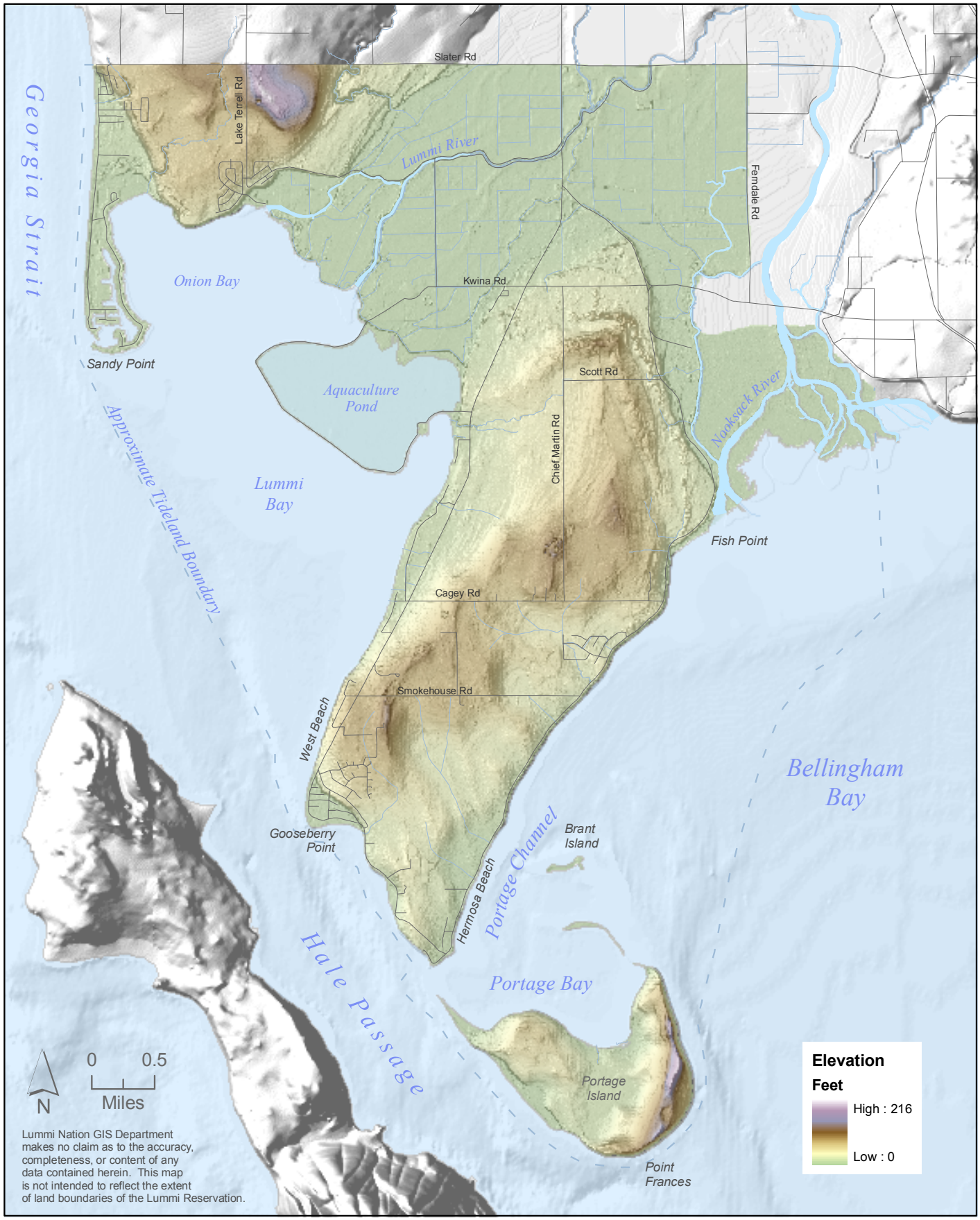

Figure 3.6 Topography, Surface Water Drainages, Place Names, and Roads of the Lummi Reservation

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Wind data for Bellingham indicates that the prevailing wind direction on the Reservation is from the south and southwest, with gusts upward of 80 miles per hour. Winds from the west are not as common and generally not as strong (Corps 1997). However, strong winds from the west-northwest, coupled with a high tide, have resulted in damaging coastal flooding along the Sandy Point Peninsula and coastal erosion along the Lummi Peninsula (see Section 4).

The Reservation experiences a variety of infrequent weather patterns. A typical but infrequent weather pattern is generated from the northeast by cold air masses moving down the Fraser River valley. Strong winds from this pattern, blowing across the Fraser and Nooksack river basins, has caused damage to the residents and businesses of the Reservation (USDA 1992). Another typical but infrequent weather pattern involves continental air masses from the east that bring unusually dry weather that can last a few days or weeks (USDA 1992). During the summer, these air masses bring unusually warm temperatures (mid to upper 90°s Fahrenheit). During the winter, these air masses usually bring cold temperatures (0°F and colder).

Because most of the precipitation occurs during the winter months when evapotranspiration demand is low, all of the ground water recharge and most of the storm water runoff occurs during this season. After the rainy season and during the summer months with low rainfall and high evapotranspiration demand, vegetation slows the movement of storm water and the amount of water available for ground water recharge or surface water runoff is small.

3.4 HYDROGEOLOGY

The hydrogeologic conditions on the Lummi Reservation have been described previously by the USGS and others (Washburn 1957, Cline 1974, Easterbrook 1973, Easterbrook 1976). In general, the Reservation is underlain by unconsolidated sediments deposited as glacial outwash, glaciomarine drift, glacial till, and floodplain or delta deposits of Quaternary age (Washburn 1957). The unconsolidated deposits consist of clay, silt, sand, gravel, and boulders. Because the composition of the deposits commonly change over short vertical and horizontal distances, it is difficult to distinguish the different stratigraphic units from the existing well log data.

3.4.1 Reservation Aquifers

Ground water in Reservation aquifers is obtained primarily from outwash deposits of sand and gravel in the unconsolidated glacial sediments, which are recharged by local precipitation. Glaciomarine drift is at or near the ground surface over much of the upland areas on the Reservation. The glaciomarine drift overlays the outwash deposits and contains substantial amounts of clay. This clay restricts the recharge to the underlying aquifer and promotes storm water runoff.

The floodplain of the Lummi and Nooksack rivers, which contains a surface aquifer that is saline (Cline 1974), separates the potable water systems in the northern and southern upland areas of the Reservation. A third potable water system may exist on Portage Island, but information on the water quality and the potential yield of this system is limited and inconclusive (LWRD 1997).

Because the hydrogeologic conditions on the Reservation vary considerably over short distances, the precise locations of the aquifer recharge zones are not definitively known at this time. Until information that is more precise is developed, all of the northern and southern upland areas on the Reservation are assumed to be aquifer recharge zones. Since the sources of potable water within these zones are outside of the floodplain and coastal flood-prone areas, flooding in these flood-prone areas will not degrade ground water quality in the Reservation aquifers. Further information is provided in the Lummi Nation Wellhead Protection Program - Phase I Report (LWRD 1997).

3.4.2 Hydrologic Soil Groups

The United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) identified and described 39 different soil map units on the Reservation (USDA 1992). As part of the USDA-NRCS characterization, each soil type was assigned to one of four hydrologic soil groups based on their runoff-producing characteristics.

The primary consideration in assigning a soil to a hydrologic soil group is the inherent infiltration capacity of the soil with no vegetation (USDA 1992). The hydrologic soil groups, which are labeled A, B, C, or D, are described in Table 3.3. In essence, Group A soils have a low runoff potential and a correspondingly high infiltration potential whereas Group D soils have a high runoff potential and a low infiltration potential. The runoff and infiltration potentials of Group B and Group C soils are between those of Group A and Group D soils.

As shown in Table 3.3, about 13 percent of the soils on the Reservation have a low or moderately low runoff potential (Group A or Group B). The remaining 87 percent of the soils on the Reservation have a moderately high or high runoff potential (Group C or Group D). These soil characteristics suggest that less than 15 percent of the Reservation uplands have a good aquifer recharge potential.

As shown in Figure 3.7, the Group C and D soils are found in much of the upland areas and in the floodplain of the Lummi and Nooksack rivers. Most of the northern and southern upland areas on the Reservation have a moderately high or high runoff potential. A review of the soil map units in the areas north of the Reservation suggests that most of these soils also have a moderately high or high runoff potential. The low infiltration potential of the soils in the floodplain and Sandy Point areas of the Reservation extends the amount of time that impounded floodwaters and local ponding of water cover the ground.

Table 3.3 Descriptions of Hydrologic Soil Groups on the Lummi Reservation

Hydrologic Soil Group	Description[1]	Percent of Reservation Soils
A	Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep (3-6+ ft), well- to excessively drained sands (loamy sands, sandy loam, and sands) and/or gravel. These soils have a high rate of water transmission and a low runoff potential.	2.7
B	Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep (20+ inches) and moderately well- to well-drained soils with moderately fine to moderately coarse textures (loam, silt loam). These soils have a moderate rate of water transmission and a moderately low runoff potential.	10.0
C	Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water and (2) soils with moderately fine to fine texture (sandy clay loam) and a slow infiltration rate. These soils have a slow rate of water transmission and a moderately high runoff potential.	40.4
D	Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with a high swelling potential, (2) soils with a high permanent water table, (3) soils with clay pan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and a high runoff potential.	46.9

[1] USDA 1970

3.5 RESERVATION WATERSHEDS

Reservation watersheds were delineated and mapped during the development of the Lummi Reservation Storm Water Management Program Technical Background Document (LWRD 1998). The watershed boundary map developed as part of the SWMP is a working map that is intended to change as new information is acquired. The working map was modified (Figure 3.7) to account for field observations made during the field verification element of the comprehensive wetland inventory of the Reservation (Harper 1999; LWRD 2000a). Further modifications are anticipated as new Digital Elevation Models are obtained and additional field research is conducted on the Reservation and in the watersheds that extend off-Reservation.

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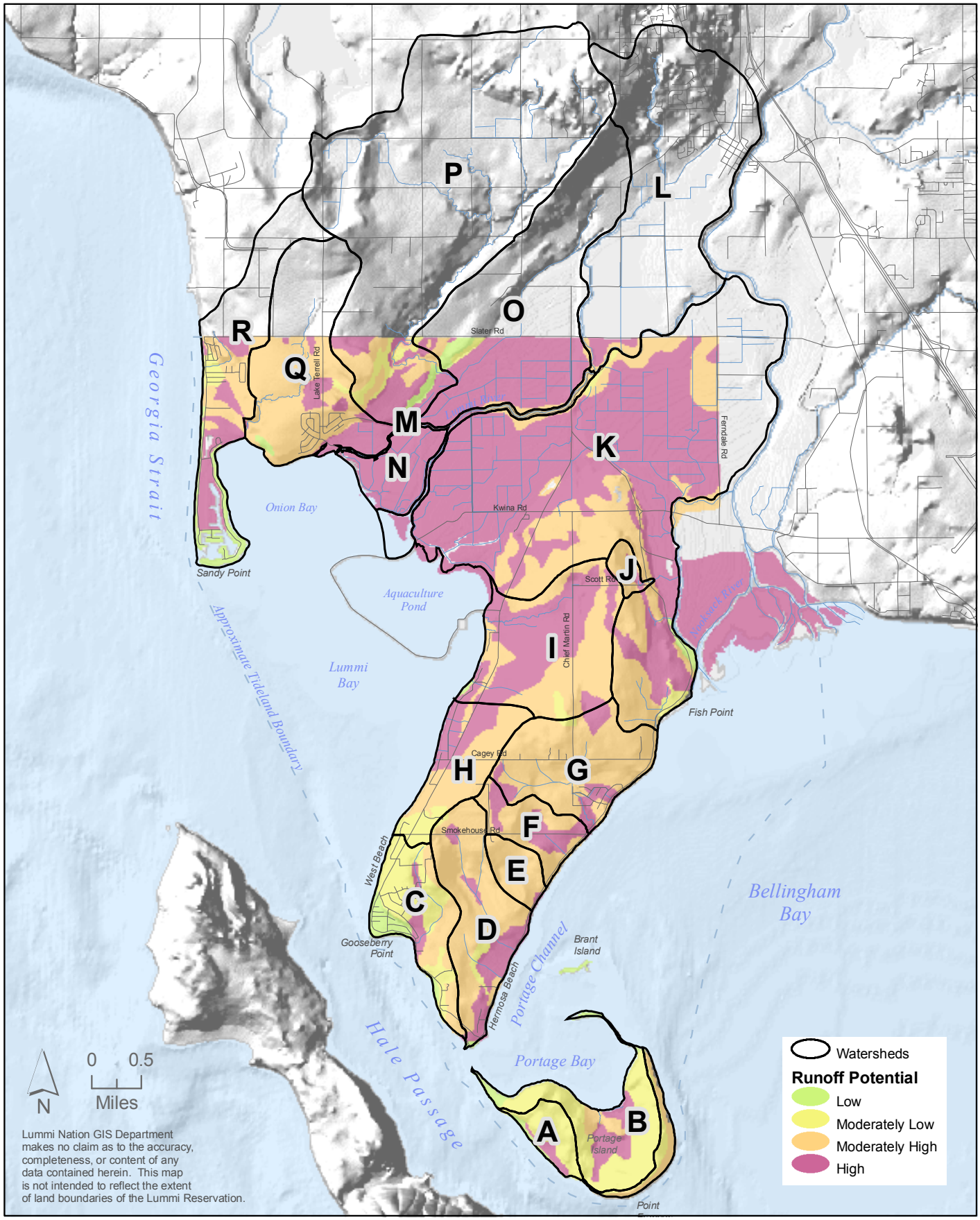

Figure 3.7 Hydrologic Soil Groups, Watersheds, and Surface Waters of the Lummi Reservation

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Alphabetic letters (A through S) identify the Reservation watersheds on an interim basis (Figure 3.7). It is anticipated that names will be assigned to the watersheds over time. Nineteen watersheds drain the Reservation uplands into Lummi and Bellingham bays, Hale Passage, and Georgia Strait. Seven of these watersheds originate off-Reservation and the remaining twelve occur entirely within the Reservation.

3.6 SURFACE WATER RESOURCES

Surface waters on the Lummi Reservation include the Nooksack River, the Lummi River, sloughs, small streams, roadside and agricultural ditches, springs, wetlands, estuaries, and marine waters. Short intermittent streams and numerous springs drain the Reservation uplands. The springs occur both above and below the high tide line. These streams and springs discharge onto tribal tidelands along Bellingham Bay, Portage Bay, Hale Passage, Lummi Bay, Onion Bay, and Georgia Strait, or to the floodplain of the Lummi and Nooksack rivers. The floodplain is drained by a network of agricultural drainage ditches and by the Lummi and Nooksack rivers (Figure 3.7). These surface waters are described in this section. The locations of most of these features were shown previously in Figures 3.7 and 3.8 or are shown in Figure 3.9.

3.6.1 Rivers, Sloughs, Streams, and Ditches

The Nooksack River drains most of western Whatcom County and currently discharges to the marine water of Bellingham Bay near the eastern extent of the Reservation. The Nooksack River reach located on the Lummi Reservation is tidally influenced. Streamside levees are in place to protect agricultural lands from flooding. Several named sloughs, which are the remains of former river channels, have been incorporated into the agricultural drainage network built on the floodplain of the Lummi and Nooksack rivers. Kwina Slough, a distributary channel on the Nooksack River delta, was used as the water source for the Seaponds salmon hatchery until March 2004. However, because this water source is unreliable and withdrawals from the channel may negatively impact salmon habitat in this area, the intake was moved to the mainstem of the Nooksack River and began operation in March 2004.

In general, the Lummi River currently carries storm water runoff from the Ferndale upland as well as the drainage from a complex network of agricultural ditches in the floodplain. Tidal waters enter the Lummi River from Lummi Bay twice daily and, during the dry season, saline water extends as far upstream as Slater Road. Although Nooksack River water currently flows through a four-foot culvert into the Lummi River channel only during high-flow events (greater than approximately 10,000 cfs), available data indicate that the Lummi River flow was around 200 cfs as recently as June 1955 (WSDC 1964), when a five-foot culvert allowed fresh water to flow from the Nooksack River into the Lummi River channel (Deardorff 1992).

There are several mapped and previously unmapped streams on the Reservation. Most of the unmapped streams have poorly defined channels and contain surface flow only during the October through May period. The approximate locations of these streams were identified as part of the 1997 inventory of storm water facilities on the Reservation (LWRD 1998). No flow was observed during a field survey of all Reservation streams in late August 1996, leading to the conclusion that, other than the Nooksack and Lummi rivers, there are no perennial streams on the Reservation.

3.6.2 Springs and Wetlands

Upland springs are found throughout the Reservation and are commonly ground water discharge zones for shallow, perched aquifers. A seep or spring occurs if the land surface intercepts the aquifer, and wetlands may occur at the seep or spring if conditions are favorable (e.g., clayey soils, shallow slope). In addition to upland springs, springs occur along the shoreline, below the ordinary high water line (vegetation line), at numerous locations on the Reservation.

Historically, springs emerging in the uplands served as a water supply for the Lummi people. In many cases, they are part of a wetland system in which the water reinfiltrates along the lower terraces to return to ground water. The springs are important for wildlife habitat and for aquifer recharge and protection. Upland aquifers, which provide the primary Reservation drinking water supply as well as the water for salmon egg incubation and rearing in the hatchery program, have experienced depletion and saltwater intrusion. Where it occurs, the infiltration of fresh water above the shorelines provides a buffer against saltwater intrusion.

The 1999 comprehensive inventory of Reservation wetlands (Figure 3.8; Harper 1999; LWRD 2000a) indicated that approximately 43 percent of the Reservation land area is either wetlands or wetland complexes. Wetland complexes are areas where wetlands and uplands form a highly interspersed mosaic. During the wetland inventory, boundaries were drawn around the outer edges of the mosaic of upland and wetland areas and the entire area was labeled as a “wetland complex”. Consequently, the estimated total wetland area identified in the inventory represents more wetland area than actually exists. Some of the wetlands and wetland complexes found in the comprehensive inventory were classified as agricultural and forest land cover areas (instead of as wetlands) in Table 3.1. About 50 percent of the total area of wetlands and wetland complexes identified on the Reservation in 1999 is located in the floodplain of the Lummi and Nooksack rivers. Approximately 60 percent of the floodplain on the Reservation was classified as wetlands or wetland complexes (Lynch 2001). An update to the 1999 wetlands inventory is currently underway. The update includes revising the locations and extent of all wetlands on the Reservation and collecting additional information on the functions and classifications of these wetlands.

Most of the once extensive floodplain wetlands of the Lummi and Nooksack rivers have been diked, drained, filled, and cultivated since the late 1800s. Low areas near some of the sloughs still reflect the rich and complex wetland habitat that likely covered most of the lower floodplain before human alteration. Small estuarine wetlands lie in sheltered, low energy areas at Onion Bay, Neptune Beach, Portage Island, the Lummi River floodplain, the Nooksack River delta, and adjacent to the Seaponds dike.

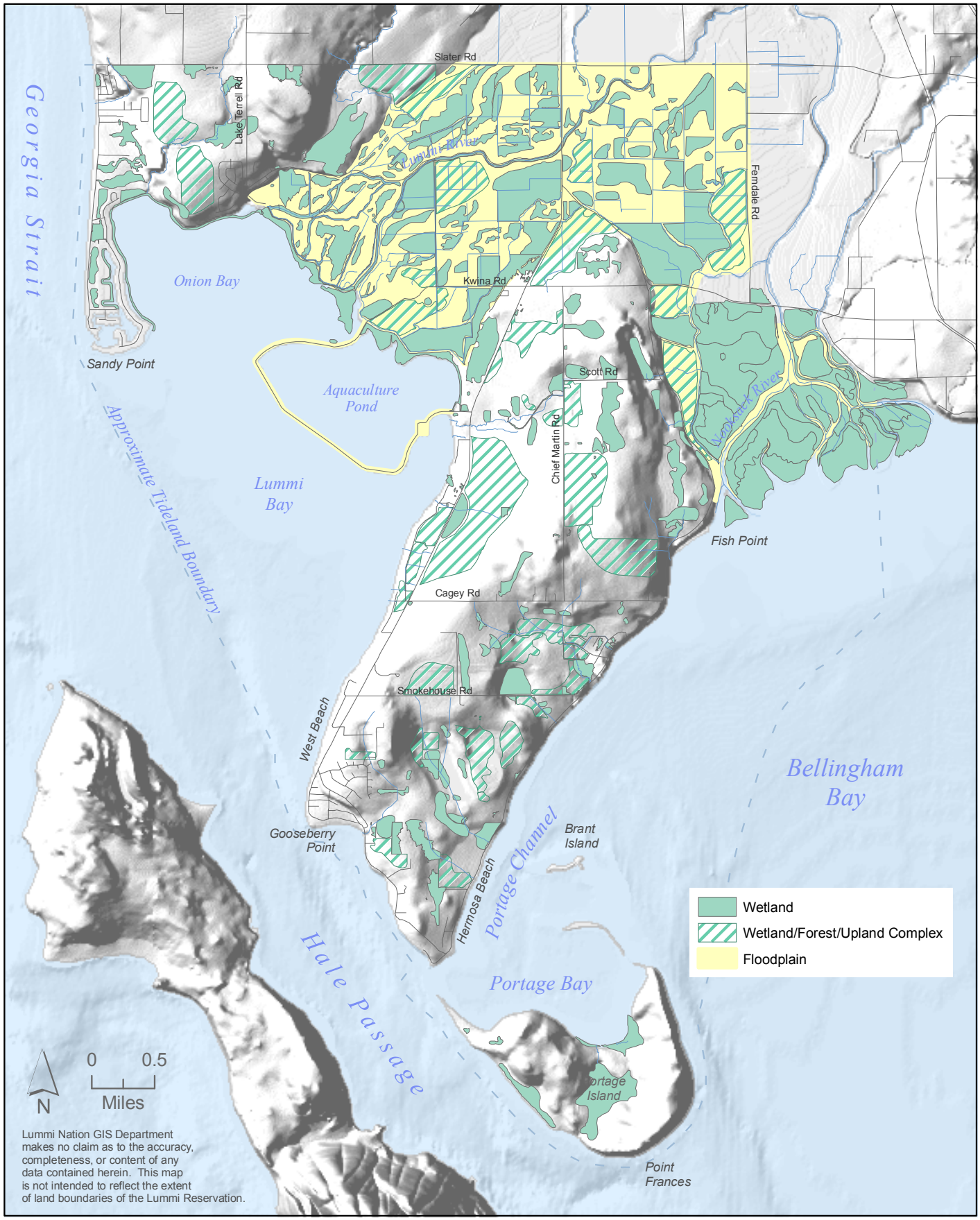

Figure 3.8 Wetlands, Streams, and Riverine Floodplains of the Lummi Reservation

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Road construction and agricultural activity have altered the wetlands that are north of Marine Drive and adjacent to the Nooksack River. South of Marine Drive, many of the wetlands in the Nooksack River delta have been physically altered by the accumulation of sediment deposited by the Nooksack River as it discharged to the marine waters of Bellingham Bay. The Nooksack River delta was identified as the fastest growing delta relative to its basin size in Puget Sound, with a progradation of approximately one mile over the 1888 - 1973 period (Bortleson et al. 1980). Consequently, a large area that was once intertidal is now supratidal and new wetlands have been formed. In addition to the delta progradation, the wetlands of the Nooksack River delta are likely affected by the low instream flows and poor water quality that characterizes the river during some summer months.

Remnants of what were once extensive, high-value wetlands are located on the Sandy Point Peninsula between Sucia Drive and the private Sandy Point marina. The private Sandy Point marina and its associated canal system were excavated in the 1960s from uplands that were periodically inundated by marine waters. Road construction, dense residential development and associated shore defense works, and drainage facilities now limit tidal inundation, but wildlife and wetland vegetation is abundant. Plants of traditional cultural significance have been identified in this area. Further north along Sucia Drive, formerly dry and seasonally wet areas are now permanently flooded as a result of road construction that blocked natural drainage.

These palustrine/estuarine emergent wetlands of the lowlands/floodplains are significant for storm water attenuation, floodwater storage, water quality enhancement, fish habitat, wildlife habitat, and for plants with traditional cultural importance. The estuarine wetlands provide critical rearing habitat for migrating salmon, herring, smelt, and other finfish and shellfish. The significance of these wetlands is increasing as wetlands upstream from the Reservation are altered and destroyed. These Reservation wetlands reduce the water quality impacts of off-Reservation land uses on Lummi commercial and subsistence shellfish beds in Portage and Lummi bays. Protecting and enhancing floodplain and estuarine wetlands is essential to preserving and/or restoring interdependent fish, shellfish, and wildlife habitats in addition to reducing flood damage.

3.6.3 Estuarine and Marine Waters

Brackish estuarine waters grade to marine waters of the Reservation in Lummi Bay, Portage Bay, portions of Bellingham Bay and Hale Passage, and the shoreline along Georgia Strait. Saline water moves across tideflats and into the Lummi and Nooksack river channels twice daily with the tidal cycle. The salt water underlies the less dense fresh water and moves as a wedge upstream. Salt water has been measured upstream as far as Slater Road in the Lummi River and nearly to the fork between the west and east distributaries of the Nooksack River. Tidal effects on the water level (backwater effects) in the Nooksack and Lummi rivers have been observed even further upstream (and possibly occur as far upstream as Ferndale).

Brackish estuarine waters of the Nooksack and Lummi river deltas form the interface between marine and fresh water. Estuarine waters are important habitat for juvenile and adult salmon as they acclimate to either saline or fresh waters during their seaward and landward migrations, respectively. Estuaries also serve as habitat for juvenile and adult life stages of many other important aquatic species.

Estuarine wetland ecosystems, including saltwater marshes, in general are considered among the most productive (in biomass production per unit area) natural ecosystems on earth. In addition to providing rearing habitat for juvenile salmonids and other species, these ecosystems export a large amount of biomass to estuaries. This biomass can form a large portion, sometimes the majority, of the base of the estuarine food web (Mitsch and Gosselink 1993, as described in LWRD 2000b). Small estuarine marshes in Lummi Bay occur in sheltered fringes of diked areas. As mitigation for wetland filling at the new casino site north of the Lummi River, a 17.1-acre saltwater marsh was restored along the waterway adjacent to the Lummi Bay seawall in August 2001.

The complex and rich aquatic resources that provide feeding grounds for fish also attract a large variety of wildlife. The estuaries of the Lummi and Nooksack rivers are a part of a major Pacific Coast flyway for ducks, geese, swans, and shorebirds. These estuaries are also habitat for the threatened and endangered bald eagle and peregrine falcon as well as numerous other birds of prey.

Lummi Bay tideflats are extensive and rich in resources for tribal subsistence and as feeding areas for wildlife. Less extensive tideflats at Gooseberry Point, the Stommish Grounds, and Portage Bay are also important to the tribal economy and culture.

3.7 STORM WATER RUNOFF

As shown in Figures 3.6 and 3.7, there are numerous intermittent streams and agricultural drainage ditches on the Reservation. These channels convey storm water either to the surrounding marine waters or to the floodplains of the Lummi and Nooksack rivers. As described previously, 87 percent of the soils on the Reservation are in Hydrologic Soil Groups C or D (soils with moderately high to high runoff potential). The presence of these soil types on the Reservation, coupled with the drainage enhancements, suggest that a large percentage of the winter precipitation becomes storm water runoff.

Unit runoff maps that were developed as part of a study of the Nooksack River Basin by the Washington State Department of Conservation (WSDC 1960) estimated that the mean annual runoff from the Reservation is about 15 inches per year. This estimate represents about 42 percent of the mean annual precipitation and about half of the precipitation that occurs from October through May.

4. NATURAL HAZARD RISK ASSESSMENT

Fundamental to effective hazard mitigation is general and specific information related to the nature, distribution, probabilities of occurrence, frequency, and severity of historic hazard events (both natural and human-caused). When linked to demographic, economic, infrastructure, structural, and other societal data, risk evaluations and vulnerability assessments can be performed. The amount, availability, and quality of information about different hazards vary widely. Limited information for some hazards results in greater uncertainty in the risk assessment for those hazards. This Multi-Hazard Mitigation Plan is focused on natural hazard mitigation. The human-caused hazard of hazardous material spills, particularly of oil, are addressed in the 2005 Lummi Nation Spill Prevention and Response Plan

The following assessment of natural hazard risks on the Reservation describes the nature and location of past and potential natural hazard events, assesses the vulnerability of Reservation areas to each hazard, estimates the value of structures and/or property in areas that are vulnerable to hazards, and provides an analysis of the risk to life, property, economic activity, and the environment that may result from natural hazard events on the Reservation. In the first subsection, the natural hazards on the Reservation are identified. Each hazard is then defined; past hazard events are described; the vulnerability of residential units, LIBC facilities, and the facilities of other organizations on the Reservation is assessed; and the potential losses to these residences and facilities are estimated. In the final subsection, the relative vulnerability of Reservation areas and critical LIBC facilities is summarized.

The PDM program rules require tribes that are submitting a State level plan to assess hazard risks by jurisdiction. Since the LIBC is the only governing body for the Lummi Reservation, there are no local jurisdictions. As a result, this MHMP defines six geographic areas of the Reservation as "jurisdictions" and assesses and compares the relative hazard risks within these six areas. Organizing the risk assessment in this way meets the jurisdiction requirement of the PDM program rules and simplifies the assessment and interpretation of relative risks to developed areas on the Reservation. The six assessment areas are labeled the Sandy Point Peninsula, Northwest Upland, Floodplain (Nooksack and Lummi river floodplains), Lummi Peninsula, Gooseberry Point (for the coastal flooding area at the southwest corner of the Lummi Peninsula), and Portage Island. The Portage Island assessment area is currently unoccupied and undeveloped. As a result, it was assessed for hazard vulnerability, but not for potential losses. Figure 4.1 identifies these six areas of the Reservation. For the purpose of this assessment, the Seaponds dike and hatchery buildings in Lummi Bay are considered as part of the Floodplain assessment area.

After a brief description of the methods used to identify hazards in each assessment area and the methods used to conduct a vulnerability assessment for each hazard, the remainder of this section addresses each of the natural hazards of concern on the Reservation. Profiles of past events, an assessment of vulnerability, and potential losses are presented for each of the natural hazards.

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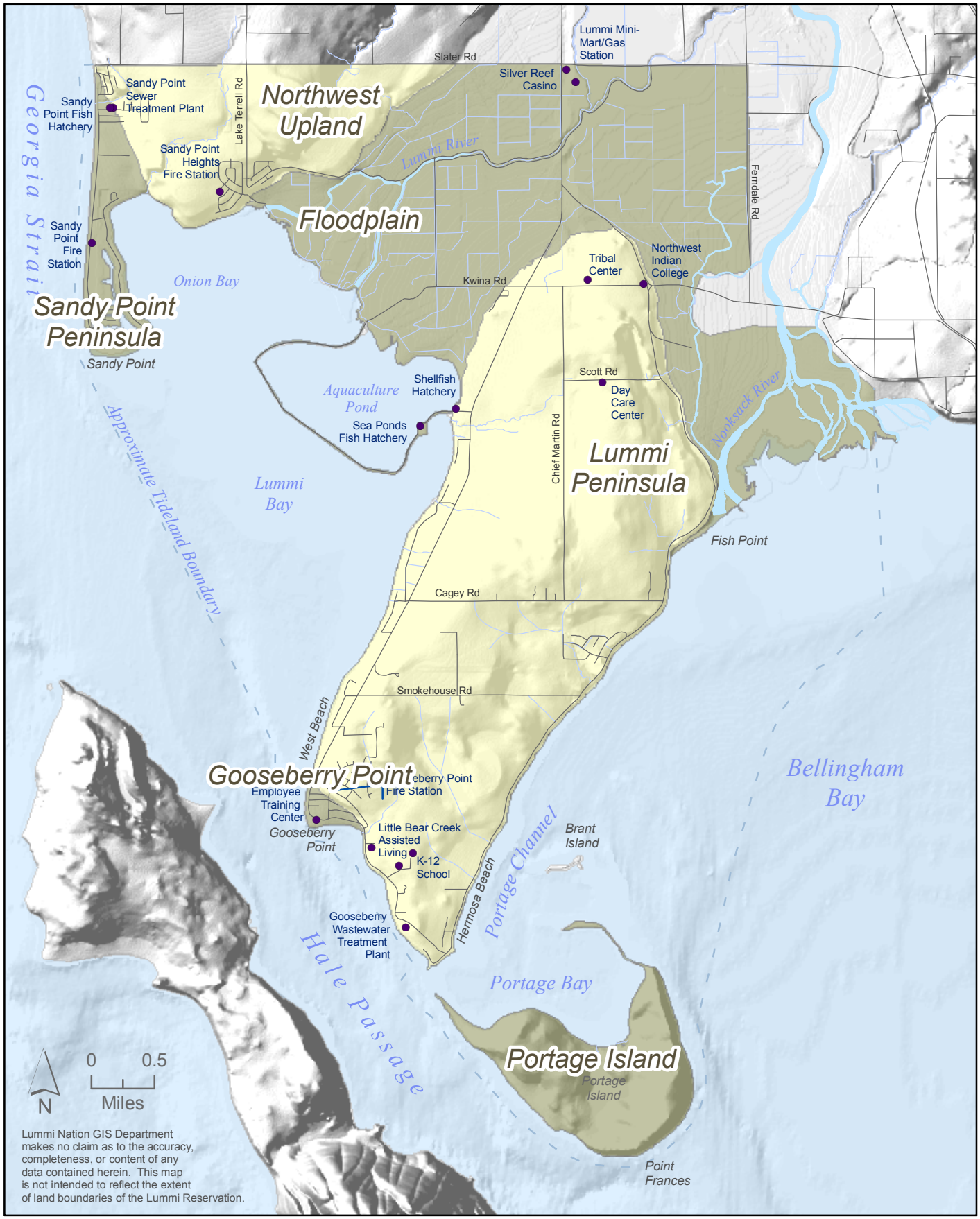

Figure 4.1 Hazard Assessment Areas on the Lummi Reservation

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4.1 HAZARD IDENTIFICATION AND VULNERABILITY ASSESSMENT METHODS

The Lummi Nation Natural Resources Department took the following steps to identify hazards that have affected the Reservation in the past and/or can be expected to affect the Reservation in the future:

- Review of past state and federal disaster designations;
- Review of regional hazard information and analyses prepared by state, federal, and Canadian agencies and reports prepared by university researchers;
- Review of Internet web sites containing regional hazard information;
- Review of the Washington State Hazard Identification and Vulnerability Assessment (WEMD 2001) and the Whatcom County Hazard Identification and Vulnerability Analysis (Whatcom County 2002); and
- Review of the Revised Preliminary 2003 Flood Insurance Rate Maps (FEMA 2003c); Nooksack River Flood History (Whatcom County 1995a); Lower Nooksack River Comprehensive Flood Hazard Management Plan (Whatcom County 1999); and the Lummi Nation Flood Damage Reduction Plan (LWRD 2001a).

Additional documents reviewed for the 2007 update include the Final January 16, 2004 Flood Insurance Rate Maps (FEMA 2004); the January 16, 2004 Flood Insurance Study for Whatcom County (FEMA 2004a) the Washington State Enhanced Hazard Mitigation Plan (WEMD 2004), the Whatcom County Natural Hazards Mitigation Plan (Whatcom County 2004), and the Tulalip Tribes Tribal/State Level Hazard Mitigation Plan (TOEM 2006). Hazard specific documents were also reviewed and are referenced in each hazard section. New data used in the GIS analyses include digital elevation models developed from Laser Imaging Detection and Ranging (LIDAR) flights, a 2007 addressed structure layer, and the 2007 Whatcom County Assessor's database.

The natural hazards that have affected the Reservation in the past and will affect the Reservation in the future are floods, earthquakes, severe winter storms, coastal erosion, windstorms, wildfires, drought, and landslides. In addition, volcanic activity from Mt. Baker and a tsunami (commonly called a "tidal wave") have a low probability of occurrence, but are potentially large hazards on the Reservation. The Reservation also has a very low vulnerability to tornadoes. As a result of the literature review described above and feedback gained from public review of the Draft Lummi Nation Multi-Hazard Mitigation Plan, all of the above natural hazards are assessed in this plan.

Information acquired from the materials listed above was also used to estimate the vulnerability of the Reservation assessment areas to each hazard. This information included the probability of occurrence of hazard events, the types of damage associated with a hazard, and the relative vulnerability of each assessment area. After compiling this hazard information, areas of the Reservation vulnerable to the hazards were identified. The estimated relative levels of vulnerability for each hazard assessment area were based on the following factors:

- Probability of damage resulting from a large hazard event;
- Types of damage associated with the hazard;

- Historic and/or potential severity of damage;
- Potential damage relative to other hazards; and
- Vulnerability of each area relative to other areas, both within the Reservation and in other regions.

The relative probability of hazard occurrence (between hazards) is not reflected in the vulnerability assessments. For example, although the Floodplain assessment area was rated as having a high vulnerability to both floods and volcanoes, it is much more likely to be affected by floods. The ratings for each hazard therefore reflect the estimated vulnerability if a large hazard event occurs. In addition, the amount of development in each assessment area was not factored into the estimated vulnerability for an area. For example, although the Sandy Point Peninsula and Floodplain areas have very different levels of development, they have the same estimated earthquake vulnerability. Different levels of development are reflected in the estimated potential losses for each area: highly developed areas have greater potential losses.

The loss estimates were determined by first by collecting the number and value of structures within each assessment area. For the 2007 update, the number of structures for each assessment area was determined by GIS analysis of a layer of all structures digitized from 2004 Pictometry® imagery with six inch resolution. Structure value was estimated from 2006 insurance reports for structures owned by the Lummi Indian Business Council (LIBC), Lummi Commercial Company (LCC), and Lummi Tribal Sewer and Water District (LTSWD); the building assessed value from the 2007 Whatcom County Assessor's database for the assessment areas with primarily fee parcels, and the replacement value for assessment areas with primarily trust parcels. For each hazard, a loss estimation was made for structures and contents for each vulnerability area as appropriate within each of the six assessment areas.

To identify any new hazards and maintain records on previously identified hazards, information on hazards that occurred during the three year period between 2004 and 2007 was collected. During this period, one previously unidentified hazard, a tornado, occurred in Whatcom County and a tornado section has been added to this hazard inventory and vulnerability assessment. The section for each existing hazard has been updated by including any new, improved, information in the description of the hazard, adding events that occurred between 2004 and 2007 to the hazard profile, considering these new events together with completed mitigation projects in the vulnerability assessment, and including updated insurance and assessed values in the estimation of potential losses.

4.2 FLOODS

Flooding in riverine systems is a natural occurrence that results when runoff from rain or snowmelt exceeds the carrying capacity of river channels, ditches, drains, reservoirs, and other waterbodies. Flooding in coastal areas is a natural occurrence that results when high tides and/or storm-driven waves overtop naturally created storm berms or man-made shore defense works. In this section, past riverine and coastal flood events, flood vulnerability, and potential flood losses on the Reservation are described.

4.2.1 Profiles of Past Flood Events

Flood events on the Lummi Reservation can be divided into two broad categories: (1) flooding of the Nooksack River and (2) coastal flooding along the approximately 38 miles of marine shoreline. During the 1990s, Nooksack River flood damage occurred at least five times on the Reservation in the Nooksack and Lummi river floodplains, while coastal flooding occurred at least eight times since 1993, causing substantial damage at least three times (2000, 2001, and 2003). The history and locations affected by flooding on the Reservation are described in this section.

4.2.1.1 Nooksack River Floods

As described previously, the Nooksack River drains a watershed of approximately 786 square miles. The river historically discharged primarily to Lummi Bay, but has discharged primarily to Bellingham Bay since around 1860 (WSDC 1960). Both of these river deltas are located on the Reservation.

Most major floods recorded on the Nooksack River occurred from late October through February. The position of the watershed on the west slopes of the Cascade Mountains results in large amounts of rainfall during warm and wet winter storms. The combination of a heavy storm, a melting low-elevation snowpack, and soils already saturated by preceding rainfall results in the most severe floods of the Nooksack River. Since over 70 percent of the watershed is in the mountainous areas above the City of Deming where precipitation is relatively high, the upper basin areas of the watershed contribute most to flood volumes (Whatcom County 1995a).

The November 10, 1990, (Veteran's Day) flood was typical of a severe Nooksack River flood. In the three days before the flood peak, ten to twelve inches of rain fell in the upper reaches of the watershed. Snowmelt above 2,500 feet was equivalent to several more inches of rainfall. Precipitation in the lowlands was six to seven inches (Corps 1991). This flood was the highest on record at the Ferndale river gage, approximately two miles north of the Reservation. With a calculated flow of 57,000 cubic feet per second (cfs), it was estimated to be a 59-year flood (i.e., to have an average return frequency of once in 59 years, which translates to a 1.7 percent chance of occurring in any given year) (Whatcom County 1995a).

Large floods of the Nooksack River have occurred throughout history, even before development in the floodplain and land use changes in the upper watersheds. The fact that floods will cause more damage today than several decades ago is more a result of the increasing amount of development susceptible to flooding than a result of increased flood magnitude. However, increased surface runoff and isolation of the river from

floodplain storage areas due to environmental alterations by humans have combined to increase downstream flows and hence the magnitude of floods.

The largest recorded floods of the Nooksack River are listed in Table 4.1. (Stream gage records began in 1935 at Deming and in 1945 at Ferndale.) Also included in Table 4.1 are current estimates of the 10-, 50-, and 100-year flood flows for the Nooksack River at Ferndale, Washington. Flows at Ferndale for floods before 1945 are estimated. The information and methods used to develop these estimates are described elsewhere (see Whatcom County 1995a and references therein). Other major known floods before 1935 occurred in 1883, 1891, 1893 or 1894, 1901, and 1927. Data from the adjacent Skagit River basin also indicate extreme floods in Western Washington in 1815, 1856, and 1909 (Whatcom County 1995a).

According to the information compiled in Table 4.1, it is possible that fourteen 10-year floods (including potential 50- and 100-year floods) occurred on the Nooksack River during the 20th century. Two 50-year, six 10-year, and eleven 5-year floods (including the 10- and 50-year floods) occurred since 1983. These higher than predicted recurrence intervals could be due to uncertainty in flood magnitude measurements or estimates (particularly at the Deming gage), an insufficient flood history for accurate recurrence interval calculations, and/or an increase in flood magnitudes in recent decades.

Flood Control Structures and Sequence of Flooding on the Reservation

Figure 4.2 shows the levels of protection provided by levees against Nooksack River flooding below Ferndale (Whatcom County 1997a). The information in Figure 4.2 is based on an inventory of the levee system performed by and for the U.S. Army Corps of Engineers (Corps) in 1988 (Corps 1988; NHC 1988). Whatcom County has developed an unsteady flow model of the lower Nooksack River that will be used to evaluate the existing levee system using levee surveys performed in 2000 (Cooper 2001, 2004). The levees in the City of Ferndale provide protection up to approximately a 60-year flood. During the November 10, 1990 flood, the river rose to within inches of overtopping sandbags on the levee near the Ferndale Wastewater Treatment Plant. The levees of Diking District No. 1 along the west bank of the Nooksack River (south of Ferndale) provide from less than five-year to up to ten-year flood protection. The main purpose of these levees is to prevent agricultural land from incurring damage from frequent floods. The levees along the east bank of this reach also provide from less than five-year up to ten-year protection. Additional flood control structures in this area include levees along the banks of the Lummi River, bank protection made of rip-rap, sea dikes/seawalls along Lummi Bay, tide gates in the Lummi Bay seawall, and floodgates along Lummi Bay and floodplain sloughs.

When the levee along the western side of the lower Nooksack River fails or is overtopped, floodwaters discharge to both Lummi and Bellingham bays. Floodwater moving toward Lummi Bay accumulates landward of the seawall. Although tide gates are designed to prevent tidal/marine waters from flowing inland and allow the floodwater to drain to Lummi Bay, historically they have been overwhelmed and ineffective during large floods. The seawall has been intentionally breached during past floods to allow the floodwaters to drain during lower tides. This draining is largely stopped during higher tides as the marine waters flow inland and “back-up” the floodwaters. Previous

Table 4.1 Nooksack River Flood Flows at the Ferndale Gage

Date	Flow (cfs)	Return Period (yr)	Chance (%/yr)	Rank (1945 - 2006)
1815	Very High[1]	n/a [2]		
1856	Very High[1]	n/a [2]		
March 15, 1908	Very High[1]	n/a [2]		
November 1909	Very High[1]	n/a [2]		
December 30, 1917	Very High[3]	n/a		
December 12, 1921	High[3]	n/a		
February 27, 1932	Very High[1,3]	n/a [2]		
January 25, 1935	Very High[3]	n/a [4]		
October 28, 1937	n/a[5]	n/a [4]		
100-year	**62,800**	**100**	**1.0**	
November 10, 1990	57,000[6]	59	1.7	1
November 24, 1990	56,600[6]	56	1.8	2
50-year	**55,500**	**50**	**2.0**	**n/a**
February 10, 1951	55,000[6]	48	2.1	3
November 11, 1989	47,800[6]	22[7]	4.5	4
November 30, 1995	47,200[6]	23[8]	4.3	5
December 3, 1975	46,700[6]	23	4.3	6
November 25, 2004	42,300	13[8]	7.7	7
October 26, 1945	41,600[6]	12	8.3	8
January 5, 1984	41,500[6]	12	8.3	9
10-year	**40,000**	**10**	**10.0**	**n/a**
October 21, 2003	39,600	9[8]	11.1	10
October 18, 2003	38,500	8[8]	12.5	11
January 31, 1971	38,100	8	12.5	12
March 20, 1997	38,100	8[8]	12.5	12
November 7, 2006	37,900	8[8]	12.5	13
December 15, 1979	36,400	7	14.3	14
November 24, 1986	36,000[6]	6	16.7	15
November 4, 1955	35,000	6	16.7	16
January 11, 1983	34,200	5	20.0	17
January 19, 2005	30,900	4[8]	25.0	18
January 16, 1961	30,800	4	25.0	19
February 23, 2002	30,300	4[8]	25.0	20
April 30, 1959	30,200	4	25.0	21
February 25, 1986	29,900	3	33.0	22
December 27, 1980	29,700	3[8]	33.0	23
November 19, 2003	29,610	3[8]	33.0	24
January 5, 1969	28,100	3[8]	33.0	25
January 9, 2002	28,100	3[8]	33.0	25
November 27, 1949	27,500[6]	3	33.0	26
February 15, 1982	27,200	3[8]	33.0	27
November 20, 1962	26,000	2	50.0	28

[1]Historical flood occurred before stream gage was established. Flow estimated from high water marks at Deming or data from the Skagit River (Whatcom County 1995a).
[2]Estimated return period greater than that of a 100-year flood at Deming or on the Skagit River (Whatcom County 1995a). (Estimates based on Deming data are unreliable.)
[3]Based on gage data (presumably estimated from high water marks) on the USGS webpage: http://water.usgs.gov/wa/nwis/ (USGS Site No. 12213100, Nooksack River at Ferndale)
[4]Flow recorded at Deming gage, which is not accurate. An estimated return period is not reliable.
[5]Flow value not available (stream gage not yet in place).
[6]Flow value influenced by upstream Everson-to-Sumas overflow.
[7]Value cited (Whatcom County 1995a) is out of sequence and may be in error.
[8]Values not found in Whatcom County 1995a were estimated by interpolation.

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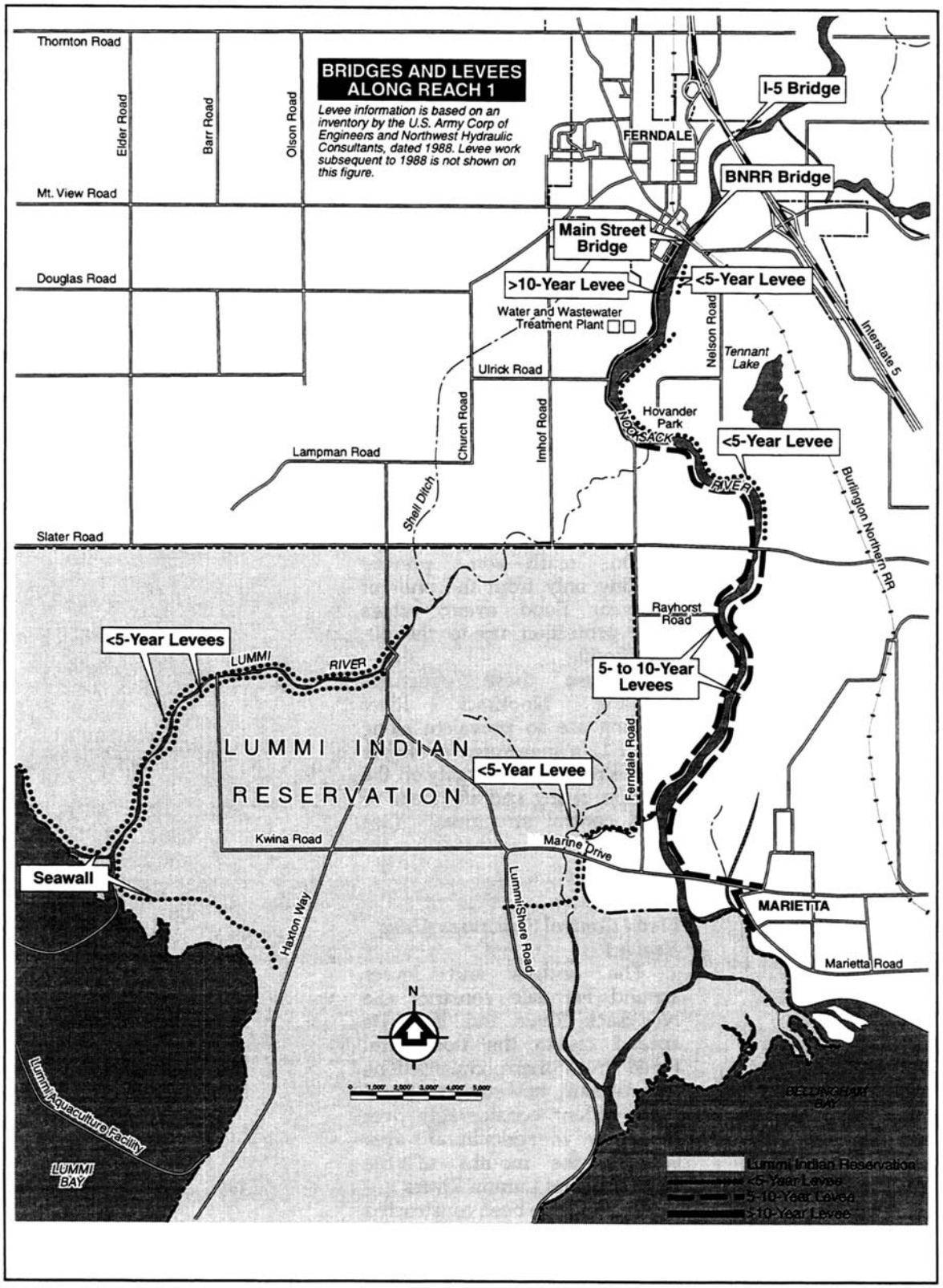

Figure 4.2 Levees along the Lower Nooksack River and Lummi River (Whatcom County CFHMP 1997)

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breaches of the seawall allowed saltwater at high tide to reach Haxton Way and the farmlands inland of the seawall. After the 1975 flood, the Corps rebuilt a short section of the seawall so that it would wash out under severe flooding. This fuse plug can prevent damage to the rest of the seawall by letting waters pass through only at that designated spot. Fuse plugs are designed to be replaced easily once the flood is over. How well this fuse plug will prevent seawall damage is not yet known (Whatcom County 1997a). If a flood results in a breach of the seawall section next to the Lummi aquaculture pond, extensive damage to this facility can be expected. In addition, in 1998 the six non-functioning tide gates mounted on 36-inch corrugated steel culverts were replaced by five concrete box culverts, four-feet-wide by six-feet-tall, fitted with “flapper” gates made out of aluminum. The effectiveness of these new tide gates has not been “tested” by a flood yet. Three five-foot by five-foot box culverts drain the northern distributary channel of the Lummi River.

One of the first areas to experience flooding on the Reservation as the Nooksack River rises is Marine Drive, west of the bridge crossing the river and just upstream from the delta. North of Marine Drive, the west bank levee follows Kwina Slough away from the main Nooksack River channel. Unprotected and crossing low ground in this stretch, Marine Drive is frequently flooded by low magnitude events (smaller than one-year floods). During the one-year period from the fall of 2001 through the summer of 2002, Marine Drive was flooded by six flood events that closed the road for at least 19 days. Marine Drive was closed twice in both 2003 and 2005, four times each year in 2004 and 2006, and twice in March 2007. These closures ranged from two to nine days long.

At flow levels near the five-year flood, the unleveed east bank across from Ferndale is overtopped with floodwaters. The floodwaters follow a natural overbank flow path through Hovander Park and eventually over Slater Road and Marine Drive. The floodwaters then generally threaten to overtop the low, poorly maintained levees surrounding the community of Marietta, on the east bank of the Nooksack River delta. At the level of 10- to 15-year floods, levees on both banks of the river downstream from Ferndale are overtopped, inundating large portions of the Lummi and Nooksack floodplains. The areas of inundation depend on where overtopping or breaching of the levees occurs and on the magnitude and duration of the flood. The Lummi River, levees along the Lummi River, and some roads in the floodplain can restrict floodwaters from spreading across the floodplain. Other roads that pass through the Reservation, including Slater Road, Haxton Way, and Marine Drive, have low elevation approaches to bridges that allow overbank flows to pass relatively unimpeded over the road surface (Whatcom County 1995a).

Major levee breaches have occurred along the lower Nooksack River during all large floods. As shown in Figure 4.4, the floods of 1951, 1971, 1975, 1989, 1990, 1995, and 1997 all caused levees to fail on both banks of the river (Whatcom County 1997a). These levee failures are most often caused by erosion when a levee section is overtopped. The levees may also weaken as the soils become saturated during extended floods, eventually resulting in failure of the levee. A levee failure relieves the pressure on downstream levees because the flow in the channel is reduced (Whatcom County 1995a).

In 1951, a breach occurred about a mile below the Ferndale Wastewater Treatment Plant, flooding the entire Lummi/Nooksack floodplain. In subsequent major floods, levee breaches occurred further downstream and floodwaters were confined to the area

between the Nooksack and Lummi rivers. A breach at Rayhorst Road was the main levee failure during the November 10, 1990 flood. Floodwaters from this breach contributed to the inundation of Haxton Way and eventually reached Lummi Bay (Whatcom County 1995a). A breach between Rayhorst Road and Kwina Slough was the main levee failure during the January 1, 1997 flood, which occurred after two ice jams that were each a mile long backed up the Nooksack River above the Slater Road and Marine Drive bridges (Bellingham Herald 1997). This flood inundated Haxton Way for four days (Whatcom County 1997a).

Effects of Recent Floods

During the 1990 floods, five major roads that provide access to and through the Reservation were inundated by floodwaters. These roads are Haxton Way, the major north-south connector, which also provides access to the Lummi Island ferry; Ferndale Road; Lummi Shore Road, north and south of Kwina Road; Marine Drive, the major access road to Bellingham from the Reservation; and Slater Road, the major access road along the northern boundary of the Reservation. Figure 4.3 presents photographs of the November 24, 1990, flood on the Reservation. Figure 4.4 shows the approximate area of inundation during the November 1990 floods.

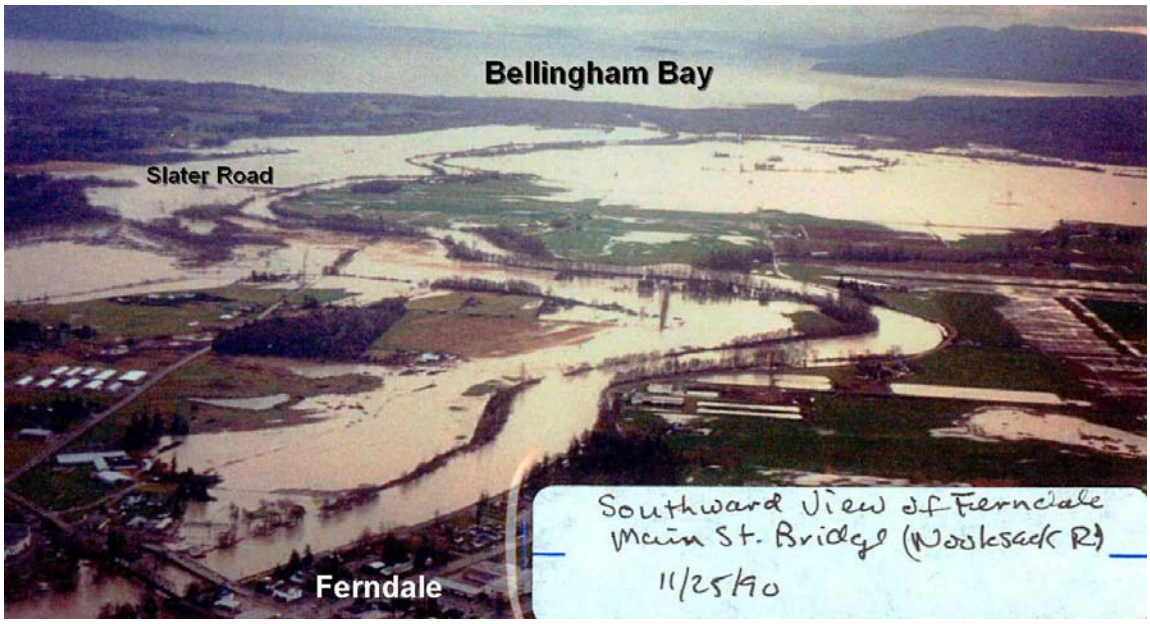
Inundation of homes and properties caused significant damage on the Reservation during these floods. Approximately 20 private residences, two businesses, and two natural resource production facilities were inundated by the 1990 floodwaters. Approximately 4,100 acres of land on the Reservation were flooded. Most of the flooded land was in agricultural use. Damage included deposition of sediment and debris on fields, erosion of topsoil near levee breaks and high velocity constriction points, and damage to fence lines and drainage structures in fields. Road damage included loss of road surfacing on North Red River Road and Marine Drive (Scott 1995).

In addition to causing erosion, high velocity floodwaters can threaten the physical integrity of buildings and other infrastructure on the Reservation. During the 1990 flood, levee breaches on the west bank of the Nooksack River allowed floodwaters to rush westward towards the intersection of Lummi Shore Road and Haxton Way, where floodwater velocities were reported to be very high. Several buildings, roads, and public water lines in the area were in danger of receiving substantial damage from the rapidly flowing floodwaters. To relieve the pressure of built-up water behind the Lummi Bay seawall during the 1990 and 1975 floods, the dike was intentionally breached at a point between the Lummi River outlet and the north end of the Aquaculture Dike. This breach and subsequent outflow of floodwater eroded portions of the aquaculture dike (Scott 1995).

Damage from the November 1995 flood included sedimentation in Kwina Slough, erosion and a breach of the Kwina dike, closure of Marine Drive, and erosion of the west bank of the Nooksack River upstream from the Marine Drive bridge (Thompson 1996). After the 1997 flooding, approximately $750,000 was obtained from the Federal Emergency Management Agency (FEMA) and the Bureau of Indian Affairs (BIA) to repair and/or refurbish the aquaculture dike.

As with any major flood on the Nooksack River, the 1990 floods carried the possibility of a public health threat to Reservation residents due to the fact that any pollution entrained by floodwaters upstream must pass through or be deposited on the Reservation.

View from Ferndale along the Nooksack River to Bellingham Bay



View along the Lummi River out to Lummi Bay

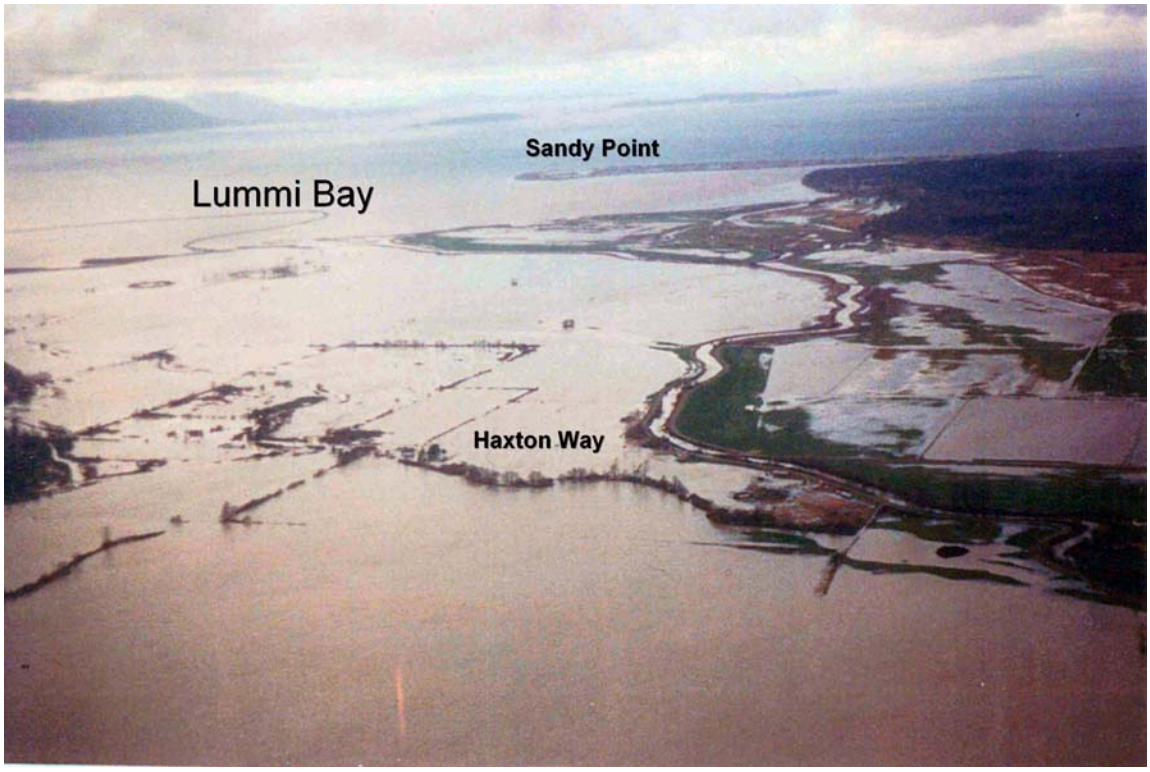


Figure 4.3 Flooding on the Reservation, November 25, 1990

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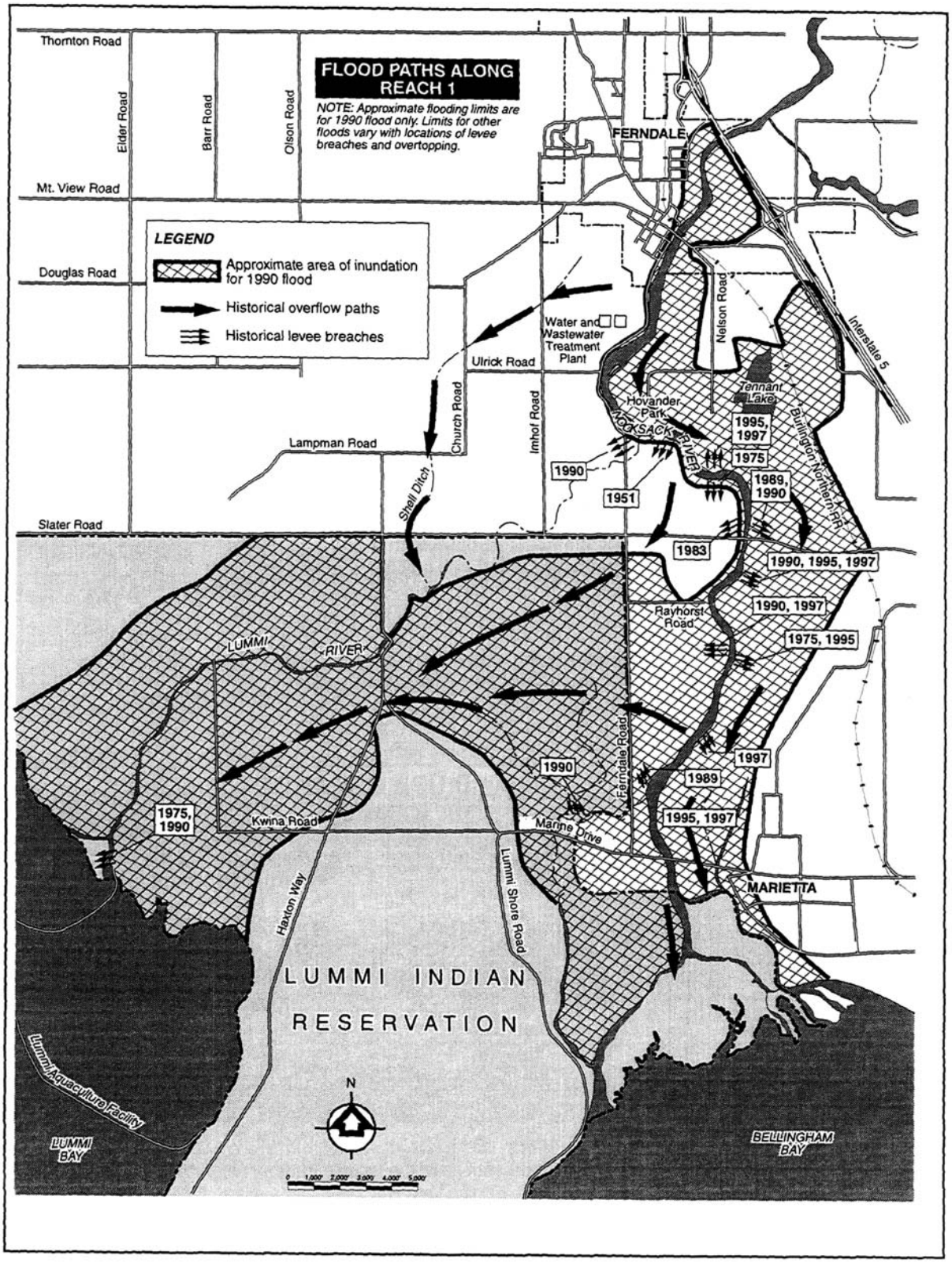

Figure 4.4 Area of Inundation (November 1990) and Historical Levee Breaches (Whatcom County CFHMP 1997)

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Various sources of pollution exist in the floodplain upstream, including dairy waste lagoons, solid waste sites, fuel storage facilities, and wastewater treatment facilities.

Marine Drive, Haxton Way, and Hillaire Road normally provide the only road access to the Lummi Peninsula and Gooseberry Point. During major floods, these transportation routes are inundated by floodwaters, blocking all land access to the peninsula and interrupting the ferry service between Gooseberry Point and Lummi Island. These roads were closed for seven days during the 1989 flood and for ten days during each of the two November 1990 floods. In early 1996 and again during an ice jam on January 1, 1997, west bank levee failures closed these roads for four days. Closure of both roads may also have occurred during the November 1995 and March 1997 floods. Over 2000 people on the Lummi Peninsula and 750 people on Lummi Island would be affected by closure of these roads today (Whatcom County 1997a).

Slater Road was closed due to flooding six times in the four year period from 2003 through 2006 with closures ranging from just over 24 hours to almost three days long. The largest of these floods was the 12 year return period event in November 2004. None of these flood events also caused the closure of Haxton Way and access to the Reservation and the ferry were maintained through detours to the north through the city of Ferndale. However, this detour has been estimated to add an additional 40 minutes to travel times on average, and therefore emergency response times, to the Reservation. The second main access road to the Reservation from Bellingham, Marine Drive, is always closed due to flooding when Slater Road is closed. In cooperation with Whatcom County, the Lummi Nation applied for and received a 2005 Pre-Disaster Mitigation-Competitive grant for the elevation of Slater Road east of the Nooksack River bridge above the 100 year flood elevation. This project and its mitigation of the riverine flood hazard is further described in the Flood Vulnerability Assessment for Nooksack River floods, Section 4.2.2.1.

A ferry normally serves Lummi Island with 28 round trips daily from Gooseberry Point, near the southern extent of the Lummi Peninsula upland. However, when flooding blocks road access, the ferry must be diverted to Bellingham, leaving only four or five round trips per day to serve the island and peninsula. Medical emergencies during the road closures must be responded to by helicopter (Whatcom County 1997a).

Because of the proximity of Puget Sound and the Strait of Georgia, flood levels along the lower Nooksack River below Ferndale are influenced by tides. High tides fill the river channel in the delta, which both reduces the channel capacity and raises the level of the fresh water as it flows over the denser salt water. Tidal effects on river discharge can cause flood flows to overtop levees and/or cause more water to spill over the banks of the river. During the flood on November 10, 1990, these effects raised the flood level at the river mouth several feet higher than what would have happened if the flood occurred several days earlier or later when tidal elevations were lower. Strong southwesterly winds may also have been a factor in this flood by raising the water level in the delta through wave setup (Whatcom County 1995a).

4.2.1.2 Coastal Floods

Coastal flooding in Puget Sound occurs most frequently during the winter months, when the highest tides of the year combine with the storm surge and waves generated by winter windstorms. Several low-lying coastal areas of the Reservation are susceptible to

flooding. The areas with the greatest probability of coastal flooding are the Sandy Point Peninsula and the Neptune Beach area in the northwestern part of the Reservation and, to a lesser degree, Gooseberry Point and portions of the southeastern shoreline of the Lummi Peninsula. Several flood events have occurred in all of these areas over the past eight years.

The probability and potential damage of flooding along the Sandy Point Peninsula and the Neptune Beach area are greater because they are exposed to a longer reach of open water in the Strait of Georgia (up to a 117-mile fetch from the northwest). Winds blowing from the west to northwest over these longer fetches generate larger waves that, when combined with a high tide and storm surge, overtop the beach berms/dunes in undeveloped areas and the shore defense works in developed areas. The marine waters of the Strait of Georgia then flow onto the lower backshore areas and wetlands that lie in relatively undisturbed areas of the Sandy Point Peninsula and the Neptune Beach area. As shown in Figure 4.6, where owners of shoreline parcels have constructed bulkheads and built houses, this combination of winds, wave build-up, and tides have resulted in substantial property damages due to the force of the wind and waves and due to rocks and logs being thrown against the structures. The flood hazards for the more frequent storms from the south and southwest are smaller because the fetches from these directions are much shorter (up to 10 miles from the southwest for Neptune Beach). The flood hazard from northeast windstorms is less because the eastern shorelines of the Sandy Point Peninsula and the Lummi Peninsula are only exposed to short, shallow-water fetches.

Coastal flooding in the Gooseberry Point area at the south end of the Lummi Peninsula has closed roadways (e.g., Haxton Way and Lummi View Drive) and flooded 15 to 20 homes along the west shoreline. Most recently, coastal flooding at Gooseberry Point occurred during December 2000 and 2001, January and November of 2003, and February of 2006. These homes are exposed to a low to moderate velocity hazard. Along the southeastern shoreline of the Lummi Peninsula, coastal flooding has inundated stretches of Lummi Shore Road and portions of some properties in the Hermosa Beach area that lie landward of the road. Some structures on these properties are flood-prone, although the velocity hazard is low. On January 2, 2003, water flowed over Haxton Way and up to two feet of water pooled around several homes along the Gooseberry Point shoreline. This flood also significantly eroded the shoulder of Lummi Shore Road in the Hermosa Beach area and deposited logs and other debris that blocked the road. Flooding on February 4, 2006 had similar effects and caused water to pond near the Fisherman's Cove store and nearby homes, removed a portion of Lummi Shore Road near the Portage, and deposited logs and debris on the road. Similar but lesser flooding occurred in these areas on November 28, 2003. In these 2003 events, the Lummi Peninsula areas were affected more than the Sandy Point Peninsula, where flooding was slight or did not occur. Figure 4.5 presents photos of the Haxton Way area on Gooseberry Point and of Lummi Shore Road shortly after the flooding occurred in January 2003.

Smaller flooding events along the Sandy Point Peninsula (and probably, on some of these occasions, at the other vulnerable Reservation locations) have occurred most recently on December 6 – 7, 1995, once in 1996, once in November 2000, and on December 14, 2001, January 2, 2003, October 28, 2003, January 11, 2005, March 20, 2005, January 5, 2006, February 4, 2006, and December 28, 2006. During these smaller storm surge events, water generally overwashed bulkheads, flowed through

(a) Gooseberry Point: Facing views, north from Haxton Way/Lummi View Drive intersection and south from Haxton Way

(b) Hermosa Beach: View north along Lummi Shore Road and west from Lummi Shore Road

Figure 4.5 Flood Effects at Gooseberry Point and Hermosa Beach, January 2, 2003

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yards, and deposited beach debris on Sucia Drive, which lies east of the houses that line the west shoreline of the peninsula. Larger, more damaging flood events occurred on March 30, 1975, in December 1982, on December 4, 1993, and on December 15, 2000 (Whatcom County 2001).

The March 1975 flood event caused damage along the Reservation and Whatcom County shorelines, with the greatest damage occurring along the Sandy Point Peninsula. The December 1982 event also affected both Reservation and Whatcom County shorelines, with damage occurring to homes along the Sandy Point Peninsula and at Birch Bay (about eight miles north of the Reservation), where roads and the golf course were also flooded. The 1975 storm was reported to have been the first major windstorm from the northwest since 1948. A major storm on October 12, 1962 (the Columbus Day Storm), generated winds from the southwest with peak gusts of over 100 miles per hour (FEMA 2003d). The 1948 and 1962 storms occurred before substantial residential development along the Sandy Point Peninsula.

On December 4, 1993, sustained winds of 40 to 50 mph, with gusts measured to 59 mph, combined with a high tide to produce large breaking waves that pounded bulkheads and homes along the west shore of the Sandy Point Peninsula and the Neptune Beach area. Waves were estimated to be 10 to 14 feet high and breaking or rising over bulkheads to the second story level of shoreline homes. Entrained logs smashed into bulkheads and through the patio door of one home. Several homes near the south end of the Sandy Point Peninsula (north of the entrance channel) were flooded with water to a depth of more than a foot and several families were evacuated from their homes. The intersection of Sucia Drive and Patos Drive was flooded to a depth of more than two feet and covered with driftwood, isolating the residents to the south. The north end of Sucia Drive was also flooded with several inches of water near the curve onto Beach Way, but remained passable. Damage costs were expected to be thousands of dollars (Sandy Point News Review 1993).

During the December 2000 event, sustained winds of up to 70 mph (Bellingham Herald 2000) generated large waves moving due east, directly into the western Sandy Point/Neptune Beach shoreline along the Strait of Georgia. The high winds combined with a high tide of 10.5 feet (according to the tide tables, the highest tide of 2000 in the Sandy Point area was 10.6 feet) and resulted in wave build-up and in waves crashing into and rising an estimated 10- to 20-feet over the bulkheads lining the Sandy Point Peninsula shoreline. The battering by these waves and associated logs and beach cobbles, which continued for three to four hours during the tide peak, damaged or destroyed bulkheads and eroded properties behind the bulkheads. Many homes suffered water damage, some with a layer of beach cobbles and gravel covering their floors. Several homes had debris (e.g., logs and a large chunk of cement) hurled into them, breaking windows, doors, and walls. A field survey of the 35 homes immediately north of the marina entrance channel (near the south end of the Sandy Point Peninsula) found the following damage: six failed bulkheads; seven damaged bulkheads; 18 bulkheads with settled rip-rap; six flooded houses; nine damaged houses; 16 destroyed decks; and all 35 properties were flooded and contained overwash debris (Johannessen 2000a). A total of approximately 60 homes/properties along the Sandy Point Peninsula and Neptune Beach had some damage. Residents said the damage from this storm, estimated to be a 15- to 25-year event, was slightly worse than that of the 1975 or 1982 storms (Whatcom County 2001). The total cost of damages from this flood was

estimated as approximately $750,000 (Whatcom County 2002). Photographs of the damage to some homes are shown in Figure 4.6.

4.2.2 Flood Vulnerability Assessment

The vulnerability of the Reservation to riverine and coastal flooding is described in the following two sections. Figure 4.7 shows the estimated vulnerabilities to flooding in the six assessment areas on the Reservation. Table 4.2 summarizes the vulnerability to flood damage and potential losses to areas and structures on the Reservation.

Actions that have been taken since 2004 that will help to lessen the risk to the Lummi Reservation from both riverine and coastal flooding are the completion a Community Assistance Visit (CAV) with FEMA in 2005 and the acquisition of the Certified Floodplain Manager certificate by a Natural Resources Department staff member. The CAV was closed on April 28, 2005 and improved the Lummi Nation's implementation of the National Flood Insurance Program by requiring slight revisions to Title 15A of the Lummi Code of Laws, the Flood Damage Prevention Code, the creation of a Lummi Nation Floodplain Development Permit and associated application, and the development of a procedure for the issuance of permits for development in the floodplain. The CFM certificate was received in 2005 and has allowed LNR staff to provide further technical support to the Planning Department in the implementation of the NFIP and Title 15A.

4.2.2.1 Nooksack River Floods

Using the Lummi Nation GIS with the 2007 Whatcom County Assessor's database, the 2007 Lummi Nation parcel layer, and the 2007 addressed structures layer, there are 214 parcels totaling 4,424 acres on the Reservation within the Nooksack River floodplain assessment area. These parcels have a combined 2007 assessed value of $13.1 million or approximately $2,961 per acre. Forty-five of these parcels are either tribally or non-tribally owned fee land and 169 are individual or tribal trust. Because trust land is not taxed and therefore not assessed, the cost per acre for fee land is assumed for the trust land. The Silver Reef Hotel, Casino, and Spa and the Shell gas station are located on a tribal trust parcel. Both of these structures comply with the Lummi Nation Flood Damage Prevention Code (Title 15A) and are constructed so that the elevation of the lowest floor is at least one foot above the base flood elevation. These numbers show no increase in the number of structures compared to the 2004 addressed structure layer. The NFIP CAV conducted by FEMA in 2005 included a tour of the floodplain development and required the installation of flood openings in the skirt of one manufactured home and the completion of an elevation certificate for one structure.

There is one Repetitive Loss structure under the NFIP located within the floodplain on the Reservation. This property is located on Ferndale Road along the eastern Reservation boundary and insured through Whatcom County's Community Identification number (530198). It is a pre-FIRM structure built in 1964 and is located in the AE zone with a Base Flood Elevation (BFE) of 12 feet on FIRM Panel 53073C1190D. There are no Repetitive Loss properties on the Reservation insured under the Lummi Nation's NFIP Community Identification number (530331).

The main physical effects of large Nooksack River floods on the Reservation are damage to flood control structures and residences, erosion of agricultural areas and roads, deposition of sediment and pollutants, and closure of roads. The isolation of the Lummi Peninsula has a large impact on public health and safety since the only

9th to 12th Houses North of Marina Channel Entrance (View East)

Destroyed Bulkhead and Deck (Several Hours after Peak Waves)

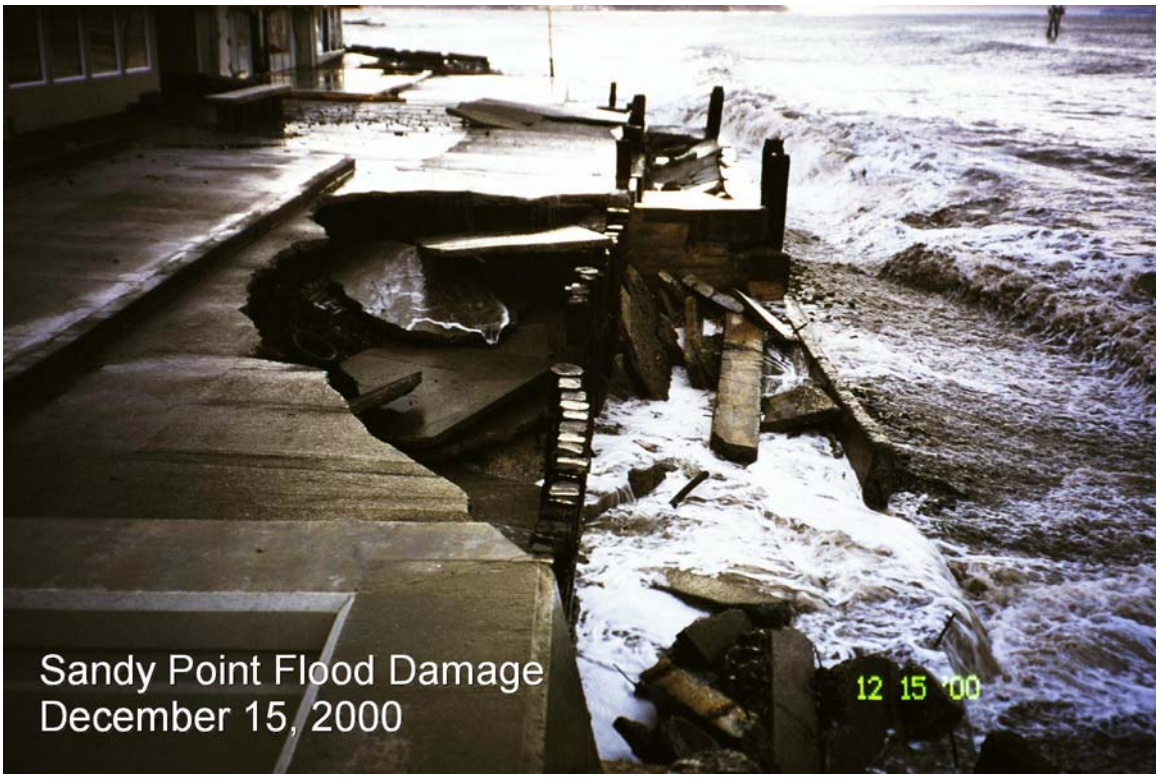

Figure 4.6 Storm Damage along Sandy Point, December 15, 2000

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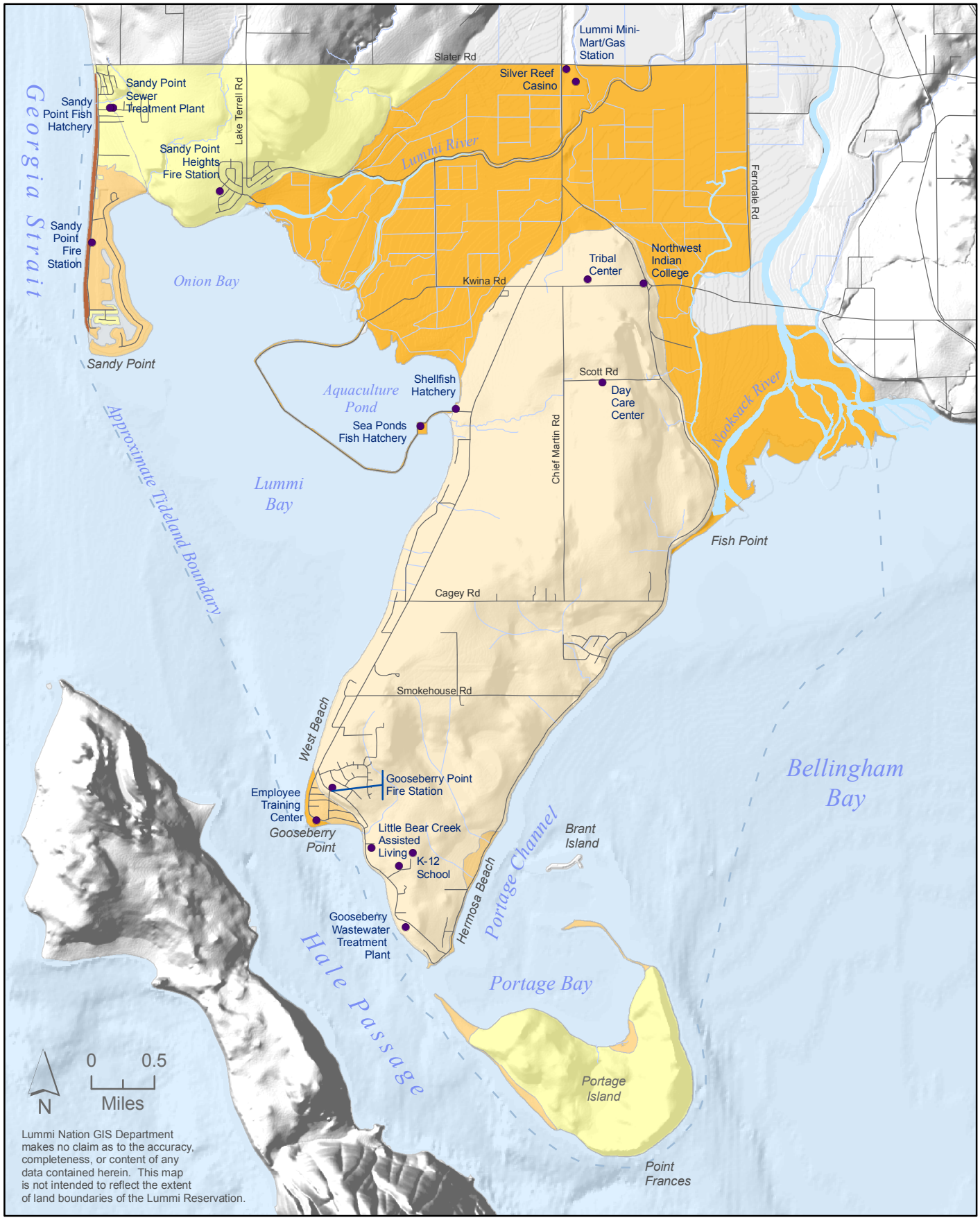

Figure 4.7 Estimated Flood Vulnerabilities in Reservation Areas

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remaining transportation is by boat or helicopter. The small ferry serving Lummi Island from Gooseberry Point is diverted from Lummi Island to provide transportation to Bellingham, but with only four round trips each day, capacity is low. Although the Lummi Nation Police Department and Fire District 8 stations are on the peninsula, extra support for emergency situations is not available in a timely manner during flood-induced road closures. Medical emergencies needing immediate transportation would require a helicopter.

The closure of roads also has a large economic effect on the community since the Lummi Peninsula is essentially isolated. Because many employees cannot get to work, this isolation affects tribal government offices, the health clinic, tribal schools, the Northwest Indian College, and some of the small businesses on the peninsula. In addition, many residents of the peninsula lose income because they cannot get to work. The Lummi Mini-Mart and the Silver Reef Hotel, Casino, and Spa are affected by both the inability of employees to get to work and by the partial to complete loss of business.

The risk to the Lummi Peninsula of isolation from road closures due to flooding will be reduced by the Slater Road Elevation Project. In cooperation with Whatcom County, the Lummi Nation applied for and received a 2005 Pre-Disaster Mitigation-Competitive grant for the elevation of Slater Road above the 100 year flood elevation. After pre-award activities, the grant was received in February of 2006 and the project will be completed in early 2009. Because the section of Slater Road to be elevated is located off of the Lummi Reservation, the Lummi Nation entered an Interlocal Agreement with Whatcom County. Through this agreement, Whatcom County and the Lummi Nation will jointly fund and implement this project. Project progress has included selection of a consultant for design and permitting, selection of the preferred road alignment, selection of the bridge type, the submission of environmental permit applications, and progress on the road and bridge design. Contractor selection is expected to occur in November, 2007. Upon completion, this project will mitigate the impacts of Nooksack River flooding by maintaining access to the Reservation, Lummi Island, Reservation businesses, and nearby industries along Slater Road through a 100-year event. However, access to the Lummi Peninsula from Slater Road may still be lost from levee breaches on the west bank of the Nooksack River leading to the closure of Haxton Way as seen in the November 1990 floods. Because this project won't be completed until 2009, effects of the completed project on Lummi Reservation flood vulnerabilities will need to be considered in the 2010 update.

Flooding on Marine Drive from small events will be relieved through the Smuggler's Slough Restoration project being planned by the Restoration Division of the Lummi Natural Resources Department. This project will include the installation of one or two larger culverts underneath Marine Drive including devices that will prevent beavers from damming the culverts. This project is expected to be implemented in 2008 and will possibly eliminate the need for Marine Drive road closures during smaller flood events.

4.2.2.2 Coastal Floods

The primary vulnerability to coastal floods on the Reservation is damage to residential buildings, shore defenses, and roads. In 2004, there were 160 residential properties along the western Sandy Point Peninsula shoreline on the Strait of Georgia with a 2000 total assessed value (i.e., assessed value of the structure and property) of $29,440,715, or an average of $192,423 per property. In 2007 the number of properties within the

Very High vulnerability area along the west shore of Sandy Point was 181 with a total assessed value of $51,866,325, or an average of $286,554 per property. The increase in properties from 160 to 181 may be partly due to improvements in the accuracy of the GIS data used. Many of these properties have bulkheads, decks, and/or homes located in the velocity zone on the 2004 final FIRMs (Maps No. 53073C1155D and No. 53073C1165D). A velocity zone is a high hazard area because of the potential for wave action and storm surges. Most of the structures on these properties are vulnerable to a 100-year flood event. This vulnerability could be increasing because the beach along the western shoreline of the Sandy Point Peninsula has been eroding and has become steeper in front of the now nearly continuous line of bulkheads (Johannessen 2000b, 2003). A steeper beach allows more wave energy to reach the bulkheads, without being dissipated by a gradual wave run-up. In addition, the vertical bulkheads direct the wave energy upward, which results in higher base flood elevations in this area than along natural beach slopes (FEMA 2003d).

In 2007, there were four Repetitive Loss structures under the NFIP located on the Sandy Point Peninsula. The properties are insured through Whatcom County's Community Identification number (530198) and are located on the western shoreline along Sucia Drive. These properties are all pre-FIRM construction, built between 1938 and 1980, and are located either within the AO zone with a depth of 3 feet or the VE zone with a BFE of 13 or 14 feet on FIRM Panel 53073C1165D. These four properties had a total of 12 claims between 1982 and 2001 with building payments ranging from $1,552.00 to $56,716.62. There are no Repetitive Loss properties on the Reservation insured under the Lummi Nation's NFIP Community Identification number (530331).

In 2004, there were 140 residential properties with a 2000 total assessed value of $15,767,595, or an average of $114,258 per property on the eastern and southern shoreline of the Sandy Point Peninsula along Lummi Bay. In 2007, the number of properties had increased to 145 with a total assessed value of $28,500,355.00 or an average of $196,544 per property. These properties are exposed to a fetch that is substantially shorter than that of the western shoreline (up to 1.6 miles from the east and 2.9 miles from the southeast across shallow Lummi Bay and up to 8.3 miles from the southwest across the Strait of Georgia). Hence the velocity hazard is less and most of the structures are not as vulnerable to structural damage during a 100-year flood event. Only 6 structures on this section of Sandy Point are within the V-zone. However, if homes on these properties are not elevated above the base flood elevation (BFE) identified on the FIRM, they will be subject to shallow flooding during a 100-year coastal flood event.

In the interior area of the Sandy Point Peninsula that is adjacent to the excavated marina canal, there were approximately 202 residences or properties in 2004 with a 2000 total assessed value of $25,449,045, or an average of $125,985 per property. Using updated GIS data, the number of properties in this area in 2007 was determined to be 196 with a total assessed value of $37,895,032, or an average of $193,342 per property There is also one fire station on the east side of Sucia Drive. This area is identified as a shallow flooding zone on the 2004 final FIRM for Sandy Point. If structures on these properties are not elevated above the BFE, they will be subject to shallow flooding during a 100-year coastal flood event.

In the Gooseberry Point area of the Lummi Peninsula, the Lummi Nation Employment Training Center (a large building holding various offices and a computer lab), the

Fisherman's Cove gas station/mini-mart, warehouses including the commodity foods warehouse, a pier, two boat launch facilities, the Lummi Island ferry terminal, and approximately 92 parcels are in the 100-year flood hazard area. Using the updated GIS database, the number of parcels in the floodplain at Gooseberry Point in 2007 had increased to 118. In the Hermosa Beach area along the southeastern shoreline of the Lummi Peninsula, seven properties are in the 100-year flood area and an approximately 1.5-mile stretch of Lummi Shore Road (LSR) is susceptible to flooding and damage from waves and erosion (as occurred most recently in January and November 2003 and February 2006). Some of the road shoulders damaged in January 2003 were part of the LSR project, a major shore and bluff stabilization project designed to protect Lummi Shore Road and landward properties from further coastal erosion. (The LSR project is described further in Sections 4.6 and 4.9.) In 2006, a section of Lummi View Drive near the tombolo to Portage Island was moved inland and away from the shoreline.

The Portage Island assessment area has low-lying shoreline areas that have a moderate vulnerability to coastal floods. Uplands of the Sandy Point Peninsula, Northwest Upland, and Portage Island areas that are outside flood zones are assigned a low flood vulnerability (Figure 4.7) to account for the inconvenience of road closures and the potential economic impacts of floods.

A factor to consider for coastal floods is the threat posed by the rise in global sea level that has resulted from warming of the global climate. Global sea level has already risen by four to eight inches in the past century and models suggest this increase will accelerate. The best estimate is that sea level will rise by an additional 19 inches by 2100, with an uncertainty range of 5 to 37 inches (NAST 2000). Since the rate of uplift or subsidence of the Reservation appears to be negligible (Shipman 1989), any rise in sea level will likely result in an equal rise of flood levels in coastal areas on the Reservation.

The Lummi Nation applied for and received a 2005 Pre-Disaster Mitigation-Competitive grant for the acquisition and removal of five residential structures from the V or coastal A zones on the Sandy Point Peninsula. The five properties were identified using the Lummi Nation GIS and the digital FIRM to identify parcels within the V-zone. Letters were sent to each property owner seeking voluntary interest in the acquisition project. Five of the properties whose owners responded were determined through Benefit Cost Analyses and completion of Elevation Certificates to be eligible for the project and were included in the PDM-C application. The acquisition and removal of one property was completed in December 2006. Three of the five original properties sold to other buyers during the period between application and receipt of the grant. Based on the success of this project, the Lummi Nation will pursue additional acquisitions projects for the mitigation of coastal flooding in the future. The cumulative effect of removing these structures will be to reduce the costs to life and property of coastal flooding.

4.2.3 Potential Flood Losses

Table 4.2 lists the flood vulnerability levels present in each assessment area, the number of structures that are located in each vulnerability level within an area, and the potential structure and contents losses to floods. The Portage Island assessment area is not listed in Table 4.2 because it is currently undeveloped.

Table 4.2 Vulnerability and Potential Losses of Structures to Floods

Assessment Area	Estimated Vulnerability	Number of Structures[1]	Structure Losses[2]	Contents Losses[3]	Location/Comment
Sandy Point Peninsula	Very High	190	$10,653,012	$5,326,506	▪ Western shoreline is highly vulnerable
	Moderate	253	$14,790,332	$7,395,166	▪ Eastern and southern shorelines are lower vulnerability ▪ Interior of peninsula has low to moderate vulnerability
	Low	166	n/a	n/a	▪ Road detours are potential inconvenience ▪ Sea level rise would increase hazard
Northwest Upland	Low	605	n/a	n/a	▪ Road detours are potential inconvenience
Floodplain (Seaponds Dike)	High	116	$20,557,732[4]	$11,402,266[4]	▪ Several homes raised after 1990
	Moderate	7	$435,150	$140,800	▪ Seaponds Hatchery buildings on aquaculture dike; dike itself has high vulnerability to storm waves and failure of the Lummi Bay seawall
Lummi Peninsula	Moderate	6	$160,000	$80,000	▪ Hermosa Beach area ▪ All structures on trust land, used replacement estimate
	Low to Moderate	1,372	n/a	n/a	▪ Isolation due to closed roads - public safety threat ▪ Economic impacts on employers and employees
Gooseberry Point	High	44	$6,476,565	$1,491,032	▪ 20 homes along western shore, plus outbuildings ▪ LIBC mini-mart, office building, pier, and fish processing plant/buying station on southern shore
	Moderate	150	$2,209,135	$1,159,092	▪ 2007 building assessed values and insured value for tribal warehouses ▪ Interior homes, outbuildings, and warehouses
Total		**2,909**	**$55,281,926**	**$26,994,862**	▪ Total Flood Losses: ~$82,276,788

[1]Residences, outbuildings, and other structures from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution.
[2]Potential structure losses estimated as half of 2007 building assessed values (if area is primarily fee land), estimated residential replacement value (if area is mixed fee and trust land), and/or 2006 insured values (see Table 4.23 for specific values). A replacement value of $80/square foot was used based on the average replacement value determined by appraisals performed for the 2005 Sandy Point Coastal Acquisition Pre-Disaster Mitigation Project.
[3]Potential contents estimated as half of the insured contents values or half of the estimated structure losses (FEMA 2001a).
[4]The Silver Reef Hotel, Casino, and Spa accounts for 72 and 76 percent of the Floodplain structure and contents values respectively, although its first floor is above the 100-year flood level.

4.2.3.1 Nooksack River Floods

The Corps estimated an average annual flood damage cost of $2.5 million (1992 dollars) for the Nooksack River floodplain, including the three forks of the river (Corps 1993). For the area downstream of Ferndale to the mouth of the river, not including the Marietta community, the estimated annual damage cost was $475,000 (1992 dollars). Most of the costs below Ferndale are due to damaged flood control facilities and agricultural areas (Corps 1993). As shown in Table 4.2, a major event resulting in losses totaling half of all structure and contents values in the Floodplain assessment area of the Lummi Reservation would cost over $31 million (2007 dollars).

The economic costs on the Reservation of lost business and lost wages would add substantially to the costs cited by the Corps in 1993. The Silver Reef Hotel, Casino, and Spa and Shell gas station and mini-mart would lose all customers during a large flood that closes Slater Road and Haxton Way north of the Lummi River. Before the two casino expansions, these two businesses, owned by the Lummi Nation, had a combined average daily wages of $16,327; average daily income exceeds this figure (Mace 2003). The LIBC and other tribal entities on the Lummi Peninsula, many of whose employees live off the Lummi Peninsula, have a daily payroll of approximately $58,000 (Brown and Brown 2003). Many other residents on the peninsula would not be able to get to jobs off the Reservation.

4.2.3.2 Coastal Floods

Given the current vulnerability of the Sandy Point Peninsula and the possibility of substantial sea level rise, an extreme flood event in this area could result in a total loss of many of the structures on the peninsula. As shown in Table 4.2, a major event resulting in losses totaling half of all structure and contents values on the peninsula would cost approximately $38 million in year 2007 dollars. Comparable losses and damages to structures in the Gooseberry Point area would total over $11 million. Additional costs would result from the displacement of people from their homes while repairs occurred to make them habitable again.

Because a detailed study that determines potential losses to residential, commercial, and critical facilities has not been completed, potential structure losses for the assessment areas were estimated as half of the 2007 building assessed values (if the area is primarily fee land), the estimated residential replacement value (if area is mixed fee and trust land), and/or insured values (used for public buildings). No assessed values are available for trust lands (as they are not subject to property taxes), so the potential losses for trust lands were estimated to be the same as for fee lands. Potential contents losses were estimated as half of the insured contents values or half of the estimated structure losses. This method has limited accuracy for estimating potential losses because depth of flooding for each structure in the flood areas was not determined. In addition, assessed values are typically less than appraised/market values, which would be used for the acquisition or replacement of structures in hazard areas.

4.3 EARTHQUAKES

Oral histories and geological records show that the Reservation region has a history of large earthquake events. An earthquake is ground shaking that is caused by the sudden release of slowly accumulated pressure within the crust of the Earth or within the tectonic plates below the crust. The movement of tectonic plates towards each other (convergence) generates this pressure. The Pacific Northwest is located above a convergent plate boundary, where the Juan de Fuca and North American tectonic plates meet. This boundary is called the Cascadia Subduction Zone, and it extends from British Columbia to northern California (GSC 2002a).

While earthquakes along this zone occur infrequently, plate movement can produce major earthquakes. In addition, the Puget Sound and Strait of Georgia region is underlain by a large and complex system of faults that can produce damaging earthquakes; these smaller faults produce lower magnitude events, but their ground shaking can be strong and can cause substantial damage to nearby structures. Earthquakes can trigger other geologic and soils failures that contribute to total damages. While surface fault rupture can produce damage to facilities and infrastructure astride the fault, such damage is generally less overall than the damage resulting from strong ground shaking and associated ground failures. These ground failures include landslides and slope failures, lateral spreading and slumping, and liquefaction of soils (Oregon 2000b; GSC 2002a).

Ground shaking, landslides, liquefaction, and amplification are the primary specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake (Oregon 2000b; Clackamas County 2002). These four hazards are described below (Oregon 2000b):

- Ground shaking is the motion caused by seismic waves generated by an earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter. Buildings on poorly consolidated and thick soils will typically have more damage than buildings on consolidated soils and bedrock.

- Earthquake-induced landslides are secondary earthquake hazards that result from ground shaking. They can destroy homes and the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Most vulnerable are developed areas with steep slopes, which occur on the Reservation above Neptune Beach and along the east and west shores of the Lummi Peninsula.

- Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. Liquefaction results in the loss of soil strength and the ability of the soil to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Areas vulnerable to liquefaction on the Reservation include the Sandy Point Peninsula, Gooseberry Point, and the riverine floodplain. Although stone columns were used to minimize the liquefaction potential at the Silver Reef Casino, such protective measures have not been taken for other structures in these areas.

- Soils and soft sedimentary rocks near the earth surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Amplification can also occur in areas with deep, sediment-filled basins and on ridge tops.

The sizes of earthquakes are commonly measured using the Richter magnitude scale, a mathematical tool developed in 1935 to compare earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distances between the various seismographs that record the event and the epicenter of the earthquake. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude of 5.3 might be computed for a moderate earthquake, and a strong earthquake might have a magnitude of 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude (i.e., magnitude 8 is 100 times greater than magnitude 6); as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the lower number (USGS 2003a).

The Richter Scale is not used to express damage. An earthquake in a densely populated area that results in many deaths and considerable damage may have the same magnitude as an earthquake in a remote area that does no damage. Large magnitude earthquakes that occur beneath the oceans may not even be felt by humans. Recently, another scale called the moment magnitude scale has been devised for more precise study of great earthquakes. Further discussion of this scale and other measurements of earthquake movement and intensity is provided in Section 4.3.2.

Most large earthquakes in the Pacific Northwest are shallow crustal, deep intraplate (Benioff zone), or subduction zone (megathrust) earthquakes. These three types of earthquakes are summarized in Table 4.3 and illustrated in Figure 4.8.

Geologic evidence shows that the Cascadia Subduction Zone has generated great megathrust earthquakes, most recently about 300 years ago. This Cascadia megathrust earthquake is thought to have been magnitude 9 or greater (like recorded megathrust earthquakes in other regions, including the 1964 southern Alaska earthquake that measured magnitude 9.2 and the 9.0 Indian Ocean earthquake). The average recurrence interval of these large Cascadia earthquakes is approximately 500 years, with gaps between events as small as 200 years and as large as 1,000 years. The evidence indicates that 13 great earthquakes have occurred in the Pacific Northwest over the last 6,000 years and a similar offshore event can be expected to happen sometime in the future. Research published in 2006 using hydroacoustic data found that the subduction zone may be shortening through the rearrangement of the Pacific, Juan de Fuca, and North American plates. This rearrangement could reduce the strength of a Cascadia Subduction Zone earthquake (Dziak 2006; Fought 2006). Such earthquakes may cause substantial damage to the coastal areas of the region, and they represent a considerable hazard to those who live in the Puget Sound region. However, because the fault is offshore, it is not the greatest earthquake hazard faced by this region (GSC 2002a).

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Table 4.3 Types of Earthquakes in the Pacific Northwest[1]

Type	Depth	Frequency (Return Period)	Location of Epicenter	Comment
Crustal	Relatively shallow (6-12 miles)	Magnitude < 4: many per year Magnitude > 6: decades or more apart	Many faults in the region, including two that pass within a few miles of the Reservation	• Most common, but usually mild • Potentially Mag. 7 • Potentially near Reservation • Aftershocks common
Intraplate, or Benioff Zone	Relatively deep (25-40 miles)	Decades apart	Anywhere in the region (western Washington, western British Columbia, or Cascade Mtns.)	• Potentially Mag. 7.5 • Potentially near Reservation • Few or no aftershocks • Nisqually Earthquake
Subduction Zone, or Megathrust	Inter-mediate depth	500 years, on average (200 to 1,000 years apart)	Most likely under the ocean off the Pacific Coast	• Potentially Mag. 9+ • Not close to Reservation • A minute or more of strong shaking • Large aftershocks

[1] Clackamas County 2002; Geological Survey of Canada [GSC] 2002a, 2002b

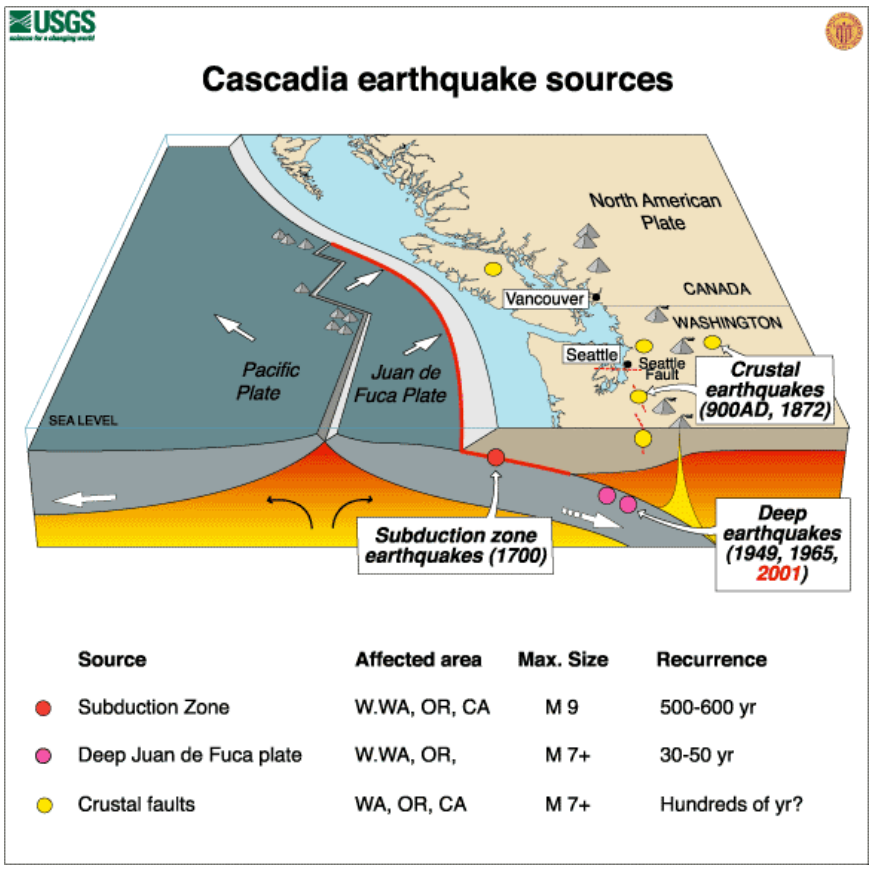

Figure 4.8 Types of Earthquakes in the Pacific Northwest (USGS 2002a)

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In the interval between megathrust earthquakes, the tectonic plates become stuck together, yet continue to move towards each other. This causes tremendous strain and deformation of the crust of the Earth in the coastal region, which results in ongoing earthquake activity. The Puget Sound region is now in such an interval. Some of these onshore crustal or intraplate earthquakes can be quite large. There have been four magnitude-7+ earthquakes in the past 130 years in southwest British Columbia and northern Washington State and five magnitude-6+ earthquakes in the Puget Sound basin since 1900 (WEMD 2004). Because these inland earthquakes occur more frequently and can be much closer to the Reservation, they represent the largest earthquake hazard to the Lummi Nation (GSC 2002a).

Shallow crustal earthquakes are the most common earthquakes, but are usually relatively mild. However, two faults pass within a few miles of the Reservation, and six crustal earthquakes with magnitudes between three and six have been recorded within approximately 10 to 20 miles of the Reservation (Table 4.4). Deep intraplate earthquakes occur in the subducting oceanic crust and can reach up to magnitude 7.5. The Nisqually Earthquake on February 28, 2001, in Washington State was a deep intraplate earthquake that had a magnitude of 6.8. It produced a rolling motion that was felt from Vancouver, British Columbia to Coos Bay, Oregon and east to Salt Lake City, Utah. A 1965 magnitude-6.5 intraplate earthquake centered south of Seattle-Tacoma International Airport caused seven deaths (USGS 2001a; Clackamas County 2002).

In the following subsections, past earthquake events, earthquake vulnerability, and potential earthquake losses on the Reservation are described.

4.3.1 Profiles of Past Earthquake Events

Many earthquakes occur in the area of the Reservation. Most are too small to feel, but relatively rare large earthquakes could potentially cause massive social, economic, and environmental impacts. Table 4.4 summarizes the largest recorded earthquakes in the region. Figure 4.9 shows the locations of recorded earthquakes in the Reservation area.

The most recent earthquake that affected the Reservation was the magnitude-6.8 Nisqually Earthquake of February 28, 2001. This intraplate earthquake was centered 35 miles southwest of Seattle (or about 120 miles south of the Reservation) and occurred 30 miles underground. It caused one death, hundreds of mostly minor injuries, and estimated total damages of $2-3.5 billion. President Bush granted federal disaster assistance on March 1, 2001 (FEMA 2001b). The Nisqually Earthquake was easily felt (light to moderate shaking) on the Reservation and caused damage to some buildings in the area as well as subsidence of the Lummi Aquaculture Dike. The FEMA awards for damage to tribal facilities from the Nisqually Earthquake totaled $128,471 (Bunton 2003). There were additional awards to individuals and possibly businesses. Other intraplate earthquakes occurred on April 13, 1949, near Olympia (magnitude 7.1) and on April 29, 1965, between Seattle and Tacoma (magnitude 6.5).

These intraplate earthquakes caused landslides, liquefaction, and/or other ground failures in the Puget Sound region. The 1949 earthquake probably triggered a landslide three days later at the Tacoma Narrows that produced an 8-foot high tsunami in Puget Sound. The tsunami reflected off of the undeveloped opposite shoreline and caused minor flood damage to homes adjacent to the landslide. The large landslide destroyed the homes in its path (Noson et al. 1988; Walsh 2003). In addition, a large portion of a

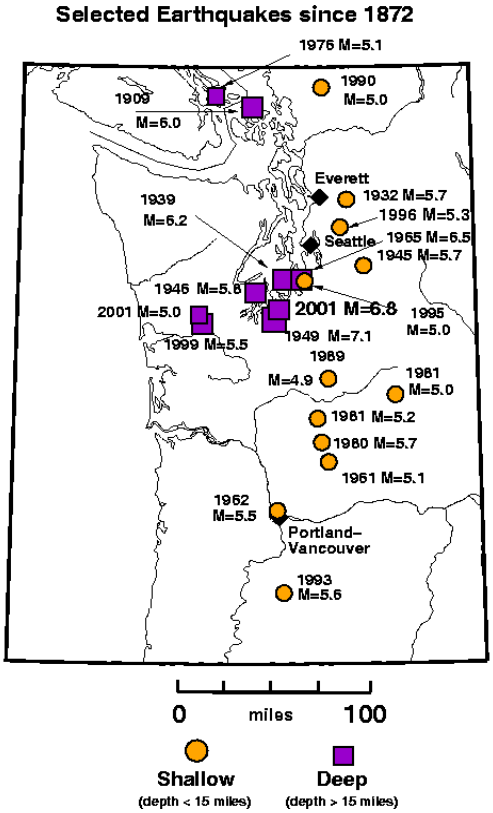
Table 4.4 Largest Known Earthquakes Capable of Damage on the Reservation[1]

Year (Name)	Type	Epicenter (from Reserv.)	Magnitude[2]	Comment
2007	Crustal	~15 miles	3.0	▪ Epicenter five miles south of Bellingham ▪ Three miles deep
2005	Crustal	~20 miles	4.1	▪ Epicenter four miles south of Kendall ▪ 1/3 mile deep ▪ no reports of damage or injuries
2001 Nisqually	Intraplate	~120 miles S (about 11 miles NE of Olympia)	6.8	▪ Strong shaking for 40 sec. ▪ One death (heart attack) ▪ 700+ injuries, four serious ▪ $2-3.5 billion total damage ▪ $128,471 public damage on Reservation (plus private)
1990	Crustal	~20 miles E	5.0	▪ Near Deming
1976	Intraplate	~33 miles W	5.1	▪ W. of North Pender Island
1967	Crustal (?)	~5-10 miles W	4.1	▪ Just off NE shore of Orcas Is.
1965	Intraplate	~105 miles S (near SeaTac Airport)	6.5	▪ Seven deaths ▪ ~$12.5 million total damage ▪ Landslides, liquefaction, and other ground failures
1964	Crustal (?)	~10 miles NE	5.0	▪ Between Ferndale and Lynden
1949	Intraplate	~130 miles S (near Olympia)	7.1	▪ Strong shaking for 20 sec. ▪ Eight deaths; many injuries ▪ ~$25 million total damage ▪ Probable trigger of landslide that caused 8-foot tsunami ▪ Other ground failures
1946	?	~125 miles NW (central Vancouver Is.)	7.3	▪ Two deaths ▪ Many chimneys toppled, buildings damaged ▪ Strong shaking on Lummi Reservation
1920	Crustal (?)	~22 miles SW	5.5	▪ NW corner of Shaw Island ▪ Slight damage in Bellingham, Anacortes, and Victoria, BC
1909	Intraplate (?)	~5-10 miles W	6.0	▪ Just off NE shore of Orcas Is. ▪ 19 miles deep ▪ Slight damage in Blaine, Bellingham, and Anacortes
1896	Crustal (?)	~20 miles S	6.0	▪ Decatur Island
1872	Crustal	~60-120 miles E or SE (?)	7.3	▪ Largest historic event in WA ▪ Damage in Victoria, BC, and Seattle, WA
1700	Megathrust	~120 miles W	~9	▪ Huge tsunami destroyed village on Vancouver Is., caused damage in Japan ▪ Evidence of land subsidence
~900	Crustal	~90 miles S (along Seattle Fault)	~7+	▪ Massive landslides ▪ Tsunami deposits along Puget Sound ▪ Land subsidence

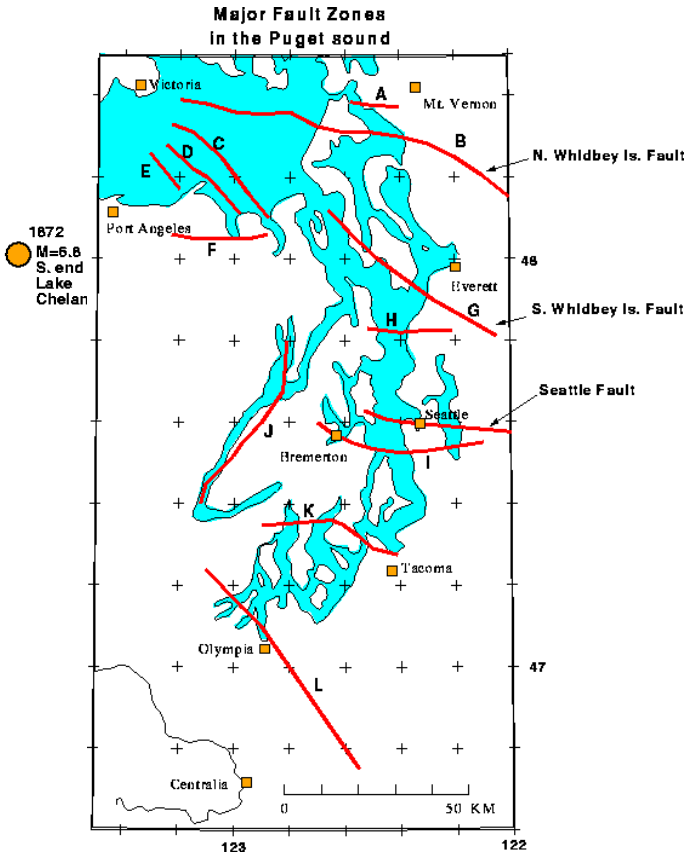
[1]Noson et al. 1988; Chleborad and Schuster 1990; Atwater and Moore 1992; Engebretson 1996; Whatcom County 2002; Clackamas County 2002; GSC 2002a, 2002b; Gambrell 2005; Millage 2007.
[2]Magnitudes before 1969 are approximate (Engebretson 1996).
Question marks indicate uncertainty regarding the type or location of an earthquake.

(a) Epicenters, dates, and magnitudes of large earthquakes that occurred between 1872 and 2002 in the Puget Sound region. The symbols represent the relative size and depth of the earthquake (PNSN 2003); (b) Major faults in the region (Gower et al. 1985); (c) Local recorded earthquakes and identified faults, with potential extensions indicated by dashed lines (Easterbrook et al. 2000).

(a)



(b)



(c)

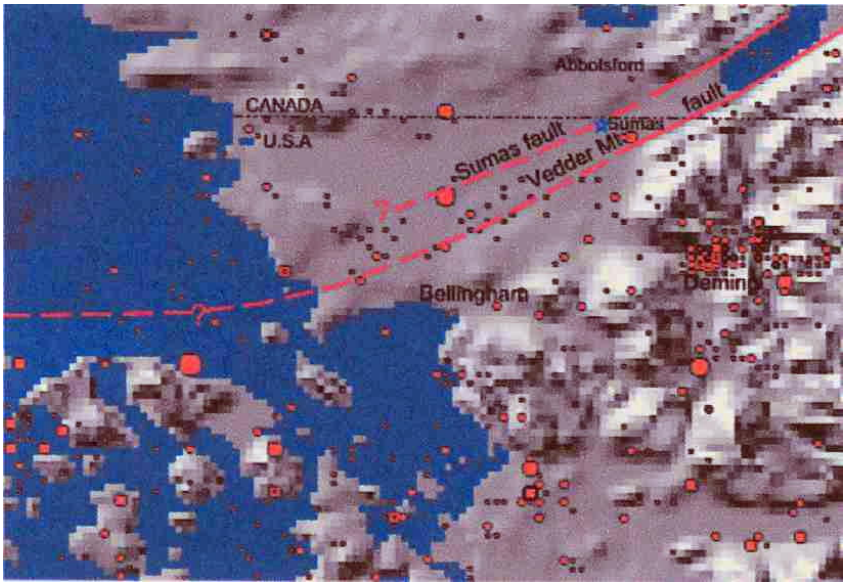


Figure 4.9 Locations of Recorded Earthquakes and Faults in the Reservation Region

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sandy spit jutting into Puget Sound north of Olympia disappeared during the earthquake (USGS 2001a). These earthquakes may also have produced damage in the Reservation area (Whatcom County 2002).

Large crustal earthquakes that may have impacted the Reservation include a magnitude-7+ earthquake on the Seattle fault about 1,100 years ago. Probable evidence of this earthquake includes large landslides and tsunami deposits (Atwater and Moore 1992). Other crustal earthquakes include an estimated magnitude-7.3 North Cascades earthquake in 1872 and the magnitude-5 earthquake in 1990 located in Whatcom County near Deming (Whatcom County 2002). During the 1872 earthquake, probably centered between Mt. Baker and Lake Chelan, the shaking was strong enough to frighten people and cause them to run out of buildings in Victoria, New Westminster, and Yale, British Columbia, and in Seattle, Washington. The earthquake was reportedly felt from central British Columbia (Quesnel) to central Oregon (Salem) and east into the present day Alberta and Montana. Occurring today, it would probably cause strong shaking but only slight damage on the Reservation since the epicenter was some distance away (GSC 2002b).

The largest historic onshore earthquake recorded in southwestern British Columbia was a magnitude-7.3 event that occurred in 1946. The epicenter was in central Vancouver Island, just to the west of the communities of Courtenay and Campbell River. This earthquake caused considerable damage on Vancouver Island, and was felt as far away as Portland, Oregon, and Prince Rupert, British Columbia. The earthquake knocked down 75 percent of the chimneys in the closest communities (Cumberland, Union Bay, and Courtenay) and did considerable damage in Comox, Port Alberni, and Powell River (on the eastern side of the Strait of Georgia). A number of chimneys were shaken down in Victoria, and people in Victoria and Vancouver were reportedly frightened. Two deaths resulted from this earthquake, one due to drowning when a small boat capsized in an earthquake-generated wave, and the other from a heart attack in Seattle (GSC 2002c). Occurring today, the shaking on the Lummi Reservation from this earthquake would be strong, or frightening to most people, but the potential damage would probably be only slight (Table 4.6; FEMA 2001a).

The most recent Cascadia Subduction Zone earthquake occurred in 1700 and was estimated as a magnitude 9, which makes it one of the largest recorded earthquakes on Earth. The undersea Cascadia thrust fault ruptured along a 1,000-km length, from the middle of Vancouver Island to northern California, producing tremendous shaking and a huge tsunami that swept across the Pacific. This earthquake was identified through Japanese records of the tsunami, which did considerable damage in Japan, as well as geological evidence in Washington State (Krajick 2005). Along the Pacific Northwest coast, it raised some land elevations up to five meters, caused underwater landslides, and caused the subsidence and drowning of coastal old growth trees. Oral traditions of the native peoples of Vancouver Island indicate that the tsunami destroyed a winter village, with no survivors, at Pachena Bay on the west coast of Vancouver Island. The oral traditions also indicate that the shaking damaged houses in the Cowichan Lake region of south central Vancouver Island. The shaking was reportedly so violent that people could not stand, and so prolonged that it made them sick (GSC 2002a).

Five earthquake events occurred near the Reservation between 2004 and 2007 but did not cause damage on the Reservation. On July 19, 2004 a magnitude 6.4 earthquake occurred off of the west coast of Vancouver Island 139 miles northwest of Neah Bay,

Washington. Shaking was reported throughout Vancouver Island and also in Bellingham, Blaine, and Anacortes Washington (USGS 2004). On November 2, 2004 a series of earthquakes occurred also off of the west coast of Vancouver Island. The largest of the series was a magnitude 6.7 which was felt in three towns and no damage was expected or reported.

On November 24, 2005 a magnitude 4.1 crustal earthquake occurred approximately 20 miles northwest of the Reservation near the town of Kendall. The earthquake had an epicenter four miles south of Kendall and a third of a mile deep, lasted only a few seconds, and caused no injuries or damage. This earthquake may have occurred along the Kendall scarp which was recently discovered through a Light Detection and Ranging (LIDAR) survey of the North Fork of the Nooksack River (Barnett et al. 2006).

In March 2005 a swarm of earthquakes occurred off of the west coast of Vancouver Island in Canada. The series of nearly 4,000 magnitude 4 and under earthquakes occurred over six days along the Juan de Fuca ridge on the seafloor. These earthquakes did not cause any damage on land and indicated the formation of new oceanic crust and the movement of the Juan de Fuca plate (Doughton 2005).

A magnitude 3.0 earthquake occurred five miles south of Bellingham on March 30, 2007 and was three miles deep. It was followed by a magnitude 1.0 earthquake from the same area 22 minutes later (Millage 2007).

4.3.2 Earthquake Vulnerability Assessment

The sizes of earthquakes are described using several methods that quantify the magnitude and intensity in different ways. The Richter Scale, described earlier, measures earthquake magnitude using the amplitude of seismograph waves. A more recent logarithmic method, moment magnitude, measures the energy released at the source of the earthquake, and is also determined from measurements on seismographs. Moment magnitude measurements are thought to describe the strength of large earthquakes more accurately than the Richter Scale (USGS 2003a). The Modified Mercalli Intensity (MMI) measures the strength of shaking produced by an earthquake at a certain location; it is determined from effects on people, human structures, and the natural environment. The MMI value for each earthquake varies from location to location (USGS 2002b). Table 4.5 shows the relationship between moment magnitudes and MMI levels of earthquakes, as well as the associated perceived motion and level of damage that are typically observed at locations near the epicenter of an earthquake. Commonly, sites on soft ground or alluvium have intensities two to three units higher on the Modified Mercalli Intensity scale than sites on bedrock. This is important on the Reservation because the floodplains of the Nooksack and Lummi rivers are comprised of alluvium and the remainder of the Reservation uplands are comprised of glacial material.

One measure of the strength of earth movement in an earthquake is peak ground acceleration (PGA), which is expressed as a percentage of the force due to gravity (g). For example, a PGA of 20 represents an acceleration equal to 20 percent of the force due to gravity. The PGA is the maximum acceleration of the ground during the course of the earthquake motion, and is related to the force a building will receive during an earthquake. This force will vary between locations based on the distance from the earthquake epicenter and on the nature of the soils or rock in a location. Table 4.6 shows the correlation between the Modified Mercalli Intensity scale, PGA values,

perceived shaking, and potential damage. A PGA of nine to eighteen would be perceived as strong shaking and would potentially result in light overall damage (FEMA 2001a). A PGA of about ten may be the approximate threshold of damage to older (pre-1965) dwellings or dwellings not made to resist earthquakes (USGS 2003b). This value should not be used in the case of particular buildings because (1) the relation between intensity and peak acceleration is quite variable; (2) for more distant sites, longer duration ground motions may cause damage at lower acceleration values; and (3) buildings differ greatly in their vulnerability (USGS 2003b).

Table 4.5 Relationship Between Moment Magnitude and Modified Mercalli Intensity[1]

Moment Magnitude	Modified Mercalli Intensity	Description of Perceived Motion and Level of Damage Associated with Each Intensity Level
1.0 - 3.0	I	I. Not felt except by a very few people under especially favorable conditions.
3.0 - 3.9	II - III	II. Felt only by a few persons at rest, especially on upper floors of buildings. III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
4.0 - 4.9	IV - V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.9	VI - VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 – 6.9	VIII - IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	VIII or higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. XII. Damage total. Lines of sight and level distorted. Objects thrown into the air.

[1] http://neic.usgs.gov/neis/general/handouts/mag_vs_int.html (USGS 2002b)

Table 4.6 Modified Mercalli Intensity, PGA Equivalents, and Potential Effects[1]

MMI	PGA	Perceived Shaking	Potential Damage
IV	1.4 - 3.9	Slight	None
V	3.9 - 9.2	Moderate	Very Slight
VI	9.2 - 18	Strong	Slight
VII	18 - 34	Very Strong	Moderate
VIII	34 - 65	Severe	Moderate to High
IX	65 - 124	Violent	High
X	> 124	Extreme	Very High

[1]FEMA 2001a.

The National Seismic Hazard Mapping Project of the United States Geological Survey (USGS) Earthquake Hazards Program indicates that an earthquake producing a PGA ranging from 23.5 to 24.7 on the Lummi Reservation has a ten percent probability of exceedence over 50 years (or an average occurrence of once in 475 years, or approximately a 0.2 percent chance of occurring in any one year). An earthquake producing a PGA ranging from 45.5 to 47.3 has a two percent probability of exceedence over 50 years (an average occurrence of once in 2,476 years, or approximately a 0.04 percent chance per year). For reference, these PGA values are ten to forty percent less than predicted PGA values for earthquakes in the Seattle area with the same recurrence interval and approximately half of the PGA values for two locations in the Oakland area and one location in the Los Angeles area of California, the state with the greatest earthquake vulnerability in the continental United States (USGS 2003b).

The USGS data and the information in Table 4.6 indicate that, since the MMI categories represent a range of PGA values, the chance the Reservation will experience an earthquake that produces very strong shaking and that results in moderate potential damage (i.e., a PGA greater than 18) is somewhat greater than ten percent over 50 years (or more frequent than once in 475 years). Likewise, there is greater than a two percent chance over 50 years (or more frequent than once in 2,476 years) that severe shaking and moderate to heavy potential damage will occur.

It is important to realize that the PGA probabilities described above were calculated using all known potential earthquake sources and all magnitudes for each source that were believed possible in the vicinity of the location (USGS 2001b). An average probability was determined for each magnitude-location pair and the probabilities were added to provide the overall probability for a specific level of ground motion. The presence of unknown or underestimated earthquake sources would mean the chance of a strong earthquake is greater. The USGS analysis determined that the most likely source for earthquake damage on the Reservation is an earthquake with a moment magnitude of 5.0 to 7.0 within 16 miles of Bellingham (e.g., the 1909 earthquake just northeast of Orcas Island with a magnitude of 6.0 on the Richter scale). Similar earthquakes up to 62 miles from Bellingham and earthquakes of moment magnitudes from 8.0 to 9.0 that are 47 to 78 miles from Bellingham are also significant contributors to the overall PGA probability for the Reservation. In this USGS study, an earthquake with a moment magnitude of 7.0 to 7.5 within 31 to 47 miles of Bellingham contributed less than 0.1 percent to the overall PGA probability for the Reservation; the probability contribution of a magnitude-7+ earthquake within 47 miles of Bellingham was otherwise considered to be zero (USGS 2001b). This information suggests that the possibility of an MMI-IX earthquake with a PGA of between 65 and124 that produces violent shaking and high potential damage on the Reservation is currently believed to be negligible.

Recent studies indicate that two long-recognized faults, the Vedder Mountain and Sumas faults, are longer and more active than previously thought. These crustal faults extend from British Columbia southwest and possibly pass through and near, respectively, the Reservation. They may connect to identified faults that extend to the northwest along the Canadian San Juan Islands. These faults are likely responsible for many small earthquakes recorded in the Whatcom County area as well as the 1909 and 1964 earthquakes listed in Table 4.4. Their close proximity suggests that they may represent the largest potential source of earthquake hazards on the Reservation (Easterbrook et al., 2000; Federal Energy Regulatory Commission 2002). As such, they may be the most likely source for the earthquakes with a moment magnitude of 5.0 to

7.0 within 16 miles of Bellingham that, as described above, contribute most to the overall PGA probability for the Reservation.

In considering potential damage to structures on the Reservation, it is important to realize that impacts will vary with the local geologic conditions and the extent to which mitigation measures were taken during either construction or retrofitting of structures. Sites and structures on shoreline fill, soft soil, or alluvial deposits, such as the Nooksack River floodplain, Sandy Point Peninsula, and Gooseberry Point shoreline, may experience damage that is one to two categories higher than the average potential damage on the Reservation (FEMA 2001a; Clackamas County 2002). The glacial deposits forming the uplands on the Reservation have a high response to seismic shaking relative to areas of bedrock (Whatcom County 1995b). The level of seismic design incorporated into structures is an important factor to consider in these areas of greater potential vulnerability. Figure 4.10 shows the estimated relative vulnerabilities to earthquakes in the six assessment areas on the Reservation. Table 4.7 lists the estimated vulnerability for structures in the five developed assessment areas. Currently undeveloped Portage Island is not listed in Table 4.7.

In 2004, the Washington State Department of Natural Resources (WDNR), Division of Geology and Earth Resources developed liquefaction susceptibility and National Earthquake Hazards Reduction Program (NEHRP) site class maps for each county in Washington State (Palmer et al. 2004). The liquefaction susceptibility map provides an estimate of the likelihood that soil will liquefy as a result of earthquake shaking. Liquefaction occurs when strong shaking causes soil to lose its strength and typically occurs in areas saturated with water such as low-lying coastal areas, lakeshores, and river valleys. The WDNR maps show that the Sandy Point and floodplain areas of the Lummi Reservation have a moderate to high liquefaction susceptibility, Portage Island and the northwest upland have a low susceptibility and the Lummi Peninsula has a combination of low and low to moderate susceptibility.

The 2004 WDNR site class maps are based on the change in earthquake wave velocity from the underlying rock of the Earth's crust to the surface soil. Ground shaking at the surface is amplified when the earthquake waves are slowed down as they travel to softer soil types. Generally, the greater the wave velocity difference, the greater the amplification of ground surface shaking. Areas mapped as site class B are those with a soft rock condition where shaking is neither amplified or reduced. Classes C, D, and E represent increasingly softer soil conditions and therefore increasing amplification of shaking. Site class F areas are those with unusual soil conditions that need site-specific evaluation. On the Lummi Reservation, the Sandy Point Peninsula and Gooseberry Point are site class D, the floodplain is D to E, the northwest upland and Portage Island are C to D, and the Lummi Peninsula is a combination of C to D and D. Both the liquefaction susceptibility and site class maps have been incorporated into the earthquake vulnerabilities for the Reservation on Figure 4.10.

4.3.3 Potential Earthquake Losses

The 2001 Nisqually Earthquake recently demonstrated the potential for damage in the Reservation region. According to a FEMA study, the state of Washington ranks second in the nation after California among states susceptible to economic loss caused by earthquake (WEMD 2004). The study predicts an annualized economic loss in Washington of $228 million due to earthquakes. Seattle is seventh and Tacoma is 22nd

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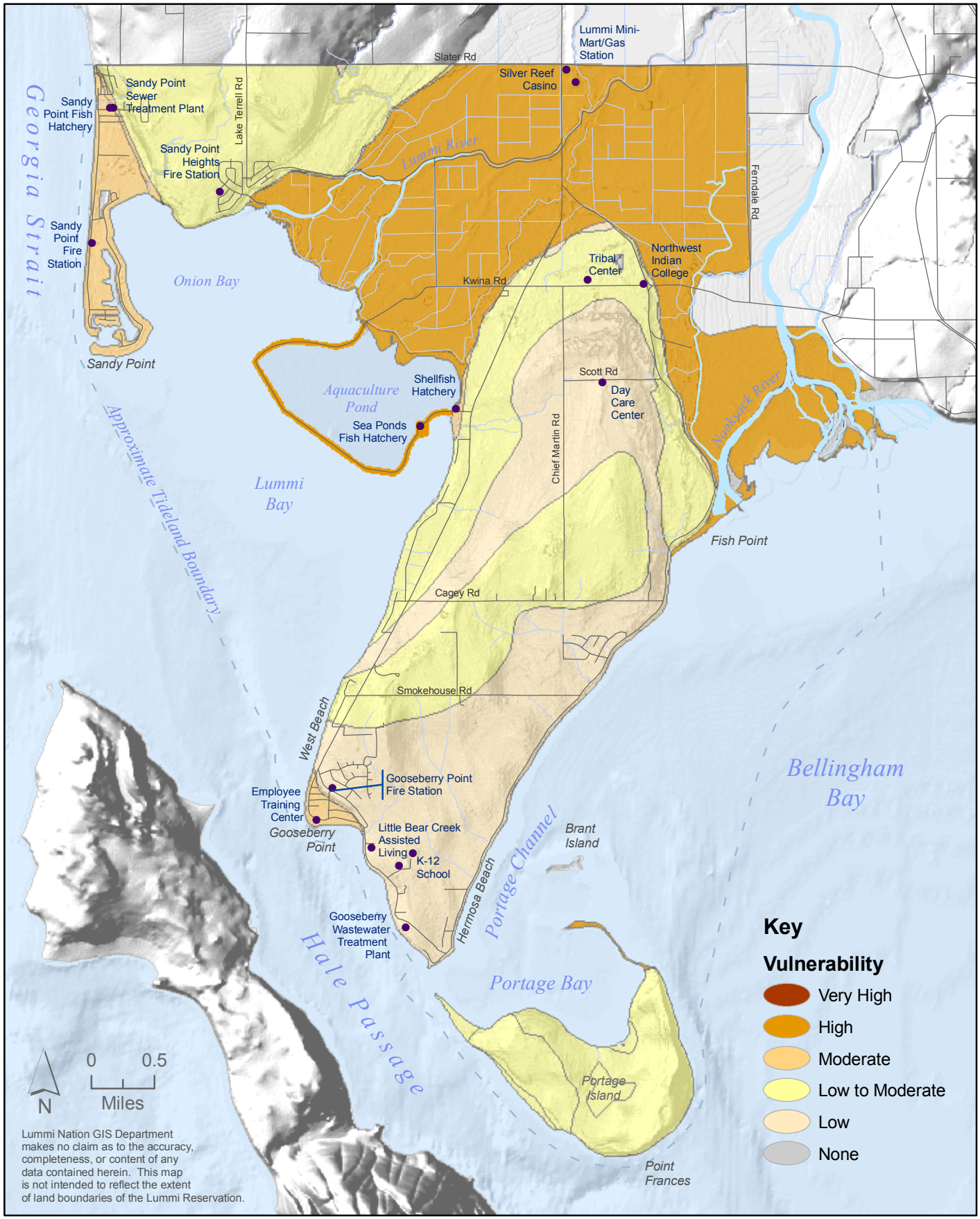

Figure 4.10 Estimated Earthquake Vulnerabilities in Reservation Areas

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Table 4.7 Estimated Earthquake Vulnerability of Structures

Assessment Area[1]	Structure(s)	Year Built	Estimated Vulnerability[2]	Comment
All (except Portage Island)	Lummi Water District wells, reservoirs, water lines	1964-Present	Moderate	• Pipelines through areas of unconsolidated soils are more vulnerable
	Lummi Sewer District treatment plants, sewer lines, and pump stations	1982-Present	Moderate	• Collection lines, force mains, and pump stations through areas of unconsolidated soils are more vulnerable; • Disruptions to sewer collection and treatment system affects entire Reservation
	Roads	Variable	Moderate	• Roads through areas of unconsolidated soils are more vulnerable
	Electric Lines	Variable	Moderate	• Lines through areas of unconsolidated soils are more vulnerable
	Phone Lines	Variable	Low	• Lines through areas of unconsolidated soils are more vulnerable
Sandy Point Peninsula	Sandy Point Fire Station	1998	Moderate	• Enhanced shaking possible in alluvial deposits, site class D; • Moderate to high liquefaction risk;.
	Lummi Sewer District Wastewater Treatment Plant	1982	Moderate to High	• Enhanced shaking possible in alluvial deposits, site class D; • Located in a moderate to high liquefaction zone
	Residences	1962-Present	Moderate to High	• Enhanced shaking possible in alluvial deposits, site class D; • Moderate to high liquefaction risk • Many homes before 1976
Northwest Upland	Sandy Point Heights Fire Station	1980s	Low	• Enhanced shaking possible in Bellingham Drift soils, site class C-D
	Lummi Natural Resources Pump House, Tank	1994	Low	• Enhanced shaking possible in Bellingham Drift soils, site class C-D
	Residences	Pre-1950-Present	Low to Moderate	• Variable age and seismic design of structures; • Approximately half of homes before 1976; • Enhanced shaking possible in Bellingham Drift soils, site class C-D
Floodplain	Silver Reef Casino	2001	Low	• Enhanced seismic design, including foundation columns extending 20 feet below the ground • Moderate to high liquefaction risk • Site class D-E
	Shell Gas Station and Mini-Mart	1998	Moderate	• Enhanced shaking possible, site class D-E; • Moderate to high liquefaction risk; • Fuel lines possible source of leaks; automatic shut-off valve; • Fuel tanks are double wall fiberglass, with approved leak detectors and monitors and meeting all EPA regulations; • Merchandise on shelves exposed
	Lummi Bay Seaponds Fish Hatchery	1972	Moderate to High	• Enhanced shaking possible, site class D-E; • Moderate to high liquefaction risk;

[1] Portage Island is not listed because it is currently unoccupied and undeveloped.
[2] Estimated based on underlying soil, site class, liquefaction susceptibility, year built/seismic design, and type of construction.

Table 4.7 Estimated Earthquake Vulnerability of Structures

Assessment Area[1]	Structure(s)	Year Built	Estimated Vulnerability[2]	Comment
	Residences	Pre-1950-Present	Moderate to High	• Enhanced shaking possible, site class D-E; • Moderate to high liquefaction risk; • Mostly agricultural land use; relatively few homes
Lummi Peninsula	Lummi Sewer District Wastewater Treatment Plant	1982	Moderate	• Enhanced shaking possible in Bellingham Drift soils, site class D
	Gooseberry Point Fire Station	1963	Low	• Enhanced shaking possible in Bellingham Drift soils, site class D
	Wex li em Community Center	1995	Low	• Large timber-frame structure
	Little Bear Creek Senior Assisted Living Facility	2000	Low	• Large wood-frame structure; • Vulnerable population
	Headstart Classroom Building	2000	Low	• Newer wood-frame structure
	Old Tribal School	~1970+	Moderate	• Mostly modular buildings built since 1990; cinder block gymnasium built in ~1970; • Enhanced shaking possible in terrace deposits, site class C-D
	Lummi K-12 Tribal School	2004	Low	• Tilt up concrete exterior walls and timber space frame long span structures and glu-lam beams; • Site class D
	Northwest Indian College	1950s-2001	Moderate	• Mostly ~1980s modular buildings with wood-frame construction, block foundations; four buildings from 1950s; one in 1989 & 2001 • Enhanced shaking possible in terrace deposits, site class C-D
	Lummi Tribal Health Center	2000	Low	• Newer wood-frame structure
	LIBC Offices	1950s/ 1990+	Moderate	• Primarily wood-frame and some cinder block construction from 1950s and since ~1990; • Enhanced shaking possible in terrace deposits, site class C-D
	LIBC Archives Building	1998	Low	• Newer wood-frame structure
	Tribal Courthouse	2003	Low	• Newer wood-frame structure
	Lummi Shellfish Hatchery	1972	Moderate	• Older structures may not meet current seismic standards; • Enhanced shaking possible in unconsolidated alluvial deposits, site class D-E
	Residences	Pre-1950-Present	Low to Moderate	• Variable age and seismic design of structures; • Many homes built before 1976
Gooseberry Point	LIBC Employment Training Center	1950s	Moderate to High	• Enhanced shaking possible, site class D; • Low to moderate liquefaction risk; • Older building, may not meet current seismic standards

Table 4.7 Estimated Earthquake Vulnerability of Structures

Assessment Area[1]	Structure(s)	Year Built	Estimated Vulnerability[2]	Comment
	Fisherman's Cove Marina (gas station, mini-mart)	1950s	Moderate to High	• Enhanced shaking possible, site class D; • Low to moderate liquefaction risk; • Fuel lines possible source of leaks; automatic shut-off valve; • Fuel tanks are double wall fiberglass, with approved leak detectors and monitors and meeting all EPA regulations; • Older building, may not meet current seismic standards; • Merchandise on shelves exposed
	Fisherman's Cove (boat storage, launching, and repair)	1950s	Moderate to High	• Enhanced shaking possible, site class D; • Low to moderate liquefaction risk; • Older structures, may not meet current seismic standards
	Residences	Pre-1950-Present	Moderate to High	• Enhanced shaking possible, site class D • Low to moderate liquefaction risk; • Most homes before 1976

on a list of cities with more than $10 million in annualized earthquake losses. The Washington State Hazard Mitigation Plan finds that Whatcom County is one of 21 counties in the state most vulnerable to future earthquakes. A HAZUS analysis determined that Whatcom County has an Annualized Earthquake Loss of $4,987,000 and an Annualized Earthquake Loss Ratio of 0.04 (WEMD 2004). These economic losses in the Reservation region will have direct and indirect effects on the residents and businesses of the Reservation.

An accurate dollar estimation of building losses due to earthquake on the Reservation would require building information such as date of construction, type of building, seismic design at date of construction, and assessed values of buildings, as well as information on the earthquake hazard. Some of this information may not be available for the Reservation and such a detailed study, even using the Hazards-U.S. (HAZUS) software developed by FEMA, is beyond the scope of this plan.

Approximate losses estimated by HAZUS (1999 version) were provided by the Washington Emergency Management Division using default data from the 1990 Census (Quarles 2003). The estimated annualized losses on the Reservation due to structural damage ($9,000), nonstructural damage ($41,000), and contents damage ($15,000) totaled $65,000 (estimated inventory loss was zero). These estimated losses to structures and contents represented a loss ratio of 0.04 percent (evidently based on an outdated total value for structures and contents of $162.5 million). Based on the figures listed in Table 4.23, the total structure and contents value of all private residences (assessed or estimated values) and public facilities (insured values) on the Reservation is over $378 million. Annualized losses based on this figure and a loss ratio of 0.04 percent indicate a total annualized loss of approximately $151,000 for structures and their contents. Since the newer structures contributing to this larger estimate of structure values are less vulnerable than older structures, the total annualized loss is likely lower than $151,000. However, private businesses have not been included in this inventory. Since residential structures represented 92 percent of structure value on the Reservation in this HAZUS analysis (Quarles 2003), residences accounted for the majority of damages. Unreinforced masonry structures were estimated to represent 0.6 percent of the structure inventory. The estimated annualized income losses (due to relocation, capital-related, wage, and rental income losses) on the Reservation totaled $9,000. With annualized total damages of $74,000, these figures suggest that over 50 years the probable damages would total $3.7 million.

For a specific, moment magnitude-7.1 earthquake on the South Whidbey Island fault with a PGA on the Reservation of 8.4, the HAZUS program estimated the following probabilities for damage to structures:

- None: 89 percent
- Slight: 8 percent
- Moderate: 3 percent
- Extensive: Less than one percent
- Complete: Zero

As described in Section 4.3.2, an earthquake generating a PGA on the Reservation greater than 8.4 will occur someday, but its probability is much lower than this modeled event. An updated HAZUS-MH (Multi-Hazard) version may show similar slight damages on the Reservation since structures built since 1990 should be resistant to earthquake

damage. However, if the estimated earthquake hazard has increased, damage may be proportionally larger.

The majority of the buildings on the Reservation were built in the past three decades, when seismic design requirements were in place, and are unlikely to suffer significant damage during the most probable earthquakes. Of the buildings built before seismic design requirements were in place, most are single story, and only a few, if any, brick or block buildings have a second story. Thus, the probability of deaths or serious injuries resulting from the collapse of buildings is low, especially given the low probability of a severe earthquake causing heavy damage. Buildings with unreinforced, weight-bearing brick walls constructed with sand-lime mortar are most vulnerable. Older multistory buildings may be moderately vulnerable, while the performance of wood frame dwellings should be excellent, based on experience in recent earthquakes (WEMD 2001). The estimated structure and contents values for buildings on the Reservation are listed in Section 4.12.

The approximately 430+ residential buildings built before 1975 are likely to suffer some damage in a strong or very strong earthquake. Many of the LIBC offices, old tribal school and NWIC buildings, and older small business buildings are also likely to suffer damage in a strong or very strong earthquake. The Nisqually Earthquake, with moderate perceived shaking on the Reservation, resulted in damages totaling $54,607 to LIBC buildings (Bunton 2003). The cost of repairing the Lummi Aquaculture dike was $73,864. Additional FEMA awards for Nisqually Earthquake damage were made to residents on the Reservation.

Other structures that are vulnerable to amplification and liquefaction along the Reservation and nearby shorelines also represent potential earthquake losses. These structures include the Fisherman's Cove piers; the Whatcom County ferry terminal pier at Gooseberry Point; bulkheads, sea walls, and dikes along the shoreline; sewer and water pipelines; and the Cherry Point refinery piers for oil tankers, just north of the Reservation. Damage to these structures, including potential spills from fuel or sewer tanks and pipelines, would result in environmental, economic, and potential public health and safety effects on the Reservation.

Public health and safety, environmental, and economic effects would also result from potential electrical powerline, water pipeline, and sewer pipeline failures. The power poles and pipelines on the Reservation are vulnerable to amplification and, in the Sandy Point Peninsula, Gooseberry Point, and Floodplain assessment areas, possibly liquefaction. Overhead power lines could slap against each other and cause short circuits. Downed electrical lines would result in short- or long-term loss of power, which would result in economic losses and could result in environmental or public health and safety hazards. Sewer lines that rely on electrical pump stations will not function during power outages resulting in sewer overflows. Pipelines that are gravity systems could be affected by changes in grade or by flotation caused by liquefaction. Water lines that fail and drain can not be used to provide water for fire suppression, drinking, sanitation, and other uses.

In a large future earthquake, the Lummi Nation would also suffer economic losses from regional damages. Road transportation on the Reservation is heavily dependent on bridges that cross the Nooksack River. These bridges are vulnerable to amplification and liquefaction of the river sediments that support the bridge columns. The disruption

of transportation resulting from damaged bridges would have economic and public health and safety effects on the Reservation. In addition to potential transportation effects, disruption of economic activity and damages to other infrastructure in the region will have direct and indirect economic effects on the Reservation and its residents.

4.4 SEVERE WINTER STORMS

Winter storm hazards include heavy snows, ice storms, and extreme cold. Like most other natural hazards, heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulation of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days. The cost of snow removal, repairing damages, and loss of business can have large economic impacts. Similarly, heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. In addition, ice jams may form on rivers and in storm sewer systems and lead to flooding. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Extreme cold often accompanies a winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening (NOAA 1991).

In this section, past winter storm events, winter storm vulnerability, and potential winter storm losses on the Reservation are described.

4.4.1 Profiles of Past Winter Storm Events

A blizzard is defined as sustained wind or frequent gusts to 35 mph or greater and considerable falling and/or blowing snow that frequently reduces visibility to less than a quarter-mile. The Washington State Hazard Mitigation Plan identifies Whatcom County as one of 16 counties in the state most vulnerable to blizzards (WEMD 2004). Nearly every winter, outflows of very cold arctic air move south down the Fraser River valley in Canada and push into the Whatcom County area, often moving directly onto the Reservation. The cold air is usually accompanied by strong northeast winds that can topple trees and disrupt power. The strong winds also can result in a dangerous wind chill effect. When the cold arctic air flowing from the north meets warm moist air from the south, snow can result, sometimes with significant accumulations. Table 4.8 lists the major recorded winter storms that have affected the Reservation.

During the 1996-97 winter storms, high snowfall and cold temperatures resulted in significant snow accumulations. The accumulations, aggravated by rain, drifting snow, and ice in roof drains, caused excessive weight and the collapse of structures. Roughly 70 residents on the Reservation received disaster assistance from FEMA to fix damaged roofs; the LIBC also received funding to repair roofs of tribal buildings (Folsom 2003). Over 400 boats in the Puget Sound region sank due to the collapse of covered marina slips. High winds and ice contributed to the repeated and extended power outages that involved over 500,000 power customers during December 1996 - February 1997 (WEMD 2001).

Table 4.8 Recorded Major Winter Storm Events in the Reservation Region[1]

Date	Storm Type	Description
January 10, 2007	Snowstorm and wind	Snow accumulations of up to 10 inches, temperatures in the 20's, and winds from 20 to 40 mph with gusts up to 65 mph. LIBC and the Lummi Nation School closed for 2 ½ days.
November 27, 2006	Snowstorm	Six to twelve inches of snow fell in Whatcom County. Temperatures were in the mid 20's to lower 30's throughout the week and a record low temperature of 12°F was recorded at the Bellingham International Airport on November 28. LIBC and the Lummi Nation School were closed for five days. Over $575,000 was spent at the local, county, and state level for Whatcom County.
December 26, 1996	Winter storm, wind, gale warning, flood, landslide, and avalanche	Storm fronts pushed across Washington, causing structures to collapse under the heavy weight of snow, road closures, power outages, landslides, and 20 weather-related deaths. The Governor declared emergencies for 37 counties. Federal Disaster Number 1159 was issued for the storm.
November 19, 1996	Ice storm	In the Puget Sound area 50,000 customers were without power. There were 4 deaths and $22 million in damages. Federal Disaster Number 1152 was issued for the storm.
1990	Winter storm	Two arctic storms, snow, high winds, thaw and refreeze, and floods on the Reservation.
January 1950	Snowstorm and wind	Blizzard dumped 21 inches of snow on Seattle and killed 13 people in the Puget Sound region. The snowfall was accompanied by 25-40 mph winds. The winter of 1949/1950 was the coldest recorded in Seattle with average temperatures of 34.4 degrees. January had 18 days with high temperatures of 32 degrees or lower.
February 1, 1916	Snowstorm and wind	Twenty-one inches of snow fell in Seattle in 24 hours and 2 to 4 feet in other parts of Western Washington. In January and February, Seattle received 58 inches of snow. Winds created snowdrifts as high as five feet.

[1]WEMD 2001; Whatcom County 2002.

4.4.2 Winter Storm Vulnerability Assessment

Relative to the size of the Reservation, winter storms are a large-scale event. Hence, all six assessment areas of the Reservation are exposed to severe winter storms to a similar degree. However, some differences exist in the vulnerabilities of the six areas to winter storms. One difference is that the relatively unforested Sandy Point Peninsula, Gooseberry Point, and Floodplain areas are exposed to somewhat greater wind speeds and wind chill effects. The forested areas of the Reservation face the hazard of branches breaking under the weight of snow and ice. In addition, there are numerous slopes in the Lummi Peninsula and Northwest Upland areas that can be difficult to drive if the roads have not been plowed and sanded. One factor that increases the relative vulnerability of the Floodplain assessment area is flooding from the Nooksack River caused by an ice dam forming in the river. Finally, the Floodplain area and the north- or east-facing areas of the Reservation (including portions of the Northwest Upland and Portage Island and the eastern-facing side of the Lummi Peninsula) are more exposed to the cold northeast winds from the Fraser Valley. Based on this greater exposure, these areas were estimated to have a high vulnerability to winter storms; the remainder

of the Reservation is estimated to have a moderate vulnerability to winter storms. The estimated vulnerabilities to winter storms of the six assessment areas and critical facilities on the Reservation are shown in Figure 4.11.

Since snow and freezing temperatures are irregular events on the Reservation, they can catch residents off-guard and less prepared than if such weather occurred on a regular basis. This factor makes the Reservation more vulnerable than colder regions in that homes may be less protected and residents less accustomed to traveling in snow and ice conditions. Older homes and facilities on the Reservation are likely more vulnerable to freezing or the burden of heavy snow than newer structures.

The overall vulnerability of the Reservation to winter storms is moderate to high. These events present a significant hazard to public health and safety and a substantial disruption of economic activity, but a limited and infrequent hazard to structures. The generally short duration of winter storm effects also limits the vulnerability of the Reservation. The probability of occurrence is high since winter storms with smaller effects occur approximately every other year, while storms with larger effects occur less often.

4.4.3 Potential Winter Storm Losses

It is difficult to estimate the cost of potential storm damages to structures on the Reservation. Damage to roofs by heavy snow accumulations depends on the quality of construction and the weight of the snow. Frozen water pipes will also result in a certain amount of damage. Storm water drains that become blocked by ice could lead to damage due to local flooding. Any number of these factors could combine at various degrees of severity to produce the total structural damages that may result from a winter storm.

Recovery from winter storms often requires assistance from emergency responders from utilities, public works, firefighting, emergency medical services, search and rescue, law enforcement, and the Coast Guard. The costs of these services can quickly add up for the governments that provide them and the governments may not have a sufficient reserve in place to cover the costs.

Utility lines could be broken by heavy accumulations of ice, causing power outages or loss of phone lines. These outages are usually small in geographic area, but the outage duration can be extended – particularly in relatively rural areas. Severe or lengthy cold periods require more electric power, which may be in short supply. Extended outages may require shelters to be opened, particularly in very cold weather.

The economic losses caused by a winter storm may frequently be greater than structural damages. Employees may not be able to get to work for several days, customers will stay at home, offices and businesses may not open, and damages will result in the cost of repairs and the cost of lost business while repairs occur. The Lummi tribal offices and schools are commonly closed after a winter storm because of icy roads. Depending on the size, duration, and timing of a winter storm, economic costs could be substantial. Overall, winter storms may occasionally result in significant human, economic, and property losses on the Reservation.

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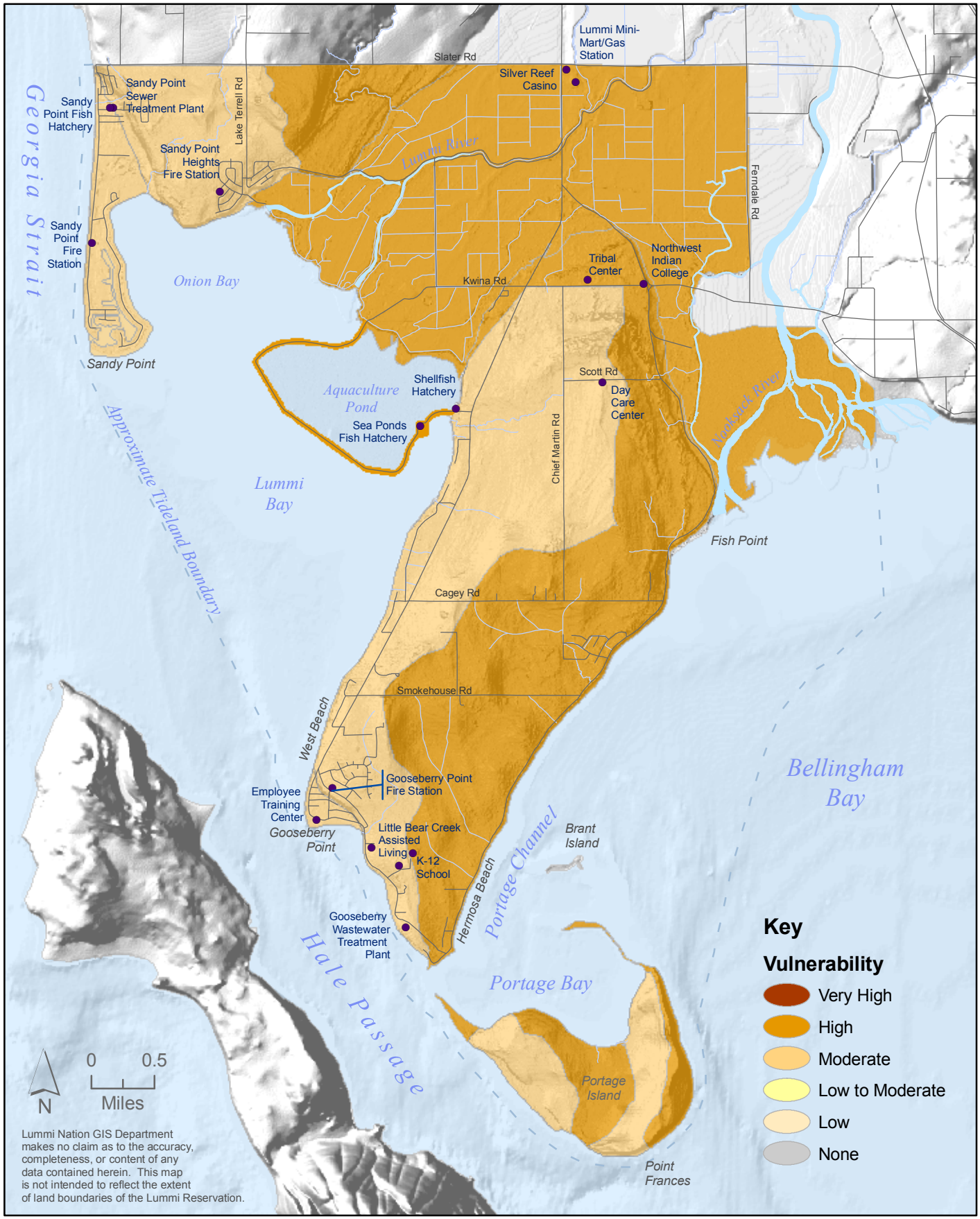

Figure 4.11 Estimated Winter Storm Vulnerabilities in Reservation Areas

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4.5 WINDSTORMS

Similar to severe winter storms, windstorms can disrupt vital electric power and telephone systems, threaten lives and property, and typically do tremendous damage to forests, both rural and urban. Windstorms on the Reservation can occur at any time of the year, but are most common from October to March. When winds are from the north or south, channeling or funneling of strong winds by Vancouver Island and the San Juan islands can increase wind speeds in the vicinity of the Reservation (Whatcom County 2002). In this section, past windstorm events, windstorm vulnerability, and potential windstorm losses on the Reservation are described.

4.5.1 Profiles of Past Windstorm Events

The Columbus Day Storm of 1962 was the strongest, most widespread, non-tropical windstorm to strike the continental United States in recorded history, affecting an area from northern California to British Columbia. The storm claimed seven lives in Washington State; 46 died throughout the affected region. One million homes lost power. More than 50,000 homes were damaged. Total property damage in the region was estimated at $235 million (1962 dollars). The storm blew down 15 billion board feet of timber worth $750 million (1962 dollars), which is more than three times the timber blown down by the May 1980 eruption of Mount St. Helens and enough wood to replace every home in the state (Hill et al. 1999). The highest recorded wind speeds (before the power went out at recording stations) were (Hill et al. 1999):

- Naselle, Washington Coast: gust to 160 mph.
- Portland, Oregon: gust of 119 mph.
- Bellingham and Vancouver: gusts of 92 mph.
- Renton, Washington: gust of 100 mph.
- Tacoma, Washington: gust of 88 mph.

The local effects of the Columbus Day Windstorm were (Whatcom County 2002):

- Sank the Lummi Island ferry Chief Kwina.
- The Bellingham Airport reported 75 mph winds and gusts to 98 mph;
- Power wires flashed;
- Windows exploded from changes in pressure;
- Rural areas took the brunt of the storm: barns, sheds, roofs, and silos collapsed throughout the county; dead cattle, trees, and debris were strewn about;
- Louis Auto Glass building in Bellingham collapsed under 98 mph wind;
- Some roofs ripped away;
- The Sumas Bus Garage was wrecked; and
- Damage was reported at Western Washington University, Battersby Field, Lowell Elementary School, and the Pioneer Rest Home in Ferndale.

Another large windstorm occurred on the morning of January 20, 1993, when a powerful low pressure system swept through central Western Washington and caused great destruction, numerous injuries, and five deaths. This storm is commonly referred to as the Inaugural Day Storm since it occurred on the day of the Presidential Inauguration. Winds averaging 50 mph caused trees to fall and knocked out power to 965,000 customers. Hurricane force winds swept King, Lewis, Mason, Pierce, Snohomish, Thurston, and Wahkiakum counties. Winds in the Puget Sound area gusted to 60-70

mph. A gust at Cape Disappointment on the Washington Coast reached 98 mph. Throughout the Puget Sound region, fifty-two single-family homes, mobile homes, and apartment units were destroyed, and 249 incurred major damage, many from falling trees and limbs. More than 580 businesses were damaged. Total damage in western Washington was estimated at $130 million (WEMD 2001; Hill et al. 1999).

Summaries of major recorded windstorm events in the region are provided in Table 4.9.

4.5.2 Windstorm Vulnerability Assessment

Windstorms with sustained winds of 50 miles per hour are powerful enough to cause significant damage and occur frequently in the Puget Sound area (WEMD 2001). In a large windstorm, the six assessment areas of the Reservation are exposed to comparable wind speeds, but the vulnerability varies because of the differences in hazards between these areas. Many of the buildings in the Lummi Peninsula and Northwest Upland areas are close to trees that could be blown onto the buildings, an obvious hazard to personal safety as well as the structures. Roads in these two areas are also more likely to be blocked by fallen trees. Areas of denser development, such as Gooseberry Point, Sandy Point Heights, and the Sandy Point Peninsula, may face a greater hazard from fallen power lines relative to less developed areas. The hazard of direct damage to structures, such as damaged roofs, should be similar in the six assessment areas, with total damages proportional to the number of structures. Wind-driven waves present a hazard of coastal flooding in the shoreline areas, especially along the Sandy Point Peninsula and to a lesser degree at Gooseberry Point, Hermosa Beach, and Portage Island (see Section 4.2 for details). These waves also generate much of the coastal erosion described in Section 4.6. The estimated vulnerability of the six assessment areas and critical facilities on the Reservation is shown in Figure 4.12. Forested areas and coastal flood zones were estimated to have high wind vulnerability and non-forested areas were estimated to have moderate vulnerability to windstorms.

4.5.3 Potential Windstorm Losses

The potential losses to structures in the five developed assessment areas from a major wind event are summarized in Table 4.10. The damages due to downed trees or direct wind effects for this hypothetical event are defined as 50 percent destruction of five percent of vulnerable buildings (adjacent to trees) and destruction of roofs on an additional five percent of buildings` (requiring roof replacement). Average estimated costs for replacement of the damaged structures were used to calculate total figures. The costs of other losses, such as downed utility lines, loss of power, economic and governmental disruption, electrocution, and danger of fire, are difficult to accurately estimate and are not included in the estimated potential losses. Loss of power also results in a disruption of sewer pump operations, which increases the possibility of environmental damage and public health risks from overflows of sewage.

It is important to note that the majority of the coastal flooding that occurs along the Reservation shorelines is caused by wind-generated waves, that is, the damage from such flooding is largely due to windstorms in combination with high tides. As described in Section 4.2, windstorms from certain directions, when combined with high tide

Table 4.9 Recorded Windstorm Events in the Reservation Region[1]

Date	Description
December 11, 2006	Gusts up to 41 mph, trees toppled and power knocked out in Whatcom County, two flights cancelled at Bellingham International Airport.
November 15,2006	SE winds from 30 to 45 mph with gusts up to 82 mph. One trailer crushed by a fallen tree on the Reservation. Little Bear Creek lost power and residents were housed and fed at the casino. 135,000 customers lost power statewide.
February 4, 2006	40 mph winds with gusts to 69 mph, flooding at Sandy Point and Gooseberry Point, County makes emergency declaration.
December 2001	Similar but less severe conditions to the December 2000 storm produced damage along the Sandy Point Peninsula on the Lummi Reservation.
December 2000	Severe damage (~$750,000) to beachfront homes along the Sandy Point Peninsula of the Reservation resulted from waves/flooding generated by a combination of gale force northwest winds, extreme high tides, storm surge, and low pressure.
October 27, 1999	A strong Pacific frontal system moved across western Washington, causing power and phone outages throughout the region. Marine storm and coastal flood warnings were issued for the coast. One citizen died when a tree fell on them.
March 3, 1999	Sustained winds of 40 mph were generated in the region, with one gust recorded at 129 mph. The Coast Guard recommended that all marine vessels report to safe moorage.
November 19, 1998	Winds of 80 miles per hour were recorded in the region, toppling trees and causing power outages to 15,000 customers.
October 29, 1997	Commercial fishing vessel Miss Lindsay, 53-feet long, overturned at night and four fishermen drowned in Hale Passage/Bellingham Bay in storm-force winds of 58-81 mph out of SE and 5- to 6-foot seas. Miss Lindsay was discovered capsized on October 30, 1997, in Bellingham Bay, 0.1 nautical mile SE of Portage Island.
December 1995	Storms starting in California generated winds of 100 miles per hour, continued north, causing three states, including Washington, to issue disaster proclamations. Federal Disaster Number 1079 was issued for the incident.
December 4, 1993	Sustained winds of 40 to 50 mph combined with a high tide to produce large breaking waves that caused damage to bulkheads and homes along the Sandy Point Peninsula of the Reservation.
January 20, 1993	Inauguration Day Storm damaged homes, businesses, and public utilities, leaving thousands without power for days from Longview to Bellingham. The state Emergency Operations Center coordinated resources. The National Guard provided generator power and equipment. The Energy Office prioritized power restoration. The American Red Cross sheltered 600 people and fed 3,200 meals. The Department of Transportation and the State Patrol coordinated transportation routes and road closures. Federal Disaster Number 981 was assigned for the event.
September 1986	Commercial fishing boat swamped at Gooseberry Point on the Reservation and sank at the dock. High winds and five-foot waves washed over the dock. Lummi Island Ferry closed, leaving 18 school children that commuted from Lummi Island without a way home.
December 1982	Flooding, severe storm, high winds, and coastal flooding affected the Reservation and Whatcom County areas. Four persons were injured, 122 people were evacuated, 129 homes and 113 businesses were damaged, and there was $1.7 million in Stafford Act assistance for public facility damage. In addition, the U.S. Small Business Administration loaned $1 million to home and business owners for damages. Federal Disaster No. 676 was declared for the Whatcom County area (Washington State Department of Emergency Services et al., 1983).

Table 4.9 Recorded Windstorm Events in the Reservation Region[1]

Date	Description
February 25, 1979	Worse local electrical power damage than Columbus Day Storm of 1962 because the winds of 25-30 mph did not let up. It interrupted power to 4,000 customers in Whatcom County, especially widespread outages at Chuckanut, Birch Bay, Custer, Nooksack, Sumas, and near Lake Louise. Most damage was by trees breaking lines. Hood Canal Bridge near Port Gamble, Washington, destroyed by windstorm.
February 13, 1979	Winds up to 70 mph knocked out power on Lummi Island, Larrabee, Chuckanut Drive, Highway 9 from Wickersham to Mount Baker Highway, and from Marine Drive (possibly including the Reservation) to Lynden in northern Whatcom County.
March 30, 1975	Windstorm from the northwest caused flood damage along the Reservation and Whatcom County shorelines, with the greatest damage occurring along the Sandy Point Peninsula.
October 12, 1962	The Columbus Day Storm is considered the greatest windstorm to hit the Northwest in recorded history. It was the top weather-related event (including floods, winter storms, and all other climatic events) in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. Federal Disaster No. 137 was assigned for the event.
November 1958	High winds in Western Washington.
November 7, 1940	Tacoma Narrows Bridge collapsed due to induced vibrations from 40 mph winds.

[1]WEMD 2001; Whatcom County 2002, FEMA 2003d, Millage 2006, Bellingham Herald 2006, Taylor 2006,

conditions, can result in coastal flooding along exposed shoreline areas. The aspect of each shoreline area, as well as the timing of the windstorm, determines whether an area is vulnerable to flooding during a specific windstorm. Thus the estimated potential losses due to coastal flooding that are listed in Table 4.2 can also be attributed to windstorms and are therefore also listed in Table 4.10. Although these flooding losses will depend on wind direction and tidal timing, the potential losses due to downed trees or direct wind effects are not dependent on wind direction or time of day and therefore could occur during any strong windstorm (although downed trees are more likely during the wet season when saturated soils are softer).

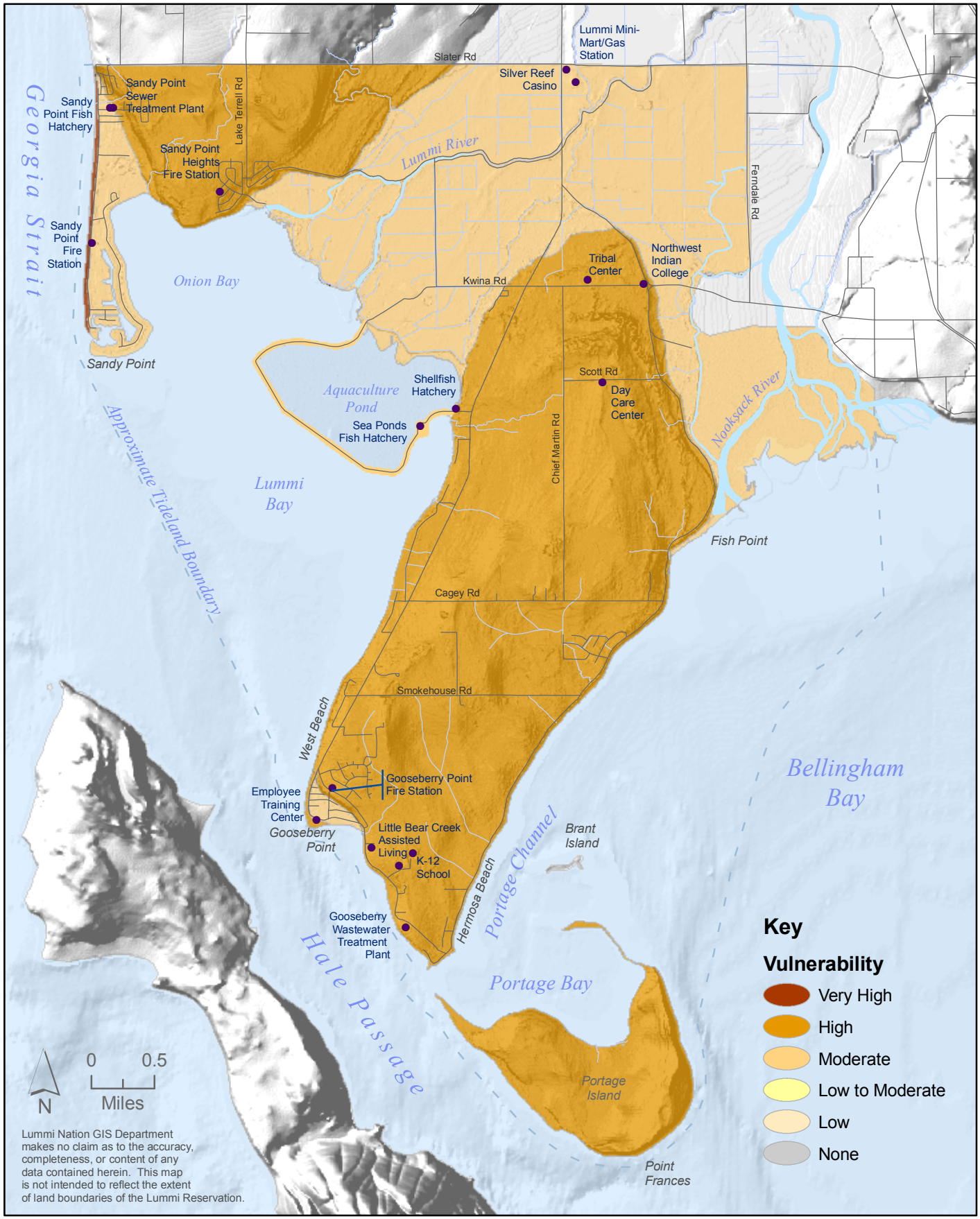

Figure 4.12 Estimated Windstorm Vulnerabilities in Reservation Areas

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Table 4.10 Vulnerability and Potential Losses of Structures to Windstorms

		Direct Wind or Tree Blowdown Damage			Coastal Flood Damage (from Table 4.2)			
Assessment Area	**Estimated Vulnerability**	**Number of Structures[1]**	**Structure Losses[2]**	**Roof Losses[3]**	**Number of Structures[1]**	**Structure Losses[4]**	**Contents Losses[5]**	**Location/Comment**
Sandy Point Peninsula	Very High				190	$10,653,012	$5,326,506	▪ Western shoreline
	Moderate				253	$14,790,332	$7,395,166	▪ Southern and eastern shorelines and interior of peninsula
		609	$0	$76,125				▪ Mostly unforested, direct wind damage for entire peninsula;
Northwest Upland	High	605	$691,792	$75,625				▪ Most of the area is forested
Floodplain	High				1	n/a	n/a	▪ Seaponds dike
	Moderate				7	$435,150	$140,800	▪ Seaponds Hatchery buildings
		123	$0	$15,375				▪ Most of the area is not forested
Lummi Peninsula	High	1,378	$1,503,687	$172,250				▪ Most of the area is forested, but public facility surroundings are mostly cleared
	Moderate				4	$160,000	$80,000	▪ Hermosa Beach
Gooseberry Point	High				44	$6,476,565	$1,491,032	▪ Western and southern shoreline
	Moderate				150	$2,209,135	$1,159,092	▪ Interior area
		194	$0	$24,250				▪ Most of the area is not forested
Total		**2,909**	**$2,195,296**	**$363,625**	**649**	**$34,724.194**	**$15,592,596**	▪ Total Windstorm Losses: ~$52,875,711

[1]Residences and other structures counted from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution. Total structures does not include utility lines.
[2]Potential structure losses due to tree blowdown are estimated replacement cost (see Table 4.23 for specific values) of 50 percent of structure for five percent of structures in high vulnerability areas.
[3]Potential roof losses due to direct wind damage are estimated replacement cost of roof ($2,500) for five percent of structures in all vulnerability areas.
[4]Potential structure losses estimated as half of 2007 assessed improvements (if area is primarily fee land), estimated residential replacement value (if area is mixed fee and trust land), and/or insured values (see Table 4.23 for specific values).
[5]Potential contents losses estimated as half of the insured contents values or half of the estimated structure losses (FEMA 2001a).

4.6 COASTAL EROSION

Erosion is the general process or group of processes whereby earth materials are loosened, dissolved, or worn away and simultaneously moved from one place to another (Bates and Jackson 1980). Coastal erosion is a chronic hazard along some of the Reservation shorelines. The processes involved may be wave action, storm surge, elevated El Niño sea level, nearshore currents, tidal effects, and even subsidence due to Cascadia Subduction Zone earthquakes or other geologic processes. Physical factors that affect erosion rates include sediment sources; changes in relative sea level; sediment size, density, and shape; sand-sharing of beaches, dunes, and offshore bars; effects of waves, currents, tides, and wind; offshore bathymetry; and shore defense works. Often more than one of these factors will occur at once to put property in peril. Human influences can include alteration of the beach, dunes, or bluffs; dredging; construction of groins and jetties; hardening shorelines with seawalls or revetments; and beach nourishment. Coastal erosion can also lead to collateral damage such as flooding, bluff recession, and landslides (Oregon 2000b).

In this section, past coastal erosion events, coastal erosion vulnerability, and potential coastal erosion losses on the Reservation are described.

4.6.1 Profiles of Past Coastal Erosion Events

A beach alteration that affected erosion on the Sandy Point Peninsula was the excavation of the Sandy Point Marina entrance channel in 1958 (a project that was completed without a permit from the U.S. Army Corps of Engineers or any other permit). This excavation interrupted the historic southward littoral drift of sediment along the west shore of the Sandy Point Peninsula. Instead of accreting on the South Cape of the peninsula, the sediment is now deposited in the entrance channel and will eventually fill the channel. Without the historic flow of sediment from the north, the formerly accreting South Cape has been eroding at a relatively high rate. The total horizontal erosion measured from 1962 to 2006 ranged between 0.5 and 64.8 ft at three transect sites along the South Cape representing erosion rates of 0.0 to 1.2 feet per year (Johannessen 2006). The shoreline adjacent to the north side of the marina entrance has also been eroding at a high rate, ranging from approximately four to five feet per year over the 1962 to 1982 period. Over these same periods, the spit extending from the north side of the marina entrance has been growing from approximately nine to nearly twelve feet per year (Johannessen 2003).

Although coastal erosion is largely a storm-driven process, its effects are generally only noticed over the long term as storm waves whittle away at beaches and coastal bluffs. However, specific erosion events occur on occasion, causing immediate damage by eroding the support of structures that were built close to the shore. Although such damage may occur during a specific storm, all such damage on the Reservation has resulted from the gradual, long-term process of erosion (Johannessen 2000c). Four recent events occurred on the Reservation along the Sandy Point Peninsula in December 2000 ,along Lummi Shore Road (LSR) in January 2003 and February 2006, and along Lummi View Drive in 2006. These events were described in detail in Section 4.2.1.2 on coastal flooding and are summarized with other recorded erosion processes below in Table 4.11. Figure 4.13 presents photographs of the erosion damage from the 2003 and 2006 Lummi Peninsula events. Photographs of erosion effects along the west

beaches of the Sandy Point and Lummi peninsulas are shown in Figures 4.6 and 4.17, respectively.

Table 4.11 Recorded Coastal Erosion Events on the Reservation

Date	Description
February 2006	▪ Winter storm with southerly winds of 40 mph and gusts up to 69 mph combined with high tides close to 10 feet. ▪ Whatcom County makes an emergency declaration ▪ Flooding at Gooseberry Point and Sandy Point. ▪ The south end of Lummi Shore Road was covered in debris, undercut in sections, and washed out in one area near the Portage.
2006	▪ A portion of the shoulder of Lummi View Drive near Little Bear Creek fell down to the beach exposing the sewer force main.
2006	▪ The eastern end of Lummi View Drive from the Stommish grounds to the intersection with Lummi Shore Drive was moved inland.
January 2003	▪ Southerly winds generated waves that flooded the Lummi Peninsula shoreline at Gooseberry Point and Hermosa Beach. ▪ The shoulder along approximately 1.5 miles of Lummi Shore Road was eroded in several sections, undercutting but not damaging the road surface in a few short sections.
December 2000	▪ A high tide and strong northwesterly winds drove large waves into the west shore of the Sandy Point Peninsula. ▪ The waves eroded sediments supporting bulkheads and decks as well as material behind bulkheads. The damage included six failed bulkheads; seven damaged bulkheads; 18 bulkheads with settled rip-rap; six flooded houses; nine damaged houses; 16 destroyed decks; and all 35 properties surveyed were flooded and contained overwash debris (Johannessen 2000a).
December 1997	▪ A coastal storm eroded the bank along Lummi View Drive, causing a large portion of the road shoulder to fall down to the beach. A 150-foot section of a force sewer line, the primary collector line from the west side of the peninsula, was nearly exposed and very vulnerable to further erosion. Emergency placement of a shore-armoring revetment was conducted to protect the road.
1990s-Present	▪ Erosion along Lummi View Drive on the Lummi Peninsula is threatening the road. A project to relocate the road away from the bluff is scheduled for completion during 2004.
1990s-Present	▪ Erosion along West Beach on the Lummi Peninsula is threatening homes near the edge of the bluff. One home was moved inland in 2002.
1990s-1998	▪ Coastal erosion severely damaged Lummi Shore Road, causing dangerous driving conditions due to the undercut roadway, which was reduced to one lane in ten locations. ▪ Erosion threatened utilities that parallel the road, including a water main, sewer force main, sewer gravity lines, sewer pump stations, and power and communications lines. ▪ An estimated 8,600 cubic yards eroded per year from the bluffs along Lummi Shore Road. ▪ In December 1994, an emergency rock revetment project was completed by the U.S. Army Corps of Engineers to protect approximately 2,500 feet of shoreline along Lummi Shore Road. ▪ In December 1998, approximately 9,400 linear feet of additional rock revetment was installed along Lummi Shore Road by the Corps of Engineers. Associated monitoring and beach nourishment activity is on-going.

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(a) View south along Lummi Shore Road in the Hermosa Beach area, January, 2003

(b) View north along Lummi Shore Road in the Hermosa Beach area, January, 2003

(c) View at the intersection of Lummi View Drive and Lummi Shore Road, February, 2006

(d) View south along Lummi Shore Road in the Hermosa Beach area, February, 2006

(d) View northwest along Lummi View Drive, road shoulder erosion 2006

(e) View northeast along Lummi View Drive, road shoulder erosion 2006

Figure 4.13 Erosion Damage along Lummi Shore Road and Lummi View Drive, 2003 and 2006

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4.6.2 Coastal Erosion Vulnerability Assessment

As described above in Table 4.11, several coastal areas on the Reservation are vulnerable to erosion. The entire shoreline of the Reservation is currently the subject of on-going monitoring and analysis of coastal erosion by Coastal Geologic Services, Inc., using the best available data for each reach of shoreline. Rates of erosion or accretion were determined from periods that represent current shoreline conditions so that the rates will predict future shoreline change more accurately. These periods were chosen based on the development history of each reach, literature-based assessment of shoreline processes, and the availability of high-resolution land and shoreline surveys. Although this analysis quantified rates of shoreline change, a qualitative assessment of the relative current and predicted future rates of change was also made (Johannesson 2003). This qualitative assessment is presented in Figure 4.14, which shows that the relative vulnerability to coastal erosion varies in sometimes short stretches. This variation is due to differing exposure of the shoreline reaches to wave action as well as the factors mentioned in the beginning of this section. In Figure 4.14, a high level of vulnerability is associated with erosion rates greater than 0.4 ft/yr, and a moderate level of vulnerability is associated with erosion rates less than or equal to 0.4 ft/yr. Reaches of negligible erosion, accretion, or mixed erosion and accretion are associated with a low level of vulnerability. This map was updated in 2007 based on new erosion monitoring. The only change was the increase in rate from low to moderate of a section of the shoreline along Lummi View Drive.

4.6.3 Potential Coastal Erosion Losses

One estimate of potential erosion losses is provided by the benefits derived from a project designed to prevent coastal erosion. The total benefits gained from the Lummi Shore Road project (slope revetment, road improvements, and drainage improvements) were calculated to be $742,600 per year (in 1997 dollars), 99 percent of which was associated with the avoided future cost of relocating the roads and utilities away from the eroding bluff. With average annual costs of $636,000, the project had a benefit-to-cost ratio of 1.2 (Corps of Engineers 1997). Phase One of this project, completed in December 1998, protected 9,400 feet of Lummi Shore Road with a rock revetment on the slope below the road. Phase Two of this project, completed in 2006, was the relocation of approximately 0.6 miles of Lummi View Drive away from the shoreline.

Along the Sandy Point Peninsula, the west shore and South Cape have high erosion rates that, over time, either have damaged or threaten damage to the structures along the shore. Continued erosion will make this area more vulnerable to coastal flooding in the future. Erosion of the toe of the bluff above West Beach on the Lummi Peninsula is increasing the landslide hazard along this shoreline reach (see Section 4.9). A similar process threatened a stretch of Lummi View Drive near the southern tip of the Lummi Peninsula and led to this portion of road being moved inland in 2006. Continued erosion and a lack of mitigation actions could eventually lead to the complete loss of the threatened structures. These potential total losses for the five developed assessment areas are estimated in Table 4.12.

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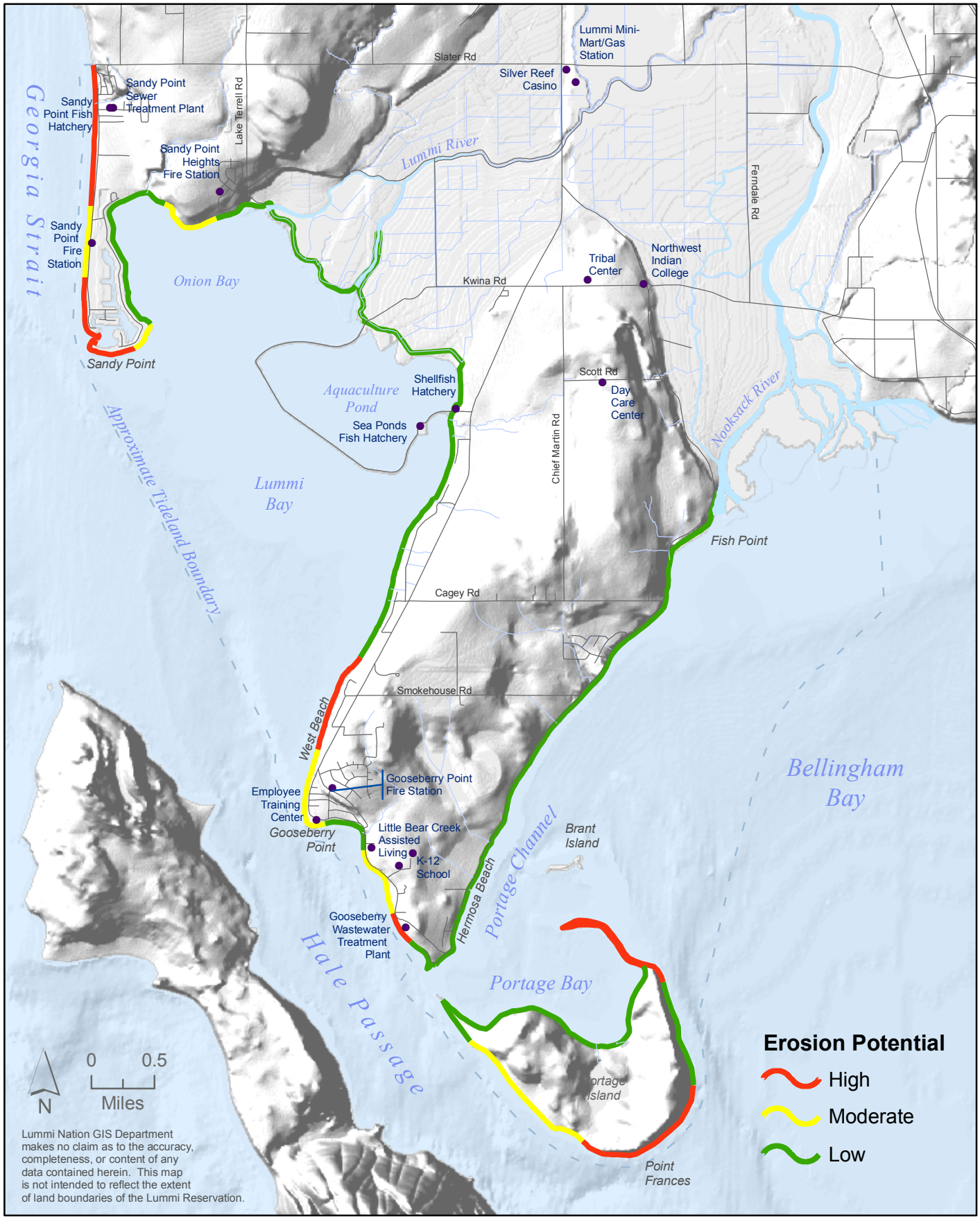

Figure 4.14 Relative Coastal Erosion Vulnerabilites along Reservation Shorelines (Johannessen, 2004)

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Table 4.12 Vulnerability and Potential Losses of Structures to Coastal Erosion

Assessment Area	Estimated Vulnerability	Number of Structures[1]	Structure Losses[2]	Contents Losses[3]	Location/Comment
Sandy Point Peninsula	Moderate to High	243	$29,900,955	$14,950,477	▪ West and south shore
Northwest Upland	Moderate	0	n/a	n/a	▪ No structures near eroding shoreline
Floodplain	Low	1	n/a	n/a	▪ Although erosion rate is low, Seaponds dike is vulnerable to storm waves
Lummi Peninsula	Moderate to High	72	$12,004,920	$4,073,310	▪ West Beach and portion of Lummi View Drive
Gooseberry Point	Moderate	40	$12,672,305	$6,107,802	▪ 20 homes along western shore, plus outbuildings ▪ LIBC mini-mart, office building, and piers
Total		**356**	**$54,578,180**	**$25,131589**	▪ Total Erosion Loss: ~$79,709,769

[1]Residences, outbuildings, and other structures counted from Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution.
[2]Potential structure losses estimated as 100 percent of 2007 building assessed values (if area is primarily fee land), estimated residential replacement value (if area is mixed fee and trust land), and/or insured values (see Table 4.23 for specific values).
[3]Potential contents losses estimated as 100 percent of insured values or 50 percent of structure losses (FEMA 2001a).

4.7 DROUGHT

Drought is a condition of dryness that is severe enough to reduce soil moisture, water, and snow levels below the minimum necessary for sustaining plant, animal, and economic systems. A drought results from a long period of abnormally low precipitation. The severity of a drought depends upon the degree and duration of low precipitation and the size of the affected area. Droughts are a natural part of the climate cycle. Unlike most disasters, droughts normally occur slowly but last a long time. In the past century, the Pacific Northwest has experienced many drought episodes, including several that lasted for more than a single season (e.g., 1928-32, 1992-94, and 1996-97). The most severe Washington State droughts on record occurred in 1977, 2001, and 2005 (WEMD 2001).

Depending upon its severity, a drought can have a widespread impact on the environment and the economy. The economic impacts of drought occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. The National Drought Mitigation Center groups the likely direct impacts of drought into three categories (National Drought Mitigation Center 2003):

- Agricultural – Crops that rely on natural precipitation are threatened.
- Water supply – Supplies for irrigated agriculture and water systems are threatened.
- Fire hazard – Threat of wildfires from dry conditions is increased.

In every drought, agriculture is adversely affected, especially in non-irrigated areas. Droughts affect individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors. Lack of snow during some droughts has forced ski resorts into bankruptcy. There is increased danger of forest fires; millions of board feet of timber have been lost to fire during drought periods. The loss of trees and other vegetation during wildfires increases erosion, causing serious damage to aquatic life, irrigation, and power development by heavy sedimentation of streams, reservoirs, and rivers. Reduced energy generation and increased energy costs have caused temporary unemployment in many industries (WEMD 2001).

Drought also reduces ground water resources, but generally not as quickly as it affects surface water supplies. Reduced replenishment of ground water can lead to a reduction in ground water levels and problems such as reduced pumping capacity, wells going dry, or saltwater intrusion in coastal areas such as the Reservation. Shallow wells are more susceptible to drought than deep wells.

Reduced replenishment of ground water also affects streams. Some of the flow in streams comes from ground water, especially in the summer when there is less precipitation and snowmelt slows. Lower ground water levels reduce the amount of water that will enter streams. Low water levels, generally at higher temperatures, have a negative effect on salmonids, which are an important resource for the Lummi people.

In this section, past drought events, drought vulnerability, and potential drought losses on the Reservation are described.

4.7.1 Profiles of Past Drought Events

The National Drought Mitigation Center at the University of Nebraska-Lincoln has compiled drought data for the period 1895 to 1995. Using the Palmer Drought Severity Index, a measure of moisture supply, the center determined the percentage of time during the 100-year period that various regions experienced drought conditions. Their data indicate that the Lummi Reservation suffered severe drought (the fourth of five drought categories) for five to ten percent of the time during this period. For the decade from 1985 to 1995, the Reservation had severe drought conditions from 10 to 20 percent of the time. During the same decade, the majority of the agricultural and hydroelectric area of eastern Washington was in severe or extreme drought for greater than 30 percent of the time (National Drought Mitigation Center 2003).

Specific drought events that affected the state of Washington over the past century are described in Table 4.13. Not all of these regional droughts affected the Reservation directly, but they likely had direct and indirect economic effects on the residents of the Reservation. Greater details for the droughts of 1977 and 2001, the worst and second-worst droughts recorded in Washington State history (since 1895), provide examples of how drought can affect the Reservation region (WEMD 2001).

Table 4.13 Recorded Drought Events in the Lummi Reservation Region[1]

Date	Occurrence
July, August 2006	▪ Driest July and August on record for Bellingham with 0.17 inch of rain
March – December, 2005	▪ Governor Gregoire authorizes the Department of Ecology to declare a statewide drought emergency on March 10, 2005. The declaration expired on December 31, 2005. ▪ The state experienced, or was expected to experience less than 75 percent of normal water supplies. ▪ Declaration makes available $2.1 million from the state Drought Preparedness Account and the 2005 legislature authorized and additional $8.2 million in emergency funding. ▪ Drought conditions were worst in the Yakima and Chelan river basins. Extreme drought conditions in central Washington and moderate to severe drought in most of eastern Washington. Conditions in much of Western Washington were abnormally dry, particularly in the Nooksack, Puyallup, and Skagit River basins. ▪ Daily record-low flows were recorded on September 26, 2005 at the South Fork Nooksack River gauge below Cascade Creek and at the Nooksack River gauge near Ferndale. ▪ Whatcom County considered to be in a moderate hydrologic drought by June 2005. ▪ Ecology processed 144 requests (85 percent approved) for emergency water rights.
November 2000 - October 2001	▪ Precipitation was 56 to 74 percent of normal. Some irrigation water right holders received only 37 percent of their normal water supplies, which allowed other water right holders to get their needed supply. At the end of the irrigation season, 50,000 acre-feet of water was in storage in the five U.S. Bureau of Reclamation reservoirs in eastern Washington, compared with 300,000 acre-feet typically in storage. ▪ More than $400 million was paid to electricity-intensive industries to shut down and remain closed for the duration of the drought. ▪ Thousands lost their jobs for months, especially aluminum smelter workers.

Table 4.13 Recorded Drought Events in the Lummi Reservation Region[1]

Date	Occurrence
	The drought, economic uncertainty, and expensive energy supplies contributed to the job losses. The Alcoa-Intalco Works aluminum plant, just north of the Reservation, shut down from May 18, 2001 to April 30, 2002 due to high electricity costs and is currently operating at a reduced capacity. ▪ More than $10.1 million in federal disaster aid provided to agricultural growers. ▪ More than $7.9 million in state funds paid for drought-related projects such as providing irrigation water to farmers with junior water rights and increasing water in fish-bearing streams. ▪ 14 major fires burned more than 178,000 acres; in total, 1,162 fires burned 223,857 acres. Fire-fighting efforts cost Washington State $38 million and various local, regional, and federal agencies another $100 million. ▪ A series of drought-related measures were taken at a dozen state hatcheries. ▪ Ecology issued 172 temporary emergency water right permits and changes of existing water rights.
1988	▪ Much of E. Washington in severe drought for over 50% of year.
October 1976 - September 1977	▪ Precipitation at most locations ranged from 50 to 75 percent of normal levels, and in parts of Eastern Washington as low as 42 to 45 percent of normal. ▪ The Washington economy lost an estimated $410 million over a two-year period. Forecasters estimated the aluminum industry was hardest hit, with major losses in agriculture and service industries, including a $5 million loss in the ski industry. Layoffs of 13,000 in the aluminum and agriculture industries. ▪ 1,319 forest fires burned 10,800 acres. State fire-fighting activities involved more than 7,000-person hours and cost more than $1.5 million. ▪ Fish had difficulties passing through Kendall Creek, a tributary to the North Fork Nooksack River. Water levels at trout hatcheries were down. ▪ Ecology issued 517 emergency temporary ground water permits throughout the state to help farmers and communities drill more wells.
Jan.-Aug. 1973	▪ Dry in the Cascades.
June-Aug.1967	▪ Drought occurred in Washington.
Spring, 1966	▪ The entire state was dry.
1952	▪ Every month was below normal precipitation except June. The hardest hit areas were Puget Sound and the central Cascades.
May-Sept. 1938	▪ Driest growing season in Western Washington.
April 1934-March 1937	▪ The longest recorded drought in the region; the driest periods were April-August 1934, September-December 1935, and July-January 1936-1937.
July-Aug. 1930	▪ Drought affected the entire state. Most weather stations averaged 10 percent or less of normal precipitation.
June 1928-March 1929	▪ Most stations in Washington averaged less than 20 percent of normal rainfall for August and September and less than 60 percent for nine months.
July 1925	▪ Drought occurred in Washington.
July-Aug. 1921	▪ Drought in all agricultural sections of Washington.
August 1919	▪ Drought and hot weather occurred in Western Washington.
July-Aug. 1902	▪ No measurable rainfall in Western Washington.

[1]WEMD 2001; Hart et al. 2001; National Drought Mitigation Center 2003; OWSC 2006; Ecology 2005.

The 2001 drought began in the fall of 2000. November and December 2000 were unusually dry, and the dry weather pattern continued through January and February of 2001, not returning to normal until March. Since the main source of water for the Pacific Northwest accumulates during the winter, by mid-March much of Washington was

suffering from a water supply deficit. Between November 2000 and March 2001, the state received just 60 percent of normal rain and snowfall. With a poor outlook for summer water supplies, there was concern that low river flows would reduce state hydroelectric power production and would put various threatened and endangered fish species at risk. On March 14, 2001, Washington Governor Gary Locke authorized the Department of Ecology to declare a statewide drought emergency. Washington was the first state in the Pacific Northwest to make such a declaration in 2001. After above-average precipitation in the final two months of the year, the drought emergency formally expired on December 31, 2001.

During the 2001 drought, the central part of the state, from the crest of the Cascade Mountains to the east banks of the Okanogan and Columbia rivers, suffered the most from water shortages. Further details of the 2001 drought impacts are (Hart et al. 2001):

- **Energy** – The drought decreased river flows, resulting in less electrical generation and tighter power supplies. Available out-of-state power was extremely expensive, causing higher rates and financial emergencies at many utilities. The Bonneville Power Administration paid electricity-intensive industries to shut down. Many small-scale power generators were placed into emergency service throughout the state.

- **Agriculture** – With stream flows below half of normal and ground water levels threatened, there was significantly less water available for irrigation. About 70 percent of the crops in Washington are produced on irrigated land, which represents about 27 percent of state cropland.

- **Fish** – To help Columbia River fish populations, the Bonneville Power Administration paid growers in the basin to remove 75,000 acres from agricultural production; this kept additional water in the river during the most critical drought months. Improvements were made at a number of hatcheries, and salmon and steelhead were moved out of two hatcheries with water problems.

The main effect of the 2001 drought on the Reservation was probably due to the reduced availability and increased price of power. The primary example of this effect is the extended shutdown of the Alcoa-Intalco Works aluminum plant just north of the Reservation. This plant is a large part of the economy in the Ferndale and Reservation areas; its potential loss means lost wages for residents in the area as well as the loss of multiplied economic activity in the area. Increased power prices obviously affected all other businesses to varying degrees and increased living costs for all residents.

For the 2001 water year (October 2000 to September 2001), Nooksack River annual total runoff and mean streamflow were 67 percent of the average for the 1967 - 2001 period. Mean flow during the months of November, December, and February were less than 50 percent of average for the 35-year period of record, with the February flow being the record low. Flow for November through April, July, and September were all less than 75 percent of average (USGS 2003c). These low flows have adverse effects on fish, including reduced habitat, increased pollutant concentrations, and higher temperatures in July and September. The low summer flows may have impacted agricultural water supplies as well.

4.7.2 Drought Vulnerability Assessment

The entire population on the Reservation is directly or indirectly vulnerable to drought because water availability affects lives in many ways. Residents are directly affected by a reduced water supply, either because well production may cease or be limited, because wells can become contaminated by seawater, because water use restrictions may be implemented, or because water costs may go up. Residents may be indirectly affected if drought effects on hydroelectric power result in increased electricity rates to industry, businesses, and private homes, which has ripple effects throughout the economy. In 2001, higher power rates were one factor resulting in loss of industries and jobs in the region, in particular at the Alcoa-Intalco Works aluminum plant. Another economic factor is a lack of irrigation for agriculture, which results in unemployment and loss of farm production and associated income.

The potential reduction of ground water due to drought is important on the Reservation since over 95 percent of the potable water supply comes from the two aquifer systems found on the Reservation. Since these aquifer systems are near the shoreline, saltwater intrusion is a current problem that could be exacerbated by a severe drought. Overpumping wells during a drought may cause salt water to move into aquifers. The effects on residents can range from the inconvenience of water conservation to severe water shortage.

Approximately 30 percent of the Reservation is currently forested, and many of the homes on the Reservation are interspersed with the forested area. During a drought, these forests have an increased risk of fire, which could be devastating in the loss of homes; recreation, natural, and cultural areas; timber; wildlife; and the possible loss of human life. Because of the proximity of homes to a potential fire, a significant fire-fighting effort would likely be made, which would increase the risk to people.

In addition to the effect on the surface water supply used in the Lummi hatchery program, lower flows in the Nooksack River can have a large impact on salmon production in the river. Salmon are important to the Lummi people both economically and culturally. The lack of harvestable salmon in recent years has had a large social effect on the Reservation because of reduced income, economic uncertainty, and an increase in the high rate of unemployment.

Since the Reservation is a relatively small area, the severity of a drought will be equal in the six assessment areas of the Reservation. However, the direct effects of drought will vary with the availability and demand for water. Residents who rely on low production wells will be more vulnerable than those with more productive wells or those who are connected to the Lummi Water District system. The majority of wells most vulnerable to drought occur on the Lummi Peninsula. With current land uses, the effect on agriculture will be limited to the floodplain area, the only area where commodity crops are currently grown on the Reservation.

4.7.3 Potential Drought Losses

Although the effects of drought can be large and far-reaching, quantifying these effects is difficult because droughts vary in severity and duration and because many of the effects are indirect, complex, and/or diffuse. Unlike other natural hazards, drought does not represent a hazard to structures (other than the associated increased risk of

wildfires). With current land uses, agricultural losses on the Reservation will be largely limited to the Floodplain Area, where approximately 3,000 acres are used to grow corn, beans, potatoes, poplar trees for pulp, and pasture and hay for dairy cows. Low Nooksack River flows will reduce future salmon runs. Eastern Washington droughts that reduce hydroelectric production will have indirect economic effects on the Reservation.

While the 2005 and 2001 droughts affected much of the region, severe droughts that have a large direct effect on the Reservation are relatively rare because of the maritime climate of the region. This climate provides moderate temperatures that minimize the effect of dry periods, and it generally provides rain-producing weather systems often enough to reduce the duration of a drought. Hence, the largest drought losses on the Reservation will generally result from the indirect effects of severe droughts occurring in eastern Washington.

4.8 WILDFIRES

Wildland fires (wildfires), whether naturally occurring or caused by humans, can result in the uncontrolled destruction of forests, brush, field crops, grasslands, and any structures found within the landscape. Fire is a natural part of the ecosystem in the western United States that has been unnaturally reduced in frequency due to fire suppression efforts over the past century. These fire suppression efforts generally resulted in an increase in the volume of wood available to feed a fire. The fire season in the Reservation region typically runs from mid-May through October. Dry periods can extend the fire season. Factors affecting the vulnerability of an area to wildfire include the type and density of vegetative fuel, weather conditions, and topography. Factors affecting potential losses due to wildfire include the number and density of structures, distance of structures from fuels, and proximity to firefighting resources.

Wildfires usually are extinguished while less than one acre in size, but can spread to thousands of acres and may require thousands of firefighters and several weeks to extinguish. Federal, state, county, city, and private agencies and private timber companies typically combine to provide fire protection and firefighting services in the region (WEMD 2004).

Many urban/wildland interface areas are located in some of the most fire-prone fuel areas. The term interface is often used to describe areas where homes and other structures have been built on or adjacent to forest and range lands. While the term is in common use, the situation is not truly an interface. It is not an identifiable line, but rather an intermingling of homes and structures with natural cover or forestlands at various degrees of growth and complexity (Clackamas County 2002). This interface is not limited to remote areas. It occurs wherever development is interspersed with forestlands, a common feature on the Reservation.

In this section, past wildfire events, wildfire vulnerability, and potential wildfire losses on the Reservation are described.

4.8.1 Profiles of Past Wildfire Events

As described previously, based on the accounts of Lummi Elders, early European explorers, and early photographs of the region, before 1850 old growth forests of massive Douglas fir, western hemlock, spruce, and western red cedar dominated what was to become the Lummi Reservation. One or more large fires swept through the Reservation area between 1850 and 1900. These fires destroyed nearly all of the remaining old growth forests. Since reforestation was not practiced during the early logging period, pioneer tree species, such as alder, willows, and cottonwoods, soon replaced the conifer forests and dominated the landscape. Although there are conifer groves and Douglas fir plantations, the present day forests on the Reservation are largely comprised of deciduous trees.

The Pacific Northwest has experienced several disastrous fire seasons over the past century. However, there have been no major fires in forests or grasslands of the Reservation region in recent years. Small fires occur on a nearly annual basis, but are typically extinguished by human intervention before they can expand into a major fire. Between 1970 and 2007, there were 49 small wildfires on the Reservation ranging in

size from 0.1 to 6 acres (WDNR 2007). Examples of such fires include (Whatcom County 2002; Dewees 2007):

1. On August 15, 2005 a small forest fire (approximately 0.25-acres) occurred on trust parcel 2-U on the Lummi Indian Reservation. It burned for less than 1 day. The Washington State Department of Natural Resources (WDNR) responded and extinguished the fire. They contacted the Lummi Nation Forestry Division afterwards. It was determined that fireworks were the cause of this fire.

2. On August 18, 2005, a small forest fire (approximately 0.10-acres) occurred on trust parcel 61. The Forestry Division received a call from a concerned landowner which was forwarded to DNR who arrived on site and extinguished the fire. It was determined that fireworks were the cause of this fire.

3. A small beach fire occurred on Portage Island in 2004. Two Lummi Natural Resources Department staff contained the fire and the Washington State Department of Natural Resources extinguished it.

4. A large fire in the wooded Whatcom Creek Park in the city of Bellingham on June 10, 1999, was caused by 277,000 gallons of gasoline pouring into the creek from a ruptured Olympic Pipeline Company gas pipeline. The resulting fire and explosion caused three deaths, burned a house, and did considerable damage to the park and creek ecosystem. However, it did not extend far beyond the creek area that was fueled by the gasoline.

5. In February 1997 a natural gas pipeline (Northwest Natural Gas) explosion and fire in a remote wooded area near Everson also caused a small forest fire.

6. In 1996, a human-caused driftwood fire on Portage Island was extinguished using a bucket brigade (Dunphy 2003).

7. In 1995, a fire on the steep slopes on the southern half of Lummi Island was fought using aerial drops then allowed to burn out.

8. On August 4, 1994, during a drought, a lightening strike on Sumas Mountain ignited a twelve-acre fire in a logged area that had been replanted. The fire spread into nearby standing timber and burned 40,000 to 50,000 board feet of timber. In order to respond, firefighters had to clear debris from logging roads and fill gullies, which slowed the fire response by several hours.

9. A smaller fire in August 1994 was caused by a bonfire on a beachfront along Marine Drive east of the Reservation and spread a mile along the beach and 100 feet high along the bluff east of the Cliffside area at the north end of Bellingham Bay.

10. A one-acre blaze was extinguished August 20, 1993, on state land near Kendall along the North Fork of the Nooksack River.

11. In late August of 1992, nearly 200 federal and county firefighters battled a 40-acre blaze caused by lightning east of Deming, near the confluence of the Nooksack River with its south fork. The cost of this effort was nearly $500,000.

12. Another fire in August of 1992 burned 13 acres east of Glacier along the North Fork Nooksack River.

13. A one-acre fire caused by lightening burned itself out in late August 1991, four miles northwest of Newhalem in North Cascades National Park.

14. Lightening caused eleven fires on August 12, 1990, in the Mount Baker area near Glacier.

15. In September 1989, sixty firefighters battled an 18-acre forest fire in a clear-cut on state and private timberland near Van Zant. A fire burned a half acre June 1, 1989, on Chuckanut Mountain. In May 1989 a two-day blaze burned seven acres of replanted young trees east of Larrabee State Park.

16. In August 1988, a quarter-acre forest fire on the southwest side of Mount Baker was extinguished by twenty-six federal firefighters.

17. In April 1987, a volunteer fireman suffered minor injuries in a forest fire that burned 1.5 acres south of Larrabee State Park.

18. In August 1985, a 600-acre fire, started by a tree blown onto a power line on Vedder Mountain, six miles east of Sumas, was fought by 350 firefighters from Washington and Oregon. On August 15, 1985, another fire burned five acres east of Interstate 5 in south Bellingham.

The Reservation region has a much lower wildfire frequency than the drier east side of the Cascade Mountains. Figure 4.15 shows the locations and sizes of fires recorded by the Washington Department of Natural Resources in the Reservation area from 1970 to 2007 (WDNR 2007).

4.8.2 Wildfire Vulnerability Assessment

Calculations of fire behavior are based on fuels, topography, and weather, or what is commonly called the fire triangle. According to the fuel model key (excerpted from the National Fire Danger Rating System developed by the U.S. Forest Service) in the Urban Wildland Interface Code (FEMA 2001a), the fire fuels in the forested areas of the Reservation can be described as light to medium (out of three classifications: light, medium, and heavy fuels). In the areas where deciduous trees dominate (the majority of Reservation forests), the fuel classes are light. In the smaller areas of coniferous trees, fuel classes are mostly medium. Because of the low critical fire weather frequency and gentle slopes in the forested areas (less than 40%), the wildfire hazard in these areas is moderate in severity. Heavy fuel, steeper slopes, and/or higher critical fire weather frequency is required for high or extreme fire hazard ratings (FEMA 2001a).

Another tool provided by FEMA estimates the vulnerability of residential areas to wildfire. Using the Wildfire Hazard Rating Form derived from the Urban Wildland Interface Code, the estimated vulnerability to wildfire of forested residential areas on the Reservation is moderate, largely due to light or medium fuels, slopes of 8 degrees or less, and the relatively close proximity of water sources for suppression (FEMA 2001a).

Much of the uplands above the floodplains on the Reservation are forested and therefore vulnerable to large wildfires. However, the relatively cool, humid, maritime climate, the usually short dry season, the gentle topography, the imposition of burning bans, and the close proximity to firefighting resources combine to make the probability of a damaging wildfire relatively low throughout all six assessment areas on the Reservation. In the rare event that a fire starts, it generally is slow to spread and quick to be contained by firefighters since there are essentially no steep slopes (greater than eight degrees slope) to increase the rate of spread and hamper firefighting. A damaging fire on the Reservation would probably require a combination of factors: an extended dry period, hot weather to dry fuels, and winds that are high enough to spread the fire faster than it can be controlled. Although these conditions evidently occurred in the 1800s when there was no fire suppression apparatus in the area, this combination of conditions is currently very rare on the Reservation.

The Lummi Peninsula is the area that is most vulnerable to wildfire on the Reservation. Its moderate vulnerability is based on its extensive forestland, relatively high number of buildings, and the interspersion of buildings with forested areas. The majority of homes on the peninsula are along the shoreline or roads, but many if not most are backed against or into forest, with many surrounded by forest.

The Northwest Upland also consists primarily of forestland and has a moderate vulnerability to wildfire. All of the buildings in this area are homes (except for one unmanned fire station), and all are close to or surrounded by forest. However, there are fewer isolated homes than on the Lummi Peninsula, and the majority of homes are concentrated in two areas, which provides some buffer from the forested surroundings.

Portage Island is largely forestland and has a moderate vulnerability to wildfire. However, because Portage Island is currently uninhabited, structural losses due to wildfire would not occur.

The Sandy Point Peninsula, Gooseberry Point, and Floodplain assessment areas have a low overall vulnerability to wildfire because their limited forestland is generally not in close proximity to buildings. The Sandy Point Peninsula and Floodplain areas have large grasslands that represent a small fire hazard. Figure 4.16 shows the estimated vulnerabilities to wildfire of the assessment areas. These vulnerabilities are in line with those determined by the Washington Department of Natural Resources (Titus 2003; WDNR 2003; WDNR 2007).

The risk to the Lummi Nation of wildfire damages and losses has been partially mitigated through firefighting preparedness and public education. The Lummi Nation Forestry Division receives annual funds from the Bureau of Indian Affairs for forest protection and has used this funding to train staff and purchase equipment. In 2006, three staff from the Forestry Division and Timber, Fish, and Wildlife Division completed the National Wildfire Coordinating Group's Firefighter Type 2 training. This training certifies these staff members to respond to wildfires on the Reservation according to national standards. In 2006, the Forestry Division purchased a gas powered pump, fireline hose, four backpack water pumps, fireline hand tools, and personal protective equipment (Dewees 2007). The Division is working on updates to the tribe's Forest Management Plan, issues burning permits, sets and announces burn bans, and distributes a wildfire brochure for public education.

4.8.3 Potential Wildfire Losses

If a wildfire gets out of control, many buildings in its path would face destruction. Table 4.14 lists the number of structures in each developed area of the Reservation that are in close proximity to forestland and the estimated total replacement value of these structures. Such a total loss is unlikely since a fire probably would not burn the whole area and would not completely damage all houses in its path. Thus the estimated potential losses represent a long-term, worst-case scenario.

A wildfire on the Reservation would result in losses other than those to buildings. Short-term effects of wildfires may include the complete destruction of valuable resources such as timber, wildlife habitat, scenic vistas, and watershed vegetation. Vulnerability to flooding can increase due to the destruction of watershed vegetation. Long-term effects include lost or damaged cultural sites, reduced timber harvests, and less desirable recreational areas. These effects would also have significant economic impacts on Reservation residents.

Table 4.14 Vulnerability and Potential Losses of Structures to Wildfires

Assessment Area	Estimated Vulnerability	Number of Structures[1]	Structure Losses[2]	Contents Losses[3]	Location/Comment
Sandy Point Peninsula	Moderate	15	$1,200,000	$600,000	▪ Forested area adjacent to Northwest Upland
	Low	594	$0	$0	▪ Not forested
Northwest Upland	Moderate	605	$27,671,696	$13,819,917	▪ Almost entirely forested
Floodplain	Low	123	$0	$0	▪ Not forested
Lummi Peninsula	Moderate	1,378	$129,829,090	$36,453,822	▪ Majority of structures are in or adjacent to forest
Gooseberry Point	Low	194	$0	$0	▪ Not forested
Total		**2,909**	**$158,700,786**	**$50,873,739**	▪ Total Wildfire Losses: ~$209,574,5255

[1]Residences, outbuildings, and other structures counted from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution.
[2]Potential structure losses are the estimated full replacement cost (see Table 4.23 for specific values) of 100 percent of all structures in moderate vulnerability areas.
[3]Potential contents losses estimated as insured values or half of the structure losses (FEMA 2001a).

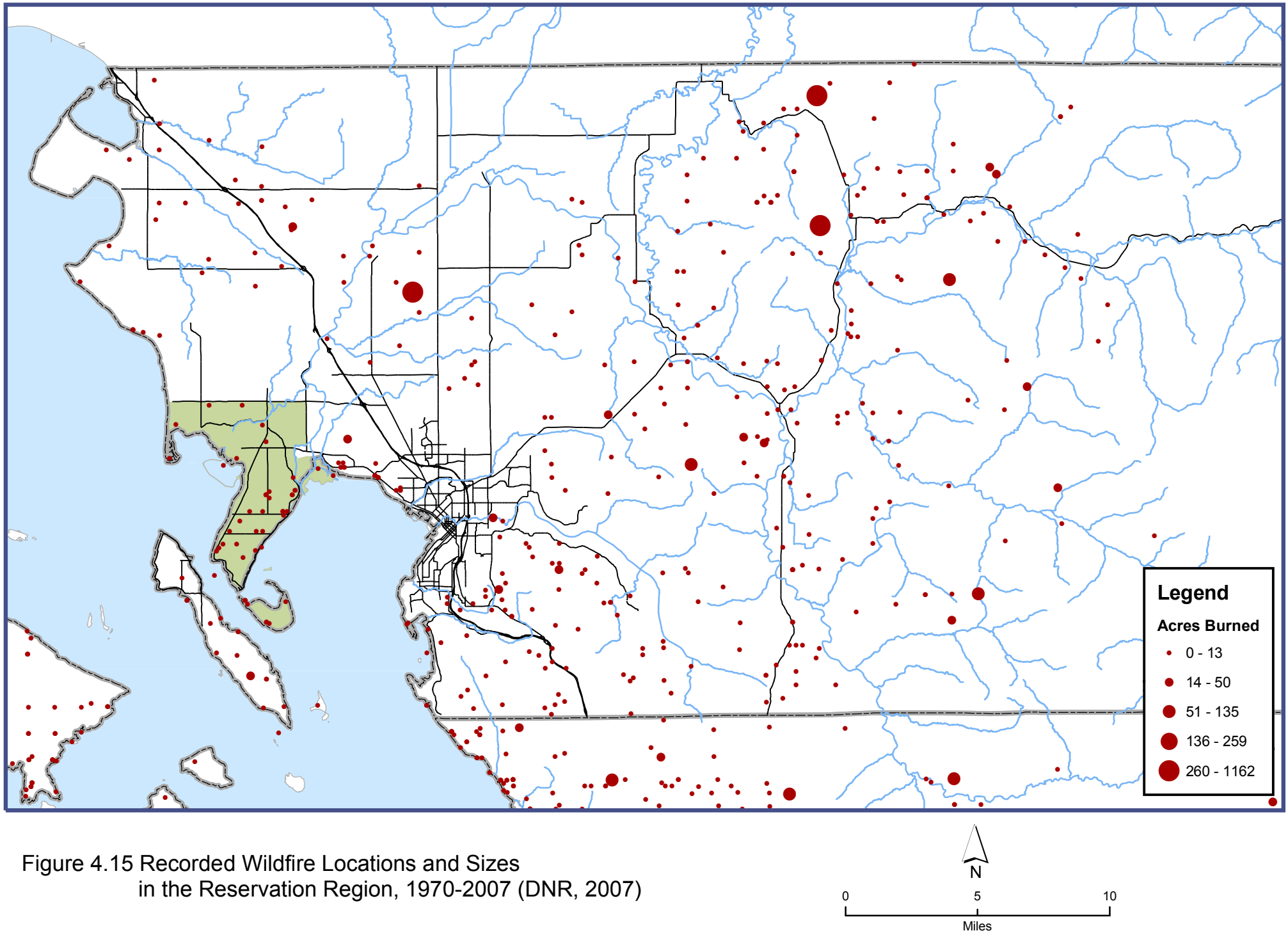

Figure 4.15 Recorded Wildfire Locations and Sizes in the Reservation Region, 1970-2007 (DNR, 2007)

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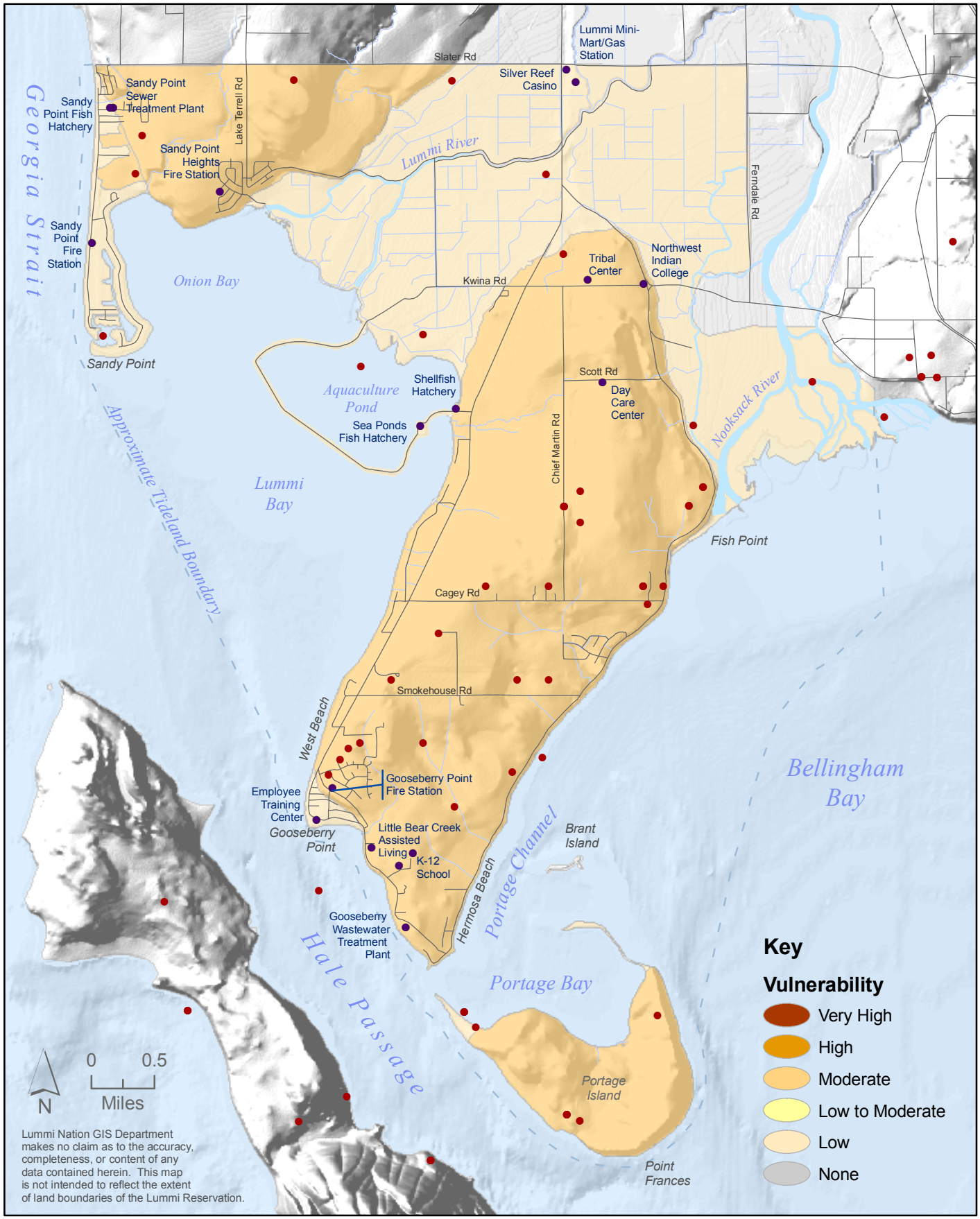

Figure 4.16 Estimated Wildfire Vulnerabilities and Locations of Recorded Wildfires in Reservation Areas

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4.9 LANDSLIDES

A landslide is the movement of rock, soil, and/or debris down a slope that occurs when the materials comprising the slope can no longer resist gravity. Factors that influence landslides (e.g., soil composition and moisture, slope steepness, precipitation, land development and zoning practices, and seismic shaking) generally decrease the shear strength (resistance) of the slope materials and/or increase the shear stress (loading) to the slope. Saturation of slope materials with water, which can be caused by heavy or prolonged rainfall and/or where human activity has altered drainage patterns such that slopes are more likely to become saturated, can decrease slope stability (shear strength). Undercutting of slopes by streams, waves, or construction activity can increase the shear stress and the likelihood of slope failure (landslide). Landslides occur without human influence, but can also be caused or exacerbated by human activities (Oregon 2000b; Ecology 2003a).

Landslides encompass a wide range of slope movements, from small rock falls to debris flows to the failure of entire mountainsides, and multiple landslides types can occur within a single event. The spatial extent of landslides also varies from square feet to square miles. In general, most steep slopes are at some risk of slope failure, and some soil/geologic formations are particularly susceptible to landslide activity, even on relatively gentle slopes. For example, when layers of sand and gravel lie above less permeable silt and clay layers, ground water can accumulate and zones of weakness can develop. In the Puget Sound region, this combination is common and widespread (Ecology 2003a), and it may occur under the slopes of the Reservation.

The following characteristics may be indicative of a landslide hazard area (WEMD 2001):

- Bluff retreat caused by erosion and sloughing of bluff sediments, resulting in a vertical bluff face with little vegetation.
- Pre-existing landslide area.
- Tension or ground cracks along or near the edge of the top of a bluff.
- Structural damage caused by settling and cracking of building foundations and separation of steps from the main structure.
- Toppling, bowed or jack-sawed trees.
- Gullying and surface erosion.
- Mid-slope ground water seepage from a bluff face.
- Topographic convergence (especially as slope increases).

This section describes past landslide events, landslide vulnerability, and potential landslide losses on the Reservation.

4.9.1 Profiles of Past Landslide Events

The primary landslide hazard areas that threaten public safety and structures on the Reservation occur along the marine shoreline where relatively tall and steep bluffs are located. Landslides have threatened and/or damaged private property, residences, and public roads along the shoreline of the Lummi Peninsula. In general, coastal bluffs in Puget Sound are recognized as unstable (WEMD 2001; Ecology 2003a).

Lummi Shore Road and Lummi View Drive are located on the Lummi Peninsula along the marine shoreline of Bellingham Bay and Hale Passage, respectively. In many

places, both of these roads are located at or near the top of the bluff along the shoreline. During the 1990s, Lummi Shore Road was reduced to one lane in up to ten places because of the retreat of the shoreline and subsequent undermining and loss of the roadbed. School buses were not allowed to travel portions of Lummi Shore Road. Poor drainage associated with Lummi Shore Road, combined with wave-caused erosion of the base of the bluff, contributed to the rapid retreat of the shoreline and subsequent undermining of Lummi Shore Road. Mitigation of the problem has been a multi-year and multi-million dollar project involving armoring of the shoreline, realignment of the roadway, and much improved storm water drainage along the road (see further details in Section 4.6). The second phase of the project, completed in 2006, was the creation of an inland replacement for a portion of Lummi View Drive and abandoning a portion of the previous alignment that was at risk of being lost due to failure of the bluff below the road.

Also along the Lummi Peninsula marine shoreline, bluffs up to 100 feet high occur immediately north of Gooseberry Point along Lummi Bay. Bluffs along this unstable shoreline, labeled on the USGS quadrangle maps as West Beach, have experienced landslides associated with poor residential development practices. In the winter of 2001, during a storm with heavy rains and strong winds from the northwest, at least five landslides occurred in this area. Two of these landslides are shown in Figure 4.17 and are described below.

In one instance, storm water generated in a development near the shoreline was concentrated and then discharged to property that slopes towards the bluff. The storm water saturated the bluff and the bluff failed (Figure 4.17a). Fortunately, the home at this location is not located adjacent to the bluff. In another instance, landslides occurred that directly threatened a residence (Figure 4.17b). In this case the remaining slope to the beach was nearly vertical and tension cracks continued under the foundation of the home. The house was subsequently moved further away from the bluff. Many other homes in this area are at risk because the bluff is relatively high, composed of materials with weak shear resistance (sand and gravel), and vulnerable to wave erosion at the base of the bluff.

There are also records or evidence of landslides on the coastal bluffs extending north from the Reservation along the Strait of Georgia. The Coastal Zone Atlas of Washington (Volume 1, 1979) shows the locations of these past landslides as well as indicating whether slopes are "stable," "intermediate," or "unstable." It identifies the slope in the Northwest Upland above Neptune Beach as intermediate in stability (Ecology 2003b). . In January 2006, after Whatcom County received 9 inches of rain in twenty-nine days, the National Weather Service warned of landslide potential. No major slides occurred but there were two small slides in Whatcom County (Johannes 2006).

(a)

(b)

Figure 4.17 Photos of Landslides along West Beach, Lummi Peninsula

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The Reservation is potentially vulnerable to the effects of potential volcanic landslides on Mount Baker. Mount Baker is capable of producing the catastrophic landslides that have occurred recently during the eruption of Mount St. Helens (see details in Section 4.11) and on Mount Adams in south-central Washington. On Mount Adams, massive landslides of large rock debris, snow, and ice occurred between August and October 1997. The slide in October 1997 was approximately 1,500 feet thick and 750 feet wide, with an estimated volume of 106 million cubic feet of rock. The slide was attributed to heavy rain in addition to the exceptionally wet weather in 1995 through 1997 (WEMD 2001). If such volcanic events occurred on Mount Baker, the potential effects on the Nooksack River could extend to the Reservation.

4.9.2 Landslide Vulnerability

The potential for landslides along very limited areas of the Reservation is high, and most of these areas with high vulnerability are located along the Portage Island coastline. The developed areas at high risk are relatively small in geographical extent. High seasonal precipitation, slopes composed of materials with low shear strength (weak layers), wave erosion of the base of slopes along marine shorelines, and the potential for earthquakes all combine to make slopes on the Reservation susceptible to landslide activity, particularly along the marine shoreline. However, the relatively low-relief and gradual topography that occurs over most of the Reservation is not susceptible to landslides. Because the location of weak layers in the sediments below slopes is uncertain or unknown, it is difficult to identify slopes that are more prone to failure. As a result, the estimated landslide vulnerability categories presented in Figure 4.18 are based simply on the following ranges of slope steepness. The delineation of these categories was refined in 2007 through the use of high resolution digital elevation models from Laser Imaging Detection and Ranging (LIDAR) data.

- High = 30 degrees slope or greater;
- Moderate = 15 to 30 degrees slope;
- Low to Moderate = 5.6 to 15 degrees slope; and
- None = Zero to 5.6 degrees slope.

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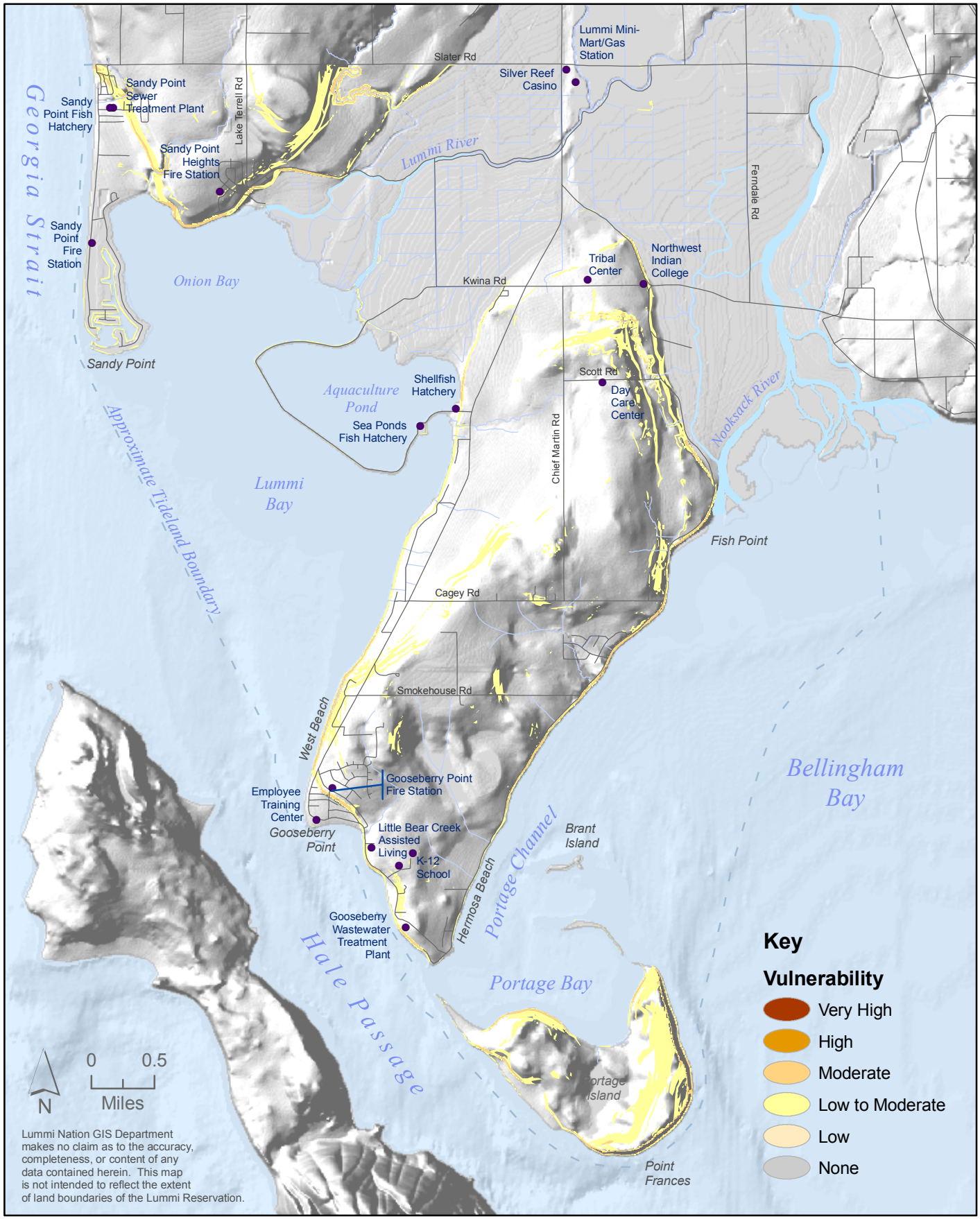

Figure 4.18 Estimated Landslide Vulnerabilities in Reservation Areas

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Because people commonly desire a home with a view, many structures have been built above, on, and/or below unstable slopes. A general lack of public awareness about unstable slopes and inconsistent slope mapping and land use regulations contribute to ongoing development in vulnerable areas (WEMD 2001). In addition, where steep slopes occur along shorelines, so-called protection measures employed to address the problem (e.g., bulkheads) can create/exacerbate problems elsewhere along the shoreline. While some protection measures are more effective than others (e.g., good storm water and vegetation management), none are completely effective at eliminating slope instabilities over the long term.

The overall landslide vulnerability of the entire Reservation is difficult to quantify because of the distribution of the hazard: much of the Reservation is at no or minimal risk of slope failure, but some areas are at significant risk of damage due to landslides. In several of the areas prone to landslides, expensive homes have been built at or near the top of bluffs to take advantage of the view of marine waters. Because the developed areas of the Reservation that are susceptible to landslide are relatively small (and not all sloped areas will have weak layers beneath them), the overall relative vulnerability to landslide on the Reservation is low to moderate. However, the probability, or risk, of a damaging landslide in these areas is high, especially if mitigation actions are not employed.

4.9.3 Potential Landslide Losses

Table 4.15 lists the vulnerability levels present in each of the five developed assessment areas (undeveloped Portage Island is not listed), the number of structures that are located in each slope category (vulnerability level) within an area, and the potential losses to landslide. There are only low to moderate slopes in the floodplain area, and there are no structures located within these slopes, and there is limited vulnerability to landslides in the Sandy Point Peninsula and Gooseberry Point areas. Other potentially hazardous slopes on the Reservation, particularly on Portage Island, have not been converted from forested areas. Potential long-term losses were estimated by assuming a worst-case scenario of total loss of all structures located in the moderate and moderate to high vulnerability areas. Using estimated replacement costs for the structures on these properties, the potential total losses on the Reservation would be approximately $2,463,218. However, some of these structures have a higher vulnerability than indicated by slope alone due to their close proximity to the bluff along West Beach.

Bluff retreat is currently occurring along West Beach, just north of Gooseberry Point on the Lummi Peninsula. Fifteen to twenty homes that were built close to the edge of the bluff along this shoreline have significant short- or long-term vulnerability to coastal erosion and resulting landslides. Since many of these homes are located on less than 30 degree slopes and therefore fall into the low-to-moderate and moderate vulnerability categories used in the vulnerability assessment, the estimated vulnerability derived simply from slope categories likely underestimates the long-term, and possibly short-term, vulnerability to landslides along West Beach.

Table 4.15 Vulnerability and Potential Losses of Structures to Landslides

Assessment Area	Estimated Vulnerability	Number of Structures[1]	Structure Losses[2]	Contents Losses[3]	Location/Comment
Sandy Point Peninsula	Low to Moderate	9	n/a	n/a	▪ Isolated patches of slopes less than fifteen degrees
Northwest Upland	Moderate	10	$1,117,790	$558,985	▪ Slopes of 15 to 30 degrees ▪ A few structures in Sandy Point Heights
	Low to Moderate	92	n/a	n/a	▪ Slopes of less than 15 degrees ▪ Various locations, many of which are likely low vulnerability
Floodplain	Low to Moderate	0	n/a	n/a	▪ Slopes of less than 15 degrees
Lummi Peninsula	High	0[4]	n/a	n/a	▪ Located along West Beach
	Moderate	3[4]	$455,295	$227,648	▪ Most structures along West Beach are near a 15 to 30 degree slope if not in it
	Low to Moderate	106[4]	n/a	n/a	▪ Various locations, many of which are likely low vulnerability
Gooseberry Point	Moderate	0	$69,000	$34,500	▪ Home on flat lot along shoreline, partially excavated from slope behind
	Low to Moderate	3	n/a	n/a	▪ Base of slope; on shoreline
Total		**309**	**$1,642,085**	**$821,133**	▪ Total Landslide Losses: ~$2,463,218

[1]Residences, outbuildings, and other structures counted from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution.
[2]Potential structure losses are estimated full replacement cost (see Table 4.23 for specific values) of 100 percent of all structures in moderate or higher vulnerability areas.
[3]Potential contents losses are insured values or half of the structure losses (FEMA 2001a).
[4]Since these vulnerability ratings are based simply on degrees slope, some of these structures have a higher vulnerability than indicated by slope alone due to their close proximity to the bluff along West Beach.

4.10 TSUNAMIS

A tsunami (pronounced tsoo-nah-mee) is a wave train, or series of waves, generated in a body of water by a sudden disturbance that vertically displaces the water column. The more commonly used term for a tsunami is a "tidal wave". Earthquakes, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis. Tsunamis can travel for thousands of miles at speeds up to 600 miles an hour in deep water before slowing in shallow water as they approach the shore. The waves may hit the shore from 5 to 90 minutes apart, and the first waves are usually not the largest. The size of the waves can also vary greatly along a coastline (Manson 1998; FEMA 2003e). Large tsunamis have caused devastating property damage and loss of life throughout recorded history, particularly around the Pacific Ocean. The Indian Ocean tsunami on December 26, 2004 is the largest, most recent event. The tsunami was up to 20 feet high, was generated by a magnitude 9.0 subduction zone earthquake in the Indian Ocean, and resulted in the deaths of over 180,000 people. During the 1990s, 82 tsunamis were reported worldwide; the ten that caused deaths claimed more than 4,000 lives (Gonzalez 1999).

Since 1946, six tsunamis have killed more than 350 people and damaged $500 million of property in Hawaii, Alaska, and the West Coast of the United States. In 1964, the most recent significant tsunami to hit Washington State caused $105,000 of damage (mostly to bridges) along the Washington coast. This tsunami, generated by the Prince William Sound earthquake in Alaska, was much more destructive in California. The third and fourth waves (11 and 16 feet above tide level) to hit Crescent City killed 11 people and caused $7.4-16 million (1964 dollars) in damage (Manson 1998; FEMA 2003e).

Although there is no record of a tsunami hitting the Reservation shoreline, the possibility exists and the USGS may study areas of the Reservation in the future to search for evidence of past of past inundation. In the following subsections, past tsunami events, tsunami vulnerability, and potential tsunami losses on the Reservation are described.

4.10.1 Profiles of Past Tsunami Events

The last known Cascadia Subduction Zone earthquake, magnitude 8.7 to 9.2, occurred on January 26, 1700 and generated a tsunami that inundated areas of the Washington coast and traveled across the Pacific Ocean to Japan. Geologic evidence of the quake and tsunami have been discovered along the west coast of North America in the forms of formerly vegetated land that subsided, buried tidal marshes, layers of sand that were washed inland and covered, and archaeological sites buried by tidal mud. The dates of these geologic features have been correlated with Japanese records of a tsunami in 2007 that was not preceded by a perceived earthquake. These records tell of a flood that drove villagers to high ground, damaged coastal structures and agriculture, sank ships, and killed sailors (Atwater et al. 2005b). Table 4.16 lists regional and worldwide tsunami events since 1946.

Table 4.16 Recent Regional and Worldwide Tsunami Events[1]

Date	Occurrence
November 15, 2006	▪ Magnitude 8.1 earthquake northeast of the Kuril Islands in Russia, 21 miles deep. ▪ West Coast and Alaska Tsunami Warning Center (WCATWC) advisory issued for the coastal areas from the California-Mexico border to Cape Flattery, Washington, watch issued for the Washington, British Columbia, and Alaska coastal areas from Cape Flattery Washington to Sand Point, Alaska and warning issued for the Alaska coastal areas from Sand Point to Attu. Warning and watch canceled by 6:41am PST on the 15th. ▪ Waves of 1.0 foot or less were observed at Hanasaki Japan, Kushiro Japan, Shemya, Alaska, and Amchitka, Alaska.
July 17, 2006	▪ Magnitude 7.7 earthquake beneath the Indian Ocean 150 southwest of Java. ▪ Six foot high tsunami struck Java. ▪ 69 deaths.
June 14, 2005	▪ WCATWC tsunami warning issued for the west coast of North America from the California-Mexico border to the northern end of Vancouver Island. The warning was cancelled about an hour after it was issued. ▪ Magnitude 7.0 strike-slip earthquake 80 miles off of the northern California coast.
December 26, 2004	▪ Magnitude 9.0 subduction zone earthquake centered 155 miles south-southeast of Banda Aceh on Sumatra and six miles under the Indian Ocean seabed. ▪ Tsunami with waves up to 20 feet high, traveled over 1,000 miles to Sri Lanka and India. ▪ Over 180,000 deaths in at least 11 countries. ▪ The largest earthquake worldwide since the magnitude 9.2 Alaskan earthquake in 1964.
July, 1998	▪ Magnitude 7.1 earthquake centered 12 miles offshore struck the northern coast of Papua New Guinea. ▪ Waves up to 50 feet high reached the shore within 15 minutes, destroying several villages and killing more than 2,200 people.
July, 1993	▪ Magnitude 7.8 earthquake in the Japan Trench. ▪ Tsunami struck the Japanese island of Okushiri. ▪ 200 deaths.
August, 1976	▪ Magnitude 7.9 earthquake in the Phillipines. ▪ Tsunami struck coastline of the Moro Gulf in the North Celebes Sea. ▪ 5,000 deaths.
March, 1964	▪ Magnitude 9.2 Prince William Sound earthquake in Alaska. ▪ Waves up to 16 feet hit Crescent City California. ▪ 106 deaths from the tsunami. ▪ $7.4-16 million in damage.
May, 1960	▪ Magnitude 9.5 subduction zone earthquake in Chile. ▪ Tsunami alone caused over 183 deaths in Hawaii and Japan. ▪ Over $550 million in damages from earthquake and tsunami.
1949	▪ Magnitude 7.1 earthquake near Olympia triggered a landslide at the Tacoma Narrows producing an 8 foot high tsunami in Puget Sound.
April, 1946	▪ Magnitude 7.3 Vancouver Island earthquake. ▪ Damage to Alaska and Hawaii. ▪ 159 deaths.

[1]Gonzalez 1999; Noson et al. 1988; Manson 1998; FEMA 2003e; WEMD 2004; Atwater et al. 2005a

Evidence of past tsunamis in the Pacific Northwest region has been identified in several locations. On the Washington coast, inland sand deposits are believed to have been carried onshore by the tsunami from the 1700 Cascadia megathrust earthquake. Oral traditions of the native peoples of Vancouver Island indicate that the same tsunami likely destroyed a winter village, with no survivors, at Pachena Bay on the west coast of Vancouver Island (GSC 2002a). In 1946, the magnitude-7.3 Vancouver Island earthquake caused one death due to drowning when a small boat capsized in an earthquake-generated wave. The 1949 magnitude-7.1 earthquake near Olympia probably triggered a landslide three days later at the Tacoma Narrows that produced an 8-foot high tsunami in Puget Sound. Minor wave damage occurred to houses adjacent to the slide, but the opposite shore, hit by the larger wave, was undeveloped at the time (Noson et al. 1988). With increased development along shorelines since that time, a similar event could cause substantial damage today. In addition to the two recorded events above, probable historic tsunami deposits uncovered during recent studies around Puget Sound are among the evidence for an earthquake 1,100 years ago along the Seattle fault (Atwater and Moore 1992).

4.10.2 Tsunami Vulnerability Assessment

The most probable and potentially greatest tsunami hazard on the Reservation is posed by a tsunami generated by a Cascadia megathrust earthquake. Recently completed modeling by the Washington Department of Natural Resources (Figure 4.19) indicates that a large tsunami from a Cascadia earthquake would inundate the Sandy Point Peninsula, the Gooseberry Point area, and the Lummi River floodplain up to the Nooksack River, as well as sweeping up the Nooksack River from Bellingham Bay to Ferndale (Walsh 2003). The computer model predicted worst-case water depths of three to six feet in the Sandy Point Peninsula and Gooseberry Point areas and three to sixteen feet in the Floodplain area (Walsh et al. 2004). A large event could generate flow velocity hazards as the tsunami waves rise and fall, perhaps several times. Since a Cascadia tsunami would be generated by the subduction zone just off the coast of Washington, the warning and response time for the Reservation area would be two to three hours, possibly just long enough for evacuation of vulnerable areas (Walsh 2003).

Locally generated tsunamis within the Strait of Georgia or San Juan Island region probably represent a smaller, less likely, and less severe hazard than a Cascadia event, but little is known about their history. For such a tsunami to occur, a "steep and deep" landslide must occur, that is, a large, steep bluff or hillside must fall rapidly into deep water, or a large, rapid underwater landslide must occur. Potential sources of steep and deep landslides in this region are an intended future subject of research by state and Canadian researchers.

Although a locally generated tsunami could cause damage on the Reservation, tsunamis of distant origin in the ocean are unlikely to seriously affect inner Puget Sound or the Strait of Georgia and therefore do not represent a significant hazard on the Reservation (Walsh 2003). A detailed but dated study on tsunamis of distant origin concluded that such tsunamis were unlikely to generate a 100-year flood event on the Reservation, both because of the predicted height of potential tsunamis and because the simultaneous occurrence of high tide and a storm surge or high, wind-generated waves with a tsunami was determined to be highly unlikely (Garcia and Houston 1975). However, geologists have greatly increased their knowledge of earthquake and tsunami events since the mid-1970s. Many new, major faults have been identified since 1975, including faults in the

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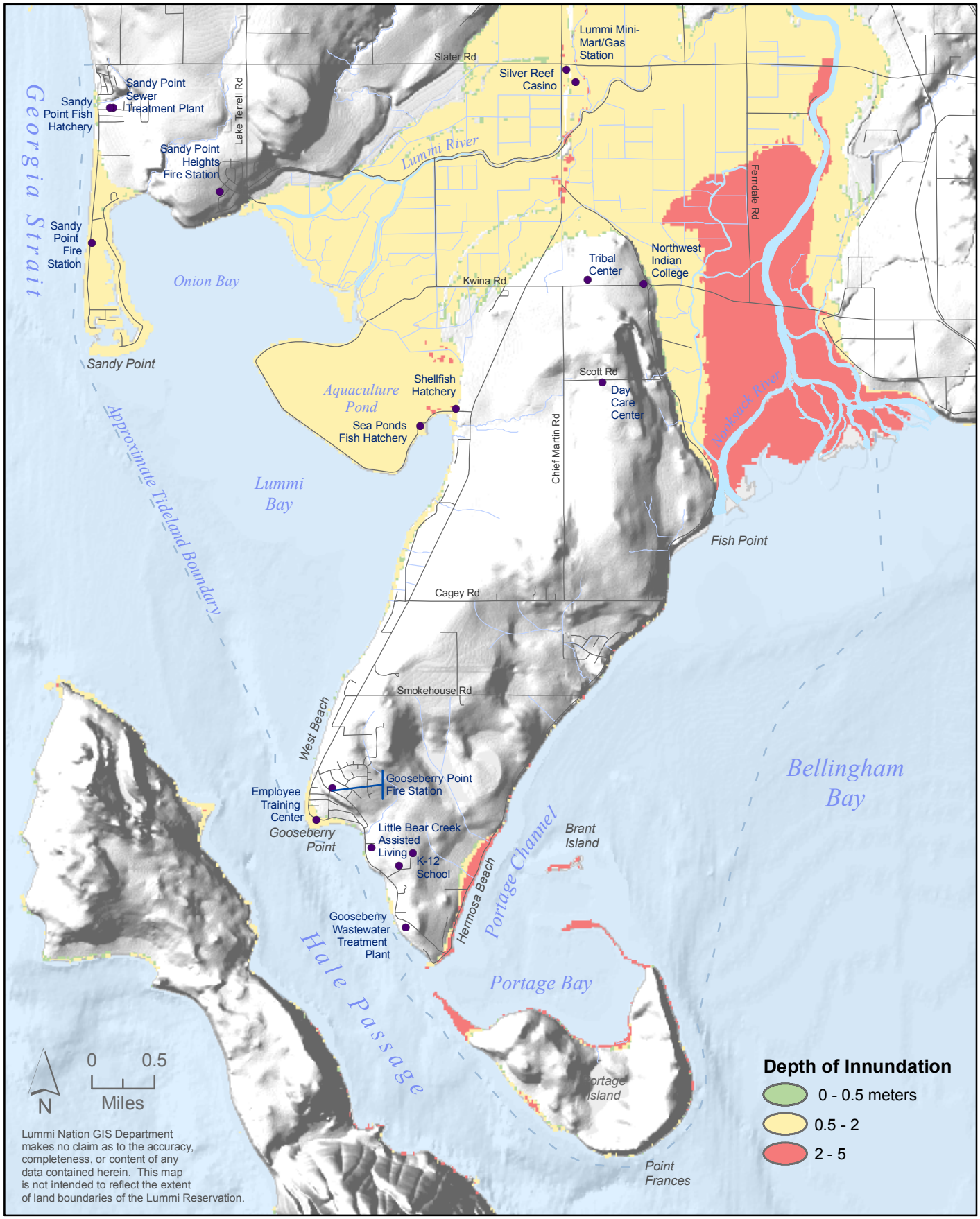

Figure 4.19 Modeled Tsunami Inundation in the Bellingham Area from a Cascadia Subduction Zone Earthquake (Walsh et al. 2004)

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North Puget Sound and Strait of Georgia area. In general, the estimated risk of a significant tsunami in the area has risen in recent years (Johannessen 2000b).

Considering that only two locally generated tsunamis have been recorded over the last century in the Puget Sound/Strait of Georgia area, and that not all tsunamis are large enough to cause damage, it appears that a damaging tsunami event on the Reservation has a low probability. However, the Sandy Point Peninsula, Floodplain, and Gooseberry Point areas are particularly vulnerable to a tsunami generated by a Cascadia Subduction Zone earthquake and tsunamis generated locally in the Strait of Georgia, which represents a fairly large source for a local tsunami. Cascadia subduction events have a return period of 400-600 years and a large tsunami event on the Reservation could have severe consequences in these heavily developed, low-lying coastal areas. Figure 4.20 shows the estimated relative tsunami vulnerabilities in the six assessment areas and incorporates the WDNR inundation modeling for a tsunami generated by a Cascadia Subduction Zone earthquake.

The risk to the Lummi Nation of tsunami damages and losses has been partially mitigated through improved communications and public education. In 2006, Whatcom County coordinated the purchase of an All-Hazard Alert Broadcast (AHAB) tsunami warning system for the Sandy Point Peninsula. This system is installed at and activated by Whatcom County Fire District #17 and is part of the Washington State tsunami warning system. The Lummi Nation has purchased two additional AHABs through an Emergency Management Preparedness Assistance Grant from WEMD for the Reservation. These systems will be installed in the floodplain and at the southern end of the Lummi Peninsula by June 2007. NOAA weather radios were also purchased and placed in each of the LIBC government departments. An improved signal has been provided for these and other radios through the installation of a new weather and hazards transmitter in Blaine in 2006. Finally, the Lummi Nation has worked since 2005 with the WDNR and the WEMD to develop tsunami evacuation route brochures for the Reservation. The draft brochure is attached as Appendix F and it is expected that the final brochure will be distributed in the summer of 2007 after the installation of the two additional AHABs.

4.10.3 Potential Tsunami Losses

The potential losses from a tsunami on the Reservation are greater than those described previously for coastal flooding because the depths and velocities of flooding are potentially greater over a much larger area. Depending on the severity of the event, damages may range from inundation of a handful of homes to destruction of many buildings. A large event could result in total loss of most buildings on the Sandy Point Peninsula, heavy damage to other buildings on the Sandy Point Peninsula, total loss or heavy damage at Gooseberry Point, and damage to the aquaculture dike in Lummi Bay, the Lummi Bay seawall, and properties in the Floodplain area. Damage could also occur along Hermosa Beach and the remainder of the Lummi Peninsula shoreline. Table 4.17 lists the number of structures vulnerable to tsunami in the five developed assessment areas and the estimated potential losses that would result from a worst-case scenario, defined as total destruction of all structures in areas judged to have moderate or higher vulnerability.

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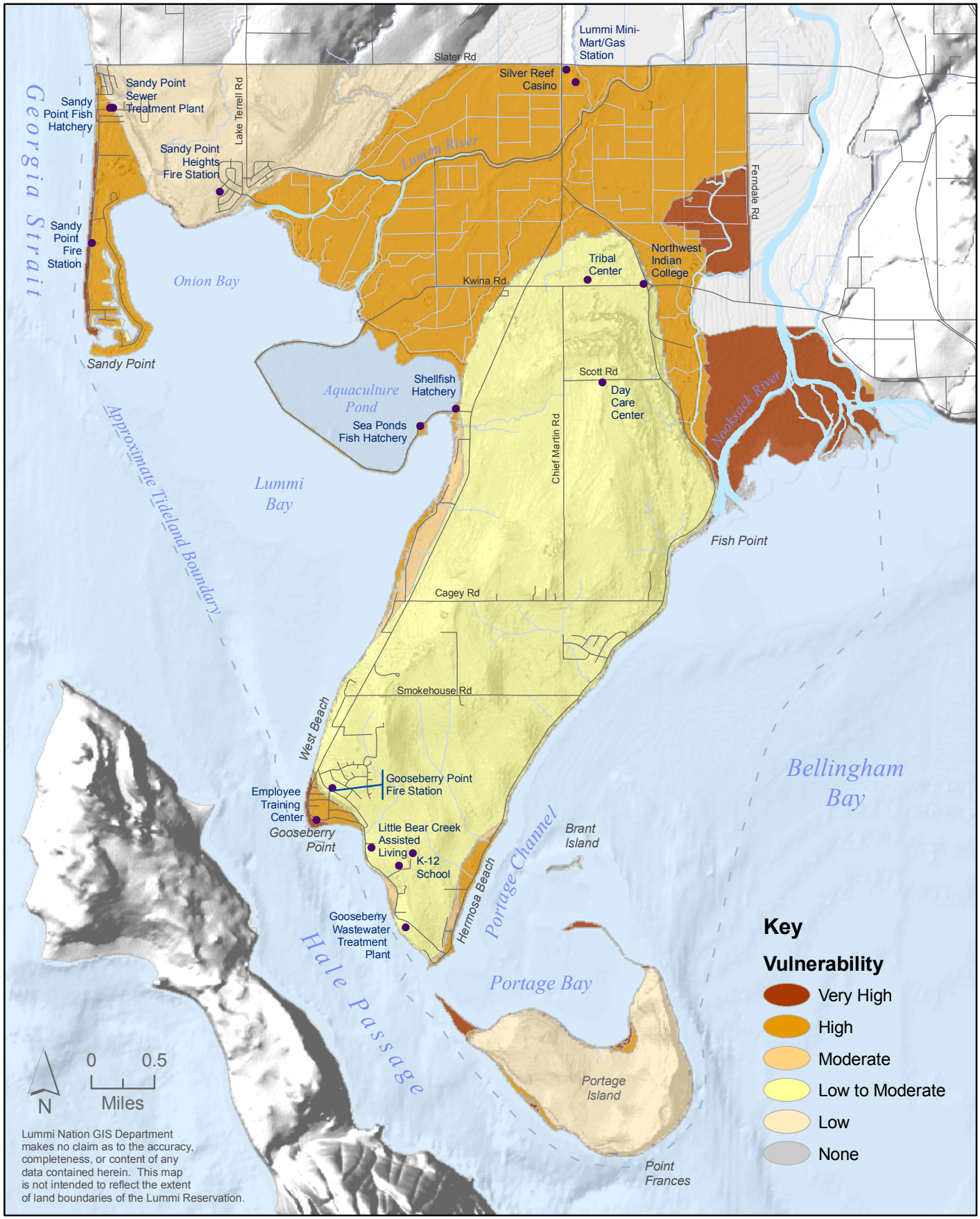

Figure 4.20 Estimated Tsunami Vulnerabilities in Reservation Areas

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Table 4.17 Vulnerability and Potential Losses of Structures to a Tsunami

Assessment Area	Estimated Vulnerability	Number of Structures [1]	Structure Losses[2]	Contents Losses[3]	Location/Comment
Sandy Point Peninsula	Very High	177	$19,797,210	$9,898,605	▪ Western shoreline is very highly vulnerable
	High	412	$39,109,550	$19,554,775	▪ South Cape and interior homes highly vulnerable ▪ Sea level rise would increase hazard
Northwest Upland	Low	604	$0	$0	▪ Road detours are potential inconvenience
Floodplain	High	117	$41,843,420	$22,733,359	▪ Several homes raised after 1990 floods ▪ Potential damage to Casino and Mini-Mart limited by flood damage reduction measures ▪ Seaponds Hatchery buildings on aquaculture dike; dike itself has high vulnerability to storm waves and failure of the Lummi Bay seawall
	Very High	6	$142,345	$71,173	▪ Area of greater inundation depth from modeled tsunami
Lummi Peninsula	High	104	$14,587,790	$7,293,895	▪ Hermosa Beach, northern West Shore, Kwina slough
	Moderate	147	$10,582,845	$5,291,422	▪ Stommish, West Shore areas
	Low to Moderate	1,127	$0	$0	▪ Isolation due to closed roads ▪ Economic impacts on employers and employees
Gooseberry Point	Very High	40	$12,408,045	$2,393,213	▪ 20 homes along western shore, plus outbuildings ▪ LIBC mini-mart, office building, and piers
	High	154	$5,003,955	$2,201,527	▪ Interior homes, outbuildings, and warehouses
Total		**2,888**	**$143,475,160**	**$69,437,969**	▪ Total Tsunami Losses: ~$212,913,129

[1]Residences, outbuildings, and other structures counted from Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution.
[2]Potential structure losses estimated as 100 percent of 2007 building assessed values (if area is primarily fee land), estimated residential replacement value (if area is mixed fee and trust land), and/or insured values (see Table 4.23 for specific values).
[3]Potential contents losses estimated as 100 percent of insured values or 50 percent of the structure losses (FEMA 2001a).

4.11 VOLCANO

A volcano is a vent in the crust of the earth through which magma (molten rock), rock fragments, gases, and ash are ejected from the interior of the earth. A volcanic mountain is created over thousands of years by the accumulation of these erupted materials on the surface of the earth. Mount Baker is a 10,781-foot high volcano that lies approximately 37 miles due east of the Reservation. The volcanic hazards presented by Mount Baker include:

- Lava flows: Lava is molten rock that pours onto the Earth surface during an eruption. Numerous eruptions of lava interbedded with rock rubble constructed Mt. Baker.

- Pyroclastic flows: Hot avalanches of lava fragments and volcanic gas formed by the collapse of lava flows or eruption clouds.

- Tephra: Fragments of rock that are blasted high into the air by explosive eruptions. Large fragments fall close to the volcano. Small fragments (called ash) from the largest eruptions can travel hundreds or thousands of miles.

- Lahars: Fast-moving slurries of rock, mud, and water that look and behave like flowing wet concrete. Landslides can transform into lahars. Pyroclastic flows can generate lahars by melting snow and ice.

Evaluation of volcanic hazards is primarily that of predicting lahar, pyroclastic flow, and related flash flood paths based on topography, and ash fall patterns based on prevailing wind patterns. Prediction of eruptions has only recently become a possibility where seismographs placed on volcanoes may detect the subsurface movement of magma. Lahars are the greatest concern at Mount Baker because of its history of frequent lahars and the ability of lahars to flow for tens of miles. Lahars generated by volcanic landslides can be triggered by eruptions, regional earthquakes, gravity, or increases in hydrovolcanic activity (i.e., steam generation) that is not associated with magma intrusion. When ground water comes into contact with either magma or hot rock, hydrovolcanic explosions of steam and rock can occur. Such events, in addition to possibly triggering collapse, can themselves be hazardous (Gardner et al. 1995; Scott et al. 2000).

In this section, past volcanic events, volcanic vulnerability, and potential volcanic losses on the Reservation are described.

4.11.1 Profiles of Past Volcanic Events

Mount Baker is an active volcano, and one of the youngest in the Cascade Range. Volcanic activity in the Mount Baker area began more than a million years ago, and many of the earliest deposits have been removed by glacial erosion. Its most recent significant activity was in 1843, at a time when permanent populations around its base were few and extensive development of structures had not yet occurred. Table 4.18 describes the past volcanic events at Mount Baker (Gardner et al. 1995; Scott et al. 2000; WEMD 2001).

Table 4.18 Past Volcanic Events at Mount Baker[1]

Specific Year or Years Ago	Description of Event
1975 - Present	Increased steam and gas emission from Sherman Crater. Heat flow increased more than tenfold, then gradually declined over two years before stabilizing at a higher level than before 1975.
1958	Boulder Glacier mudflow and avalanches.
1891	About 20 million cubic yards of rock fell from flank, producing a lahar that flowed more than six miles and covered one square mile.
1843	Large hydrovolcanic eruption and flank collapse in Sherman Crater. Widespread tephra and forest fires. Ash-clogged rivers killed many salmon. Lahar raised natural Baker Lake at least ten feet.
100 - 300	Boulder Creek mudflow and tephra. Rainbow Creek avalanche.
300 - 6,000	Tephra. Middle Fork Nooksack River and Park Creek mudflow.
6,000 - 10,350	Pyroclastic and lahar flows and tephra. Tephra eruption produced ash layer 20 miles to the northeast. Middle Fork Nooksack River mudflow, probably to Bellingham Bay. Boulder Creek lava flows. Sulphur Creek mudflow and lava flow. Park Creek mudflow.
10,350 - 15,000	Multiple lava, pyroclastic, and lahar flows and tephra eruptions from summit. Sulfur Creek and other mudflows.

[1] Gardner et al. 1995; Scott et al. 2000; WEMD 2001.

The last event that directly affected the area of the Reservation to a significant level was about 6,600 years ago, when the largest flank collapse in the post-glacial history of the volcano occurred. A lahar was produced that was over 300 feet deep in the upper reaches of the Middle Fork Nooksack River. This lahar was at least 25 feet deep 30 miles downstream from the volcano and probably reached Bellingham Bay. The initial flank collapse was followed by a huge hydrovolcanic explosion that triggered a second collapse and lahar that traveled at least 20 miles. An eruption cloud deposited several inches of ash as far as 20 miles downwind (Scott et al. 2000).

Although unlikely, Mount Baker is presumably capable of producing an event that would rival the 1980 Mount St. Helens eruption that killed 57 people and caused huge, widespread damage. The collapse of Mount St. Helens produced a landslide (the largest in recorded history on Earth) that buried 14 miles of the North Fork Toutle River valley to an average depth of 150 feet. The initial blast cloud accelerated to at least 300 mph and traveled as far as 17 miles northward. Later, hot pyroclastic flows traveled at 50 to 80 mph as far as 5 miles northward. Several lahars poured into river valleys, ripping trees from the banks and destroying roads and bridges along the way. The lahars damaged or destroyed a total of 27 bridges and nearly 200 homes. The largest and most destructive lahar eroded material from both the huge landslide deposit and the channel of the North Fork Toutle River. It increased in size as it traveled downstream, and after 15 hours reached its maximum size in the Cowlitz River about 50 miles downstream from the volcano. Sediment deposition reduced the carrying capacity at flood stage of the Cowlitz River at Castle Rock from 76,000 cfs to less than 15,000 cfs; the channel depth in the Columbia River was reduced from 40 to 14 feet, stranding 31 ships in upstream ports (Brantley and Myers 2000). Since the Nooksack River flows through the Reservation, a comparable eruption event at Mount Baker would have a substantial impact on the Lummi Nation.

The Mount St. Helens eruption also deposited 1.4 billion cubic yards of (uncompacted) ash. The downwind depth of ash was ten inches at ten miles (ash and pumice), one inch at 60 miles, and 1/2 inch at 300 miles (Brantley and Myers 2000).

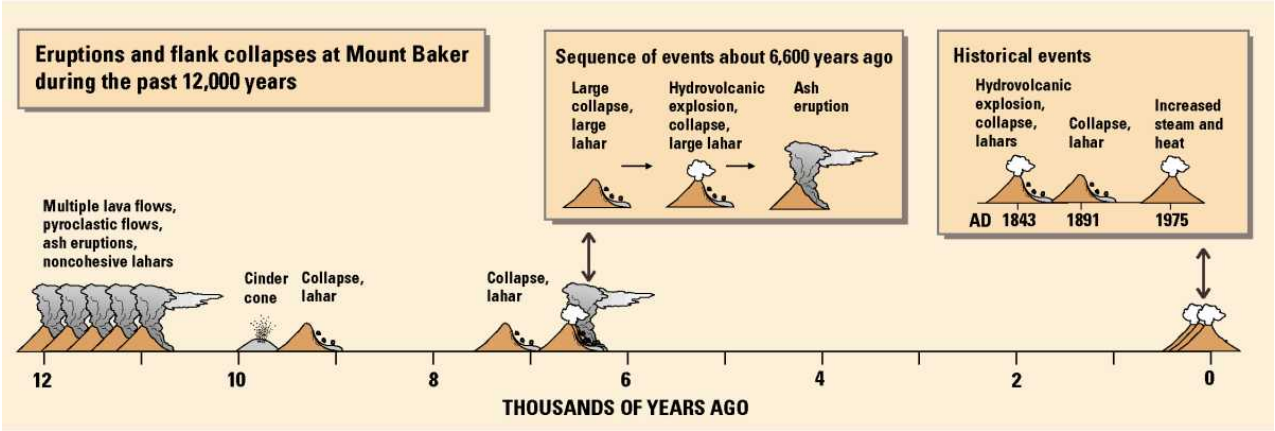
4.11.2 Volcano Vulnerability Assessment

Scientists define a volcano as active if it has erupted in historic time or is seismically or geothermally active. By this definition, Mount Rainier, Mount Baker, and Mount St. Helens are active volcanoes in Washington State. Volcanoes commonly repeat their past behavior. It is likely that the types, frequencies, and magnitudes of past activity will be repeated in the future. Hence, it is likely that at some point another lahar will flow down the Nooksack River, causing damage on the Reservation from flooding and sedimentation (Gardner et al. 1995, WEMD 2004).

The potential effects of a large lahar on the Reservation will be similar to that of a large Nooksack River flood (see Section 4.2.2.1 for details). The Floodplain area is vulnerable to inundation, sedimentation, and damage to structures. Ground transportation to the Lummi Peninsula could be cut off, leaving the peninsula isolated until the roads are cleared. The Sandy Point Peninsula and Northwest Upland areas would face the inconvenience of detour routes.

The level of sedimentation from a lahar would be much greater than that from a flood. Such sedimentation would reduce the capacity of the river; heavily impact salmon populations; alter the delta, Bellingham Bay, and shellfish beds in Portage Bay; and potentially change the course of the Nooksack River, even redirecting it into the Fraser River in Canada via the Sumas River drainage. The latter event would have dramatic effects on the entire region. Figure 4.21 shows regional volcanic hazards that may result from an eruption of Mount Baker.

Areas downwind of a volcanic eruption are also vulnerable to reduced visibility, ash fall, and caustic gases. Ash falls are harsh, acidic, gritty, smelly, and cause lung damage, particularly to the young, old, or people suffering from respiratory problems. When atmospheric sulfur dioxide combines with water it forms diluted sulfuric acid that causes burns to skin, eyes, mucous membranes, nose, and throat. Acid rains affect water supplies, strip and burn foliage, strip paint, corrode machinery, and dissolve fabric. Heavy ash falls blot out light. Heavy demand for electric light and air conditioning can cause a drain on power supplies. Ash clogs waterways and machinery, causes electrical short circuits, and drifts into roadways, railways, and runways. Very fine ash is harmful to mechanical and electronic equipment. The weight of ash causes structural collapse, particularly when it becomes saturated with water. Because it is carried by winds, it continues as a hazard to machinery and transportation systems for months after the eruption (WEMD 2001). Although the prevailing winds on the Reservation are westerly, occasional weather patterns blow from the east and would expose the Reservation to ash fall (Gardner et al. 1995). A potential ash fall could equally affect all six assessment areas of the Reservation.



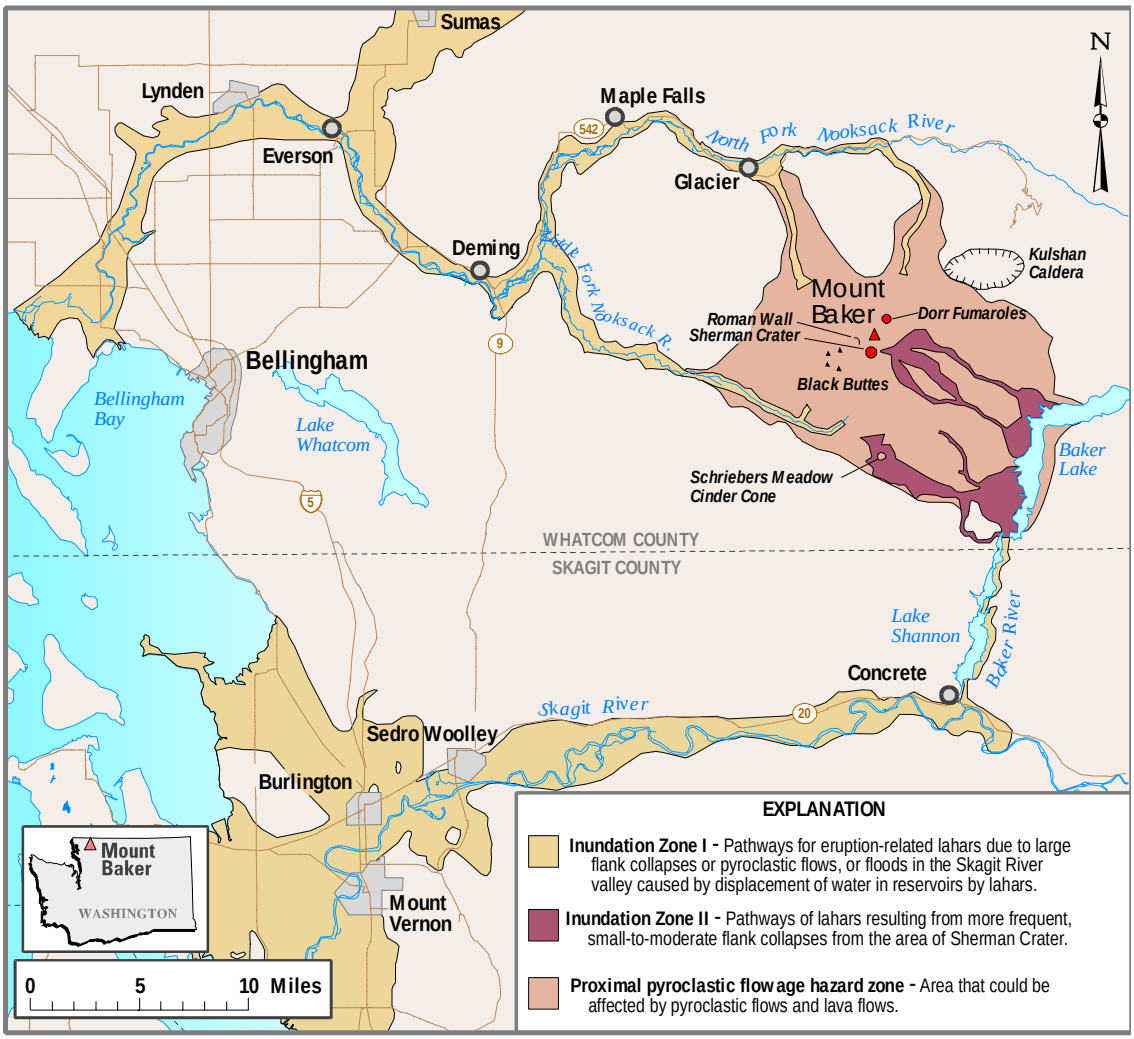


Figure 4.21 Mount Baker Eruption History and Regional Volcanic Hazards

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Volcanoes usually exhibit warning signs that can be detected by instruments or observations before erupting. However, explosions caused by heated material encountering ground water can happen without warning. Since Mount Baker is monitored closely by the Cascades Volcano Observatory, it is likely that the public will be warned before a potential eruption occurs. Such a warning would allow the preparation and implementation of measures that may reduce the impacts of an eruption (Gardner et al. 1995).

Overall, the vulnerability of the Reservation to a Mount Baker eruption ranges from low to high, depending on the area. However, the probability of a large, damaging eruption is very low since these types of eruptions only occur thousands of years apart. Figure 4.22 shows the estimated relative volcano vulnerabilities in the six assessment areas of the Reservation. Areas affected only by road detours and/or ash (i.e., Sandy Point Peninsula, Northwest Upland, and Portage Island) were assessed a low volcano vulnerability. Areas affected by isolation because of road closures (i.e., Lummi Peninsula and Gooseberry Point) and by ash were assessed a moderate volcano vulnerability. The vulnerabilities and probabilities for the six areas and for specific structures on the Reservation are listed in Table 4.22.

4.11.3 Potential Volcano Losses

The potential losses to structures on the Reservation are essentially the same as for a Nooksack River flood. As with a large flood, residents and businesses in the assessment areas would be affected economically by the closure of offices and businesses, fewer customer visits, effects on the regional economy, and the cost of recovering from the disaster. Section 4.2.3.1 describes the details of potential losses from a Nooksack River flood on the Reservation.

An ash fall on the Reservation would result in some damage to the painted surfaces of buildings and vehicles and potential damage to mechanical and electrical systems. The effects of ash would present a threat to public health and safety and residents and/or the government would incur the costs of care and treatment.

Sedimentation in the Nooksack River and Portage Bay from a lahar could cause large losses for tribal harvesters of salmon and shellfish. The impacts on salmon populations in the Nooksack River could be long-term if spawning and rearing habitats are buried under large volumes of sediment. Impacts on shellfish populations in Portage Bay are less likely than salmon impacts in the Nooksack River, but potentially could be long-term.

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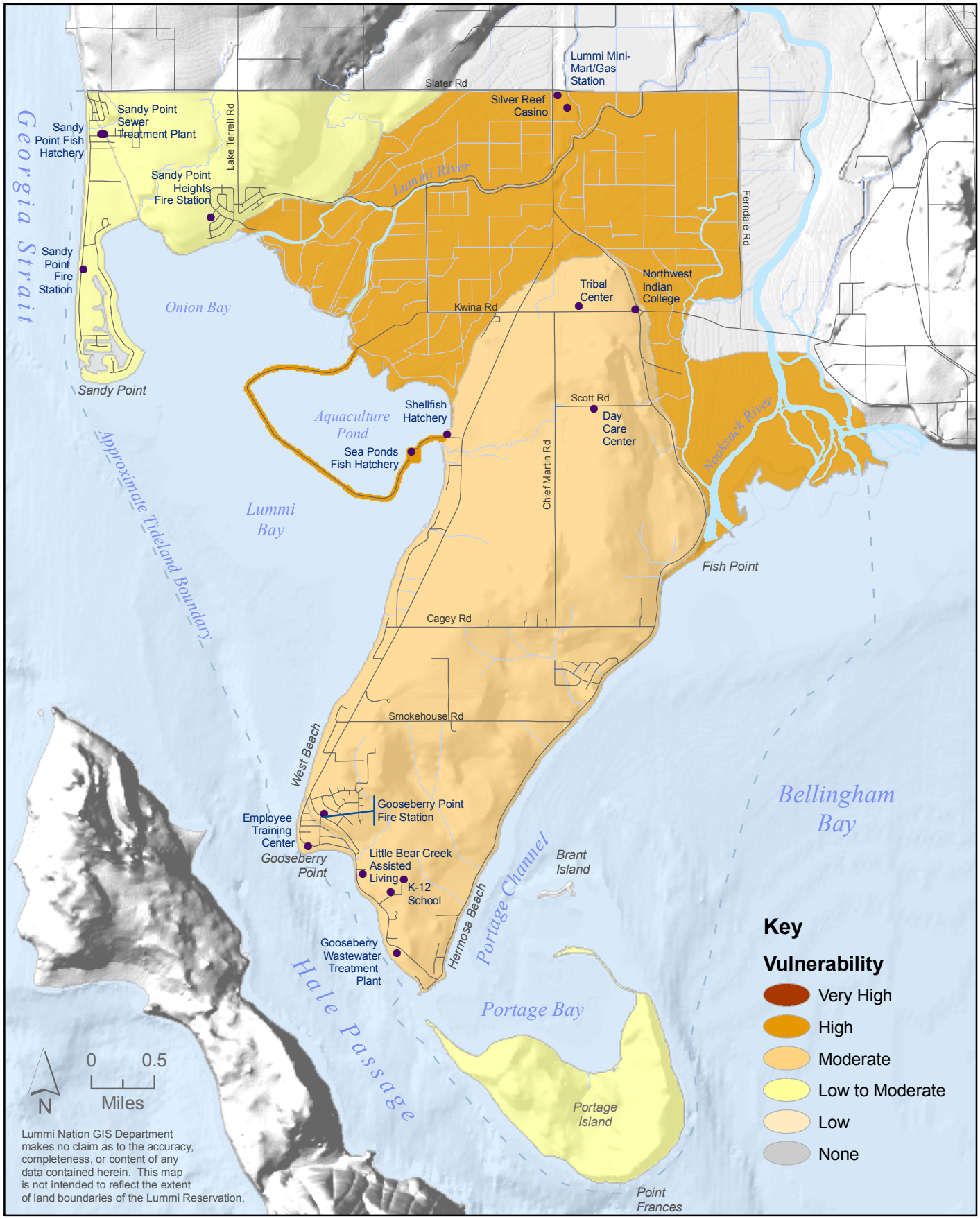

Figure 4.22 Estimated Volcano Vulnerabilities in Reservation Areas

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4.12 TORNADO

A tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud" (AMS 2000). To be classified as a tornado, the rotating air or vortex must be in contact with the ground and the cloud base. Tornadoes develop from severe thunderstorms in warm, moist, unstable air along or ahead of cold fronts and are often accompanied by thunderstorms, hail, strong non-tornadic winds, lightning, and flash floods. Although tornados generally occur in the spring and summer and between 3:00 PM and 9:00 PM, they can happen at any time of the year and day.

Tornadoes are measured by the Fujita, or F, scale which ranks the storms from F0 to F5 and relates the degree of damage to the intensity of the wind. The original F-scale was replaced on February 1, 2007 by the Enhanced F-scale which accounts for different degrees of damage to different types of structures (Edwards 2006). Because all prior tornadoes, including those discussed in this section, have been classified according to the original F-scale, it is included here as Table 4.19.

In this section, past tornado events, tornado vulnerability, and potential tornado losses on the Reservation are described.

Table 4.19 Fujita Tornado Damage Scale[1]

Scale	Wind Estimate mph	Typical Damage
F0	<73	**Light damage.** Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	**Moderate damage.** Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	**Considerable damage.** Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	**Severe damage.** Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	**Devastating damage.** Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

[1]Edwards 2006

4.12.1 Profiles of Past Tornado Events

Tornados were not included in the 2004 Multi-Hazard Mitigation Plan because there were no tornado occurrences previously recorded for Whatcom County (Pizzillo, 2004) and the Reservation is not located within a Design Wind Speed Zone on FEMA's Wind Zone map. However, an F-0 tornado occurred in Whatcom County on Tuesday April 27, 2004 causing a small amount of damage and raising awareness that tornados do occur in Western Washington. The 2004 tornado hit a barn east of the town of Sumas and damaged the barn's metal roofing. The tornado had wind speeds of 70 mph, traveled over 2.7 miles across farmland, and caused an estimated $10,000 worth of property damage. It was classified as an F-0 tornado and its base was determined to be 300 feet wide at one point (Pizzillo 2004). Although no other tornadoes have been recorded for Whatcom County, in 1997 a waterspout was observed on Bellingham Bay and a funnel cloud was observed within a thunderstorm near the towns of Lynden and Blaine (NCDC 2006).

One to two tornadoes are reported in western Washington State each year although most of these are of low velocity and cause little damage (Pizzillo 2004). There have been three larger tornado events recorded throughout Washington State. The State's deadliest tornado outbreak occurred on April 5, 1972 when two F-3 tornadoes touched down in Vancouver, Washington and west of Spokane, Washington and an F-2 struck rural Stevens County. The storms caused $50 million in damage, 6 deaths, and 300 injuries (NWS 2006). On May 31, 1997, a record of six tornadoes touched down in the State in one day with four F-1 tornadoes hitting Stevens and Spokane counties and two F-0 tornadoes in western Washington near Vancouver and Tacoma. These six storms contributed to a record year of 14 tornadoes throughout the State in 1997 which replaced the previous record of four tornadoes in one year in 1989 (NWS 2006). Table 4.20 summarizes these past tornado events.

Table 4.20 Past Tornado Events in Whatcom County and Washington State[1]

Year	Description of Event
April 27, 2004	F-0 tornado in Whatcom County just east of the town of Sumas. Winds speeds of 70 mph, traveled over 2.7 miles, 300 foot wide base.
October 7, 1997	A brief waterspout was observed at 6:40 AM in Bellingham Bay.
June 21, 1997	Thunderstorms were reported in the Lynden and Blaine areas in Whatcom County throughout the day and one thunderstorm reportedly contained a funnel cloud.
May 31, 1997	Six tornadoes in one day. Four F-1 storms in Stevens and Spokane counties and two F-0 tornadoes in Vancouver and Tacoma. A new record of 14 tornadoes occurred in 1997.
1989	Record of four tornadoes throughout the state for the year.
April 5, 1972	Three tornadoes in Washington State: an F-3 in Vancouver, an F-3 near Spokane, and an F-2 in Stevens County. Six deaths, 300 injuries, and $50 million in damage.

[1]NCDC 2006; NWS 2006; Pizzillo 2004.

4.12.2 Tornado Vulnerability Assessment

Every state is at some risk to tornado hazards (FEMA 2006) and tornadoes have been found to occur historically throughout Washington State, including western Washington. Although tornadoes are infrequent in Washington, with an annual average of two

compared to the highest annual average of 139 in Texas (NCDC 2005), it is likely that the types, frequencies, and magnitudes of past events will be repeated in the future. Similar to severe winter storms and windstorms, tornadoes can cause damage from disrupting electric power and telephone systems, interrupting transportation, threatening lives and property, and damaging forests.

Because the four necessary elements of a tornado: moisture, instability, lift, and wind shear, could occur in any of the six assessment areas of the Reservation, the areas are at equal, moderate, risk of tornado damage. However, because of the differences in development in these areas, the vulnerability varies. The hazard of direct damage to structures, such as damaged roofs, should be similar in the six assessment areas, with total damages proportional to the number of structures. Areas of denser development, such as Gooseberry Point, Sandy Point Heights, and the Sandy Point Peninsula, may face a greater hazard from fallen power lines relative to less developed areas. Many of the buildings in the Lummi Peninsula and Northwest Upland areas are close to trees that could be blown onto the buildings, an obvious hazard to personal safety as well as the structures. Roads in these two areas are also more likely to be blocked by fallen trees.

4.12.3 Potential Tornado Losses

The potential losses to structures on the Reservation from a tornado are similar to those estimated for a windstorm without the inclusion of losses from coastal flood damage. The damages due to direct tornado effects are estimate as 50 percent destruction of five percent of all buildings and destruction of roofs on an additional five percent of buildings (requiring roof replacement). Average estimated costs for replacement of the damaged structures were used to calculate total figures. The costs of other losses, such as downed utility lines, loss of power, economic and governmental disruption, electrocution, and danger of fire, are difficult to accurately estimate and are not included in the estimated potential losses. Loss of power also results in a disruption of sewer pump operations, which increases the possibility of environmental damage and public health risks from overflows of sewage. Table 4.21 lists the number of structures vulnerable to tornadoes in the five developed assessment areas and the estimated potential losses.

Table 4.21 Vulnerability and Potential Losses of Structures to Tornadoes

Assessment Area	Estimated Vulnerability	Number of Structures[1]	Structure Losses[2]	Roof Losses[3]	Location/Comment
Sandy Point Peninsula	Moderate	609	$1,518,357	$76,125	▪ Mostly unforested, highly developed
Northwest Upland	Moderate	605	691,792	$75,625	▪ Denser development in Sandy Point Heights
Floodplain	Moderate	123	$1,049,644	$15,375	▪ Mostly unforested
Lummi Peninsula	Moderate	1,378	$3,245,727	$172,250	▪ Mostly forested
Gooseberry Point	Moderate	194	$435,300	$24,250	▪ Highly developed
Total		**2,909**	**$6,940,820**	**$363,625**	▪ Total Tornado Losses: ~$7,304,445

[1]Residences and other structures counted from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution. Total structures does not include utility lines.
[2]Potential structure losses are estimated replacement cost (see Table 4.23 for specific values) of 50 percent of structure for five percent of structures in each assessment area.
[3]Potential roof losses are estimated replacement cost of roof ($2,500) for five percent of structures in all vulnerability areas.

4.13 RISK ASSESSMENT SUMMARY

Table 4.22 lists the six assessment areas and primary facilities on the Reservation, the hazards that potentially threaten them, the estimated relative vulnerability to the hazard, and the estimated relative probability or frequency of damage from a hazard event occurring. The estimated vulnerability represents an overall rating for the hazard sites within a Reservation area. In these ratings, consideration was given to the vulnerability of an area relative to other areas, both on and off the Reservation. Many of the hazards pose a threat to an entire area; these threats may vary across an area (e.g., wildfire), may be largely uniform across an area (e.g., earthquake, winter storm, or drought), or may vary in some areas and be uniform in other areas (e.g., flood). Other hazards pose site-specific threats (e.g., landslides and coastal erosion) and the vulnerability rating for an area is based on the hazard sites in the area and not the whole area. That is, although there is a generally low to moderate vulnerability in the landslide-prone areas of the Lummi Peninsula, there is also a high vulnerability in a few specific locations, while the remainder of the peninsula is not vulnerable to landslide.

Figure 4.23 depicts the combined, estimated, multi-hazard vulnerability of the six assessment areas on the Reservation for all of the assessed hazards except drought, coastal erosion, and tornado. (Drought and tornado vulnerability were considered equal for the whole Reservation and were not mapped for this MHMP; relative coastal erosion vulnerabilities were not mapped on the uplands and therefore did not overlap with the mapping of the other hazards.) The combined vulnerability for the eight natural hazards mapped on the upland areas was determined using GIS by assigning values of zero to five to the vulnerability levels of none, low, low to moderate, moderate, high, and very high, respectively. These values were summed for each point on the map and overall vulnerability levels were then assigned to appropriate ranges of summed values. The overall vulnerability levels reflect the relative vulnerability between areas on the Reservation. Table 4.23 lists the number and value of critical and other public facilities, commercial facilities owned by the Lummi Nation, and residences in the six assessment areas of the Reservation.

Table 4.22 Summary of Hazard Vulnerability and Probability on the Reservation[1]

Assessment Areas and Critical Facilities within each area	Flood	Earthquake	Winter Storm	Windstorm	Coastal Erosion	Drought	Wildfire	Landslide	Tsunami	Volcano	Tornado
Sandy Point Peninsula Assessment Area	H	H	M	M/H	M/H	M	L	L	H	L	M
	H	M	H	H	H	L/M	L	L	L	L	L
Sandy Point Fire Station	M	M	M	M/H	L	M	L	—	H	L	M
	H	M	H	H	M	L/M	L	—	L	L	L
Lummi Sewer District Treatment Plant	L	M/H	M	M	L	M	L	—	H	L	M
	H	M	H	H	M	L/M	L	—	L	L	L
Northwest Upland Assessment Area	L[2]	M	M/H	H	M	M	M	L/M	L[2]	L[2]	M
	H	M	H	H	M	L/M	L/M	M/H	L	L	L
Sandy Point Heights Fire Station	L[2]	L	M	M/H	L	M	M	L/M	L[2]	L[2]	M
	H	M	H	H	M	L/M	L/M	M/H	L	L	L
Floodplain Assessment Area	H	H	H	M	L	M	L	—	H	H	M
	H	M	H	H	H	L/M	L	—	L	L	L
Silver Reef Casino, Shell Mini-Mart and Gas Station	M	H	H	M	L	L/M	L	—	H	H	M
	H	M	H	H	H	L	L	—	L	L	L
Lummi Peninsula Assessment Area	L/M[2]	L/M	M/H	H	M/H	M	M	L/M	L/M[2]	M[2]	M
	H	M	H	H	H	L/M	L/M	M/H	L	L	L
Gooseberry Point Fire Station	L/M[2]	L	M	M	—	M	M	L	L/M[2]	M[2]	M
	H	M	H	H	—	L/M	L/M	L	L	L	L
Lummi Sewer District Treatment Plant	L/M[2]	L	M	M/H	L	M	M	L/M	L/M[2]	M[2]	M
	H	M	H	H	H	L/M	L/M	M/H	L	L	L
Elders Assisted Living Facility	L/M[2]	L	M	H	—	M	M	L	L/M[2]	M[2]	M
	H	M	H	H	—	L/M	L/M	L	L	L	L
New Tribal School and Wex li em Comm. Bldg.	L/M[2]	L	M	H	—	M	M	—	L/M[2]	M[2]	M
	H	M	H	H	—	L/M	L/M	—	L	L	L
Health Clinic, Police Station, Headstart, LIBC Offices, K-12 School, NWIC, Archives	L/M[2]	L/M	H	H	—	L/M	M	—	L/M[2]	M[2]	M
	H	M	H	H	—	L	M	—	L	L	L
Gooseberry Point Assessment Area	M/H[2]	H	M	M/H	M	M	L	L	H[2]	M[2]	M
	H	M	H	H	M	L/M	L	L	L	L	L
Portage Island Assessment Area	L/M	L/M	M/H	H	M/H	M	M	M/H	L	L	M
	H	M	H	H	H	L/M	L/M	M/H	L	L	L

[1]Vulnerability to hazard is ranked on top; probability or frequency of damaging event is ranked below; H = High, M = Moderate, L = Low.
[2]Northwest Uplands is affected but not isolated by flood road closures; facilities on the Lummi Peninsula are isolated and therefore merit a higher vulnerability to flood, lahar, and tsunami.
[3]— = not applicable

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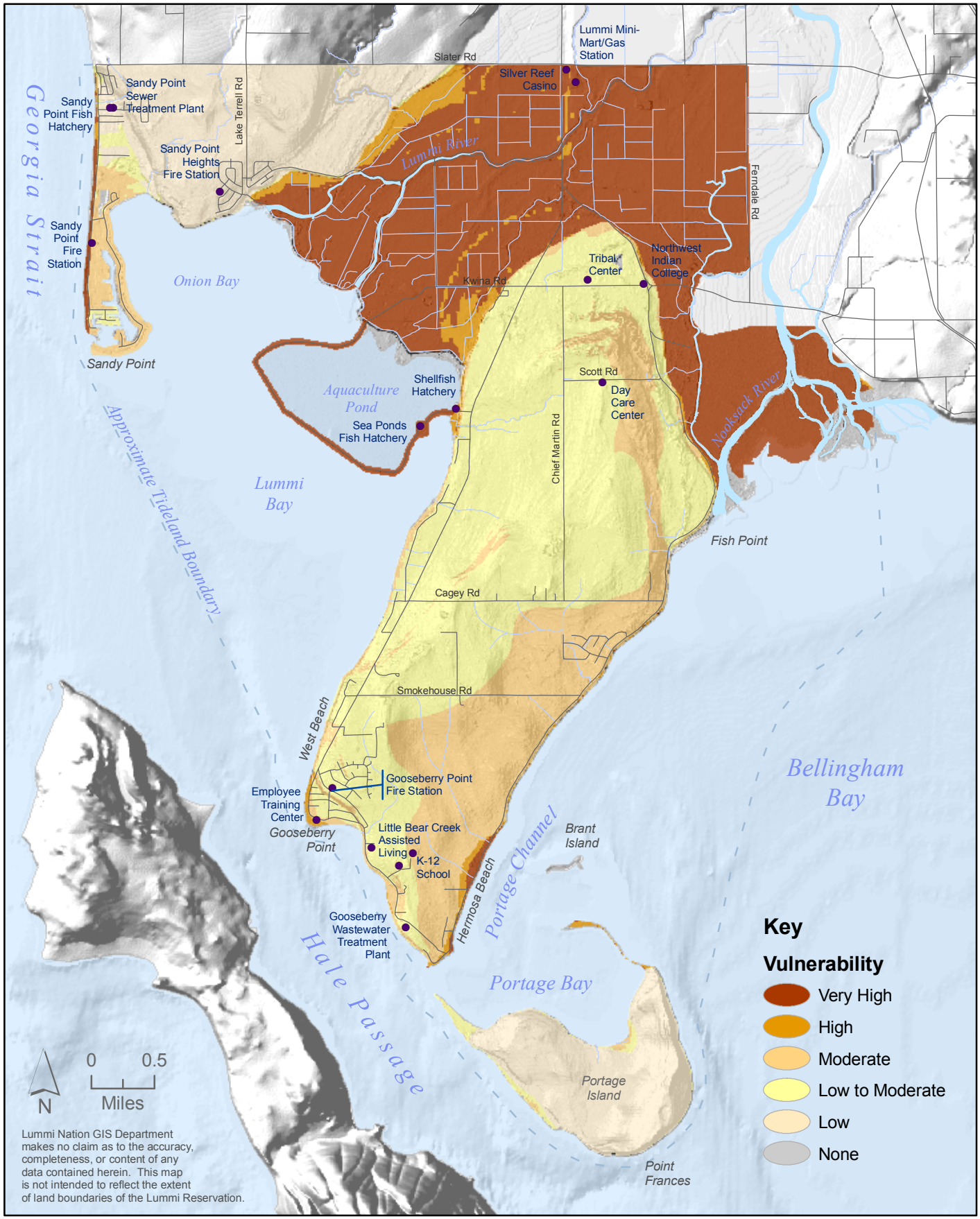

Figure 4.23 Combined Relative Multi-Hazard Vulnerability on Reservation Areas

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Table 4.23 Number and Value of Structures in the Six Assessment Areas

Area	Structure Type	Number of Structures[1]	Estimated Value[2]		Comment
			Structure(s)	Contents[3]	
Sandy Point Peninsula	Lummi Water and Sewer District Facilities	5	$157,000	$500,000	▪ Critical: Public Health and Safety
	Sandy Point Fire Station	2	$303,560	$294,000	▪ Critical: Public Safety ▪ Contents include $200,000 for pumper truck, estimated $80,000 for aid car
	LIBC Hatchery	2	$202,400	$67,100	▪ Enhances tribal salmon harvest
	Residences, Outbuildings, and Other Structures	~600	$60,071,320	$30,035,660	▪ 2007 building assessed values for all fee parcels ▪ Values for small number of trust properties not available
	Area Total	**~609**	**$60,734,280**	**$30,896,760**	
Northwest Upland	Sandy Point Heights Fire Station	1	$32,136	$225,237	▪ Critical: Public Safety ▪ Contents include $223,000 for two pumper trucks
	Lummi Natural Resources Pump House, Water Tank	2	$200,200	$0	▪ Critical: Water Supply
	Lummi Water District Lake Terrell Booster Station	1	$50,000	$0	▪ Critical: Water Supply
	SPIC Water District Pump House, Tank	2	$200,000	$0	▪ Critical: Water Supply
	Residences, Outbuildings, and Other Structures	~599	$27,189,360	$13,594,680	▪ 2007 building assessed value for all fee parcels ▪ Small number of trust property improvements not available
	Area Total	**~605**	**$27,671,696**	**$13,819,917**	
Floodplain	LIBC Silver Reef Casino	1	$30,125,000[4]	$17,401,000[4]	▪ Important income source and job provider
	LIBC Shell Mini-Mart	1	$1,129,000[4]	$332,000[4]	▪ Income source
	Seaponds Hatchery	7	$870,300	$140,800	▪ Enhances tribal salmon harvest
	Residences, Outbuildings, and Other Structures	~114	$9,861,465	$4,930,732	▪ 12 structures on fee land, remainder on trust parcels ▪ 2007 building assessed values for all fee parcels
	Area Total	**~123**	**$41,985,765**	**$22,804,532**	

Table 4.23 Number and Value of Structures in the Six Assessment Areas

Area	Structure Type	Number of Structures[1]	Estimated Value[2]		Comment
			Structure(s)	Contents[3]	
Lummi Peninsula	Gooseberry Point Fire Station	1	$203,000	$317,000	▪ Critical: Public Safety ▪ Contents include 1989 engine and an aid car
	LIBC Law & Order Police Station	1	$190,000	$44,000	▪ Critical: Public Safety
	LIBC Tribal Health Clinic	1	$2,568,500	$1,755,600	▪ Critical: Public Health
	Lummi Water & Sewer District Facilities	25	$15,973,735	$479,000	▪ Total of insured values for all sewer and water district facilities less Sandy Point and Northwest Upland facilities ▪ Critical: Water Supply and Quality, Public Health ▪ Well buildings, pump stations, and sewage treatment facility
	LIBC Wex li em Community Bldg	1	$2,532,200	$190,000	▪ Critical: Red Cross Shelter with emergency provisions
	LIBC Little Bear Creek Elders Home	1	$3,500,000	$0	▪ Vulnerable population (seniors assisted living facility)
	Lummi Head Start	2	$856,900	$138,600	▪ Vulnerable population (~90 preschool children)
	Old Lummi Tribal School Buildings	18	$3,806,000	$670,300	▪ Used as offices for tribal government, services to tribal members and Reservation residents
	Lummi Tribal K-12 School	1	30,000,000	1,000,000	▪ Vulnerable population, capacity for 750 K-12 children
	Northwest Indian College	16	$3,820,200	$1,249,600	▪ Approximately 580 full- and part-time students
	LIBC Archives Building	1	$320,000	$225,000	▪ Important historical and cultural artifacts and documents
	LIBC Courthouse	1	$500,000	$125,000	▪ Includes offices for tribal justice system and legal staff
	LIBC Oyster Hatchery	4	$2,170,300	$358,600	▪ Income source ($500,000 annual sales) and job provider
	LIBC Water Tower & Pump	2	$514,300	$0	▪ Critical: Water Supply
	LIBC Offices & Other Buildings	17	$5,133,200	$1,209,900	▪ Various services to tribal members and Reservation residents ▪ Daily LIBC payroll is approximately $58,000
	Stommish Grounds	7	$358,300	$0	▪ Recreation area

Table 4.23 Number and Value of Structures in the Six Assessment Areas

Area	Structure Type	Number of Structures[1]	Estimated Value[2]		Comment
			Structure(s)	Contents[3]	
	Residences, Outbuildings, and Other Structures	~1,279	$57,382,445	$28,691,222	▪ 2007 building assessed values
	Area Total	**~1,378**	**$129,829,090**	**$36,453,822**	
Gooseberry Point	LIBC Commodity Food Warehouse	1	$273,900	$123,000	▪ Supplemental food storage
	LIBC Employment Training Center	1	$1,000,000	$435,600	▪ Important social services
	LCC Fisherman's Cove Pier	1	$2,116,000[4]	$0[4]	▪ Boat storage, launching, and pier that support tribal fishery
	LIBC Fish Buying Station	1	$2,547,600	$44,000	
	LCC Fisherman's Cove Mini-Mart	1	$400,000[4]	$123,000[4]	▪ LIBC income source
	Whatcom County Ferry Terminal	1	$3,336,400	$0	▪ Provides access to Lummi Island community ▪ Transportation off Lummi Peninsula during flood road closures
	Residences, Outbuildings, and Other Structures	~188	$7,738,100	$3,869,050	▪ 2007 building assessed values, area is mostly fee land except for 7 individual native fee parcels and the tribal trust land valued above
	Area Total	**~194**	**$17,412,000**	**$4,594,650**	
Portage Island	None	n/a	n/a	n/a	• Currently undeveloped and unoccupied

[1]Residences and other structures counted from the Lummi Nation GIS layer of structures digitized from 2004 Pictometry imagery with six inch resolution. Total structures does not include utility lines.
[2]Unless otherwise noted (e.g., residences, Lummi Commercial Company), estimated values are insured values of structures and contents (Brown & Brown 2003; Crawford 2003; Peterson 2003; Schlehuber 2004; Conover Insurance 2006).
[3]For residences and other structures, the estimated contents value equals half of the structure value or the insured contents value.
[4] 2007 insured values reported by Lummi Commercial Company.

5. MITIGATION STRATEGY

5.1 HAZARD MITIGATION GOALS AND OBJECTIVES

The following goals and objectives were adapted from the Lummi Nation Flood Damage Reduction Plan (FDRP; LWRD 2001a), adopted by the Lummi Indian Business Council in November 2001 and approved by FEMA in January 2002. As part of the 2007 plan update, the goals and objectives were reviewed by the Multi-Hazard Mitigation Team on January 25, 2007 and by members of the Natural Resources, Planning, and Cultural Commissions on February 28, 2007 and determined to still be valid. Based on the comments from these meetings, the goals and objectives of the Lummi Nation Spill Prevention and Response Plan were considered to ensure that they are incorporated within this plan's goals and objectives. No changes were made as the spill plan's goal to minimize the adverse effects of oil and hazardous materials spill through prevention, preparedness, and response is consistent with the mitigation strategy.

Goals

The goals of the Lummi Nation MHMP are to:

1. Reduce the threats to public health and safety posed by natural hazards;

2. Reduce the structural damages caused by natural hazards;

3. Reduce the environmental impacts of natural hazards, mitigation actions, and future development activities; and

4. Reduce the long-term costs resulting from natural hazards and their mitigation.

Objectives

The objectives of the MHMP are listed below. These are long-term objectives that will continue to be followed over the next three year period. Actions that have been taken to implement each objective have been listed as part of the plan update.

1) Discourage new development in areas that are vulnerable to hazards or ensure that development occurs in such a way that risk is minimized.
   ⇒ This objective has been followed through continued application of Title 15, 15A and the National Flood Insurance Program (NFIP), and Title 22 of the Lummi Nation Code of Laws.

2) Protect or alter existing development in hazardous areas to make it less susceptible to damage.
   ⇒ This objective has been followed through the Slater Road Elevation Pre-Disaster Mitigation project, the alteration of two existing floodplain residential developments to better comply with the NFIP, and a project to post 911 house numbers throughout the Reservation.

3) Ensure that the solution chosen to protect existing development is the most cost-effective available; protects or enhances cultural resources, natural resources, and

sensitive terrestrial, riparian, or coastal habitats; and is consistent with applicable land use plans and regulations.

⇒ This objective was followed during the development and implementation of two Pre-Disaster Mitigation projects. Both projects were determined to have a benefit-cost ratio greater than 1.0 through a benefit-cost analysis, underwent environmental and cultural resource reviews, and have followed the proper tribal, county, state, and federal permitting procedures.

4) Ensure that the benefits of maintaining existing facilities outweigh their costs; if not, redesign facilities to make them less susceptible to damage or implement some other type of solution at the site.

5) Redesign existing projects and/or change maintenance practices to protect or enhance riparian or coastal habitats;

6) Manage floodplains, rivers, streams, and other water resources for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, finfish and shellfish harvesting, open space, recreation, water supply, cultural/traditional practices, and hydropower;
   ⇒ This objective has been followed in part through improvements to the Lummi Nation's participation in the National Flood Insurance Program by a Community Assistance Visit from FEMA and through the Environmental Protection Agency's approval of the Lummi Nation's application to administer the water quality standards program of the Federal Clean Water Act. Additionally, both Pre-Disaster Mitigation projects will reduce flooding hazards, restore areas of the floodplain, and improve habitat.

7) Improve coordination and consistency between the Lummi Nation and other jurisdictions, as appropriate, in management activities for floodplain and coastal areas;
   ⇒ This objective has been implemented in part through efforts to coordinate with Whatcom County and Washington State for the purchase and installation of tsunami warning systems and the development of tsunami brochures.

8) Increase public awareness of natural hazards and improve appropriate preparation for and response to such hazards;
   ⇒ This objective is being implemented through the work of the Multi-Hazard Mitigation Team, articles in the community newspaper, development of tsunami evacuation route maps and brochures, and sharing of this plan and associated grant applications with other tribes.

9) Improve hazard warning and emergency response systems.
   ⇒ This objective has been implemented through the adoption of the Lummi Nation Comprehensive Emergency Management Plan, receipt of a grant for turn-key installation of two tsunami warning systems, development of tsunami brochures, and the 911 house numbering project.

5.2 TRIBAL AND LOCAL CAPABILITY ASSESSMENT

This section will discuss the pre- and post-disaster hazard management policies, programs, and mitigation capabilities of the Lummi Nation and the other jurisdictions that provide support services to the Lummi Nation during disasters on the Lummi Reservation. This discussion will include an evaluation of Lummi Nation laws, regulations, policies, and programs that are related to hazard mitigation and to development activity in hazard-prone areas. Funding capabilities for hazard mitigation projects are also discussed. The local capability assessment includes a general description and analysis of the mitigation policies, programs, and capabilities of local organizations on the Reservation (e.g., Lummi Water and Sewer District, Northwest Indian College, and the tribal schools).

5.2.1 Tribal Capability Assessment

Land Use Plans and Development Regulations

Land use planning is a necessary and useful tool for addressing natural hazards. With land use planning and associated regulations, a jurisdiction is able to reduce future damages by controlling the density, location, construction, and type of development that occurs in a hazardous area. The Lummi Nation Planning Department, Natural Resources Department, and Cultural Resources Department administer regulations that control development in environmentally sensitive and hazardous areas on the Reservation. Whatcom County has historically exerted permitting authority for fee lands (i.e., lands where property taxes are assessed and paid to the county) on the Reservation and permitted nearly all of the development that is currently located in the most hazardous areas on the Reservation.

As described in Section 3.1.3, the Lummi Nation is striving to reduce potential hazards by regulating where and how development occurs. The policies and regulations include the Lummi Nation Building Code; Land Use, Development, and Zoning Code; the Flood Damage Prevention Code; the Coastal Zone Management Plan; and the Water Resources Protection Code. The current Building Code adopts the Uniform Building Code by reference, which includes seismic design standards (the Reservation is in Seismic Zone 3) and wind design standards (the Wind Speed Area is 80 mph, with exposure factor B or C). These standards have been in place since the Uniform Building Code was adopted by the Lummi Nation in 1975. The Lummi Building Code was amended in January 2004, primarily to update references to various uniform codes. The Lummi Nation plans to adopt the International Building Code when it is adopted by other jurisdictions in the near future.

As noted previously, there are approximately 38 miles of marine shorelines on the Reservation. The Lummi Coastal Zone Management Plan (CZMP) provides important guidance on development in the coastal zone, which is the location of the most serious hazard vulnerabilities on the Reservation. The CZMP was adopted in 1979 and is scheduled to be updated by 2007 to improve its ability to reduce hazard damages as well as other environmental impacts associated with development activities along the shoreline.

The LIBC incorporated the environmental review and permitting provisions of a Tribal Environmental Policy Act (TEPA; LWRD 2003) into the recently adopted Title 15 Land

Use, Development, and Zoning Code. These provisions formalize an environmental review process that has been functioning since it began in 1968 with the adoption of an interim zoning ordinance by the LIBC. The original Zoning Ordinance and other LIBC ordinances (e.g., the Tidelands Ordinance, Water Code, and Coastal Zone Management Plan) initiated procedures for project review and permitting. Approval for projects came from the designated Lummi Planning Department staff, unless the project appeared to be controversial. More controversial projects required approval by the Lummi Planning Commission.

To improve the permitting system, the Lummi Nation Technical Review Committee (TRC) was created in October 1996. The purpose of the TRC was to refine the LIBC environmental review capacity so that the Lummi Nation's goals related to resource protection and compliance with federal and tribal laws could be supported, while the development needs of Reservation landowners could also be met. In 1997, the LIBC charged the TRC with reviewing proposed land use activities on the Reservation and implementing tribal and federal laws to protect public and private resources. The TRC is composed of representatives from each of the seven departments of the LIBC.

In early 1997, the TRC incorporated provisions of the National Environmental Policy Act (NEPA) into two revised permit applications, one for small projects and one for large projects. These applications are generally compatible with the environmental review checklist required off-Reservation under the Washington State Environmental Policy Act (SEPA). Completed permit applications are distributed to all department representatives. The representatives assemble comments for consideration at the weekly TRC meeting. At the TRC meeting, an application is either not approved pending further information, approved, approved with conditions, or denied.

The permit applications also help the TRC members determine if additional review is required pursuant to the NEPA or other federal laws. The TRC incorporated the basic aspects of the NEPA process into its review process, including an environmental checklist; the concept of avoiding, minimizing, and mitigating impacts; and the use of Environmental Assessments (EAs) or Environmental Impact Statements (EISs) to consider the effects of major projects. If it appears that a project will have a significant impact on natural or public resources and there is a federal nexus (e.g., federal permitting or federal funding), an EA or an EIS is required to comply with the NEPA. Upon completion, the EA or EIS is evaluated by the TRC to determine project approval, conditioned approval, or denial (LWRD 1999). This environmental review process allows the TRC to ensure that the method and type of development that occurs in hazard areas minimizes the potential for future damages. The new Lummi zoning code adopted in January 2004 codifies the TRC and the NEPA provisions described above that previously had been authorized by an LIBC resolution (Resolution No. 97-104).

In 1968, the federal government began the National Flood Insurance Program (NFIP) as a way to limit future development in flood-prone areas and thereby prevent additional flood damages. The NFIP, which is administered by FEMA, qualifies residents of communities that adopt and administer minimum floodplain regulations for federally subsidized flood insurance. The Lummi Nation adopted floodplain regulations in 1997 in the form of the Title 15A Flood Damage Prevention Code (FDPC; see Appendix D). Following the adoption of the FDPC, the Lummi Nation joined the NFIP on October 14, 1997. The NFIP Community Number for the Lummi Reservation is 530331. The Reservation moved from the emergency phase to the regular phase of the NFIP with the

release of final Flood Insurance Rate Maps (FIRMs) and a Flood Insurance Study for the Reservation on January 16, 2004. A NFIP Community Assistance Visit (CAV) was conducted for the Reservation by FEMA in 2005 and was successfully closed on April 28, 2005. The CAV improved the Lummi Nation's implementation of the National Flood Insurance Program through revisions to the Flood Damage Prevention Code, the creation of a Lummi Nation Floodplain Development Permit and associated application, and the development of a procedure for the issuance of permits for development in the floodplain. To further improve this implementation, the Water Resources Division began the process of joining the Community Rating System in 2006 by contacting the Insurance Services Office representative and requesting a support letter from FEMA Region X. The availability of flood insurance and regulation of development within the floodplain will help reduce overall damage and costs on the Reservation after future floods. In addition, by joining the NFIP, the Lummi Nation is eligible to apply for state and federal grant programs to reduce flood hazards and repair flood damages.

Further details on the FDPC can be found in Section 5.3 and in the Lummi Nation Flood Damage Reduction Plan (FDRP; LWRD 2001a).

Flood Damage Reduction Plan Policies

An extensive list of policies recommended to guide floodplain, coastal, and watershed management activities are described in the Lummi Nation FDRP (LWRD 2001a), adopted by the LIBC in 2001 (Resolution No. 2001-131). These policies provide a set of operating principles to guide flood mitigation efforts over the long term. The policies are divided into seven categories: general policies; floodplain land use; watershed management; flood mitigation projects; river channel maintenance; flood warning, information, and education; and emergency response. These policies will help the Lummi Nation meet its goals and objectives for hazard mitigation. A summary of the policies is attached in Appendix E.

Wildfire Policies and Programs

The Lummi Nation Title 10 Natural Resources Code (first enacted March 6, 1964; last amended September 24, 2001) designated the Lummi Natural Resources Department (LNR) to be responsible for forest management on the Reservation. Chapter 10.18 (Forestry) of the Natural Resources Code established a forest practices review process, permit terms and conditions for forestry activities, and fire suppression authority for the LNR. The forestry chapter gave the LNR the authority to issue regulations governing burning on the Reservation during hazardous periods, including but not limited to:

- An open burning ban;
- The requirement for an open burning permit with conditions for fire protection; and
- Providing requirements for safe burning.

The Lummi Nation adopted a Forest Management Plan in August 2002 (LNR 2002) to support a comprehensive program to manage the forest resources on the Reservation. The program will require or encourage management practices that will reduce the probability of wildfires on the Reservation.

All Hazards

The Lummi Indian Business Council has adopted the Lummi Nation Comprehensive Emergency Management Plan (CEMP, Appendix C) and the Natural Resources Department has developed the Lummi Nation Spill Prevention and Response Plan putting in place guidelines to direct LIBC actions in the event of a disaster or oil spill. The Comprehensive Emergency Management Plan coordinates with other plans and establishes procedures for LIBC departments to follow in case of an emergency. It calls for the formation of a Lummi Office of Emergency Management within the Lummi Nation Police Department and the hiring of a Director of Emergency Management. These plans instruct responsible officials and employees how to respond in order to minimize the effects of such a disaster.

The LIBC policy is to coordinate with and support the Whatcom County Division of Emergency Management (DEM) both on and off the Reservation. In accordance with the CEMP and under the direction of the LIBC, the Lummi Nation Police Department will establish an Emergency Operations Center (EOC) in the event of a disaster. The Lummi EOC and Lummi response efforts will cooperate and work in coordination with the Whatcom County EOC. The Whatcom County DEM is responsible for coordinating the disaster mitigation, preparedness, and response and recovery efforts of its member agencies under the direction and control of the Whatcom County Emergency Management Council. The Lummi Nation CEMP details that the tribe's Director of Emergency Management will act as an advisor to the LIBC and to the Whatcom DEM during disaster operations. This coordination provides an important communication role by providing the county with the Lummi Nation perspective on possible responses to a disaster and helps ensure an effective response.

Because property tax revenue from fee lands on the Reservation is currently paid to Whatcom County, the LIBC has limited revenue and generally has higher funding priorities than hazard mitigation. Outside funding is therefore necessary to implement mitigation projects that have significant costs. The Lummi Nation is eligible for and has received Hazard Mitigation Grant Program funds when a disaster has been declared in Washington State. Other sources indirectly related to hazard mitigation, such as Economic Development Authority grants or Environmental Protection Agency grants, may help fund projects that have implications for hazard mitigation. In addition, the LIBC may be able to implement some inexpensive mitigation actions, such as public education, with current staffing. For example, the LIBC has a communication office that publishes a community newspaper (the Squol Quol) and provides community information through a cable news program. These and other media (e.g., newsletters, flyers, and telephone calls) have been used in the past and are currently used to provide public education or information to the community.

5.2.2 Local Capability Assessment

The LIBC is the only government on the Lummi Reservation and has sole jurisdiction for hazard mitigation and other programs on the Reservation. Thus, for the purposes of this state-level mitigation plan, there are no local governments under the LIBC to be assessed. The local public organizations on the Reservation (e.g., Lummi Water and Sewer District, Northwest Indian College, and the tribal schools) are under the oversight of the LIBC and have limited scope and limited capabilities to respond to a disaster. They are basically responsible for their own facilities and commonly need assistance to recover from a disaster. It is the intention of the Lummi Nation to provide leadership, guidance, and assistance to private citizens, businesses, and other Reservation

organizations, both through the tribal capabilities described above and through the mitigation measures described below in Section 5.3.

5.2.3 Mitigation Capability Effectiveness

The plans and programs listed above to describe both tribal and local mitigation capability have been an effective starting point from which to mitigate the damage from natural hazards on the Reservation. As described above, the land use development codes and regulations limit development in hazardous areas, the permit review process ensures these codes and regulations are applied, and the plans describe policies and recommend activities for specific hazards (e.g. floods, spills) and general emergency management. This existing capability has been unified and significantly enhanced through the development and application of this Multi-Hazard Mitigation Plan. The implementation of the MHMP has greatly improved the tribe's hazard mitigation efforts primarily through its resulting list of prioritized mitigation activities and the funding eligibility it creates. The development, implementation, and update of the plan have improved the awareness of the natural hazards on the Reservation and heightened the tribal government's awareness of the need and usefulness of mitigation activities.

The initial implementation of the MHMP has been effective in beginning to mitigate damage from natural hazards as shown through projects completed or begun in the first-three year period of the plan, including the elevation of Slater Road above the base flood elevation, the acquisition of houses in the coastal floodplain, and the purchase and installation of tsunami warning systems. The Sandy Point Coastal Acquisition has resulted in the purchase and removal of one home from the Coastal V-Zone representing future avoided losses of $2,654,163. The Slater Road elevation project was begun in 2006 and, upon completion in 2009, will lead to avoided future losses of over $4 million. After installation of two additional systems in June, 2007, the three tsunami warning systems on the Reservation are expected to reach approximately 1,240 commercial and residential structures. With an average household size of 3.66 persons and inclusion of average occupancy rates for the included commercial and public structures, approximately 6,500 people, approximately 3,000 of which are within the modeled inundation zones, would be notified of a tsunami or other hazard by these systems. Additionally, as a result of a Community Assistance Visit (CAV) with FEMA, one house in the Nooksack River floodplain was elevated to one foot above the Base Flood Elevation in 2005.

Although some of these projects will be completed in the next three year period and their actual impacts reported on in the next update, the funding and commencement of these projects represents a commitment by the tribe to follow the plan and its recommendations. The tangible benefits of the completed and ongoing projects are expected to be shown after large hazard events that impact the mitigated areas, although these events didn't occur in this period for the completed projects. For example, although located in the FEMA floodplain, no flood event occurred in this period large enough to flood the areas of the Sandy Point acquisition or the floodplain elevation projects. After completion of the Slater Road elevation project, loss-of-function impacts such as traffic counts will be able to be measured during floods that would have previously led to a road closure. The effectiveness of the tribe's mitigation efforts, through the reduction of costs to life and property from natural hazards, will continue to improve through the monitoring of completed projects, the implementation of the

recommended activities, and particularly the establishment of an emergency management division.

5.3 MITIGATION MEASURES

This section will identify, evaluate, and prioritize feasible and environmentally sound mitigation actions currently in use or under consideration by the Lummi Nation. This discussion will include an explanation of how each activity contributes to the overall mitigation strategy for the Lummi Nation. Where pertinent, links to local organizations will be identified.

For the purposes of this MHMP, short-term actions are those actions that the Lummi Nation is capable of implementing within its existing resources and authorities over the next two years. Long-term actions are those actions that will require new or additional resources or authorities to implement, and those actions that cannot occur or be completed over the next two-year period. The recommended mitigation actions, and priorities as discussed in Section 5.4, for all hazards are listed in Table 5.1 at the end of this section.

5.3.1 All Hazards

5.3.1.1 Current Mitigation Actions

As described in Section 5.2, current mitigation actions employed by the Lummi Nation that apply to all hazards include land use plans and development regulations, emergency management and spill response plans, and coordination with the Whatcom County Emergency Response Team. For early warning of impending hazard events, the LIBC relies on communication with the Whatcom County Division of Emergency Management as well as pertinent federal and state agencies. Residents on the Reservation receive warnings from public news outlets as well as through the LIBC.

Mitigation actions for all-hazards that have been taken since the adoption of this plan based on the plan's recommendations are:

Short Term

- The Multi-Hazard Mitigation Team was formed in 2004 pursuant to LIBC Resolution 2004-015 and consists of the Natural Resources Department Executive Director, the Planning Department Director, the Chief of the Lummi Nation Police Department, the Safety Officer, and assigned staff from the Natural Resources and Planning departments. The team met five times between 2005 and 2007 to discuss and review progress on mitigation projects, review the CEMP and Spill Prevention and Response Plan, and discuss the MHMP update. The Water Resources Division of the Natural Resources Department has served as the coordinator for the team and team meetings. The team is responsible for overseeing the development, implementation, and monitoring of this plan.
- The Planning Department developed a draft version of the Lummi Nation Comprehensive Plan.
- The Lummi Nation Multi-Hazard Mitigation Plan was posted on the Lummi Nation website (www.lummi-nsn.gov) and will be replaced with the adopted and approved 2007 update. The plan and associated grant applications were shared with at least eight tribes including tribes in Massachusetts, Oklahoma, Idaho, Washington, and Oregon.

- The Lummi Nation Comprehensive Emergency Response Plan was adopted in 2006 by LIBC Resolution 2006-036.
- The Lummi Nation Spill Prevention and Response Plan was finalized in 2005 and is being implemented through spill response preparedness efforts including equipment purchases and training.
- The Lummi Nation has made efforts to coordinate with Whatcom County and has worked closely with Washington State for the purchase and installation of tsunami warning systems and the development of tsunami brochures.
- The establishment of 72-hour kits and family plans was encouraged through articles in the community newspaper.
- A public health nurse was added to the staff at the Lummi Nation Health Clinic.

Long Term

- A 2005 FEMA Pre-Disaster Mitigation-Competitive grant was received for a total project cost of $5,976,843 and a 75 percent federal share of $4,482,632. The grant includes two project subgrants and one management subgrant. The two projects are:
    - The Slater Road Elevation Project. This project is the elevation of an almost 1-mile long, frequently flooded, section of Slater Road east of the Nooksack River bridge to above the 100-year flood level. The elevation will include an approximately 389 foot long bridge and will allow continued access to the Reservation, Lummi Island, and nearby industries through a 100-year flood event. The project will be completed in early 2009.
    - The Sandy Point Coastal Acquisition Project. This project is the acquisition and removal of up to three homes from the high velocity coastal flood zone (V zone) along the Sandy Point Peninsula.
- A 2006 Emergency Management Preparedness Assistance Grant (EMPAG) grant was received from the Washington State Emergency Management Division for the turn key installation of two All Hazard Alert Broadcast (AHAB) tsunami warning systems within the modeled tsunami inundation zones on the Reservation.

5.3.1.2 Proposed Mitigation Actions

The following actions are recommended to meet the Lummi Nation's goals and objectives for mitigation of all hazards.

Short Term:

1) Establish the formal goal of becoming a disaster-resistant Indian nation, including objectives or benchmarks for preparedness.

2) Maintain the established Multi-Hazard Mitigation Team comprised of representatives from pertinent LIBC departments and other organizations on the Reservation.

3) Establish an emergency management division within the Lummi Nation Police Department and hire an emergency manager.

4) Finalize a Comprehensive Plan that is aligned with the provisions of the Title 15A Flood Damage Prevention Code, the FDRP, other hazard-related ordinances and regulations, and the recommendations of this MHMP.

5) To help disseminate the MHMP, expand knowledge of hazard mitigation on the Reservation, and encourage further mitigation actions, maintain the posting of this plan, including updated versions, on the Lummi Nation web site, and add links to further hazard mitigation information (e.g., DisasterHelp.gov) as time and resources permit.

6) Implement, maintain, and update the Lummi Nation Comprehensive Emergency Management Plan (Appendix C).

7) Continue to implement and maintain the Lummi Nation Spill Prevention and Response Plan through government-wide preparedness (e.g. Incident Command System training), safety and response training, and coordination with area industries.

8) Continue to coordinate LIBC emergency response efforts, as appropriate, with those of Whatcom County and other federal, state, and local agencies.

9) Establish 24-hour emergency medical response capability (an equipped Medic 1 unit along with paramedics and emergency medical technicians) located on the Reservation.

10) Further promote the establishment and maintenance of home survival/emergency kits.

11) Purchase, or make available for purchase, 911 house number signs for all addressed structures on the Reservation to aid emergency responders.

Long Term:

1. Continue to pursue funding for the Lummi Nation mitigation priorities and recommendations described below, including funding for needed staff and infrastructure.

2. Promote a disaster and hazard mitigation fund to assist the mitigation and response efforts of individuals and organizations on the Reservation.

3. Coordinate hazard planning, as appropriate, with other jurisdictions.

4. Improve and sustain public information and education programs aimed at mitigating natural hazards.

The Multi-Hazard Mitigation Team plays a major role in hazard mitigation activities, including the monitoring and development of this MHMP. The maintenance of this team is important because it is the only Lummi Nation organization focused on coordination of multi-hazard mitigation. The LIBC resolution (Appendix A) that adopted this updated MHMP authorizes the continuation of the Multi-Hazard Mitigation Team and directs the LIBC General Manager or his designee to coordinate the formation, staffing, and operations of this team and to ensure its effectiveness. The Water Resources Division of the Natural Resources Department has served as the coordinator for the team and team meetings.

Establishing benchmarks for preparedness will help maintain focus on the goal of developing a disaster-resistant Indian nation. These benchmarks will track progress towards institutionalizing preparedness and hazard mitigation, including the characterization of natural hazards; the presence of ordinances or standards to mitigate natural hazards; and ongoing education on natural hazard preparedness and mitigation. By measuring or tracking progress toward achieving the benchmarks and being accountable to the LIBC, the chances of success will increase.

Creation of a disaster and hazard mitigation fund would allow financial commitments to be made quickly to support hazard mitigation. However, with the current lack of property tax revenue and other competing needs of Reservation residents, the availability of funding to meet immediate emergency needs, including early hazard mitigation activities, and support disaster preparedness efforts is a major concern. Federal assistance programs require various matching fund contributions from applicants and are not guaranteed to exist in the future. Hence, creation of a hazard fund is necessarily a long-term action; the importance of this action will depend on the availability of future outside funding.

Many post-disaster reports note the need to strengthen and sustain public information, education, and training efforts by providing additional resources (Oregon 2000a). Although it is commonly recognized that interest in reducing losses increases during and after events, there is an ongoing need to provide residents with hazard mitigation information. Post-disaster assessment reports cite the need to have timely seasonal information available, have better methods to inform residents where they can obtain hazard mitigation information, use improved electronic methods (e.g., web sites), and have materials oriented toward the intended users. This helps keep awareness levels higher, will stimulate actions by some, and reminds users to consider and include hazard mitigation measures in the contexts of regular activities, such as building a new home, relocating an office, or repairing a business. Information has been provided to Reservation residents through the community newspaper and the Lummi Nation News television program about the ongoing mitigation projects and the need for personal preparedness.

5.3.2 Floods

5.3.2.1 Current Mitigation Actions

To date, various governmental agencies in the Nooksack River basin have used five different approaches to reduce the costs and impacts of flooding:

- Flood control structures;
- Channel maintenance;
- Flood warnings;
- Land use plans; and
- Development regulations.

Flood control structures, channel maintenance, and flood warnings are used to protect existing properties in flood hazard areas. Land use plans and development regulations are used to prevent future development that would be vulnerable to flooding and reduce

the impacts of new construction on flooding. A more complete description of past and current flood mitigation activities is contained in the Lummi Nation FDRP (LWRD 2001a).

Flood Control, Elevation, and Floodproofing

The primary flood control measures protecting the riverine floodplain on the Reservation are the 5- to 10-year levees along the bank of the Nooksack River and the sea wall along Lummi Bay. In addition, Marine Drive was raised after the 1990 floods to reduce the frequency of closures during low magnitude floods. However, Marine Drive is still inundated by less than one-year floods. Many of the existing homes in the floodplain along Haxton Way were raised to the base flood elevation after the 1990 floods (LIBC 1997). Some homes west of Lummi Shore Road were also flood-proofed after the 1990 floods (Deardorff 1996). The Whatcom County CFHMP for the lower Nooksack River describes other past and current mitigation activities that have occurred upstream from the Reservation (Whatcom County 1997a, 1999).

Past coastal flood mitigation along exposed Reservation shorelines has largely consisted of the construction of bulkheads, which have become bigger and higher over the years, especially along the southern Sandy Point shoreline. These bulkheads extend below the high tide level and onto tribal tidelands (an on-going legal issue between the United States and the Lummi Nation and Sandy Point homeowners that is currently the subject of a federal lawsuit: *United States, Lummi Nation vs. Keith E. Milner and Shirley A. Milner, et al.,* Civil Action No. C01-809R [U.S. District Court, Western District of Washington]). These bulkheads have resulted in substantial physical and biological damages to tribal tidelands. Physical damages that result from bulkheads include increased beach scour/erosion, a steeper beach and therefore decreased tideland area, increased net shore drift rate, a coarser beach, sediment impoundment along the up-drift side and landward of bulkheads, increased erosion along the down-drift extent of bulkheads (“end effects”), and loss of storm berm and beach resiliency. Biological damages caused by bulkheads include loss of habitat area, decreased and degraded shellfish habitat, likely loss of spawning habitat for surf smelt and sand lance, increased predation of juvenile salmon, less stable beach, loss of organic debris on beach, and unknown “threshold effects”.

Rip-rap shore armoring was also used along most of the length of Lummi Shore Road to reduce coastal flood impacts and prevent erosion that undermined the road and created a public health and safety hazard. The recognized negative physical and biological effects of this project are being mitigated through a beach nourishment program.

Land Use Plans and Development Regulations

The Lummi Planning Department administers regulations that control development in flood hazard areas on the Reservation. As described in Section 3.1.3, the Lummi Nation is striving to reduce potential hazards by regulating where and how development occurs.

To reduce flood vulnerability, the Lummi Nation adopted floodplain regulations in 1997 in the form of the Title 15A Flood Damage Prevention Code (FDPC; see Appendix D). Following the adoption of the FDPC, the Lummi Nation joined the NFIP on October 14, 1997. The Reservation moved from the emergency phase to the regular phase of the NFIP with the release by FEMA of final Flood Insurance Rate Maps (FIRMs) and a Flood Insurance Study for the Reservation and the surrounding area on January 16, 2004.

The lack of FIRMs for the Reservation was the only requirement that kept the Lummi Nation in the emergency phase of the NFIP. The previous FIRMs for the Nooksack River and coastal shorelines were revised and released by FEMA in 1990, but they contained no data for the Lummi Reservation. Updated Preliminary FIRMs, which include the Lummi Reservation, were released in 1999, 2002, and 2003; the LWRD reviewed and provided comments on all of these revised Preliminary FIRMs. The final FIRMs include a recent study of the Sandy Point Peninsula coastal flood hazard, but do not include a floodway south of Ferndale. Further hydraulic modeling is required in order to define a floodway in this area. The availability of flood insurance and regulation of development within the floodplain will help reduce the overall damage and costs on the Reservation after future floods. In addition, by joining NFIP, the Lummi Nation is eligible to apply for state and federal grant programs to reduce flood hazards and repair flood damages.

The Lummi Nation's participation in the NFIP was improved through a Community Assistance Visit (CAV) with FEMA that closed on April 28, 2005. The CAV resulted in revisions to Title 15A of the Lummi Code of Laws, the Flood Damage Prevention Code, the creation of a Lummi Nation Floodplain Development Permit and associated application, and the development of a procedure for the issuance of permits for development in the floodplain. Additionally, a Natural Resources Department staff member received the Certified Floodplain Manager certification in 2005 which has allowed the department to provide further technical support to the Planning Department in the implementation of the NFIP and Title 15A.

The NFIP program establishes a 100-year floodplain that is divided into two zones: a floodway and a flood fringe. Development may be permitted in these areas if it satisfies conditions and requirements regarding the height of the first floor of a structure above the projected 100-year flood elevation, flood-proofing construction, displacement of floodwaters, and related concerns.

Similarly, Executive Order 11988 of May 24, 1977, prohibits non-water-dependent development in a floodplain unless there is no practicable alternative. This order requires federal agencies to recognize the significant value of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. The objective of Executive Order 11988 is avoidance, to the extent possible, of long- and short-term adverse impacts associated with occupancy and modification of the base floodplain (100-year floodplain) and the avoidance of direct and indirect support of development in the base floodplain wherever there is a practicable alternative.

The Lummi Title 15A FDPC prohibits any development in a floodway that would cause 100-year flood levels to rise. Also prohibited in a floodway are all new construction and substantial improvement of residential structures, as well as repair or improvement of existing structures, if the work will increase the ground floor area. The FDPC allows development in the flood fringe, but requires the following measures (among others) to minimize flood damage:

- The lowest floor of new and substantially improved residential structures, including an occupied basement, must be elevated at least one foot above the 100-year flood elevation. New construction, substantial improvements, and manufactured homes must be anchored;

- Construction and utility design should be consistent with minimizing flood damage;
- Subdivisions should be consistent with minimizing flood damage;
- Enclosed areas below the lowest floor of new and substantially improved residential structures should be designed to minimize structural damage; and
- New and substantially improved nonresidential structures must have their lowest floor elevated at least one foot above the 100-year flood elevation or be flood-proofed and designed to resist the forces of floodwaters up to this elevation.

Pursuant to Title 15A, in coastal high flood hazard areas, all new construction and substantial improvements must be elevated on pilings and columns so that the bottom of the lowest floor is elevated at least one foot above the 100-year flood level. The foundation must also be anchored to resist the total force of wind and water acting simultaneously on the whole structure. All new construction must also be located landward of the reach of ordinary high water. The use of fill for structural support and the alteration of sand dunes that would increase potential flood damage is prohibited.

Critical facilities (e.g., hospitals, schools, nursing homes, police stations, fire stations, and facilities for hazardous waste storage) must, to the extent possible, be located outside the Special Flood Hazard Area (SFHA, the area inundated by a 100-year flood). If constructed within the SFHA, they must be elevated three feet or more above the base flood elevation. Toxic substances must be protected from exposure to floodwaters and elevated access routes must be provided, to the extent possible, to all critical facilities.

Current land use on the Reservation is relatively compatible with flooding in the Nooksack River floodplain, but is relatively incompatible with flooding along the low-lying coastal zones. Historical agricultural use of the floodplain and an awareness of the flood risk have resulted in a low housing and commercial density in this area and in flood-proofing actions to reduce the probability of flood damage. Conversely, the desire for scenic waterfront properties and a lack of awareness or respect of flood hazards has resulted in a high housing density along the low-lying coastal zones of the Reservation. Most of the properties and many of the structures along the western Sandy Point Peninsula and Neptune Beach shorelines lie within the coastal velocity zone designated on the 2004 FIRMs for the Reservation (FEMA Maps No. 53073C1155 D and 53073C1165 D, dated January 16, 2004). Based on these final FIRMs, field observations during flood events, and high-resolution topographic mapping, most of these residences are not in compliance with Title 15A provisions for flood damage reduction presumably because they are pre-FIRM construction.

Repetitive Loss properties as identified through the NFIP are currently addressed through the policies of the Lummi Nation Flood Damage Reduction Plan (Appendix E). Flood Hazard Reduction Policy 12 states that alternatives to returning a property to its pre-damage condition should be considered when, among other criteria, the property has experienced repetitive damage and incurred repetitive repair costs. Flood Hazard Reduction Policy 6 lists criteria for the prioritization of acquisition projects including structures with the greatest potential for future flood damage. The Repetitive Loss list could be used to identify such properties. In addition, Title 15A requires the Planning Commission to consider to costs of providing governmental services during and after flood conditions for floodplain development when hearing appeals of floodplain permit decisions. There are currently five Repetitive Loss properties under the NFIP on the

Reservation which are all insured through Whatcom County's Community Identification number (530198).

Critics of FEMA's flood management system, in particular the NFIP, have pointed out that it has actually led to increased flood damages in the United States. This occurs in part because the program encourages development in the floodplain and coastal zones by providing federally backed flood insurance for damages to houses and property within these areas. This financial safeguard for developing within flood-prone areas, along with a false sense of security from regulations and flood control structures that may not be adequate, imposes additional costs on both property owners and tax payers (Tillamook County 1996). To avoid such problems, it is important for land use plans and regulations to direct development to locations that are outside of flood-prone areas.

Flooding on the Reservation is strongly affected by land uses and floodplain management upstream from the Reservation. Whatcom County has jurisdiction over land use in much of the lowlands, west of the foothills and mountains of the Cascade Range. The forested uplands are regulated by either the state or federal governments. To meet requirements of the Washington State Growth Management Act, the Whatcom County Comprehensive Plan, was adopted (Whatcom County 1997b) and revised in 2005 (Whatcom County 2005). This plan includes the following policies:

- Discourage development in areas prone to flooding;
- Limit lands in the 100-year floodplains to low intensity land uses such as open space corridors or agriculture;
- Use the Whatcom County CFHMP as a basis to balance land use and flooding;
- Discourage expansion of urban growth areas into flood-prone areas and consider danger to individuals related to flooding when designating land use in other areas;
- Encourage multi-purpose problem solving relative to flooding, aquifer recharge, improved water quality, water for human consumption, and fish habitat. Consider the purchase of land along the Nooksack river for flood water storage that could be utilized by cities and water providers;
- Development in flood-prone areas must comply with adopted regulations to mitigate identified flood hazards;

About 75 percent of the 20,000 acre Lower Nooksack River floodplain is zoned for agricultural use and about an additional ten percent is zoned for other open space uses. Thus 85 percent of the floodplain is zoned for flood-compatible uses. Retaining such uses is important not only to avoid flood damages but also to provide floodwater storage during large floods (Whatcom County 1997a). Whatcom County adopted floodplain regulations and entered the regular phase of the NFIP in 1977.

5.3.2.2 Proposed Mitigation Measures

<u>Administration</u>

In order to implement the Lummi Nation FDRP and to coordinate flood management activities with the Whatcom County Public Works Department (River and Flood Section), the Whatcom County Sheriff's Office, the Federal Emergency Management Agency, and the Corps of Engineers, the Lummi Nation recommends obtaining funding to provide for a 0.80 full-time equivalent (FTE) position. The Lummi Nation also recommends a

benefit-cost analysis of implementation of the Community Rating System to qualify residents for discounts on NFIP premiums; funding for the 0.80 FTE would allow for such an analysis and potential implementation of the CRS. This funding would also assist in the administration of the NFIP and enforcement of the FDPC, which includes the inspection of structures and issuance of certifications that structures are constructed above the base flood elevation (BFE).

Short-Term Flood Mitigation Action No. 1: Identify funding to support a 0.80 FTE Hazard Mitigation Specialist, who would be responsible for coordinating the Multi-Hazard Mitigation Team and implementation of hazard plans.

Coordinating Organization: Natural Resources and Planning Departments
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Implementation, Public Health and Safety, Improve Habitat

Short-Term Flood Mitigation Action No. 1 – 2007 Update: The LWRD Water Resources Analyst has been performing this role at approximately 0.3 FTE. The Analyst has obtained and managed grants for mitigation projects, coordinated project review and implementation with MHMT members, and coordinated the MHMT meetings. This function may be better served within a tribal office of emergency management under an emergency manager. The Analyst has also begun the process of joining the NFIP Community Rating System, at the recommendation of the FEMA Region X Floodplain Management Specialist by contacting the Insurance Services Office representative and requesting a support letter from FEMA Region X.

Protection of Existing Development in Flood-Prone Areas

Protection of new development from flooding is a necessary preventive solution to flooding, but this does not solve flooding and erosion problems for structures that have already been built in hazardous areas. These structures and properties receive protection from existing measures, including numerous levees and revetments and the Whatcom County flood warning and emergency response programs. However, the overall potential for flood damage remains high.

Mitigation alternatives for existing developments include the following:

(1) Raise or flood-proof structures;
(2) Relocate or buyout existing structures;
(3) Construct flood control structures to protect properties;
(4) Relocate manure lagoons; and
(5) Do nothing.

Existing structures will need to be addressed on a case-by-case basis. The best alternative for each case will vary depending on the specific factors involved. The alternative chosen should have a positive benefit-cost analysis and should meet the applicable goals, objectives, and policies described in this plan.

Short-Term Flood Mitigation Action No. 2: Identify funding to complete elevation certificates for pre-FIRM tribal residences and businesses located in the floodplain.

Coordinating Organization: Natural Resources and Planning Departments
Timeline: 2 years
Plan Goals Addressed: Reduce Vulnerability, Implementation, Public Health and Safety,

Short-Term Flood Mitigation Action No. 3: Identify funding to purchase flood insurance for LIBC buildings in or adjacent to the floodplain.

Coordinating Organization: Natural Resources and Planning Departments
Timeline: 2 years
Plan Goals Addressed: Reduce Vulnerability, Implementation, Public Health and Safety,

Long-Term Flood Mitigation Action No. 1: Develop capability to use HAZUS-Multi-Hazard (MH) software to estimate potential losses and benefit-cost analysis software to analyze possible mitigation options. Develop list of projects prioritized by benefit-cost ratio and their importance to the Lummi Nation and its resources.

Ideas for Implementation

- Use software to analyze a test case and assess usefulness of the methods.
- As conditions change, update the project list.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Implementation, Public Health and Safety, Improve Habitat

Long-Term Flood Mitigation Action No. 1 – Update: LWRD staff attended training on the FEMA benefit-cost analysis software in 2004 and used the software to run analyses for their 2005 application for two PDM-C projects. HAZUS-MH courses are offered through the Emergency Management Institute and this course and capability are still recommended.

Nooksack River

The Nooksack River regularly overtops the east and west bank levees below Ferndale during larger floods. Breaches of the levees along both sides have also occurred during most recorded large floods. The resulting floodwaters inundate farmlands, damage structures in the floodplain, threaten the Lummi Bay seawall, and cut off road access to the Lummi Peninsula and the Lummi Island ferry terminal. As described previously, the cost of damages and lost economic activity during such flooding is high.

Moving the west bank levees about 500 feet further from the river was a flood management alternative for the Nooksack River that was analyzed by Whatcom County using a computer model (Whatcom County 1997a). Such a large distance was chosen to evaluate whether using setback levees has merit for further consideration. The levee section considered was from just south of the Ferndale wastewater treatment plant to just south of Rayhorst Road and was evaluated at the current levee height. The model found that the average capacity increase along this river segment would be about 12,000 cfs. The improvement upstream was much less – only about 4,500 cfs at the treatment plant and about 3,000 cfs at the southern city limit of Ferndale. Thus the evaluated levee setback substantially increased river capacity along the setback

segment, but the upstream benefit was not considered significant (Whatcom County 1997a).

The Whatcom County CFHMP describes three options for flood hazard management using flood control along the Nooksack River below Ferndale:

1. Keep the alignment and protection level of the levees essentially the same as they are today and allow historical flooding patterns to continue;
2. Construct a 100-year levee from Ferndale to Lummi Shore Road, along or west of Ferndale Road, that provides a wider flow corridor to Bellingham Bay and limits overflows to Lummi Bay; or
3. Strengthen and raise the existing west bank levees to prevent overflows to Lummi Bay.

Under the first option, the problems of Haxton Way inundation and associated isolation of the Lummi Peninsula and Lummi Island, potential damage to the Lummi Bay seawall, and inundation of floodplain properties would remain. To minimize dangerous and costly levee breaches, improvements would be required to ensure levees are stable when overtopping occurs. This would involve selecting and designing the overflow locations.

The second option would require the compensation of property owners in the form of easements, buyouts, or relocation for some properties lying between the old levees and the new levee. About ten improved properties would be affected. The levee elevation required would be eight to nine feet higher than the existing elevations along Ferndale Road and ten to twelve feet higher than the ground elevations west of Ferndale Road. The estimated construction and total project costs are $2.1 million and $4.4 million for the Ferndale Road approach and $1.5 million and $3.1 million for the levee across agricultural land west of Ferndale Road (Whatcom County 1997a). If not already included, a bridge crossing the Lummi River channel should be a part of this project.

The third option would increase the flow through the east bank overflow corridor during large floods. Raising the existing west bank levees would have estimated construction and total project costs of $1.1 million and $2.3 million (Whatcom County 1997a).

The Whatcom County CFHMP recommends the second option. Under this option, existing agricultural levees along the west bank would remain overtoppable, but an overflow corridor would be in place to direct floodwaters to Bellingham Bay instead of Lummi Bay. Buyouts or flood-proofing would be required for properties in the overflow corridor. However, this option could avoid the cost of raising Haxton Way, reduce the probability of isolating the Lummi Peninsula and Lummi Island, and would not increase flood flow in the overflow corridor along the east bank (Whatcom County 1997a). The Lummi Nation FDRP adopted this option as a high priority mitigation action (LWRD 2001a).

To improve channel complexity, increase habitat quality and quantity for salmonids, and reconnect the river with the floodplain, the Lummi Nation supports moving the agricultural levees further from the river. This action would provide another increase in the flood capacity of the river channel and the flood storage of the floodplain.

The Whatcom County CFHMP recommendation to build a 100-year setback levee along Ferndale Road is in line with the priorities and policies of the Lummi Nation. This

recommendation is also consistent with the recommended flood mitigation actions of the Whatcom County Natural Hazards Mitigation Plan (Whatcom County 2004). Such a levee would create (according to the Whatcom County CFHMP) a regulatory floodway, which would require the buyout of at least ten improved properties in the floodway between the river and the new levee. Without the 100-year setback levee or in the event of a failure of such a levee, flood overflows would spread over the floodplain on the Reservation and would require elevation, relocation, or flood-proofing of the vulnerable existing structures in the floodplain. The Lummi Nation therefore recommends continued implementation of Title 15A FDPC regulations in the floodplain behind any future levee.

Although it would protect Haxton Way and Hillaire Road, failure of a 100-year levee along Ferndale Road could result in substantial damage to these roads, temporarily closing them. After floodwaters recede, closure of Haxton Way and Hillaire Road would leave Marine Drive (susceptible to further flooding) and the unimproved roadway along the Seapond Dike as the only road access to Lummi Peninsula until repair of Haxton Way or Hillaire Road occurred. Instead of only constructing a 100-year levee, the Lummi Nation recommends also raising Haxton Way to the level of the 100-year, future-conditions flood to provide access to the Lummi Peninsula during floods. Adequate flow capacity under the road would be required and the Lummi Bay seawall may have to be modified to allow for the rapid release of floodwaters in case the 100-year levee is breached.

Long-Term Flood Mitigation Action No. 2: Obtain funding for construction of 100-year levee along Ferndale Road.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County in pursuit of funding (Hazard Mitigation Grant Program, Flood Control Assistance Account Program).

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Partnerships and Implementation, Public Health and Safety

Slater Road

Slater Road is the primary transportation route from Interstate Highway 5 to the Reservation and the Silver Reef Casino, and is a primary transportation corridor to the industrial areas north of the Reservation (i.e., ConocoPhillips refinery, Alcoa-Intalco Works aluminum plant). It is inundated and closed on the east side of the Nooksack River even during small floods because it crosses the overflow corridor south of Tennant Lake. Large floods can close the road on both sides of the river for several days. The level of flood that closes Slater Road (approximately 27,000 cfs) closes Marine Drive as well, leaving the roads through or north of Ferndale as the only routes to the west side of the river.

Mitigation alternatives for Slater Road include the following:

1. Maintain the current elevation of the road, allowing periodic inundation;

2. Raise the roadway on the east bank and provide an 800-foot bridge to allow passage of floodwaters under the road; or
3. Raise the roadway to the 100-year level on both sides of the river and provide a bridge or causeway to allow passage of floodwaters on both sides of the river.

Since the Whatcom County CFHMP recommends maintaining the overflow corridor on the east side of the Nooksack River, the periodic closures of Slater Road and the resulting traffic congestion in Ferndale would continue under the first option. The second option, with an estimated total project cost of $4.6 million, would keep the road open through the overflow corridor, but, during large floods, the road would still be inundated on the west side of the river. Since the second option represents an incomplete solution, the Whatcom County CFHMP recommended the first option in the short term and reconsideration of the second option in the future as traffic demands change and if special financing becomes available (Whatcom County 1997a; 1999). The third option, adopted as a long-term priority in the Lummi Nation FDRP (LWRD 2001a), would preserve overflow corridors on both sides of the river, maintain direct access to important economic areas both on and off the Reservation, protect public health and safety, and reduce traffic congestion in Ferndale.

Long-Term Flood Mitigation Action No. 3: Obtain funding for raising Slater Road and providing for underflow.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County in pursuit of funding (Hazard Mitigation Grant Program, Flood Control Assistance Account Program). Also coordinate with industries at Cherry Point and the City of Ferndale.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety, Improve Habitat

Long-Term Flood Mitigation Action No. 3 - Update: In cooperation with Whatcom County, the Lummi Nation applied for and received a 2005 FEMA Pre-Disaster Mitigation-Competitive project grant for the elevation of Slater Road east of the Nooksack River bridge. This was determined to be the best alternative based on new traffic count information for Slater Road and Marine Drive, data on lost revenue for the casino during Slater Road closures, eligibility for the FEMA Pre-Disaster Mitigation-Competitive grants, and new information about the future plans for the left (east) bank levee. The Washington State Department of Fish and Wildlife owns the parcels adjacent to the left bank of the river north and south of Slater Road, and the associated portion of the levee, and does not intend to maintain the levee on these parcels. This project was determined to be eligible for a PDM-C project grant through a benefit-cost analysis with a ratio greater than 1.0. The project will elevate an approximately 1 mile long section of Slater Road 12 feet to 1 foot above the 100-year flood level including a 389 foot bridge span over Tennant Creek. Construction bids will be sought in November, 2007 and construction will begin in early 2008 and be completed by February 2009. Elevation of this frequently flooded section will allow continued access to the Reservation, the Cherry Point industries, and Lummi Island through a 100-year flood event.

Lummi River

The Lummi River currently receives flow from the Nooksack River only at relatively high flow levels (greater than approximately 10,000 cfs). Water passes to the Lummi River through a four-foot culvert in the levee that is reportedly collapsed. The normal flow capacity of this culvert is less than the flow capacity of the Lummi River; its poor condition presumably reduces the flow further.

Mitigation alternatives for the Lummi River include the following:

1. Maintain the current flow capacity of the Lummi River diversion culvert;
2. Increase the flow capacity of the culvert to match the capacity of the Lummi River channel; and
3. Enlarge the Lummi River channel and increase the diversion from the Nooksack River.

Since the modest increase of Lummi River channel capacity to 4,600 cfs (less than ten percent of the November 1990 flood flow) would cost up to about $15.8 million, it is not considered a cost-effective option (Whatcom County 1997a). The improvement recommended by the draft Lower Nooksack River Comprehensive Flood Hazard Management Plan (CFHMP) for the Lummi River is not to increase the river capacity, but instead to rehabilitate the existing culvert at the confluence with the Nooksack River, including a gate or similar flow control structure, and to modify downstream structures if necessary (Whatcom County 1997a).

Pursuant to LIBC Resolution 98-62, the Lummi Natural Resource Department has been evaluating the potential for a Nooksack Estuary Recovery Project (NERP). The NERP is a project to restore coastal wetlands and marshes on the Lummi Reservation, including the possible reconnection of the Lummi and Nooksack rivers (instead of the Lummi River only receiving Nooksack River water during high flows). In general, the NERP addresses hydromodification in the Lummi River and Nooksack River estuaries. If the historical flow is not restored to the Lummi River, increasing the flow capacity of the diversion culvert to match the capacity of the Lummi River channel may be a desirable action that would enhance the estuarine character of Lummi Bay. Additionally, the 2005 Lummi Nation Nooksack River Estuary Habitat Assessment (LNR 2005) recommends the replacement of the collapsed culverts to improve fish passage between the Lummi and Nooksack Rivers and improve floodplain function by establishing a more consistent flow regime. The poor water quality in the Nooksack River and the threat it represents to tribal shellfish beds in Lummi and Portage bays currently limits the feasibility of this option.

Consistent with the desire of the Lummi Nation to improve the quality of the Lummi River estuary (via the NERP) and the policy of reconnecting the river with the floodplain, this plan recommends increasing the flow in the Lummi River by repairing, maintaining, and possibly increasing the capacity of the culvert from the Nooksack River. Although contingent on improving the quality of Nooksack River water to protect tribal shellfish beds in Lummi Bay, such an action will reduce the downstream Nooksack River flood flow and reestablish a historic migration corridor for anadromous fish. If limited to the capacity of the Lummi River channel, the flow increase should not contribute to flooding in the floodplain. If flow is reestablished on a fairly regular (or even continuous) basis, it could improve habitat quality in the Lummi River and in the Lummi Bay estuary, but will

reduce instream flow in the Nooksack River downstream from the Lummi River distributary.

Long-Term Flood Mitigation Action No. 4: Obtain funding for construction and maintenance of a new culvert from the Nooksack River to the Lummi River.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County in pursuit of funding (Hazard Mitigation Grant Program, Flood Control Assistance Account Program).

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety, Improve Habitat

Lummi Bay Seawall

The Lummi Bay seawall is threatened by overflows and levee breaches along the west bank of the Nooksack River. In 1998 the six non-functioning tide gates on the south side of the Lummi River, mounted on 36-inch corrugated steel culverts, were replaced by five concrete box culverts, four-feet-wide by six-feet-tall, fitted with “flapper” gates made out of aluminum. These gates prevent saltwater from entering the delta and associated agricultural land during high tides. In addition, a fuse plug was added to the seawall on the south side of the Lummi River to provide for the release of impounded floodwater during a large flood. Three five-foot by five-foot box culverts drain the northern distributary channel of the Lummi River. Whether these two sets of culverts and the fuse plug will eliminate the hazard of a seawall breach during a large flood is not yet known. A 100-year levee along the west side of the river, as described in the previous section, would minimize this threat. If such a levee is not constructed, the following options would address a potential seawall breach:

1. Add more culverts with tide gates;
2. Construct additional, easily repairable fuse plugs in the seawall to accelerate floodwater drainage during severe flooding;
3. Remove all or part of the seawall for habitat restoration or mitigation banking purposes (LNR 2005); or
4. Maintain the seawall as it exists.

Because the 100-year setback levee that was adopted as a high priority in the Lummi Nation FDRP and was recommended in the Whatcom County CFHMP would minimize the threat to the seawall, none of the first three alternatives are recommended in the short term. Continued maintenance of the existing structure, culverts, and tide gates is recommended in anticipation of the construction of a 100-year levee.

Long-Term Flood Mitigation Action No. 5: Monitor condition of culverts, tide gates, and seawall and identify funding sources for potential maintenance or repairs.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County to address necessary pre- and post-disaster repairs.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety

Marine Drive

Marine Drive, which floods frequently and early in a flood, was raised after the 1990 floods to prevent inundation during small floods. However, raising the road had the effect of limiting floodwater passage and diverting more of the overflow toward Haxton Way. If existing levee protection is unchanged, lowering Marine Drive, or raising Marine Drive and providing for underflow, would allow more overflow to reach Bellingham Bay and thereby would reduce inundation of Haxton Way and pressure on the Lummi Bay seawall. The estimated total project cost for lowering Marine Drive is $113,000 (Whatcom County 1997a).

Mitigation alternatives for Marine Drive include the following:

1. Maintain the current elevation of Marine Drive;
2. Lower the road surface to allow more overflow; or
3. Raise the road surface and provide for flow under the road.

Maintaining the current elevation of Marine Drive would result in a continued pattern of frequent closures during minor floods (six flood events closed the road for at least 19 days from Fall 2001 through Summer 2002 and the road was closed twice in both 2003 and 2005 and four times each year in 2004 and 2006). Flooding and road closures from very small events will be reduced through the Smuggler's Slough Restoration project being planned by the Restoration Division of the Lummi Natural Resources Department. This project will include the installation of one or two larger culverts underneath Marine Drive with devices that will prevent beavers from damming the culverts. This project is expected to be implemented in 2008 and will possibly eliminate the need for Marine Drive closures during smaller flood events.

Lowering the road surface would result in more frequent closures of Marine Drive during the flooding season. The benefits of raising the road surface across the full width of the floodplain and providing underflow include reducing or eliminating road closures, maintaining the shortest route for emergency response vehicles to travel to the Lummi Peninsula and to the hospital in Bellingham, and possibly providing a significant habitat improvement value west of Kwina Slough. If Marine Drive is raised, the elevation of the road west of Kwina Slough should match the elevation of the 100-year setback levee proposed for along Ferndale Road. If road access to the Lummi Peninsula via Haxton Way is protected by a 100-year setback levee or by the raising of Haxton Way (a more heavily used road), or if 24-hour emergency response capabilities are established on the Lummi Peninsula, then keeping Marine Drive open during large floods becomes a lower priority.

The Whatcom County CFHMP recommends maintaining the Marine Drive approach to the bridge over the Nooksack River at the current elevation. This would allow continued overtopping and the resulting road closures during relatively minor floods. Lowering the roadway provides little benefit if the recommended 100-year setback levee along

Ferndale Road is constructed to control overflows to Lummi Bay or if Haxton Way is raised (Whatcom County 1999). The Lummi Nation favors raising Marine Drive and providing for flow under the road (LWRD 2001a).

Long-Term Flood Mitigation Action No. 6: Obtain funding for raising Marine Drive and providing for underflow.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County in pursuit of funding (Hazard Mitigation Grant Program, Flood Control Assistance Account Program).

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Long-Term Flood Mitigation Action No. 6 – Update: Flooding on Marine Drive from small events will be relieved through the Smuggler's Slough Restoration project being planned by the Restoration Division of the Lummi Natural Resources Department. This project will include the installation of one or two larger culverts underneath Marine Drive including devices that will prevent beavers from damming the culverts. This project is expected to be implemented in 2008 and will possibly eliminate the need for Marine Drive road closures during smaller flood events.

Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety, Improve Habitat

Haxton Way

Haxton Way, the primary route onto the Lummi Peninsula and to the ferry terminal and ferry that provide access to Lummi Island, is inundated by floodwaters that overflow or breach the west bank levees of the Nooksack River. Access to the peninsula and island can be cut off for days during a large flood.

Mitigation alternatives for Haxton Way include the following:

1. Maintain the current elevation of the road, allowing periodic inundation;
2. Raise 7,000 feet of the roadway, with bridges or culverts included in the project to allow passage of floodwaters under the road and improve salmon habitat;
3. Protect the road with a 100-year setback levee along Ferndale Road.

The periodic inundation of Haxton Way and the resulting isolation of the Lummi Peninsula and Lummi Island are a threat to public health and safety, especially in the case of a medical emergency. The loss of road access to the area also has a substantial economic cost, both from a reduction of business and from employees unable to get to work. These reasons, combined with effects in other areas of the west bank floodplain, make the first option (maintaining existing elevation) undesirable.

The project described in the second option (making the roadway a causeway) has an estimated construction cost of $1.8 million and total project cost of $3.8 million (Whatcom County 1997a, 1999). While this project would solve the access problem, other floodplain problems would remain, including extended inundation of agricultural lands and a threat to the Lummi Bay seawall. A comprehensive solution to these problems is preferable.

The Whatcom County CFHMP recommends the third option, which would protect Haxton Way, the seawall, and much of the floodplain with a 100-year levee at a cost that is comparable to the cost of raising Haxton Way. However, the Whatcom County CFHMP also recommends that until this option is accepted and implemented, it may be appropriate to raise the lowest sections of Haxton Way to prevent periodic inundation in the interim period (Whatcom County 1999). The Lummi Nation FDRP adopted the second option as a short- and long-term priority, protecting the road both before a 100-year levee is built and in the case of a future 100-year levee failure (LWRD 2001a).

Long-Term Flood Mitigation Action No. 7: Obtain funding for raising Haxton Way and providing for underflow.

Ideas for Implementation

- Coordinate with FEMA and Whatcom County in pursuit of funding (Hazard Mitigation Grant Program, Flood Control Assistance Account Program).

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety, Improve Habitat

Summary of Road Recommendations

In its adopted FDRP (LWRD 2001a), the Lummi Nation recommends raising Ferndale Road by constructing a 100-year setback levee that extends along Ferndale Road from Ferndale to Kwina Slough, then along the north side of Kwina Slough to Marine Drive, and finally along Marine Drive to Lummi Shore Road. The levee should include a bridge over the Lummi River channel where Ferndale Road crosses the river and culverts allowing flow under Marine Drive. This levee will prevent the inundation of the Nooksack River floodplain on the Reservation and thereby protect Haxton Way, which in turn will maintain road access to the Lummi Peninsula during large floods. The Lummi Nation also recommends and is in the process of raising Slater Road to the 100-year flood level east of the Nooksack River and using bridges to allow floodwaters to pass downstream, underneath the roadway. This action will keep an important transportation corridor open during floods and will thereby minimize the economic impact of flooding. Finally, the Lummi Nation supports raising Haxton Way to the 100-year flood level and providing for the flow of floodwaters under Haxton Way. This action will provide access to the Lummi Peninsula and Lummi Island in case of a breach of the 100-year setback levee along Ferndale Road and Marine Drive.

Development and Land Use in Flood-Prone Areas

As described in Section 3.1.3, the Lummi Planning Department is developing a Comprehensive Plan for the Lummi Reservation. This plan will modify the existing zoning map and identify areas that will be developed for residential, commercial, industrial, and agricultural purposes, as well as showing areas that require protection (e.g., Special Flood Hazard Areas [SFHA], wetlands, and aquifer recharge zones). The Comprehensive Plan; the Land Use, Development, and Zoning Code; the Flood Damage Prevention Code (Title 15A); the Coastal Zone Management Plan; and the Water

Resources Protection Code will reduce flood damage by ensuring that land use is compatible with the landscape, that infrastructure is developed in a coordinated fashion, and that development in SFHAs is minimized and flood-protected. In addition to continuing to administer all other existing regulations that protect development from flooding, the Lummi Nation should continue to pursue joining the Community Rating System (CRS). Implementing the CRS will provide a reduction in flood insurance premiums to Reservation residents who are insured through the Lummi Nation's participation in the NFIP.

One solution to the potential problem of increased future flood levels is to require higher elevation of the first floor of new structures within the floodplain. A safer standard is to require that all new structures be elevated or flood-protected to an elevation of three feet above the FIRM base flood level within the 100-year floodplain and to an elevation of one foot above the flood elevation within the designated 500-year floodplain (not yet determined for the Reservation).

Mitigation alternatives for development and land use include the following:

1. Retain the current standards in Title 15A of the Lummi Nation Code of Laws;
2. Increase the standards in Title 15A;
3. Prohibit new development in high hazard areas and restrict development in other flood-prone areas to flood-compatible land uses unless there is no practicable alternative;
4. Build a 100-year setback levee with three feet of freeboard along Ferndale Road; or
5. Combination of the above.

An analysis of future-condition flood levels and of the benefit-cost ratio of increasing development standards would be necessary in order to choose the best alternative listed above.

Long-Term Flood Mitigation Action No. 8: After modeling of Nooksack River flooding is completed by Whatcom County, analyze flood levels under future conditions of land use and assess the benefits of more protective development standards.

Ideas for Implementation

- Coordinate with Whatcom County to review models of Nooksack River flooding and to analyze the benefit-cost ratios of various development standards.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Develop Partnerships, Implementation, Public Health and Safety

Low-Lying Coastal Areas

In coastal areas subject to hazardous velocity flows, the Lummi Nation recommends the enforcement of the restrictions in the Title 15A FDPC for new development and a program of buyout or relocation of vulnerable existing structures. Restrictions on new structures will keep the problem from getting worse and an acquisition program for existing structures (probably implemented in response to damaging future floods) will

avoid perpetuating the problem (LWRD 2001a). Any acquisition effort should prioritize on-Reservation Repetitive Loss properties identified through the NFIP.

In areas subject to flooding but not velocity hazards, the Lummi Nation recommends elevation or flood-proofing of new and existing development as described in Title 15A. These coastal floodplain areas are shown in Figure 5.1. The assessment of potential mitigation projects for existing development in coastal areas of the Reservation is addressed by Long-Term Flood Mitigation Action No. 1.

The Lummi Nation applied for and received a 2005 Pre-Disaster Mitigation-Competitive grant for the acquisition and removal of five residential structures from the V or coastal A zones on the Sandy Point Peninsula. The properties were identified using the Lummi Nation GIS and the digital FIRM to identify parcels within the V-zone and were determined to be eligible through Benefit Cost Analyses and completion of Elevation Certificates. The five properties included were partly selected based on the homeowner's interest in the project and none of owners of the four Repetitive Loss properties responded to the letter seeking interest. This project was intended to serve as a pilot acquisition project to determine the feasibility of future coastal acquisitions. Based on the success of this project, the Lummi Nation will pursue additional acquisitions projects for the mitigation of coastal flooding in the future. The cumulative effect of removing these structures will be to reduce the costs to life and property of coastal flooding.

Long-Term Flood Mitigation Action No. 9: Enforce the provisions of Title 15A for new development in the coastal floodplain and continue to pursue acquisitions of existing vulnerable structures.

Ideas for Implementation

- Obtain funding for acquisition and removal or relocation.
- Prioritize the acquisition of Repetitive Loss properties.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Reduce Vulnerability, Implementation, Public Health and Safety

5.3.3 Earthquakes

Earthquake damage occurs because structures are built that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (e.g., highways and utility lines) suffer damage in earthquakes. Damage can be very severe if structures are not designed to withstand shaking, are on ground that amplifies shaking, or ground that liquefies because of shaking. Unreinforced masonry buildings are known to be the most susceptible to damage.

While it is possible to design structures to withstand earthquakes, it can be prohibitively expensive to design for significant events. Most new buildings are currently designed with sufficient integrity for the occupants to safely survive the event and evacuate, but not necessarily to protect the building from damage. Thus, the main advantage of improved seismic design requirements is that they can protect lives as well as maintain the functionality of the structure in lesser magnitude events. Buildings that were not built to an adequate seismic standard can often be retrofitted and strengthened to help

withstand earthquakes and provide personal safety. Further, developing knowledge of seismic hazards in specific areas before beginning development can potentially reduce or prevent property destruction and loss of lives.

Since the Reservation faces an infrequent but significant earthquake hazard, identifying seismic-prone locations, adopting strong policies, implementing damage reduction measures, and utilizing other mitigation techniques are essential to reducing risk from seismic hazards on the Reservation. This section describes current and proposed mitigation actions on the Reservation.

5.3.3.1 Current Mitigation Actions

The LIBC originally adopted a Building Code, Title 22 of the Lummi Nation Code of Laws, on January 5, 1968; an amended code was adopted in January 2004. The original Building Code adopted the Uniform Building Code (UBC) of the International Conference of Building Officials (1975) by reference to govern construction within all areas of the Reservation. Thus when the Uniform Building Code is updated, the changes take effect immediately on the Reservation. The UBC includes earthquake standards that are scaled to the earthquake hazard of an area; the Lummi Reservation is in Seismic Zone 3 (Southern California is in the highest zone, Zone 4). In the near future, the Lummi Nation plans to adopt the International Building Code, which applies seismic design standards based on peak ground acceleration (PGA) values instead of seismic zones.

For construction of the Silver Reef Casino in the Floodplain area during 2001 and the later expansions, several actions were taken to mitigate the earthquake hazard posed by liquefaction. Soil borings and cone penetration tests (from 58 to 71 feet below the ground surface) were conducted to determine the potential for liquefaction. The high ground water table and loose sand and soft silt or clay layers that were found indicated that there was a high risk for liquefaction. This is confirmed by the liquefaction susceptibility maps produced by the Washington Department of Natural Resources which show a high susceptibility for the floodplain area (Palmer et al. 2004). Based on the results of these tests, GeoEngineers estimated that if there were no site improvements and a conventional foundation (i.e., shallow footings) were used, 4 to 6 inches of total settlement and 2 to 4.5 inches of differential settlement (the primary concern) could occur and lateral displacement was likely. To reduce the settlement potential, approximately 3-foot diameter columns of gravel and cobbles were placed to a depth of 20 feet below ground surface into the soils at regular intervals to strengthen the surrounding soil. Using this technique, less than 2 inches of total settlement and 0.5 to 1.5 inches of differential settlement could occur and lateral displacement is unlikely. Expected performance during the design earthquake is minor damage (LIBC 2001).

The Lummi Nation received a computer system and software in 2006 from the Washington State Division of Emergency Management and the University of Washington's Pacific Northwest Seismic Network to connect to and run the California Integrated Seismic Network (CISN) Display system. CISN Display will allow Lummi Nation emergency responders to view information about an earthquake after the event to determine its severity and prioritize response efforts.

5.3.3.2 Proposed Mitigation Measures

Long-Term Earthquake Mitigation Action No. 1: Encourage seismic strength evaluations of critical facilities on the Reservation to identify vulnerabilities for mitigation of schools, public infrastructure, and critical facilities to meet current seismic standards.

Ideas for Implementation.

- Develop an inventory of critical facilities that do not meet current seismic standards;
- Encourage owners of non-retrofitted reservoirs or water tanks to upgrade them to meet seismic standards; and
- Encourage all water providers to replace all old cast iron pipes with ductile iron, and identify partnership opportunities with other agencies for pipe replacement.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: 5 years
Plan Goals Addressed: Protect Life and Property, Emergency Services, Public Health and Safety

Long-Term Earthquake Mitigation Action No. 2: Identify funding sources for structural and nonstructural retrofitting of structures that are identified as seismically vulnerable.

Ideas for Implementation

- Provide information to property owners, small businesses, and organizations regarding sources of funds (e.g., loans, grants); and
- Explore options for including seismic retrofitting in existing programs such as low-income housing, insurance reimbursements, and pre- and post-disaster repairs.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Partnerships and Implementation, Public Awareness, Public Health and Safety

Long-Term Earthquake Mitigation Action No. 3: Encourage purchase of earthquake hazard insurance.

Ideas for Implementation

- Provide earthquake insurance information to Reservation residents; and
- Coordinate with insurance companies and organizations to produce and distribute earthquake insurance information.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness

Long-Term Earthquake Mitigation Action No. 4: Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.

Ideas for Implementation

- Provide information to government building and school facility managers and teachers on securing bookcases, filing cabinets, light fixtures, and other objects that can cause injuries and block exits;
- Encourage facility managers, business owners, and teachers to refer to FEMA's practical guidebook: *Reducing the Risks of Nonstructural Earthquake Damag*e;
- Encourage homeowners and renters to use *Is Your Home Protected from Earthquake Disaster? A Homeowner's Guide to Earthquake Retrofit* (IBHS) for economic and efficient mitigation techniques;
- Explore partnerships to provide retrofitting classes for homeowners, renters, building professionals, and contractors; and
- Target development located in potential fault zones or in unstable soils for intensive education and retrofitting resources.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness, Public Health and Safety

5.3.4 Severe Winter Storms

5.3.4.1 Current Mitigation Actions

- Early warning of storms is provided by the National Weather Service, Whatcom County DEM, radio, or television.
- Tribal offices and schools commonly close when roads are hazardous.
- During recent winter storms, the construction division of the Lummi Planning Department has coordinated road clearing with local contractors and with Whatcom County (Kamkoff 2003).
- Vulnerable citizens typically receive assistance from family members, friends, neighbors or the Lummi Nation Police Department.

5.3.4.2 Proposed Mitigation Measures

Mitigation actions should focus on providing public information on emergency preparedness and self-help, warning and notification of the public, prioritization of roads and streets to be cleared, provision of emergency services, mutual aid with other public entities, and procedures for requesting state and federal assistance if needed.

<u>Short-Term Severe Winter Storm Mitigation Action No. 1</u>: Enhance strategies for debris management for severe winter storm events.

Ideas for Implementation
- Develop coordinated management strategies for de-icing roads, plowing snow, ensuring utility service, clearing roads of fallen trees, and clearing debris from public and private property.

Coordinating Organization: Planning Department, Police Department
Timeline: 2 years
Plan Goals Addressed: Partnerships and Implementation, Emergency Services, Public Health and Safety

Short-Term Severe Winter Storm Mitigation Action No. 2: Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public and private infrastructure from severe winter storms.

Ideas for Implementation

- Partner with responsible agencies and organizations to design and implement programs that reduce risk to life, property, and utility systems; and
- Develop partnerships between utility providers and local public works agencies to document known hazard areas and implement actions to ensure timely response.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: 2 years
Plan Goals Addressed: Emergency Services, Partnerships, and Implementation

Long-Term Severe Winter Storm Mitigation Action No. 1: Increase public awareness of severe winter storm mitigation measures.

Ideas for Implementation

- Collect, develop, and distribute public education materials for protecting life, property, and the environment from severe winter storm events;
- Distribute educational materials to Reservation residents and public and private sector organizations regarding evacuation routes during road closures; and
- Target the vulnerable populace for disseminating preparedness information.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property

5.3.5 Windstorms and Tornadoes

5.3.5.1 Current Mitigation Actions

- The Uniform Building Code adopted by reference in the Lummi Nation Title 22 Building Code sets a wind design standard of 80 mph.
- The LNR Forestry Manager handles hazard tree removal through the Lummi Nation land use permitting process and works to expedite hazard tree removal permits. The Forestry Manager has developed a Memorandum of Understanding between the Lummi Nation and the BIA which waives the BIA timber cutting permit for small clearings such as hazard tree removal.
- Provisions in the Flood Damage Reduction Code will reduce impacts due to the wind-driven waves that cause coastal flooding.
- Underground power lines were installed for two well sites and for the community center and new Tribal K-12 school.

5.3.5.2 Proposed Mitigation Actions

The primary ways to reduce direct damage from high winds is to build wind-resistant structures and to keep debris, particularly trees, from falling onto structures. The Lummi Nation already has a building code with a wind speed standard, and works both through the land use permitting process and with local utility providers to reduce the hazard presented by falling trees. High winds are also responsible for damage through coastal

flooding. Therefore the proposed mitigation actions listed above for coastal flooding should also be considered as mitigation actions for windstorms.

Short-Term Windstorm Mitigation Action No. 1: Continue to develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.

Ideas for Implementation

- Collect, design, and disseminate useful education information to property owners to reduce risk from falling trees to life, property, and utility systems;
- Develop partnerships with utility providers to document known hazard areas and implement actions to ensure timely response; and
- Identify potentially hazardous trees and either remove or prune to reduce the hazard.

Coordinating Organization: Lummi Planning Department, Lummi Natural Resources Department
Timeline: 2 years
Plan Goals Addressed: Emergency Services, Partnerships, Implementation, Public Health and Safety

Short-Term Windstorm Mitigation Action No. 2: Enhance strategies for debris management after windstorm events.

Ideas for Implementation

- Develop coordinated management strategies for clearing roads of fallen trees, and clearing debris from public and private property.

Coordinating Organization: Lummi Planning Department
Timeline: 2 years
Plan Goals Addressed: Emergency Services, Partnerships, and Implementation

Long-Term Windstorm Mitigation Action No. 1: Support/encourage electrical utilities to use underground construction methods where possible to reduce power hazards and outages from windstorms.

Ideas for Implementation

- Increase the use of underground utilities where possible.
- Develop local utility to ensure timely response and repair.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: 5 years
Plan Goals Addressed: Natural Systems, Partnerships, and Implementation

Long-Term Windstorm Mitigation Action No. 2: Increase public awareness of windstorm mitigation activities.

Ideas for Implementation

- Provide public education materials for protecting life, property, and the environment from windstorm events; and
- Distribute educational materials to Reservation residents and public and private sector organizations regarding preparedness for loss of power.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: Ongoing
Plan Goals Addressed: Public Awareness, Protect Life and Property

5.3.6 Coastal Erosion

Coastal erosion has historically been addressed most often through structural means, which have sometimes exacerbated the problem by increasing erosion in front of or adjacent to the structure, such as can be seen along the Sandy Point Peninsula.

5.3.6.1 Current Mitigation Actions

- The Lummi Shore Road project, with its associated beach nourishment effort, stabilized the shoreline bluffs along Bellingham Bay.
- On-going monitoring will allow future problems to be anticipated.
- Review of land use permit applications by the Lummi Technical Review Committee provides an opportunity to direct new development away from vulnerable areas.
- In 2006, a section of Lummi View Drive near the tombolo to Portage Island was moved inland and away from the shoreline.
- In 2006, one structure was purchased and removed from the west side of the Sandy Point Peninsula through a FEMA PDM-C project grant, the Sandy Point Coastal Acquisition Project.

5.3.6.2 Proposed Mitigation Actions

The following mitigation measures are proposed to reduce coastal erosion damages along the shorelines of the Reservation. Mitigation actions for coastal flooding and for landslides also apply to coastal erosion.

<u>Long-Term Coastal Erosion Mitigation Action No. 1</u>: Continue monitoring of erosion rates along the Reservation shorelines.

Ideas for Implementation
- Complete evaluation of all Reservation shorelines and monitor eroding reaches to gain understanding of the processes generating the erosion.

Coordinating Organization: Lummi Water Resources Division, Lummi Planning Department
Timeline: Ongoing
Plan Goals Addressed: Protect Life, Property, and Natural Resources; Public Awareness

<u>Long-Term Coastal Erosion Mitigation Action No. 2</u>: Redirect and/or relocate development away from eroding shorelines.

Ideas for Implementation
- Regulate construction near the shoreline under the existing Land Use, Development, and Zoning Code, CZMP, and Flood Damage Prevention Code.
- Use the opportunity of disaster funding to relocate structures away from the shoreline.

- Continue pre-disaster property acquisition and removal of structures.

Coordinating Organization: Lummi Planning Department, Lummi Natural Resources Department
Timeline: Ongoing
Plan Goals Addressed: Protect Life, Property, and Natural Resources; Public Awareness

5.3.7 Drought

In general, drought effects on domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used.

5.3.7.1 Current Mitigation Actions

Proper management of water resources can reduce the damages that may otherwise result from a drought. Drought information collection assists in the response to a drought and in the formulation of programs for future droughts. Drought forecasting information and mitigation strategies used in Washington State that may influence the effects of a drought on the Reservation include (WEMD 2001):

- Irrigation before a forecasted drought
- Advance warning of changes in stream flows
- Measurement of snow pack conditions
- Limit irrigation and sprinkling
- Study of ground water supplies
- Shut down of logging operators
- Water conservation measures
- Reduce hydroelectric power use
- Voluntary energy conservation programs
- Purchase of out-of-region energy
- Apply for federal drought relief programs
- State drought legislation
- Consider emergency supplemental ground water permits

The Lummi Water Resources Division has an on-going ground water monitoring program that tracks water levels in Reservation aquifers. This effort is improving the understanding of water resources on the Reservation and will help manage potential water shortages in the future. In addition, the LWRD is currently developing a Lummi Nation Water Conservation Plan that will include actions applicable to reducing drought effects. The Lummi Nation participated in the development and adoption of the Water Resources Inventory Area 1 (WRIA 1) Watershed Management Plan and the Instream Flow Action Plan.

5.3.7.2 Proposed Mitigation Actions

Long-Term Drought Mitigation Action No. 1: Implement the mitigation actions recommended in the Lummi Nation Water Conservation Plan, both before and after drought conditions occur.

Coordinating Organization: Lummi Water District, Lummi Water Resources Division
Timeline: Ongoing
Plan Goals Addressed: Protect Economic Interests, Environmental Quality

Long-Term Drought Mitigation Action No. 2: Protect the senior water rights of the Lummi Nation in the Nooksack River watershed.

Coordinating Organization: LIBC, Lummi Natural Resources Department
Timeline: Ongoing
Plan Goals Addressed: Protect Economic Interests, Environmental Quality

5.3.8 Wildfire

Building in or near woodlands increases the potential loss from wildfires. Structures are often built with minimal awareness of the need for protection from wildfires. Public education about reducing hazards from wildfires and planning escape routes is necessary. Early-warning systems are essential to save lives. There are a number of ways to reduce wildland fires and minimize injury and property loss. Potential mitigation activities include (WEMD 2001):

- Develop ordinances and educate people regarding wildfire risks and mitigation measures;
- Develop fire detection programs and emergency communications systems;
- Exercise warning systems and evacuation plans;
- Road closures during fires;
- Woodland property owner precautions:
  - Maintain appropriate defensible space around homes
  - Provide access routes and turnarounds for emergency equipment
  - Minimize fuel hazards adjacent to homes
  - Use fire-resistant roofing materials
  - Maintain water supplies
  - Ensure that home address is visible to first responders

5.3.8.1 Current Mitigation Actions

Since the probability of a damaging wildfire on the Reservation is relatively low, the few current mitigation actions for wildfire are:

- The LNR Forestry Manager implements a ban on open burning when conditions are appropriately dry.
- Fire hydrants, sufficient water storage, and water pressure are maintained in developed areas, although some isolated homes are too far from hydrants for them to be used.
- There are three fire stations on the Reservation, one each in the main forested areas of the Reservation.

- In 2006, three staff from the Forestry Division and Timber, Fish, and Wildlife Division completed the National Wildfire Coordinating Group's Firefighter Type 2 training. This training certifies these staff members to respond to wildfires on the Reservation according to national standards.
- In 2006, the Forestry Division purchased a gas powered pump, fireline hose, four backpack water pumps, fireline hand tools, and personal protective equipment (Dewees 2007).
- The Forestry Division is working on updates to the tribe's Forest Management Plan, issues burning permits, and distributes a wildfire brochure for public education.

5.3.8.2 Proposed Mitigation Actions

Short-Term Wildfire Mitigation Action No. 1: Educate LIBC personnel on federal cost-share and grant programs, Fire Protection Agreements, and other related federal programs so the full array of assistance available is understood.

Ideas for Implementation:
- Investigate potential funding opportunities for individual mitigation projects;
- Develop, approve, and promote Fire Protection Agreements and partnerships to clarify roles and responsibilities and to provide for fire mitigation activities and suppression preparedness; and
- Ensure adequate water storage to meet increasing demands for water.

Coordinating Organization: LIBC Funding Department, Multi-Hazard Mitigation Team, Lummi Water District
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness

Short-Term Wildfire Mitigation Action No. 2: Inventory alternative firefighting water sources and encourage the development of additional sources.

Ideas for Implementation:
- Advocate for water storage facilities with fire-resistant electrical pump systems in developments outside of fire protection districts that are not connected to a community water or hydrant system; and
- Develop a protocol for fire jurisdictions and water districts to communicate all hydrant outages and water shortage information.

Coordinating Organization: Multi-Hazard Mitigation Team, Lummi Water District, Lummi Planning Department
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property

Long-Term Wildfire Mitigation Action No. 1: Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property, and businesses to wildfire.

Ideas for Implementation:
- Visit urban interface neighborhoods and rural areas and conduct education and outreach activities;

- Conduct specific community-based demonstration projects of fire prevention and mitigation in the urban interface;
- Establish neighborhood "drive-through" activities that pinpoint site-specific mitigation activities. Fire crews can give property owners personal suggestions and assistance; and
- Perform public outreach and information activities at Reservation fire stations by creating "Wildfire Awareness Week" activities. Fire stations can hold open houses and allow the public to visit, see the equipment, and discuss wildfire mitigation with the station crews.

Coordinating Organization: Multi-Hazard Mitigation Team, Individual Fire Departments
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness

Long-Term Wildfire Mitigation Action No. 2: Continue to increase communication, coordination, and collaboration between wildland/urban interface property owners, tribal planners, and fire prevention crews and officials to address risks, existing mitigation measures, and federal assistance programs.

Ideas for Implementation:
- Encourage single-family residences to have fire plans and practice evacuation routes;
- Encourage fire inspections in residential homes by fire departments to increase awareness among homeowners and potential fire responders;
- Require fire department notification of new business applications to ensure that appropriate fire plans have been developed;
- Work closely with landowners and/or developers who choose to build in the wildland/urban interface to identify and mitigate conditions that aggravate wildland/urban interface wildfire hazards, including:
  - Ensure the width and grade of roadways is adequate to provide access for emergency equipment;
  - Ensure adequate water supplies;
  - Ensure adequate fuel breaks and a defensible space through the spacing, consistency, and species of vegetation around structures;
  - Avoid highly flammable construction materials;
  - Ensure building lots and subdivisions are in compliance with tribal land use/fire protection regulations; and
  - Ensure adequate entry/escape routes.
- Encourage all new homes and major remodels involving roofs or additions that are located in the interface to have fire-resistant roofs and residential sprinkler systems.

Coordinating Organization: Multi-Hazard Mitigation Team, Individual Fire Departments
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness, Emergency Services, Partnerships, and Implementation

Long-Term Wildfire Mitigation Action No. 3: Encourage implementation of wildfire mitigation activities in a manner consistent with the goals of promoting sustainable ecological management and community stability.

Ideas for Implementation:

- Employ mechanical thinning and prescribed burning to abate the risk of catastrophic fire and restore the more natural regime of higher frequency, low-intensity burns. Prescribed burning can provide benefit to ecosystems by thinning hazardous vegetation and restoring ecological diversity to areas homogenized by invasive plants; and
- Clear trimmings, trees, brush, and other debris completely from sites when performing routine maintenance and landscaping to reduce fire risk.

Coordinating Organization: Multi-Hazard Mitigation Team, LNR Forestry Manager, Individual Fire Departments
Timeline: Ongoing
Plan Goals Addressed: Natural Systems

5.3.9 Landslide

Landslide problems are often compounded by poor land use management practices. Applying established ordinances where geological hazards have been identified will prevent some landslide losses. However, the Reservation already has several areas of established homes that are above or below unstable slopes. Careful maintenance of vegetation on slopes, prevention of erosion, engineered drainage of slopes, and other mitigation using qualified expertise is necessary to protect these areas.

5.3.9.1 Current Mitigation Actions

- Monitoring of coastal erosion to provide information on shoreline areas susceptible to future landslides.
- Review of land use permit applications by the TRC provides an opportunity to reduce erosion and loading of slopes by improper drainage.
- Use of high-resolution digital elevation models (LIDAR) to refine mapping of landslide hazard areas.

5.3.9.2 Proposed Mitigation Actions

Short-Term Landslide Mitigation Action No. 1: Continue to improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in landslide-prone areas.

Ideas for Implementation

- Develop public information to emphasize economic risk when building on potential or historical landslide areas.

Coordinating Organization: Multi-Hazard Mitigation Team, Lummi Natural Resources Department, Lummi Planning Department, Technical Review Committee
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness

Short-Term Landslide Mitigation Action No. 2: Encourage construction and subdivision design that can be applied to sloped areas to reduce development effects on landslide vulnerability.

Ideas for Implementation

- Increase communication and coordination between the Lummi Planning Department divisions and developers.

Coordinating Organization: Lummi Technical Review Committee
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Partnerships, and Implementation

Long-Term Landslide Mitigation Action No. 1: Limit construction in identified potential and historical landslide areas through regulation and public outreach.

Ideas for Implementation

- Analyze existing regulations regarding development in landslide-prone areas;
- Continue to use land use permitting process to review proposed projects in potential landslide areas;
- Conduct public outreach through appropriate channels (e.g., neighborhood associations, Squol Quol).

Coordinating Organization: Multi-Hazard Mitigation Team, Technical Review Committee
Timeline: Ongoing
Plan Goals Addressed: Protect Life and Property, Public Awareness, Natural Systems

5.3.10 Tsunami

The tsunami hazard on the Reservation is similar in nature but potentially much larger in scale than the hazard associated with coastal flooding. Hence, the mitigation actions listed for coastal flooding also apply to the tsunami hazard. Structural losses and the threat to public health and safety can be reduced by discouraging further development in the primary hazard zones and by relocating existing homes. However, relocation may be difficult to implement since many owners may be reluctant to move. A public education effort is therefore very important to reduce the public health and safety hazard.

5.3.10.1 Current Mitigation Actions

- Adoption and implementation of the Flood Damage Prevention Code.
- Recent improvement of the Lummi Bay seawall.
- Development of this Multi-Hazard Mitigation Plan.
- Installation of three All-Hazard Alert Broadcast tsunami warning systems on the Reservation:
    - The purchase of one system for the Sandy Point Peninsula by Washington State and ConocoPhillips was coordinated by Whatcom County
    - Two additional systems were purchased by the Lummi Nation through an Emergency Management Preparedness Assistance Grant from Washington State and will be installed by June 2007.
- Development of tsunami evacuation route maps and brochures with Washington State (Appendix F).
- In 2006, one structure was purchased and removed from the west side of the Sandy Point Peninsula through a FEMA PDM-C project grant, the Sandy Point Coastal Acquisition Project. This structure was in the area modeled to have a 0.5 to 2.0

meter inundation from a tsunami generated by a Cascadia Subduction Zone earthquake.

5.3.10.2 Proposed Mitigation Actions

Short-Term Tsunami Mitigation Action No. 1: Complete the installation of tsunami warning systems and evacuation route signs in hazard areas. The signs will be purchased and installed after installation of the purchased AHABs and receipt and distribution of the evacuation route map brochures from Washington State.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: 1-2 years
Plan Goals Addressed: Protect Life and Property, Public Awareness

Short-Term Tsunami Mitigation Action No. 2: Provide residents in the hazard area with updated information on the tsunami hazard, including the probability of occurrence, potential size of the hazard, signs of an impending tsunami, and best route to avoid a tsunami. After installation of the AHABs and distribution of the brochures, this action should be continued through additional mailings and public meetings.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: 1-2 years
Plan Goals Addressed: Protect Life and Property, Public Awareness

Long-Term Tsunami Mitigation Action No. 1: Use the availability of Pre-Disaster Mitigation funding to continue acquisition and relocation of vulnerable homes.

Ideas for Implementation

- Prepare a relocation/buyout plan to be ready for opportunity of future HMGP funds.

Coordinating Organization: Multi-Hazard Mitigation Team
Timeline: On-going
Plan Goals Addressed: Protect Life and Property, Reduce Future Vulnerability

5.3.11 Volcano

Preparedness and land use planning are important for mitigation of volcanic hazards. Reducing population growth in paths of lahars, implementing warning systems, and planning evacuations can lower the potential loss of life and property during future eruptions.

5.3.11.1 Current Mitigation Actions

Federal, state, and local governments have joined to develop a volcanic hazard plan that addresses issues of emergency response and strategies for mitigation and expanded public awareness. The Mount Baker-Glacier Peak Coordination Plan is designed to coordinate efforts between governmental agencies if volcanic activity occurs at Mount Baker or Glacier Peak, Washington (Mount Baker/Glacier Peak Facilitating Committee, undated). Lummi Nation Water Resources Division staff attended the 2006 Pierce County Disaster Planning and Response for Key Lifeline Infrastructure Systems workshop where the possibility of reassembling the plan team and updating this plan

was discussed with Snohomish County staff and USGS scientists. Mitigation actions in the current plan include:

- Continuous monitoring of the areas around Mount Baker by the Pacific Northwest Seismograph Network, which is jointly operated by the University of Washington and the USGS. The first indications of volcanic unrest at Mount Baker will likely be an increase in earthquake activity, and it will likely take days to weeks to decide whether the increase is the result of magma movement towards the surface or not.

- In response to developing volcanic activity, a USGS response team expects to:

  - Establish a temporary volcano observatory at or near an Emergency Operations Center in Whatcom or Skagit County. The observatory will maintain close contact with emergency managers and will be sited to allow efficient daily helicopter access to the volcano. The primary function of the USGS response team is to monitor all volcanic developments and provide eruption forecasts and hazard assessment information to support decisions by public officials.

  - Install monitoring instruments to collect and analyze visual, seismic, lahar detection, deformation, and gas emission data. As an important element of redundancy, critical seismic data will be received and analyzed both at the University of Washington and the local temporary volcano observatory.

- Among other activities listed in the plan, the Whatcom County Division of Emergency Management would implement an Emergency Operation Plan and activate and maintain an Emergency Operations Center.

5.3.11.2 Proposed Mitigation Actions

For a variety of reasons, hazardous magmatic eruptions at Mount Baker will probably be preceded by weeks or more of activity. In addition, the most significant volcanic hazard that may affect the Reservation, a lahar, would take on the scale of hours to reach the Reservation. Residents on the Nooksack River floodplain would therefore have sufficient time to avoid a potential lahar. Since the effects of a lahar, by the time it reached the Reservation, would be similar to that of a Nooksack River flood, the proposed mitigation actions for volcanic lahars that threaten the Reservation are the same as described for Nooksack River flooding in Section 5.3.2.

Table 5.1 Summary of Recommended Mitigation Actions and Priorities by Hazard

Hazard	Action	Activity	Progress
All-Hazard	ST-1	Establish the formal goal of becoming a disaster-resistant Indian nation, including objectives or benchmarks for preparedness.	
	ST-2	Maintain the established Multi-Hazard Mitigation Team comprised of representatives from pertinent LIBC departments and other organizations on the Reservation.	Priority action. The MHMT was established in 2004 by LIBC Resolution 2004-015 and reauthorized by Resolution 2007-060.
	ST-3	Establish an emergency management division within the Lummi Nation Police Department and hire an emergency manager.	Priority action, 2007 recommendation.
	ST-4	Finalize a Comprehensive Plan that is aligned with the provisions of the Title 15A Flood Damage Prevention Code, the FDRP, other hazard-related ordinances and regulations, and the recommendations of this MHMP.	Planning Department has a draft Comprehensive Plan.
	ST-5	Maintain the posting of this plan, including updated versions, on the Lummi Nation web site, and add links to further hazard mitigation information (e.g., DisasterHelp.gov) as time and resources permit.	MHMP is posted on the Lummi website (www.lummi-nsn.gov) and will be replaced with adopted and approved update.
	ST-6	Implement, maintain and update the Lummi Nation Comprehensive Emergency Management Plan	CEMP was adopted by LIBC Resolution 2006-036. Will need to be updated.
	ST-7	Continue to implement and maintain the Lummi Nation Spill Prevention and Response Plan through government-wide preparedness (e.g. Incident Command System training), and safety and response training, and coordination with area industries.	Spill Plan was finalized in 2005.
	ST-8	Continue to coordinate LIBC emergency response efforts, as appropriate, with those of Whatcom County and other federal, state, and local agencies.	Coordination has occurred through flood event responses, tsunami warning system purchases, and tsunami evacuation route map development.
	ST-9	Establish 24-hour emergency medical response capability (an equipped Medic 1 unit along with paramedics and emergency medical technicians) located on the Reservation.	Priority action.
	ST-10	Further promote the establishment and maintenance of home survival/emergency kits.	Priority action. Personal preparedness has been encouraged through community newspaper articles. Lummi Nation CERT established in 2004.
	ST-11	Purchase, or make available for purchase, 911 house number signs for all addressed structures on the Reservation to aid emergency responders.	2007 recommendation. GIS layer of addressed structures was developed in 2006.

Table 5.1 Summary of Recommended Mitigation Actions and Priorities by Hazard

	LT-1	Continue to pursue funding for the Lummi Nation mitigation priorities and recommendations described below, including funding for needed staff and infrastructure.	Priority action. Three PDM sub-grant projects funded: Slater Road, Sandy Pt., management costs. One EMPAG grant for tsunami warning systems
	LT-2	Promote a disaster and hazard mitigation fund to assist the mitigation and response efforts of individuals and organizations on the Reservation.	
	LT-3	Coordinate hazard planning, as appropriate, with other jurisdictions.	
	LT-4	Improve and sustain public information and education programs aimed at mitigating natural hazards.	Priority action. Public information has been provided through community newspaper articles, tribal television spots, brochures, and the formation of the Lummi CERT.
Flood	ST-1	Identify funding to support a 0.80 FTE Hazard Mitigation Specialist, who would be responsible for coordinating the Multi-Hazard Mitigation Team and implementation of hazard plans.	Water Resources Analyst has been performing this work at approx. 0.3 FTE and has begun the process to join the CRS.
	ST-2	Identify funding to complete elevation certificates for pre-FIRM tribal residences and businesses located in the floodplain.	2007 recommendation.
	ST-3	Identify funding to purchase flood insurance for LIBC buildings in or adjacent to the floodplain.	Priority action, 2007 recommendation
	LT-1	Develop capability to use HAZUS multi-hazard software and BCA software.	Water Resources staff have received training and have used BCA software.
	LT-2	Obtain funding for construction of 100-year levee along Ferndale Road.	Priority action.
	LT-3	Complete the elevation of Slater Road.	Priority action. Received 2005 PDM grant for this project. To be completed in 2009.
	LT-4	Obtain funding for construction and maintenance of a new culvert from the Nooksack River to the Lummi River.	
	LT-5	Monitor condition of Lummi River/Lummi Bay culverts, tide gates, and seawall and identify funding sources for potential maintenance or repairs	
	LT-6	Obtain funding for raising Marine Drive to allow underflow.	The planned Smuggler's Slough project for 2008 will reduce closures from small events.
	LT-7	Obtain funding to raise Haxton Way to allow underflow.	Priority action.
	LT-8	After modeling of Nooksack River flooding is completed by Whatcom County, analyze flood levels under future conditions of land use and assess the benefits of more protective development standards.	

Table 5.1 Summary of Recommended Mitigation Actions and Priorities by Hazard

	LT-9	Enforce the provisions of Title 15A for new development in the coastal floodplain and continue to pursue acquisitions of existing vulnerable structures.	Priority action. Implementation of Title 15A was strengthened through August 2004 FEMA CAV which included development of a Lummi Floodplain Development Permit Application, a list of floodplain permitting procedures, and amendments to 15A.
Earthquake	LT-1	Encourage seismic strength evaluations of critical facilities on the Reservation to identify vulnerabilities for mitigation of schools, public infrastructure, and critical facilities to meet current seismic standards.	Priority action.
	LT-2	Identify funding sources for structural and nonstructural retrofitting of structures that are identified as seismically vulnerable.	
	LT-3	Encourage purchase of earthquake hazard insurance	
	LT-4	Encourage reduction of non-structural and structural earthquake hazards in homes, schools, businesses, and government offices	Priority action
Severe Winter Storms	ST-1	Enhance strategies for debris management for severe winter storm events.	
	ST-2	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public and private infrastructure from severe winter storms.	
	LT-1	Increase public awareness of severe winter storm mitigation measures	Public information has been provided through community newspaper articles, tribal television spots, brochures, and the formation of the Lummi CERT.
Windstorms and Tornadoes	ST-1	Continue to develop and implement programs to keep trees from threatening lives, property, and public infrastructures during windstorm events.	Priority action. Forestry Manager addresses through expediting of hazard tree permits.
	ST-2	Enhance strategies for debris management after windstorms.	
	LT-1	Support/encourage electrical utilities to use underground construction methods where possible to reduce power hazards and outages from windstorms.	Two well sites and K-12 school have underground powerlines.
	LT-2	Increase public awareness of windstorm activities.	
Coastal Erosion	LT-1	Continue monitoring of erosion rates along Reservation shorelines.	Priority action. Monitoring has been continued through 2004, 2005, and 2006 through a contract with Coastal Geologic Services.
	LT-2	Redirect and/or relocate development away from eroding shorelines.	One structure was removed from the Sandy Point Peninsula through a 2005 PDM grant and a section of Lummi View Drive was moved inland.
Drought	LT-1	Implement the mitigation actions recommended in the Lummi Nation Water Conservation Plan, both before and after drought conditions occur.	Development of water facilities plan.

Table 5.1 Summary of Recommended Mitigation Actions and Priorities by Hazard

	LT-2	Protect the senior water rights of the Lummi Nation in the Nooksack River watershed	Adoption of WRIA 1 Watershed Management Plan and Instream Flow/Fish Habitat Plan.
Wildfires	ST-1	Educate LIBC personnel on federal cost-share and grant programs so the full array of assistance is understood.	Forestry Division receives BIA funding and has purchased firefighting equipment and training.
	ST-2	Inventory alternative firefighting water sources and encourage the development of additional sources.	
	LT-1	Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property, and businesses to wildfire.	The Forestry Division distributes a wildfire brochure and imposes burn bans.
	LT-2	Continue to increase communication, coordination, and collaboration between wildland/urban interface property owners, tribal planners, and fire prevention crews and officials to address risks, existing mitigation measures, and federal assistance programs.	
	LT-3	Encourage implementation of wildfire mitigation activities in a manner consistent with the goals of promoting sustainable ecological management and community stability.	The LNR Forest Management Plan will be updated by 2008. A Fire Management Plan needs to be written.
Landslide	ST-1	Continue to improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property.	Refined by LIDAR elevation model.
	ST-2	Encourage construction and subdivision design that can be applied to sloped areas to reduce development effects on landslide vulnerability.	
	LT-1	Limit construction in identified landslide areas through regulation and outreach.	Priority action. Implemented through Technical Review Committee and improved through use of LIDAR elevation model.
Tsunami	ST-1	Complete the installation of tsunami warning systems and evacuation route signs in hazard areas.	Priority action. Received EMPAG grant for two AHABs County installed AHAB at Sandy Pt. Developing brochures with the state. Signs will be installed after installation of warning systems and distribution of brochure.
	ST-2	Provide residents in the hazard area with updated information on the tsunami hazard, including the probability of occurrence, potential size of the hazard, signs of an impending tsunami, and best route to avoid a tsunami.	Articles have been published in the community newspaper on tsunami mitigation and preparedness activities. After installation of the AHABs and distribution of the brochures, this action should be continued through additional

Table 5.1 Summary of Recommended Mitigation Actions and Priorities by Hazard

			mailings and public meetings.
	LT-1	Use the availability of PDM funding to relocate or acquire vulnerable homes.	Begun through 2005 PDM acquisition grant.
Volcano		Mitigation actions for lahars are the same as for Nooksack River flooding.	

5.4 MITIGATION PRIORITIES

5.4.1 All Hazards

The mitigation priorities are also listed in Table 5.1 at the end of Section 5.3.

Short Term:

1. Establish an emergency management division within the Lummi Nation Police Department and hire an emergency manager.

2. Maintain the Multi-Hazard Mitigation Team

3. Promote the establishment and maintenance of home survival/emergency kits; and

4. Establish 24-hour emergency medical response capability located on the Reservation.

Long Term:

1. Redirect and/or relocate development away from hazard areas

2. Pursue funding for the Lummi Nation mitigation priorities and recommendations described in this MHMP, including funding for needed staff and infrastructure;

3. Improve and sustain public education programs aimed at mitigating natural hazards;

5.4.2 Floods, Tsunamis, and Volcanic Lahars

The following are specific long-term priorities on the Reservation, in order of importance (LWRD 2001a):

1. Protect the Nooksack River floodplain on the Reservation and maintain access to the Lummi Peninsula by constructing a 100-year setback levee that extends along Ferndale Road from Ferndale to Kwina Slough, then along the north side of Kwina Slough to Marine Drive, and finally along Marine Drive to Lummi Shore Road (the levee should include a bridge over the Lummi River channel and culverts allowing flow under Marine Drive);

2. Reduce the potential for flood damage along the low-lying coastal areas and concurrently reduce damage done to shoreline resources by bulkheads through the acquisition or relocation of flood-prone structures currently located in the coastal velocity zones;

3. Complete the elevation of Slater Road to the 100-year flood level east of the Nooksack River including a bridge to allow floodwaters to pass downstream;

4. Protect, acquire, or relocate vulnerable structures in the coastal and riverine floodplains, outside of the velocity zone and floodway, respectively; and

5. Provide access to the Lummi Peninsula in the case of levee failure by raising Haxton Way and providing for the flow of floodwaters under Haxton Way (this could serve as an interim measure prior to construction of a 100-year setback levee).

6. Purchase flood insurance for all LIBC structures within or adjacent to the floodplain.

The locations of the specific priorities listed above are shown in Figure 5.1.

5.4.3 Other Hazards

Long Term:

1. Encourage seismic strength evaluations of schools, public infrastructure, and critical facilities on the Reservation to identify vulnerabilities for mitigation to meet current seismic standards.

2. Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.

3. Continue to develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.

4. Continue monitoring of erosion rates along the shorelines of the Reservation.

5. Continue to limit construction in identified landslide areas through regulation and outreach.

6. Complete the installation of tsunami warning systems and evacuation route signs in hazard areas and provide residents in the hazard areas with updated information on the tsunami hazard, including the probability of occurrence, potential size of the hazard, signs of an impending tsunami, and best route to avoid a tsunami.

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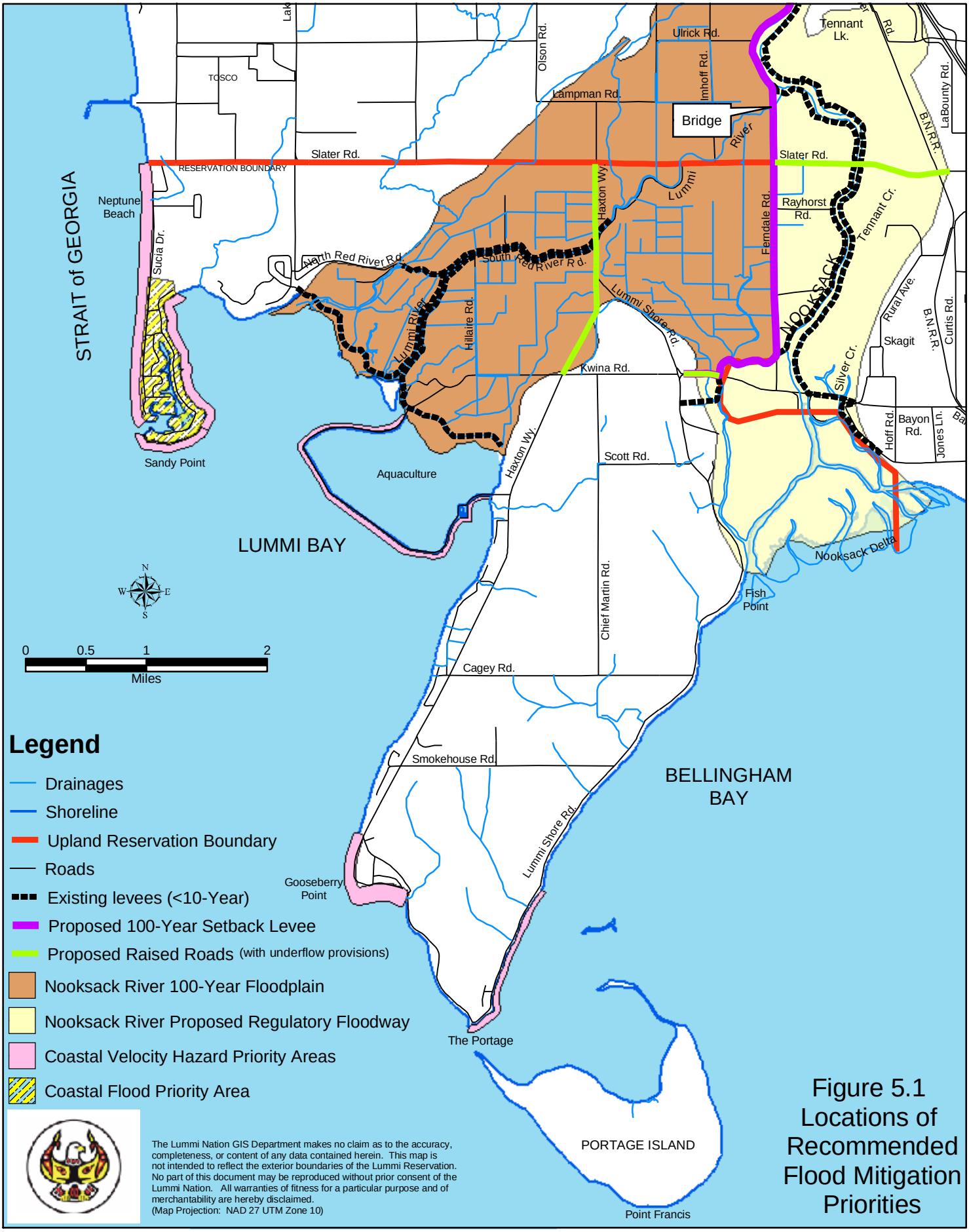

Figure 5.1
Locations of Recommended Flood Mitigation Priorities

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5.5 MITIGATION FUNDING SOURCES

In this section, current and potential sources of federal, tribal, state, local, or private funding for mitigation activities are identified. This plan, which was funded by a PDM planning grant from FEMA, may help the Lummi Nation acquire funding from the following programs or agencies:

- **Pre-Disaster Mitigation Program**, which provides funds to develop mitigation plans and implement mitigation projects, is administered by FEMA (by submitting a state-level plan, the Lummi Nation will qualify as a direct grantee). The Lummi Nation received a 2005 FEMA Pre-Disaster Mitigation-Competitive grant for a total project cost of $5,976,843 and a 75 percent federal share of $4,482,632. The grant includes two project subgrants and one management subgrant. The two projects are:
    - The Slater Road Elevation Project. This project is the elevation of an approximately 1-mile long, frequently flooded, section of Slater Road east of the Nooksack River bridge to above the 100-year flood level. The elevation will include a 389 foot long bridge and will allow continued access to the Reservation, Lummi Island, and nearby industries through a 100-year flood event. The project will be completed in early 2009.
    - The Sandy Point Coastal Acquisition Project. This project is the acquisition and removal of up to three homes from the high velocity coastal flood zone (V zone) along the Sandy Point Peninsula.

- **Hazard Mitigation Grant Program**, which provides post-disaster funds for hazard reduction projects (e.g., elevation, relocation, or buyout of structures), is administered by the Washington State Emergency Management Division (by submitting this hazard mitigation plan to the state, the Lummi Nation will qualify as a sub-grantee);

- **Flood Control Assistance Account Program**, which provides funds for developing flood hazard management plans, for flood damage reduction projects and studies, and for emergency flood projects (e.g., repair of levees), is administered by the Washington State Department of Ecology (Ecology);

- **Flood Mitigation Assistance Program**, which provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods, is administered by FEMA;

- **Repetitive Flood Claims Program,** which provides funds to reduce damages, primarily through acquisition and demolition or relocation, to insured properties that have had on or more claims to the National Flood Insurance Program (NFIP);

- **Severe Repetitive Loss Program,** which provides funds to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures under the NFIP. SRL structures are residential properties that:
    - Have at least four NFIP claim payments over $5,000 each, when at least two such claim**s have occurred within any ten-year period, and the cumulative amount of such claims payments exceeds $20,000; or**
    - **For which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims**

exceeding the value of the property, when two such claims have occurred within any ten-year period;

- **Emergency Management Preparedness Assistance Grant Program (EMPAG),** which provides funds to local and tribal governments, regional agencies, regional incident management teams, and private organizations to enhance statewide emergency preparedness through short term, high impact, projects. Administered by WEMD. The Lummi Nation received a 2006 EMPAG award for $94,200 for the turn-key installation of two All-Hazard Alert Broadcast tsunami warning systems. This equipment was received in March, 2007 and will be installed by June, 2007.

- **Department of Homeland Security funding**, in addition to FEMA programs;

- **U.S. Fire Administration**, which provides wildfire program funds;

- **Environmental Protection Agency**, which could provide funds for projects with dual hazard mitigation and environmental protection goals as well as updates to this MHMP and related planning efforts such as spill prevention and response planning;

- **Indian Health Service**, which could provide funds for hazard mitigation projects that address public health and safety;

- **Rural Development Agency, USDA**, which provides loan and grant funds for housing assistance, business assistance, community development, and emergency community water and wastewater assistance in areas covered by a federal disaster declaration;

- **Community Development Block Grant**, which provides funds for a variety of community development projects, is administered by the Department of Housing and Urban Development;

- **Small Business Administration Loans**, which help businesses recover from disaster damages, is administered by the Small Business Administration; and

- **Bureau of Indian Affairs**, which provides funds to support tribal activities. The LNR Forestry Division receives funds from the BIA for forest protection services and used these funds in 2006 to purchase firefighter equipment and training.

In the past, Reservation residents and the Lummi Nation have received disaster relief funds from FEMA directly, or indirectly through the programs administered by Washington State. In addition, the Lummi Nation has secured grant funding from FEMA to develop a Flood Damage Reduction Plan and this Multi-Hazard Mitigation Plan.

Local potential funding sources for pre-disaster mitigation activities on the Reservation are very limited. Currently, the only potentially significant sources are the LIBC and the Silver Reef Casino. However, the LIBC has a very limited tax base (essentially only employment/income taxes, permit fees, and license fees as no property taxes are collected on trust properties and taxes on fee land are collected and retained by Whatcom County) and largely relies on funding from annual appropriations negotiated through the Bureau of Indian Affairs Office of Self-Governance and grant funds from other federal and state agencies. Profits from the Silver Reef Casino are distributed

through a prioritized system to various community programs. This distribution is based on initial casino profits being used to repay loans secured to build the casino and the remainder allocated pursuant to a formula approved by the LIBC. This allocation has been described as a "waterfall" where, depending on profit levels, available funding is provided to a specific program up to a specified amount. If available profits exceed the specified amount for the first priority program, funding is provided to the second priority program to its specified limit. If profits exceed this amount, the third prioritized program is funded to its limit. This allocation method is repeated until the profits are fully allocated. The most likely future use of such funds to support hazard mitigation is property acquisition, but hazard mitigation is not specifically identified as a target for LIBC casino profits. As a result, financial support for hazard mitigation projects will largely rely on off-Reservation sources in the foreseeable future.

The ability of private citizens on the Reservation to pay for mitigation measures is also limited. While the per capita income of non-tribal residents generally exceeds that of surrounding Whatcom County, the median per capita income of tribal members ($17,000; LIBC 2003) is significantly lower than the median income of Whatcom County residents. Hence, the ability of many tribal members to pay for hazard mitigation is very limited, and hazard mitigation may fall very low on the priority list for people struggling to pay for food, housing, energy, and other basic necessities.

There are other private companies and public agencies that could potentially help fund pre-disaster mitigation projects on or near the Reservation. Local public agencies and private companies that could fund such projects include Whatcom County, the City of Ferndale, and local businesses (most likely the two oil refineries and the aluminum plant just north of the Reservation). All of these organizations would benefit from some of the mitigation projects proposed in this plan (e.g., raising Slater Road).

5.6 MITIGATION ACTION PLAN

The following actions are proposed to meet the Lummi Nation's goals and objectives for hazard mitigation:

1. Establish a Lummi Nation division of emergency management within the Lummi Nation Police Department and hire an emergency manager.

2. Maintain the Multi-Hazard Mitigation Team composed of representatives from pertinent LIBC departments on the Reservation;

3. Continue to pursue funding for the Lummi Nation mitigation priorities and recommendations described above, including funding for needed staff and infrastructure;

4. Finalize the Comprehensive Plan that is aligned with the provisions of the Land Use, Development, and Zoning Code; the Flood Damage Prevention Code; the Building Code; the FDRP; the CZMP; the Water Resources Protection Code; other hazard-related ordinances; and the recommendations of this MHMP;

5. Coordinate hazard planning with other jurisdictions, as appropriate, and review any actions proposed for the Nooksack River and/or Lummi River watersheds that may affect flooding on the Reservation (i.e., all proposed actions);

6. Review and possibly amend the Flood Damage Prevention Code in response to an analysis of future-conditions flood levels and flood management actions implemented throughout the Nooksack River watershed;

7. Continue to pursue participation in the Community Rating System and take appropriate actions to earn points toward discounts of flood insurance premiums for residents of the Reservation;

8. Continue to review hazard maps for accuracy and any changes in the estimated vulnerability of the Reservation;

9. Coordinate LIBC emergency response efforts with other appropriate jurisdictions and agencies; and

10. Implement a public education effort that will inform residents of the potential natural hazards on the Reservation.

6. LOCAL MITIGATION PLANNING COORDINATION

The LIBC is the sole governing body with specific jurisdiction over the Lummi Reservation. Hence, unlike a state, there are no local jurisdictions within the Reservation that have a responsibility to develop a hazard mitigation plan as required by the Disaster Mitigation Act of 2000. Local public organizations on the Lummi Reservation (e.g., Lummi Water and Sewer District, Northwest Indian College, and the tribal schools) fall under the jurisdiction of the LIBC and will be served by this Multi-Hazard Mitigation Plan. These organizations will be encouraged to develop appropriate site plans or measures to prepare for and respond to the hazards that pose the greatest threats to people and buildings.

6.1 LOCAL FUNDING AND TECHNICAL ASSISTANCE

The Lummi Natural Resources (LNR) and Planning departments can provide various types of assistance to local organizations, businesses, or individuals that are trying to identify appropriate mitigation measures for their facilities. These include providing current hazard vulnerability estimates and technical information, improving communications between local organizations and hazard-related agencies, and coordinating hazard mitigation training. In addition, the Multi-Hazard Mitigation Team (MHMT) can provide public education materials or presentations to organizations or residents on the Reservation. This team should proactively identify appropriate mitigation measures and present them to local organizations, businesses, and/or individuals.

The LIBC currently has limited funds to provide direct funding of mitigation measures to local entities. However, the LIBC can apply for and pass on funds from outside sources to local entities and/or implement activities that directly or indirectly help local organizations, businesses, and/or individuals implement mitigation measures.

Since the adoption of this plan, the Natural Resources and Planning departments have provided mitigation assistance through:

- The Technical Review Committee's review of land use permit applications. This review results in the approval, approval with conditions, or denial of applications. Conditions placed on permits include requirements for siting, seismic strength, floodplain management, stormwater management, and natural and cultural resources protection;
- Assistance to individuals, insurance agents, and government departments on floodplain determinations and floodplain development requirements;
- Provision of information to Reservation residents on tsunami hazard zones;
- Coordinating and providing oil spill response training for Natural Resources Department staff; and
- Public outreach through the community newspaper and television channel on personal emergency preparedness and specific hazard events.

6.2 LOCAL PLAN INTEGRATION PROCESS

Since this MHMP is intended to serve all organizations and individuals on the Reservation, the Lummi Nation does not anticipate integrating local mitigation plans into this MHMP. However, site plans or lists of mitigation measures or strategies developed

by local organizations and tribal departments will be incorporated into and attached as appendices to revisions of this MHMP, which are required every three years. For example, it is anticipated that the Lummi Water and Sewer District will identify pertinent mitigation measures that can be attached to this plan. The MHMT, or its representatives from the LNR and/or Lummi Planning departments, will be responsible for compiling specific mitigation measures that are identified and implemented by local organizations.

The 2007 update has incorporated goals, objectives, and recommendations from the 2006 Lummi Nation Comprehensive Emergency Management Plan and the 2005 Lummi Nation Spill Prevention and Response Plan. The Spill Prevention and Response Plan was written after the adoption of this MHMP and the mitigation goals and objectives were considered in its development. The CEMP was further developed from a draft which was reviewed and considered in the initial MHMP. The final CEMP (Appendix C) has been incorporated in the 2007 update through its description in the Tribal Capability Assessment and review of its recommendations for tribal emergency operations and coordination with Whatcom County for emergency management. The Lummi Tribal Sewer and Water District is developing both a Sewer Facilities Plan and a Water Facilities Plan and the MHMP goals and objectives will be considered in the Planning and Natural Resources Department's review of the draft plans. Any mitigation measures identified in these plans will be reviewed and incorporated as appropriate in the 2010 MHMP update.

6.3 LOCAL ASSISTANCE PRIORITIZATION CRITERIA

With no local jurisdictions within the Lummi Indian Reservation, the Lummi Nation does not anticipate receiving grant applications under its Multi-Hazard Mitigation Plan that it will need to prioritize. However, in order to use its limited resources and funding most efficiently and effectively, the Lummi Nation will need to prioritize the areas of the Reservation that are most vulnerable to hazards and the projects that are most appropriate and effective in mitigating those hazards. In general, the following criteria will be used by the MHMT to prioritize mitigation actions and to seek potential funding for local organizations or projects:

- Projects that provide the greatest enhancement to public health and safety;
- Projects in which the benefits are maximized according to a benefit-cost review of proposed projects and their associated costs;
- Organizations with or projects that address the highest risks of hazard damage;
- Projects that involve repetitive loss properties; and
- Projects that address the most intense development pressures.

The MHMT will develop a ranking system that weights various factors and provides a relative score that reflects the importance of a project to the Lummi Nation and the residents of the Reservation. The MHMT will use these scores to rank proposed mitigation projects and to prioritize mitigation activities for action by the MHMT. The ranking system will include the following criteria:

- Reduction of threats to public health and safety;

- Reduction of potential structural damages;
- Reduction of potential economic losses;
- Effects on environmental and cultural resources;
- Degree of support for the MHMP goals and objectives; and
- The benefit/cost ratio of the project.

Since most hazard mitigation funding from federal and state sources requires a benefit/cost ratio greater than one, this ratio will be an important factor in the assessment of projects. Unless a project involves overriding public health and safety or cultural factors, the MHMT will only consider projects in which project benefits at least exceed project costs. In seeking to maximize public benefits, the MHMT will acquire the information and/or assistance necessary to determine the best possible benefit-cost ratio for high priority projects before submitting applications for these projects to funding agencies. Projects that are recommended for funding will be those that best document their ability to reduce future impacts of natural disasters as well as demonstrate cost-effectiveness through a benefit-cost review. It is anticipated that projects addressing the multiple high vulnerabilities of the Sandy Point Peninsula, Floodplain, and Gooseberry Point areas will be top priority projects on the Reservation.

The recommended prioritization criteria and ranking system were reviewed by the Multi-Hazard Mitigation Team as part of the first three-year plan update and have not been changed. Although the team recognized that the above lists weren't physically referred to for at least the three large mitigation projects that have been undertaken (the Slater Road Elevation project, the Sandy Point Acquisition Project, and the purchase of the tsunami warning systems), these projects were well known to the team as priority mitigation actions listed in this plan. It was understood that these projects would have public safety and health benefits, reduce hazard damage, and reduce economic losses. The projects address two of the higher vulnerability assessment areas, the floodplain and the Sandy Point Peninsula, and two of the most likely or damaging hazards, flood and tsunami. In addition, cost benefit analyses were performed for the two PDM projects. With a new awareness of the above criteria, this section will be more strictly referred to in the future.

7. PLAN MAINTENANCE PROCESS

The federal hazard mitigation planning regulations (44 CFR 201.4) require state-level plans such as this MHMP to be reviewed, revised, and submitted for approval to the FEMA Regional Director every three years. The regulations require a plan maintenance process that includes an established method and schedule for monitoring, evaluating, and updating the plan; a system for monitoring implementation of mitigation measures and project closeouts; and a system for reviewing progress on achieving goals as well as specific activities and projects identified in the mitigation plan.

This MHMP is a living document that is intended to provide a guide for hazard mitigation to the Lummi Nation. The MHMP can be revised more frequently than three years if the conditions under which it was developed change significantly (e.g., a major disaster occurs or funding availability changes). This section details the Lummi Nation's method and schedule for monitoring, evaluating, and updating the MHMP and for monitoring the progress of mitigation actions.

7.1 RESPONSIBILITY FOR PLAN MAINTENANCE

The LIBC resolution adopting this plan (No. 2004-015; Appendix A) directs the pertinent LIBC department directors to form a MHMT by appointing appropriate representatives from their departments to be members of the MHMT. The core of the MHMT should include the LIBC Safety Officer as well as representatives from the Planning, Natural Resources, Law and Order, and Cultural Resource Management Program departments. Other LIBC divisions (e.g., Funding, Sewer and Water, Lummi Commercial Company, Housing, Communications, and others) may be represented as needed. This MHMT will be responsible for coordinating the implementation of mitigation measures and the maintenance of the plan. The MHMT will also be responsible for annual progress reports to be submitted to the LIBC and for the three-year update to be submitted to the LIBC and subsequently to FEMA for approval.

The MHMT was formed in 2004 and was authorized to continue its work under the direction of the General Manager. The Multi-Hazard Mitigation Team was formed in 2004 pursuant to LIBC Resolution 2004-015 and consists of the Natural Resources Department Executive Director, the Planning Department Director, the Chief of the Lummi Nation Police Department, the Safety Officer, and assigned staff from the Natural Resources and Planning departments. The team met five times between 2005 and 2007 to discuss and review progress on mitigation projects, review the CEMP and Spill Prevention and Response Plan, and discuss the MHMP update. The Water Resources Division of the Natural Resources Department has served as the coordinator for the team and team meetings. The team is responsible for overseeing the development, implementation, and monitoring of this plan and was authorized to continue this work under Resolution 2007-060 (Appendix A).

7.2 MONITORING, EVALUATING, AND UPDATING THE PLAN

7.2.1 Planned Update Process

The MHMT will review this MHMP annually and will update the MHMP every three years. Annual reviews will identify progress made on the implementation of mitigation

measures and projects. Annual reviews will also assess the impacts of disasters in the Reservation region to determine whether the MHMP should be revised based on the new information. The annual review will occur during the last quarter of each calendar year to coincide with the tribal fiscal year and community reporting requirements. Assuming that FEMA will approve this MHMP during the first or second quarter of 2004, this timeline will ensure that the annual review every third year will occur during the period when the plan will be updated for re-approval by FEMA. Hazard mitigation progress and needs identified in the annual review will be described in an annual progress report for the LIBC and the General Council.

The effectiveness of projects and other actions will be evaluated at appropriate, project-specific intervals or, at a minimum, when the MHMP is updated every three years as required for state-level plans submitted directly to FEMA. The process of updating the MHMP will include a review of hazard assessments, vulnerability assessments, potential losses, tribal capability, coordination with other planning efforts, funding sources, and recommended and potential new mitigation measures. In support of the three-year update, the MHMT will:

- Examine and revise the Hazard Risk Assessment (Section 4) as necessary to ensure that it describes the current understanding of hazard risks;
- Examine progress on and determine the effectiveness of the mitigation actions and projects recommended in this MHMP;
- Identify implementation problems (technical, political, legal, and financial) and develop recommendations to overcome them;
- Recommend ways to increase participation by LIBC departments and to improve coordination with other jurisdictions and agencies; and
- Review and, if desirable, revise the MHMP Action Plan.

The updated MHMP will be presented to the Lummi commissions identified in Section 2 (Planning Process) for approval and then to the LIBC for adoption before it is submitted to FEMA for re-approval.

7.2.2 Update Process Description and Evaluation

The first three-year plan update was performed in 2007, adopted by the LIBC by Resolution 2007-060 (Appendix A), and submitted to FEMA on April 24, 2007. The update process followed is described in Chapter 2.

In summary, the update was done pursuant to FEMA regulations and guidance and the process outlined in this section. This included the review of hazard event information and new scientific information and gathering input from the MHMT and the relevant Lummi commissions. The original document was modified by updating the description of the Reservation, the natural hazard risk assessment, and the mitigation strategy. The assessment of each hazard was updated as appropriate to include new information, new hazard occurrences, input on vulnerabilities from the MHMT and commissions, and current valuation data for the loss estimates. All of the vulnerability maps were revised

to include current GIS base layers (e.g. parcels, structures, roads, water bodies) and the vulnerability areas for earthquakes, coastal erosion, wildfires, landslides, and tsunamis were changed in order to incorporate new information. The Mitigation Strategy was revised by incorporating mitigation activities begun and completed since 2004, editing the recommended mitigation measures and priorities, adding new funding sources, and revising the Mitigation Action Plan to reflect progress and changes.

The Multi-Hazard Mitigation Team met five times from 2004 to 2007 primarily to discuss direction for and progress on mitigation projects and to evaluate the plan for the three year update. The impacts of disasters and therefore any changes to the previous vulnerability assessments were reviewed for the three year update but not as part of annual reviews and annual progress reports. The MHMT determined that, with good record keeping of hazard events, the three-year review was sufficient for incorporation of hazard events and evaluation of the vulnerability assessment. Project progress was reported on to the General Council through articles in the community newspaper and to the LIBC through the LNR and Planning Department's annual reports. Based on the MHMT's three-year review of this process, it is recommended that a more regular schedule be established and followed for MHMT meetings, the original annual review recommendation be removed, and the annual progress report be considered submitted through the ongoing newspaper articles and required departmental annual reports.

7.3 MONITORING PROGRESS OF MITIGATION ACTIONS

7.3.1 Planned Monitoring Process

Once established, the MHMT will meet on a regular basis, perhaps monthly, to ensure consistent progress on the implementation of mitigation actions. Representatives to the MHMT will report on the progress made by their respective departments. Departments not represented on the MHMT will be invited to meetings as needed to report on activities in their departments. The implementation of all short-term mitigation actions will be monitored by the MHMT on an ongoing basis until implementation is complete. Long-term actions being actively implemented will be monitored on an ongoing basis, or at least annually as needed. Long-term actions planned for the future will be reviewed during plan updates every three years.

The system for reviewing progress on achieving goals, objectives, and specific actions included in the mitigation strategy will be based on a checklist of all objectives and actions. This checklist will be reviewed annually by the MHMT. As described in the previous section, progress on mitigation actions will be described in an annual report to the LIBC and the General Council and in the three-year update of the MHMP.

In addition to the work products described in approved work plans for projects funded by the Pre-Disaster Mitigation Program, the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, or other grant programs, quarterly or semi-annual (depending on reporting requirements of funding agencies) performance reports that identify accomplishments toward completing the work plan commitments, a discussion of the work performed for all work plan components, a discussion of any existing or potential problem areas that could affect project completion, budget status, and planned activities for the subsequent quarter will be submitted to the funding agency by the assigned LIBC Project Officer. The agency-specific final grant closeout documents will also be prepared by the LIBC Project Officer at the conclusion of the performance period and submitted to the funding agency.

7.3.2 Monitoring Process Description and Evaluation

Between 2004 and 2007, the MHMT met as needed to gather the team's input on project direction and progress and to gather mitigation activity information from each department. Monthly meetings were not necessary and the team recommends future meetings be held on a quarterly schedule. At the previous MHMT meetings, the system used for evaluating projects and tracking project progress was a table listing the mitigation actions detailed in Section 5 of this plan. This table is now included as Table 5.1 and includes new projects from the update.

The Water Resources Division has served as the team coordinator and has been the lead for applying for mitigation project grants, managing these grants, and providing information to the MHMT and General Council on project progress. For the three Pre-Disaster Mitigation project grants, the Division has submitted the required quarterly financial and performance reports to FEMA through the e-Grants system. These reports describe activities that demonstrate quarterly performance as compared to the objectives established in the grant applications, describe any anticipation of time or budget overruns, and provide budget reports. The Division has also submitted monthly progress and financial reports to the WEMD for the EMPAG grant for the tsunami warning systems. These reports include project activities for each month, deliverables achieved as detailed in the work plan, improvements to the identified baseline, and a discussion of successes and challenges encountered.

In summary, the process that has been used to implement the plan and monitor progress has been that the MHMT has chosen and guided projects based on the plan and Table 5.1, projects have been implemented by the LIBC departments, and the team has received reports on project progress. This monitoring process has shown that a number of mitigation activities have been begun or completed since the adoption of the original plan in 2004 and clarifies actions that should follow. The Water Resources Division will continue to coordinate the team, track project progress, and apply for and manage project grants. This responsibility may be turned over to the Lummi Nation Police Department if a Division of Emergency Management is established. The recommended changes to the originally described monitoring process are for the MHMT to meet quarterly, for Table 5.1 to continue to be used as a tracking system, and for the coordination responsibility to be transferred to an emergency manager when appropriate.

8. SUMMARY

The Lummi Reservation has exposure to eleven natural hazards, and five of the six assessment areas on the Reservation have vulnerability to all eleven hazards. The sixth assessment area, the Nooksack River Floodplain, is vulnerable to ten hazards (but safe from landslides). On a scale from low to high, the estimated vulnerability in the Reservation areas is moderate or above for up to nine of the hazards. Although the probability of occurrence for some of these hazards is low, the potential for damaging events, however rare, is real. With the combination of high vulnerability and high probability of both Nooksack River and coastal flooding, the flood hazard on the Reservation poses the largest natural hazard in terms of potential annual damages to structures, government services, and economic activity.

Some areas face a higher vulnerability to certain hazards. Structures in woodland areas have a greater risk of damage from wildfires, severe winter storms, and windstorms. Coastal areas generally have greater vulnerability to earthquakes, landslides, and windstorms relative to some other areas, as well as being vulnerable to coastal erosion, flooding, and tsunamis. With many areas of the Reservation vulnerable to multiple natural hazards, there is a cumulative effect on overall potential losses. For example, a single earthquake may damage the same structures in the coastal or Nooksack River floodplain areas via ground motion, liquefaction, and subsidence; by triggering landslides; and by generating a tsunami. A strong windstorm could damage individual structures with downed trees, with the multiple effects of a power outage, and with wind-generated waves and coastal flooding. Coastal erosion damages properties, increases the probability of landslides in bluff areas, and increases the probability of flooding in low-lying areas.

Where there is a cumulative effect on potential losses, there will also be a cumulative effect on the benefits derived from mitigation actions. For example, development regulations or property buyouts that keep or remove structures from hazard areas will avoid the damages associated with all of the hazards that uniquely affect the property. Likewise, the establishment of home emergency kits and improved emergency response capabilities will benefit residents during all hazard events. It is important to consider both cumulative impacts and cumulative benefits when assessing mitigation measures.

Achieving the objective of becoming a disaster-resistant Indian nation will require significant investment of funds that the Lummi Nation does not currently possess. Expensive measures necessary to reach this objective include relocation or acquisition and removal of many structures that are in highly vulnerable locations, construction of substantial flood protection structures, and possible seismic retrofitting of older structures (replacement of some structures may be more cost effective). Given the high cost of these projects, acquiring outside funds for these measures is a high priority action item. In addition to pre-disaster mitigation, recovery from disasters will also present a financial challenge to both the LIBC and individuals. Given the low median income for tribal members, the damages and economic disruption caused by a hazard event will be difficult to recover from without assistance.

Threats to public health and safety from natural hazards are also significant on the Reservation. Floods, earthquakes, winter storms, windstorms, wildfires, landslides, tsunamis, and volcanic activity all pose public health and safety hazards. Structural

mitigation measures, especially those proposed in this MHMP, are important in addressing public safety hazards, and public education measures that improve preparation for and response to natural hazards may be equally important, or in many cases, more important than structural measures.

This MHMP represents a step toward disaster resistance. The Lummi Nation has already taken significant steps, including implementation of development and construction regulations (e.g., the Flood Damage Prevention and Building codes), monitoring of hazard conditions, and implementation of recommended mitigation actions. The mitigation actions and measures described in this plan offer the potential for significant progress toward reducing future natural hazard damages. Consistent attention and adequate funding to implement identified mitigation measures will be required to realize the potential for damage reduction.

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LIST OF ACRONYMS AND ABBREVIATIONS

Programs and Terms:	
AHAB	All Hazard Alert Broadcast
BFE	Base Flood Elevation
CAV	Community Assistance Visit
CEMP	Comprehensive Emergency Management Plan
CFHMP	Comprehensive Flood Hazard Management Plan
CFR	Code of Federal Regulations
CRS	Community Rating System
CWRMP	Comprehensive Water Resources Management Program
CZMP	Coastal Zone Management Plan
EAs	Environmental Assessments
EISs	Environmental Impact Statements
EMPAG	Emergency Management Preparedness Assistance Grant
EOC	Emergency Operations Center
FDPC	Flood Damage Prevention Code
FDRP	Flood Damage Reduction Plan
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FTE	Full-Time Equivalent
GIS	Geographic Information System
HAZUS	Hazards – United States (FEMA software program)
LIDAR	Laser Imaging Detection and Ranging
LSR	Lummi Shore Road
LZC	Lummi Zoning Code
MHMP	Multi-Hazard Mitigation Plan
MHMT	Multi-Hazard Mitigation Team
MMI	Modified Mercalli Intensity
NEHRP	National Earthquake Hazard Reduction Program
NEPA	National Environmental Policy Act
NERP	Nooksack Estuary Recovery Project
NFIP	National Flood Insurance Program
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
SEPA	State Environmental Policy Act
SFHA	Special Flood Hazard Area
SRL	Severe Repetitive Loss
SWMP	Storm Water Management Program
TEPA	Tribal Environmental Policy Act
TRC	Technical Review Committee
UBC	Uniform Building Code
USCG	United States Coast Guard

Agencies and Organizations (Parent Organization):	
AMS	American Meteorological Society
BIA	Bureau of Indian Affairs
CISN	California Integrated Seismic Network
Corps	U.S. Army Corps of Engineers
Ecology	Department of Ecology, Washington State
DEM	Division of Emergency Management
DOH	Department of Health, Washington State
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GSC	Geological Survey of Canada
LCC	Lummi Commercial Company
LIBC	Lummi Indian Business Council
LNR	Lummi Natural Resources Department
LWRD	Lummi Water Resources Division
LTSWD	Lummi Tribal Sewer and Water Districts
NAST	National Assessment Synthesis Team
NEI	Northwest Economics, Inc.
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service (USDA)
NWIC	Northwest Indian College
NWS	National Weather Service
TOEM	Tulalip Office of Emergency Management
USDA	US Department of Agriculture
USDI	US Department of the Interior
USEPA/EPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service (USDI)
USGS	US Geological Survey (USDI)
WCATWC	West Coast and Alaska Tsunami Warning Center
WDNR	Washington State Department of Natural Resources
WEMD	Washington State Emergency Management Division
WSDC	Washington State Department of Conservation
WWU	Western Washington University

Appendix A:

LIBC Resolution No. 2004-015
“Adoption of the Lummi Nation Multi-Hazard Mitigation Plan”
and
LIBC Resolution No. 2007-060
“Adoption of the 2007 Lummi Nation Multi-Hazard Mitigation Plan”

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

Natural Res.

RESOLUTION # 2004 - 015 OF THE LUMMI INDIAN BUSINESS COUNCIL

TITLE: Adoption of the Lummi Nation Multi-Hazard Mitigation Plan

WHEREAS, the Lummi Indian Business Council is the duly constituted governing body of the Lummi Indian Reservation by the authority of the Constitution and By-laws of the Lummi Nation of the Lummi Reservation, Washington; and

WHEREAS, the Council is responsible for protecting and ensuring the health, safety, and welfare of the Lummi People and the Lummi Reservation community; and

WHEREAS, the Council is responsible for the protection, restoration, enhancement, and management of the natural resources within the exterior boundaries of the Lummi Reservation and throughout the Lummi Nation's Usual and Accustomed (U&A) Fishing and Gathering Grounds and Stations; and

WHEREAS, natural hazard events have occurred in the past and larger events can be expected to occur in the future on and near the Lummi Reservation and within the Lummi Nation's U&A; and

WHEREAS, defined hazard management policies and a coordinated hazard plan will reduce the impacts of natural hazard events on the Lummi Reservation and within the Lummi Nation's U&A; and

WHEREAS, the Lummi Nation Multi-Hazard Mitigation Plan identifies proposed actions for hazard preparedness and damage reduction, recommends priorities for natural hazard mitigation, and gains eligibility for future hazard mitigation programs; and

WHEREAS, implementation of the Lummi Nation Multi-Hazard Mitigation Plan will reduce natural hazard-related damages, reduce environmental impacts of hazard mitigation activities, and reduce the long-term costs of hazard mitigation; and

WHEREAS, the Lummi Nation Multi-Hazard Mitigation Plan is consistent with the Lummi Flood Damage Prevention Code (Title 15A Lummi Nation Code of Laws), the Lummi Zoning Code (Title 15 Lummi Nation Code of Laws), the Lummi Building Code (Title 22 Lummi Nation Code of Laws), and the Water Resources Protection Code (Title 17 Lummi Nation Code of Laws); and

WHEREAS, the Lummi Fisheries and Natural Resources Commission (at their meeting on November 25, 2003), the Lummi Natural Resources Department Executive Director, the Lummi Planning Commission (at their meeting on December 18, 2003), and the Lummi Law and Justice Commission (at their meeting on January 15, 2004) recommend that the Lummi Indian Business Council adopt the Lummi Nation Multi-Hazard Mitigation Plan.

NOW THEREFORE BE IT RESOLVED, that the Lummi Indian Business Council adopts the Lummi Nation Multi-Hazard Mitigation Plan and directs the Directors of the Natural Resources and the Planning departments to designate appropriate staff members to implement the actions identified in the plan; and

BE IT FURTHER RESOLVED, that the Lummi Indian Business Council authorizes the formation of a Multi-Hazard Mitigation Team and directs the General Manager or his designee to coordinate the formation, staffing, and operations of this team and to ensure its effectiveness; and

BE IT FURTHER RESOLVED, that the Lummi Indian Business Council directs the Multi-Hazard Mitigation Team to report its activities semi-annually to the General Manager or his designee and annually to the Lummi Indian Business Council and General Council; and

BE IT FURTHER RESOLVED, that the Chairman (or Vice Chairman in his absence is hereby authorized and directed to execute this resolution and any documents connected therewith, and the Secretary (or the Recording Secretary in his absence) is authorized and directed to execute the following certification.

LUMMI INDIAN NATION

William Jones vice chairman for
Darrell Hillaire, Chairman
Lummi Indian Business Council

CERTIFICATION

As Secretary of the Lummi Indian Business Council, I hereby certify that the above Resolution #2004-015 was adopted at a Regular Meeting of the Council held on the 19th of January 19, 2004, at which time a quorum of 7 was present by a vote of 6 For, 0 Against, and 0 Abstentions(s).

Sheri Williams
Sheri Williams, Secretary
Lummi Indian Business Council

OFFICE OF THE ARCHIVIST LUMMI NATION TRIBAL ARCHIVES

Resolution 2004-015

Corrected version per 1/19/04 approved minutes

LUMMI INDIAN BUSINESS COUNCIL
2616 KWINA ROAD • BELLINGHAM, WASHINGTON 98226 • (360) 384-1489

RESOLUTION # 2007 - 060 OF THE LUMMI INDIAN BUSINESS COUNCIL

TITLE: Adoption of the 2007 Lummi Nation Multi-Hazard Mitigation Plan

WHEREAS, the Lummi Indian Business Council is the duly constituted governing body of the Lummi Indian Reservation by the authority of the Constitution and By-laws of the Lummi Nation of the Lummi Reservation, Washington; and

WHEREAS, the Council is responsible for protecting and ensuring the health, safety, and welfare of the Lummi People and the Lummi Reservation community; and

WHEREAS, the Council is responsible for the protection, restoration, enhancement, and management of the natural resources within the exterior boundaries of the Lummi Reservation and throughout the Lummi Nation's Usual and Accustomed (U&A) Fishing and Gathering Grounds and Stations; and

WHEREAS, natural hazard events have occurred in the past and larger events can be expected to occur in the future on and near the Lummi Reservation and within the Lummi Nation's U&A; and

WHEREAS, defined hazard management policies and a coordinated hazard management plan, with a focus on the homeland, will reduce the impacts of natural hazard events on the Lummi Reservation and within the Lummi Nation's U&A ; and

WHEREAS, the Council adopted the Lummi Nation Multi-Hazard Mitigation Plan by resolution 2004-015 on January 19, 2004 as recommended by the Lummi Fisheries and Natural Resources Commission, the Lummi Nation Natural Resources Department Director, the Lummi Planning Commission, and the Lummi Law and Justice Commission; and

WHEREAS, the Lummi Nation Multi-Hazard Mitigation Plan identifies proposed actions for hazard preparedness and damage reduction, recommends priorities for natural hazard mitigation, and gains eligibility for future hazard mitigation programs; and

WHEREAS, the Lummi Nation Multi-Hazard Mitigation Plan was developed in compliance with the Stafford Act and FEMA regulations and allows the Lummi Nation to be eligible for certain hazard mitigation and disaster response funding sources; and

WHEREAS, to remain eligible for these funding sources, FEMA requires the Plan to be updated every three years to reflect changes in development, progress in mitigation efforts, and changes in priorities and to be resubmitted to the FEMA Regional Director; and

WHEREAS, members of the Lummi Multi-Hazard Mitigation Team met on January 25, 2007, to review and discuss potential changes to the 2004 plan, provided input on the update, and recommended that the updated plan be presented to the affected Lummi commissions; and

WHEREAS, members of the Lummi Natural Resources Commission, the Lummi Planning Commission, and the Lummi Cultural Commission met on February 28, 2007, were presented with a summary of changes to the 2004 plan, provided input on the update, and recommended that the Council adopt the updated plan; and

WHEREAS, continued implementation of the Lummi Nation Multi-Hazard Mitigation Plan will reduce natural hazard-related damages, reduce environmental impacts of hazard mitigation activities, and reduce the long-term costs of hazard mitigation; and

WHEREAS, the Lummi Nation Multi-Hazard Mitigation Plan is consistent with the Lummi Flood Damage Prevention Code (Title 15A Lummi Nation Code of Laws), the Lummi Zoning Code (Title 15 Lummi Nation Code of Laws), the Lummi Building Code (Title 22 Lummi Nation Code of Laws), and the Water Resources Protection Code (Title 17 Lummi Nation Code of Laws).

NOW THEREFORE BE IT RESOLVED, that the Lummi Indian Business Council adopts the 2007 Lummi Nation Multi-Hazard Mitigation Plan and directs the Directors of the Natural Resources and the Planning departments to continue to designate appropriate staff members to implement the actions identified in the plan; and

BE IT FURTHER RESOLVED, that the Lummi Indian Business Council authorizes the Multi-Hazard Mitigation Team to continue its work and directs the General Manager or his designee to coordinate the ongoing staffing and operations of this team and to ensure its effectiveness; and

BE IT FURTHER RESOLVED, that the Lummi Indian Business Council directs the Multi-Hazard Mitigation Team to report its activities annually to the Lummi Indian Business Council and General Council and to update the plan every three years; and

BE IT FURTHER RESOLVED, that the Chairwoman (or Vice Chairman in her absence is hereby authorized and directed to execute this resolution and any documents connected therewith, and the Secretary (or the Recording Secretary in her absence) is authorized and directed to execute the following certification.

LUMMI NATION

Evelyn Jefferson

Evelyn Jefferson, Chairwoman
Lummi Indian Business Council

CERTIFICATION

As Secretary of the Lummi Indian Business Council, I hereby certify that the above Resolution **#2007-060** was adopted at a **Regular** Meeting of the Council held on the **17th** of **April** 2007, at which time a quorum of **6** was present by a vote of **5** For, **0** Against, and **0** Abstentions(s).

Donna Cultee

Donna Cultee, Secretary
Lummi Indian Business Council

Appendix B:

Public PowerPoint Presentations on the Lummi Nation Multi-Hazard Mitigation Plan, 2003 and 2007

Draft Lummi Nation
Multi-Hazard Mitigation Plan

Natural Resources Commission, Planning Commission, Law and Justice Commission, and Cultural Commission Briefing

December 2003

1

Purpose Statement

- The purpose of this presentation is to:
  - Describe the federal Pre-Disaster Mitigation (PDM) Program
  - Provide an overview of the Draft Multi-Hazard Mitigation Plan (MHMP)
  - Identify natural hazard vulnerabilities on the Lummi Reservation
  - Review past and current hazard mitigation
  - Identify the MHMP priorities and action plan

2

Presentation Outline

- Introduction
- Multi-Hazard Mitigation Plan (MHMP) Overview
- Estimated Hazard Vulnerabilities
- Past and Current Hazard Mitigation on the Reservation
- MHMP Hazard Mitigation Priorities
- MHMP Action Plan
- Summary

3

Pre-Disaster Mitigation Program

- The FEMA PDM program was authorized by the Federal Disaster Mitigation Act of 2000
- Provides funding for hazard mitigation plans and projects
- Lummi Nation received a 2002 PDM planning grant
- By adopting a hazard mitigation plan, the Lummi Nation is eligible to apply for state and federal grant programs to reduce potential damages from hazard events and repair future damages

4

Why a MHMP?

- Proposed actions are a proactive plan for increasing the health and safety of the Lummi people
- Reservation residents will benefit from defined hazard policies and a coordinated hazard plan
- Required for future mitigation funding eligibility
- Establish eligibility for the Lummi Nation as a direct grantee for hazard mitigation grant programs:
  - Pre-Disaster Mitigation Program project grants
  - Hazard Mitigation Grant Program (State EMD)
  - Flood Mitigation Assistance Program (FEMA)
  - Flood Control Assistance Account Program (Ecology)

5

Purpose of the MHMP

- The purpose of the Multi-Hazard Mitigation Plan is to:
  - Assess natural hazard risks on the Lummi Reservation
  - Assess current mitigation capabilities of the Lummi Nation
  - Identify current and potential mitigation measures to increase public safety and reduce future damages on the Reservation
  - Identify mitigation priorities and an action plan

6

Draft Multi-Hazard Mitigation Plan (MHMP) Overview

7

MHMP Table of Contents

Executive Summary

1. Introduction
2. Planning Process
3. Description of the Lummi Reservation
4. Risk Assessment
   Profiles of past events, vulnerability assessments, and estimated potential losses from large events
5. Mitigation Strategy
   Goals and Objectives, Capability Assessment, Mitigation Measures, Mitigation Priorities, Funding Sources, and Action Plan
6. Local Planning Coordination
7. Plan Maintenance Process
8. Summary

8

MHMP Goals

- Reduce the threats to public safety posed by natural hazards
- Reduce the structural damages caused by natural hazards
- Reduce the environmental impacts of natural hazards, mitigation actions, and future development activities
- Reduce the long-term costs resulting from natural hazards and their mitigation

9

MHMP Objectives

- Prevent new development in areas that are vulnerable to hazards or ensure that development occurs in such a way that risk is minimized
- Protect or alter existing development in hazardous areas to make it less susceptible to damage
- Ensure that the solution chosen to protect existing development is the most cost-effective available; protects or enhances cultural resources, natural resources, and sensitive terrestrial, riparian, or coastal habitats; and is consistent with applicable land-use plans and regulations
- Ensure that the benefits of maintaining existing facilities outweigh their costs; if not, redesign projects to make them less susceptible to damage or implement some other type of solution at the site

10

MHMP Objectives

- Redesign existing projects and/or change maintenance practices to protect or enhance riparian or coastal habitats
- Manage floodplains, rivers, streams, and other water resources for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, fish harvesting, open space, recreation, water supply, cultural/traditional practices, and hydropower
- Improve coordination and consistency between the Lummi Nation and other jurisdictions, as appropriate, in management activities for floodplain and coastal areas
- Improve public awareness of natural hazards and appropriate preparation for and response to such hazards
- Improve hazard-warning and emergency response systems

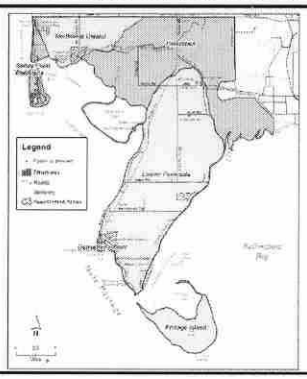
11

Natural Hazards Assessed in MHMP

- Floods
- Earthquakes
- Severe Winter Storms
- Windstorms
- Coastal Erosion
- Drought
- Wildfires
- Landslides
- Tsunamis
- Volcanoes

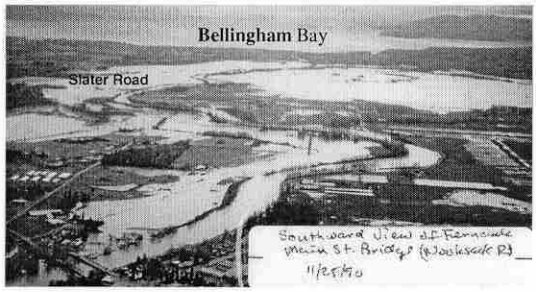
12

Assessment Areas on the Reservation



13

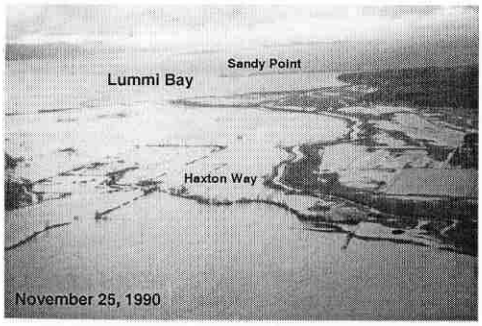
Nooksack River Flood History



November 25, 1990

14

Nooksack River Flood History



15

Coastal Flood History

- Lummi Shore Road, January 2, 2003

16

Coastal Flood History

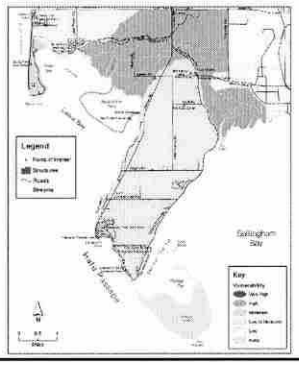
Gooseberry Point, January 2, 2003 (Haxton Way, looking south)

17

Coastal Flood History

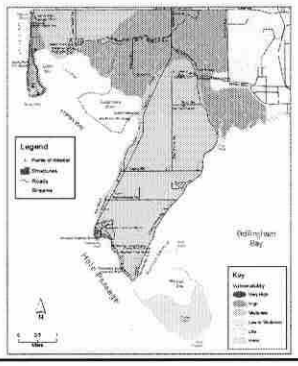
18

Estimated Flood Vulnerability



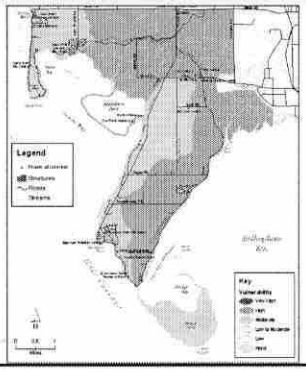
19

Estimated Earthquake Vulnerability



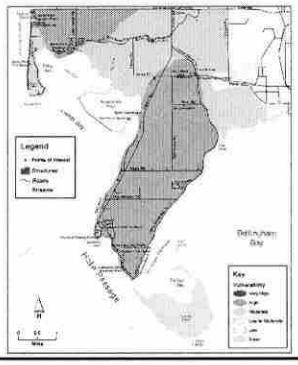
20

Severe Winter Storm Vulnerability



21

Estimated Windstorm Vulnerability



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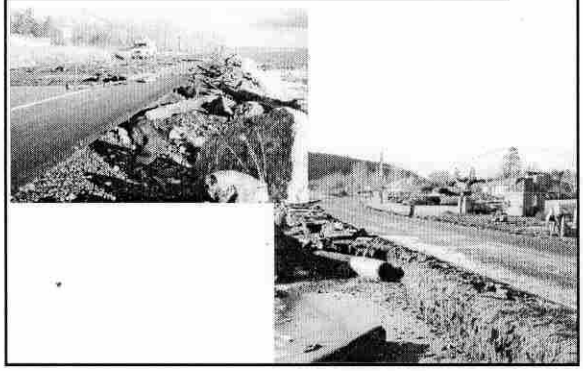
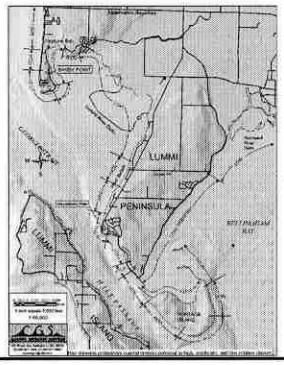
Coastal Erosion on the Reservation



Estimated Coastal Erosion Vulnerability



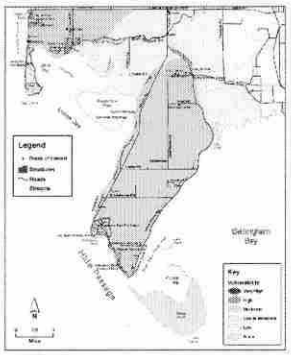
24

Drought Vulnerability

- Drought effects:
  - Ground water shortage/saltwater intrusion
  - Reduced and degraded salmon habitat
  - Increased energy and food costs
  - Economic and job losses
  - Increased fire hazard
- Moderate vulnerability on the Reservation, but low-to-moderate probability of occurrence
  - Direct local effects reduced by maritime climate
  - Indirect effects of severe Eastern WA droughts can be large

25

Estimated Wildfire Vulnerability



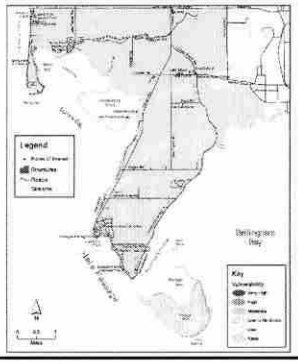
26

Landslide History

- Coastal erosion in the past decade has caused landslides along West Beach (above), Lummi Shore Road, and Lummi View Drive

27

Estimated Landslide Vulnerability



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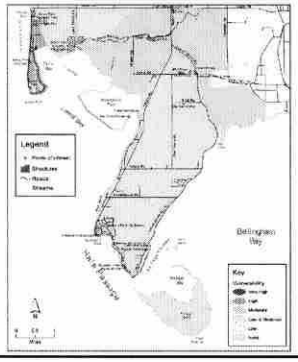
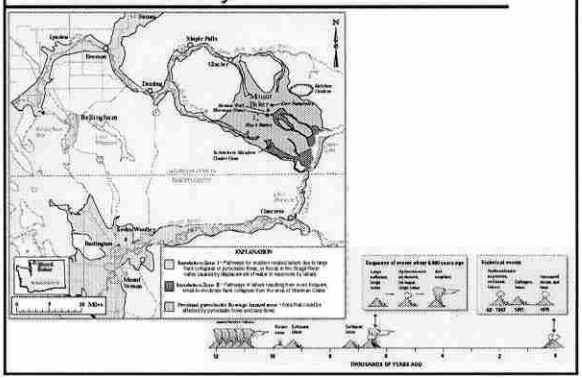
Estimated Tsunami Vulnerability

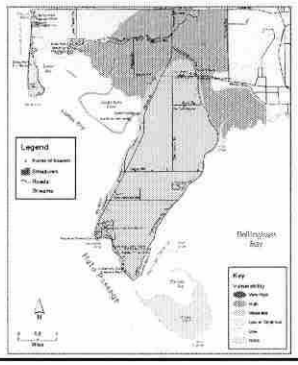


29

Volcano History

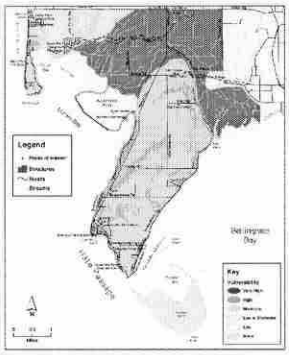


Estimated Volcano Vulnerability



31

Combined Multi-Hazard Vulnerability



32

Past and Current Hazard Mitigation

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Lummi Flood Mitigation History

- Lummi Diking Project, 1926 - 1934: Lummi Bay seawall, Nooksack River levee, Lummi River levees
- Fuse plug in Lummi Bay seawall in 1975
- Floodplain homes raised after 1990 floods
- Tidegates in Lummi Bay seawall replaced and another fuse plug installed in 1998
- Lummi Title 15A Flood Damage Prevention Code, 1997
  - Established eligibility for National Flood Insurance Program (NFIP)

34

Current Mitigation Measures

- Zoning Code
- Building Code (includes wind and earthquake design standards)
- Flood Damage Prevention Code
- Comprehensive Water Resources Management Program
- Comprehensive Plan
- Coastal Zone Management Plan
- Forest Management Plan
- Land-use permit review by the Technical Review Committee
- Emergency Management Response Interim Plan
- Spill Prevention and Response Plan (under development)
- Coordination with the Whatcom County Emergency Management Division, including participation on the Emergency Response Team

35

MHMP Hazard Mitigation Priorities

36

Mitigation Priorities for All Hazards

- Short Term:
  - Establish a Multi-Hazard Mitigation Team;
  - Promote the establishment and maintenance of home survival/emergency kits; and
  - Establish 24-hour emergency medical response capability located on the Reservation.
- Long Term:
  - Pursue funding for the Lummi Nation mitigation priorities and recommendations described in this MHMP, including funding for needed staff and infrastructure;
  - Improve and sustain public education programs aimed at mitigating natural hazards;
  - Redirect and/or relocate development away from hazard areas.

37

Mitigation Priorities for Floods, Tsunamis, and Volcanic Hazards

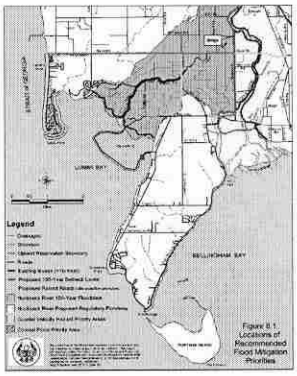
- Protect the Nooksack River floodplain on the Reservation and maintain access to the Lummi Peninsula by constructing a 100-year setback levee that extends along Ferndale Road from Ferndale to Kwina Slough, then along the north side of Kwina Slough to Marine Drive, and finally along Marine Drive to Lummi Shore Road (the levee should include a bridge over the Lummi River channel and culverts allowing flow under Marine Drive)
- Reduce the potential for flood damage along the low-lying coastal areas and concurrently reduce damage done to shoreline resources by bulkheads through the acquisition or relocation of flood-prone structures currently located in the coastal velocity zones

38

Mitigation Priorities for Floods, Tsunamis, and Volcanic Hazards

- Raise Slater Road to the 100-year flood level both east and west of the Nooksack River and use bridges or causeways to allow floodwaters to pass downstream
- Protect, acquire, or relocate vulnerable structures in the coastal and riverine floodplains, outside of the velocity zone and floodway, respectively
- Provide access to the Lummi Peninsula in the case of levee failure by raising Haxton Way and providing for the flow of floodwaters under Haxton Way (this could serve as an interim measure prior to construction of a 100-year setback levee)

39



40

Mitigation Priorities for Other Hazards

- Encourage seismic strength evaluations of critical facilities on the Reservation to identify vulnerabilities for mitigation of schools, public infrastructure, and critical facilities to meet current seismic standards
- Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices
- Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events

41

Mitigation Priorities for Other Hazards

- Continue monitoring of erosion rates along the shorelines of the Reservation
- Limit construction in identified landslide areas and encourage construction and subdivision design that can be applied to sloped areas to reduce development effects on landslide vulnerability
- Install tsunami warning and evacuation route signs in hazard areas and provide residents in the hazard areas with updated information on the tsunami hazard, including the probability of occurrence, potential size of the hazard, signs of an impending tsunami, and best route to avoid a tsunami

42

Recommended Action Plan of MHMP

43

Recommended Action Plan

- Establish and maintain a Multi-Hazard Mitigation Team composed of representatives from pertinent LIBC departments and other organizations on the Reservation
- Pursue funding for the Lummi Nation mitigation priorities and recommendations described above, including funding for needed staff and infrastructure
- Approve a Comprehensive Plan that is aligned with the provisions of the Title 15A Flood Damage Prevention Code, the FDRP, the CZMP, other hazard-related ordinances, and the recommendations of this MHMP
- Coordinate hazard planning with other jurisdictions and review any actions proposed for the Nooksack watershed that may affect flooding on the Reservation (i.e., all proposed actions)

44

Recommended Action Plan

- Review and possibly amend the Flood Damage Prevention Code in response to an analysis of future-conditions flood levels and flood management actions implemented throughout the Nooksack River watershed
- Review potential participation in the Community Rating System and, if desirable and practicable, take appropriate actions to earn points toward discounts of flood insurance premiums for residents of the Reservation
- Continue to review hazard maps for accuracy and any changes in the estimated vulnerability of the Reservation
- Coordinate LIBC emergency response efforts with those of Whatcom County and other jurisdictions/agencies
- Implement a public education effort that will inform residents of the potential hazards

45

Summary

- The Lummi Reservation has significant exposure to ten natural hazards
- Large disasters will occur at some point in the future
- A coordinated hazard plan and a defined action plan will better protect Reservation residents
- By approving the MHMP, the LIBC will:
  - establish policies for reducing hazard damages
  - recommend priorities for reducing hazard damages
  - set a course of action
  - gain eligibility for future hazard mitigation grants
- Some recommendations will require further study
- Implementation will require adequate staff commitment and funding

46

Recommended Action

- Pass a motion that recommends to the LIBC that they adopt a resolution approving the MHMP

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Lummi Nation
Multi-Hazard Mitigation Plan
Update

Natural Resources Commission,
Planning Commission, Law and Justice Commission, and
Cultural Commission Briefing
February 27, 2007

1

Purpose

- Provide an overview of the existing Multi-Hazard Mitigation Plan (MHMP)
- Review FEMA's update requirement
- Present the changes and seek commissioner input
  - planning process
  - risk assessments
  - mitigation strategy
    - » action plan
- Seek approval of update

2

Presentation Outline

- Review MHMP purpose, need, and content
- Overview of update requirement
- Overview of mitigation efforts, 2004-2007
- Review for update of plan components, proposed changes
  - Planning process
  - Hazard Identification and Vulnerability Assessment
  - Mitigation strategy
    - » Action plan
- Additional input
- Request for approval

3

The Lummi Nation MHMP

- Written in compliance with the Stafford Act through the FEMA Pre-Disaster Mitigation (PDM) program.
  - Provides funding for hazard mitigation plans and projects
  - Lummi received a 2002 PDM planning grant
- Adopted by LIBC on January 19, 2004
  - Presented to Commissions in December, 2003
  - Motion passed to recommend LIBC adoption
- Approved by FEMA on May 5, 2004
  - First of its type approved in the nation
- An eligibility requirement for certain FEMA funding
  - Public Assistance, Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Severe Repetitive Loss, Repetitive Flood Claims

4

Purpose of the MHMP

- Assess natural hazard risks on the Lummi Reservation
- Assess current mitigation capabilities of the Lummi Nation
- Identify current and potential mitigation measures to increase public safety and reduce future damages on the Reservation
- Identify mitigation priorities and an action plan

5

MHMP Update

"State" level plans must be:

- Reviewed and revised to reflect
  - Changes in development
  - Progress in mitigation efforts
  - Changes in priorities
- Resubmitted to the FEMA Regional Director
- Every three years
- 45 day FEMA review

6

MHMP Update

- Planning process
  - Original - How plan was developed
  - Update - How it was reviewed and revised
- Risk assessment, by hazard
  - Events since 2004
  - Review vulnerability assessment – still accurate?
- Mitigation strategy
  - Goals and objectives
  - Capability assessment
  - Mitigation actions

7

Mitigation Activity Since 2004

- Established Multi-Hazard Mitigation Team
- Slater Road Elevation (PDM)
- Sandy Point Acquisition (PDM)
- Tsunami warning system grant (EMPAG)
- Tsunami brochures with the State
- Progress towards joining Community Rating System (CRS)
- Participated twice in PDM National Evaluation
- Addressing project
- LNR staff obtained CFM certification
- Shared plan and applications with other tribes
- Addition of public health nurse to LIBC
- Engineering study for seaponds tidegate repair

- Updates to Flood Damage Prevention Code
  - Addition of floodplain permit application
- Natural Hazard conferences
  - Pierce County volcano workshop
  - Three regional floodplain management conferences (NORFMA)
- Public education
  - 12 Squol Quol articles on grants, projects, personal preparedness.
- MHMP posted on Lummi web site (www.lummi-nsn.gov)
- Forestry Division developed fire-fighting capability for forest fires – equipment and training
- Obtained CISN earthquake response system

8

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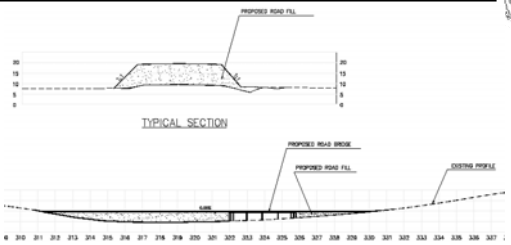
Slater Road Elevation



- Progress
  - Contract with Whatcom County
  - Selection of consultant for design and permitting
  - Design work in progress
  - Permitting in progress
  - Request for bids by November, 2007

10

Mitigation Activity Since 2004

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11

Sandy Point Coastal Acquisition

12

Mitigation Activity Since 2004

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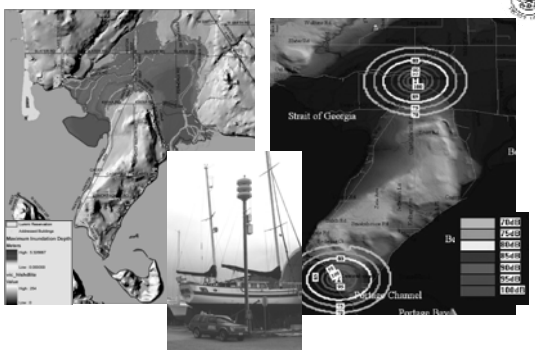
13

Tsunami Warning Systems



14

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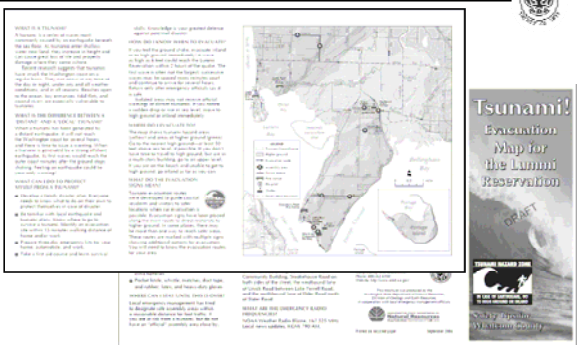
15

Tsunami Evacuation Routes



Review of Plan Components and Updates

17

Plan Components

- Planning process
- Hazard Identification and Vulnerability assessments
- Mitigation strategy
  - Action plan

18

Natural Hazards Assessed

1. Floods
2. Earthquakes
3. Severe Winter Storms
4. Windstorms
5. Coastal Erosion
6. Drought
7. Wildfires
8. Landslides
9. Tsunamis
10. Volcanoes
11. Tornadoes

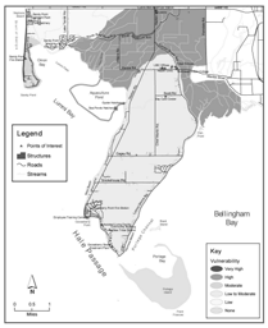
Assessment Areas on the Reservation

Flood Events, 2004-2007

- Nooksack River flooding
  - November 25, 2004 – 12 year event, 42,000 cfs
  - January 19, 2005 – approximately 3 year event, 29,100 cfs, 18.61 feet at Ferndale
  - November 7, 2006 – Marine Drive and Slater Road closed
  - January, 2007 – flood warning issued, Marine Drive closed for 3 days
  - Slater Road closed 6 times from 2003 through 2006, from 24 hours to almost 3 days long
  - Marine Drive closed 12 times from 2003 through 2006 – from 2 to 9 days long
- Coastal flooding
  - January 12, 2005 flood watch issued for Sandy Point
  - December 27, 2006 – minor flooding, yards and Sucia Drive

Estimated Flood Vulnerability

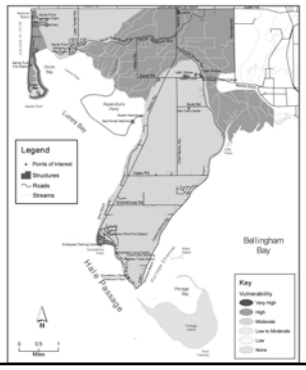
- Vulnerability
  - Based on physical effects, isolation, road closures, damage to buildings, damage to infrastructure
- Changes
  - None
  - Hazard mitigated by:
    - » Slater Road elevation and Smuggler's Slough project – for 2010
    - » Addition of CFM
    - » Completion of CAV
    - » Joining CRS -2010



Earthquake Events, 2004-2007

- Events
  - July 19, 2004 – 6.4 magnitude earthquake of the west coast of Vancouver Island
  - March 2005 - Underwater eruptions from earthquakes off of Vancouver Island – shaking on the Juan de Fuca Ridge
  - November 23, 2005 - 4.1 magnitude earthquake near Kendall
- New information
  - Potential that CSZ quake could be less severe than predicted
  - Liquefaction and site class maps from DNR

Earthquake Vulnerability



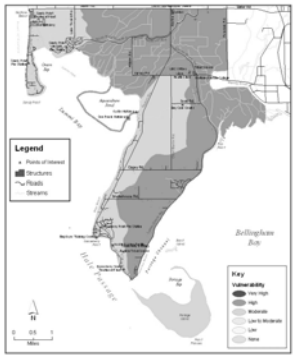
- Vulnerability
  - Based on severity of earthquake, construction quality, geology
- Changes
  - None, unless indicated by DNR maps
  - Hazard mitigated by:
    - » New construction compliance with building codes according to earthquake zone
    - » Hotel, casino expansion, NWIC, K-12, Wexliem, Little Bear Creek, Archives, Fitness Center, etc.

Winter Storm Events, 2004-2007

- Events
  - January 11, 2005 – Sudden Valley
  - February 4, 2006 – wind storm, sustained 40 mph winds, gusts to 69 mph
  - February 15 – 16, 2006 – freezing temperatures, no snow
  - November 27, 2006 – 6-12 inches of snow, temperatures in mid 20's to low 30's. Closed LIBC and Lummi School for three days
  - January 10, 2007 – snow accumulations up to 10 inches, temperatures in the 20's, winds 20-40 mph, gusts up to 65, LIBC and Lummi School closed Wednesday afternoon, Thursday, and Friday
  - January 15, 2007 – 2 to 4 inches of snow

25

Severe Winter Storm Vulnerability



- Vulnerability
  - Based on degree of exposure/ forestation and wind direction
- Changes
  - None
  - Hazard mitigated by:
    - » Information on preparedness
      - 72-hour kits
      - Family plans

26

Windstorm Events, 2004-2007

- Events
  - October 26, 2005 – 44 mph gusts
  - January 27-February 4, 2006
    - » State declared disaster
  - February 1, 2006 – to 41 mph
  - February 4, 2006 – county makes emergency declaration, 40 mph winds with gusts to 69 mph, Sandy Point and Gooseberry Point flooding
  - November 6-9, 2006
  - November 15, 2006, wind from the SE, 30-45 mph, gusts to 82 mph, power lost to Little Bear Creek – generator too small, 135,000 customers lost power statewide
  - December 11, 2006 – gusts up to 41 mph, high wind warning, flights cancelled
  - December 14, 2006, high wind warning, SE winds 40-50 mph with gusts to 75
- New information
  - Some new information on historic storms

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Windstorm Events, 2004-2007

November 15, 2006

February 4, 2006

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Estimated Windstorm Vulnerability

Figure 4.10 Estimated Windstorm Vulnerabilities in Reservation Areas

- Vulnerability
  - Based on degree of exposure/ forestation and proximity to shoreline
- Changes
  - None
  - Hazard mitigated by:
    - » Information on preparedness
      - 72-hour kits
      - Family plans

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Tornado Events and Vulnerability

- Events
  - April 27, 2004 – F-0, east of Sumas, 70 mph, traveled 2.7 miles
  - 1 to 2 tornadoes reported in western Washington each year
  - October 7, 1997 – waterspout in Bellingham Bay
  - June 21, 1997 – funnel cloud near Lynden
  - May 31, 1997 – six tornadoes in WA in one day, new record of 14 tornadoes that year
  - 1989 – record of four tornadoes throughout state
  - April 5, 1972 – three tornadoes in state, two F-3s and an F-2, six deaths and 300 injuries, $50 million in damage
- Vulnerability
  - Same criteria as for windstorms - based on degree of exposure/ forestation and proximity to shoreline

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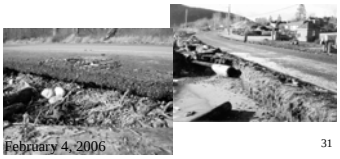
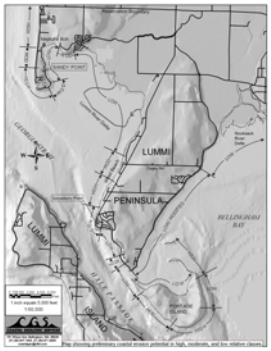
Coastal Erosion Events, 2004-2007

- Events
  - March 1, 2006 report from Coastal Geologic Services
    - » Lummi Shore Road – further deterioration of revetment
  - August 29, 2006 report from Coastal Geologic Services
    - » South Cape, Sandy Point – erosion rate between 2.5 and 3.4 feet/year from 1996 to 2006
  - Erosion exposed force main near Little Bear Creek
- New information
  - CGS reports



Coastal Erosion Vulnerability



- Vulnerability
  - Based on erosion rates
- Changes
  - None
  - Hazard mitigated by:
    - » PDM buyout
    - » CGS monitoring
    - » Movement of LVD inland

Drought Events, 2004-2007

- Events
  - March 10, 2005 – statewide drought proclamation issued by Ecology, state provides $8.2M in relief
  - September 7, 2006 – Bellingham had driest July and August on record with 0.17" of rain
- Vulnerability
  - Equal across Reservation
  - Use of low production wells, agriculture areas
- Changes
  - None
  - Hazard mitigated by:
    - » Development of Water Facilities Plan
    - » Adoption of WRIA 1 Watershed Management Plan and Instream Flow/Fish Habitat Plan

Wildfire Events, 2004-2007

- Events
  - 2004 Portage Island fire
  - Two fireworks fires: August 15 and 18, 2005, less than one acre total
- New information
  - March 24, 2006 – more wildfires expected with global warming
  - February 19, 2007 – number of wildfire deaths rising, 24 in 2006

Estimated Wildfire Vulnerability

Figure 4.14 Estimated Wildfire Vulnerabilities in Reservation Areas

- Vulnerability
  - Based on fuels, topography, and weather
- Changes
  - None
  - Hazard mitigated by:
    - » Establishment of fire team
    - » Wildfire brochure
    - » Burn ban signs/brochure
    - » Updates in progress to Forest Management Plan

Landslide Events, 2004-2007

- Events
  - January 6, 2006 – landslide advisory issued for Seattle
  - January 17, 2006 – heavy rainfall increases landslide potential in Whatcom County, 9" over 29 days
- New information
  - LIDAR – high resolution elevation data

Estimated Landslide Vulnerability

Figure 4.16 Estimated Landslide Vulnerabilities in Reservation Areas

- Vulnerability
  - Based on slope steepness
- Changes
  - Refine map using LIDAR digital elevation model
  - Hazard mitigated by:
    - » Use of LIDAR
    - » Use of TRC

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Tsunami Events, 2004-2007

- Events
  - December 26, 2004 – Indian Ocean tsunami, 20 foot waves, 9.0M earthquake, >180,000 killed
  - June 14, 2005 – 7.0M earthquake off of CA, tsunami warning issued for coast to Vancouver Island, cancelled
  - July 17, 2006 – Indonesia tsunami, 6 feet high, 7.7M earthquake, 69 deaths
  - November, 2006 – tsunami advisory for WA coast, 8.1M earthquake off of Russia

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Estimated Tsunami Vulnerability

Figure 4.17 Estimated Tsunami Vulnerabilities in Reservation Areas

- Vulnerability
  - Based on elevation, modeling, flood hazard
- Changes
  - None
  - Hazard mitigated by
    - » Sandy Point AHAB
    - » 2 additional AHABs
    - » Blaine transmitter
    - » Public information
    - » NOAA weather radios
    - » Evacuation route brochures
    - » PDM buyout

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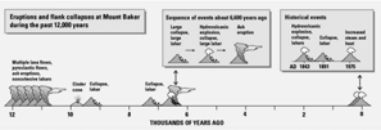
Volcano Events, 2004-2007

- Events
  - Sept 2004-March 2005 - Mount St. Helens activity, earthquake swarms, steam and ash explosions, lava dome growth
- New information
  - October 2006 volcano workshop



40

Estimated Volcano Vulnerability

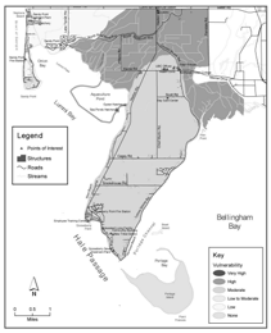


Figure 4.19 Estimated Volcano Vulnerabilities in Reservation Areas

- Vulnerability
  - Based on ash fall, road detours, road closures (isolation), lahar zone
- Changes
  - None

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Combined Vulnerability

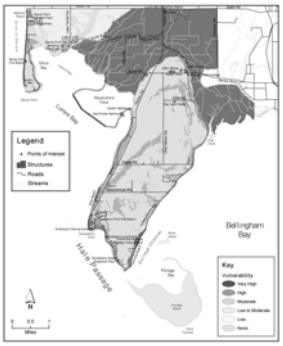

Figure 4.20 Combined Overall Estimated Vulnerability on the Reservation

- Vulnerability
  - Based on combination of all hazards (except drought and coastal erosion)
- Changes
  - Inclusion of tornado

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Plan Components

- Planning process
- Vulnerability assessments
- Mitigation strategy
  - Goals and objectives
  - Capability assessment
  - Mitigation actions
  - Action plan

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MHMP Goals

- Reduce the threats to public safety posed by natural hazards
- Reduce the structural damages caused by natural hazards
- Reduce the environmental impacts of natural hazards, mitigation actions, and future development activities
- Reduce the long-term costs resulting from natural hazards and their mitigation

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MHMP Objectives

1. Prevent new development in areas that are vulnerable to hazards or ensure that development occurs in such a way that risk is minimized
2. Protect or alter existing development in hazardous areas to make it less susceptible to damage
3. Ensure that the solution chosen to protect existing development is the most cost-effective available; protects or enhances cultural resources, natural resources, and sensitive terrestrial, riparian, or coastal habitats; and is consistent with applicable land-use plans and regulations
4. Ensure that the benefits of maintaining existing facilities outweigh their costs; if not, redesign projects to make them less susceptible to damage or implement some other type of solution at the site

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MHMP Objectives

5. Redesign existing projects and/or change maintenance practices to protect or enhance riparian or coastal habitats
6. Manage floodplains, rivers, streams, and other water resources for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, fish harvesting, open space, recreation, water supply, cultural/traditional practices, and hydropower
7. Improve coordination and consistency between the Lummi Nation and other jurisdictions, as appropriate, in management activities for floodplain and coastal areas
8. Improve public awareness of natural hazards and appropriate preparation for and response to such hazards
9. Improve hazard-warning and emergency response systems

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Capability Assessment

- Capability originally described by:
  - Land use plans and development regulations
  - Flood damage reduction plans
  - Wildfire policies and programs
  - Emergency management plan
- Capability has been improved through:
  - Drafting of Comprehensive Plan, Planning
  - Title 15 development regulations
  - Improvements to Title 15A and its implementation
  - New Forest Management Plan
  - Finalization and adoption of Comprehensive Emergency Management Plan

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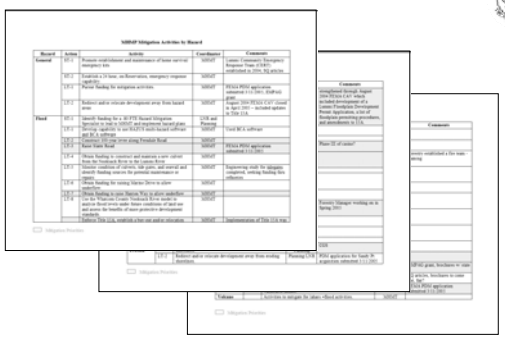
Mitigation Actions - Original



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Existing Action Plan

- Establish and maintain a Multi-Hazard Mitigation Team composed of representatives from pertinent LIBC departments and other organizations on the Reservation
- Pursue funding for the Lummi Nation mitigation priorities and recommendations described above, including funding for needed staff and infrastructure
- Approve a Comprehensive Plan that is aligned with the provisions of the Title 15A Flood Damage Prevention Code, the FDRP, the CZMP, other hazard-related ordinances, and the recommendations of this MHMP
- Coordinate hazard planning with other jurisdictions and review any actions proposed for the Nooksack watershed that may affect flooding on the Reservation (i.e., all proposed actions)

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Existing Action Plan

- Review and possibly amend the Flood Damage Prevention Code in response to an analysis of future-conditions flood levels and flood management actions implemented throughout the Nooksack River watershed
- Review potential participation in the Community Rating System and, if desirable and practicable, take appropriate actions to earn points toward discounts of flood insurance premiums for residents of the Reservation
- Continue to review hazard maps for accuracy and any changes in the estimated vulnerability of the Reservation
- Coordinate LIBC emergency response efforts with those of Whatcom County and other jurisdictions/agencies
- Implement a public education effort that will inform residents of the potential hazards

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Mitigation Actions - Additions

- Hire an Emergency Manager within the Police Department
- Improve public outreach and education about hazards, Lummi efforts, and individual preparedness
- Improve meeting regularity for MHMT
- Prioritize earthquake retrofitting based on site class and liquefaction maps
- Inventory existing generator supply, improve
  - Purchase back-up generator for LTSWD to maintain pump stations during power outages
- Complete revisions to Forest Management Plan
- Write Wildfire Management Plan
- Pursue funding to complete Elevation Certificates for tribal homes in the floodplain
- Relocate Commodity Foods
- Purchase flood insurance for LIBC buildings in the floodplain

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Summary of Proposed Changes

- Planning Process
  - Don't need annual plan review by MHMT
  - MHMT composition
- Hazard Identification and Vulnerability Assessment
  - Addition of one hazard – tornado
  - No major changes to vulnerabilities
    - » Potential refinement of earthquake hazard
    - » Increased coastal erosion – no change in areas of vulnerability
    - » Potential refinement of landslide mapping with LIDAR
    - » Explanation of mitigation actions
- Mitigation Strategy
  - Incorporate Spill Plan goals and objectives
    - » Goal – minimize adverse effects
    - » Objectives – prevention, preparedness, response
  - Addition of Emergency Manager to all-hazards mitigation actions – a priority action
  - Add recommended items to mitigation measures, mitigation priorities, and action plan

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Summary

- The Lummi Reservation has significant exposure to eleven natural hazards
- Large disasters will occur at some point in the future
- A coordinated hazard plan and a defined action plan will better protect Reservation residents
- By approving the MHMP update, the LIBC will:
  - confirm policies for reducing hazard damages
  - recommend priorities for reducing hazard damages
  - set a course of action
  - retain eligibility for future hazard mitigation grants
- Some recommendations will require further study
- Implementation will require adequate staff commitment and funding

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Recommended Action

- Pass a motion that recommends to the LIBC that they adopt a resolution approving the MHMP update.

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Commissioner's recommendations/input

- Hazards
  - Winterstorms – color east side of Sandy Pt to high – same as peninsula – hit by same wind (is there an elevation line or will all of SP end up being "high"
  - Coastal erosion – fish point – increase in cliff, point is being washed away – Dicky Greene
  - Wildfire – LD said Zach is looking to purchase a pumper truck
  - Flood – elevation of Haxton Way – County is working on, needs BIA money
- Al – need to make connection between existing regs/plans and recommendations – how do things link up – what is long, long, term approach
- Actions
  - Randy – need a truck to handle snowstorms (sanding, plowing), Richard – is talking with County and working on this
  - ASJ – improve coordination with CEMP
- Approval – Richard – take it to council and say you presented to commissions – no need to go before individual commissions
- In attendance – Cliff Cultee (LNR), Richard Jefferson (P), Doug McD (P staff), Randy Kinley (C), Jeremy Freimund (L staff), Merle Jefferson (L staff), Leroy Deardorff (L), Richard M Greene (C, P), Al Scott Johnnie (C), James Wilson (L), David Leach (P), Stacy Fawell (L staff), Elden Hillaire (L) - noone from Law and Justice Commission

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Thank You

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Appendix C:

Lummi Nation Comprehensive Emergency Management Plan

LUMMI NATION

Comprehensive Emergency Management Plan

FOR OFFICIAL USE ONLY

To develop and complete this CEMP

Chief of Police
Lummi Nation Police Department
2616 Kwina Rd
Bellingham, WA 98226

For Further Information Contact:

NW Tribal Emergency Management Council
7720 Waterworks Road
Tulalip, WA 98201
Phone: 360-658-2904
Dispatch: 360-651-4608
Fax: 360-651-3360
Contact: Lynda Harvey, Curt Russell

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Appendices

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Emergency Support Functions

- ***List of ESF's***

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- ESF 2 – Telecommunications/Information Systems and Warning
- ESF 3 – Public Works and Engineering
- ESF 4 – Fire Service
- ESF 5 – Information Analysis and Planning
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- ESF 21 – Recovery and Restorations
- ESF 22 – Law Enforcement
- ESF 23 – Damage Assessment
- ESF 24 – Evacuation and Movement
- ESF 25 – Reserved for Additional State ESF's

- ESF 26 – Reserved for Additional State ESF's
- ESF 27 – Reserved for Additional State ESF's

Jump to start of ESF section while in Word

Emergency Contact Numbers

Business Hours:

8:00 a.m. – 4:30 p.m.

After Hours:

After hours, weekends, and holidays:

Contact Lummi Nation Police Department on duty officer at 9-1-1. The LNPD maintains a 24 hour duty schedule.

Emergency Contact Numbers & Persons:

Name	Primary Contact #	Secondary Contact #
Gary James	**360.384.2266**	**360.815-3298**
Evelyn Jefferson	**360.384.1489**	
Merle Jefferson	**360.384.2277**	**360.410.1706**

Silver Reef Casino Emergency Numbers and Contact Persons

Name	Primary Contact #	Secondary Contact #
Chad Sherfey, Security Director	**360.383.0777**	
Harlan Oppenheimer, General Manager	**360.383.0777**	
Sam Wetzler, TGA	**360.383.0777**	

Radio Frequencies

Whatcom EOC Radio Frequencies

	VHF	RX	TX	TX PL Tone
1.	Fire 1	154.430	154.430	114.800
2.	Fire 2	154.220	154.220	114.800
3.	Fire 3	154.340	154.340	114.800
4.	Fire 4	154.325	154.325	114.800
5.	HEAR	155.340	155.340	173.800
6.	RED NET	153.830	153.830?	
7.	WCSO/Lummi PD Primary	155.610	155.610	100.000
8.	BPD	155.070	155.070	114.800
9.	Border Patrol	163.625	162.825	c/s-100.0
10.	State LERN	155.370	155.370	
11.	NLEEC	155.475	155.475	
12.	Search & Rescue	155.160	155.160	100.000
13.	BMRC	155.205	155.205	
14.	WCPW	150.995	150.995	
15.	WCPW Repeater	150.995	156.180	100.000
16.	OSCCR	156.135	156.135	
17.	Coast Guard CH 16	156.800	156.800	
18.	Coast Guard CH 21A	157.050	157.050	
19.	Coast Guard CH 22A	157.100	157.100	
20.	D.N.R.	151.415	151.415	
21.	State Parks	151.280	151.280	
22.	NCNP	166.750	166.750	
23.	USFS	169.925	169.925	146.200
24.	NOAA Wx	162.550		

	UHF					
				TX	*RX*	*TX*
Tone				*RX Tone*		
1.	WCSO (TOAD	458.325	453.325	107.2	118.8	
2.	BHAM (SEHOME)	458.225	453.225	100.0	c/s	
3.	BHAM (CITY HALL)	458.225	453.225	118.8	c/s	
4.	BHAM (SIMPLEX)	453.225	453.225	118.8	c/s	
5.	WCSO JAIL	453.975	453.975	023	023	
6.	SUDDEN VALLEY	469.425	464.425	118.8	118.8	
7.	WC PARKS TRANS	458.500	4453.500	118.8	118.8	
8.	BHAM TRAN	458.425	453.425	151.4	151.4	
9.	PORT OF BHAM	458.875	453.875	123.0	123.0	
10.	EAS WHATCOM	455.0625	450.0625	100.0	100.0	
11.	WWU SECURITY	458.550	453.550	118.8	100.0	
12.	WWU SIMPLEX	453.550	453.550	100.0	100.0	
13.	SEA CITY LIGHT	456.150	451.150	156.7	c/s	
14.	WCSO NEWHALEM	458.325	453.325	107.2	118.8	
15.	MED 2	468.025	463.025	156.2	156.2	
16.	MED 4	468.075	463.075	156.2	156.2	

17. KGMI	**455.350**	**450.350**	**27.0**	**27.0**
18. WCSO RACEHORSE	**458.325**	**453.325**	**100.0**	**118.8**
19. WCSO CONNIE	**458.325**	**453.325**	**118.8**	**118.8**
20. WCSO SIMPLEX	**453.325**	**453.325**	**118.8**	**118.8**

LIBC Radio Frequencies

1. **LIBC – Trunked**
    a. **LNS School**
    b. **Facilities**
    c. **Head start**
    d. **High School Transport**
    e. **IS**
    f. **Operation & maintenance**
    g. **Tribal School Ops**
    h. **Tribal School**

Note: Radio frequencies maintained thru contract with Wiztronics
1800 Ellis St
Bellingham, WA
(360) 733-5560

Distribution Page

This plan will be distributed to all participating Tribal Departments and entities that have designated responsibilities delineated within this plan.

Primary Distribution

Lummi Indian Business Council
Lummi Nation Police Department
Lummi Tribal Health Clinic Personnel
LIBC Housing
Lummi Water & Sewer
LIBC Maintenance
Lummi Nation Schools
LIBC Natural Resources
LIBC Finance
LIBC Maintenance
Silver Reef Casino

Secondary Distribution

Whatcom County Department of Emergency Management
Washington State EMD
Washington State Patrol
City of Bellingham
City of Ferndale
Whatcom County Fire District #8
Whatcom County Fire District #17
Whatcom County Fire District #7
Region I Homeland Security Tribal Committee
Northwest Tribal Emergency Management Council
Region I Homeland Security Council

CEMP Suggestion Form

Dear CEMP Reviewer:

Fill in your name, title, department, address, phone and fax number. There are three review sections: (1) Basic Plan, (2) Appendices and (3) Emergency Support Functions. Fill in the blanks regarding the location of information in the plan being reviewed. Attach marked-up copies to this sheet with any suggested changes. Make other suggestions or comments in the space provided below. Add extra sheets as necessary. Thank you in advance for your contributing efforts and for taking the time to make the Lummi Tribe Comprehensive Emergency Management Plan better.

Mail or Drop Off at:

Lummi Nation Police Department
2616 Kwina Rd
Bellingham, WA 98226
360-384-2266

Name _____ Title _____

Agency/Department _____

Address _____

City _____ State _____ Zip Code _____

Phone _____ Fax _____

Email _____

Suggestions or Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Revisions

Change No.	Date Entered	Contents of Change	Initials
Initial creation	12/29/05	New Document	CGR

Basic Plan

Introduction

The Lummi Tribal government has the responsibility for protecting life, property and environment threatened by natural or manmade disasters. Tribal emergency responders provide services such as rescue and medical treatment of the injured, evacuation of Tribal members at risk, initial isolation of an area, and identification of hazard. Tribal responders also notify other local, state, Tribal, and Federal agencies per applicable laws, regulations, plans and mutual aid agreements. The Lummi Tribe Comprehensive Emergency Management Plan provides a decision-making management system that facilitates Tribal involvement for multi-agency and multi-jurisdictional response to natural or technological disasters. The Lummi Tribe Comprehensive Emergency Management Plan recognizes and adapts to each agency's authority and responsibility.

When a natural disaster or man caused disaster requires an emergency response, a tiered response flow typically occurs. The general order of the tiered response is as follows:

1. Lummi Tribal First Responders
2. Local first responders from the surrounding area (including the public and private sector resources
3. Regional first responders
4. State responders
5. Federal responders

A Federal response is likely for complex and/or widespread natural hazard or man caused disaster incidents in situations when the incident exceeds the level of response available from state, local and Tribal agencies, or at the request of the Lummi Tribe. Federal response capabilities include providing immediate response resources, access to funds and response coordination, and addressing federal interests. The Lummi Tribe may request State and Federal resources by following established procedures set forth in this document.

Emergency management is a system that through organized analysis, planning, decision-making, and assigning of resources will help prevent, prepare for, respond to and recover from the effects of all- hazards within the Lummi Reservation**.**

1. Mission

1. To coordinate all emergency management activities that protects the members, property, economy and the environment of the Lummi Tribe**.**

2. This is applicable to all natural and man-caused disasters.

3. Disaster is defined as any hurricane, tornado, storm, flood, high water, wind driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snow storm, drought, fire, explosion, hazardous materials incident, incident at fixed nuclear facilities, civil disturbance, terrorism, sabotage, enemy attack, international hostilities, or other catastrophe, emergency or situation in any part of the reservation which in the judgment of the Tribal Council threatens or actually cause damage of sufficient severity and magnitude to warrant execution of this Lummi Tribe Emergency Plan.

4. Provides the following:

    a. A basis for incorporating all Tribal programs, members, individuals and tribal organizations with disaster responsibilities into the emergency program.

    b. Continuity of operations of the Lummi Tribal government.

    c. A comprehensive framework for tribal disaster mitigation, preparedness, response and recovery operations.

5. This follows the planning guidelines outlined by the State of Washington's Comprehensive Emergency Management Plan and is consistent with the Whatcom County Comprehensive Emergency Management Plan.

    a. This shares general emergency management planning concepts with neighboring jurisdictions, but it stands alone.

2. Purpose

To establish the Lummi Tribe Emergency Management functions and responsibilities of the Tribal Council, committees, departments, and programs. This Plan is intended as a comprehensive framework for Tribal wide mitigation, preparedness, response, and recovery activities.

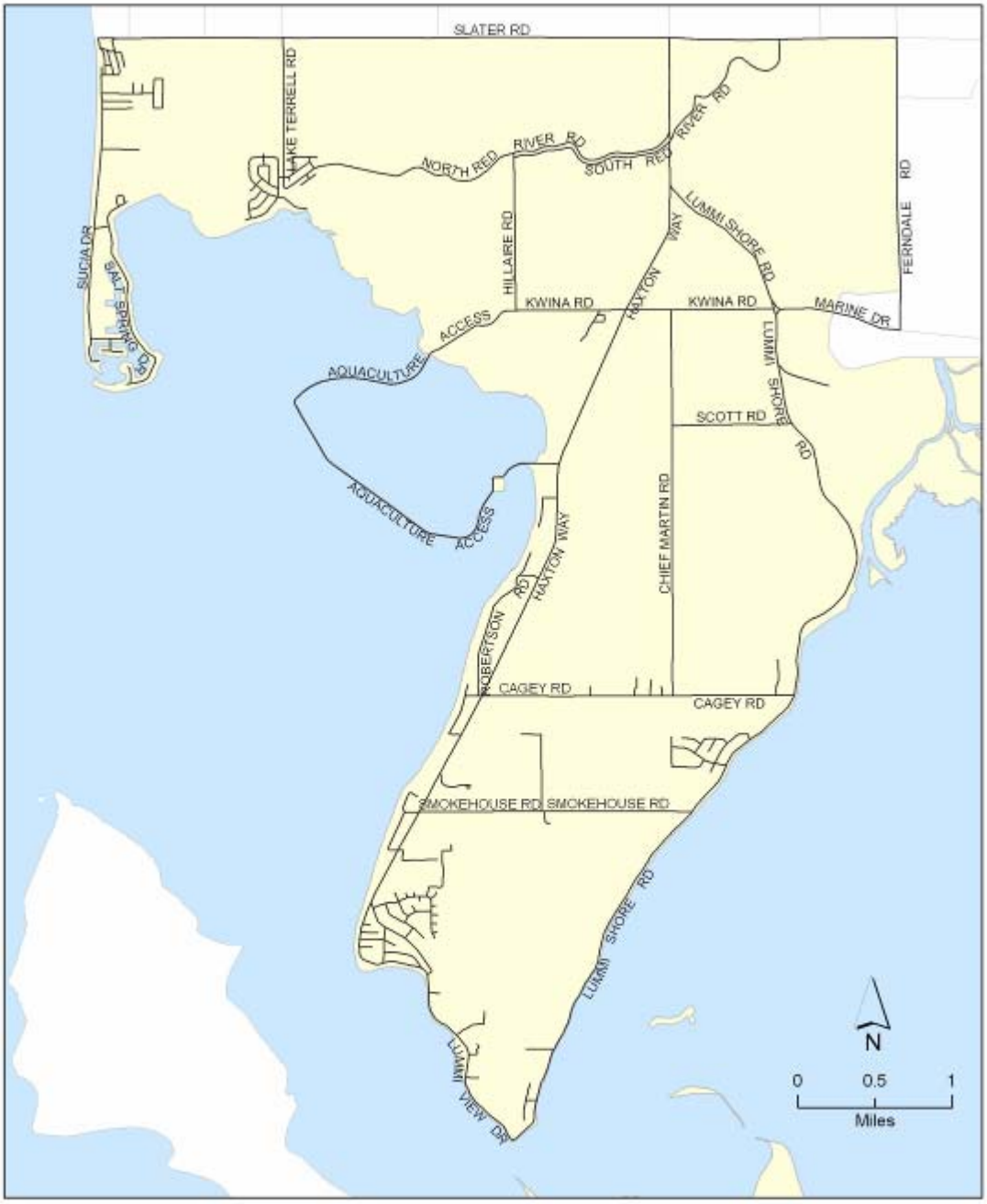
3. Authority

a. The Lummi Tribe Comprehensive Emergency Management Plan has been developed and is maintained under the following authorities:

- Lummi Indian Business Council Resolution 2006-xxxx
- Lummi Tribal Ordinance # XX
- Federal Civil Defense Act of 1950, as amended.
- Public Law 93-288, "Disaster Relief Act of 1974" as amended by PL 100-707, "Robert T. Stafford Disaster Relief and Emergency Assistance Act".
- Public Law 96-342, "Improved Civil Defense".
- Public Law 99-499, "Superfund Amendments and Reauthorization Act of 1986".
- RCW 38.52.070, Local Organizations and Local Organizations authorized-establishment, operation, emergency powers, and procedures
- Other Lummi Tribal Codes and Ordinances

4. Demographics

a. Geographic Area:



Roads of the Lummi Reservation

b. Population:
Enrolled Population Profile:
- As of July 2005, there are 4,259 enrolled Lummi tribal members.
- 49.6% of the enrolled population is female; 50.4% of the population being male
- It is estimated that roughly 2,564 of the enrolled tribal members live within the Lummi Nation.
- It is estimated that, the Nation, for every four enrolled members there is one non-enrolled person that is related to (or lives with) an enrolled Lummi tribal member—thus there is roughly 3,229 individuals affiliated to Lummi living within its boundaries.

Total tribal and non tribal (including non-native) residents within reservation boundaries:
- 6,200 (per Lummi PD)
- Not including transient population. i.e. casino patrons, employees, etc

5. Situation

a. The Lummi Tribe has the responsibility to respond and direct operations to all disasters within their borders.

b. A major earthquake may hamper response by damaging bridges, overpasses, roadways, transportation facilities, communications systems, and public safety facilities.

c. Other natural disasters could damage various lifelines and thus reduce the effectiveness of an emergency response. See the Lummi Nation Hazard Mitigation Plan developed by the Lummi Natural Resources Department, for a more detailed description of the Lummi Reservation's demographics and geography.

Organization and Responsibilities

A. Organization

1. The Lummi Indian Business Council provides oversight to emergency management activities by drafting those ordinances, resolutions, contracts, rules and regulations that are necessary for emergency management within the exterior boundaries of the Lummi Reservation.

2. The Whatcom County Department of Emergency Management (DEM) is charged with the responsibility of coordinating the disaster mitigation, preparedness, and response and recovery efforts of its member agencies under the direction and control of the Emergency Management Council. DEM's jurisdiction includes all unincorporated Whatcom County and the cities and towns of Blaine, Sumas, Lynden, Ferndale, Bellingham, Everson, and Nooksack.

3. DEM's governing body is the Emergency Management Council and is comprised of the cities of Blaine, Sumas, Lynden, Ferndale, Bellingham, Everson, Nooksack (all the cities), the County and the Port of Bellingham.

4. The Mayors of neighboring jurisdictions are responsible, by law, for disaster operations in their respective jurisdictions.

5. The Lummi Nation Director of Emergency Management acts as the staff advisor to the LIBC officials and to DEM during disaster operations using the Incident Command System.

6. The Lummi Tribe government will retain the authority and responsibility for direction and control of its own disaster operations, use of resources and application of mutual aid within its own boundaries.

7. Disaster operations will be coordinated with the Whatcom County Department of Emergency Management and conducted by the two forces, supplemented as necessary, by trained auxiliaries and by manpower available within the local jurisdiction as well as at the county and federal level.

B. Concept of Operations

1. When possible, Whatcom County DEM will provide warning of an impending disaster. If a disaster occurs, Tribal, county, city and all other appropriate forces shall respond.

2. The first priority shall be the preservation of life, with other mitigation and recovery efforts second.

1. Each affected jurisdiction shall maintain control of its own operations, with the Lummi Tribe providing coordination and assistance as necessary.

2. If the disaster should exceed any jurisdiction's capabilities, the Chairman of the Lummi Indian Business Council and/or designee may issue a proclamation of emergency and request additional assistance though local, state and federal agencies.

3. Disaster and Emergency Response Operations will be carried out according to existing plans and shall be coordinated by the LIBC Director of Emergency Management currently housed at the Lummi Nation Police Department.

C. Time Phases of Disaster Operations

Emergency management programs include four functional divisions: mitigation, preparedness, response and recover.

- The **mitigation function** includes programs and activities designed to reduce or eliminate the effects of future disasters upon people and property.

- The **preparedness function** includes activities that encourage a state of readiness in governments, public organizations, businesses, families and individuals that provides the capability to survive a disaster and to ensure the continuity of government.

- The **response function** primarily includes dissemination of warning and emergency information; coordination for the over-all emergency response through the Emergency Operations Center; management of emergency resources; and liaison with state and federal government. DEM is responsible for the coordination of all major disasters and emergencies that may befall the Lummi Tribe. This includes winter storms, floods, earthquake, major fires, Haz-Mat spills/leaks and incidents related to weapons of mass destruction.

- The **recovery function** primarily includes collecting and reporting damage assessment information relating to both government and private property; assisting the establishment of Disaster Application Centers that provide local, state and federal disaster relief programs to citizens; and coordination of the disaster relief activities of community level human services agencies and organizations within the Lummi Tribe reservation boundaries.

1. Mitigation and Preparedness

Before a disaster strikes, Tribal departments should take steps to reduce potential disaster effects.

These steps may include, but are not limited to:

a. Conducting continuous planning studies of potential disaster elements in the Tribe.
b. Reviewing disaster readiness capabilities and upgrading procedures in keeping with changing emergency management and response technology.
c. Encouraging and maintaining interagency cooperation and coordination of readiness planning.
d. Maintaining vehicles, equipment and facilities in a readiness condition.
e. Conducting programs of public information and education on disaster preparedness and personal survival.
f. Reviewing and improving response capabilities by conducting training, drill and exercises.

2. Response-Increased Readiness Period

If a disaster is imminent, all agencies with emergency responsibilities should:

a. Comply with established checklists and review response status and procedures.
b. Notify key staff according to standard operating procedures.
c. Notify the appropriate departments and programs.
d. Prepare and update necessary information for release to the public.
e. Activate the appropriate LIBC Emergency Operations Center.
f. Initiate mitigation and preparedness programs to reduce the effects of the disaster.
g. Initiate all record keeping, data collection and control measures as needed.

3. Response-Emergency Period

When a disaster strikes, all agencies with emergency responsibilities should:

a. Initiate and conduct disaster response operations according to SOPs.
b. Coordinate their response with the Director of Emergency Management and all involved departments and programs within the Lummi Tribe.

c. Keep the Director of Emergency Management and the Lummi Indian Business Council fully advised of actions taken.
d. Assess and evaluate the effectiveness of emergency response efforts and establish priorities in the application of available resources.

4. Recovery Phase

After the threat to life and property has passed, those departments and programs involved in the emergency response should:

a. Obtain detailed damage assessment information.
b. Coordinate the application of resources to meet the long-term needs of the Lummi Tribe.
c. Identify any and all deficiencies in response and conduct after-event critiques to assist in the implementation of actions for improvement.

D. Responsibilities

1. Lummi Indian Business Council

a.) LIBC shall:

1) Establish policy and make major decisions.

2) Direct emergency operations and provide liaison.

3) Activate the Emergency Operations Center

4) Issue proclamations of emergency and requests for assistance.

5) Request additional assistance through Whatcom County Department of Emergency Management.

6) Direct the implementation of emergency response and recovery.

7) Adopt and enact ordinances/resolutions and appropriate revenue.

8) Conduct general council meetings and take action to assist in informing the public and to identify emergency needs.

9) Provide for the continuity of the Tribal government and temporarily fill any vacancy of an elected position by appointment.

b.) The LIBC Director of Emergency Management shall:

1. Be responsible for the current update of the Comprehensive Emergency Management Plan.

2. Coordinate emergency activities of local agencies in preparing and responding to a disaster.

3. Provide communications coordination for response agencies during a disaster.

4. Assist the Tribal Council by providing staff assistance in a disaster.

5. Act as the contact point for requesting disaster assistance from other governmental agencies (except mutual aid).

6. Prepare damage assessment, incident, or disaster analysis reports, as necessary.

7. Warn the public of impending disasters and provide adequate instructions before, during, and after emergencies.

8. Provide reconnaissance and field operations teams.

9. Provide public information and education as it pertains to disaster preparedness and response.

10. Coordinate the use of all available resources.

11. Maintain current Standard Operating Procedures for the Lummi Tribe EM Office (TEMO) disaster responsibilities.

c.) Law Enforcement shall:

1. Operate all dispatch and communications systems

2. Use appropriate crowd and traffic control procedures to limit access to the disaster area.

3. Assist in warnings and carry out the evacuation of citizens from the affected area.

4. Maintain law and order and provide physical security in and around the affected area.

5. Provide incident command for law enforcement oriented disasters.

6. Oversee all security departments during an emergency.

7. Carry out search and rescue missions.

8. Provide damage assessment reports, as necessary.

    a. Develop procedures for the mass arrest and detention of prisoners.

    b. Maintain current suggested operating procedures for disaster responsibilities.

    c. Maintain NIMS (National Incidence Management System) compliance

d.) Fire Services shall be coordinated through Whatcom County Fire District #8 and Whatcom County Fire District #17:

1. Control and/or suppress fires and secure hazardous materials scenes.

2. Provide on-scene medical assistance.

3. Assume incident command of fire related disasters.

4. Provide on-scene search, rescue, and extraction operations.

5. Assist law enforcement, as necessary, in warning and evacuation operations.

6. Provide damage assessment reports, as necessary.

7. Maintain current suggested operating procedures for disaster responsibilities.

8. Coordinate HAZMAT teams to handle hazardous materials incidents.

e.) Finance shall:

1. Ensure disaster-related expenditures are made in accordance with applicable resolutions, ordinances, emergency procurement, and accounting policies.

2. Remove and secure financial records as necessary.

3. Provide personnel for other agencies with disaster responsibilities.

4. Maintain current suggested operating procedures for disaster responsibilities.

5. Assist in the Lummi Tribe EOC, if requested.

f.) Maintenance shall:

1. Maintain/repair major thoroughfares and bridges for emergency vehicles.

2. Provide refuse and debris removal and/or disposal.

3. Keep storm and sanitary sewer, and water systems in operation.

4. Provide barricades and other traffic control equipment as needed.

5. Provide equipment and operators to assist in other emergency situations.

6. Ensure that all tribal trucks and vehicles are fueled and operational.

7. Provide damage assessment reports, as necessary.

8. Provide information on road conditions and status.

9. Maintain current suggested operating procedures for disaster responsibilities.

10. Ensure maintenance and custodial staff are available to carry out search and rescue responsibilities in tribal buildings.

11. Ensure supply and logistic responsibilities are met.

12. Assist in the Lummi Tribe EOC, if requested.

g.) The Lummi Tribal Health Clinic shall:

1. Manage disease control and immunization programs.

2. Ensure the health clinic is operational for the duration of an emergency or disaster and is staffed with medical or first responder personnel.

3. Ensure that an alternate treatment center, as well as the EOC, has supplies needed for emergency medical operations.

4. Ensure that emergency medical supplies are stored for use at both main and alternate storage facilities.

5. Maintain an inventory of pharmaceuticals for use at both main and alternate storage facilities.

6. Advise on public health matters as requested.

7. Maintain current suggested operating procedures for disaster responsibilities.

8. Assist in the Lummi Tribe EOC, if requested.

h.) Lummi Tribe Emergency Operations Center

i.) Lummi Housing

1) Provide on-scene search, rescue, and extraction operations in Tribal housing.

2) Maintain emergency supply kits for 10-person rescue crew, to include food, water, goggles, gloves, hard hats, etc.

3) Maintain first aid supplies for 100 persons that may be needed for first responder first aid.

j.) Lummi Natural Resources

1) Ensure that all Tribal loggers are available to clear trees and other debris from tribal roads.

2) Maintain forest-removing equipment to clear trees and logging debris

3) Have chainsaws and fuel for chainsaws for ten days of continual operation

4) Maintain food and water supply for logging crew for ten days of operation

5) Coordinate the disposal of dead animals.

K.) Lummi Water & Sewer

1) Supervise the food and water quality control program.

2) Maintain tribal pump truck to be ready to use

3) Manage water supply

4) Manage portable toilet and trench facilities

5) Maintain emergency supply kit for emergency work crew of 10.

2. Other Agencies

a.) Whatcom County DEM:
Need to expand on what this relationship will look like

b.) Puget Sound Energy has responsibility and shall:

1) Restore electrical power on a priority basis.

2) Repair damaged generating facilities and equipment.

3) Remove downed electrical lines from roadways and other dangerous areas.

c.) American Red Cross shall:

1) Provide mass care for disaster victims including shelter and food.

2) Provide non-emergent health and mental health services.

3) Provide damage assessment.

4) Establish a welfare inquiry service.

5) Provide recovery assistance for disaster victims.

Concept of Operations

A. Concept

1. When possible, the Lummi Tribe Emergency Management Office (TEMO) will provide warning to its citizens of an impending disaster. If a disaster occurs, Tribal, county, fire district, and other forces shall respond.

2. The first priority shall be the preservation of life with other mitigation and recovery efforts second.

3. Each affected jurisdiction shall maintain control of its own operations, with the Lummi Tribe TEMO, providing coordination and assistance as necessary.

4. The Lummi Tribe EM Coordinator (TEMC), in coordination with Whatcom County DEM, will respond to the scene to provide field personnel, communications, and on-scene coordination if requested by the incident commander.

5. If the disaster should exceed any jurisdiction's capabilities, the chief elected official may issue a proclamation of emergency and request additional assistance through Whatcom County DEM. See Appendix 12-Emergency Proclamation by the Tribal Council.

6. Member agencies of the (COAD), including American Red Cross, shall provide either individual or mass assistance to disaster victims.

7. Disaster operations will be carried out according to the existing Comprehensive Emergency Management Plan and shall be coordinated by officials in their respective EOC(s) using the Incident Command System.

B. Disaster Phases

1. Mitigation and Preparedness

Before a disaster strikes – Tribal, county, and other government agencies shall take steps to reduce the disaster effects.

These steps shall include, but not be limited to:

a. Conducting continuous planning studies of potential disaster elements on the reservation

b. Reviewing the disaster readiness capabilities and up-grading procedures in keeping with changing emergency management and response technology.

c. Encouraging and maintaining interagency cooperation and coordination of readiness planning.

d. Maintaining vehicles, equipment, and facilities in a readiness condition.

e. Conducting programs of public information and education on disaster preparedness and personal survival.

g. Reviewing and improving response capabilities by conducting training, drills, and exercises at least once a year.

h. Updating the Lummi Comprehensive Emergency Management Plan and the Lummi Hazard Mitigation Plan at least once a year.

2. Response - Increased Readiness Period

If a disaster is imminent all agencies with emergency responsibilities shall:

a. Comply with established checklists and review response status and procedures.

b. Notify key staff according to CEMP and department SOPs.

c. Notify the appropriate organizations.

d. Prepare and update necessary information for release to the public.

e. Activate the appropriate Emergency Operations Center(s).

f. Initiate mitigation and preparedness programs to reduce the effects of the disaster.

g. Initiate all record keeping, data collection, and control measures as needed specifically as related to records of any emergency expenditures.

3. Response - Emergency Period

When a disaster strikes all agencies with emergency responsibilities shall:

a. Initiate and conduct disaster response operations in accordance with established SOPs.

b. Coordinate their response with all involved agencies and jurisdictions through the Tribal EOC.

c. Keep the public and government officials advised of the actions taken.

d. Assess and evaluate the effectiveness of emergency response efforts and establish priorities in the application of resources.

4. Recovery Phase

After the threat to life and property has passed those agencies involved in the response shall:

a. Obtain detailed damage assessment information.

b. Coordinate the application of resources to meet the long-term needs of the Tribe with the TEMO.

c. Identify deficiencies in response, conduct after action critiques, and implement actions for improvement.

Administration and Logistics

A. Administration

1. All organizations with disaster responsibilities shall establish and maintain files of disaster related directives and forms.

2. Reports may be requested by Whatcom County DEM from local jurisdictions and agencies in order to provide local, state, and federal officials with information concerning the nature, magnitude, and impact of the disaster. These reports may be necessary to evaluate response options and in allocating resources on a priority basis.

3. Whatcom County DEM will be requested by Washington State EMD to provide specific reports and the Lummi Tribe EMC will, in turn, prepare the following reports:

   a. Situation Reports

   b. Proclamations of Emergency

   c. Requests for Assistance

   d. Damage Assessment Reports

      1. Public Damages

      2. Private Damages

B. Financial Management

1. Emergency expenditures are integrated into the Tribal budgeting process. However, disasters can occur requiring substantial and necessary unanticipated obligations and expenditures. The following ordinances cover the financing of emergency response and recovery actions:

   a. Lummi Tribe Ordinance 05-XXXX

   b. Counties: RCW 36.40.180 and 36.40.190

   c. Cities under 300,000 population: RCW 35.33.081 and 35.33.101

d. Municipal and county governments are authorized to contract for construction or work on a cost basis for emergency services by RCW 38.52.390.

e. RCW 38.52.070(2) Power to enter into contracts and incur obligations necessary to combat disaster, protecting the health, safety, and property, and providing emergency assistance to the victims of disaster.

2. Records shall be kept so disaster related expenditures and obligations of the Lummi Tribe, county, cities, and towns can be readily identified from regular or general programs and activities.

3. Disaster related expenditures and obligations of the Lummi Tribe, county, cities, and towns may be reimbursed under a number of federal programs. Reimbursement of approved costs for work performed in the restoration of certain public facilities may be authorized by the federal government after a Major Disaster declaration by the President or under the statutory authority of certain federal agencies.

4. Audits of the Lummi Tribe, county's, and cities' disaster related emergency expenditures will be conducted in the course of normal audits of Tribal, state and local records. Audits of projects approved for funding with federal disaster assistance funds are necessary at project completion to determine the propriety and eligibility of the costs claimed by the applicant. These audits are conducted by the federal government.

5. Refer to Appendix 6, "Emergency Administration Procedures" and Appendix 7, "Emergency Fiscal Procedures", for detailed instructions.

C. Logistics

1. Coordination for maximum utilization of a limited supply of disaster related resources is a primary duty of the Lummi Tribe EMC.

2. Each department of the Tribe shall keep a current inventory of all resources that may be called upon for use in disasters. This inventory shall be provided to the Lummi Tribe Director of Emergency Management upon request and updated as necessary. (To Be added to this document as an Annex)

Direction and Control

A. General

1. Direction and control of emergency services within the Lummi Tribe rests with the Lummi Indian Business Council and the Director of Emergency Management.

2. During emergencies The Lummi Tribe Director of Emergency Management shall be responsible for overall coordination of the Lummi Tribe utilizing the Incident Command System.

3. The Lummi Indian Business Council, upon determining that a disaster exists within their jurisdiction with the potential to affect life, property, or the public peace may proclaim a declaration of emergency.

B. Coordination

1. During disasters the Lummi Tribe EMC provides an organized channel for bringing together those citizens and public entities with disaster related needs and those having the necessary capabilities and resources to meet such needs.

2. Lummi Nation PD maintains a mobile command post for supplementing on scene communications and coordination.

C. Facilities

1. The Lummi Tribe EMO has established the **Lummi Nation Police Department**, as a central facility for coordination for the Lummi Tribe.

2. Suggested operating procedures have been adopted and are maintained to ensure the Lummi Tribe EOC is adequately staffed and equipped to be immediately available in time of need.

3. In the event a disaster renders the Lummi Tribe EOC unusable, one of the following locations will be used as an alternate EOC:

   a. Lummi Nation School
   b. Silver Reef Casino

Appendices

Table of Contents - Appendix

- Appendix 1 – Direction and Control
- Appendix 2 – Continuity of Government
- Appendix 3 – Emergency Resource Management
- Appendix 4 – Emergency Public Information
- Appendix 5 – Emergency Administrative Procedures and Records
- Appendix 6 – Emergency Fiscal Procedures
- Appendix 7 – Training and Education
- Appendix 8 – Abbreviations
- Appendix 9 – Definitions
- Appendix 10 – Emergency Contact Lists
- Appendix 11 – Emergency Proclamation

Note: *"Ctrl"* and *"click"* above to jump to each appendix while in Word.

Appendix 1 – Direction and Control

I. Purpose

A. To provide the effective direction, control, and coordination of emergency operations undertaken in accordance with the Lummi Nations Comprehensive Emergency Management Plan (CEMP). This function involves the use of a centralized management center, the EOC, to facilitate policy making, coordination and control of operation forces and resources in a large-scale emergency situation.

B. To ensure continued operation and continuity of the Tribal government and its function during and after emergencies or disasters.

C. To ensure the preservation of public and private records essential to the continued operations of government and the private sector.

II. Operational concepts

A. Direction and control of emergency services functions is the responsibility of the Emergency Management Director. Delegation of that responsibility shall be in writing and a copy sent to the Lummi Indian Business Council. Direction, control, and coordination are conducted along the general guidelines shown in Figure 1, Emergency Management Organizational Chart and Figure 2, Emergency Management Operational Chart.

B. During disasters and catastrophic events the Lummi Tribe Emergency Operations Center provides an organized channel for coordinating response and resources to the event.

C. Depending on the severity of the emergency or disaster, the Lummi Tribe Emergency Operations Center may be activated and will coordinate requests for assistance and information.

D. Upon activation of the Emergency Operation Center, representatives of emergency response and support agencies will be requested to report to the operations center to make decisions and coordinate efforts and resources in response to the emergency/disaster.

E. Communications utilized during emergency and disaster operations will include all systems now in use by all response agencies and emergency support units.

F. Agency two-way radio communications will be the primary means of communication used to direct, control and coordinate emergency operations. Telephone and amateur radio systems will be used when necessary to support communications.

G. Facilities

1. The Lummi Tribe will establish an EOC to serve as a central coordination point. Operation procedures will be maintained to adequately staff and support the EOC to ensure efficient operations.

2. The EOC will be equipped with information, display materials, internal communications and any additional equipment, materials and supplies required to ensure efficient operations.

   The primary location for the EOC will be at:

   Lummi Nation Police Department
   2616 Kwina Rd
   Bellingham, WA 98226
   360.384.2266

3. Criteria for alternate locations for the EOC will be developed and locations identified in Annex A to this Appendix.

4. The Lummi Tribe shall activate an EOC to be used in local emergencies. When it appears that the magnitude of the emergency may reach beyond the local EOC capability, the County EOC may be activated.

5. Each response and support agency that is identified to have a role within the EOC will be responsible for material, supplies and communications to support that EOC function.

6. Agencies providing representation to the Lummi Tribe Emergency Operation Center (EOC) are listed on Annex B to this Appendix.

III. Responsibilities

A. The LIBC Director of Emergency Management (TEMC) shall have the responsibility for coordinating all local government activities taken to prevent, respond to, and recover from imminent threat of, or an emergency, disaster, and/or catastrophic event.

B. Private and public agencies that respond to or support emergency operations will identify liaison personnel to work with the Lummi Tribe EM and support EOC operations. Each agency will provide a list of those identified and how to contact them in the event of EOC activation. (Annex B to this Appendix.)

IV. Annexes

1. LIBC Emergency Operations Center Criteria
2. LIBC Emergency Operations Center Representatives
3. Other Local Emergency Operations Center Location/Points of Contact

Figure 1 to Appendix 1
Emergency Management Organizational Chart

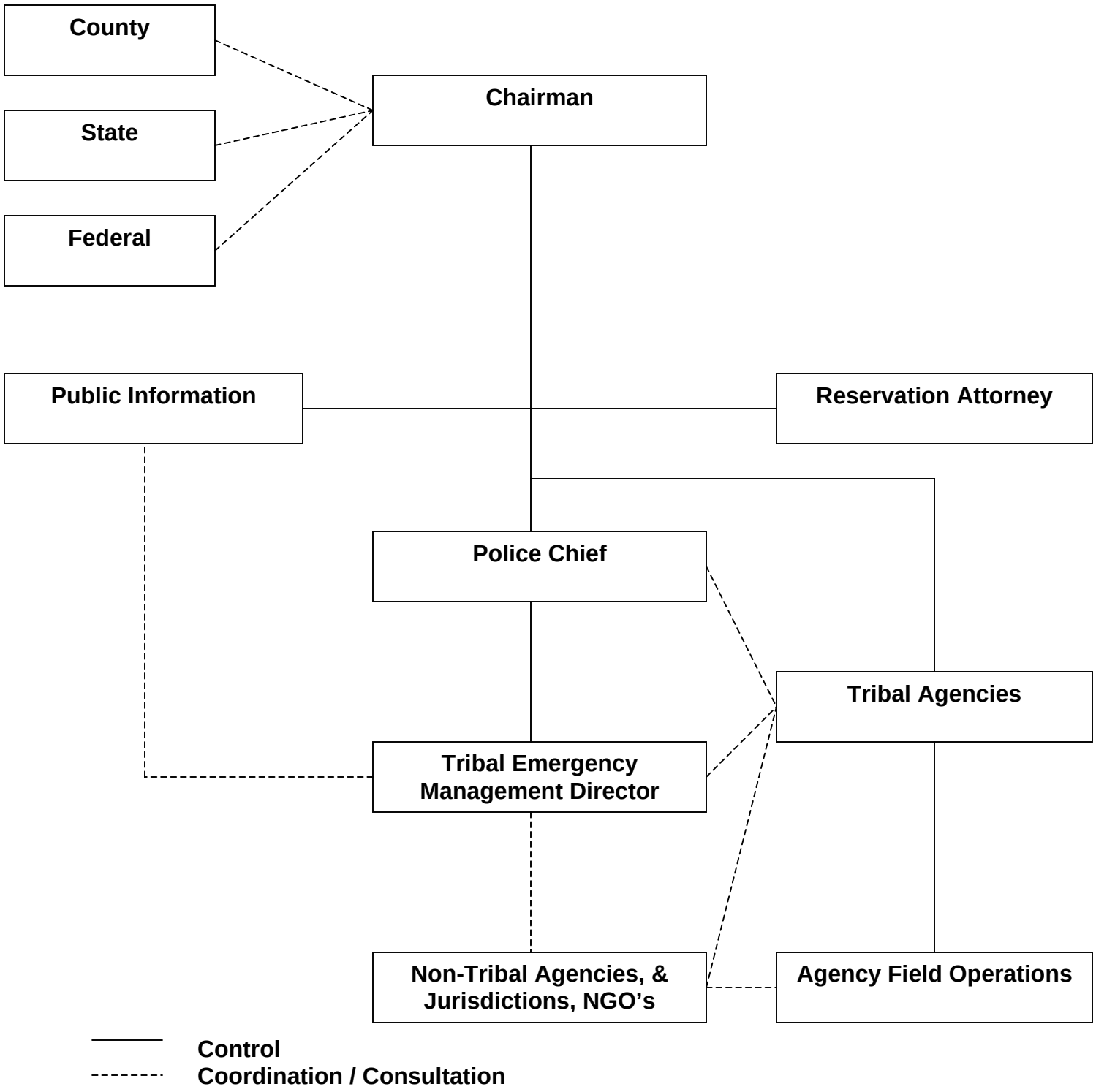
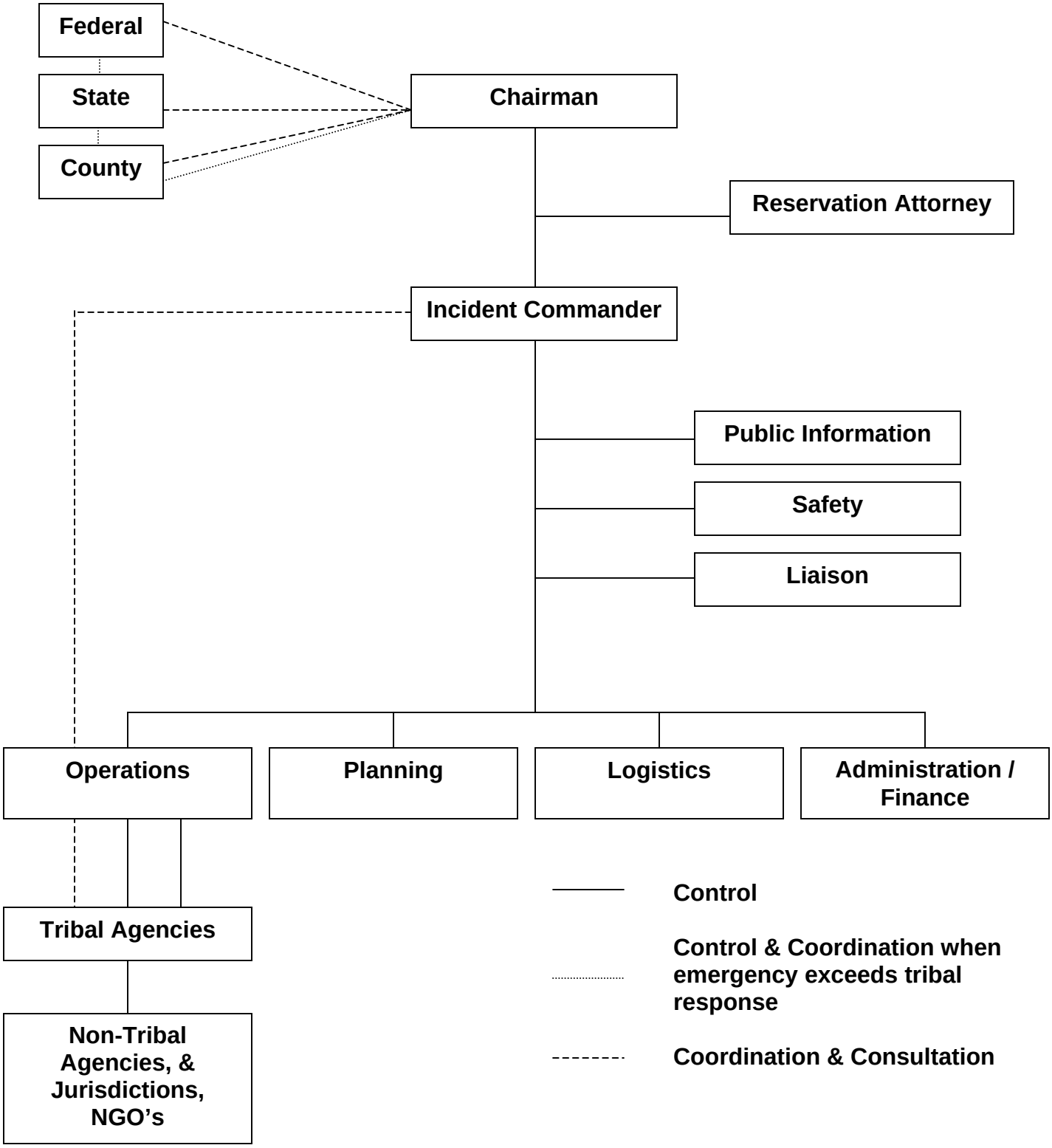


Figure 2 to Appendix 1
Emergency Management Operational Chart



ANNEX A to APPENDIX 1
LUMMI TRIBE EMERGENCY OPERATIONS CENTER

A. Minimum Requirements

1. Emergency generator
2. Multiple phone lines
3. Adequate, secure, dedicated, EOC facility (large room)
4. Auxiliary heating service
5. Disaster proof building (flood, earthquake, etc.)
6. Cooking facilities
7. Adequate parking on-site
8. Multi-channel VHF radio communication (base station)
9. Bathroom, handicap accessible
10. Tables and chairs
11. Facsimile machine
12. Computer\printer capabilities
13. Copy machine
14. Water
15. ADA Compliant

B. Other Considerations

1. Good reception for cell - phone
2. Large parking (staging) area
3. Separate sleeping facilities
4. Food supplies (72 hours)
5. CB base Station
6. Cable/Satellite TV
7. Easy access to services

ANNEX B to APPENDIX 1
EMERGENCY OPERATIONS CENTER REPRESENTATIVES

Title	Name	Primary #	Secondary #	Alternate
Tribal Chairman	Evelyn Jefferson	360.384.1489		Perry Adams
Police Chief	Gary James	360.384.2266		Rance Sutten
Tribal Emergency Management Director				
Human Resources Director	Bobby Thompson	360.384.2398	360.384.1489	
Natural Resources Director	Merle Jefferson		360.384.1489	
Planning Director	Richard Jefferson	360.384.2307		
Fire Department	Shaun Ward	360.		
Public Works	Bill McCort	360.758.		
School	Dave Tomlin	360.758.3147		
Information Technology	Mike James	360.384.	360.384.1489	
Public Information	Rena Priest			
Finance Director	June Woolverton	360.384.2281	360.384.1489	
Reservation Attorney	Judy Bush			Dave Neubeck
Archeology/Culture	Smitty Hillaire			

ANNEX C to APPENDIX 1
OTHER LOCAL EMERGENCY OPERATIONS CENTER LOCATION/POINTS OF CONTACT

Jurisdiction	Telephone #	Address	City	Zip Code
1) Whatcom County	360.676.6681	311 Grand Ave, Suite B-08	Bellingham	98225
a) Lummi Tribe	360.384.1489	2616 Kwina Rd	Bellingham	98226
b) Nooksack Tribe	360 592.9065	4979 Mt Baker Hwy Suite E-1	Deming	98244
c) Bellingham	360.676.6979	210 Lottie St	Bellingham	98225
d) Ferndale	360.384.4302	2095 Main St	Ferndale	98248
e) Lynden	360.354.4270	323 Front St	Lynden	98264
f) Blaine	360.332.8311	344 H Street	Blaine	98230
g) Everson				
h) Nooksack	360.966.2531	103 W Madison St	Nooksack	98276
i) Deming				
2) Skagit County	360.428.3250	2911 E College Wy	Mt Vernon	98273
a) Samish Tribe	360.293.6404	2918 Commercial Ave	Anacortes	98221
b) Sauk-Suiattle Tribe	360.436.1438	5318 Chief Brown Ln	Darrington	98241
c) Swinomish tribe	360.466.7237	17353 Reservation Rd	La Conner	98257
d) Upper Skagit Tribe	360.854.7082	25944 Community Plaza Wy	Sedro-Woolley	98284
e) Mt Vernon	360.336.6211	910 Cleveland Ave	Mt Vernon	98273
f) Burlington	360.755.0531	900 E Fairhaven Ave	Burlington	98233
g) Sedro-Woolley	360.855.0111	220 Munro	Sedro-Woolley	98284
h) Anacortes	360.293.1900	904 6th St	Anacortes	98221
3) Snohomish County	425.423.7635	3509 - 109th St SW	Everett	98204
a) Stillaguamish Tribe	360.654.9466	22714 6th Ave NE	Arlington	98223
b) Tulalip Tribe	360.658.2904	7720 Waterworks Ave	Tulalip	98271
c) Everett	425.257.8100	2811 Oakes Ave	Everett	98201
d) Marysville	360.363.8000	1049 State Ave	Marysville	98270
e) Arlington	360.403.3421	238 N Olymic Ave	Arlington	98223
f) Snohomish	360.568.3115	116 Union Ave	Snohomish	98290
g) Monroe	360.794.7400	806 W Main St	Monroe	98272
h) Sultan	360.793.2231	319 Main St	Sultan	98294
j) Stanwood	360.629.2181	10220 270th St NW	Stanwood	98292
k) Everett Naval Station	425.304.3366	2000 West marine View Dr	Everett	98207
l) Boeing Company				
4) Island County	360.679.7370		Coupeville	98239
a) Oak Harbor	360.279.4500	865 SE Barrington Dr	Oak Harbor	98277
b) Coupeville				
c) NAS Whidbey Island	360.279.1080	3730 N Charles Porter Ave	Oak Harbor	98278
5) San Juan County	360.378.9932		Friday Harbor	98250
a) Friday Harbor	360.378.2810	60 Second St	Friday Harbor	98250

Appendix 2 – Continuity of Government

I. **Purpose**

II. **Operational concepts**

III. **Responsibilities**

IV. **Annexes**

Appendix 3 – Emergency Resource Management

I. Purpose

To identify emergency resource needs, local resources and to provide a system for prioritization, utilization and reimbursement of those resources during times of emergency.

II. Operational concepts

A. General

It is the responsibility of the tribal government to protect the lives and property of its local citizens. At the time of an emergency, the Director of the Tribal Emergency Management Office shall appoint a Resource Manager or a Coordinator of the Emergency Supply Services. The resource manager will determine the availability of essential resources and recommend priorities for the use of scarce supplies and materials needed to maintain the best welfare of the population. The Resource Manager will form a team that consists of the head of each government or private organization or their designee that ordinarily controls or furnishes such resources or services that will be needed. The makeup of the team will vary based on the type and scope of the emergency or disaster. The Resource Manager may appoint an assistant to help wit the most critical supply efforts, as shown in the organizational chart. Plans and duties in these areas are found in other appropriate appendices.

Resources and Supply Service Team (TBD)

B. Phases of Management

1. Mitigation

   a. Plan resources services to be provided in an emergency.
   b. Maintain current inventory listings for all Tribal resources
   c. Establish mutual aid agreements for the coordination of resources – manpower, equipment, supplies, etc.
   d. Coordinate activities through the Tribal Emergency Management Office.
   e. Establish purchase prices and contract costs for specific items through tribal purchasing guidelines and mutual aid agreements.
   f. Plan and train adequate personnel for maximum utilization of resources from the following departments/agencies:
      i. Law Enforcement

   ii. Fire Department
   iii. Public Health (Tribal, County, & State)
   iv. Facilities
   v. Human Resources
   vi. Public Works
g. Coordination and utilization of available resources during an emergency.
h. Develop procedures for emergency purchasing of equipment, supplies, etc
i. Establish procedures and guidelines for volunteers and donations.
j. Develop procedures for the restoration of vital services such as utilities. Maintain current listing of point of contact names and numbers.

2. Preparedness

   a. Identify emergency resources and sources for requesting assistance
   b. Prepare and update list of current and readily available resources with the tribe.
   c. Coordinate resources with other agencies and volunteers in order to maintain adequate resources.
   d. Update mutual aid agreements
   e. Update all emergency plans and procedures to ensure accurate information.
   f. Maintain listing of all resources within the community.
   g. Conduct needs assessment.
      i. Ongoing process by each organization with emergency responsibilities
      ii. Damage assessment and past experience
   h. Assess current plans, procedures, and inventory and make needed adjustments identified in the needs assessment.

3. Response
   a. Notification
      i. Activate the resources management plan
   b. Emergency activity
      i. Determine needs
         - Needs assessment – ongoing
         - Prioritization – ongoing
         - Follow up
      ii. Obtain supplies
         - Notify suppliers
         - Evaluate requests against known supplies
         - Soliciting donations

iii. Financial accountability – finance officer should keep the resource manager aware of:
   - Authorized budget
   - Log and process transactions
   - Track accounts
   - Secure access for additional funding as necessary and feasible

iv. Legal accountability – legal advisor should keep the resource manager aware of:
   - Legal obligations
   - Special powers granted by law to expedite tasks.

v. Distribution of goods and services.
   - Activate and operate key facilities
     1. donations receiving areas
     2. checkpoints
     3. warehouses
   - traffic control
     1. high priority resources should be dispatched quickly
   - hauling/transportation
     1. assistance may be needed to suppliers to transport procurement and donations efforts
   - reporting and coordination
     1. EOC to notify checkpoints and other facilities of incoming resources to expect and priority designation
     2. Checkpoints and other facilities are to provide regular reports on resources passing through to the EOC.
     3. Distribution group will use this information to track location of resources and timeliness of deliveries.
     4. coordination of resources to disaster victims
     5. identify resource distribution centers
     6. coordinate services with all agencies and departments within the tribe
     7. prioritize needs of additional resources
     8. Request activation of emergency purchasing process.
     9. make available lists of sources to provide materials, equipment, and other sources during emergencies
     10. Coordinate local efforts with other agencies.
     11. Keep records and track all services, personnel, equipment, supplies, and other resources needed during an emergency.

4. Recovery

   a. Asses needs of victims
   b. Estimate cost to provide additional resources

c. Assess impact of the emergency on the available resources and identifiable needs
d. Coordinate resource management
e. Public information for proper communication to victims
f. Record resource needs and available supplies.
g. Conduct a needs assessment with all response agencies, local officials, and the EOC to identify all resources used during a emergency – available resources and needed resources
h. Replace used inventories to maintain tribal inventory list.
i. Disposal of excess stocks
    i. Return loaned equipment.
    ii. Surplus – normal procedures
j. Stand down – deactivate facilities and staff used for resource management.
k. Financial reconciliation.
    i. Reimbursement or compensation to owners of private property
    ii. Compile appropriate reports that may address financial liability for any assistance received under the Stafford Act.

III. Responsibilities

a. The Lummi Tribe EMC will collect and maintain a database of resources identified by jurisdictions and agencies that may be required during emergency, disaster and catastrophic events to save lives and mitigate damage.

b. Public and private agencies and departments will provide the Lummi Tribe EMC an up-to-date list of resources (including equipment, materials and labor) that will be maintained in the database.

IV. Annexes

Appendix 4 – Emergency Public Information

I. Purpose

To provide and maintain a program for the coordinated dissemination of emergency information and instructions to the public.

II. Operational concepts

A. Public information provides citizens with information regarding when and how to prepare and to recover from an emergency, disaster or catastrophic event.

B. The functions of public information include the dissemination of accurate, timely and comprehensive information which:

1. Promotes personal safety, survival and personal public health information;

2. Offers advice on protection of private property;

3. Provides accurate information on the actions of government and the expected role of citizens;

4. Neutralizes rumors; and

5. Outlines assistance programs offered by local, state, federal and volunteer agencies.

C. The Lummi Tribe along with Whatcom County DEM will coordinate long-term education efforts with all public and private agencies and departments.

D. The Lummi Tribe shall control and release all public information statements through the Lummi EOC during an emergency, disaster or catastrophic event.

E. American Red Cross operates under its own National Guidelines regarding Public Information. The American Red Cross will generate and disseminate all public information regarding Red Cross operated mass care facilities.

III. Responsibilities

A. The Lummi Tribe EMC will develop and maintain a Public Information Policy and Plan that is consistent with the National Incident Management System and that includes each jurisdiction and public agency/department with a responsibility in time of emergency, disaster or catastrophic event.

B. Each political jurisdiction, public agency and department will participate in and plan with the Lummi Tribe EMO to coordinate and control public information.

C. The Lummi Tribe EMO will establish a public information center as soon as practicable after an emergency, disaster or catastrophic event is declared.

IV. Annexes

Appendix 5 – Emergency Administrative Procedures and Records

I. Purpose

To provide for special administrative support of emergency management operations during emergencies or disasters.

II. Operational concepts

A. Agencies with disaster responsibilities should establish orderly files of emergency directives and forms so that during a disaster these materials will be readily available.

B. Logistics

1. Coordination on the use of a limited supply of resources and assets for maximum mitigation of the effects of emergency/disaster is a principal duty of local emergency organizations.

2. Inventories:

   Each Tribal agency/department shall keep an updated inventory of all resources and assets that may be called upon for use in disasters. This inventory will be made available to the Office of Emergency Management upon request.

3. Disaster Operations:

   a. In carrying out the provisions of Resolution 05-XXXX, the Tribal Council and the General Manager of the Tribe are directed to utilize the services, equipment, supplies and facilities of existing departments, offices, and agencies of the Lummi Tribe to the maximum extent practicable, and the managers and personnel of all such departments, offices and agencies are directed to cooperate with and extend such services and facilities to the Office of Emergency Management.

   b. The General Manager and/or his designee and the Director of Emergency Management appointed in accordance with Resolution 05-XXXX, in the event of a

disaster, after proclamation by the Tribal Council, shall have the power to command the service and equipment of as many citizens as considered necessary in the light of the disaster proclaimed. Provided, that citizens so commandeered shall be entitled during the period of such service to all privileges, benefits and immunities as are provided by Tribal, Federal and State emergency management regulations for registered emergency workers.

C. Contracts

1. General Authority

The Lummi Indian Business Council is authorized to contract with any person, firm, corporation, or entity to provide construction or work on a cost basis to be used in emergency management functions or activities or said functions or activities to expressly include natural disasters, whether appropriated funds, local funds, or from whatever source, may be used to pay for the construction, equipment, or work contracted for under this section.

D. Emergency Purchases

1. Emergency purchases shall be made per applicable Lummi Tribe ordinances.

E. Mutual Aid

1. The Lummi Indian Business Council is authorized to enter into Mutual Aid agreements with any local jurisdictions for the purpose of providing Emergency Management services to the residents of the Lummi Tribe.

2. Mutual aid between local political subdivisions can be enacted when a disaster is beyond the capabilities of the Lummi Tribe.

F. Reports and Reporting

1. Reports are required from local political subdivisions when a disaster has occurred in order to provide LIBC, the Governor, the State Emergency Management Division, and other governmental officials with information concerning the nature, magnitude, and impact of a disaster, and for use in evaluating

and providing the most efficient and appropriate disaster response assets and services.

G. Registration of Emergency Workers

1. "Emergency Worker" is defined by Whatcom County as any person who is registered with a state or local emergency management organization and holds an identification card issued by the state or local emergency management director for the purpose of engaging in authorized emergency management activities or is an employee of the state of Washington or any political subdivision thereof who is called upon to perform emergency management activities (RCW 38.52.010(4)).

2. The Whatcom County Department of Emergency Management registers local emergency workers and maintains a current listing of all registered emergency workers.

3. Whatcom County Emergency workers are registered per the rules and regulations established by the state Emergency Management Division as defined in RCW 38.52.310.

4. The Lummi Tribe will register emergency workers for the purpose of engaging in authorized emergency activities.

H. Liability Coverage

1. The Lummi Tribe shall request a mission number from the Whatcom County Department of Emergency Management, who shall obtain an Emergency Management Mission Number from the State Emergency Management Division for actions intended to protect life and property during the incident period of any given disaster. The Mission Number serves as state approval of appropriate activities and to cover the liability and certain damages, as prescribed by state statute, that are incurred by registered emergency workers within each jurisdiction for the duration of the incident and recovery period.

2. Equipment and vehicles should only be used by trained and qualified personnel, under the direction of an appropriate authority. Any personal property that is not relevant to the mission will not be considered for compensatory coverage.

I. Environmental Review -- Permits

Projects that are new activities or any expansion of or addition to an existing activity may require an environmental impact study or permit prior to final project approval. Tribal Resolutions and Ordinances that apply to include, but are not limited to the following:

Tribal Resolutions and Ordinances

J. Environmental Review -- Permits and Exemptions for Emergency Actions

In instances involving emergency work performed to protect life and property, requirements for environmental review and permits may be waived or orally approved per the following Tribal resolutions, ordinances and related state and federal laws

Tribal Resolutions and Ordinances

1. State Environmental Policy Act (SEPA - Environmental Review)

   WAC 197-10-180 "Actions which must be undertaken immediately, or within a time too short to allow for full compliance with this Chapter, to avoid an imminent threat to public health or safety, to prevent an imminent danger to public or private property, or to prevent an imminent threat of serious environmental degradation, shall be exempt. Agencies may specify these emergency actions in their guidelines."

2. Hydraulics Act (Hydraulics Permit)

   RCW 75.20.100 "In case of an emergency rising from weather or stream flow conditions or other natural conditions, the Department of Fisheries or Department of Game, through their authorized representatives, shall issue immediately upon request oral permits to a riparian owner or lessee for removing any obstructions, repairing existing structures, restoring stream banks or to protect property threatened by the stream without the necessity of obtaining a written permit prior to commencing work. Conditions of an oral permit shall be reduced to writing within thirty days and complied with as provided for in this section."

3. Forest Practices Act (Application for Forest Practices)

RCW 76.09.060(2) "Notwithstanding any other provision of this section no prior application or notification shall be required for any emergency forest practice necessitated by fire, flood, windstorm, earthquake, or other emergency as defined by the (Forest Practices) board, but the operator shall submit an application or notification, whichever is applicable to the Department of Natural Resources within forty-eight hours after commencement of such practice."

4. Shoreline Management Act (Shorelines Permit)

   WAC 173-14-040(2), (3) "The following shall not require permits for the purposes of the Act: Normal maintenance or repair of existing structures or developments, including damage by accident, fire or elements."

5. Flood Control Zones (Permit for Improvement)

   a. RCW 86.16.080 "Provided, however, that whenever, in cases of emergency, flood waters shall threaten to or shall endanger lives or damage property, or it shall be necessary to repair, reconstruct, or restore property damaged by such flood water, in order that such property may be used immediately for the purpose or purposes theretofore used, no permit shall be required."

K. Archaeological/Historical Preservation

Many structures, archaeological sites, or properties of historical significance are protected by law. Non time-critical missions and recovery actions affecting such protected areas will be coordinated with the Tribal Cultural Department or similar office and as to the extent appropriate the state Office of Archaeology and Historical Preservation.

L. Non-discrimination in Disaster Assistance

All local actions encompassed by the Tribal/Federal/State Agreement will be subject to the State's program of non-discrimination in disaster assistance (reference Title 44 CFR, Section 205.16).

1. Federal financial assistance to local political subdivisions is conditioned on full compliance with Title 44 CFR, Section 205.44 or CFR 3A, Part 98.

III. Responsibilities

A. Local

1. Lummi Indian Business Council

LIBC has overall responsibility for Emergency Administrative Plans and Procedures within the Lummi Tribe.

2. Office of Emergency Management

a. The Office of Emergency Management provides technical advice and assistance to the Lummi Tribe and their department managers in the preparation and execution of their emergency administrative plans and procedures.

b. Coordinates with all jurisdictions/departments in development of emergency administrative procedures and record keeping.

3. LIBC Tribal Attorneys

a. Provide legal advice to the LIBC, Director of Emergency Management, and department heads in the development and execution of emergency administrative plans and procedures.

4. Department Managers

a. Prepare and execute their emergency administrative plans and procedures.

b. Keep records of all emergency actions, transactions, events, and damages.

c. Report on availability of manpower, equipment, facilities, and supplies to the Emergency Operations Center.

d. Provide for the safeguarding of critical records, files, and equipment during an emergency.

B. State

The Governor proclaims an emergency when the situation is beyond the capability of local resources. (Note: this may initially be a verbal declaration per the Washington State Comprehensive Emergency Management Plan, Annex V)

C. Federal

Provides advice and assistance on matters of federal administrative procedures and records.

IV. Annexes

Annex 1 - Department Closures/Reassignment

ANNEX 1 to APPENDIX 5
DEPARTMENT CLOSURES/REASSIGNMENTS

TRIBAL

Closures - Reassignments (As Required)

The following departments may be closed during major emergency/disaster operations, and their personnel may be available for reassignment by the Lummi Office of Emergency Management/EOC (with the exception of personnel placed in EOC operations.)

Finance	Administration
Accounting	Council Ops
Planning	Tribal Attorneys
IS	Health Services
Public Works	Family Services
Maintenance	Natural Resources

COUNTY

The following departments/agencies may be closed during major emergency/disaster operations, and their personnel may be available for reassignment by the Department of Emergency Management/EOC (with the exception of Executives or alternates participating in EOC operations) on an as needed basis:

Treasurer	Assessor
Parks and Recreation	Clerk
Planning	District Courts
Data Processing	Budget

TRIBAL AND COUNTY

Expansions

The following departments/agencies will expand their operations capability, as required.

Lummi Nation Police Department
Silver Reef Casino Security
County Fire Services
Sheriff' Department
Public Works
Emergency Management

Whatcom County Health District
Planning/Community Development
Personnel/Human Resources
Medical Examiner
Tribal Attorneys (advisory)
Finance (emergency expenditures rationing)

Appendix 6 – Emergency Fiscal Procedures

I. Purpose

To provide fiscal procedures to support emergency actions at all levels during any disasters or emergencies.

II. Operational concepts

A. The Lummi Indian Business Council has the power to enter into contracts and incur obligations in carrying out the provisions of LIBC Emergency Management Resolutions and Ordinances without regard to time consuming procedures and formalities prescribed by Tribal Procurement Policies.

B. Expenditures necessary for the immediate survival of persons endangered by an emergency or disaster may exceed the limitations of individual budgets.

C. Authorization of Emergency Expenditures.

Emergency expenditures are not normally integrated into the budgeting process. Nevertheless, disasters occur on a periodic basis requiring substantial and necessary unanticipated obligations and expenditures.

1. The Lummi Tribe will incur disaster related obligations and expenditures in carrying out the provisions in which any disaster occurs. LIBC shall have the power to enter into contracts and incur obligations necessary to combat such disaster, protecting the health and safety of persons and property, and providing emergency assistance to the victims of such disaster. The emergency management director is authorized to exercise the powers vested under this section in the light of the exigency of an extreme emergency situation without regard to time-consuming procedures and formalities prescribed by Tribal Resolutions and Ordinances, procurement limitations, requirements of competitive bidding and publication of notices, provisions pertaining to the performance of public work, entering into contracts, the incurring of obligations, the employment of temporary workers, the rental of equipment, and the purchase of supplies and materials.

D. Record-keeping

Records shall be kept in such a manner that the disaster related expenditures and obligations of Lummi Tribe departments can be broken out and identified, separated from regular or general programs and activities.

Complete and accurate records are necessary:

1. To document requests for assistance and ensure maximum eligible reimbursement.

2. To facilitate reimbursement under approved applications pertaining to declared emergencies or major disasters.

3. For audit reports and audit records. Detailed records will be kept from the onset of the disaster, including but not limited to:

    a. Appropriate extracts from payrolls, with any cross-references needed to locate original documents.

    b. A schedule of equipment used on the job.

    c. Invoices, purchase orders, and checks issued and paid for materials and supplies used on the job.

E. The following organizations are eligible for state and federal disaster assistance programs: (1) Towns and Cities, (2) Special Districts (those classed as political subdivisions by the State), (3) Authorized Tribal Organizations, and (4) Qualifying Private Non-Profit Organizations.

F. Any financial assistance that may be provided will be based on Damage Survey Reports and the further submission and approval of project applications that apply to the following:

1. Debris removal.

2. Emergency protective measures for the protection of life or property.

3. Repair, replacement or restoration of Tribal facilities.

4. Disaster assistance to Tribal communities that suffer a substantial loss.

5. Use of federal equipment, supplies, facilities, personnel, and other resources.

G. Federal Reimbursement

1. Disaster related expenditures and obligations of local political subdivisions may be reimbursed under a number of federal programs. Reimbursement of approved costs for work performed in the restoration of certain public facilities may be authorized by the federal government after a major disaster declaration by the President or under the statutory authority of certain federal agencies.

H. Audits of Disaster Related Expenditures and Obligations

Audits of local disaster related emergency expenditures will be conducted during the normal audit period. Audits of projects approved for federal disaster assistance funding are necessary to determine the eligibility of the costs claimed by the applicant.

III. Responsibilities

Each Tribal entity has authority to obligate funds without regard to statutory limitations, when necessary for the survival of the population during emergencies.

A. The Finance Director

The Finance Director will establish a means of recording emergency purchases authorized by the Tribal Council and/or Emergency Management Director during the even of an emergency.

B. All Departments/Agencies

1. All Tribal department managers will ensure the preparation of Fiscal Plans and procedures for their respective departments for the continuation of fiscal procedures and record-keeping in the event of an emergency/disaster.

2. Tribal department managers will protect essential fiscal records within their departments.

3. Provide information to be used in compiling data to establish the extent of the financial burden resulting from a disaster event.

C. Tribal Attorneys

1. Provide legal advice and assistance to the Tribal Council in the preparation of agreements, contracts, and other disaster related agreements.

D. Office of Emergency Management

1. Advises the LIBC Tribal departments concerning emergency fiscal procedures.

2. Assist the resolution of problems associated with damage claims resulting from loss or damage to property and/or injury or death of registered emergency workers as a result of emergency response to a disaster.

3. TEMO shall designate an FEMA Applicant Agent to ensure recordkeeping and documentation of losses, damages, and recovery costs are accurately recorded for potential reimbursement. The Applicant Agent shall be designated as soon as is practicable.

IV. Annexes

Appendix 7 – Training and Education

I. Purpose

To provide an adequate training and education program that ensures maximum readiness of Tribal officials, employees, and volunteers who are assigned emergency responsibilities. To provide 72-hour preparedness information and training for other citizens and businesses.

II. Operational concepts

A. Seventy-two hour preparedness education and training, exercises and suggested operating procedures are vital to facilitate the effectiveness of Emergency Plans and to assure that operational concepts are sound and resources are adequate to carry out necessary functions in time of emergency, disaster or catastrophic events.

B. Education and training of emergency response personnel takes place at all levels of government and in volunteer organizations to enhance decision-making capabilities and familiarity with operational concepts and procedures.

C. Exercising Plans determines the effectiveness and feasibility of Plans and suggested operating procedures.

D. Exercises will be conducted on a routine basis with critiques and evaluations to follow each exercise.

E. Drills are supervised instructional sessions devised to maintain and develop skills in a specific area. Drills may be an element of an exercise.

F. The Lummi Tribe Office of Emergency Management will utilize all staff in designing, executing and evaluating training, exercises and drills for the Lummi Tribe.

III. Responsibilities

A. The Lummi Tribe Office of Emergency Management (TOEM)

1. Develop and initiate local training and education programs, exercises and drills for all Tribal management, emergency

response personnel, school personnel, private businesses and the communities of the Lummi Reservation.

2. Develop special training programs that address but are not limited to, earthquake, severe weather, flooding, hazardous materials and other significant hazards to the Lummi Reservation.

3. Provides training, drill and exercise information in annual progress reports to LIBC and Emergency Management Director.

4. Determines local training requirements as appropriate.

5. Registers emergency workers within the Lummi Tribe.

6. Trains emergency management volunteers and workers.

7. Exercises Lummi Nation Comprehensive Emergency Management Plan and Standard Operating Procedures.

8. Ensures participation in professional development training by emergency management staff and associated unified incident command personnel.

B. **Other Response Agencies**

1. Coordinate with Whatcom County Department of Emergency Management and Regional emergency management efforts to develop and implement ongoing disaster training and education programs and participate in regular exercises of Emergency Management Plans and programs.

2. Conduct training on an on-going basis to maintain readiness.

IV. Annexes

1. Training Priorities
2. Exercises and Drills

ANNEX A TO APPENDIX 7
TRAINING PRIORITIES

Training will be conducted on a continual basis as outlined by the Lummi NIMS Implementation Plan and shall be provided to the following groups:

Emergency Workers (volunteers)

EOC Staff/Response

First Response Personnel

- Fire
- Public Works
- Law Enforcement
- Emergency Medical Services
- Transportation
- Communications

Tribal Officials

Department Managers

School District Personnel

Search and Rescue Personnel

Public education will be encouraged and conducted on a continual basis as funding and staffing allows. The public education priority is 72-hour preparedness for all emergencies, disasters and catastrophic events.

ANNEX B to APPENDIX 7
EXERCISE AND DRILLS

I. PURPOSE

To provide real life scenarios in a controlled environment in which to practice newly acquired skills and knowledge in the event of an emergency that allow for the evaluation of the four principles of emergency management: preparedness, response, recovery and mitigation. Exercises are part of the preparedness phase. Undertake to prepare response and recovery efforts from the hazards that cannot be fully mitigated.

II. OPERATIONAL CONCEPTS

A. To be further determined by the Lummi NIMS Implementation Plan

Appendix 8 – Abbreviations, Definitions, & Acronyms

This appendix is courtesy of Washington State Emergency Management Divisions Comprehensive Emergency Management Plan. Not all abbreviations, acronyms, and defined words are necessarily used in this CEMP.

A CENTRAL COMPUTERIZED ENFORCEMENT SERVICE SYSTEM (ACCESS) - Statewide law enforcement data network controlled and administered by the Washington State Patrol. Provides capability to send warning and notification of emergencies from state to local jurisdictions.

ACCESS CONTROL POINT (ACP) - Road intersection or other logistically viable point on the relocation and food control boundaries, which enable law enforcement and other emergency workers to maintain access control of the respective area(s).

ADVANCE ELEMENT OF THE EMERGENCY RESPONSE TEAM (ERT-A) - The portion of the Federal Emergency Response Teams that is the first federal group deployed to the field to respond to a disaster.

AERIAL RADIOLOGICAL MONITOR - A radiological monitor who utilizes aircraft and specialized aerial radiological instruments to acquire radiation exposure rate data on large areas at or between locations of special interest.

AEROSOL - Fine liquid or solid particles suspended in a gas such as fog or smoke.

AIR FORCE RESCUE COORDINATION CENTER (AFRCC) - The Rescue Coordination Center (RCC) operated by the U.S. Air Force at Langley Air Force Base, Virginia, which coordinates the federal response in search and rescue (SAR) operations within the Inland Search and Rescue Region. This Region is defined as the 48 contiguous states (see RCC definition).

AIR SEARCH AND RESCUE - Search and rescue operations for aircraft in distress, missing, or presumed down are conducted by the Washington State Department of Transportation, Aviation Division, under authority of Revised Code of Washington (RCW) 47.68 and Washington Administrative Code (WAC) 468.200. Related land SAR operations, including the rescue and/or recovery of victims of a downed aircraft incident, are the responsibility of the chief law enforcement officer in whose jurisdiction the incident site is located. Air search and rescue does not include air support of land search and rescue operations conducted under authority of Chapter 38.52 RCW. See also SEARCH AND RESCUE.

ANAEROBIC - Pertaining to a microorganism that can live and grow in the absence of oxygen.

ANIMAL - any live or dead dog, cat, nonhuman primate, guinea pig, hamster, rabbit, or any other warm blooded animal, which is being used, or is intended for use for research, teaching, testing, experimentation, exhibition purposes, or as a pet. This term excludes:

Birds; rats of the genus Rattus and mice of the genus Mus bred for use in research; horses not used for research purposes; other farm animals including but not limited to livestock or poultry used or intended for use as food or fiber; livestock or poultry used or intended for use for improving animal nutrition, breeding, management, or production efficiency, or for improving the quality of food or fiber. With respect to a dog, the term means all dogs, including those used for hunting, security, or breeding purposes.

COMPANION ANIMAL - not a legally defined, but is accepted as another term for pet.

EXOTIC ANIMAL – any animal not identified in the definition of "animal" provided in this part that is native to a foreign country or of foreign origin or character, is not native to the United States, or was introduced from abroad. This term specifically includes animals including but not limited to lions, tigers, leopards, elephants, camels, antelope, anteaters, kangaroos, water buffalo, and species of foreign domestic cattle such as Ankole, Gayal, and Yak.

FARM ANIMAL - any domestic species of cattle, sheep, swine, goats, llamas, or horses, which are normally and have historically been kept and raised on farms in the United States, and used or intended for use as food or fiber, for improving animal nutrition, breeding, management, production efficiency, or for improving the quality of food or fiber. This term also includes animals such as rabbits, mink, and chinchilla when they are used solely for purposes of meat or fur, and animals such as horses and llamas when used solely as work and pack animals.

FISH - finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. Under "Definitions" of the Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94-265, (as amended in October 1996).

MARINE MAMMAL - any mammal which (A) is morphologically adapted to the marine environment (including sea otters and members of the orders Sirenia, Pinnipedia and Cetacea), or (B) primarily inhabits the marine environment (such as the polar bear); and, for the purposes of this chapter, includes any part of any such marine mammal, including its raw, dressed, or dyed fur or skin. Under the Marine Mammal Protection Act of 1972 (as amended in 1994).

PET ANIMAL - any animal that has commonly been kept as a pet in family households in the United States such as dogs, cats, guinea pigs, rabbits, and hamsters. This term excludes exotic animals and wild animals.

SERVICE ANIMAL - any animal individually trained to do work or perform tasks for the benefit of a person with a disability. Such tasks can include guiding a person with impaired vision, alerting a person with impaired hearing to the presence of people or sounds, pulling a wheelchair, retrieving dropped items, etc. Dogs are most frequently trained as service animals, but sometimes other animals can to this work. (American with Disabilities Act, 1990)

SOCIAL ANIMAL - often animals that did not complete service animal/service dog training due to health, disposition, trainability, or other factors, and are made

available as pets for people who have disabilities. These animals might or might not meet the definition of service animals. There is no legal definition.

THERAPY ANIMAL - not legally defined by federal law, but some states have laws defining therapy animals. They provide people with constant contact with animals but are not limited to working with people who have disabilities. They are usually the personal pets of their handlers and work with their handlers to provide services to others. Federal laws have no provisions for people to be accompanied by therapy animals in places of public accommodation that have "no pets" policies. Therapy animals are not usually service animals.

WILD ANIMAL - any animal that is now or historically has been found in the wild, or in the wild state, within the boundaries of the United States, its territories, or possessions. This term includes, but is not limited to, animals such as deer, skunk, opossum, raccoons, mink, armadillos, coyotes, squirrels, fox, and wolves.

ANTIBIOTIC - A substance that inhibits the growth of or kills microorganisms.

AUTHORIZED OFFICIAL - An individual authorized under Chapter 38.52 RCW and Chapter 118.04 WAC to direct the activities of emergency workers. These individuals are The Adjutant General of the Military Department or designee, the Director for the Emergency Management Division or designee, the Director or designee of a local emergency management agency, the chief law enforcement officer or designee of a political subdivision, or other such officials as identified in ESF 9 - Search and Rescue of a local comprehensive emergency management plan.

AUTHORIZED ORGANIZATION - A state or local agency authorized under Chapter 38.52 RCW and Chapter 118.04 WAC to register and/or employ emergency workers. These agencies are: the Military Department, Emergency Management Division, local jurisdiction emergency management agencies, and law enforcement agencies of political subdivisions.

ANTHRAX - An acute bacterial disease that usually affects the skin, but which may also involve the intestinal or respiratory tract. Bacillus anthracis, the agent that causes Anthrax, is usually transmitted to humans through contact with infected animals or animal products. Depending on the mechanism of transmission, a cutaneous (skin) form (contact), a gastrointestinal form (food borne), or pulmonary form (airborne) may develop. Antibiotics are necessary for treatment.

BACTERIA - Single celled organisms that multiply by cell division and that can cause disease in humans, plants or animals. Plural of bacterium

BRUCELLOSIS - A disease caused by one of several Brucella species that is characterized by fever, night sweats, anorexia, headache and back pain. Brucella is found naturally worldwide. Associated with infectious abortions in animals, the six species of Brucella are linked to chronic infections in animals and pose an occupational hazard to those who work with animals. Antibiotics are necessary for treatment.

BIOLOGICAL WARFARE - The intentional use of biological agents as weapons to kill or injure humans, animals, or plants, or to damage equipment.

CATASTROPHE - An expected or unexpected event in which a community, because of the severity of the event, is unable to use its resources or the need for resources has greatly exceeded availability disrupting the social or economic structure of the community, preventing the fulfillment of the community's essential functions, and rendering the community is incapable of responding to or recovering from the effects of the event without massive and prolonged outside help.

CHEMICAL ACCIDENT/INCIDENT RESPONSE AND ASSISTANCE (CAIRA) PLAN - A plan that spells out how an Army installation will handle chemical material events. This on-post plan must be integrated with off-post plans.

CHEMICAL AGENT - A chemical substance that is intended for use in military operations to kill, seriously injure, or incapacitate people through its physiological effects. Excluded from consideration are riot control agents, smoke, and flame materials. The agent may appear as a vapor, aerosol, or liquid. It can be either a casualty/toxic agent or an incapacitating agent.

BLISTER AGENT (vesicants) - Category of chemical warfare agents that damage any tissue they contact. Vapor can affect the eyes, respiratory tract, and blister the skin. They may produce lethalities, but skin damage is their main casualty-causing effect. All these agents are persistent and can poison food and water, make other supplies and installations dangerous, and restrict the use of contaminated terrain. Blister agents include mustards, arsenicals, and urticants.

BLOOD AGENT - Cyanide-containing compounds that are absorbed into the body primarily by breathing. They poison the body's cytochrome oxidase system, preventing cell respiration and the normal transfer of oxygen from the blood to body tissues. Blood agents are rapid acting, causing effects within seconds and death within minutes. Typical agents include hydrogen cyanide (AC), cyanogen chloride (CK), and arsine (SA). All are highly volatile and therefore non-persistent even at low temperatures.

CHOKING AGENT - Compounds that injure an unprotected person chiefly in the respiratory tract (the nose, throat and particularly the lungs). In extreme cases, membranes swell, lungs become filled with liquid, and death results from lack of oxygen; thus, these agents "choke" an unprotected person. Choking agents include phosgene, diphosgene, and chlorine.

NERVE AGENT - Organophosphate ester derivatives of phosphoric acid. Nerve agents are potent inhibitors of the enzyme acetyl cholinesterase (AChE), causing a disruption in normal neurological function. Symptoms appear rapidly with death occurring as rapidly as several minutes. Nerve agents are generally divided into G-series agents and V-series agents. They include tabun (GA), sarin (GB), soman (GD), and VX.

CHEMICAL STOCKPILE DISPOSAL PROGRAM (CSDP) - The congressionally mandated program that requires the Army to dispose of all its unitary chemical agents by the year 2004. The preferred mode of disposition is on-post incineration.

CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM (CSEPP) – A federally-funded program established by Congress in 1988 to provide the "maximum possible protection" for citizens near the nation's eight chemical weapons storage sites,

including the Umatilla Army Depot. This protection is provided through emergency planning, early warning systems and public education.

CLAIMANT - The individual making a claim or their legal representative.

COMPREHENSIVE EMERGENCY MANAGEMENT - See EMERGENCY MANAGEMENT.

COMPREHENSIVE EMERGENCY MANAGEMENT NETWORK (CEMNET) - Dedicated 2-way Very High Frequency (VHF) low-band radio system. Provides direction and control capability for state and local jurisdictions for administrative use, and during an emergency or disaster. This is an emergency management net belonging to and managed by the Washington State Military Department, Emergency Management Division.

COMMON PROGRAM CONTROL STATION (CPCS) - A broadcasting station in a local operational area that has special communications links with appropriate authorities (e.g. National Weather Service, and local jurisdiction Emergency Operations Centers). Provides common emergency program for its operational area.

CONGREGATE CARE CENTER - A public or private facility that is predesignated and managed by the American Red Cross during an emergency, where evacuated or displaced persons are housed and fed.

CONSEQUENCE MANAGEMENT - Measures to alleviate the damage, loss, hardship and/or suffering caused by emergencies. It includes measures to restore essential government service, protect public health and safety, and provide emergency relief to affected governments, businesses and individuals.

CONTAGIOUS - Capable of being transmitted from one person to another.

COUNTER-TERRORISM - Strategic and/or tactical measures taken, in a collaborative effort, to prevent or respond to acts of terrorism.

CRISIS MANAGEMENT - Measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat, act, or incident. In a terrorist incident, crisis management includes intelligence, surveillance, tactical operations, negotiations, forensics, investigation, agent identification, search, render safe procedures, transfer and disposal, limited decontamination, and assurance of public health and safety.

CUTANEOUS - Pertaining to the skin.

DECONTAMINATION - The process of making people, objects, or areas safe by absorbing, destroying, neutralizing, making harmless, or removing the hazardous material.

DEFENSE COORDINATING OFFICER (DCO) - Individual supported and provided by the Department of Defense to serve in the field as the point of contact to the Federal Coordinating Officer and the Emergency Support Functions regarding requests for

military assistance. The Defense Coordinating Officer and staff coordinate support and provide liaison to the Emergency Support Functions.

DEPARTMENT OF NATURAL RESOURCES (DNR) EMERGENCY COORDINATION CENTER - Site where DNR's Emergency Management Team accomplishes the duties assigned in the Department Emergency Management Plan. The primary office is the Fourth Floor Dispatch Office, 1111 Washington Street Southeast, Olympia, Washington.

DEPARTMENT OF NATURAL RESOURCES EMERGENCY OPERATIONS ADMINISTRATOR - The individual with the primary responsibility for the operations of the Department of Natural Resources Emergency Coordination Center and the mobilization of department assets.

DEPLETED URANIUM AD-38 - Uranium with a concentration of Uranium-235 smaller than that found in nature (0.711 percent). It is largely a byproduct ("tails") of the Uranium enrichment process. This material is essentially not harmful to human health. It is often found in aircraft as counterweights and in boats as ballast material. It is also used in anti tank or armor piercing ammunition to enhance penetration.

DIRECTION AND CONTROL EXERCISE - An activity in which emergency management officials respond to a simulated incident from their command and control centers. It mobilizes emergency management and communications organizations and officials. Field response organizations are not normally involved.

DISASTER - An event expected or unexpected, in which a community's available, pertinent resources are expended, or the need for resources exceeds availability, and in which a community undergoes severe danger, incurring losses so that the social or economic structure of the community is disrupted and the fulfillment of some or all of the community's essential functions are prevented.

DISASTER FIELD OFFICE (DFO) - The office established in or near the designated area to support federal and state response and recovery operations. The Disaster Field Office houses the Federal Coordinating Officer (FCO) and the Emergency Response Team (ERT) and where possible, the State Coordinating Officer (SCO) and support staff.

DISASTER RECOVERY CENTER (DRC) - A temporary facility where, under one roof, representatives of federal agencies, local and state governments, and voluntary relief organizations can explain the disaster recovery programs and process applications from businesses.

DISASTER RECOVERY MANAGER (DRM) - This is a function, rather than position, to which the Federal Emergency Management Agency Regional Director delegates the authority to administer the Federal Emergency Management Agency response and recovery programs. The function oversees the physical obligation from the President's Disaster Relief Fund.

DISASTER SEARCH AND RESCUE - Large scale search and rescue operations conducted as a result of a natural or technological (human-caused) emergency, disaster, or catastrophe.

DIRECT EFFECTS - The effect classified as “direct” includes flash, blast, thermal radiation, electromagnetic pulse, and initial nuclear radiation.

DIRECT FEDERAL ASSISTANCE - Emergency work or assistance, beyond the capability of state and local jurisdictions, which is performed by a federal agency under mission assignment from Federal Emergency Management Agency.

DOSIMETER - A radiation detection device that can measure accumulated radiation dose. The device could be a film badge, thermo luminescent dosimeter (TLD), or an electrostatic pocket dosimeter. Different dosimeter designs are required to measure gamma radiation, neutron radiation, etc.

EMERGENCY - An expected or unexpected event involving shortages of time and resources that places life, property, or the environment in danger and requires response beyond routine incident response resources.

EMERGENCY ALERT SYSTEM (EAS) - Established to enable the President, federal, state, and local jurisdiction authorities to disseminate emergency information to the public via the Commercial Broadcast System. Composed of amplitude modulation (AM), frequency modulation (FM), television broadcasters, and the cable industry. Formerly known as the Emergency Broadcast System (EBS).

EMERGENCY MANAGEMENT or COMPREHENSIVE EMERGENCY MANAGEMENT - The preparation for and the carrying out of all emergency functions other than functions for which the military forces are primarily responsible, to mitigate, prepare for, respond to, and recover from emergencies and disasters, to aid victims suffering from injury or damage resulting from disasters caused by all hazards, whether natural or technological, and to provide support for search and rescue operations for persons and property in distress.

EMERGENCY OPERATIONS CENTER (EOC) - A designated site from which government officials can coordinate emergency operations in support of on-scene responders.

EMERGENCY PLANNING ZONES (EPZs) - The areas for which emergency plans are made to assure that prompt and effective action can be taken to protect the public in the event of a radiological or chemical emergency. In Washington State the first zone is the plume exposure emergency planning zone with an approximate radius of ten miles from the nuclear power plant or chemical depot. The second zone is the ingestion exposure EPZ with an approximate radius of 50 miles. Immediate Response Zone (IRZ) and Protective Action Zone (PAZ) are associated with nuclear and chemical storage facilities.

EMERGENCY SUPPORT FUNCTION (ESF) – The functional approach that groups the types of assistance that a state is most likely to need, (e.g. mass care, health and medical services) as well as the kinds of federal operations support necessary to sustain state response actions (e.g., transportation, communications). ESFs are expected to support one another in carrying out their respective missions.

EMERGENCY WORKER - Emergency worker means any person including but not limited to an architect registered under Chapter 18.08 RCW or a professional engineer

registered under Chapter 18.43 RCW, who is registered with a local emergency management organization or the department and holds an identification card issued by the local emergency management director or the department for the purpose of engaging in authorized emergency management activities or is an employee of the state of Washington or any political subdivision thereof who is called upon to perform emergency management activities.

ENDOGENOUS - Produced or originating from within the cell or organism. Concerning spore formation within the bacterial cell.

ENGINEER - Any person registered under Chapter 38.52 RCW as an emergency worker who is an architect or professional engineer as registered under Chapters 18.08 and
18.43 RCW respectively.

ENRICHED URANIUM - Uranium in which the abundance of the Uranium-235 isotope has been increased above the natural amount (0.711 percent), Uranium-235.

EVIDENCE SEARCH - An unscheduled, non-emergency training activity utilizing emergency worker skills to look for evidentiary materials resulting from criminal activity.

EXPLOSIVE ORDNANCE DISPOSAL (EOD) - The detection, identification, field evaluation, rendering-safe, and/or disposal of explosive ordnance which has become hazardous by damage or deterioration when the disposal of such explosive ordnance is beyond the capabilities of personnel assigned to routine disposal.

FALLOUT PROTECTION FACTOR (FPF) - Fallout Protection Factor is a numerical factor (ratio) of gamma radiation exposure at an unprotected location to exposure at a protected location. It is a calculated value suitable as an indictor of relative protection.

FEDERAL COORDINATING OFFICER (FCO) - The individual appointed by the Federal Emergency Management Agency Director (by delegation of authority from the President) to coordinate assistance in a federally-declared disaster.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - Agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery. Federal Emergency Management Agency manages the President's Disaster Relief Fund and coordinates the disaster assistance activities of all federal agencies in the event of a Presidential Disaster Declaration.

FEDERAL EMERGENCY MANAGEMENT AGENCY-STATE AGREEMENT - A formal legal document between Federal Emergency Management Agency and the affected state that describes the understandings, commitments, and binding conditions for assistance applicable as a result of a declaration by the President. It is signed by the Federal Emergency Management Agency Regional Director and the Governor. The agreement establishes the disaster incident period, the state and local jurisdiction commitment, and the financial grant requirements as administered by Federal Emergency Management Agency through the state.

FEDERAL EMERGENCY RESPONSE TEAM - An interagency team consisting of the lead representative from each federal department or agency assigned primary responsibility for an Emergency Support Function and key members of the FCO's staff, formed to assist the FCO in carrying out his/her coordination responsibilities. The Emergency Response Team provides a forum for coordinating the overall federal response, reporting on the conduct of specific operations, exchanging information, and resolving issues related to Emergency Support Functions and other response requirements. Emergency Response Team members respond to and meet as requested by the FCO. The Emergency Response Team may be expanded by the FCO to include designated representatives of other federal departments and agencies as needed.

FEDERAL INFORMATION PROCESSING STANDARD (FIPS) - Pre-assigned numbers by the Federal government to identify local jurisdictions throughout the nation. The code for any location consists of eight (8) digits.

FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT PLAN (FRMAP) - (formerly known as the Interagency Radiological Assistance Plan) - A plan developed, coordinated and maintained by the U.S. Department of Energy for provision of federal radiological monitoring and assessment support during a response to a nuclear emergency.

FEDERAL RADIOLOGICAL EMERGENCY RESPONSE PLAN - The plan that describes the Federal response to the radiological and on-site technical aspects of an emergency in the United States and identifies the lead federal agency for an event. The events include one involving the Nuclear Regulatory Commission or state licensee, the U.S. Department of Energy or the U.S. Department of Defense property, a space launch, occurrence outside the United States but affecting the United States, and one involving radium or accelerator-produced material. Transportation events are included in those involving the U.S. Nuclear Regulatory Commission, state licensee, U.S. Department of Energy, or U.S. Department of Defense.

FEDERAL RESPONSE PLAN (FRP) - The plan that establishes the basis for the provision of federal assistance to a state and the local jurisdiction impacted by a catastrophic or significant disaster or emergency that results in a requirement for federal response assistance.

FIELD ASSESSMENT TEAM (FAST) - A designated team of technical experts from federal, state, and local emergency management organizations that are alerted and deployed to a disaster to augment or supplement state and local jurisdiction assessment capabilities.

FIRE COMMUNICATIONS (FIRECOM) - Statewide mutual aid firefighting frequency used by firefighters of different departments and districts for the command and coordination of fire suppression operations.

FIRE SERVICES DEFENSE REGIONS - One of nine regions within the state responsible to the development and maintenance of Washington State Regional Fire Services Resource Mobilization Procedures (WSFSRMP) consistent with local plans and with WSFSRMP, CEMP, and ICS. Administers the WSFSRMP as it applies within the region, maintains local liaisons, and maintains inventories of equipment.

FIRESET - The system of components in a nuclear weapon that converts (if necessary), stores, and releases electrical or chemical energy to detonate weapon when commanded by the fusing system.

FISSILE MATERIAL - An isotope that readily fissions after absorbing a neutron of any energy, either fast or slow. Fissile materials are Uranium-235, Uranium-233, Plutonium-239 and Plutonium-241. Uranium-235 is the only naturally occurring fissile isotope.

FISSION - The splitting of the nucleus of a heavy atom into two lighter nuclei. It is accompanied by the release of neutrons, X rays, gamma rays, and kinetic energy of the fission products.

FISSION WEAPON - A nuclear warhead whose material is Uranium or Plutonium that is brought to a critical mass under pressure from a chemical explosive detonation to create an explosion that produces blast, thermal radiation, and nuclear radiation through fission. The complete fission of one pound of fissionable materials has a yield equivalent to 8,000 tons of TNT.

FOOD ACCESS CONTROL POINT (FACP) - An access control point established along the food control boundary to ensure that food control measures are maintained. (Synonymous with Food Control Point).

FOREST FIRE - The uncontrolled destruction of forested lands by wildfires caused by natural or human-made events. Wildfires occur primarily in undeveloped areas characterized by forestlands.

FORMALIN - A watery solution of 37 percent formaldehyde.

FULL-SCALE EXERCISE - An activity intended to evaluate the operational capability of emergency management systems in an interactive manner over a substantial period of time. It involves the testing of a major portion of the emergency plan and organizations in a highly stressful environment. It includes the mobilization of personnel and resources to demonstrate coordination and response capabilities. The EOC is activated and field command posts may be established. A full-scale exercise is always formally evaluated.

FUNCTIONAL EXERCISE - An activity designed to test or evaluate the capability of individual or multiple emergency management functions. It is more complex than a tabletop exercise in that activities are usually under time constraints and are followed by an evaluation or critique. It usually takes place in some type of coordination or operating center. The use of outside resources is often simulated. No field units are used.

FUSION - The opposite of fission, in which two light nuclei atoms deuterium and/or tritium-combine to form a heavier nucleus with the release of a substantial amount of energy. Extremely high temperatures, resulting in highly energetic, fast moving nuclei, are required to initiate fusion reactions,

FUSION WEAPON - Two stage nuclear warhead containing fusion materials, such as Deuterium and Tritium, that are brought to critical density and temperature conditions by use of a primary fission reaction in order to initiate and sustain a rapid fusion process. This process in turn creates an explosion that produces blast, thermal radiation, and

nuclear radiation. This type of device is commonly known as hydrogen bomb and thermonuclear weapon.

GAMMA RADIATION - High-energy electromagnetic radiation emitted by nuclei during nuclear reactions or radioactive decay. These rays have high energy and a short wave length. Shielding against gamma radiation requires thick layers of dense materials, such as lead. Gamma rays or radiation are potentially lethal to humans, depending of the intensity of the flux.

GOVERNOR'S AUTHORIZED REPRESENTATIVE (GAR) - The person empowered by the Governor to execute, on behalf of the state, all necessary documents for disaster assistance.

G-SERIES NERVE AGENTS - Chemical agents of moderate to high toxicity developed in the 1930's. Examples are tabun (GA), sarin (GB), soman (GD), and GF.

GUN-TYPE WEAPON - A gun barrel-shaped device in which two or more pieces of fissionable material, each less than a critical mass, are brought together very rapidly so as to form a supercritical mass that can explode as the result of a rapidly expanding fission chain reaction.

HANFORD SITE - A 560 square mile complex, located north of the city of Richland, Washington, under the direction of the U.S. Department of Energy.

HAZARD MITIGATION GRANT PROGRAM - A program authorized under Section 404 of the Stafford Act, which provides funding for hazard mitigation projects that are cost effective and complement existing post-disaster mitigation programs and activities by providing funding for beneficial mitigation measures that are not funded through other programs.

HEMORRHAGIC - Pertaining to or marked by an abnormal, severe internal or external discharge of blood.

HIGH-LEVEL WASTE (HLW) - Nuclear power plant waste that is very radioactive. This waste is usually (1) irradiated (spent) reactor fuel; (2) liquid waste resulting from the operation of the first cycle solvent extraction system and the concentration wastes from subsequent extraction cycles, in a facility for reprocessing irradiated reactor fuel; and (3) solids into which such liquid wastes have been converted. Most HLW in the United States is spent fuel discharged from commercial nuclear power reactors, but there is some reprocessed HLW from defense activities and a small quantity of reprocessed commercial HLW.

HOSPITAL EMERGENCY ADMINISTRATIVE RADIO (HEAR) - Radio frequency for communications between emergency medical responders.

IMMEDIATE RESPONSE ZONE (IRZ) – The planning zone immediately surrounding each Army CSEPP installation. Generally, it extends to about 6 miles from the installation's chemical storage area. At some installations it extends to about 9 miles.

IMPLOSION WEAPON - A spherical device in which a quantity of fissionable material, less than a critical mass at ordinary pressure has its volume suddenly reduced by

compression - a step accomplished by using chemical explosives - so that it becomes supercritical, producing a nuclear explosion.

INCAPACITATING AGENTS - Produce temporary physiological and/or mental effects via action on the central nervous system. Effects may persist for hours or days and victims usually do not require medical treatment; however, such treatment does speed recovery.
VOMITING AGENTS - Produce nausea and vomiting effects, can also cause coughing sneezing, pain in the nose and throat, nasal discharge, and tears.

TEAR (riot control agents) - Produce irritating or disabling effects that rapidly disappear within minutes after exposure ceases.

CENTRAL NERVOUS SYSTEM DEPRESSANTS - Compounds that have the predominant effect of depressing or blocking the activity of the central nervous system. The primary mental effects include the disruption of the ability to think, sedation, and lack of motivation.

CENTRAL NERVOUS SYSTEM STIMULANTS - Compounds that have the predominant effect of flooding the brain with too much information. The primary mental effect is loss of concentration, causing indecisiveness and the inability to act in a sustained, purposeful manner.

INCIDENCE – Frequency of disease occurrence.

INCIDENT - An occurrence or event, either human-caused or natural phenomena, that requires action by emergency services personnel to prevent or minimize loss of life or damage to property and/or the environment.

INCIDENT COMMAND SYSTEM (ICS)

a. An all-hazards, on-scene functional management system that establishes common standards in organization, terminology, and procedures, provides a means (unified command) for the establishment of a common set of incident objectives and strategies during multi-agency/multi-jurisdiction operations while maintaining individual agency/jurisdiction authority, responsibility, and accountability, and which is a component of the National Interagency Incident Management Systems (NIMS).

b. An equivalent and compatible all-hazards, on-scene, functional management system.

INDIVIDUAL ASSISTANCE (IA) - Supplementary federal assistance available under the Stafford Act to individuals, families, and businesses which includes disaster housing assistance, unemployment assistance, grants, loans, legal services, crisis counseling, tax relief, and other services or relief programs (see Individual and Family Grant Program below).

INDIVIDUAL ASSISTANCE OFFICER (IAO) - The individual who, under the direction of the Federal Coordinating Officer monitors the Individual Assistance programs of all

agencies, and reports to the Federal Coordinating Officer on the total effectiveness of the Individual Assistance effort.

INDIVIDUAL AND FAMILY GRANT (IFG) PROGRAM - The program authorized under Section 411 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act for the purpose of making grants to individuals and families whose disaster-related serious needs or necessary expenses cannot be satisfied by any other federal, state, or volunteer program. The grant program is normally seventy five percent federally funded and twenty five percent state funded. The state administers the program.

INDUSTRIAL AGENTS - Chemicals developed or manufactured for use in industrial operations or research by industry, government, or academia. These chemicals are not manufactured, primarily, for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for use by man. Hydrogen cyanide, cyanogen chloride, phosgene, chlorine, chloropicrin, and many herbicides and pesticides are industrial chemicals that also can be chemical agents.

INFECTIOUS - Capable of being transmitted with or without contact. Pertaining to a disease caused by a microorganism. Producing infection.

INGESTION - The process of taking material (particularly food) into the gastrointestinal tract or the process by which a cell takes in foreign particles.

INGESTION EXPOSURE PATHWAY - When human beings are exposed to radioactive or hazardous materials from a facility through consumption of water and foodstuffs, including dairy products. Emergency planning and protective actions are designed in part to eliminate or reduce to the minimum exposures due to ingestion of contaminated materials in the area surrounding a facility.

INGESTION PLANNING ZONE (IPZ) – Per Integrated Plan it is the Ingestion Exposure Pathway Emergency Planning Zone. Ingestion exposure pathway is the potential pathway of radioactive materials to the public through consumption of radiological contaminated water, food crops, or dairy products. This planning zone extends 50 miles in radius from the nuclear power plant.

INHALATION - The act of drawing breath, vapor, or gas into the lungs.

INTERFACE AREA - The area where residences are built in proximity to the flammable fuels naturally found in wildland areas, such as forests, prairies, hillsides and valleys.

INTERFACE FIRE - Fire that threatens or burns the interface area. Fire affecting both wildland areas and homes.

INTERMIX FIRE - Fire that threatens or has caused damage in areas containing both forestlands and structures.

IRRADIATION - Exposure to neutrons in a nuclear reactor or more generally, exposure to any source of radiation.

IONIZING RADIATION - Any radiation displacing electrons from atoms or molecules, thereby producing ions. Examples: alpha, beta, gamma radiation, X-ray or short-wave ultraviolet light. Ionizing radiation may produce severe skin or tissue damage.

JOINT INFORMATION CENTER (JIC) - A facility that may be used by affected utilities, state agencies, counties, local jurisdictions, and/or federal agencies to jointly coordinate the public information function during all hazards incidents.

JOINT PRIMARY AGENCY - Two state agencies assigned primary responsibilities to manage and coordinate a specific Emergency Support Function (ESF), jointly. Joint primary agencies are designated on the basis of their having shared authorities, resources, capabilities, or expertise relative to accomplishment of the specific ESF activities. Joint primary agencies are responsible for overall planning and coordination with support agencies for the ESF, with ESF
delivery assistance, if requested, from the state EOC. An example of Joint Primary Agency activities is the Department of Ecology and the Washington State Patrol for ESF 10, Hazardous Materials.

LAND SEARCH AND RESCUE - See SEARCH AND RESCUE.
LAW ENFORCEMENT RADIO NETWORK (LERN) - Statewide law enforcement mutual aid frequency controlled by the Washington State Police Chiefs Association and Washington State Patrol.

LESION - An injury or wound. A single infected patch in a skin disease.

LIQUID AGENT - A chemical agent that appears to be an oily film or droplets. The color ranges from clear to brownish amber.

LOCAL DIRECTOR - The director or designee of a county or municipal emergency management agency jurisdiction.

LOCAL EMERGENCY MANAGEMENT AGENCY - The emergency management or emergency services organization of a political subdivision of the state established in accordance with RCW 38.52.070.

LOCAL EMERGENCY PLANNING COMMITTEE (LEPC) - The planning body designated by the Superfund Amendments and Reauthorization Act, Title III legislation as the planning body for preparing local hazardous materials plans.

LYMPHATIC - Of or pertaining to the alkaline fluid found in the lymphatic vessels

MAJOR DISASTER - As defined in federal law, is any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion, or other technological or human caused catastrophe in any part of the United States which, in the determination of the President, causes damage of sufficient severity and magnitude to warrant major disaster assistance… in alleviating the damage, loss, hardship, or suffering caused thereby.

MEDICAL EMERGENCY DELIVERY NETWORK (MEDNET) - Dedicated two-way Ultra High Frequency (UHF) radio system to provide communications between emergency medical responders and hospitals.

MILITARY DEPARTMENT - Refers to the Emergency Management Division, the Army and Air National Guard, and Support Services.

MISSION - A distinct assignment of personnel and equipment to achieve a set of tasks related to an incident, emergency, disaster, catastrophe, or search and rescue operations that occurs under the direction and control of an authorized official.

MISSION ASSIGNMENT - A task assigned by the Federal Emergency Management Agency to any capable federal agency to provide necessary disaster assistance not available under other statutory authorities. The task may involve logistical and personnel of federal assistance as well as direct federal assistance to state and local jurisdictions.

MITIGATION - Actions taken to eliminate or reduce the degree of long-term risk to human life, property, and the environment from natural and technological hazards. Mitigation assumes our communities are exposed to risks whether or not an emergency occurs. Mitigation measures include but are not limited to: building codes, disaster insurance, hazard information systems, land use management, hazard analysis, land acquisition, monitoring and inspection, public education, research, relocation, risk mapping, safety codes, statues and ordinances, tax incentives and disincentives, equipment or computer tie downs, and stockpiling emergency supplies.

MORBIDITY - State of being diseased. The number of sick persons or cases of disease in relationship to a specific population.

MORTALITY - The condition of being mortal. The death rate; the ratio of the number of deaths to a given population.

NATIONAL CONTINGENCY PLAN (NCP) - "The National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR Part 300) prepared by the Environmental Protection Agency to put into effect the response powers and responsibilities created by the Comprehensive Environmental Response, Compensation and Liability Act, and the authorities established by Section 311 of the Clean Water Act.

NATIONAL DISASTER MEDICAL SYSTEM (NDMS) - A system designed to deal with extensive medical care needs in very large disasters or emergencies. The system is a cooperative effort of the U.S. Department of Health and Human Services, Federal Emergency Management Agency, U.S. Department of Defense, state and local government agencies, and the private sector.

NATIONAL INTERAGENCY COORDINATION CENTER (NICC) - The organization responsible for coordination of the national emergency response to a wildland fire. The NICC is headquartered in Boise, Idaho.

NATIONAL RESPONSE CENTER - A communications center for activities related to hazardous materials response actions at Coast Guard headquarters in Washington D.C. The center receives and relays notices of discharges or releases to the appropriate on-scene coordinator, disseminates on-scene coordinator and Regional Response Team reports to the National Response Team when appropriate, and provides facilities for the National Response Team to use in coordinating national response action when required.

NATIONAL PUBLIC SAFETY PLANNING ADVISORY COMMITTEE (NPSPAC) - Advisory committee that reviews and approves or disapproves applications in accordance with National Public Safety Planning Advisory Committee Region 43 (Washington State) for use of a specific band of 800 megahertz (MHZ) frequencies within the state.

NATIONAL SEARCH AND RESCUE PLAN (NSP) - A U.S. interagency agreement providing a national plan for the coordination of Search and Rescue services to meet domestic needs and international commitments.

NATIONAL WARNING SYSTEM (NAWAS) - The federal portion of the Civil Defense Warning System, used for the dissemination of warnings and other emergency information from the Federal Emergency Management Agency National or Regional Warning Centers to Warning Points in each state. Also used by the State Warning Points to disseminate information to local
Primary Warning Points. Provides warning information to state and local jurisdictions concerning severe weather, earthquake, flooding, and other activities affecting public safety.

NATURAL URANIUM - Uranium as found in nature, containing about 0.711 percent of Uranium-235, 99.283 percent of Uranium-238, and a trace (0.0006 percent) of Uranium-234. It is mined as an ore in various regions of the world and is relatively inexpensive.

NEBULIZER - A device for producing a fine spray or aerosol.

NEUROLOGIC - Adjective relating to the branch of medicine that deals with the nervous system and its diseases.

NEUROMUSCULAR - Concerning both nerves and muscles

NEUROTOXIN - A substance that attacks nerve cells.

NON-PERSISTENT AGENT - An agent that, upon release, loses its ability to cause casualties after 10-to-15 minutes. It has a high evaporation rate and is lighter than air and will disperse rapidly. It is considered to be a short-term hazard. However, in small and unventilated areas, the agent will be more persistent.

NUCLEAR EMERGENCY SEARCH TEAM (NEST) - A U.S. Department of Energy sponsored team trained to search for and identify lost or stolen weapons and special nuclear materials, and to respond to nuclear bomb threats or radiation dispersal threats. The team is made up of personnel from many agencies and other organizations.

NUCLEAR REGULATORY COMMISSION (NRC) - The federal agency that regulates and licenses commercial nuclear facilities.

ON-SCENE COMMAND AND COORDINATION RADIO (OSCCR) - A frequency used by “on-scene” emergency responders of different agencies for command and coordination of an incident or emergency, according to a joint Military Department, Emergency Management Division and Association of Police Communications Officers (APCO) agreement.

ORGANOPHOS-PHOROUS COMPOUND - A compound, containing the elements phosphorus and carbon, whose physiological effects include the inhibition of neurotransmitters. Many pesticides (malathion and parathion) and virtually all nerve agents are organophosphorous compounds.

PATHOGEN - Any organism (usually living) capable of producing serious disease or death, such as bacteria, fungi, and viruses.

PATHOGENIC AGENTS - Biological agents capable of causing serious disease.

PERSISTENT AGENT - An agent that upon release retains its causality-producing effects for an extended period of time, usually anywhere from 30 minutes to several days. A persistent agent usually has a low evaporation rate and its vapor is heavier than air. Therefore, its vapor cloud tends to hug the ground. It is considered to be a long-term hazard. Although inhalation hazards are still a concern, extreme caution should be taken to avoid skin contact as well.

PLAGUE - A disease caused by Yersinia pestis, which is usually transmitted occupationally or recreationally to humans through the bite of infected fleas but may also be disseminated by aerosol. Can result in three clinical forms Bubonic, Septicemic or Pneumonic with the later being the most common result of a bioterrorist event. Pneumonic plague is characterized by sudden onset of fever, headache, fatigue, muscle aches and cough progressing to pneumonia, respiratory distress and death, if untreated. Treatment with appropriate, sensitive antibiotics is necessary.

PLUME - Airborne material spreading from a particular source; the dispersal of particles, gases, vapors, and aerosols into the atmosphere.

POINT-SOURCE DELIVERY SYSTEM - A delivery system in which the biological agent is dispersed from a stationary position. This delivery method results in coverage over a smaller area than with the line source system. (See also “Line-Source Deliver System.”)

PRELIMINARY DAMAGE ASSESSMENT (PDA) - The joint local, state, and federal analysis of damage that has occurred during a disaster and which may result in a Presidential declaration of disaster. The PDA is documented through surveys, photographs, and other written information.

PRELIMINARY DAMAGE ASSESSMENT TEAM - An ad hoc group that comes together after a disaster whose main purpose is to determine the level of disaster declaration that is warranted. The team usually consists of federal, state, and local representatives to do an initial damage evaluation to sites damaged.

PREPAREDNESS - Actions taken in advance of an emergency to develop operational capabilities and facilitate an effective response in the event an emergency occurs. Preparedness measures include but are not limited to: continuity of government, emergency alert systems, emergency communications, emergency operations centers, emergency operations plans, emergency public information materials, exercise of plans, mutual aid agreements, resource management, training response personnel, and warning systems.

PRESIDENTIAL DECLARATION - Formal declaration by the President that an Emergency or Major Disaster exists, based upon the request for such a declaration by the Governor and with the verification of Federal Emergency Management Agency preliminary damage assessments.

PRIMARY AGENCY - A state agency or agency assigned primary responsibility to manage and coordinate a specific ESF. Primary agencies are designated on the basis of who has the most authorities, resources, capabilities, or expertise relative to accomplishment of the specific Emergency Support Function (ESF) with assistance, if requested, from the state EOC. An example of a primary agency is the Department of Transportation for ESF 1, Transportation.

PRIVATE BRANCH EXCHANGE (PBX) - A telephone switch system owned and operated by the user.

PROJECT WORKSHEET – Detailed record of an on-site inspection of disaster damage caused to property of the state and local jurisdictions.

PROJECT WORKSHEET TEAMS - Teams of federal, state, and local jurisdiction experts, typically architects or engineers who conduct detailed on-site inspections, of disaster damage caused to property of state and local jurisdictions. The team determines costs and categories of
repair work needed for damages offered. The results are used in the preparation of Project Worksheets. Used in conjunction with Presidential Disaster Declaration.

PROPHYLAXIS - Observance of rules necessary to prevent disease. Protective treatment for or prevention of disease.

PROTECTION - Any means by which an individual protects their body. Measures include masks, self-contained breathing apparatuses, clothing, structures such as buildings, and vehicles.

PROTECTIVE ACTION DECISION (PAD) - An action or measure taken by public officials to prevent or minimize radiological or chemical exposures to people.

PROTECTIVE ACTION RECOMMENDATION (PAR) - A recommendation based on technical scientific data for public officials to use in forming a decision to prevent or minimize the contamination of people and foodstuffs.

PUBLIC ASSISTANCE (PA) - Supplementary federal assistance provided under the Stafford Act to state and local jurisdictions, special purpose districts, Native Americans, or eligible private, nonprofit organizations.

PUBLIC ASSISTANCE OFFICER (PAO) - A member of the Federal Emergency Management Agency Regional Director's staff who is responsible for management of the Public Assistance Program.

PULMONARY - Concerning or involving the lungs.

Q FEVER - A disease caused by the rickettsia Coxiella burnedi that is characterized by fever, malaise, and muscular pains. The average incubation period is 2 to 3 weeks but may be less depending on the dose. Q-fever is rarely transmitted from person to person. Antibiotics are necessary for treatment.

RADIO AMATEUR CIVIL EMERGENCY SERVICES (RACES) - Licensed amateur radio operators who support state and local jurisdictions during emergencies or disasters.

RADIOGRAPHIC - Adjective relating to the process of producing an image on a radiosensitive surface like photographic film with radiation other than visible light, especially by x-rays passed through an object.

RADIOLOGICAL CALIBRATION - A procedure utilizing radioactive sources for establishing the accuracy of radiological instruments.

RADIOLOGICAL CONTAMINATION - Radioactive material deposited on the surface of structures, areas, objects, or persons following a release of any radioactive material.

RADIOLOGICAL COUNTERMEASURES - Protective actions to reduce the effects of any nuclear incident, including fallout, upon the population. Example: decontamination.

RADIOLOGICAL PROFILE (RADPRO) - A microcomputer-based file containing records from each of the local jurisdictions that have a radiological defense system. Each record has 38 data fields containing specific information about the jurisdiction. The file is maintained by the state Radiation Safety Officer.

RADIOLOGICAL MONITOR (RM) - An individual trained to measure, record, and report radiation exposure and exposure rates, and to provide limited field guidance on radiation hazards.

RADIOLOGICAL RESPONSE TEAM (RRT) - A community-based radiological defense cadre consisting of members from the community emergency services, vital facilities, and essential services. This cadre, trained and exercised on an on-going basis, forms a baseline radiological defense capability which can be used for surge training and to assist in the rapid build up of community radiological defense capability during an increased readiness period. The Radiological Response Team may be used to respond to peacetime radiological accidents such as transportation and nuclear power plant accidents.

RECOVERY

a. Activity to return vital life support systems to minimum operating standards and long-term activity designed to return life to normal or improved levels, including some form of economic viability. Recovery measures include, but are not limited to, crisis counseling, damage assessment, debris clearance, decontamination, disaster application centers, disaster insurance payments, disaster loans and grants, disaster unemployment assistance, public information, reassessment of emergency plans, reconstruction, temporary housing, and full-scale business resumption.

b. The extrication, packaging, and transport of the body of a person killed in a search and rescue incident.

RECOVERY and RESTORATION TASK FORCE (RRTF) - In the wake of a catastrophic disaster, the Governor may direct the formation of the RRTF. Its purpose is to guide, recommend and coordinate efforts to restore normalcy to areas adversely impacted by the disaster. The RRTF will determine the extent of economic impacts on citizens, businesses, as well as the ecological impacts on land and property.

RECOVERY RESOURCE GROUP (RRG) – The group constituted by the Governor, at the request of the senior locally elected official, to assist with recovery activities for the Chemical Stockpile Emergency Preparedness Program. The RRG will be chaired by the senior locally elected official or designee and composed of a representative from the local jurisdiction, state, and federal governments. The group will coordinate recovery activities of the members' respective government and provide advice to the chairperson on recovery issues.

REGIONAL DIRECTOR, FEDERAL EMERGENCY MANAGEMENT AGENCY (RD) - The individual in the federal government who responds to the Governor's request for a Presidential declaration by organizing and coordinating the preliminary damage assessment, makes the regional analysis and recommendation as to whether the situation warrants a Presidential Disaster Declaration. If the President declares a major disaster or emergency, the Regional Director administers the Public Assistance Program and monitors the Individual and Family Grant Program under Public Law 93-288. The Regional Director is a presidential appointee and manages one of ten federal regions.

REMOTE PICK-UP UNIT (RPU) - A radio transmitter and receiver used in conjunction with Emergency Alert System to provide communications between the Primary Emergency Alert System (EAS) station and the local emergency operations center.

REPROCESSED URANIUM - Uranium that has been recovered from spent fuel rods. It typically contains small amounts of Uranium-234 and Uranium-236 in addition to Uranium-235 and Uranium-238.

RESCUE COORDINATION CENTER (RCC)

a. (Federal) - A unit responsible for promoting efficient organization of search and rescue services and coordinating conduct of search and rescue operations within a search and rescue region (National Search and Rescue Plan).

b. (State) - An extension of the state Emergency Operations Center (EOC) activated in an emergency or disaster to support local search and rescue operations by coordinating the state, out-of-state, and federal search and rescue resources responding to the incident. The RCC may be co-located with the EOC or deployed to a location in the proximity of the incident site.

RESPONSE - Actions taken immediately before, during, or directly after an emergency occurs, to save lives, minimize damage to property and the environment, and enhance the effectiveness of recovery. Response measures include, but are not limited to, emergency plan activation, emergency alert system activation, emergency instructions to

the public, emergency medical assistance, staffing the emergency operations center, public official alerting, reception and care, shelter and evacuation, search and rescue, resource mobilization, and warning systems activation.

ROBERT T. STAFFORD DISASTER RELIEF AND EMERGENCY ASSISTANCE ACT (Public Law 93-288, as amended) - The act that authorizes the greatest single source of federal disaster assistance. It authorizes coordination of the activities of federal, state, and volunteer agencies operating under their own authorities in providing disaster assistance, provision of direct federal assistance as necessary, and provision of financial grants to state and local jurisdictions as well as a separate program of financial grants to individuals and families. This act is commonly referred to as the Stafford Act.

ROENTGEN MAN EQUIVALENT (REM) - The unit of exposure expressed as dose equivalent. The amount of ionizing radiation needed to produce the same biological effect as one roentgen of high-penetration x-rays.

ROUTE OF EXPOSURE (Entry) - The path by which a person comes into contact with an agent or organism; for example, through breathing, digestion, or skin contact.

SEARCH AND RESCUE - The act of searching for, rescuing, or recovering by means of ground, marine, or air activity any person who becomes lost, injured, or is killed while outdoors or as a result of a natural or human-caused event, including instances of searching for downed aircraft when ground personnel are used. Includes DISASTER, URBAN, and WILDLAND SEARCH AND RESCUE. Also referred to as LAND SEARCH AND RESCUE to differentiate from AIR SEARCH AND RESCUE.

SELF-PROTECTION MONITORING - A capability that provides for the personnel in emergency services, vital facilities, and essential industries with the ability to conduct radiological monitoring for their own protection. It includes a means to monitor and control the radiation exposure of emergency workers who would be engaged in peacetime emergency response and post-attack recovery operations.

SHELTER MONITORING - A capability which provides for the means to detect, measure, and assess, in public fallout shelters, the radiation hazards from fallout following a nuclear accident or attack. The fallout shelter is the primary countermeasure in the radiological defense system to protect people from radiation.

SPILL RESPONSE - All actions taken in carrying out the Washington State Department of Ecology's responsibilities to spills of hazardous materials, e.g. receiving and making notifications, information gathering and technical advisory phone calls, preparation for and travel to and from spill sites, direction of clean-up activities, damage assessment, report writing, enforcement investigations and actions, cost recovery, and program development.

SPORE - A reproductive form some microorganisms can take to become resistant to environmental conditions, such as extreme heat or cold, while in a "resting stage."

STATE AND REGIONAL DISASTER AIRLIFT PLAN (SARDA) - A plan prepared by Washington State Department of Transportation, Aviation Division, which provides overall policy and guidance for aviation support in time of emergency.

STATE COORDINATING OFFICER (SCO) - The individual appointed by the Governor to act in cooperation with the Federal Coordinating Officer to administer disaster recovery efforts. The SCO may also function as the Disaster Recovery Manager and as the Governor's Authorized Representative.

STATE EMERGENCY OPERATIONS OFFICER (SEOO) - An individual designated as the initial point of contact for state level emergency response and coordination activities for all hazards (natural or human made) that could adversely affect lives, property, environment or the economy of Washington State operating within the Alert and Warning Center at the State Emergency Operations Center (EOC).

STATE FIRE DEFENSE COMMITTEE - A committee of the Fire Protection Policy Board which develops the Washington State Fire Services Resource Mobilization Plan, develops planning guidance for the Fire Services Mobilization Regions, promotes standardization of fire communications, develops alerting and dispatching procedures, maintains a listing of regional firefighting resources, and provides guidance for the approval of reimbursement requests.

SUPPORT AGENCY - An agency designated to assist a specific primary or joint primary agency with available resources, capabilities, or expertise in support of Emergency Support Function (ESF) activities under the coordination of the primary or joint primary, agency. An example of a support agency is the Department of Agriculture for ESF 8 - Health and Medical Services.

SURGE/INCREASED READINESS - A strategy for moving from a pre-established or existing base capability to a higher level of capability. Per the Federal Emergency Management Agency, Civil defense surge and increased readiness are not concepts that can be separated into different and distinct compartments. State and local increased readiness actions might be taken before, during, and after the initiation of a civil defense surge and may be part of it. Surge may be thought of as a federally supported enhanced form of increased readiness.

SURVIVABLE CRISIS MANAGEMENT (SCM) - The operational capability to survive a catastrophic disaster and be able to direct, control, and coordinate emergency operations within the state and in coordination and cooperation with other states and the federal government.

SYNDROME - A group of symptoms and signs of disordered function related to one another by means of some anatomical, physiological, or biochemical peculiarity. Provides a frame of reference for investigating an illness.

TABLETOP EXERCISE - An activity in which officials and key staff or others with emergency responsibilities are gathered together informally to discuss simulated emergency situations. It is designed to elicit constructive discussion by the participants without time constraints. Participants evaluate plans and procedures and resolve questions of coordination and assignment of responsibilities in a non-threatening format under minimum stress.

TERRORISM - The unlawful use of force or violence committed by an individual or group against persons or property in order to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives.

THERMONUCLEAR WEAPON - A nuclear weapon (also referred to as a hydrogen bomb) in which the main contribution to the explosive energy results from fusion of light nuclei such as Deuterium and Tritium. The high temperatures required for such fusion reactions are obtained by means of an initial fission explosion.

TITLE III - Public Law 99-499, Superfund Amendment and Reauthorization Act (SARA) of 1986, Title III, Emergency Planning Community Right-to-Know Act (EPCRA), requires the establishment of state and local planning organizations, State Emergency Response Commission (SERC) - a subcommittee of the Emergency Management Council -, and Local Emergency Planning Committees (LEPCs) to conduct emergency planning for hazardous materials incidents. It requires (1) site-specific planning for extremely hazardous substances, (2) participation in the planning process by facilities storing or using hazardous substances, and (3) notifications to the commission or committee of releases of specified hazardous substances. It also provides for mechanisms to provide information on hazardous chemicals and emergency plans for hazardous chemical events to the public.

TOXICITY - A measure of the harmful effect produced by a given amount of a toxin on a living organism. The relative toxicity of an agent can be expressed in milligrams of toxin needed per kilogram of body weight to kill experimental animals.

TOXINS - A substance, in some cases produced by disease-causing microorganisms, that is toxic to other living organisms. Numerous organisms including bacteria, fungi, algae, and plants produce toxins. Many toxins are extremely poisonous, with a toxicity that is several orders of magnitude greater than the nerve agents. Since toxins have low volatility, they are dispersed as aerosols and then taken up primarily through inhalation. Some examples of toxins include:

BOTULINUM TOXIN - Produced by the bacterium Clostridium botulinum and is one of the most lethal compounds known. There are three forms of botulism – food borne (the classic form), wound, and intestinal (infant and adult) botulism. The site of toxin production is different for each of the forms but all share the flaccid descending paralysis. In its natural form, botulism toxin is most often found in improperly canned or undercooked foods. Ventilatory assistance is required for recovery and if available administration of the botulism antitoxin can aid treatment.

RICIN - A toxin made from the processing of Castor beans for oil. Symptoms of ricin poisoning would result about 3 hours after exposure through inhaling, ingesting or injecting and would cause cough, tightness of the chest, difficulty breathing, nausea and muscle aches. This could progress to death within 36-48 hours from respiratory or circulatory collapse. No vaccine or anti-toxins are available, only supportive treatment.

SAXITOXIN - A potent neurotoxin produced by certain dinoflagellates that accumulates in shellfish feeding on these organisms and consequently causes paralytic shellfish poisoning in human beings who eat the contaminated shellfish. Development of this illness is extremely rapid with initial symptoms such as numbness or tingling in the lips, tongue and fingertips followed by a general lack of muscle coordination. At high doses death from respiratory paralysis may occur within less than 15 minutes.

TRAINING EVENT - A planned, non-emergency activity for the development, maintenance, or upgrading of emergency worker skills.

TRIAGE - The screening and classification of sick, wounded, or injured persons during disasters to determine priority needs for the efficient use of medical and nursing personnel, equipment, and facilities. Triage is also done in emergency rooms and acute care clinics to determine priority of treatment. The use of triage is essential to save the maximum number of lives specifically during an emergency situation that produces many more sick and wounded individuals than the available medical care facilities and personnel can handle.

TRIGGER LIST - A list of sensitive items to which export controls are to be applied. The Zangger Committee (INFCIRC 209) and the Nuclear Supplier Group (INFCIRC 254) each have trigger lists.

TULAREMIA - A disease caused by the bacterium Francisella tularensis that is characterized by an abrupt onset of fever, chills, headaches, muscle aches and non-productive cough. The average incubation period is 3 to 5 days but can range from 1 to 21 days. Tularemia is usually transmitted occupationally to humans through infected animals, animal products or tick bites. Tularemia is not transmitted from person to person. Antibiotics are necessary for treatment.

UMATILLA CHEMICAL DEPOT (UMCD) - A United States Army ordnance storage facility located in northeastern Oregon formerly known as Umatilla Depot Activity (UMDA). The Depot has been operated since 1942 as a storage site for conventional Army ammunition, bombs, artillery shells, and landmines. It is now a storage site for unitary and binary chemical weapons and agents. Send to steve debow for clarification

UNPROTECTED LANDS - Lands that are not protected by any fire suppression agency. (There is private property that does not have fire protection from rural fire districts, but does have protection from the Department of Natural Resources. This protection is for wildland and forest fires and not for protection of structures.)

URANIUM DIOXIDE - The chemical form of Uranium that is most commonly used in power reactors. Also known as “Brown Oxide,” even though it is nearly black when pressed into pellets.

URANIUM OXIDE - The generic name for a group of uranium compounds that includes Uranium Dioxide (U02, Brown Cycle), Uranium Trioxide (U03, Orange Cycle), Uranus-Uranium Oxide (U308, Black Cycle), and Uranium Peroxide (U04.2H20).

URBAN FIRE - Fire that is primarily found within the boundaries or limits of a city.

URBAN SEARCH AND RESCUE (USR) - Locating, extricating, and providing for the immediate medical treatment of victims trapped in collapsed or damaged structures.

URBAN SEARCH AND RESCUE TASK FORCE - A 62 member organization sponsored by the Federal Emergency Management Agency in support of Emergency Support Function 9. The task force is trained and equipped to conduct heavy urban search and rescue and is capable of being deployed to any disaster site nationwide.

VACCINE - A preparation of killed or weakened microorganism products used to artificially induce immunity against a disease.

VAPOR AGENT - A gaseous form of a chemical agent. If heavier than air, the cloud will be close to the ground. If lighter than air the cloud will rise and disperse more quickly.

VENOM - A poison produced in the glands of some animals such as snakes, scorpions, and bees.

VESICLE - A blister-like, small elevation on the skin containing fluid or a small sac or bladder containing fluid. Vesicles may vary in diameter from a few millimeters to a centimeter. They may be round, transparent, opaque, or dark elevations of the skin.

VIRUS - An infectious microorganism that exists as a particle rather than as a complete cell. Particle sizes range from 20 to 400 nanometers (one billionth of a meter). Viruses are not capable of reproducing outside of a host cell. Some examples include:

HEMORRHAGIC FEVER - Any of a diverse group of diseases characterized by a sudden onset of fever, aching, bleeding in the internal organs, petechiae, and shock. They include Ebola, Lassa, and Marburg viruses.

SMALLPOX - An acute, highly contagious, sometimes fatal, disease caused by Variola Major Virus. Symptoms include a high fever and successive stages of severe widespread skin eruptions (papules) that eventually blister, suppurate, and form pockmarks. Smallpox can be spread by direct contact or through the airborne route.

VENEZUELAN EQUINE ENCEPHALITIS (VEE) - VEE is a mosquito-borne arbovirus. In nature, VEE is infects animals and is transmitted to humans through mosquitoes that have fed on the infected animals. The disease is characterized by sudden onset of headache, chills and fever, nausea and vomiting, muscle and bone aches, and encephalitis occurring in a very small portion of cases.

V-SERIES NERVE AGENTS - Chemical agents of moderate to high toxicity developed in the 1950s. They are generally persistent. Examples are VE, VG, VM, VS, and VX.

VITRIFICATION - The solidification process to bind hazardous waste indefinitely. Hazardous waste is melted with a mixture of sand and reground fusing materials (a frit) to form a glass for ease of handling and storage.

VOLATILITY - A measure of how readily a substance will vaporize.

WASHINGTON PUBLIC POWER SUPPLY SYSTEM (Name changed to Energy Northwest in 1999) - A public corporation planning the construction and operation of three nuclear facilities in the state of Washington. Two facilities (WNP-1 and WNP-2 – Name changed to Columbia Generating Station) are located on land leased from the United States Department of Energy, Hanford Site, and one facility (WNP-3) is located in Grays Harbor County. Columbia Generating Station is the sole operating plant.

WASHINGTON STATE EMERGENCY INFORMATION CENTER (WEIC) - State level emergency public information may be established, provided to media and public, and

managed through the WEIC, which is a part of the Washington State Emergency Operations Center (EOC).

WEAPONS GRADE MATERIAL - Nuclear material considered most suitable for a nuclear weapon. It usually connotes Uranium enriched to above 90 percent Uranium-235 or Plutonium with greater than about 90 percent Plutonium-239.

WEAPON OF MASS DESTRCUTION (WMD) (TITLE 18 USC, SECTION 2332a) - Any weapon or device that is intended or has the capability to cause death or serious bodily injury to a significant number of people through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors; a disease organism; or radiation or radioactivity. Any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than one-quarter ounce, min or device similar to the above; poison gas; any weapon that is designed to release radiation or radioactivity at a level dangerous to life.

WILDLAND - An area in which development is essentially non-existent except for roads, railroads, power lines, and similar transportation facilities. Used in place of WILDERNESS, which frequently refers to specifically designated federal lands intended to remain in their natural state to the greatest extent possible.

WILDLAND FIRE - Fire that occurs in wildland areas made up of sagebrush, grasses, or other similar flammable vegetation.

WILDLAND SEARCH AND RESCUE - Search and rescue conducted in wildland areas. Due to the increasing wildland urban interface, wildland search and rescue strategy and tactics may also be employed for subjects lost or missing in urban or suburban areas. See SEARCH AND RESCUE, DISASTER SEARCH AND RESCUE, and URBAN SEARCH AND RESCUE.

WIND (DF) MESSAGES - Weather information concerning wind direction and speed. The information would be used for fallout forecasting.

YELLOWCAKE - A concentrated form of Uranium ore known as Uranium Diuranate.

ACRONYMNS

ACCESS	A Central Computerized Enforcement Service System
ACP	Access Control Point
ADA	Americans with Disabilities Act
AFRCC	Air Force Rescue Coordination Center
APHIS	Animal and Plant Health Inspection Services (USDA)
ANRC	American National Red Cross
ARC	American Red Cross
AVIC	Area Veterinary In Charge (USDA)
ATA	Air Transport Association of America
CAEC	County Animal Emergency Coordinator
CAIRA	Chemical Accident/Incident Response and Assistance

CAMEO	Computer Aided Management for Emergency Operations
CDRG	Catastrophic Disaster Response Group
CEMP	Comprehensive Emergency Management Plan
CFR	Code of Federal Regulation
CLOREP	Chlorine Emergency Plan
CMA	Chemical Manufactures Association
CPCS	Common Program Control Station
CSDP	Chemical Stockpile Disposal Program
CSEPP	Chemical Stockpile Emergency Preparedness Program
DCE	Defense Coordinating Element
DCO	Defense Coordinating Officer
DFO	Disaster Field Office
DSHS	Washington State Department of Social and Health Services
DIS	Washington State Department of Information Services
DNR	Washington State Department of Natural Resources
DOD	US Department of Defense
DOH	Department of Health
DOS	US Department of State
DRC	Disaster Recovery Center
DRM	Disaster Recovery Manager
DSHS	Washington State Department of Social and Health Services
DWI	Disaster Welfare Information
EAS	Emergency Alert System
EFSEC	Energy Facility Site Evaluation Council
EICC	Emergency Information and Coordination Center (FEMA)
EMC	Washington State Emergency Management Council
EMD	Washington State Emergency Management Division
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
EOP	Emergency Operating Procedures
EPA	Environmental Protection Plan
EPC	Emergency Processing Center
EPCRA	Emergency Planning Community Right-to-Know Act
FPF	Fallout Protective Factor
EPZ	Emergency Planning Zone
ERT-A	Emergency Response Team A
ESF	Emergency Support Function
EWAC	Emergency Worker Assistance Center
FAA	Federal Aviation Administration
FACP	Food Access Control Point
FADD	Foreign Animal Disease Diagnostician
FAST	Federal Assessment Team
FBI	Federal Bureau of Investigation
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
FHA	Federal Highway Administration
FIPS	Federal Information Processing Standards
FIRECOM	Fire Communications

FNS	Food and Nutrition Service (US)
FRMAP	Federal Radiological Monitoring and Assessment Plan
FRP	Federal Response Plan
FSAHCS	Food Safety Animal Health and Consumer Services
FS&LI	Food Safety and Livestock Identification
GA	Washington State Department of General Administration
GAR	Governor's Authorized Representative
GSA	US General Services Administration
HF	Statewide Emergency Communications System
HHS	Department of Health and Human Services (US)
HIVA	Hazard Identification and Vulnerability Assessment
HLW	High-Level Waste
HMS	Hazard Mitigation Strategy
HUD	US Department of Housing and Urban Development
IA	Individual Assistance
IAO	Individual Assistance Officer
IC	Incident Commander
IFGP	Individual and Family Grant Program
ICS	Incident Command System
INS	Immigration and Naturalization Services
IPZ	Ingestion Planning Zone
IRZ	Immediate Response Zone
ISB	Washington State Information Services Board
JIC	Joint Information Center
JTF	Joint Task Force
LERN	Law Enforcement Radio Network
LNO	Liaison Officer
MEDNET	Medical Emergency Delivery Network
NAWAS	National Warning System
NCP	National Contingency Plan
NDMS	National Disaster Medical System
NERP	National Emergency Repatriation Plan
NEST	Nuclear Emergency Search Team
NICC	National Information Coordination Center
NIMS	National Interagency Incident Management System
NPAC	National Poison Antidote Center
NPSPAC	National Public Safety Planning Advisory Committee
NRC	Nuclear Regulatory Commission
NRDA	National Resource Damage Assessment
NSRP	National Search and Rescue Plan
NVOAD	National Volunteer Organizations Active in Disasters
NWACP	Northwest Area Contingency Plan
OFA	Office of Family Assistance

OIE	Office International des Epizooties
OSC	On-Scene Coordinator
OSCCR	On-Scene Command and Coordination Radio
PA	Public Assistance
PAD	Protective Action Decision
PAO	Public Affairs Officer
PAO	Public Assistance Officer
PAR	Protective Action Recommendation
PAZ	Protective Action Zone
PDA	Preliminary Damage Assessment
PHS	Public Health Services
PIO	Public Information Officer
POE	Point of Entry
PPQ	Plant Protection and Quarantine
PSCDG	Primary State Core Decision Group
PW	Project Worksheet
RACES	Radio Amateur Civil Emergency Services
RADPRO	Radiological Profile
RCW	Revised Code of Washington
RCC	Rescue Coordination Center
READEO	Regional Animal Disease Eradication Organization (USDA)
REM	Roentgen Man Equivalent
ReVAC	Regional Veterinary Activities Commander
RM	Radio Monitor
ROC	Regional Response Center (FEMA)
RPU	Remote Pick-Up Unit
RRG	Recovery Resource Group
RRT	Radiological Response Team
RRTF	Washington State Recovery and Restoration Task Force
SAR	Search and Rescue
SARA	Superfund Amendment and Reauthorization Act
SARDA	State and Regional Disaster Airlift Plans
SATO	Scheduled Airline Traffic Office
SCM	Survivable Crisis Management
SECURE	State Emergency Communications
SEOO	State Emergency Operations Officer
SERC	State Emergency Response Commission
SCO	State Coordinating Officer
SLA	State and Local Assistance
SSA	Social Security Administration
SSCDG	Secondary State Core Decision Group
TANF	Temporary Assistance to Needy Families
UC	Unified Command
UHF	Ultra High Frequency
UMCD	Umatilla Chemical Depot
USA	Underground Service Alert

USCS	U.S. Customs Services
USDA	United States Department of Agriculture
US&R	Urban Search and Rescue
WAC	Washington Administrative Code
WADDL	Washington Animal Disease Diagnostic Laboratory
WARM	Washington Animal Response Management
WAVOAD	Washington Volunteer Organizations Active in Disasters
WEIC	Washington Emergency Information Center
WMD	Weapons of Mass Destruction
WNG	Washington National Guard
WSP	Washington State Patrol
WSDOT	Washington State Department of Transportation
WUTC	Washington Utilities and Transportation Commission

Appendix 9 – Reserved

Appendix 10 – Emergency Contact Lists

LUMMI INDIAN BUSINESS COUNCIL 2616 Kwina Rd.

Adams, Perry	Council Member	2304
Aus, Tasha	Youth Rec.	2383
Ayosa, Michael	Public Defender	2309
Ballew, Bill	Realty Specialist	2307
Ballew, Cathy	Child Support Enforcement	2478
Ballew, John	Language Instructor	2268
Ballew, Laural	Budget Officer	2290
Ballew, Tim	Probation/Secretary	2328
Ballew, Tim II	Statistics	2220
Ballew-Nelson, Jacci	Planning	2307
Barrie, Karen	Drug Court Clerk	2306
Bennett, Connie	Finance Analyst	2295
Bertram, Shaleena	Mental Health Counselor	2373
Bland, Rosalynn	Records/Archives	2246
Bob,Frank	Natural Resources	2343
Bob, Melissa	Special Proj. Coord. Court	2484
Brandow, Robert	Land Acquisition Specialist	2307
Breiler, Glenda	Court Clerk Assistant	2498
Brewer, Ernie	Procurement Manager	2219
Brionez, Armondo	Juvenile Probation Officer	2708
Broulette, John	Project Manager	2295
Brown, Melissa	Natural Resources	2322
Bunton, David	Chief of Staff	2297
Burke, Karen	Child Support Services	2214
Bush, Judy	Lead Attorney	2258
Butler, Nina	Admin. Asst. -Court	2232
Butler,Teresa	Council Operations Mgr.	2215
Cagey, Amber	Purchasing	2205
Cagey, Virginia	401K Benefits Coordinator	2350
Cagey, Yvonne	Natural Resources	2244
Cantzater, Tanesha	Child Support Enforcement	2326
Cardoza, Mary	Public Defender Office	2200
Chang,Shannan	I.S.	2203
Chapman, Alan	Natural Resources	2202
Charles, Kathy	Public Health Educator	2386
Coberly, Rolan	Lummi Police	2256

Folsom, Jerry	Funding Director	2352
Foot, David	I.S.	2342
Freimund, Jeremy	Water Resource	2212
Frye, Peter	Land Use Planner	2307
George, Marilyn	Records/Archives	2246
George, Carolee	Land Specialist	2307
George, Michelle	Collections	2295
George, Nicole	Public Defender Ast.	2355
Grahm, Scott	Lummi Police	2266
Hall, Robert	Seaponds	2221
Hall, Roberta	Intake Specialist	2295
Hamilton, Mark	Land Use Planner	2307
Hansen, Jim	Natural Resources	2340
Hawley, Paul	Courts	2250
Hillaire, Darrell		2229
Hillaire, Debbie	Recruitment Coordinator	2349
Hillaire, Edward	Shellfish	2316
Hillaire, Edward	NR Officer	2266
Hillaire, Elden	Fish Commission/Treasurer	2391
Hillaire, (Smitty) James	Schelangen	2298
Hillaire, Mary	Accounting	2281
Hillaire, PennyCarol	YESS Director	2373
Hillaire, Trina	Accounts Payable	2210
Holmes, Christian	Waste Management	2307
Humphries, Pat	I.S.	2342
Jacobs-Revey, Rosa	HR Admin. Asst.	2385
James, Betty	Victims of Crime	2285
James, David A	NR Officer	2266
James, David F	Maintenance Director	2211
James, Dolly	Natural Resources	2216
James, Gary	Lummi Police	2266
James, Harlan	Policy Representative	2294
James, Jewell	Policy Analyst	2337
James, Mike	I.S.	2361
Jefferson-A., Adrian	Accounts Receivable	2336
Jefferson, Charles	Forestry	2277

Conway, Ed	NR Officer	2266
Cook, Diane	Child Support Enforcement	2326
Cordero, Tess	Criminal Court Clerk	2486
Coss, Sharon	Victims of Crime	2285
Cultee, Cliff	Natural Resource Comm.	2368
Deardorff,Jessie	Headstart	2260
Deardorff,Leroy	NR Water	2272
Delgado,Linda	Seaponds	2346
Delketti, Michelle	Juvenile Court Clerk	2305
Dewees, Zach	Forestry Manager	2228
Dixon, Lenny	Planning	2307
Dixon,Ty	Lummi Police	2266
Dolphin, Craig	Natural Resources	2387
Doucet, Randy	Associte Judge	2305
Dudley, Wallace	Counselor	2305
Dunphy, Gregg	NR Biologist	2318
Edwards, Tom Jr.	Schelangen	2298
Easter, Kelly	Historic Preservation	2298
Emley, Dan	Facilities Manager	2307
Fawell, Stacy	Water Resource Analyst	2396
Finkbonner, Becky	Human Resource	2702
Finkbonner,Julie	Juvenile Probation Officer	2239
Finkbonner,Nikki	LVOC Director	2285
Finkbonner, Ron	TERO	2307
Finkbonner, Sandra	Housing	2295
First, Lee	Wetland Surveyor	2329
Kamkoff, Vela	Enrollment	2237
Kauffmann, Mary	Mortgage & Finance	2295
Kelly, Juanita	Language Intern	2238
Kinley, Randy Sr.	Fish Commissioner	2223
Kinley Shawnee	VOC Advocate	2285
Kinley, Sherri	Probate Clerk	2307
Laclair, Helena	Youth Outreach	2373
LaClair, Sharlaine	LNSO Coorinator	2317
Laclair-Lane, Trena	Housing Counselor	2295
LaClair, Willie	Youth Outreach	2373
Lane, Carol	Accounting	2217
Lane, Fred Sr.	Veterans/Council	2283
Lane, Fred	Communications	2351

Jefferson, David	Veterans	2283
Jefferson, Ernie Jr.	Seaponds	2221
Jefferson, Evelyn	Council Member	2304
Jefferson, Jewell	Enrollment Assistant	2206
Jefferson, Juanita	Archives/Records	2246
Jefferson, Karyl	Public Works Administrator	2307
Jefferson, Kelly	Child Support Enforcement	2326
Jefferson, Merle	Natural Res/Council	2225
Jefferson, Michelle	Admin. Asst. VOCA	2285
Jefferson, Ray	Lummi Police	2266
Jefferson, Richard	Planning Director	2307
Jefferson, Rita	Policy Asst. to Treasurer	2382
Jefferson, Rob	Natural Res. Enforcement	2266
Jefferson, Sunshine	Human Resources	2398
Jefferson, Victor	Assistant surveyor	2307
Johnnie, Al	Schelangen	2298
Johns, Glen	Lummi Police	2266
Johnson, Cheryl	Safety Office	1464
Johnson, Victor	Natural Resources	2267
Jojola, Idelle	OMB/Grants Asst.	2310
Jojola, Juliene	CARE Receptionist	2330
Jones, Selena	Child Support Asst.	2326
Jones, Willie	Vice-Chairman	2288
Julius, Gail	Records Coordinator	2315
Julius, Tina	Accounting	2384
Kamkoff, Andy	Construction Mgr	2307
Rubio, David	telephone technician	2377
Ruiz, Paula	Prosecutors Asst.	2208
Russell, Curt	Workplace Safety Officer	1464
Sanders, Cheryl	Victims of Crime	2285
Sattler, Amy	Water Resource Specialist	2712
Schumacher, Leia	Legal Assistant	2363
Salomon, Jesse	VOC Attorney	2213
Scott, Angel	Resident Service Mgr.	2295
Smith, Sheree	Payroll	2204
Solomon, Candy	Communications	2393
Solomon, Cheryl	Admin. Asst. Headstart	2260
Solomon, Christina	Contracts	2254
Solomon, Marylou	YESS Admin. Asst.	2373

Lane, Jeff	Forestry	2207
Lane, George Sr.	Oyster Hatchery	2303
Lawrence, Theresa	Natural Resources	2242
Leach, Bob	I.S.	2342
LeGarde, Louise	Benefits Coordinator	2371
Levinson, Ken	Asst. Prosecutor	2715
Lewis, Mann	Water Resource Tech.	2358
Lewis, Nicole	Assets	2354
Long, Kelly	Lummi Police	2266
Long, Ralph	Lumm iPolice	2266
Martin, Jay	Adult Probation Officer	2240
Martin, Leanne	CARE Office Receptionist	2330
Martinez, Joni	Cash Receipts	2222
Maudlin, Mike	Natural Resources	2344
Maurico, Jennifer	Victims of Crime	2213
McDonald, Doug	Planning Department	2307
MacKay, Mike	Natural Resources	2230
Mishler, Matthew	Law & Order	2266
Moe, India	Realty Clerk	2307
Moreno, Pedro	Law & Order	2266
Morris, Tom	Natural Resources	2348
Neil, Mary	Staff Attorney	2395
Neil, Terri	Law & Order	2266
Neubeck, David	Staff Attorney	2226
Ogden, Jenai	Resident Case Manager	2295
Olsen, Tara	Council Operations	2304
Ortiz, Julia	Technical Support/YESS	2373
Ostenson, Alan	Realty Supervisor	2307
Peat, Sharmaine	Lead Court Clerk	2496
Pfundt, Adam	Natural Resources	2327
Phair, Diana	Housing Manager	2295
Phair, Francine	Advocate	2295
Phair, John Sr.	Housing Maintenance	2295
Phair, Patty	Financial Analyst	2295
Phair, Rachel	TERO Admin. Asst.	2307
Phair,Susan	G/L Accountant	2276
Plaster, James	Maintenance	2211
Point-Moore Gloria	Community Liaison	2287
Preist, Larry	TERO	2307
Preist, Rena	Funding Specialist	2711
Price, Michael	Law and Order	2266
Solomon, Ralph	Oyster Hatchery	2303
Solomon, Olivia	VOC Legal Assistant	2213
Solomon, Ted	Language Director	2380
Spane, Steve	Law & Order	2266
Stafford, Julie	Law & Order	2266
Stark, Ann	GIS	2372
Sutten, Rance	Law & Order	2266
Syme, Mary	Training Coordinator	2235
Thompson, Bobby	HR Director	2381
Thompson, Tamera	Funding	2302
Toby, Jerome	Youth Rec.	2383
Tom, Keith	Youth Rec.	2383
Tom, Tammy	Resident Counselor	2295
Tso, Lena	Historic Preservation	2298
Valz, Erin	Chief Statistician	2362
Veale, Carol	Switchboard Operator	1489
Wall, Joyce	Cultural-Admin. Asst.	2298
Warbus, Jan	Accounting Tech.	2248
Warbus, Matt	Language Researcher	2390
Warbus,Denise	Accounts Payable	2201
Washington, Bernalyn	Accounts Payable	2364
Washington, Danita	CMAD Coordinator	2263
Watne, Wayne	Resource/TFW Manager	2247
Wenger, Joni	Grants Manager	2289
Wilbur, Nadine	Payroll Supervisor	2359
Wilbur,Loreen	Grants Accountant	2374
Willard, Alfred	Project Superintendent	2295
Williams, Autumn	Purchasing	2300
Williams, Kathleen	Accounting	2271
Williams, Mike	Natural Resources	2340
Williams, Teresa	Prosecuting Attorney	2208
Wilson, Candice	Case Manager/Council	2480
Wilson, James	Council	2304
Woolverton, June	Controller	2209

Ranello, Chris	I.S.	2342
Reading, Ann	ICW Attorney	2360
Redpath, Randy	Finance Director	2357
Revey, Andre	Shellfish	2221
Revey, Bill	Seaponds	2221
Revey,Loretta	Natural Resources	2267
Rollins, Alyson	Semiahmoo	2298
Roque, Anna	Accounting Assistant	2333

Appendix 11 – Emergency Proclamation

I. Purpose

To provide the tribal government an outline and documentation for declaring an emergency.

Local Proclamation of Emergency

When a disaster occurs requiring Tribal action beyond normal capabilities to protect lives and property, a LIBC proclamation of emergency can be made to use or obtain additional Tribal resources. The Tribal proclamation is also a prerequisite for some state or federal assistance. A Lummi Tribe proclamation of emergency authorizes the emergency use of Tribal resources and allows emergency expenditures, as well as allowing for waiver of normal bid procedures, if necessary.

The proclamation of emergency will be prepared by the Lummi Tribe EMO. Attachment 1 to this is a sample proclamation. The local proclamation of emergency describes the following:

1. The event (what has happened)
2. When the event happened;
3. Expected impacts without obtaining other resources;
4. Authorization of the use of local resources to combat disaster effects;
5. Authorization to expend local funds.
6. Allows waiving normal bid procedures, if needed.

Local Action

___ Prepare a blank proclamation on computer. Copies of the blank proclamation should be printed out for those emergencies when electrical power is not available.

___ Develop and process the local resolution or ordinance that is the proclamation of emergency.

___ Advise Whatcom County DEM by fastest telecommunications method available when local government is about to or has executed a proclamation of emergency. Supply all pertinent details.

___ Forward a written copy of the proclamation to Whatcom County DEM by the most rapid means available (e.g., law enforcement teletype, facsimile (FAX) machine, courier, U.S. mail, etc.).

___ Prepare to submit local requests for assistance and other supporting material; as necessary.

II. Annexes

a. Sample Proclamation of Emergency
b. Supporting Tribal Resolutions/Ordinances
c. Supporting RCW's for reference
d. Blank Proclamation for printing

ANNEX 1 TO APPENDIX 11
SAMPLE PROCLAMATION OF EMERGENCY

RESOLUTION #2006-___ OF THE LUMMI INDIAN BUSINESS COUNCIL

TITLE: A proclamation of emergency by the Lummi Indian Business Council.

WHEREAS, the Lummi Indian Business Council is the duly constituted governing body of the Lummi Indian Reservation by the authority of the Constitution and By-laws of the Lummi Tribe of the Lummi Reservation, Washington; and

WHEREAS, the Lummi Indian Business Council continues to make a commitment to public safety on the Lummi Reservation; and

WHEREAS, the Lummi Nation Department of Emergency Management has reported to the Lummi Indian Business Council of the Lummi Nation, THAT ON _____, at _____. a severe earthquake with the magnitude of 6.8, has severely disrupted the infrastructure within the Lummi Reservation and caused extensive damages in parts of Whatcom County; and

WHEREAS, damages have occurred to Lummi roads and bridges, utilities, private roads, homes, businesses and farm land; and

WHEREAS, significant economic loss to businesses has occurred as a result of shutdowns necessary to conduct structural assessments of facilities; and

BE IT RESOLVED, that as a result of the aforementioned emergency situation and under Lummi Ordinance #XX-XX do hereby proclaim that a State of Emergency exists in Lummi and direct the supporting plans and procedures to the Lummi Comprehensive Emergency Management Plan be implemented.

BE IT RESOLVED, that designated departments are authorized to enter into contracts and incur obligations necessary to combat such emergency to protect the health and safety of person and property, and provide emergency assistance to the victims of such disaster.

BE IT RESOLVED, that each designated department is authorized to exercise the powers vested in this resolution in the light of the demands of an extreme emergency situation without regard to time consuming procedures and formalities prescribed by law (excepting mandatory constitutional requirements).

BE IT RESOLVED, that this declaration of emergency is valid and in effect for thirty (30) days from the date of this resolution unless renewed or extended by the Lummi Indian Business Council.

NOW THEREFORE BE IT RESOLVED, that the Lummi Indian Business Council does hereby declare a local disaster and a state of emergency exists within the exterior boundaries of the Lummi Reservation, and

BE IT FINALLY RESOLVED, that the chairman (or the Vice Chairman in his absence) is hereby authorized and directed to execute this resolution and any documents connected therewith, and the Secretary (or the Recording Secretary in his absence) is authorized and directed to execute the following certification.

LUMMI NATION

_____

Evelyn Jefferson, Chairman
Lummi Indian Business Council

CERTIFICATION

As Secretary of the Lummi Indian Business Council, I hereby certify that the above Resolution #2006-___ was adopted at a special meeting of the Council held on the ____ day of _____, 2005, at which time a quorum of ____ was present by a vote of ____ for, ____ against, and ____ abstention(s)

_____

Donna Cultee, Secretary
Lummi Indian Business Council

ANNEX 2 TO APPENDIX 11
SUPPORTING TRIBAL ORDINANCES/RESOLUTIONS

As ordinances are developed insert here.

ANNEX 3 to APPENDIX 11
RCW

Provided as reference for legal standard used in other governments across the state.

RCW 35.32A.060
Emergency fund.

Every city having a population of over three hundred thousand may maintain an emergency fund, which fund balance shall not exceed thirty-seven and one-half cents per thousand dollars of assessed value. Such fund shall be maintained by an annual budget allowance. When the necessity therefore arises transfers may be made to the emergency fund from any tax-supported fund except bond interest and redemption funds.

The city council by an ordinance approved by two-thirds of all of its members may authorize the expenditure of sufficient money from the emergency fund, or other designated funds, to meet the expenses or obligations:

(1) Caused by fire, flood, explosion, storm, earthquake, epidemic, riot, insurrection, act of God, act of the public enemy or any other such happening that could not have been anticipated; or

(2) For the immediate preservation of order or public health or for the restoration to a condition of usefulness of public property the usefulness of which has been destroyed by accident; or

(3) In settlement of approved claims for personal injuries or property damages, exclusive of claims arising from the operation of a public utility owned by the city; or

(4) To meet mandatory expenditures required by laws enacted since the last budget was adopted.

The city council by an ordinance approved by three-fourths of all its members may appropriate from the emergency fund, or other designated funds, an amount sufficient to meet the actual necessary expenditures of the city for which insufficient or no appropriations have been made due to causes which could not reasonably have been foreseen at the time of the making of the budget.

An ordinance authorizing an emergency expenditure shall become effective immediately upon being approved by the mayor or upon being passed over his veto as provided by the city charter.

[1985 c 175 § 64; 1973 1st ex.s. c 195 § 20; 1967 c 7 § 8.]

NOTES:

Severability -- Effective dates -- Construction -- 1973 1st ex.s. c 195: See notes following RCW 84.52.043.

RCW 35.33.081
Emergency expenditures – Non-debatable emergencies. (Cities over 300,000)

Upon the happening of any emergency caused by violence of nature, casualty, riot, insurrection, war, or other unanticipated occurrence requiring the immediate preservation of order or public health, or for the restoration to a condition of usefulness of any public property which has been damaged or destroyed by accident, or for public relief from calamity, or in settlement of approved claims for personal injuries or property damages, or to meet mandatory expenditures required by laws enacted since the last annual budget was adopted, or to cover expenses incident to preparing for or establishing a new form of government authorized or assumed after adoption of the current budget, including any expenses incident to selection of additional or new officials required thereby, or incident to employee recruitment at any time, the city or town legislative body, upon the adoption of an ordinance, by the vote of one more than the majority of all members of the legislative body, stating the facts constituting the emergency and the estimated amount required to meet it, may make the expenditures therefor without notice or hearing.

[1969 ex.s. c 95 § 11.]

RCW 36.40.180
Emergencies subject to hearing – Non-debatable emergencies.

Upon the happening of any emergency caused by fire, flood, explosion, storm, earthquake, epidemic, riot, or insurrection, or for the immediate preservation of order or of public health or for the restoration to a condition of usefulness of any public property the usefulness of which has been destroyed by accident, or for the relief of a stricken community overtaken by a calamity, or in settlement of approved claims for personal injuries or property damages, exclusive of claims arising from the operation of any public utility owned by the county, or to meet mandatory expenditures required by any law, the board of county commissioners may, upon the adoption by the unanimous vote of the commissioners present at any meeting the time and place of which all of such commissioners have had reasonable notice, of a resolution stating the facts constituting the emergency and entering the same upon their minutes, make the expenditures necessary to meet such emergency without further notice or hearing.

[1963 c 4 § 36.40.180. Prior: 1925 ex.s. c 143 § 2, part; 1923 c 164 § 6, part; RRS § 3997-6, part.]

RCW 38.52.010
Definitions.

As used in this chapter:

(1) "Emergency management" or "comprehensive emergency management" means the preparation for and the carrying out of all emergency functions, other than functions for which the military forces are primarily responsible, to mitigate, prepare for, respond to, and recover from emergencies and disasters, and to aid victims suffering from injury or damage, resulting from disasters caused by all hazards, whether natural, technological, or human caused, and to provide support for search and rescue operations for persons and property in distress. However, "emergency management" or "comprehensive emergency management" does not mean preparation for emergency evacuation or relocation of residents in anticipation of nuclear attack.

(2) "Local organization for emergency services or management" means an organization created in accordance with the provisions of this chapter by state or local authority to perform local emergency management functions.

(3) "Political subdivision" means any county, city or town.

(4) "Emergency worker" means any person, including but not limited to an architect registered under chapter 18.08 RCW or a professional engineer registered under chapter 18.43 RCW, who is registered with a local emergency management organization or the department and holds an identification card issued by the local emergency management director or the department for the purpose of engaging in authorized emergency management activities or is an employee of the state of Washington or any political subdivision thereof who is called upon to perform emergency management activities.

(5) "Injury" as used in this chapter shall mean and include accidental injuries and/or occupational diseases arising out of emergency management activities.

(6)(a) "Emergency or disaster" as used in all sections of this chapter except RCW 38.52.430 shall mean an event or set of circumstances which: (I) Demands immediate action to preserve public health, protect life, protect public property, or to provide relief to any stricken community overtaken by such occurrences, or (ii) reaches such a dimension or degree of destructiveness as to warrant the governor declaring a state of emergency pursuant to RCW 43.06.010.

(b) "Emergency" as used in RCW 38.52.430 means an incident that requires a normal police, coroner, fire, rescue, emergency medical services, or utility response as a result of a violation of one of the statutes enumerated in RCW 38.52.430.

(7) "Search and rescue" means the acts of searching for, rescuing, or recovering by means of ground, marine, or air activity any person who becomes lost, injured, or is killed while outdoors or as a result of a natural, technological, or human caused disaster, including instances involving searches for downed aircraft when ground personnel are used. Nothing in this section shall affect appropriate activity by the department of transportation under chapter 47.68 RCW.

(8) "Executive head" and "executive heads" means the county executive in those charter counties with an elective office of county executive, however designated, and, in the case of other counties, the county legislative authority. In the case of cities and towns, it means the mayor in those cities and towns with mayor-council or commission forms of government, where the mayor is directly elected, and it means the city manager in those cities and towns with council manager forms of government. Cities and towns may also designate an executive head for the purposes of this chapter by ordinance.

(9) "Director" means the adjutant general.

(10) "Local director" means the director of a local organization of emergency management or emergency services.

(11) "Department" means the state military department.

(12) "Emergency response" as used in RCW 38.52.430 means a public agency's use of emergency services during an emergency or disaster as defined in subsection (6)(b) of this section.

(13) "Expense of an emergency response" as used in RCW 38.52.430 means reasonable costs incurred by a public agency in reasonably making an appropriate emergency response to the incident, but shall only include those costs directly arising from the response to the particular incident. Reasonable costs shall include the costs of providing police, coroner, fire fighting, rescue, emergency medical services, or utility response at the scene of the incident, as well as the salaries of the personnel responding to the incident.

(14) "Public agency" means the state, and a city, county, municipal corporation, district, town, or public authority located, in whole or in part, within this state which provides or may provide fire fighting, police, ambulance, medical, or other emergency services.

(15) "Incident command system" means: (a) An all-hazards, on-scene functional management system that establishes common standards in organization, terminology, and procedures; provides a means (unified command) for the establishment of a common set of incident objectives and strategies during multi-agency/multi-jurisdiction operations while maintaining individual agency/jurisdiction authority, responsibility, and accountability; and is a component of the national interagency incident management system; or (b) an equivalent and compatible all-hazards, on-scene functional management system.

[1997 c 49 § 1; 1995 c 391 § 2. Prior: 1993 c 251 § 5; 1993 c 206 § 1; 1986 c 266 § 23; 1984 c 38 § 2; 1979 ex.s. c 268 § 1; 1975 1st ex.s. c 113 § 1; 1974 ex.s. c 171 § 4; 1967 c 203 § 1; 1953 c 223 § 2; 1951 c 178 § 3.]

NOTES:

Effective date -- 1995 c 391: See note following RCW 38.52.005.

Finding -- Intent -- 1993 c 251: See note following RCW 38.52.430.

Severability -- 1986 c 266: See note following RCW 38.52.005.

RCW 38.52.070
Local organizations and joint local organizations authorized -- Establishment, operation -- Emergency powers, procedures.

(1) Each political subdivision of this state is hereby authorized and directed to establish a local organization or to be a member of a joint local organization for emergency management in accordance with the state comprehensive emergency management plan and program: PROVIDED, That a political subdivision proposing such establishment shall submit its plan and program for emergency management to the state director and secure his or her recommendations thereon, and verification of consistency with the state comprehensive emergency management plan, in order that the plan of the local organization for emergency management may be coordinated with the plan and program of the state. Local comprehensive emergency management plans must specify the use of the incident command system for multi-agency/multi-jurisdiction operations. No political subdivision may be required to include in its plan provisions for the emergency evacuation or relocation of residents in anticipation of nuclear attack. If the director's recommendations are adverse to the plan as submitted, and, if the local organization does not agree to the director's recommendations for modification to the proposal, the matter shall be referred to the council for final action. The director may authorize two or more political subdivisions to join in the establishment and operation of a joint local organization for emergency management as circumstances may warrant, in which case each political subdivision shall contribute to the cost of emergency management upon such fair and equitable basis as may be determined upon by

the executive heads of the constituent subdivisions. If in any case the executive heads cannot agree upon the proper division of cost the matter shall be referred to the council for arbitration and its decision shall be final. When two or more political subdivisions join in the establishment and operation of a joint local organization for emergency management each shall pay its share of the cost into a special pooled fund to be administered by the treasurer of the most populous subdivision, which fund shall be known as the . . . . . emergency management fund. Each local organization or joint local organization for emergency management shall have a director who shall be appointed by the executive head of the political subdivision, and who shall have direct responsibility for the organization, administration, and operation of such local organization for emergency management, subject to the direction and control of such executive officer or officers. In the case of a joint local organization for emergency management, the director shall be appointed by the joint action of the executive heads of the constituent political subdivisions. Each local organization or joint local organization for emergency management shall perform emergency management functions within the territorial limits of the political subdivision within which it is organized, and, in addition, shall conduct such functions outside of such territorial limits as may be required pursuant to the provisions of this chapter.

(2) In carrying out the provisions of this chapter each political subdivision, in which any disaster as described in RCW 38.52.020 occurs, shall have the power to enter into contracts and incur obligations necessary to combat such disaster, protecting the health and safety of persons and property, and providing emergency assistance to the victims of such disaster. Each political subdivision is authorized to exercise the powers vested under this section in the light of the exigencies of an extreme emergency situation without regard to time-consuming procedures and formalities prescribed by law (excepting mandatory constitutional requirements), including, but not limited to, budget law limitations, requirements of competitive bidding and publication of notices, provisions pertaining to the performance of public work, entering into contracts, the incurring of obligations, the employment of temporary workers, the rental of equipment, the purchase of supplies and materials, the levying of taxes, and the appropriation and expenditures of public funds.

[1997 c 49 § 4; 1986 c 266 § 28; 1984 c 38 § 7; 1974 ex.s. c 171 § 9; 1951 c 178 § 8.]

NOTES:

Severability -- 1986 c 266: See note following RCW 38.52.005.

RCW 38.52.091
Mutual aid and inter-local agreements -- Requirements.

(1) The director of each local organization for emergency management may, in collaboration with other public and private agencies within this state, develop or cause to be developed mutual aid arrangements for reciprocal emergency management aid and assistance in case of disaster too great to be dealt with unassisted. Such arrangements must be consistent with the state emergency management plan and program, and in time of emergency it is the duty of each local organization for emergency management to render assistance in accordance with the provisions of such mutual aid arrangements. The adjutant general shall maintain and distribute a mutual aid and inter-local agreement handbook.

(2) The adjutant general and the director of each local organization for emergency management may, subject to the approval of the governor, enter into mutual aid arrangements with emergency management agencies or organizations in other states for reciprocal emergency management aid and assistance in case of disaster too great to be dealt with unassisted. All such arrangements must contain the language and provisions in subsection (3) of this section.

(3) Mutual aid and inter-local agreements must include the following:

Purpose

The purpose must state the reason the mutual aid or inter-local agreement or compact is coordinated, the parties to the agreement or compact, and the assistance to be provided.

Authorization

Article I, section 10 of the Constitution of the United States permits a state to enter into an agreement or compact with another state, subject to the consent of Congress. Congress, through enactment of Title 50 U.S.C. Sections 2281(g), 2283 and the Executive Department, by issuance of Executive Orders No. 10186 of December 1, 1950, encourages the states to enter into emergency, disaster and civil defense mutual aid agreements or pacts.

Implementation

The conditions that guide the agreement or compacts may include, but are not limited to:

(a) A statement of which authority or authorities are authorized to request and receive assistance and the conditions that must exist for the request or receipt of assistance.

(b) A statement of how the requests for assistance may be made, what documentation of the request is required, the specifics of any details included in the request, and the required approval for the request.

(c) A statement of the direction and control relationship between the personnel and equipment provided by the jurisdiction to the requester and the requirements of the requester to coordinate the activities of the jurisdiction providing the assets.

(d) A statement of the circumstances by which the assisting jurisdiction may withdraw support from the requester and the method by which this is to be communicated.

General Fiscal Provisions

The terms of reimbursement must be stated defining the relationship between the requesting jurisdiction and the aiding jurisdiction, when reimbursement will be made, and details of the claim for reimbursement. The provisions may include statements that discuss but are not limited to:

(a) A statement of what costs are incurred by the requesting jurisdiction.

(b) A statement of what costs and compensation benefits are made to individuals from the aiding jurisdiction by the requesting jurisdiction.

Privileges and Immunities

The conditions and immunities that are enjoyed by the individuals from the aiding jurisdiction to the requesting jurisdiction must be stated. These provisions may include but are not limited to:

(a) A statement of the privileges and immunities from liability and the law an employee of a supporting jurisdiction enjoys while supporting the requesting jurisdiction.

(b) A statement of the privileges and immunities from liability and the law a volunteer from a supporting jurisdiction enjoys while supporting the requesting jurisdiction.

(c) A statement on the use of the national guard between the requesting and supporting jurisdictions.

(d) A hold harmless agreement between the signatory jurisdictions.

(e) The precedence this agreement takes with existing agreements.

(f) A time line by which information required by the agreement is exchanged and updated annually.

(g) The time in which the agreement becomes effective.

(h) The time and conditions when a signatory may withdraw and render the agreement ineffective.

[1997 c 195 § 1.]

RCW 38.52.310
Coverage, classification, registration, of workers.

The department shall establish by rule and regulation various classes of emergency workers, the scope of the duties of each class, and the conditions under which said workers shall be deemed to be on duty and covered by the provisions of this chapter. The department shall also adopt rules and regulations prescribing the manner in which emergency workers of each class are to be registered.

[1986 c 266 § 36; 1984 c 38 § 32; 1974 ex.s. c 171 § 33; 1953 c 223 § 15.]

NOTES:

Severability -- 1986 c 266: See note following RCW 38.52.005.

RESOLUTION #2006-___ OF THE LUMMI INDIAN BUSINESS COUNCIL

TITLE: A proclamation of emergency by the Lummi Indian Business Council.

WHEREAS, the Lummi Indian Business Council is the duly constituted governing body of the Lummi Indian Reservation by the authority of the Constitution and By-laws of the Lummi Tribe of the Lummi Reservation, Washington; and

WHEREAS, the Lummi Indian Business Council continues to make a commitment to public safety on the Lummi Reservation; and

WHEREAS, the Lummi Nation Department of Emergency Management has reported to the Lummi Indian Business Council of the Lummi Nation, THAT ON _____, at _____AM/PM. A _____
_____
has severely disrupted the infrastructure within the Lummi Reservation and caused extensive damages in parts of Whatcom County; and

WHEREAS, damages have occurred to Lummi roads and bridges, utilities, private roads, homes, businesses and farm land; and

WHEREAS, significant economic loss to businesses has occurred as a result of shutdowns necessary to conduct structural assessments of facilities; and

BE IT RESOLVED, that as a result of the aforementioned emergency situation and under Lummi Ordinance #XX-XX do hereby proclaim that a State of Emergency exists in Lummi and direct the supporting plans and procedures to the Lummi Comprehensive Emergency Management Plan be implemented.

BE IT RESOLVED, that designated departments are authorized to enter into contracts and incur obligations necessary to combat such emergency to protect the health and safety of person and property, and provide emergency assistance to the victims of such disaster.

BE IT RESOLVED, that each designated department is authorized to exercise the powers vested in this resolution in the light of the demands of an extreme emergency situation without regard to time consuming procedures and formalities prescribed by law (excepting mandatory constitutional requirements).

BE IT RESOLVED, that this declaration of emergency is valid and in effect for thirty (30) days from the date of this resolution unless renewed or extended by the Lummi Indian Business Council.

NOW THEREFORE BE IT RESOLVED, that the Lummi Indian Business Council does hereby declare a local disaster and a state of emergency exists within the exterior boundaries of the Lummi Reservation, and

BE IT FINALLY RESOLVED, that the chairman (or the Vice Chairman in his absence) is hereby authorized and directed to execute this resolution and any documents connected therewith, and the Secretary (or the Recording Secretary in his absence) is authorized and directed to execute the following certification.

LUMMI NATION

_____

Evelyn Jefferson Chairman
Lummi Indian Business Council

CERTIFICATION

As Secretary of the Lummi Indian Business Council, I hereby certify that the above Resolution #2006-___ was adopted at a special meeting of the Council held on the ____ day of _____, 2006, at which time a quorum of ____ was present by a vote of ____ for, ____ against, and ____ abstention(s)

_____

Donna Cultee, Sr, Secretary
Lummi Indian Business Council

Emergency Support Functions

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- ESF 2 – Telecommunications/Information Systems and Warning
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- ESF 12 – Energy and Utilities
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- ESF 20 – Military Support to Civil Authorities
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- ESF 27 – Reserved for Additional State ESF's

Note: *"Ctrl"* and *"click"* above to jump to each ESF while in Word.

ESF 1 – Transportation

I. Purpose

To provide a guideline for accessing and coordinating ground, air and water transportation resources, personnel and support equipment to support emergency operations.

II. Operational Concepts

A. Ground transportation resources will be coordinated by a representative from the Transportation Committee in the Tribal EOC.

B. Busses will be used to provide transportation support upon request of the Incident Commander through the EOC for:

1. Evacuation of the public.

2. Movement of emergency workers to and from staging areas.

3. Movement of special populations.

C. Busses will be used for command centers and protection from the weather, if needed. (Command center usage will require equipment be supplied by user.)

D. Busses can be used for detention centers, if necessary.

E. Bus communication systems can be used to gather damage assessment and situation information.

F. Transit centers can be used for command centers.

G. Whatcom County Search and Rescue will be used for emergency rescue and critical equipment and supplies transportation.

H. The tribal marine assets will be used for transportation, search and rescue, and other duties in support of the EOC.

III. Responsibilities

A. Transportation Committee shall:

1. Designate a representative and alternate to respond to the County EOC to direct and coordinate transportation resources.

2. Develop, maintain and provide available resource information to the Lummi Tribe EM for inclusion to the Resource Plan, see Appendix 3 – Emergency Resource Management of the Basic Plan.

3. The Tribe in coordination with Whatcom County DEM will collect cost recovery information after the emergency, disaster or catastrophic event that was incurred by transportation providers.

B. Lummi Nation School District Transportation provider shall:

- Provide an agency representative to the Transportation Committee if available.

- Provide safe transportation to the students within their jurisdiction.

- Make busses, fuel, maintenance, and facility resources available to support emergency operations.

- Provide 72-hour preparedness information and training to employees.

- Develop and provide resource list information to the Transportation Committee.

- Maintain cost recovery information.

C. Whatcom County Search and Rescue helicopters will assist in rescue and damage assessment as available.

D. Lummi Tribal Police & Natural Resources Enforcement Marine Division shall assist as needed and directed by Tribal EOC.

ESF 2 – Telecommunications/Information Systems and Warning

I. Purpose

To establish, coordinate, maintain, augment and provide back-up for all channels and methods of communication needed for emergency response and recovery.

II. Operational Concepts

- Whatcom 9-1-1 is the primary radio communications center providing dispatch for police and fire within the Lummi Tribe.
- Radio Amateur Civil Emergency Services (RACES) is the volunteer amateur radio groups that will provide communication support to the County, Municipal EOC(s) and the 9-1-1 facilities.
- Amateur Radio Emergency Services (ARES) is a volunteer amateur radio group that will provide communication support to the private and volunteer relief organizations.
- Incident Commander will initiate DEM notification via Whatcom 9-1-1
- Incident Commander and DEM Coordinator will coordinate activation of local and/or county EOC.
- Whatcom 9-1-1 will be notified when the county EOC is opened and appropriate representatives from the first response community are in place to prioritize and direct response from the EOC.
- A detailed inventory and systems design for the Lummi Tribe communications is appended to this annex.

III. Responsibilities

1. **Whatcom 9-1-1 Dispatch**

    a. Collect and disseminate emergency and non-emergency information via established and alternate communication channels to the appropriate public safety agency/department and/or EOC.

    b. Facilitate mutual aid requests for law enforcement and fire agencies/departments.

c. Maintain all communication equipment, supplies and back-up systems.

d. Respond to the direction of the appropriate authority in the utilization and dispatch of resources.

e. Relay public works and utility information to the appropriate agencies/departments.

2. Whatcom County DEM

a. Maintain county EOC and mobile communication equipment, supplies and back-up systems.

b. Coordinates all communications elements in the county EOC.

3. RACES

a. Provides auxiliary communication support to government.

b. Will serve as net control for the calling frequency.

c. Will define and assign frequencies to be utilized for specific purposes.

4. ARES

a. Provides auxiliary communication support for the American Red Cross and volunteer organizations.

IV. Appendices

- Current, Alternate and Additional Communication Systems

APPENDIX 1 TO ESF 2
CURRENT, ALTERNATE AND ADDITIONAL COMMUNICATION SYSTEMS

I. Whatcom 9-1-1

A. VHF Radio System

1. Law Enforcement Channels
   - a. Tribal
   - b. Sheriff & Small Cities
2. Fire/Aid Channels
   - a. WCFD
   - b. County
3. Other Whatcom Channels

B. UHF Radio System

WSP - Whatcom County LERN

C. Telephone Systems

1. Facsimile line
2. Cellular phone sets (6)
3. National Warning System (NAWAS) (also monitored by DEM)

E. Alternate Communication Systems

F. Communication Systems with Emergency Power Generation Capability

II. Department of Emergency Management

A. VHF Radio Systems

1. DEM network (154.055)

2. Emergency Broadcast System – KVOS (Channel 12) & KIRO (Channel 7) (FCC)

3. Washington State Comprehensive Emergency Management Network (CEMNET) radio link with Olympia (State Emergency Management Division) and neighboring county Emergency Management agencies.

B. UHF Radio System

Emergency Broadcast System - KVOS (Channel 12) & KIRO (Channel 7) (FCC)

C. National Oceanographic and Atmospheric Administration (NOAA) - Satellite Weather Information System

1. Warnings: severe weather, flood, volcano, tidal wave

2. Earthquake information

3. Other emergency public information statements

D. Alternate Communication Systems

1. RACES (Radio Amateur Civil Emergency Services)

   a. Voice and packet radio capabilities on 2 meters, 220 MHZ and 440 MHZ

   b. Long range voice communication in HF band

   c. Full repeater system at Mt. Constitution (county's electronic site)

E. Communication Systems with Emergency Power Generation Capability

1. Whatcom County Emergency Operations Center – 311 Grand Ave Basement Bellingham, WA 98226

   a. Back-up generator

   b. UPS battery backup for telephone system and National Warning System (45 minutes)

F. Telephone Systems

III. Additional Communication Systems

A. Washington State National Guard

B. Community Transit

C. School busses

D. County Public Works - 153.980

E. Region X, FEMA - Mobile Emergency Response System

ESF 3 – Public Works and Engineering

I. PURPOSE

To provide for coordination of tribal, county, and city public works departments, engineering services and structural engineers to protect, maintain and restore roads, structures, and lifelines exclusive of water.

II. ORGANIZATIONAL CONCEPTS

A. Emergency engineering services provide for:

1. The inspection of facilities for structural condition and safety.
2. Demolition of unsafe structures.
3. Debris and wreckage clearance.
4. Temporary repair of essential facilities.
5. Damage assessment.
6. Transportation system restoration and maintenance.

B. Public works departments will provide engineering services within their own jurisdictions as necessary.

C. Neighboring jurisdictions will provide support as requested through mutual aid pacts.

D. Each jurisdiction shall be responsible for its own emergency repairs and restoration of services. All requests for assistance will be forwarded to the Lummi Tribe EM Coordinator, who will coordinate with the Whatcom County DEM.

E. The Lummi Tribe Coordinator will forward damage assessment and situation reports to the Whatcom County DEM.

F. The Lummi Tribe Public Works will provide a liaison to the Lummi Tribe EOC upon request.

III. RESPONSIBILITIES

A. The Lummi Tribe EMO shall:

1. Maintain public works resource information in accordance with Annex C and as identified by public works agencies and departments.

2. Assist the public works liaison in the Lummi Tribe EOC as requested.

B. **Public works agencies/departments** shall:

1. Identify critical facilities and routes and provide information to Lummi Tribe EOC.

2. Identify and provide local and agency resource information to Lummi Tribe EOC.

3. Assess and report damage to Lummi Tribe EOC.

4. Coordinate removal of debris and wreckage as necessary to facilitate open transportation routes and detours for the first response community.

5. Provide barricade and road/bridge closure equipment as needed.

6. Request additional resources exclusive of mutual aid through the Lummi Tribe EOC in coordination with Whatcom County DEM.

7. Develop and maintain suggested operating procedures outlining emergency, disaster and catastrophic responsibilities and activities.

8. Provide equipment and manpower as requested and if available.

C. The Lummi Tribe-Facilties

1. Develop and maintain procedure for evaluation, assessment and placarding of the city facilities.

2. Provide damage assessment information during and following a major emergency, disaster or catastrophic event to the E.O.C.

3. Develop and maintain lists of structural engineers and other resources critical to damage assessment and determining structural integrity of buildings.

1. Develop and maintain suggested operating procedures.

Insert the following if possible:

-Personnel Assignment Sheet
-Personnel Roster
-Location Resource Report
-Periodic Review Log including Date of Last Review

ESF 4 – Fire Service

I. Purpose

To provide an organizational framework utilizing the Incident Command System that will effectively utilize and coordinate available fire fighting and fire emergency medical services apparatus and personnel when the size and nature of the emergency, disaster or catastrophic event exceeds local capabilities.

II. Operational Concepts

1. Normal emergency operations are handled with resources of the responding fire agency that includes local mutual aid.

2. When an emergency goes beyond local mutual aid, task force/strike team responses from zones within Whatcom County maybe utilized or task force/strike team responses from other counties may be utilized. [Emergency Operations Center (EOC) may be advised at this time to coordinate additional logistical support.] (Appendix 3 Annex 1 – The Lummi Tribe- Emergency Resource Plan

3. When the emergency exceeds the regional response effort, the Washington State Fire Mobilization Plan shall be utilized to obtain additional resources.

4. An Emergency Operations Center (EOC) is opened for the purpose of providing technical and logistic assistance in coordinating resources under a unified command when prioritization becomes necessary.

5. In the event of a catastrophic event each fire agency/department/district may initially find themselves operating independently and reliant on their 72- hour preparedness.

6. The fire service community shall be represented in the Emergency Operations Center (EOC).

7. Department of Natural Resources (DNR) and United States Forest Service (USFS) are responsible for Wild-land fires and individual fire districts may have separate working agreements with Department of Natural Resources (DNR).

8. Fire agencies/department's/district's responsibilities for emergency medical services are defined in ESF-8.

9. Fire agencies/department's/district's communications capabilities are defined in ESF-2.

10. Fire apparatus with the use of their sirens and public address systems are a valuable resource for disseminating warning and emergency information.

III. Responsibilities

a. Whatcom County Department of Emergency Management (DEM) in coordination with the Lummi Tribe EMO shall:

1. Serves as liaison between city service and the state for requesting additional resources.

a. Provides mission number for regional response.

b. Serves as contact agency for state mobilization.

2. Provides training to fire response personnel as appropriate.

3. Shall determine location for and provide staff and supplies to Whatcom County Emergency Operations Center (EOC).

B. Fire Agencies/Departments/Districts

1. Provide suppression and control of fires within their respective fire protection jurisdictions.

2. Provide emergency medical service response under the scope of ESF-8.

3. Support warning, notification and evacuation assistance to the limit of their training, equipment and statutory authority.

4. Provide limited mobile radiological monitoring as appropriate.

5. Provide hazardous materials control and response per department policy and capabilities.

6. Each county/district/department in the regional task force/strike team response shall appoint an emergency operations center representative and alternate (in the event the primary is not able) to respond to and staff the county emergency operations center (EOC) and provide field assessment teams as required after EOC activation.

7. Each agency/district/department will report their operational capabilities to the county emergency operations center (EOC) for the purpose of providing support/resources through existing Plans.

   a. City mutual aid.

   b. County mutual aid.

   c. Fire/EMS Resource Plan

   d. State Fire Mobilization Plan

8. Each fire agency/department/district should develop and maintain Standard Operating Procedures (SOP's) to support this Annex. (Develop – 72-Hour Preparedness Plan Guide for First Responders with Checklist)

9. Each fire agency/department/district will report damage assessment to the county emergency operations center (EOC).

ESF 5 – Information Analysis and Planning

I GENERAL INFORMATION

A. Purpose
   1. To collect, analyze, and share information about a potential or actual emergency or disaster to enhance response and the provision of recovery activities.

B. Scope
   1. This ESF applies to the information needs of the Lummi Emergency Operations Center (EOC) for assessing a disastrous or potentially disastrous situation and supporting related response and planning efforts.
   2. The analysis and planning for every type of emergency or disaster is beyond the scope of this ESF.

II POLICIES

A. It is policy of Lummi Department of Emergency Management (DEM) to disseminate current and accurate information and request the same from Tribal and county agencies and volunteer organizations during times of EOC activations. The analysis of this information, planning for anticipated resources will occur in support of emergency or disaster response and recovery activities.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.

B. Planning Assumptions
   1. Urgent response requirements during an emergency or disaster, or the threat of one, and to plan for continuing response and recovery activities, necessitates the immediate and continuing collection, processing, and dissemination situational information.
   2. Information will be provided by cognizant field personnel, responders, volunteers, the public, the media, and others.
   3. Information, particularly initial information, may be ambiguous, conflict with information from other sources or with previous information from the same source, or be limited in detail.
   4. Information collection may be hampered due to many factors including, but not limited to: damage to communication systems; communication systems overload; damage to the transportation infrastructure; and effects of weather, smoke, and other environmental factors.

IV CONCEPT OF OPERATIONS

A. Tribal and volunteer representatives in the EOC will work to meet the information requirements of the EOC, Washington Emergency Information Center (WEIC), and the Executive Team. This will include receiving periodic reports from field representatives. Additionally the EOC staff may be required to request information from EOC representatives and field personnel to meet a specific requirement.
B. The Information Analysis and Planning Section of the Incident Command System (ICS) is responsible for the management of the information received in the EOC. This section will be responsible to collect, analyze, report and display the current information. From this information the section will assure that action plans are developed, as needed.

V RESPONSIBILITIES

A. Primary Agency
   1. The DEM is the lead agency in the collection, analysis, and dissemination of information during EOC activations.
B. Support Agencies
   1. Lummi Departments
      a. Budget and Finance responsible for financial planning, management of revenues and expenditures, preparation of financial reports, and other related fiscal operations. Also assists in the allocation of funds for the procurement of emergency resources.
      b. Information Services provide information to the EOC of the damages to the ISD infrastructure and equipment and the resources needed for repair or replacement.
      c. Risk Management provides information to the EOC on building evacuations and personnel safety.
      d. Personnel provide information to the EOC on the staffing status in departments critical to response and initial recovery to an emergency or disaster.
      e. Lummi Council provides legislative advice related to response and recovery to an emergency or disaster.
      f. Lummi Reservation Attorney provides legal counsel when needed by the EOC during an emergency or disaster.
   2. Volunteer Services
      a. American Red Cross
         i. Provide information to the EOC on the provision and coordination of emergency service function for feeding, sheltering, distribution of bulk supplies, disaster welfare inquiry, and emergency assistance to families and individuals.

ESF 6 - MASS CARE

I GENERAL INFORMATION

A. Purpose
   1. To provide guidance for furnishing basic human needs to persons affected by emergencies and disasters, including the provision of emergency shelter.

B. Scope
   1. This ESF addresses sheltering needs within the Lummi Reservation during an emergency or disaster having local or widespread impact, and the coordinating of opening shelters through the Lummi Tribe Emergency Operations Center (EOC). The initial response activities will focus on meeting urgent needs of victims on a mass care basis.

II POLICIES

A. It is the policy of Lummi to coordinate mass care efforts with the American Red Cross Mt Baker-Whatcom County Chapter (ARC Chapter) to provide prompt disaster relief to victims of major disasters in the county. The Lummi Tribal Social Programs in coordination with Whatcom County Department of Human Services will supply similar services to its respective clients during times of disaster.

B. It is the policy of Lummi Tribe that spiritual support and assistance from cultural department.

C. The American Red Cross (ARC) policy is to provide emergency shelter for 72 hours to all who have a need. After 72 hours, only those persons who can demonstrate that they have a permanent place of residence by providing a rent receipt, utility bill, etc., and that their domicile is not habitable will continue to receive ARC assistance. Others are considered a socio-economic concern and are referred to other agencies for assistance.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.

B. Planning Assumptions
   1. Mass care requirements during an emergency or disaster may overwhelm social service agencies.
   2. Depending on the hazard and the severity of its effects, the county may have limited numbers of shelters or resources to manage them.
   3. The ARC Chapter is responsible for mass care and shelter during an emergency or disaster. If the Chapter cannot provide all of the services

needed, victims will be referred to community, church, or other social service shelters that may be opened.

4. The opening of ARC shelter for all jurisdictions will be coordinated through the EOC.

IV CONCEPT OF OPERATIONS

A. Mass Care

1. The ARC Chapter provides the emergency service function of feeding and sheltering victims of an emergency or disaster for 72 hours after the event.
2. The Lummi Tribal Social Programs in coordination with Whatcom County Department of Human Services is responsible for coordinating the support to the emergency needs of agency clients. The chain of command for the Lummi Tribal Social Programs **to be determined**
   i. **Eg:**
      - **Tribal Council**
      - **Chairman**
      - **Program Director**
      - **EM Director**

   ii. Whatcom County Human Services is as follows:
      - Director, Human Services.
      - Emergency Management Plan Coordinator.
      - Involuntary Commitment Services Supervisor.
      - Aging Case Management and RN supervisors.
3. Any of the chain of command, when acting as the lead for the Director of Human Services, has the authority of the Director in matters of operations and department policy.
4. On a day to day basis, the Emergency Management Plan Coordinator for the Department of Human Services is the primary point of contact to the Whatcom County Department of Emergency Management (DEM).

B. Shelter

1. The ARC Chapter, in cooperation with the Salvation Army and other volunteer groups, manages the emergency shelter program in Whatcom County. The Lummi shelter program is administered by to be determined and coordinated with Whatcom County. This includes identification and inventory of shelters, opening and closing shelters, registration of persons coming to the shelters, medical care, feeding and the accountability of personnel occupying shelters.
2. The Lummi Tribal Social Programs in coordination with Whatcom County Department of Human Services coordinates long term shelter needs, in cooperation with the ARC Chapter and other human service agencies, as necessary.

3. It is the national policy of the ARC that animals and pets are not allowed in shelters, other than animals used to assist the physically impaired. The Whatcom County Humane Society may assist evacuees with the care of pets.
4. Temporary shelter for persons may be in buses, which can provide short term heated spaces until more suitable shelter can be arranged.

V RESPONSIBILITIES

A. Joint Primary Agencies
   1. Lummi Tribal Departments
      a. Emergency Management
         i. Coordinate with the ARC Chapter and other county departments which provide basic human needs.
         ii. Identify appropriate sites for Disaster Application Centers, subject to FEMA approval.
         iii. Support shelter operations upon request.
         iv. Support and coordinate with the AM.
   2. Community and Human Services
      a. Responsible for the care and housing of their assigned clients.
      b. Coordinate with the DEM and provider agencies for mass care needs and problems not addressed by the ARC Chapter or other human service agencies.
      c. Provide for the identification and preservation of essential records.
      d. Coordinate with contractors providing crisis intervention services.
      e. Lead department in the assessment of human needs after a disaster.
      f. Act as the lead agency for the coordination of long term shelter needs.
B. Support Agencies
   1. Whatcom County Departments
      a. Facilities Management assists with the identification and acquiring of long term shelter space.
      b. Parks and Recreation provide county park facilities, equipment and manpower to support shelter operations.
      c. Whatcom County Health Department establishes and monitors emergency environmental health standards for public shelters and/or congregate care facilities.
      d. Sheriff's Chaplaincy
         i. Provide chaplaincy services in accordance with established protocol among other religious bodies throughout Pierce County.
         ii. Provide critical incident stress defusing and debriefing capability.
         iii. Provide personnel to the EOC, when requested.
      e. Whatcom Transit

   i. Provide expedient shelter (buses).
f. School Districts
   i. By agreement with the ARC, provide school facilities for shelter and feeding.
g. Whatcom County Humane Society
   i. Provide limited emergency care and shelter for pets whose owner(s) is housed in a public shelters.
h. Volunteer Organizations
i. American Red Cross
   i. Primary provider and coordinator of emergency service function of feeding, sheltering, distribution of bulk supplies, disaster welfare inquiry, and emergency assistance to families.
   ii. Provide mobile canteen service to both victims and emergency services workers.
   iii. Provide personnel to EOC when requested.

ESF 7 - RESOURCE SUPPORT

I. GENERAL INFORMATION

a. Purpose
   i. To provide coordinated logistic and resource support to an emergency or disaster, or the threat of one.

b. Scope
   i. Support involves coordinating the provision of resources to tribal organizations during the immediate response to an emergency or disaster and to subsequent response and recovery operations. Coordination includes the effort and activity necessary to evaluate, locate, procure, and provide facilities, materials, services, and personnel.
   ii. Coordination of provision of resources for every type of emergency or disaster is beyond the scope of this ESF.

II. POLICIES

a. It is the policy of Lummi Tribe that the Purchasing Division is the lead agency for coordinating emergency purchases. The purchasing agent may report to the Lummi Tribe Emergency Operations Center (EOC) to coordinate emergency purchases if the situation warrants it. Payment for such needs is the responsibility of the requesting agency. If funds are not available, purchases shall be made in accordance with emergency purchasing policies.

b. It is the policy of the Lummi Tribe that the Chairman may invoke temporary controls on local resources and establish priorities when a State of Emergency is proclaimed. These may include, but not be limited to fuel, food, shelter and other resources necessary for human needs. Any controls established will be in coordination with other cities and towns in Whatcom County.

c. It is the policy of Lummi Tribe that departments utilize their personnel to the maximum extent possible, including use of personnel not normally assigned emergency responsibilities. Tribal employees required to work either overtime or “out of class” in responding to a disaster shall be compensated in accordance with existing rules and bargaining agreements and the requirements of the Fair Labor Standards Act (FLSA).

III. SITUATION

a. Emergency/Disaster Conditions and Hazards
   i. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.

b. Planning Assumptions
   i. Lummi will not have all of the resources, either in type or quantity that may be required to combat the effects of all potential hazards. If a disaster causes a shortage of essential

resources, the Lummi Tribe will endeavor to cooperate with local jurisdictions on the reservation, with Whatcom County, and with the state in encouraging voluntary controls and to enforce mandatory controls when necessary.

ii. Support agencies will perform tasks and expend resources under their own authorities, including implementation of mutual aid agreements, in addition to resources received under the authority of this plan.

iii. Resource needs beyond the capacity of support agencies and incorporated cities and towns will be coordinated through the Emergency Operations Center (EOC).

iv. Weather conditions, damage to transportation routes or other factors may restrict access to a disaster site or to a storage area and therefore affect the availability and distribution of resources.

v. The tribe's initial response will focus on lifesaving and injury reduction activities followed by protection of public property. The protection of private property will be the responsibility of the landowner or tenant.

IV. CONCEPT OF OPERATIONS

a. It is the responsibility of the Lummi Tribe Department of Emergency Management (DEM) and other tribal departments to develop appropriate contacts to facilitate the emergency use of resources. Some resource lists and contacts are maintained in the EOC.

b. Staging and dispatching of these resources from the mobilization centers, identified by Tribe EOC, will be done from the EOC or by a local Incident Commander, as appropriate. These resources will be staged and inventoried, with this information being relayed to the EOC. Communications shall be established between staging areas and the EOC by utilizing amateur radio operators or existing county communications resources.

c. Outside resources may also be brought to Whatcom County & the Lummi Reservation by way of aircraft. The primary local airports are the Whatcom County Airport. If resources are brought into one of these, a mobilization center will be established as near to the airport as possible. The same general concepts of mobilization centers, inventory and communications with the EOC will apply.

d. Information on mobilization centers shall be disseminated to the state and other surrounding jurisdictions.

e. The Lummi Emergency Public Information Officer (PIO) will coordinate with the state and county Emergency Public Information Officer for disseminating information concerning any emergency measures, voluntary controls or rationing.

f. The Lummi Personnel Department is the lead agency for the recruitment and hiring of additional human resources which may be

needed in an emergency or disaster. The chain of command for the Personnel Department is as follows:

i. Personnel Director.
ii. Assistant Director.
iii. Organizational Development and Training Manager.
    1. Any of the chain of command, when acting on behalf of the Director, has the authority of the Director in matters of Personnel Department operations and policy.
    2. If an emergency or disaster occurs during normal business hours, Personnel Department staff shall check on the status of fellow employees, the condition of their facility and equipment, and their capability to continue Personnel Department operations. A representative of the Department should report to the EOC to determine tribal personnel needs. If a major disaster occurs during non-working hours, and normal methods of communication and call-back are disrupted, key staff, as appointed by the Director, should ensure that their families are all right, then report to the Personnel Department office and ascertain damages and capabilities. They then report to the EOC for coordination of personnel needs. Other staff should monitor the radio for instructions.
    3. The Director of Personnel shall designate a representative to report to the EOC, when requested. The Director of Personnel shall also designate appropriate support staff during emergency operations; to coordinate personnel needs, and assist county employees obtain recovery assistance if they are impacted by the event. This employee assistance is in the form of liaison with the American Red Cross and other disaster and recovery assistance availability.
    4. Tribal departments should coordinate their personnel needs with the Personnel Department. The Personnel Department may assist departments in identifying employees who can be released to assist in the emergency or disaster. Additional employee needs may be met by hiring temporary extra-hire persons.

g. Trained volunteers from organized Search and Rescue (SAR) Units and Community Emergency Response Teams (CERT) provide initial additional emergency manpower resources for field operations. These organized volunteers may be utilized as team leaders and untrained volunteers assigned to them for specific task assignments.
h. It can be anticipated that in any disaster a large number of persons from the local community will volunteer to assist. Staging areas may

be designated and persons wishing to volunteer may be directed there for registration and assignments.

V. RESPONSIBILITIES

a. Joint Primary Agencies

VI. Lummi Tribe

i. Emergency Management

1. Coordinate with public and private sector for maintaining resources information.
2. Develop and maintain specific resource lists as required.
3. Establish coordination between and among the EOC, staging areas and incident sites.
4. Register emergency workers (other than employees of the tribe, county, cities or towns) under RCW 38.52 and WAC 118-04.
5. Request the Chairman to invoke temporary controls on local resources and establish priorities when a local State of Emergency is proclaimed to protect lives and property.

ii. Personnel

1. Lead agency for the recruitment and hiring of additional human resources which may be needed in an emergency or disaster.

iii. Support Agencies

1. Lummi Departments
   a. Purchasing Division coordinate emergency procurement and purchase of emergency supplies and equipment.
   b. All Other Departments
      i. Develop appropriate resource lists.
      ii. Establish policy and procedures for emergency purchases on needed resources.
      iii. Develop procedures to utilize all agency staff for emergency assignments and identify staff which could be released to assist other departments.

ESF 8 – Health and Medical Services

I PURPOSE

A. To provide emergency medical, public health, mental health, definitive hospital care, recovery and mortuary services during and after a declared emergency, disaster or catastrophic event.

II OPERATIONAL CONCEPTS

A. Emergency Medical Services (EMS)
   1. EMS shall include "pre-hospital" basic life support, advanced life support and transport services provided by fire departments, private or hospital based units and hospital Emergency Rooms.
   2. EMS' primary objective is to continue providing on a broader scope, emergency medical evaluation, treatment and transportation of injured or sick victims pertinent to the type of disaster.
   3. In the event of a declared emergency, disaster or catastrophic event that causes mass casualties, each jurisdiction shall render necessary care in accordance with the Lummi Tribe Mass Casualty Plan in coordination with Whatcom County Mass Casualty Plan. *
   4. Emergency medical service agencies may also be called upon to establish and staff local provisional emergency medical care facilities and may also be called upon to provide health care services to local evacuation centers until such time as hospitals are available and accessible

B. Hospitals
   1. In the event of an emergency, disaster or catastrophic event, Providence Everett is the Hospital Control.
   2. Other hospital within Whatcom County is St. Joseph Hospital.
   3. Hospitals will assess their capability and report information to hospital control in accordance with Hospital Emergency Plans.
   4. Aid station locations and capabilities will be developed at the tribal levels within the zones for medical observation areas. Both primary and alternate locations will be identified.

C. Other Health Care Facilities

D. Public Health
   1. The Lummi Tribal Health Clinic in coordination with the Whatcom County Public Health District will assess community needs following a declared emergency, disaster or catastrophic event and coordinate all public health issues.
   2. All mental health needs will be organized and provided by the Disaster Assistance Council (DAC) at the request of the Lummi Tribe EM Coordinator, in coordination with Whatcom County DEM.

E. Mortuary

1. Medical Examiner has jurisdiction over bodies of all deceased persons who come to their death suddenly when in apparent good health without medical attention within the thirty-six (36) hours preceding death.
2. The Public Health District will assist the Medical Examiner in coordinating mortuary services.

F. Mental Health Providers

III RESPONSIBILITIES

A. Emergency Medical Services Providers, Pre-hospital (EMS)
   1. Establish incident command system.
   2. Execute reliable situation assessment and casualty count and provide to EOC.
   3. Provide systematic search, extrication and rescue operations to affected areas.
   4. Provide triage, treatment and transportation functions. In cases of mass casualty, implement the Lummi Tribe Mass Casualty Plan, in coordination with/or defer to, Whatcom County Mass Casualty Plan.
   5. Assist local medical professionals in establishing and staffing local, provisional emergency medical care facilities in the event of a major regional event or if the hospital services are unavailable or overwhelmed.
   6. Establish, facilitate and coordinate prearranged aircraft landing zones for emergency airlift of critically injured, sick patients and incoming supplies.
   7. Assist in temporary staffing of evacuation shelters for evaluation and minor treatment of evacuees if resources and personnel are available.
B. Hospitals
C. Other Health Care Facilities
D. Public Health
   1. Coordinate and provide environmental health consultation services.
   2. Assist with mortuary services by issuing death certificates and burial permits.
   3. Manage and provide preventative communicable disease related services.
   4. Provide support to the EMS system with registered public health and clinic nursing staff.
   5. Assist in the coordination of access to non-emergency medical care for the public.
   6. Provide environmental health consultation services concerning food, water, housing and waste sanitation.
   7. Coordinate distribution of sanitary facilities i.e., portable toilets and showers.
E. Medical Examiner
F. Mental Health Providers

G. American Red Cross shall have nurses available in shelter locations to provide basic first aid and non-emergency health services.
H. Additional Emergency Medical Services Providers and Transporters
    1. Airlift Northwest
    2. Sheriff/search and rescue helicopter
    3. MAST helicopter
    4. Army Reserve at Paine Field
    5. Bellingham Med Life Flight
    6. Whidbey Island search and rescue
    7. Cascade Ambulance

IV APPENDICES

1. The Lummi Tribe Mass Casualty Plan (To Be Developed)
2. Whatcom County Mass Casualty Plan

ESF 9 – Search and Rescue

I GENERAL INFORMATION

A. Purpose
   1. To provide guidance for wilderness and urban search and rescue operations.
B. Scope
   1. This ESF addresses wilderness and urban search and rescue operations, and includes search and rescue on the ground, from the air, or in the water.
   2. Planning for every search and rescue situation is beyond the scope of this ESF.

II POLICIES

A. The Lummi Police Department in coordination with Whatcom County Sheriff's Office (WCSO) is responsible for all search and rescue operations which includes searching for persons injured by a natural disaster and heavy urban search and rescue (US&R) operations (RCW 38.52). The Lummi Public Works along with Whatcom County Public Works Department (PWD) is the lead agency for the provision of heavy equipment.

B. It is the policy of Lummi that US&R operations be a team effort of law enforcement, fire services, volunteers, other agencies, and the private sector.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.
B. Planning Assumptions
   1. US&R operations, or water rescue, will be a team effort of law enforcement, fire service, trained search and rescue (SAR) personnel and other agencies as appropriate under the Incident Command of the appropriate response agency.
   2. People will become lost, injured, or killed while outdoors, requiring SAR activities.
   3. An emergency or disaster can cause buildings to collapse, or leave people stranded due to rising water, threatening lives and requiring prompt SAR, or medical care.
   4. Large numbers of local residents and volunteers will initiate activities to assist in SAR operations and will require coordination and direction.

IV CONCEPT OF OPERATIONS

A. For reference, Search and rescue is defined by Washington state law (RCW 38.52) as the act of searching for, and rescuing, any person who is lost injured or killed in the out of doors, or as a result of a human caused or natural disaster. The chief law enforcement officer of a political subdivision (county, city or town) is responsible for ground SAR operations (RCW 38.52.400). As such, the WCSD is responsible for SAR operations in the unincorporated areas of Whatcom County and may, by agreement or upon request, support SAR operations in tribes, cities and towns within Whatcom County.
B. The primary source of personnel for SAR comes from volunteers, particularly the Whatcom County SAR Council. The Whatcom County Department of Emergency Management (DEM) and the WCSD work in cooperation with the SAR Council providing appropriate training and support.
C. Additional SAR resources may be requested through the state Emergency Management Division duty officer via the Whatcom DEM. The DEM duty officers provide the coordination for such outside resources.
D. If additional urban search and rescue capabilities are needed, this may be accomplished through mutual aid with existing jurisdictions which have the capability, or, if they are impacted by a major event, through a request to the state for additional resources from the National Urban Search and Rescue Response System.

V RESPONSIBILITIES

A. Primary Agency
   1. Lummi Police Department
      a. Lead agency for SAR operations.
      b. Responsible for lost person search and rescue and coordination of US&R operations.
      c. Responsible for informing the DEM duty officer of the need for SAR resources from outside of Lummi Tribe.
B. Support Agencies
   1. Tribal Departments
      a. Emergency Management support SAR operations with resource coordination and activation of the Tribal Emergency Operations Center (EOC), if required by the scope of the event.
      b. Public Works provide heavy equipment to support rescue operations.
      c. Public Safety Answering Points support SAR operations with prompt dispatch activities.
   2. Fire Services
      a. Provide limited response to SAR in off-road situations and coordination and resources for heavy rescue operations.

3. Volunteer Organizations
    a. Whatcom County SAR Council Member Organizations
        i. Establish membership standards in accordance with county policy and keep DEM informed of latest active membership lists and call-out procedures.

ESF 10 – Hazardous Materials

I GENERAL INFORMATION

A. Purpose
   1. To provide guidance and coordination for responding to hazardous materials incidents of disastrous proportions.

B. Scope
   1. This ESF provides for a coordinated response to actual or potential discharges and/or releases of hazardous materials within or near Lummi
   2. Planning for every hazardous material contingency is beyond the scope of this ESF. This plan will provide broad objectives that will provide the greatest protection of life and health, the environment, and property.

II POLICIES

A. The state Department of Ecology (DOE) has overall responsibility for 24-hour environmental pollution prevention, preparedness, and response within the state of Washington as identified in the 1996 Northwest Contingency Plan.

B. The emergency field response to incidents of hazardous materials spills and releases is the responsibility of the local municipal and county fire services, or in the case of state highways, the Washington State Patrol.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.

B. Planning Assumptions
   1. A natural or technological disaster could result in a single or numerous situations in which hazardous materials are released into the environment.
   2. Fixed facilities (chemical plants, tank farms, laboratories, and industries operating hazardous waste sites which produce, generate, use, store, or dispose of hazardous materials) could be damaged so that existing spill control apparatus and containment measures are not effective.
   3. Hazardous materials that are transported may be involved in railroad accidents, highway collisions, waterway, or airline incidents.
   4. Damage to, or rupture of, pipelines, transporting materials that are hazardous if improperly released will present serious problems.
   5. Emergency exemptions may be needed for disposal of contaminated material.

6. Laboratories responsible for analyzing hazardous material samples may be damaged or destroyed in a disaster.

IV CONCEPT OF OPERATIONS

A. Washington State Patrol has the responsibility for hazardous materials incidents except in areas where this has been taken by local fire services. Local fire services may be the initial responding agency. Fire services plans and procedures will detail local operational concepts and responsibilities to the extent of the level of training and resources available.
B. Local emergency responders provide services such as, but not limited to, rescue and medical treatment of the injured, evacuation of persons at risk, initial isolation of the area, and identification of involved materials. The Incident Commander will ensure that the Whatcom County Department of Emergency Management (DEM) duty officer is notified.
C. Wherever possible, mutual aid agreements among local emergency agencies and the private sector should be developed to promote and facilitate the sharing of resources and expertise.
D. Each agency that has assumed Incident Commander responsibilities will ensure that there are trained responders, notification and activation capability and appropriate resources to carry out respective hazardous materials responsibilities.
E. State agencies will respond to hazardous materials incidents according to appropriate Federal and state laws, regulations, and agency plans.
F. Federal agencies and resources will be utilized if local and state capabilities have been exceeded and/or if Federal response is required under Federal laws, regulations, and plans.

V RESPONSIBILITIES

A. Joint Primary Agencies
   1. Washington State Department of Ecology
      a. Coordinate the activities found in this ESF according to the state DOE Central Programs Spill Prevention and Policy, and Spill Operations Sections.
   2. Washington State Patrol
      a. Coordinate on-scene activities of hazardous materials spills and releases occurring on state highways.
   3. Local Fire Services
      a. Respond to hazardous materials spills and releases not occurring on state highways and perform initial identification and containment activities.
   4. Support Agencies
      a. Lummi Departments
         i. Emergency Management

- Coordinate and support field activities by activating the Lummi Emergency Operations Center (EOC) when indicated.

ii. Police Department

- Provide on-scene security to prevent further contamination in support hazardous materials spills and releases occurring on or near the reservation.

VI Annex

Annex 1 -- Emergency Planning and Community Right to Know Act

ANNEX 1 TO ESF 10
EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT

I PURPOSE

A. To provide guidance for hazardous materials incident notification and response, and off-site emergency planning and notification procedures as required by Title III of the Superfund Amendments and Re-Authorization Act of 1986 (SARA), currently known as the Emergency Planning and Community Right to Know Act (EPCRA).

II OPERATIONAL CONCEPTS

A. General

1. For the purposes of this plan, a hazardous material is defined as "Any substance or material, including radioactive materials, which, when uncontrolled, can be harmful to people, animals, property or the environment." The Whatcom County DEM has been designated the Hazardous Materials Incident Coordinating Agency for Whatcom County. Incident Coordinating Agency shall mean the agency which provides the planning, training and support to first responders and other on-scene agencies to facilitate a coordinated response to hazardous materials incidents.
2. Local government has the primary responsibility for protecting life and property threatened by hazardous materials incidents, except where this has been specifically preempted by state or Federal law or regulation. The state Emergency Management Division provides a single point of contact through the 24-hour phone number 1-800-258-5990 for notification of these state agencies, and for requesting specific state assistance.
3. The LEPC, as established by EPCRA, is the group which coordinates the community planning for hazardous materials and the Community Right-to-Know program established under the Act.
4. Lummi is a member of the Whatcom County LEPC, which is currently chaired by the Whatcom County DEM. Community Right-To-Know information is filed for public availability in the office of the Whatcom County DEM
5. The LEPC has designated the Whatcom County DEM as the agency to receive and file follow-up written reports from facilities concerning releases covered under Section 304 of Title III of the Superfund Amendments and Re-Authorization Act of 1986.
6. This annex outlines the general off-site emergency procedures as required by EPCRA for facilities in or near the Lummi Reservation. On-site emergency procedures are in individual facility plans.
7. Infectious and bio-hazardous waste items, such as discarded needles, human blood, blood products and medical wastes are to be treated as hazardous materials under the scope of this plan. The Tribal and/or the County Health Department may provide guidance for Incident

Command agencies on the cleanup, handling, and disposal of such materials.

8. The identification and elimination of clandestine drug labs is primarily a law enforcement responsibility. Law enforcement agencies may utilize the specific expertise of other departments relevant to the hazardous materials aspects of drug labs. This includes, but is not limited to communications, decontamination, fire suppression, clean-up and disposal services.
9. The Whatcom Public Health Department must be notified of all clandestine drug laboratory seizures. Response is made by public health personnel after the property has been secured. For reference: Under RCW 64.44 and WAC 246-205, the Public Health District is mandated to perform certain actions after a clandestine drug laboratory seizure. Actions may include: investigation and assessment of the affected property to determine whether contamination has occurred; posting a warning notice on the premises; declaring the property unfit for use; requiring decontamination of the property in accordance with established standards; review of contaminated property cleanup reports to ensure verification that levels of hazardous chemicals are within applicable guidelines; and release of the property for re-occupancy.

B. Notification
1. Public safety answering points (PSAPs) provide a single point of contact for notification of hazardous materials incidents. Any local agency or Title III facility becoming aware of a hazardous materials incident should immediately notify the appropriate fire dispatch by telephone or radio. The PSAP will attempt to get as much information about the incident as possible.
2. After being notified of a hazardous material(s) incident, PSAPs are responsible for making the following notifications:
   a. The fire district in which incident occurred.
   b. Appropriate local law enforcement, if necessary.
   c. Public Health, if necessary.
   d. DEM duty officer, if necessary.
   e. The state Emergency Management Division duty officer.
3. If a spill is from the fuel tank of a motor vehicle, public health or DEM need not be notified, unless the Incident Command Agency feels the expertise of services of one or more of these agencies is needed. If the spill is from another source, these departments need to be notified, and from the information gathered on the Incident Worksheet, each will make a decision as to whether or not to respond.

C. Response
1. Most Whatcom County Fire Districts have designated themselves as the Incident Command Agency under RCW 70.136 (reference). Where the local fire district has not, the Washington State Patrol is the Incident Command Agency, as the expert agency.

2. The EOC may be activated if requested by the Incident Command Agency or by a response agency to support on-scene operations. On-scene agencies should provide the EOC with situation reports (sitreps) on operations and needs.
3. The two primary strategies for public protection in the case of an event are evacuation and shelter-in-place. The decision on what strategy to use is made by the on-scene Incident Command Agency with input from whatever technical expertise may be available (see ESF 24).
4. **It is the policy of Lummi that employees who are not assigned to do tasks which would require them to come into direct contact or handle hazardous materials themselves, shall need only "First Responder Awareness Level" training in accordance with WAC 296-62-3112.**
5. **It is the policy of Lummi that if the specific job assignment requires an employee handle or come in direct contact with hazardous materials products themselves at an incident site, appropriate higher levels of training as required by WAC 296-62-3112 shall apply.**

D. On-scene Management
1. The Incident Command Agency is responsible for assessing the situation and making determinations of appropriate actions.
2. **It is the policy of Lummi that response to hazardous materials incidents on the reservation shall follow the concept of an Incident Command System (ICS).**
3. **Some improvisation may be necessary to accommodate special circumstances, and the structure of an ICS would depend on the scope of the incident. For the purposes of this plan, the Incident Commander is the on-scene manager responsible for ensuring each response agency on scene can carry out their responsibilities.**

III RESPONSIBILITIES

A. Lummi Department of Emergency Management
1. Coordinate the provision of additional resources at the request of local response agencies or an Incident Command Agency.

B. Lummi Police Department
1. Provide traffic control, area security, communications support and evacuation.
2. Act as the Incident Command Agency under tribal law for activities related to illegal drug labs.

C. Whatcom County Health Department
1. Act as an advisor to the Hazardous Materials Incident Command agencies on personnel protection, public health, situation assessment, environmental impacts and identification of unknown products.
2. Assist the Hazardous Materials Incident Commander with information on handling, cleanup and disposal techniques or contacts for cleanup and disposal contractors.

3. May provide public notice for health problems related to hazardous materials spills.

D. Whatcom Fire District 7, 8, &/or 17
   1. Act as advisor to the Hazardous Materials Incident Commander on the enforcement of all county codes relating to the storage, use and handling of flammable, explosive, combustible, toxic, corrosive and other hazardous materials.
   2. Responsible for the inspection and declaration of unsafe buildings and evacuation of buildings when there is a threat to the occupants' life or safety.

E. Fire Services
   1. Provide initial efforts of response to and size-up of hazardous materials incidents, and contacting and coordinating proper outside authorities for assistance if necessary.
   2. May assume role of On-scene Incident Commander at hazardous material(s) incident(s).

F. Facilities - TITLE III
   1. Designate Facility Emergency Coordinators and notify the Whatcom County LEPC of any changes.
   2. Provide initial and updated emergency contacts, hazard analyses, capability assessments, Tier II information, Material Safety Data Sheets (MSDS) or list of chemicals, and other required information to the LEPC, state Emergency Response Commission, and the local Fire Department as required by the Act.
   3. Update Tier II forms annually to the LEPC, state Emergency Response Commission and the local fire department.
   4. Provide Section 313 information (Form R) to the Environmental Protection Agency, if required.
   5. Develop procedures for determining if there has been a release of chemicals in accordance with the Act and appropriate on-site response procedures for facility personnel.
   6. Provide emergency notification and follow-up written notice of any release in accordance with the Act and this Plan.

G. Other Departments (as appropriate)
   1. Provide assistance upon the request from DEM in accordance with responsibilities and capabilities as outlined in other parts of this plan.

ESF 11 – Food and Water

I GENERAL INFORMATION

A. Purpose
   1. To provide guidance for the emergency use of food and potable water for emergency workers and rescue personnel, and individuals and families displaced from their homes because of an emergency or disaster.

B. Scope
   1. It is beyond the scope of this ESF to plan for all food and potable water needs of the residents of Lummi affected by an emergency or disaster. It is expected the individuals, families and businesses within the reservation be prepared for a minimum of 72 hours of total self sufficiency, including food and water. Every effort will be made to ensure the feeding of emergency workers and rescue personnel.

II POLICIES

A. It is the policy of Lummi that purveyors of potable water are responsible for their own plans to supply their customers with potable water should their systems fail. Citizens are advised to prepare their own emergency water supplies.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis.

B. Planning Assumptions
   1. The Lummi Department of Emergency Management (DEM) will work closely with the American Red Cross Mt Baker-Whatcom County Chapter, Salvation Army and other disaster relief organizations in the distribution of food and potable water for the feeding of rescue personnel and county residents displaced from their homes.
   2. Schools, institutions and other facilities with inventories of USDA commodities, and in proximity of the event, will be used in the feeding of rescue personnel and displaced county residents.
   3. It is likely food and potable water inventories will become exhausted if the emergency or disaster is widespread, affecting many people over an extended period of time.
   4. The delivery of food and potable water may be hindered due to the disruption of transportation routes.
   5. The state Emergency Operations Center will receive requests for food supplies from local jurisdictions or disaster relief organizations 72 hours after the event.

IV CONCEPT OF OPERATIONS

A. The Red Cross-Mt Baker Chapter provides food and potable water to displaced individuals and families in shelters, and emergency workers and rescue personnel.
B. The Accounting Department is the lead agency for the procurement of emergency food supplies. Upon the occurrence of a major event, the Purchasing Agent or designee is to make contact with or report to the Lummi Emergency Operations Center (EOC) to assess the need for the procurement of food supplies.
C. The Lummi Tribal Health Center in coordination with the Whatcom County Health Department is the lead agency for the coordination and dissemination of information regarding preventive measures for contamination of food and the purification of water. The department is also the lead agency for monitoring emergency water supplies for compliance with health regulations.
D. Lummi Social Services in coordination with Whatcom County Department of Human Services is responsible for coordinating the support to the emergency needs of agency clients. These needs include food and potable water.
E. The DEM will endeavor to coordinate with major food distributors, grain storage facilities and other elements of the food industry to establish an emergency distribution system if a disaster disrupts the normal distribution process.

V RESPONSIBILITIES

A. Joint Lead Agencies
    1. Lummi Departments
        a. Emergency Management
            i. Lead agency for coordination with disaster relief organizations and major food distributors for the provision and distribution of food to disaster victims or food service organizations.
        b. Accounting
            i. Coordinate the procurement of emergency food and water supplies.
    2. Whatcom County Health Department
        a. Provide information for the public regarding food contamination, proper handling, distribution, conservation and safe drinking water.
        b. Monitor food preparation at point of consumption and emergency water supplies for compliance with applicable standards.
    3. Support Agencies
        a. Lummi Social Services and Whatcom County Department of Human Services
            i. Coordinate the support of emergency needs of agency clients. These needs include food and potable water.

ii. Schools, institutions and facilities housing USDA commodity inventories provide food and water for emergency workers and victims.

4. Volunteer Organizations
   a. American Red Cross Mt Baker Chapter provide food and water for displaced individuals and families at shelters, and emergency workers and rescue personnel.
   b. Salvation Army Canteen Service provide food and water for emergency workers and victims.

ESF 12 – Energy and Utilities

I GENERAL INFORMATION

A. Purpose
   1. To provide guidance for emergency coordination with providers of power, water, natural gas, petroleum, sanitation, and telecommunication resources to meet the essential needs of Lummi during an emergency or disaster.

B. Scope
   1. This ESF:
      a. Addresses the coordination of energy systems and utilities assessments for damage, supply, demand, and requirements to restore such systems.
      b. Assists Lummi departments and agencies obtain fuel for transportation, communications, emergency operations, and other critical functions.
      c. Helps energy suppliers and utilities obtain equipment, specialized labor, and transportation to repair or restore energy systems.

II POLICIES

A. It is the policy of Lummi that all utilities, whether publicly or privately owned, be prepared to respond to needs caused by an emergency or disaster. The Lummi Department of Emergency Management (DEM) may establish liaison with such utility providers to coordinate disaster and emergency needs and services.

III SITUATION

A. Emergency/Disaster Conditions and Hazards
   1. Refer to the Whatcom County Hazard Identification and Vulnerability Analysis

B. Planning Assumptions
   1. A severe natural disaster or other significant event can sever energy and utility lifelines, hindering supplies in impacted areas, or in areas with supply links to impacted areas, and also affect firefighting, transportation, communication and other lifelines needed for public health and safety.
   2. There may be widespread and/or prolonged electric power failure. With no electric power, communications, transportation, health care, business, education and infrastructure will be greatly impeded.
   3. There may be extensive pipeline failure in water, wastewater, and gas utilities. It may take an extended period of time to repair.
   4. Natural gas lines may break and may erupt in fire.
   5. Water pressure may be low, hampering firefighting and impairing sewer system function.

IV CONCEPT OF OPERATIONS

A. It is expected that public and private utility providers, such as those which provide power, water, natural gas, petroleum, sanitation, or communications services, will develop internal organizational procedures which will guide operations after a major event. These procedures should facilitate the basic assessment of what happened, what can be done about it and what is needed. If appropriate, this information should be provided to the Lummi Emergency Operations Center (EOC) as soon as possible.
B. Contact with utility providers may be established by the EOC to coordinate resources, establish priorities, assess and document damages and provide information to the public. The EOC may initiate information programs to keep the public informed of utility status and any restrictions.
C. Utility providers shall send a liaison to the EOC to facilitate coordination and shall provide communications equipment to be in contact with field units, when requested.
D. Requests for assistance are primarily made by utility providers through existing mutual aid agreements with other providers. The DEM or the EOC may assist with coordinating outside resources, upon request.
E. The DEM may advise public utilities operating in Lummi of Federal or state restrictions, or any emergency restrictions or operating policies established by Tribal government. The DEM may also coordinate with the Emergency Resources Management Organization if activated by the Governor.

V RESPONSIBILITIES

A. Primary Agency
   1. Energy and Utility Providers
      a. Lead agency for the assessment, provision, and restoration of electric power, water resources, and telecommunications, natural gas, and petroleum products to meet the needs of Lummi.
      b. Operate in the tradition of self-help and mutual aid.
      c. Comply with the requirements relating to curtailment of customer demands, restoration of services and provision of emergency services.
B. Support Agencies
   1. Lummi Departments
      a. Emergency Management
         i. Liaison and coordinate with utility and energy providers.
      b. Coordinate with providers for compliance with any restrictions or limitations placed on utilities by the local, state or Federal government.
      c. Environmental Services Division, Public Works maintain liaison with water purveyors and support efforts in preparedness and response to water shortage emergencies.

VI ANNEX

A. Annex 1 - Utility Providers Summary (TBD)

ESF 13 – Public Safety and Security – Reserved

ESF 14 – Long Term Economic Stabilization and Mitigation – Reserved

ESF 15 – External Affairs – Reserved

ESF 16 – Reserved – Federal

ESF 17 – Reserved – Federal

ESF 18 – Reserved – Federal

ESF 19 – Reserved – Federal

ESF 20 – Military Support to Civil Authorities

The geographic location of the Lummi Reservation and lack of military bases in or near the reservation precludes the need for this ESF.

If the disaster or emergency requires the use of military in or near the reservation this will be determined by the incident and implemented by the Federal or State government and coordinated in Whatcom County by the Whatcom County DEM.

Lummi Nation's interests will be represented at the Whatcom DEM per mutual aid agreements and liaison present at the DEM/EOC.

The United States Coast Guard has developed plans that include working with local governments for incidents involving areas of their jurisdiction.

ESF 21 – Recovery and Restoration – Reserved

ESF 22 – Law Enforcement

I INTRODUCTION

A. Purpose
   1. To provide for the effective coordination of law enforcement operations within the reservation in the event of an emergency/disaster.
   2. To provide support for state law enforcement operations.
   3. To utilize local law enforcement communication resources to support emergency operations.

B. RELATED POLICIES
   1. Under emergency/disaster conditions, law enforcement activities are the responsibility of the local law enforcement.
   2. Law enforcement units supplied by other levels of government will remain under the command of their parent agency but will operate under the direction and control of the Tribal Incident Commander.

II PLANNING ASSUMPTIONS

A. General law enforcement problems are compounded by disaster related community disruption.

B. The capabilities of local law enforcement agencies may be strained or exceeded. Supplemental assistance shall be requested through local and state emergency management channels.

III CONCEPT OF OPERATIONS

A. In time of an emergency/disaster, law enforcement agencies shall be called upon to perform a wide range of functions, including, but not limited to: warning and evacuation; search and rescue; emergency transportation; emergency communications; control of disaster site access; looting control; crowd control; emergency traffic control; and damage assessment.
   1. Law Enforcement agencies presently available for emergency operations on the reservation consist of:
      a. Tribal Police
      b. WSP
      c. Sheriff
      d. FBI

B. The Tribal Police, in addition to having 24-hour operational capability, has two-way radio communication links between its respective mobile units and the county EOC. This becomes a valuable resource during a disaster situation. (See ESF #2 Communications and Warning for communication frequencies available.)

C. If an emergency occurs within the reservation, the Tribal Police will exercise overall authority for law enforcement activities and responsibilities.

D. Law enforcement units, with the use of their sirens and public address systems, may be used to disseminate warning and emergency information.
E. The Washington State Patrol may provide a representative to the Whatcom County EOC to coordinate disaster law enforcement activities between local, district, and state law enforcement agencies, if available.

IV RESPONSIBILITIES

A. Local
   1. Tribal Police

      The Tribal Police will provide the following:

      a. Notify the Emergency Program Manager of major police emergencies. Notification of the Tribal Council will be at the discretion of the Police Chief.
      b. Coordinate ground and water search and rescue operations within the reservation, in conjunction with the law enforcement agency within each respective political subdivision, and using paid, reserve, and volunteer personnel.
      c. Control traffic during and after emergencies and disaster; and maintain access and egress routes.
      d. Maintain order in and around emergency/disaster scene; safeguard property in and around scene. Investigate all crimes committed.
      e. Provide a representative to the Tribal and/or County EOC as requested. Provide security for the EOC if necessary.
      f. Recommend the evacuation of endangered population. Inform the public of evacuation orders including, but not limited to: door-to-door notification of persons in affected area, and warning the public through the use of mobile public address systems. Provide security to evacuated property, if resources are available.
      g. Assist the coroner in necessary investigation, identification, recovery and management of deceased persons.
      h. Maintain necessary mutual aid agreements with other jurisdictions for law enforcement services.
      i. Provide incident documentation, reports, and financial information.
   2. Emergency Management
      a. Activate EOC and issue emergency warning(s).
      b. Provide the means for coordinating capabilities, resources, and assets necessary to alleviate disaster impacts on citizens and public entities caused by an emergency or disaster.
      c. Coordinate documentation of emergency activities and recovery of funds.
      d. Public Information
      e. Coordinate all public information and instructions and media relations as defined in ESF #31 Public Information.
B. State

1. State Emergency Management
   a. Serves as the central point of contact for local government requests for specific state and federal disaster resources and services.
2. Washington State Patrol
   a. Assist the local Emergency Management, Tribal Police, County Sheriff, and City Police in law enforcement operations.
   b. Coordinate and maintain liaison with the appropriate state departments, as identified in the *Washington State Comprehensive Emergency Management Plan*.
   c. Provide warning and communications support.
3. All Law Enforcement Agencies
   a. Support recovery operations as defined in agency Emergency Operation Procedures (EOPs) and Standard Operating Procedures (SOPs) or as requested by the Tribal EOC, to include:
      i. Maintaining post emergency/disaster security patrols.
      ii. Controlling re-entry.
      iii. Assisting in damage assessment activities.

ESF 23 – Damage Assessment

I INTRODUCTION

A. Purpose

The purpose of this ESF is to establish uniform policies for the Tribal Government to conduct rapid impact assessment and assessment of damages resulting from natural or technological disasters.

B. Scope

Disasters cause injury or death to individuals and damage to property, the environment, businesses, nonprofit entities, and to government-owned assets.

Damage information is collected in three phases:

a. To drive the response process,
b. Determine eligibility to federal disaster aid, and
c. Verify the damage in individual sites.

To determine a priority of response efforts, Rapid Impact Assessment (RIA) must be promptly carried out to provide the EOC information on life safety threats, major problems, and the status of lifelines, essential facilities, imminent hazards, and access routes.

A more quantified damage assessment process is then conducted to determine eligibility for various forms of disaster aid; this process is called Preliminary Damage Assessment (PDA).

Combined Verification includes a detailed inspection of individual sites by specialized personnel and is a procedure established by FEMA to qualify for various recovery programs.

II POLICIES

Rapid Impact Assessment (RIA) can be activated following any event where disaster intelligence is needed. RIA involves teamwork among personnel from law enforcement, fire, public works, and other agencies within and outside of the tribal government. Secondarily, the media, volunteer organizations, businesses and industry, and private citizens can contribute to this process.

FEMA policies mandate that damage from disaster events and federal aid and assistance are organized and approved by county boundaries. Even when the effect of an incident is so profound as to be readily apparent that the

county will qualify for federal disaster relief, a Preliminary Damage Assessment (PDA) must be completed. Whatcom County DEM in coordination with Lummi DEM will distribute PDA forms to all public jurisdictions within the reservation, as well as providing individual citizens and businesses with “hotline telephone numbers” to report damage and register with FEMA. Once jurisdictions have completed their PDAs, they will forward them to Whatcom DEM, who will subtotal and transmit to Washington State EMD, to assist the state in determining if a Presidential Declaration is warranted. If the PDAs ultimately lead to a Presidential Declaration of Disaster authorizing “Public Assistance,” then detailed Project Worksheets [previously titled Damage Survey Reports (DSRs)] of public sector damages will be completed by public and other qualifying agencies. Other inspectors survey damages suffered by individuals and businesses if “Individual Assistance” is authorized. These activities are coordinated through the Whatcom County Department of Emergency Management in coordination with Lummi DEM.

III SITUATION

A. Emergency/Disaster Conditions and Hazards

See Basic Plan.

B. Planning Assumptions

An emergency or disaster has occurred, causing damage that requires an initial rapid impact assessment, which will be followed by a thorough damage assessment. Damage assessment information for businesses and citizens will initially be reported through the Whatcom County EOC phone bank “hotline,” and later through the FEMA registration process.

IV CONCEPT OF OPERATIONS

A. General

1. Rapid Impact Assessment (RIA) is a process that is launched to quickly capture the degree that the event has challenged the community. The goals of RIA or ‘rapid reconnaissance’ are to assess:

    a. Boundaries of the disaster area
    b. Social, economic and environmental impacts
    c. Assessment of jurisdictions impacted
    d. Status of transportation routes
    e. Status of communication systems
    f. Access points to the disaster
    g. Status of operating facilities and critical facilities

h. Hazard specific information
i. Weather data
j. Status of key personnel
k. Resource shortfalls
l. Priorities for response
m. Status of upcoming activities
n. Historical information
o. Endangered Species Act impact

2. The RIA will steer initial response activities. As the event unfolds, the goal of damage assessment may shift toward making the case for a Presidential Disaster Declaration. To facilitate the receipt of more comprehensive damage information, a damage information hot line (phone bank) may be set up and staffed by the EOC. If it appears that the county may meet the threshold for federal disaster assistance, the Lummi DEM in coordination with Whatcom County Office of Emergency Management will complete a formal Preliminary Damage Assessment (PDA), see ESF 21 Recovery.
3. The Preliminary Damage Assessments (PDAs) are tools used, in part, to determine the tribe's and county's eligibility for disaster assistance. At this stage, tribal and county personnel accompany state and federal inspectors through damaged areas.

B. Organization

1. The Lummi Emergency Operations Center (EOC) will shift from response activities to recovery activities including RIA and PDA. Tribal departments will provide information on their rapid impact assessments to the EOC.
2. Tribal Departments with operational functions will have to adapt their information management systems so they can accommodate expanded communication lines, screen and synthesize complex or incomplete information, and provide timely reports in pre-determined formats to the EOC.

C. Procedures

See appendix 1 to this ESF

D. Mitigation Activities

All tribal departments will reduce the effects of disasters by providing safe work environments for their staff members, to include seismic tie-downs, emergency supplies, and selected operational training as mandated by each department's procedures.

E. Preparedness/Response Activities

All tribal departments will ensure that appropriate staff are identified, trained, and provided appropriate support to prepare each department to respond to emergencies and disasters.

F. Recovery Activities

All tribal departments will identify, train and provide appropriate support to selected staff in order to perform damage assessment, manage recovery projects, including documentation and costs, and return each department to normal operations

V RESPONSIBILITIES

A. Lummi DEM
   1. Coordinate the collection, evaluation, and dissemination of damage assessment information from all tribal departments.
   2. Forward PDA information to the Whatcom County DEM and/or Washington State Emergency Management Division (EMD).
   3. Coordinate the collection, evaluation and dissemination of damage assessment information from citizens and the business community. Forward that information to the Whatcom County DEM and/or Washington State Emergency Management Division (EMD).

B. All Support Agencies
   1. Perform rapid impact assessment and damage assessment tasks in support of this ESF (see appendix 23A).
   2. Evaluate staffing and operational capabilities and damage to real property and utilities and report this information to the EOC in a timely manner.

C. Tribal Police
   1. Deploy Search and Rescue support organizations (4x4 Rescue, etc.) and use field personnel to gather information about the event impacts.

D. Mt Baker Chapter of the American Red Cross
   1. Conduct Red Cross ‘windshield survey’ damage assessment of residential structures in the affected area and report this information to the Whatcom County EOC.

ESF 24 – Evacuation and Movement

I INTRODUCTION

A. Purpose
   1. The purpose of this Emergency Support Functions is to coordinate efforts in safely evacuating the public from a threat to life and/or health.
B. Scope
   1. Evacuation and movement involves the coordination of varying agencies and good communications with the public. Evacuation and movement is the responsibility of law enforcement and LIBC. This ESF applies to those agencies and others that are necessary for an evacuation.
C. Limitations
   1. An emergency or disaster situation could require the evacuation of a large number of people in or near a threatened or stricken area. However, the coordination of a major evacuation may be extremely difficult due to severe local conditions including the possible isolation of the area to be evacuated and the difficulty of providing sufficient warning and means of transportation for those in rural areas. This is especially true for those individuals who are at risk medically, the elderly, and the handicapped.
   2. In addition, although an evacuation can be ordered by government, people cannot be forced by government to leave. Government has only the responsibility to warn and advise the public to evacuate.

II POLICIES

A. The Incident Commander (IC) of a particular situation has the authority to call for an evacuation to protect the life and health of the populous immediately in harm's way.
B. The Lummi Nation Police is operationally in charge of evacuations.
C. The Lummi Indian Business Council has the ultimate responsibility for any and all evacuations. This is especially true for any evacuation that will be extended in nature or is not immediately threatening the health and safety of the populous.

III SITUATION

A. Emergency/Disaster Conditions and Hazards: Any disaster situation could cause the need for evacuation. Of particular concern to the reservation is from earthquake/tsunami, flooding or a wild fire, which could cause the need for an immediate evacuation, with very little time to plan for the specific evacuation.
B. Planning Assumptions

1. Individuals and families may be displaced from their homes and may be provided shelters by one or more volunteer organizations.
2. Approximately 10% of the populous may seek shelter in organized shelters. The rest usually will find their own via friends, family, or commercial sources.
3. Displaced persons may require transportation to shelter facilities. This should be provided for by private transportation.
4. Shelter operations will have sufficient sanitation and cooking facilities, including cold and frozen storage, to maximize the use of available products.

IV CONCEPT OF OPERATIONS

A. General
   1. Unless an evacuation is of an emergency nature, LIBC will coordinate with the Police Department and Emergency Management regarding the decision to evacuate.
   2. Emergency Management will coordinate with Whatcom County and/or the State Emergency Management for additional state or federal assistance, if required.
   3. Operational priorities will be established by the senior law enforcement representative working with the other responding agency head from the Emergency Operation Center, or other established Command Center.
   4. Levels have been established as follows:
      a. **Precautionary** - Public is advised by local media and available means of a potential for an evacuation.
      b. **Level 1** - Public is advised by door-to-door method and media that an area has the potential of being evacuated and that all citizens within that area should be ready to evacuate immediately.
      c. **Level 2** - An area is being evacuated and the public is requested to leave that area immediately and that there will be no further warnings
   5. Warning will be accomplished by all means available.
   6. For planning purposes it is assumed private vehicles may provide the means of evacuation for the majority of people in the evacuation zone. Public transportation resources will be utilized, if possible, to evacuate those without other means of transportation.
B. Organization: The responsibility of carrying out this ESF falls with Law Enforcement. In the event a disaster affects more than one jurisdiction, the concepts of the Incident Command System, Unified Command will be followed.
C. Procedures: Existing agency procedures for the operations of shelters, feeding and movement of the populous will be followed.
D. Mitigation Activities
   1. Primary Agencies: None

2. Support Agency – American Red Cross Ensures that shelters are capable of handling influx of evacuees.

E. Preparedness Activities
1. Primary Agencies
   a. Develop and maintain evacuation procedures and ensure that personnel are trained in the implementation of these procedures.
   b. Develop and maintain procedures to coordinate with human services organizations dealing with the opening of shelters and reception areas.
2. Support Agency – American Red Cross should
   a. Develop and maintain procedures for handling of displaced persons from an evacuation.
   b. Develop a volunteer family preparedness program.
   c. Develop and maintain a 24-hour contact / call-out procedures so that public safety can contact a representative.
3. Other Support Agencies
   a. Develop and maintain procedures on their roles and responsibilities during an evacuation.
   b. Ensure personnel are trained in the implementation of their roles and responsibilities during an evacuation.

F. Response Activities
1. Primary Agencies
   a. Responsible for implementing and coordinating emergency evacuation. This is done in the event of a situation that immediately threatens an area and there is no time to obtain a proclamation from elected officials.
   b. Responsible for determining when and how the public can re-enter the evacuated area(s).
   c. Provides security for evacuated areas.
   d. Documents evacuation status and disseminate status to appropriate personnel, agencies and the public on a continual and timely basis.
2. Support Agency - Incident Commander
   a. In the event an incident requires an emergency evacuation, such as a Hazardous Materials incident, flooding, fire, or any other localized incident, the incident commander has emergency authority to call for an emergency evacuation of a potentially affected area.
   b. Alerts the American Red Cross as soon as possible for the opening of shelters.
   c. Must document justification for calling for an evacuation.
   d. Must advise LIBC as soon as practical.
3. Support Agency – LIBC: Directly responsible for the decision, proclamation, and issuing evacuation orders to evacuate areas within its jurisdiction. Justification or reasons for the threat to life or property of local citizen must be well documented.
4. Support Agency - Emergency Management

a. Provide support to law enforcement, as appropriate.
b. Coordinate public information / instructions with local public safety agencies and the media.
c. Act as the point of contact with the Red Cross for shelter opening, tracking of displaced persons and other activities as appropriate.

5. Support Agency – American Red Cross: Responsible for the sheltering and tracking of displaced citizens (Disaster Welfare Inquiry) due to an evacuation.
6. Support Agency – Public Works
   a. Assist with request for additional personnel.
   b. Provide traffic control signs, barricades, etc.
   c. Assist in the determination of safe evacuations routes.

G. Temporary shelters.
H. Movement of citizens out of an affected area, as needed.
   a. Provide liaison at the County EOC, as appropriate.
I. Recovery Activities
   1. Primary Agencies
      a. Evaluate the safety of an evacuated area prior to allowing citizens back in.
      b. Provide a detailed summary of actions taken and cost relating to the evacuation.
   2. Support Agencies: Perform recovery as outlined in departmental procedures.

V RESPONSIBILITIES

A. Primary Agencies: Performing evacuations for the protection of the public and coordinating the provisions of this Emergency Support Function.
B. Support Agencies: Support the Primary Agencies' goals in the accomplishment of evacuation and movement.

ESF 25 – Reserved – State

ESF 26 – Reserved – State

ESF 27 – Reserved – State

Appendix D:

Lummi Nation Title 15A Flood Damage Prevention Code

TITLE 15A

LUMMI NATION CODE OF LAWS

FLOOD DAMAGE PREVENTION CODE

Enacted: Resolution 97-119 (7/22/05)

Amended: Resolution 2005-125 (09/12/05)

TITLE 15A
LUMMI NATION CODE OF LAWS
FLOOD DAMAGE PREVENTION CODE

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TITLE 15A
LUMMI NATION CODE OF LAWS
FLOOD DAMAGE PREVENTION CODE

Chapter 15A.01 Authorization, Finding of Fact, and Purpose

15A.01.010 Statutory Authorization

The Lummi Indian Business Council is delegated the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of the citizens of the Lummi Reservation. Therefore, the Lummi Indian Business Council does ordain as follows:

15A.01.020 Finding of Fact

(a) The flood hazard areas of the Lummi Indian Reservation are subject to periodic inundation that may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, damages to treaty protected resources, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

(b) These flood losses are caused by the cumulative effect of winter storms and upstream land uses in the Nooksack River basin which increase flood heights and velocities, and when inadequately managed, damage uses in other areas. Uses that are inadequately floodproofed, elevated, or otherwise protected from flood damage also contribute to the flood loss.

15A.01.030 Statement of Purpose

It is the purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed

(a) to protect human life and health;

(b) to minimize expenditure of public money and costly flood control projects;

(c) to minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

(d) to minimize prolonged business interruptions;

(e) to minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in the special flood hazard areas;

(f) to minimize damage to treaty protected resources;

(g) to help maintain a stable tax base by providing for the sound use and development of the special flood hazard areas so as to minimize future flood areas;

(h) to ensure that potential buyers are notified that property is in a special flood hazard area; and,

(i) to ensure that those who occupy the special flood hazard areas assume legal and financial responsibility for their actions.

15A.01.040 Methods of Reducing Flood Losses

In order to accomplish its purposes, this ordinance includes methods and provisions for

(a) restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

(b) requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(c) controlling the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;

(d) controlling filling, grading, dredging, and

other development which may increase flood damage; and

(e) preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or may increase flood hazards in other areas.

Chapter 15A.02 Definitions

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

15A.02.010 Appeal

Means a request for a review of the interpretation of any provision of this ordinance or a request for a variance.

15A.02.020 Area of Shallow Flooding

Means a designated AO, or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow and AH indicates ponding.

15A.02.030 Base Flood

Means the flood having a one percent chance of being equaled or exceeded in any given year. Also referred to as the "100-year flood." Designation on maps always includes the letters A or V.

15A.02.040 Basement

Means any area of the building having its floor subgrade (below ground level) on all sides.

15A.02.050 Breakaway Wall

Means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.

15A.02.060 Coastal High Hazard Area

Means a special flood hazard area extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1-V30, VE or V.

15A.02.070 Critical Facility

Means a facility for which even a slight chance of flooding might be too great. Critical facilities include, but are not limited to, schools, nursing homes, hospitals police, fire and emergency response installations, and installations which produce, use, or store hazardous materials or hazardous waste.

15A.02.080 Development

Means any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations located within the special flood hazard areas.

15A.02.090 Elevated Building

Means for insurance purposes, a non-basement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, post, piers, pilings, or columns.

15A.02.100 Existing Manufactured Home Park or Subdivision

Means a manufactured home park subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the adopted floodplain management regulations.

15A.02.110 Expansion to an Existing Manufactured Home Park or Subdivision

Means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either

final site grading or the pouring of concrete pads).

15A.02.120 Flood or Flooding

Means a general and temporary condition of partial or complete inundation of normally dry land areas from

(a) the overflow of inland or tidal waters and/or

(b) the unusual and rapid accumulation of runoff of surface waters from any source.

15A.02.130 Flood Insurance Rate Map (Firm)

Means the official map on which the Federal Insurance Administration has delineated both the special flood hazard areas and the risk premium zones applicable to the community.

15A.02.140 Flood Insurance Study

Means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Boundary-Floodway Map, and the water surface elevation of the base flood.

15A.02.150 Floodway

Means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

15A.02.160 Lowest Floor

Means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance found at Section 15A.05.050(a)(2).

15A.02.170 Manufactured Home

Means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

15A.02.180 Manufactured Home Park or Subdivision

Means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

15A.02.190 New Construction

Means structures for which the "start of construction" commenced on or after the effective date of this ordinance.

15A.02.200 New Manufactured Home Park or Subdivision

Means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of adopted floodplain management regulations.

15A.02.210 Recreational Vehicle

Means a vehicle which is

(a) built on a single chassis;

(b) 400 square feet or less when measured at the largest horizontal projection;

(c) designed to be self-propelled or permanently towable by a light duty truck; and

(d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

15A.02.220 Special Flood Hazard Area

Means the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.

15A.02.230 Start of Construction

Includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation of the property or accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

15A.02.240 Structure

Means a walled and roofed building including a gas or liquid storage tank that is principally above ground.

15A.02.250 Substantial Damage

Means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

15A.02.260 Substantial Improvement

Means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either

(a) before the improvement or repair is started; or

(b) if the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

The term can exclude:

(c) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or

(d) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

15A.02.270 Variance

Means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.

15A.02.280 Water Dependent

Means a structure for commerce or industry which cannot exist in any other location and is dependent on the water by reason of the intrinsic nature of its operations.

Chapter 15A.03 General Provisions

15A.03.010 Land to Which this Ordinance Applies

This ordinance shall apply to all special flood hazard areas within the exterior boundary of the Lummi Indian Reservation, including fee and trust land parcels.

15A.03.020 Basis for Establishing the Special Flood Hazard Area

A scientific and engineering report commissioned by the Federal Insurance Administration (FIA) shall identify the special flood hazard areas. When the report is completed, along with accompanying flood insurance rate maps (FIRM), it shall be adopted and incorporated by reference into this ordinance. Future studies and flood insurance maps, as amended, shall become a part of this ordinance. The Flood Insurance

Study (FIS), when completed, shall be on file at the Lummi Nation Planning Department. Until the study is completed, the Lummi Nation Planning Department shall use the best information available, as outlined in Chapter 15A.04.031(b), to determine the special flood hazard areas and required elevations of structures, until a new FIRM is issued which incorporates the data utilized in Chapter 15A.04.031(b).

15A.03.030 Penalties for Non Compliance

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violations of the provisions of this ordinance by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions), shall constitute a misdemeanor. Any person who violates this ordinance or fails to comply with any of its requirements shall upon conviction thereof be fined not more than $1000.00, for each violation, and in addition shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the Lummi Indian Business Council from taking such other lawful action as is necessary to prevent or remedy any violation.

15A.03.040 Abrogation and Greater Restrictions

This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

15A.03.050 Interpretation

In the interpretation and application of this ordinance, all provisions shall be

(a) considered as minimum requirements;

(b) liberally construed in favor of the governing body; and

(c) deemed neither to limit or repeal any other powers granted under Lummi Nations laws and federal statutes.

15A.03.060 Warning and Disclaimer of Liability

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the special flood hazard areas or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of Lummi Indian Business Council, any officer or employee thereof, or the Federal Insurance Administration, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

Chapter 15A.04 Establishment of Development Permit

15A.04.010 Development Permit Required

A development permit shall be obtained before construction or development begins within any special flood hazard area established in Chapter 15A.03.020. The permit shall be for all structures including manufactured homes, as set forth in the "DEFINITIONS," and for all development including fill and other activities, also as set forth in the "DEFINITIONS."

15A.04.020 Application for Development Permit

Application for a development permit shall be made on forms furnished by the Planning Department and may include but not be limited to plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. Specifically, the following information is required:

(a) Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures;

(b) Elevation in relation to mean sea level to which any structure has been floodproofed;

(c) Certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in Chapter 15A.05.050(b); and

(d) Description of the extent to which a watercourse will be altered or relocated as a result of proposed development.

15A.04.030 Designation of the Director of Planning Department

The Director of the Planning Department (Director) is hereby appointed to administer and implement this ordinance by granting or denying development permit applications in accordance with its provisions.

15A.04.031 Duties and Responsibilities of the Director

Duties of the Director shall include, but not be limited to:

(a) Permit Review.

(1)Review all development permits to determine that the permit requirements of this ordinance have been satisfied.

(2)Review all development permits to determine that all necessary permits have been obtained from those Federal, State, or local governmental agencies from which prior approval is required.

(3)Review all development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of Chapter 15A.05.060(a) are met.

(b) Use of Other Base Flood Data
When base flood elevation data has not been provided in accordance with Chapter 15A.03.020, BASIS FOR ESTABLISHING THE SPECIAL FLOOD HAZARD AREAS, the Director shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State or other source, in order to administer Chapters 15A.05.050, SPECIFIC STANDARDS, and 15A.05.060 FLOODWAYS.

(c) Information to be Obtained and Maintained.

(1) Where base flood elevation data is provided through the Flood Insurance Study or required as in Section 15A.04.031(b), obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.

(2) For all new or substantially improved floodproofed non-residential structures

(A) verify and record the actual elevation (in relation to mean sea level), and

(B) maintain the floodproofing certifications required in Section 15A.04.020(c).

(c) Maintain for public inspection all records pertaining to the provisions of this ordinance.

(d) Alteration of Watercourses.

(1) Provide the Director plans and application for watercourse alteration prior to any alteration or relocation of a watercourse, and submit evidence of Tribal approval to the Federal Insurance Administration.

(2) Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished and fish and wildlife habitats are protected according to designs and mitigation plans jointly approved by the Director and by the Lummi Natural Resources Department.

(e) Interpretation of FIRM Boundaries.
Make interpretations where needed, as to exact location of the boundaries of the special flood hazard areas (for example, where there

appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in Section 15A.04.040.

15A.04.040 Appeal and Variance Procedure

(a) Appeal Board.

(1) The Lummi Planning Commission (Commission) as established by the Lummi Indian Business Council shall hear and decide appeals and requests for variances from the requirements of this ordinance.

(2) The Commission shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the Planning Department in the enforcement or administration of this ordinance.

(3) Those aggrieved by the decision of the Commission, or any landowner, may appeal such decision to the Lummi Indian Business Council , as provided in the Constitution of the Lummi Nation .

(4) In passing upon such applications, the Commission shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and

(A) the danger that materials may be swept onto other lands to the injury of others;

(B) the danger to life and property due to flooding or erosion damage;

(C) the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

(D) the importance of the services provided by the proposed facility to the community;

(E) the necessity to the facility of a waterfront location, where applicable;

(F) the availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;

(G) the compatibility of the proposed use with existing and anticipated development;

(H) the relationship of the proposed use to the comprehensive plan and flood plain management program for that area;

(I) the safety of access to the property in times of flood for ordinary and emergency vehicles;

(J) the expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site;

(K) the costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and streets and bridges;

(L) the potential adverse impacts to natural resources; and

(M) the potential adverse impacts to treaty protected resources.

(5) Upon consideration of the factors of Section 15A.04.040(a)(4) and the purposes of this ordinance, the Commission may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.

(6) The Commission shall maintain the records of all appeal actions and report any variances to the Federal Insurance Administration upon request.

(b) Conditions for Variances

(1) Generally, the only condition under which a variance from the elevation

standard may be issued is for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing items (A-M) in Section 15A.04.040(a)(4) have been fully considered. As the lot size increases the technical justification required for issuing the variance increases.

(2) Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, or declared a historic place by the Lummi Nation, without regard to the procedures set forth in this section.

(3) Variances shall not be issued within a designated floodway if any increase in flood levels during the base flood discharge would result.

(4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

(5) Variances shall only be issued upon

(A) a showing of good and sufficient cause;

(B) a determination that failure to grant the variance would result in exceptional hardship to the applicant; and

(C) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public as identified in Section 15A.04.040(a)(4), or conflict with existing local laws or ordinances.

(6) Variances as interpreted in the National Flood Insurance Program are based on the general zoning law principle that they pertain to a physical piece of property; they are not personal in nature and do not pertain to the structure, its inhabitants, economic or financial circumstances. They primarily address small lots in densely populated residential neighborhoods. As such, variances from the flood elevations should be quite rare.

(7) Variances may be issued for nonresidential buildings in very limited circumstances to allow a lesser degree of floodproofing than watertight or dry-floodproofing, where it can be determined that such action will have low damage potential, complies with all other variance criteria except 15A.04.040(b)(1), and otherwise complies with Sections 15A.05.010(a) and 15A.05.010(b) of the GENERAL STANDARDS.

(8) Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

Chapter 15A.05 Provisions For Flood Hazard Reduction

15A.05.010 General Standards

In all special flood hazard areas, the following standards are required:

(a) Anchoring

(1) All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.

(2) All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).

(b) Construction Materials and Methods

(1) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

(2) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

(3) Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(c) Utilities

(1) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

(2) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

(3) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

(d) Subdivision Proposals

(1) All subdivision proposals shall be consistent with the need to minimize flood damage;

(2) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;

(3) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

(4) Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments which contain at least 50 lots or 5 acres (whichever is less).

(e) Review of Building Permits.
Where elevation data is not available either through the Flood Insurance Study or from another authoritative source Section 15A.04.031(b), Applications for building permits shall be reviewed to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet above grade in these zones may result in higher insurance rates.

15A.05.050 Specific Standards

In all special flood hazard areas where base flood elevation data has been provided as set forth in Section 15A.03.020, BASIS FOR ESTABLISHING THE SPECIAL FLOOD HAZARD AREAS or Section 15A.04.031, Use of Other Base Flood Data, the following provisions are required:

(a) Residential Construction

(1) New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated one foot above the base flood elevation.

(2) Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:

(A) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall provided.

(B) The bottom of all openings shall be

no higher than one foot above grade.

(C) Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(b) Nonresidential Construction
New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated one foot above the base flood elevation; or, together with attendant utility and sanitary facilities, shall

(1) be floodproofed so that below one foot above the base flood level the structure is watertight with walls substantially impermeable to the passage of water;

(2) have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

(3) be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in Section 15A.04.031(c)(2);

(4) nonresidential structures that are elevated, not floodproofed, must meet the same standards for space below the lowest floor as described in 15A.05.050(a)(2);

(5) applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the floodproofed level (e.g., a building floodproofed to the base flood level will be rated as one foot below).

(c) Manufactured Homes.

(1) All manufactured homes to be placed or substantially improved within Zones A1-A30, AH, and AE on the community's FIRM on sites

(A) outside of a manufactured home park or subdivision,

(B) in a new manufactured home park or subdivision,

(C) in an expansion to an existing manufactured home park or subdivision, or

(D) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood; shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated one foot above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation collapse and lateral movement.

(2) Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A1-30, AH, and AE on the community's FIRM that are not subject to the above manufactured home provisions shall be elevated so that either

(A) the lowest floor of the manufactured home is elevated one foot above the base flood elevation, or

(B) the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement. At a minimum a "reinforced pier" would have a footing adequate to support the weight of the manufactured home under saturated soil conditions such as occur during a flood. In addition, if stacked concrete blocks are used, vertical steel reinforcing rods should be placed in the hollows of the blocks and those hollows filled with concrete or high strength mortar. In

areas subject to high velocity floodwaters and debris impact, cast-in-place reinforced concrete piers may be appropriate.

(d) Recreational Vehicles.
Recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM shall

(1) be on the site for fewer than 180 consecutive days and fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or

(2) meet the requirements of 15A.05.050(d) above and the elevation and anchoring requirements for manufactured homes.

15A.05.060 Floodways

Located within the special flood hazard areas established in Section 15A.03.020 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

(a) Prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

(b) Construction or reconstruction of residential structures is prohibited within designated floodways, except for

(1) repairs, reconstruction, or improvements to a structure which do not increase the ground floor area; and

(2) repairs, reconstruction or improvements to a structure, the cost of which does not exceed 50 percent of the market value of the structure either

(A) before the repair or reconstruction is started, or

(B) if the structure has been damaged, and is being restored, before the damage occurred. Work done on structures to comply with existing health, sanitary, or safety codes or to structures identified as historic places shall not be included in the 50 percent.

(c) If Section 15A.05.060(a) is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 15A.05, PROVISIONS FOR FLOOD HAZARD REDUCTION.

15A.05.070 Encroachments

In areas with a designated floodway, no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, where combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

15A.05.080 Standards For Shallow Flooding Areas (AO Zones)

Shallow flooding areas appear on FIRMs as AO zones with depth designations. The base flood depths in these zones range from 1 to 3 feet above ground where a clearly defined channel does not exist, or where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is usually characterized as sheet flow. In these areas, the following provisions apply:

(a) New construction and substantial improvements of residential structures and manufactured homes within AO zones shall have the lowest floor (including basement) elevated above the highest grade adjacent to the building, one foot or more above the depth number specified on the FIRM (at least two

feet if no depth number is specified).

(b) New construction and substantial improvements of nonresidential structures within AO zones shall either

(1) have the lowest floor (including basement) elevated above the highest adjacent grade of the building site, one foot or more above the depth number specified on the FIRM (at least two feet if no depth number is specified); or

(2) together with attendant utility and sanitary facilities, be completely flood proofed to or above that level so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. If this method is used, compliance shall be certified by a registered professional engineer or architect as in section 15A.05.050(b)(3).

(c) Require adequate drainage paths around structures on slopes to guide floodwaters around and away from proposed structures.

(d) Recreational vehicles placed on sites within AO Zones on the community's FIRM shall

(1) be on the site for fewer than 180 consecutive days and be fully licensed and ready for highway use on its wheels or jacking system; be attached to the site only by quick disconnect type utilities and security devices; and have no permanently attached additions; or

(2) meet the requirements of 15A.05.080 above and the elevation and anchoring requirements for manufactured homes.

15A.05.090 Coastal High Hazard Areas

Located within the special flood hazard areas established in Section 15A.03.020 are Coastal High Hazard Areas, designated as Zones V1-V30, VE and/or V. These areas have special flood hazards associated with high velocity waters from surges and, therefore, in addition to meeting all provisions in this ordinance, the following provisions shall also apply:

(a) All new construction and substantial improvements in Zones V1-V30 and VE (V if base flood elevation data is available) shall be elevated on pilings and columns so that

(1) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated one foot or more above the base flood level; and

(2) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Wind and water loading values shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).

(b) A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (1) and (2) of this Section.

(c) Obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures in Zones V1-30 and VE, and whether or not such structures contain a basement. The local administrator shall maintain a record of all such information.

(d) All new construction shall be located landward of the reach of ordinary high water.

(e) Provide that all new construction and substantial improvements have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to

collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purpose of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:

(1) Breakaway wall collapse shall result from water load less than that which would occur during the base flood; and

(2) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).

(f) If breakaway walls are utilized, such enclosed space shall be useable solely for parking of vehicles, building access, or storage. Such space shall not be used for human habitation.

(g) Prohibit the use of fill for structural support of buildings.

(h) Prohibit man-made alteration of sand dunes which would increase potential flood damage.

(i) All manufactured homes to be placed or substantially improved within Zones V1-V30, V, and VE on the community's FIRM on sites

(1) outside of a manufactured home park or subdivision,

(2) in a new manufactured home park or subdivision,

(3) in an expansion to an existing manufactured home park or subdivision, or

(4) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood shall meet the standards of paragraphs 15A.05.090(a) through (h) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones V1-30, V, and VE on the FIRM meet the requirements of Section 15A.05.050(d).

(j) Recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either

(1) be on the site for fewer than 180 consecutive days and be fully licensed and ready for highway use on its wheels or jacking system; be attached to the site only by quick disconnect type utilities and security devices; and have no permanently attached additions; or

(2) Meet the requirements of Section 15A.04.010 (Permitting requirements) and paragraphs 15A.05.090(a) through (h) of this section.

15A.05.100 Critical Facility

Construction of new critical facilities shall be, to the extent possible, located outside the limits of the Special Flood Hazard Area (SFHA) (100-year floodplain). Construction of new critical facilities shall be permissible within the SFHA if no feasible alternative site is available. Critical facilities constructed within the SFHA shall have the lowest floor elevated three feet or more above the level of the base flood elevation (100-year) at the site. Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into flood waters. Access routes elevated to or above the level of the base flood elevation shall be provided to all critical facilities to the extent possible.

Appendix E:

Summary of Lummi Nation Flood Policies

FLOOD-MITIGATION POLICIES OF THE LUMMI NATION

Policies recommended to direct the floodplain, coastal, and watershed-management activities of the Lummi Nation are listed in this appendix. Adoption of the FDRP by the LIBC (Resolution # 2001-131) certifies that these policies have been adopted by the LIBC. These policies provide a set of operating principles to guide flood-hazard-reduction efforts over the long term. The policies are divided into seven categories: general policies; floodplain land use; watershed management; flood-hazard-reduction projects; river-channel maintenance; flood warning, information, and education; and emergency response. These categories and much of the text were incorporated or adapted from the Tillamook County Flood Hazard Mitigation Plan (Tillamook County 1996).

GENERAL POLICIES

The general policies listed below form a mission statement for the FDRP, providing general guidance for all future activities. All other policies and recommendations in this plan are designed to fulfill one or more of these general policies.

National Flood Insurance Program (NFIP)

Policy G-1:

In order to better protect public health and safety and to achieve discounts of flood-insurance premiums by qualifying for the CRS Program, the Lummi Nation should not only meet, but also exceed where practicable, the federal minimum standards for NFIP qualification.

Restricting New Development in Hazardous Areas

Policy G-2:

New subdivisions, new residential and commercial development, and substantial improvement of commercial and residential structures should be discouraged (if not already prohibited by Title 15A FDPC) on lands identified as a floodway or a coastal velocity zone. Title 15A restrictions must be enforced.

Policy G-3:

Development may be allowed in areas of lesser flood hazard in identified floodplains (i.e., the flood fringe) or in coastal flooding areas only if it can be built to withstand flooding without suffering significant damage. Title 15A restrictions must be enforced.

Reducing Flood Impacts to Existing Developments

Policy G-4:

The Lummi Nation should seek to reduce the risk of severe flood hazards and damages experienced by existing public and private developments.

Policy G-5:

New development or other actions should not be allowed to increase flood risks to existing properties and development.

Reducing Long-Term Public Costs

Policy G-6:

Where possible, flood-hazard-reduction projects should be selected, designed, and implemented to be permanent or low-maintenance solutions to flood problems.

Protecting Natural Resources and Functions

Policy G-7:

The existing flood storage, conveyance functions, and ecological values of floodplains, wetlands, and riparian corridors should be protected and, where possible, enhanced or restored.

Multi-Objective Management of Water Resources

Policy G-8:

Floodplains, rivers, streams, coastal areas, and other water resources should be managed for multiple uses, including flood- and erosion-hazard reduction, fish and wildlife habitat, fish harvesting, agriculture, open space, recreation, and, where appropriate, water supply.

Planning with a Watershed Perspective

Policy G-9:

Flood-damage-reduction plans and projects should be developed in a basin-wide context using watershed councils or similar inter-governmental commissions, recognizing that the watershed and drainage network function as an interdependent system.

Intergovernmental Coordination and Cooperation

Policy G-10:

The Lummi Nation's floodplain- and watershed-management activities should be planned and implemented in cooperation with cities, counties and other agencies sharing jurisdiction in the Nooksack River basin, consistent with co-management responsibilities of tribes and tribal treaty rights. The Lummi Nation should also closely review the management plans and activities of other jurisdictions.

Assessment of Flood Problems and Mitigation Alternatives

Policy G-11:

Solutions to flood problems should be derived from a science-based assessment of flood problems and potential mitigation alternatives.

FLOODPLAIN LAND-USE POLICIES

Future-Conditions Floodplain

Policy FP-1:

Wherever future-condition flows have been modeled and adopted as part of a basin plan, they should be used to define the 100-year flood of record and future-conditions floodplain (i.e., the 100-year floodplain expected under build-out of current land-use plans and regulations for the basin). In the Nooksack River basin and coastal flood areas, land-use policies and flood-hazard regulations should apply to the 100-year future-conditions floodplain.

Development in the FEMA Floodway

Policy FP-2:

The current floodway standards, contained in the Lummi Nation Title 15A FDPC, should be maintained and consistently enforced. These standards prohibit new residential structures. New commercial development in a floodway should be avoided unless it is the only practicable alternative.

Development in FEMA Coastal High Hazard Areas (Velocity Zones)

Policy FP-3:

The current standards for coastal high hazard areas, contained in the Lummi Nation Title 15A FDPC, should be maintained and consistently enforced. New commercial development should be avoided unless it is the only practicable alternative.

Construction Standards for Flood Protection

Policy FP-4:

New development and substantial improvements in the floodplain should be constructed so that they can withstand the 100-year flood without sustaining significant damage. They should be built so that the lowest finished floor is one foot above the projected 100-year flood within the designated 100-year flood fringe. Areas below the lowest finished floor of residential structures should be designed to allow for the entry and exit of floodwaters.

Floodplain Land Uses

Policy FP-5:

In areas designated for agriculture or "rural residential" use in the Lummi Nation General Land-Use Plan (GLUP), land uses which preserve the natural flood storage and conveyance functions of the floodplain – such as agriculture, open space, fish and wildlife habitat, and recreation – are preferred within the floodplain.

Policy FP-6:

Critical facilities and land uses that represent special risks (e.g., hazardous waste storage facilities, hospitals, schools, nursing homes, and police and fire stations) should not be built in the floodplain or coastal flood zones unless no reasonable alternative is available. If located in the floodplain, these facilities and the access routes needed for their operation should be built in a manner that protects public health and safety during at least the 100-year flood. In addition, special measures should be taken to ensure that hazardous or toxic substances are not released into floodwaters.

Migrating Rivers

Policy FP-7:

Channel-migration hazard areas should be identified through geomorphologic analyses and review of historic channel-migration patterns and rates. Land-use regulations should be adopted and applied in order to preclude unsafe development in these areas.

Reducing Flood Impacts on Agriculture - Cow Pads and Manure Lagoons

Policy FP-8:

The construction of elevated cow pads is encouraged as a means to protect livestock on farms that are subject to significant flooding.

Policy FP-9:

If manure lagoons associated with concentrated animal feeding operations are located in the flood plain, they must be flood-proofed

WATERSHED-MANAGEMENT POLICIES

Impacts of Basin-wide Land Uses on Flooding

Policy WM-1:

The Lummi Nation should participate in the development of watershed analysis and comprehensive basin plans for the Nooksack River watershed (as in the Water Resource Inventory Area 1 [WRIA 1] Watershed Management Project) to ensure that the best available science is used to support decisions on natural resource management.

Policy WM-2:

Basin plans should estimate the downstream effects of increased runoff rates and/or volumes caused by clearing and development of upstream lands.

Policy WM-3:

Where downstream impacts will result from increased runoff rates and volumes, new upland land uses should be required to either control runoff rates and volumes or to apply other equally effective measures to protect downstream properties.

FLOOD-HAZARD-REDUCTION PROJECT POLICIES

Flood-Hazard Problems

Policy FHR-1:

The following types of properties and problems are eligible for protection:

(1) Properties where there is an imminent threat to public health or safety;
(2) Usual and accustomed (U & A) grounds and stations for which the Lummi Nation has treaty rights to hunt, fish, and gather;
(3) Cultural resources;
(4) Lummi Nation capital improvements (e.g., water-treatment plants, wastewater-treatment plants, roads, fish hatcheries, and buildings);
(5) The Lummi Nation has a written maintenance agreement or other legal obligation to protect the site;
(6) A Lummi Nation action caused or contributed to the problem;
(7) Other public property (such as a road, bridge, or park); and
(8) Private homes, businesses, or agricultural uses vulnerable to severe damage.

Problem Prioritization

Policy FHR-2:

In determining the priority of a problem, the following factors should be taken into consideration: consequences, urgency, responsibility, and opportunity. These factors are described below.

Consequences:

The primary factor that determines the priority of a problem is the consequences that would result if a project is not implemented. Consequences should generally be prioritized in the following order:

(1) Threats to public health and safety. Threats to public health and safety include threats to critical facilities (e.g., hospitals, schools, nursing homes, and emergency response facilities) and/or health-related infrastructures (e.g., water supply systems, sewer lines). The presence of deep, high velocity flows carrying debris through populated areas also constitutes a threat to life and limb.

(2) Damage to public infrastructure and developed public property. Public infrastructure and developed public property includes, but is not limited to, roads, bridges, utility systems, public buildings, and fish hatcheries.

(3) Damage to private structures. Private residential structures should receive higher priority than non-residential structures.

(4) Damage to significant natural resources. Significant natural resources include fish and wildlife species and habitats that are considered regionally significant.

(5) Damage to undeveloped public land. Undeveloped public land refers to both publicly-owned open space and land for which development rights have been purchased, such as agricultural land.

Urgency:

Urgency is a measure of how quickly action needs to be taken in order to prevent a problem from growing worse and requiring an increasingly costly solution. For example, the magnitude of an erosion-related problem will generally increase over time if not addressed. In comparing problems where equal consequences would result if action is not taken, the most urgent problem should be addressed first.

Responsibility:

Another important factor is whether the problem is related to a facility that the Lummi Nation has a legal commitment to maintain. In comparing problem sites with comparable consequences and urgency, those associated with facilities that the Lummi Nation has a legal commitment to maintain should be a higher priority than sites where no such commitment exists.

Opportunity:

Although consequences, urgency, and responsibility are the primary factors in determining problem priorities, projects can sometimes present opportunities for meeting multiple objectives. Examples include projects that enhance ecological resources, provide public access to the river system or coastal areas, and/or provide opportunities to cooperate with private landowners or other jurisdictions in funding and implementation of a project. The prioritization procedures should allow flexibility to give higher priority to projects that meet multiple objectives.

<u>Modifications to Problem-Prioritization Criteria</u>

Policy FHR-3:

Basin-specific modifications to the Problem Prioritization Policy (Policy FHR-2) may be made in accordance with the recommendations of an adopted basin plan and the approval of the Lummi Nation Natural Resources Department Director and the Lummi Nation Planning Department Director.

Alternative Evaluation and Selection

Policy FHR-4:

Project alternatives shall be evaluated according to the following criteria:

(1) Risks to life and public health. The effect of the project on public health and safety shall be evaluated both upstream and downstream of the site. The project must have a beneficial or negligible impact on public health and safety.

(2) Benefits versus costs. Benefits are measured as the effect on flood damages over the entire river or coastal system; costs are measured as public and private costs for implementing and maintaining the solution over the long term. Flood-damage-reduction benefits over the entire river or coastal system should exceed long-term costs.

(3) Environmental impacts. The environmental impacts of the project include its effect on fish and wildlife habitat, wetlands, water quality, and other elements of the natural and human environment protected by federal and tribal laws. Impacts should be evaluated both upstream and downstream of the project site. The net environmental impacts of the project (plus any mitigation measures) over the long term should be positive or negligible.

(4) Consistency with applicable land-use plans and regulations. The project should be consistent with land-use plans for the area and should not conflict with regulations governing activities in the floodplain, riparian corridor (e.g., stream or wetland buffers), or coastal zone unless the benefits of the project justify seeking an exception from applicable regulations.

Voluntary Acquisition versus Condemnation

Policy FHR-5:

Except under very limited circumstances, public acquisition of threatened buildings should be voluntary on the part of the property owner. Condemnation should be considered only under the following circumstances: (1) federal and/or tribal regulations prohibit reconstruction of the building; (2) the property in question is causing significant flood damage to other properties; (3) a property owner refuses to sell a portion of an area in which the majority of property owners have agreed to sell to the Lummi Nation; or (4) a property owner refuses to sell an area needed to complete an approved flood-hazard-reduction project.

Relocation or Acquisition Prioritization

Policy FHR-6:

In addition to the criteria listed in FHR-2 and FHR-4, flood-prone private structures should be prioritized for relocation or acquisition in the following order: (1) structures with unrepaired damage from a recent flood; (2) structures with the greatest potential for future flood damage; (3) structures with repaired damage from a past flood; and (4)

structures for which relocation or acquisition would provide the greatest public or natural resource benefit.

Using Land Created by Relocation or Acquisition

Policy FHR-7:

Open land created by the relocation or acquisition of structures should become either a tribal easement (if the structure is relocated to another site on the same lot) or be owned, managed, and retained by the Lummi Nation as an agricultural land, open space, riparian corridor, wetland area, recreation area, or some other similar use that is compatible with periodic flooding.

Level of Protection

Policy FHR-8:

New flood-hazard-reduction projects, whether protecting new or existing development, should seek to provide protection from the 100-year, future conditions flood, plus a margin of safety. When new projects are being built to protect existing development, lesser protection may be provided where 100-year protection is not practical or cost effective. Existing flood-hazard-reduction projects protecting existing developments should be maintained at their current level of protection unless the alternatives evaluation shows that a different level of protection is warranted or that maintenance of the existing project is not cost effective.

Multi-Objective Flood-Hazard-Reduction Projects

Policy FHR-9:

The Lummi Nation should, wherever practicable, design (on-Reservation) and encourage (off-Reservation) flood-hazard-reduction projects to include preservation or reestablishment of wetlands and other habitats for fish and wildlife and to be compatible with open space and recreation opportunities.

Designing for Low Maintenance

Policy FHR-10:

The Lummi Nation should, wherever possible, design and encourage projects in ways that require minimal or no maintenance over the long term. Levees and bank stabilization projects should include, where possible, toe rock, setback areas, vegetated stream banks, gentle riverward slopes, and materials and placement methods that provide long-term stability to the interior and face of the project.

Applying Standards of the Lummi Nation to Nontribal Projects

Policy FHR-11:

If another agency seeks the participation of the Lummi Nation in developing a flood-hazard-reduction project, the Lummi Nation should work with the lead agency to

incorporate Lummi flood-hazard-reduction policies and standards into the project. The Lummi Nation should not act as a sponsor for a flood-hazard-reduction project unless the project is consistent with or exceeds tribal flood-hazard-reduction policies and standards.

Alternatives to Maintenance

Policy FHR-12:

The Lummi Nation should evaluate alternatives to returning an existing project to its pre-damage condition when the original design appears to (1) contribute to high maintenance costs; (2) provide inadequate protection from flooding and erosion hazards; (3) transfer problems to other sites; (4) degrade aquatic or riparian habitat; (5) experience repetitive flood damage and repair costs; or (6) prevent an opportunity for habitat enhancement. This evaluation should occur on an ongoing basis. Alternative recommendations should be incorporated into the maintenance and/or project priorities of the responsible jurisdiction or agency. This policy is not intended to prevent emergency repairs necessary to address extreme threats to public health and safety.

Maintenance Program versus New Project

Policy FHR-13:

Any project that significantly changes the cross-section geometry or length of an existing flood- or erosion-control facility should be considered a new project, and should be analyzed, prioritized, and implemented as such. Projects that do not significantly change the cross-section geometry or length of an existing facility should be implemented as part of a maintenance program.

Public Access to Tribally Funded Projects

Policy FHR-14:

Tribal members should be granted access to new flood-hazard-reduction projects built with tribal funds. This access should be limited to passive uses such as fishing and hiking, which do not require any additional right-of-way or design modifications to the project and which will not increase the risk of structural damage to the facility.

Transportation Corridors for Bypassing Floods

Policy FHR-15:

Road projects that alleviate or mitigate the serious threat to public health and safety caused by flood closures should receive the highest priority for federal, tribal, state, and local funding.

RIVER-CHANNEL-MAINTENANCE POLICIES

Logjam Removal

Policy RCM-1:

Accumulations of large woody debris should be removed or dislodged only if they pose a direct threat to properties eligible for protection under Policy FHR-1 and can be removed without endangering personnel or equipment. Logjam removal should be prioritized along with other project needs according to the criteria in Policy FHR-2. Logjams that do not pose a direct threat to eligible properties should not be disturbed.

Policy RCM-2:

If large woody debris must be moved, it should either be dislodged so it can continue down through the system or removed and put back into the system at the next available downstream location. If it is not practical or reasonable to return the materials to the channel, they should, if possible, be incorporated into the riparian corridor adjacent to the river channel. When woody debris is placed in the river channel or corridor, its placement should not create new direct threats to other properties.

Dredging

Policy RCM-3:

Gravels may be removed from river and stream channels only if their presence poses a demonstrated direct threat to properties eligible for protection under Policy FHR-1 and only where such activity is determined to be the best flood-damage and erosion-reduction alternative available (using the criteria in Policy FHR-3). Dredging should be prioritized along with other project needs according to the criteria in Policy FHR-2. A basin-wide sediment budget, geomorphologic analysis, flood-simulation computer model, and associated Environmental Impact Statement and Biological Assessment should guide decisions related to dredging activity.

FLOOD WARNING, INFORMATION, AND EDUCATION POLICIES

Public Awareness of Flood Hazards

Policy E-1:

The Lummi Nation should make the following information available to current and prospective residents and landowners in flood-hazard areas: (1) the known flood risks of their property and the associated threats to their safety; (2) steps they can take to protect themselves and their belongings from flood damage; (3) regulations affecting floodplain-development activities; and (4) types of disaster assistance available. This information should be provided in advance of flood emergencies, during the emergency itself (through the Lummi Nation Law and Order Department and the Whatcom County Emergency Management Division), and after the emergency has passed.

Technical Coordination with Other Jurisdictions

Policy E-2:

The Lummi Nation should coordinate with governmental agencies that share jurisdiction of the Nooksack River basin to develop and adopt floodplain policies, regulations, and standards that are consistent with those of the Lummi Nation.

Sharing Information with Other Jurisdictions and the Public

Policy E-3:

The Lummi Nation should provide other governments and the public with accurate, clearly presented information that helps provide an understanding of flood management recommendations and decisions.

Flood Warnings

Policy E-4:

The Lummi Nation Law and Order Department should maintain and review coordination with existing emergency public-warning systems as well as methods for making such warnings available to the public on the Reservation.

EMERGENCY-RESPONSE POLICIES FOR FLOODS

The Lummi Nation's Role in Responding to Flood Emergencies

Policy ER-1:

Whatcom County is the lead jurisdiction in managing and coordinating emergency public health, safety, and welfare services before, during, and after flood emergencies within the county, off the Reservation. The Lummi Indian Business Council (LIBC) is responsible for flood-management services on the Reservation. The LIBC should coordinate flood-management planning with the River and Flood Division of the Whatcom County Public Works Department and emergency preparedness and response with the Whatcom County Sheriff's Office. The LIBC should also coordinate with the U.S. Army Corps of Engineers, the Federal Emergency Management Agency (FEMA), and other agencies and jurisdictions that have a role in responding to flood emergencies.

Sandbag Distribution

Policy ER-2:

The LIBC should provide a limited supply of sand and sandbags for private property owners during flood emergencies. Citizens should be responsible for requesting, picking up, filling, and placing sandbags, as well as cleaning up sandbags and sand on their property after floods. Sandbags should be placed as close as possible to the foundation of the structure being protected.

Appendix F:

Draft Tsunami Evacuation Route Map for the Lummi Indian Reservation

HOW DO I GET INLAND OR TO HIGH GROUND?

Car evacuation may not be possible if an earthquake has damaged roads and power lines and resulted in significant debris. If this is the case, do not try to follow the evacuation routes out. Evacuate on foot directly to the nearest high ground. Avoid lakes and wetlands, which are prone to flooding and liquefaction during aftershocks.

WHAT SHOULD I HAVE IN MY EMERGENCY KIT?

You should prepare an emergency kit with a three-day supply of necessary items for each member of your family. The kit should be adapted to your needs, but keep it light and manageable in case you must evacuate on foot. Have it ready to go for immediate evacuation. Possible supplies include:

- Maps showing safe routes to high ground
- Non-perishable food and cooking and eating utensils, including can opener
- Water and a water purification kit
- First-aid kit and prescriptions
- Plastic bags for water storage and waste
- Dental and personal hygiene items
- Sturdy shoes, clothes, sleeping bag, tent
- Portable radio, headlamp/flashlight, and extra batteries
- Pocket knife, whistle, matches, duct tape, and rubber, latex, and heavy-duty gloves

WHERE CAN I STAY UNTIL THIS IS OVER?

Local emergency management has tried to designate safe assembly areas within a reasonable distance for foot traffic. If you are at risk from a tsunami, but do not have an "official" assembly area close by, you are urged to develop a neighborhood evacuation site. The site should be outside the tsunami hazard area, easy to get to, and capable of accommodating the number of people expected. If it is on private property, you will need the permission of the owner.

After the immediate danger is past and if there is damage to the degree that you cannot return home, you should then attempt to reach a designated assembly area. Since this may not be possible, it is a good idea to inform your local emergency manager of the location of your neighborhood evacuation site.

DOES MY COMMUNITY HAVE ANY PLANS IN PLACE?

Outdoor assembly areas have been selected to facilitate delivery of emergency services. It may be several days before help can arrive, so if possible, bring your own three-day emergency kit and emergency shelter.

The assembly areas listed below are not specific in terms of boundaries. You may camp or park in adjacent areas. Take care not to block a roadway—leave access for emergency vehicles. Assembly areas must be on publicly owned property.

Designated assembly areas are LIBC Tribal Center, Northwest Indian College, Lummi Day Care Center, Little Bear Creek Assisted Living Center, Wex li em Community Building, Smokehouse Road on both sides of the street, the westbound lane of Unick Road between Lake Terrell Road, and the northbound lane of Elder Road north of Slater Road.

WHAT ARE THE EMERGENCY RADIO FREQUENCIES?

NOAA Weather Radio Blaine, 162.525 MHz
Local news updates, KGMI 790 AM.

WHEN YOU FEEL AN EARTHQUAKE:

- Protect yourself—drop, cover, hold until the earthquake is over
- Grab your three-day emergency kit
- Move quickly inland to high ground and away from low-lying coastal areas
- Evacuate on foot if at all possible because of potential road damage and traffic jams
- Do not wait for an official warning
- Do not pack or delay
- Do not return to the shore
- Listen to NOAA Weather Radio or your local radio station for information on shelter locations and emergency broadcasts
- Be alert for aftershocks
- Do not return to the beach until emergency officials say it is safe

WHO CAN I CONTACT FOR MORE INFORMATION?

THE LUMMI NATION
2616 Kwina Road, Bellingham, WA 98226
Phone: 360-384-1489
Website: http://www.lummi-nsn.gov

WASHINGTON MILITARY DEPARTMENT
Emergency Management Division
Camp Murray, WA 98430-5122
Phone: 800-562-6108
Website: http://www.emd.wa.gov/

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WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

Printed on recycled paper

September 2006

Tsunami!

Evacuation Map for the Lummi Reservation

DRAFT

Safety Tips for Whatcom County

WHAT IS A TSUNAMI?

A tsunami is a series of waves most commonly caused by an earthquake beneath the sea floor. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage where they come ashore.

Recent research suggests that tsunamis have struck the Washington coast on a regular basis. They can occur at any time of the day or night, under any and all weather conditions, and in all seasons. Beaches open to the ocean, bay entrances, tidal flats, and coastal rivers are especially vulnerable to tsunamis.

WHAT IS THE DIFFERENCE BETWEEN A 'DISTANT' AND A 'LOCAL' TSUNAMI?

When a tsunami has been generated by a distant earthquake, it will not reach the Washington coast for several hours, and there is time to issue a warning. When a tsunami is generated by a strong offshore earthquake, its first waves would reach the outer coast minutes after the ground stops shaking. Feeling an earthquake could be your only warning!

WHAT CAN I DO TO PROTECT MYSELF FROM A TSUNAMI?

- Develop a family disaster plan. Everyone needs to know what to do on their own to protect themselves in case of disaster.
- Be familiar with local earthquake and tsunami plans. Know where to go to survive a tsunami. Identify an evacuation site within 15 minutes walking distance of home and/or work.
- Prepare three-day emergency kits for your home, automobile, and work.
- Take a first aid course and learn survival skills. Knowledge is your greatest defense against potential disaster.

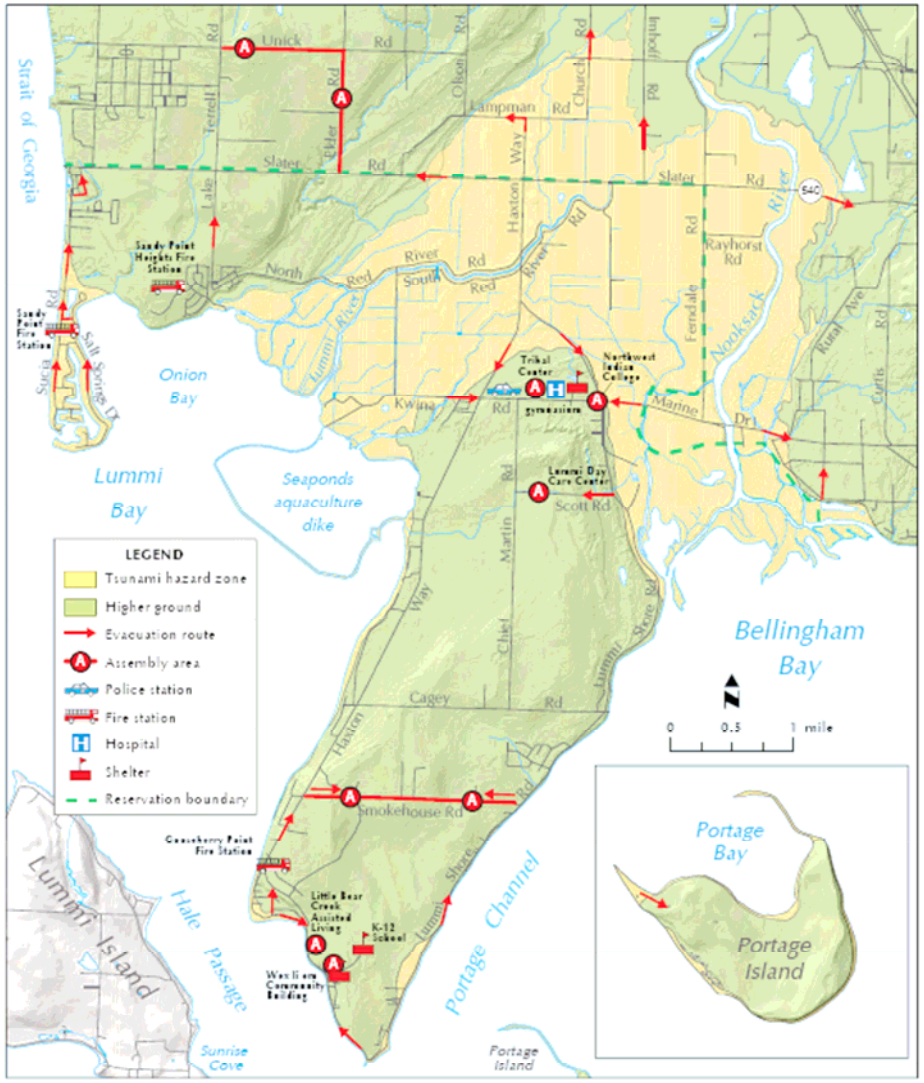
HOW DO I KNOW WHEN TO EVACUATE?

If you feel the ground shake, evacuate inland or to high ground immediately! A wave as high as 6 feet could reach the Lummi Reservation within 2 hours of the quake. The first wave is often not the largest; successive waves may be spaced many minutes apart and continue to arrive for several hours. Return only after emergency officials say it is safe.

Isolated areas may not receive official warnings of distant tsunamis. If you notice a sudden drop or rise in sea level, move to high ground or inland immediately.

WHERE DO I EVACUATE TO?

The map shows tsunami hazard areas (yellow) and areas of higher ground (green). Go to the nearest high ground—at least 50 feet above sea level, if possible. If you don't have time to travel to high ground, but are in a multi-story building, go to an upper level. If you are on the beach and unable to get to high ground, go inland as far as you can.

WHAT DO THE EVACUATION SIGNS MEAN?

Tsunami evacuation routes were developed to guide coastal residents and visitors to safer locations when car evacuation is possible. Evacuation signs have been placed along the main roads to direct motorists to higher ground. In some places, there may be more than one way to reach safer areas. These routes are marked with multiple signs showing additional options for evacuation. You will need to know the evacuation routes for your area.