Rockaway Beach TEFIP
Planning Commission DRAFT
04/16/2019
Appendices

Appendix 1 - Implementation Matrix and Potential Funding Sources

Citywide Recommendations - Policy and Administration

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost
RB-1	Adopt recommended Comprehensive Plan policies	High	Rockaway Beach City Manager, Rockaway Beach Planning Department, DLCD	DLCD grants/City Match	$250,000
RB-2	Identify or hire staff member to lead implementation.	High	Rockaway Beach City Manager, Rockaway Beach Planning Department, Rockaway Beach Public Works Department	City General Funds	TBD
RB-3	Increase interdepartmental coordination	High	Rockaway Beach City Manager, Rockaway Beach Planning Department, Rockaway Beach Public Works, Rockaway Beach Emergency Preparedness Leadership	-	-
RB-4	Integrate evacuation facilities improvements with ongoing planning efforts	High	Rockaway Beach City Manager, Rockaway Beach Planning Department, Rockaway Beach Public Works Department	-	-
RB-5	Explore hiring a City Emergency Manager	Medium-High	Rockaway Beach City Manager, Rockaway Beach City Council	TBD	TBD

Citywide Recommendations - Evacuation Facilities and Preparedness

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost
RB-6	Establish supply caches and emergency shelters in strategic areas outside of the inundation zone	High	Rockaway Beach Public Works, Rockaway Beach Emergency Preparedness Leadership, DLCD	TBD	TBD
RB-7	Continue to pursue acquisition of land for relocation of critical facilities.	High	Rockaway Beach City Manager, Rockaway Beach Public Works, Rockaway Beach Planning Department, DLCD, Greenwood Resources	TBD	TBD
RB-8	Create trail connectivity between high ground and assembly areas	Medium	Rockaway Beach Public Works, Greenwood Resources	TBD	TBD

RB-9	Map logging roads that may be used for evacuation/movement post-disaster.	Medium	Rockaway Beach Planning Department, Rockaway Beach Emergency Preparedness Leadership, Oregon Department of Forestry, Greenwood Resources	TBD	TBD

Nedonna Beach & North Rockaway Beach - Wayfinding Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
NB-1	Scenic View Reservoir, McMillan Creek Reservoir, and Neah-Kah-Nie School Assembly Area Signage	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	National Tsunami Hazard Mitigation Program (NTHMP), OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
NB-2	Add evacuation arrow signage at Mcmillan Creek Reservoir Trail entrance	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
NB-3	Add evacuation arrow signage at school parking lot entrance and at base of evacuation trail	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
NB-4	Add entering/leaving tsunami hazard area signage on Hwy 101	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness
NB-5	Expand Evacuation Route Signage in Nedonna Beach Neighborhood	Medium-High	Rockaway Beach Public Works Department, DLCD, DOGAMI, Oregon State Parks, Nedonna Beach Neighborhood Association	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
NB-6	Add "You are Here" Sign at Manhattan Beach Park. Replace "You Are Here" sign at Nedonna Beach access lot to reflect fastest evacuation to high ground east of Section Line Street, rather than Scenic View Assembly Area	Medium	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness
NB-7	Install new signs to replace those in Nedonna Beach neighborhood that are not consistent with state desgin standards	Medium	Rockaway Beach Public Works Department, DLCD, DOGAMI, Nedonna Beach Neighborhood Association	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness

Nedonna Beach & North Rockaway Beach - Construction Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits

NB-8	Landlside mitigation east of Hwy 101	High	TBD	TBD	TBD	Asset Protection
NB-9	Improvements to Section Line Street and Riley Street evacuation trails to increase seismic resilience	Medium	Rockaway Beach Public Works Department, Port of Tillamook Bay, Nedonna Beach Neighborhood Association	TBD	TBD	Transportation Effectiveness, Health and Wellness

Lake Lytle & Crescent Lake - Wayfinding Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
LL-1	NE 15th Assembly Area Signage	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
LL-2	Expand Evacuation Route Signage along Highway 101	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
LL-3	Expand Evacuation Route Signage in neighborhoods east of Highway 101	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
LL-4	Add signage to indicate arrivial at safety at high ground areas	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
LL-5	Add "You Are Here" map signs to major beach access points	Medium	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness

Lake Lyle & Crescent Lake - Construction Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
LL-6	Highway 101 bridge retrofit or replacement	High	ODOT	ODOT	TBD	Transportation Effectiveness, Asset Protection
LL-7	Highway 101 pedestrian bridge	High	ODOT, Rockaway Beach Public Works Department, Port of Tillamook, Salmonberry Trail Intergovernmental Alliance	ODOT, FEMA Hazard Mitigation Assistance (HMA)	TBD	Transportation Effectiveness, Asset Protection, Health and Wellness, Economic Development
LL-8	NE 12th bridge retrofit or replacement	High	Rockaway Beach Public Works Department	FEMA HMA	TBD	Transportation Effectiveness, Asset Protection
LL-9	NE 12th pedestrian bridge	High	Rockaway Beach Public Works Department	FEMA HMA	TBD	Transportation Effectiveness, Asset Protection, Health and Wellness

LL-10	Vertical Evacuatiuon Structure	Low	Rockaway Beach Public Works Department, Rockaway Beach Planning Department, DOGAMI, DLCD	FEMA Hazard Mitigation Assistance	TBD	Hazard Awareness and Education

Central Rockaway Beach - Wayfinding Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
CRB-1	N 3rd Street Reservoir, S Rock Creek Road, and S 3rd Avenue Assembly Area Signage	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
CRB-2	Expand Evacuation Route Signage along Highway 101	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
CRB-3	Expand Evacuation Route Signage in neighborhoods east of Highway 101	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
CRB-4	Add signage or blue lines to indicate arrivial at safety at high ground areas	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign; cost of paint and labor for blue lines	Hazard Awareness and Education, Personal Preparedness
CRB-5	Add "You Are Here" map sign to Phyllis Baker City Park and major beach access points	High	Rockaway Beach Public Works Department, Rockaway Beach Parks and Recreation Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness
CRB-6	Replace "You Are Here" signs at Wayside, City Hall, and S 6th Avenue beach access. Maps should illustrate routes for fastest evacuation to high ground area, rather than closest Assembly Area	Medium	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness

Central Rockaway Beach- Construction Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
CRB-7	Landslide mitigation on north and west side of Pacific View neighborhood hill	Medium-High	TBD	TBD	TBD	Asset Protection

South Rockaway Beach - Wayfinding Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
SRB-1	Washington Street and Victoria Street Assembly Area Signage	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
SRB-2	Expand Evacuation Route Signage	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
SRB-3	Add signage to indicate arrivial at safety at high ground areas	High	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
SRB-4	Add "You Are Here" map sign at Nature Preserve Trailhead parking lot	High	Rockaway Beach Public Works Department, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness
SRB-5	Add "You Are Here" map signs to major beach access points	Medium	Rockaway Beach Public Works Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness

South Rockaway Beach- Construction Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
SRB-6	Trail improvements at Washington Street and Victoria Street assembly areas	Medium	TBD	TBD	TBD	Transportation Effectiveness, Health and Wellness

Twin Rocks & Barview - Wayfinding Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
TRB-1	Twin Rocks Reservoir, Gravel Pit, Barview Hill, Terwiliger Heights Assembly Area Signage	High	Tillamook County Public Works Department, Tillamook County Emergency Management, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
TRB-2	Expand Evacuation Route Signage along Highway 101	High	Tillamook County Public Works Department, Tillamook County Emergency Management, ODOT, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
TRB-3	Expand Evacuation Route Signage in Barview	High	Tillamook County Public Works Department, Tillamook County Emergency Management, Tillamook County Parks Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
TRB-4	Add signage to indicate arrivial at safety at high ground areas	High	Tillamook County Public Works Department, Tillamook County Emergency Management, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	$500-1,000 per sign	Hazard Awareness and Education, Personal Preparedness
TRB-5	Add "You Are Here" map sign at Twin Rocks and Barview Jetty beach accesses	High	Tillamook County Public Works Department, Tillamook County Emergency Management, Tillamook County Parks Department, DLCD, DOGAMI	NTHMP, OEM Grants, Tillamook County wayfinding grant, local funding	TBD	Hazard Awareness and Education, Personal Preparedness

Twin Rocks & Barview- Construction Projects

Project ID	Project Name	Priority	Potential Project Partners	Potential Funding Sources	Estimated Cost	Co-Benefits
TRB-6	Landslide Mitigation East of Highway 101	Low	TBD	TBD	TBD	Asset Protection

Potential funding sources identified to finance evacuation improvements

Source: DLCD Tsunami Resilience Land Use Planning Guide

- FEMA has three funding programs under their Hazard Mitigation Assistance program. The application process and grant administration of these funding programs can be onerous but are worthwhile. Sign up for updates regarding these grant sources through the Oregon Office of Emergency Management Hazard Mitigation Officer who can help guide communities through the application process. DLCD coastal and natural hazard staff can also be used as resources in the development of projects and applications.
    - The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. Eligible Applicants include states, local governments, and Indian tribes or other tribal organizations.
    - The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Eligible Applicants include States, local governments, Indian tribes or other tribal organizations, and private non-profit organizations.
    - The Flood Mitigation Assistance (FMA) program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist States and communities who implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under NFIP. Eligible Applicants include states, local governments and Indian tribes or other tribal organizations.

- National Tsunami Hazard Mitigation Program (NTHMP) Funds: Distributed through the Oregon Office for Emergency Management (OEM) and the Oregon Department of Geology and Mineral Industries (DOGAMI), these funds could be used for a variety of tsunami evacuation improvements, including for signage and wayfinding, and outreach and education. DOGAMI and OEM develop a funding request to NTHMP every year for a variable amount of money. If a jurisdiction is interested in using these funds for a project, talk to staff at DOGAMI or OEM to see if the project can be written into the next funding request. Projects are typically one year in duration. Examples of how this funding has benefited communities in the past: “You are Here” signs, tsunami evacuation route signs, lighted informational kiosks, evacuation drills, and Beat the Wave modeling.

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- **Urban renewal** is a public financing tool to improve local infrastructure for tsunami evacuation and could facilitate new improvements or the redevelopment of existing improvements. It is a valuable tool for those with existing urban renewal programs and those contemplating developing one. Urban renewal is funded through a strategy called tax increment financing. When an urban renewal district is established, the county assessor determines the current assessed value of all property within the district, and freezes that tax base. Once the base is frozen, the property tax revenue local jurisdictions receive from all property within the district is likewise set at a fixed amount until the urban renewal area is terminated. Over time, as property values increase, all tax revenues generated by the "increment" between the frozen value and the current real market value of all properties in the district are directed to improvement projects within the urban renewal district. Assessed values can increase yearly at the 3% maximum allowed amount by state statute, or by more than this if new development occurs within the area. When the urban renewal area expires, the frozen base also expires, and the local taxing jurisdictions resume receiving taxes on the full assessed value of the area.

  Tax increment financing can be used to fund a variety of improvement projects including projects that help mitigate tsunami risk. Projects such as multi-use paths and green spaces that can double as tsunami evacuation routes and assembly areas, infrastructure upgrades (water, sewer, and utility), and the relocation of critical facilities outside of tsunami hazard areas are examples of work that could be accomplished through urban renewal financing.

  For more information about urban renewal visit the following websites:
  - State of Oregon - Urban Renewal Webpage: www.oregon.gov/DOR/PTD/Pages/IC_504_623.aspx
  - Urban Renewal in Oregon: History, Case Studies, Policy Issues, and Latest Developments: www.rockawaybeachor.us/Portals/56/urOregon.pdf
  - An Overview of Urban Renewal: www.oregon.gov/oprd/HCD/PROGRAMS/docs/omsc_2011_ur101_main_street.pdf

- **System Development Charges** (SDCs) are one-time charges on new development, and certain types of redevelopment, to help pay for existing and planned infrastructure to serve the development. SDCs are one means available to local governments for financing growth. State law creates a framework for local SDCs and specifies how, when, and for what improvements they can be imposed. Under ORS 223.297-223.314, SDCs may be used for capital improvements for:
  - Water supply, treatment, and distribution;
  - Wastewater collection, transmission, treatment, and disposal;
  - Drainage and flood control;
  - Transportation; and
  - Parks and recreation.

System development charges may be charged to new development based on a fee to reimburse for unused infrastructure capacity and/or to make planned improvements that increase infrastructure

capacity. System development charge revenues may only be used for capital costs. They cannot be used for ongoing system or facility maintenance or projects that fix existing system deficiencies or replace existing capacity.

Local governments must establish their SDCs by ordinance. They must have a methodology to calculate a reimbursement fee and/or an improvement fee and provide credit if a developer finances a qualified capital improvement. Prior to imposing an SCD based on an improvement fee for capital facilities, the local government must have in place: 1) a capital improvement plan; 2) a public facilities plan or comparable plan that lists improvements to be funded with the improvement fee portion of the SDC; and 3) an estimate of the cost and timing for each improvement.

System development charges could be utilized for evacuation route component financing if those components are directly related to capital improvements that SDCs can legally fund (e.g. transportation, parks, and recreation) and the charges are developed consistent with ORS 223-297. These SDCs should be directly linked to the local government's capital improvement plan and the TEFIP which has comparable components to a public facilities plan. The plan must include specific associated standards for evacuation route paths, bridges and other related improvements (i.e. size, width, seismic capacity, and cost for each listed improvement). As indicated in the applicable statute, development of a legal formula to apply system development charges to these improvements is required and addresses rough proportionality as necessary. Improvements may be evacuation route facilities associated with the transportation system (e.g. streets/bridges). They may also be associated with multi-use paths or trails that would fall within the transportation, park, or recreation systems of the community.

The local government should seek guidance and direction from its legal counsel and other qualified professionals to assist in the use of this option and in potential development of this tool. Local government organizations (LOC, AOC) may also have information on this option. For more information about system development charges, visit the following websites:

- ORS 223-297(SDCs):
  www.leg.state.or.us/ors/223.html
  www.oregonlaws.org/ors/223.302

- Legal Exactions refers to a broad range of regulatory techniques used by local governments to require developers to contribute to the cost of community public facilities. Specifically, exactions require contributions toward public improvements that fall outside the boundary of the development (such as access roads or off-site drainage easements), or will serve larger segments of the community in addition to the specified development (such as new parks or a new evacuation route needed to adequately serve the area where the development is located).

  The underlying and common legal issue with respect to fees, dedications, and exactions is the connection, also referred to as the "nexus," to the impact of land development. Without this nexus, land development regulations that impose exactions may be deemed unconstitutional takings of property without just compensation.

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The United States Supreme Court has held that under limited circumstances, a government may have the right to limit certain uses, and invoke certain permit conditions and exactions if they are necessary to limit or avoid specific public harms threatened by the development. The Court has set forth a three part test to determine whether an exaction results in an unconstitutional taking. To avoid resulting in a taking, an exaction must:

- Substantially advance a legitimate public purpose;
- Be based on an essential nexus between that purpose and the harm threatened by the proposed use; and
- Be roughly proportional to the degree of threatened harm.

The public purpose advanced by exactions for tsunami evacuation improvements is to reduce life safety risk. New or intensified development within the tsunami hazard area will, by definition, place more people at risk from tsunami; thus the clear nexus for evacuation related exactions is to mitigate the harm presented by this increased risk. Proportionality can be addressed by establishing a process for evaluating the impacts of new development in terms of increased risk exposure, and identifying evacuation improvements or other measures that are roughly proportional to those impacts.
In adopting regulations that establish evacuation system related exactions, jurisdictions should incorporate findings that address these three requirements. Such findings should clearly articulate the purpose of the regulations, the essential nexus between new development and increased risk, and the process for determining proportionality. The TEFIP provides a key foundation for these findings and the establishment of regulation based exactions.

The local government should seek guidance and direction from its legal counsel and other qualified professionals to assist in development of this option. Local government organizations such as the League of Oregon Cities and Association of Oregon Counties also may have helpful information on this topic.

- Local improvement districts, or special assessment districts, function as mainstays of local improvement financing. A local improvement district is a geographic area in which real property is taxed to defray all or part of the cost of a public improvement. The distinctive feature of a special assessment is that its costs are apportioned according to the established benefit that will accrue to each property. In Oregon, local improvement districts are governed by local ordinances, but the Bancroft Bonding Act (ORS 223.205-295) addresses the means by which local governments may finance public improvements.

  In the case of tsunami evacuation route improvements, a local government can use this financing mechanism to work with neighborhoods lacking needed route facilities to help them overcome those deficiencies in their portion of the evacuation route system. The costs of the needed evacuation route improvements would be apportioned to each property owner according to the direct benefit of the route improvement to the property.

The local government should seek guidance and direction from its legal counsel and other qualified professionals to assist in development of this tool. Local government organizations (LOC, AOC) may also have information on this option.

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- A **land trust** is a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements. Land trusts work with landowners and the community to conserve land by accepting donations of land, purchasing land, negotiating private, voluntary conservation agreements on land, and stewarding conserved land through the generations to come. Land trusts can be used in tsunami mitigation to:
    - Acquire developable land in high risk areas;
    - Create buffer zones to protect urban development from tsunami impacts;
    - Acquire open space for community assembly areas.

For more information about land trusts, visit the following websites:

- Oregon Land Trust Contacts: www.opb.org/programs/oregonstory/land_trusts/resources/page_2.html
- Land Trust Alliance: www.landtrustalliance.org/

- A **conservation easement**, which is a legal agreement between a landowner and a land trust or government agency, can be used to permanently limit the use of land in order to protect its conservation value. It allows landowners to continue to own, use, or sell their land.
  When a conservation easement is put in place by a landowner, some of the rights associated with the land are given up. For example, in high-risk tsunami inundation areas, the right to build certain types of structures could be given up, while retaining some or all of the land as open space. Conservation easements are permanent, and future owners are also bound by the easement terms. The easement holder is responsible for making sure the easement's terms are followed. Easement holders are typically a land trust or other conservation oriented NGO, but may also be governmental entities. While conservation easement are typically focused on preserving important natural resource or open space values, as voluntary, non-regulatory mechanisms for limiting development, conservation easements may also serve to help reduce exposure to tsunami risk. For more information, see:
    - Conservation Easements Oregon:
    - www.nature.org/about-us/private-lands-conservation/conservation-easements/
    - Southern Oregon Land Conservancy:
    - www.landconserve.org/content/conservation-easements
    - Cannon Beach Conservation Easement:
    - www.ci.cannon-beach.or.us/News/EcolaCreek/OWEBease.pdf
    - Land Trust Alliance – Conservation Easements Webpage: www.landtrustalliance.org/conservation/landowners/conservation-easements
    - National Park Service: www.nps.gov/tps/tax-incentives/taxdocs/easements-historic-properties.pdf

- **Transferable Development Credits** (TDC) is more widely known as "Transfer of Development Rights" or TDR. Currently this option has limited utility as current Oregon statute (ORS 94.531-538) on "TDR" sending areas is limited to "resource lands." The term "resource lands" is defined in a way that would

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not allow sending areas to be designated based solely on tsunami hazard/risk; sending areas would have to possess other defined natural resource/conservation values in order to qualify. However, if a jurisdiction has an existing TDR program it may be able to provide secondary hazard mitigation value in addition to its primary purpose of conserving "resource lands."

In cases where qualifying resource land sending areas are within a tsunami hazard area, Transfer Development Rights (TDR) would be another incentive-based approach that could be used to limit development in high risk inundation zones and encourage development outside of inundation zones. For more information about this strategy visit the following website:

  - ORS 94.531-538: www.leg.state.or.us/ors/094.html

- ODOT Bicycle & Pedestrian Program Grants: Multi-use paths and transportation facilities can also serve a dual purpose as evacuation routes when these transportation facilities are also identified as necessary routes within the community's TEFIP. Information for this funding source is located at: www.oregon.gov/ODOT/HWY/BIKEPED/pages/grants1.aspx.

- Recreation Related Funding Sources:
  Recreation District: ORS 198.010 and 198.335 authorize 28 types of districts, including "park and recreation" districts. Special Districts are financed through property taxes, fees for services, or a combination of these. Recreation districts in Oregon are directed by OAR 226 and may provide for a variety of recreational facilities. If the community has a recreation district, or is contemplating developing one, which includes or would include hiking and biking trails and other multi-use facilities, it may be possible to utilize these funds to further develop evacuation routes if the primary purpose of these routes is recreation. The Special Districts Association of Oregon (SDAO) provides support services to member districts throughout the state in the areas of research and technical assistance, legislative representation, training programs, insurance services, information and reference materials, financing services, and employee benefits programs.

  OPRD Recreation Trails Program (RTP) Grants: These federally funded grants provide awards for recreation trail-related projects such as hiking, running, bicycling, off-road motorcycling and all-terrain vehicle riding. Information for this funding source is located at: www.oregon.gov/OPRD/GRANTS/pages/about_us.aspx.

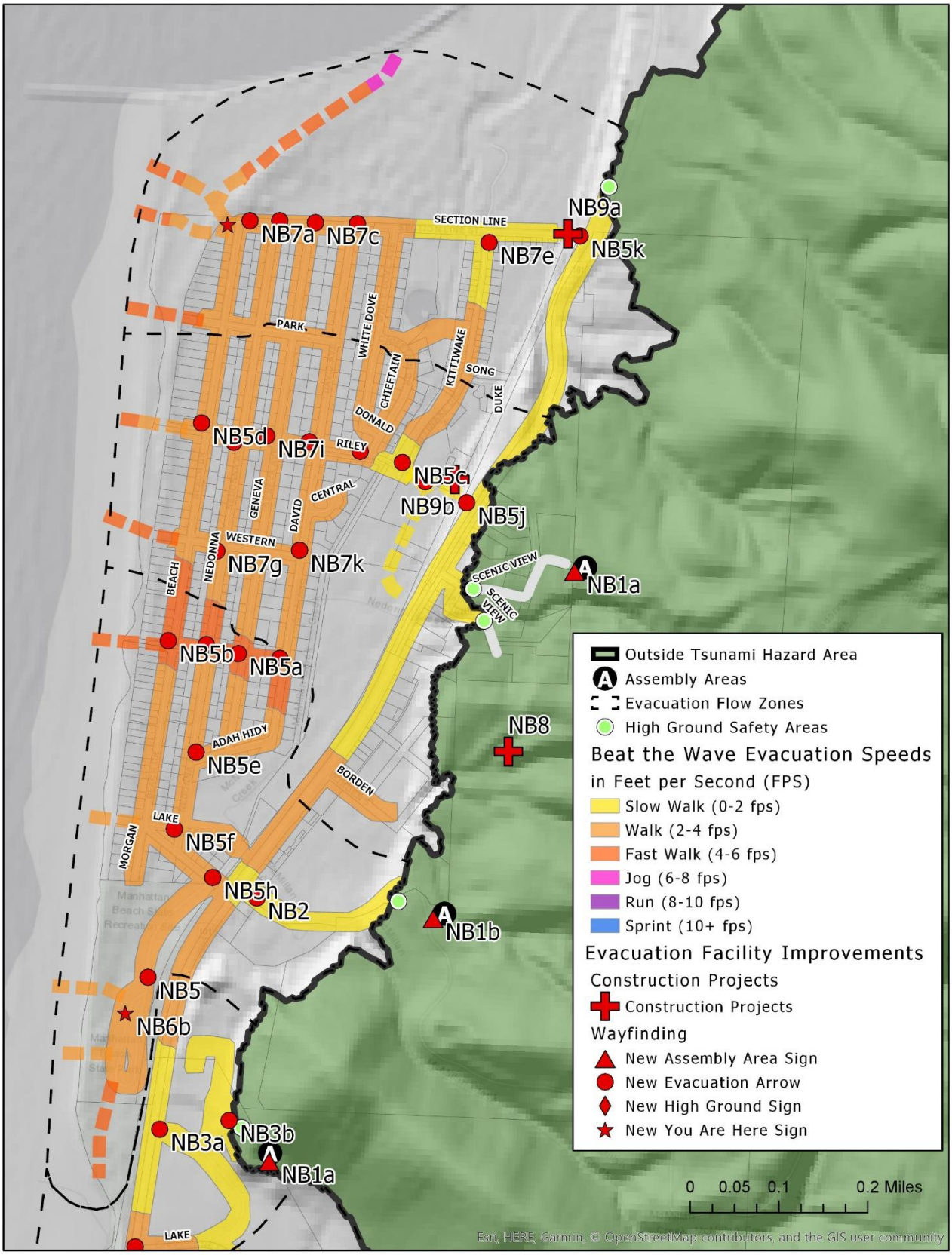
- Purchase Strategies: Local governments can purchase property, through fee simple acquisitions for a variety of public purposes. A number of communities have implemented programs to acquire land to conserve critical ecosystems or natural features, as well as to provide open space for recreational benefits to their communities. In some cases, such acquisitions may also serve to remove properties at risk from tsunami hazard from the private market; alternatively, a community could specifically identify tsunami hazard mitigation as an objective for a land acquisition program or strategy. Some communities have successfully used purchase strategies for negotiating/purchasing easements and acquiring new right-of-ways. Other specific tools and strategies may include fee simple purchases,

acquisition of development and easement rights, and relocation of existing structures in the hazardous areas pre-disaster. These programs can be costly for local governments; although in certain cases, significant life safety benefits may be realized.

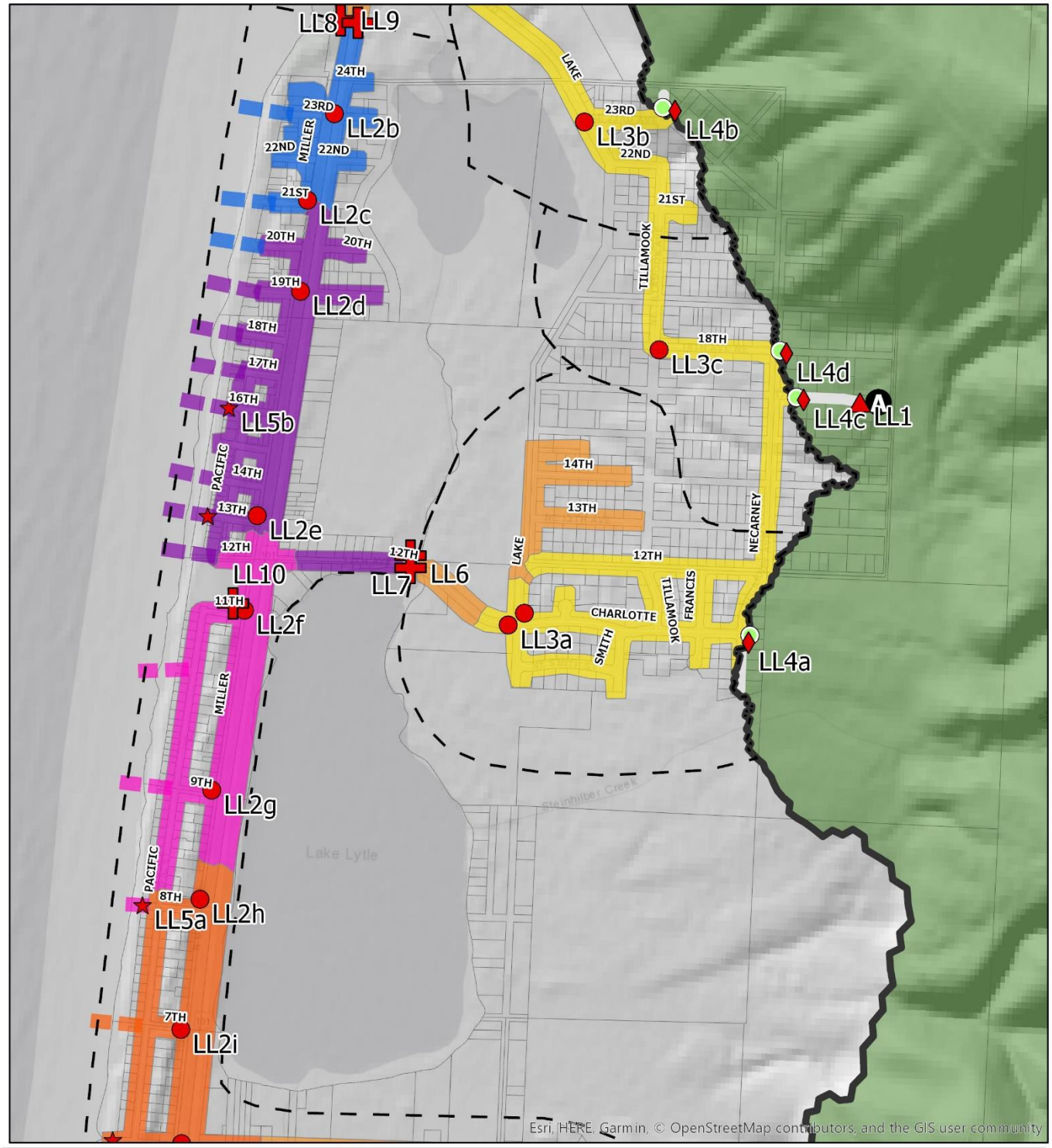
Local governments should seek guidance and direction from legal counsel and other qualified professionals to assist in development of this tool. Local government organizations (LOC, AOC) may also have information on this option.

Appendix 2 – Evacuation Improvements Project Identification Maps

Nedonna Beach and North Rockaway Beach



Lake Lytle and Crescent Lake



Outside Tsunami Hazard Area
Assembly Areas
Evacuation Flow Zones
High Ground Safety Areas

0 0.05 0.1 0.2 Miles

Beat the Wave Evacuation Speeds in Feet per Second (FPS)

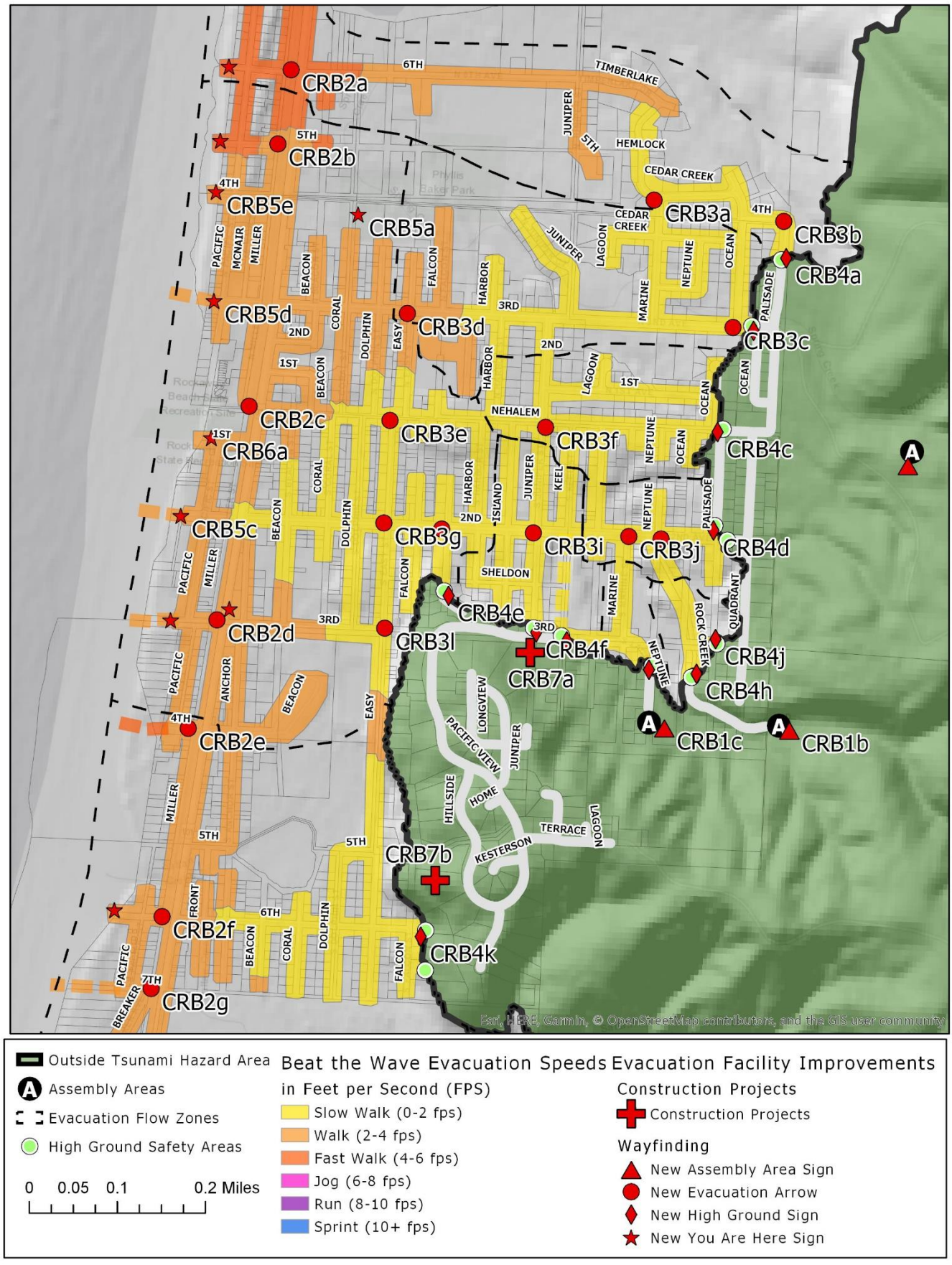
- Slow Walk (0-2 fps)
- Walk (2-4 fps)
- Fast Walk (4-6 fps)
- Jog (6-8 fps)
- Run (8-10 fps)
- Sprint (10+ fps)

Evacuation Facility Improvements

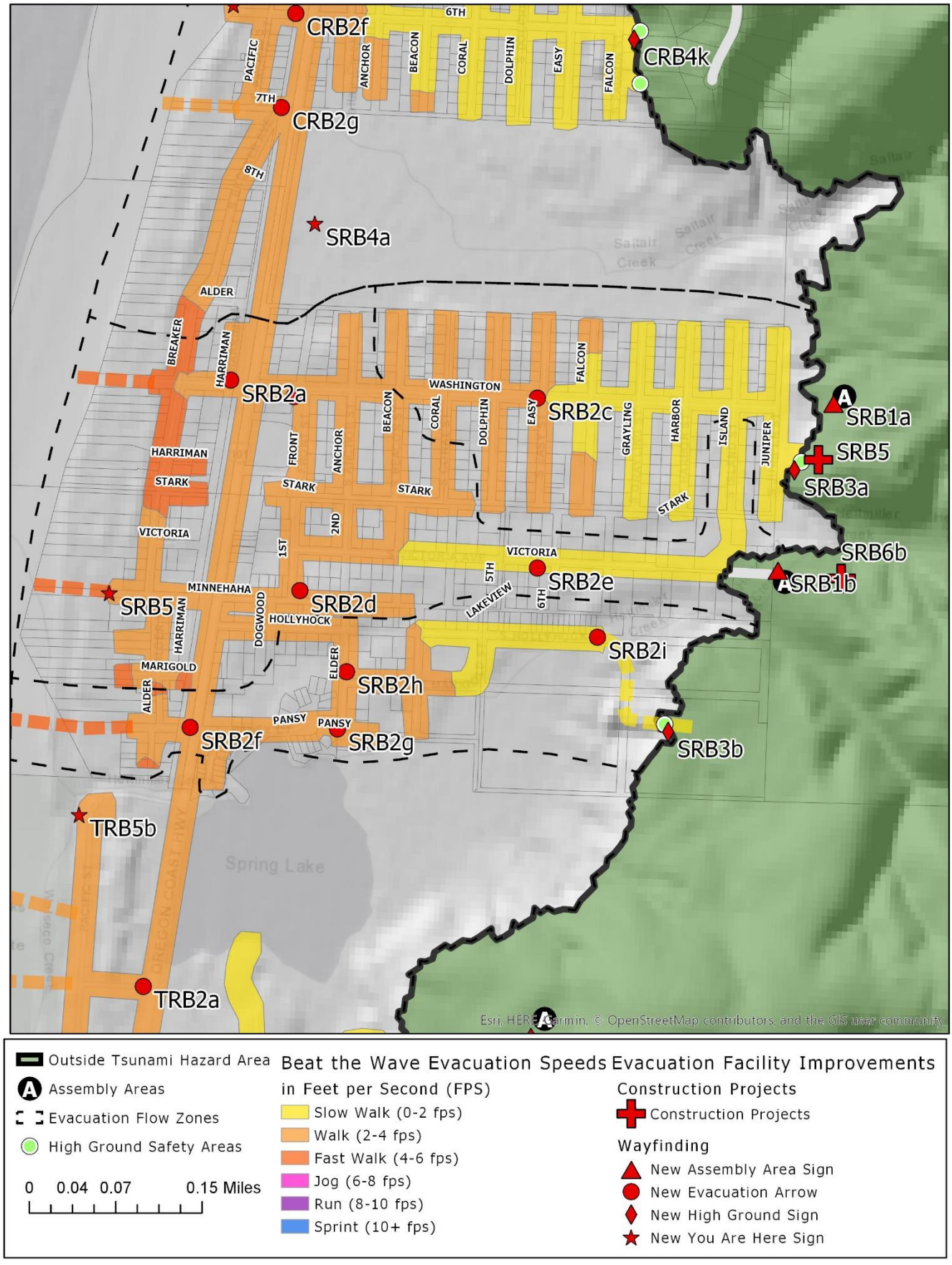
Construction Projects
- Construction Projects

Wayfinding
- New Assembly Area Sign
- New Evacuation Arrow
- New High Ground Sign
- New You Are Here Sign

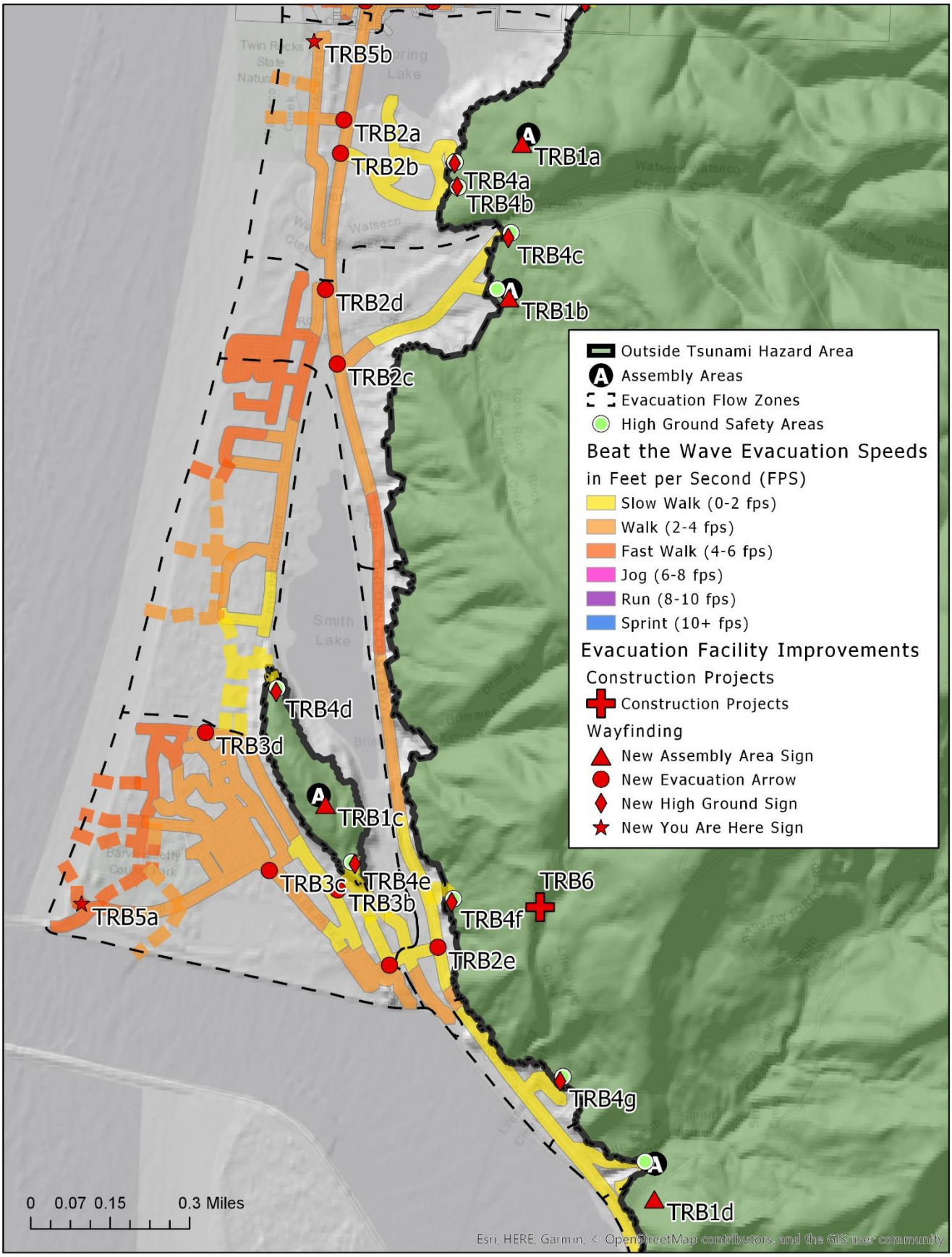
Central Rockaway Beach



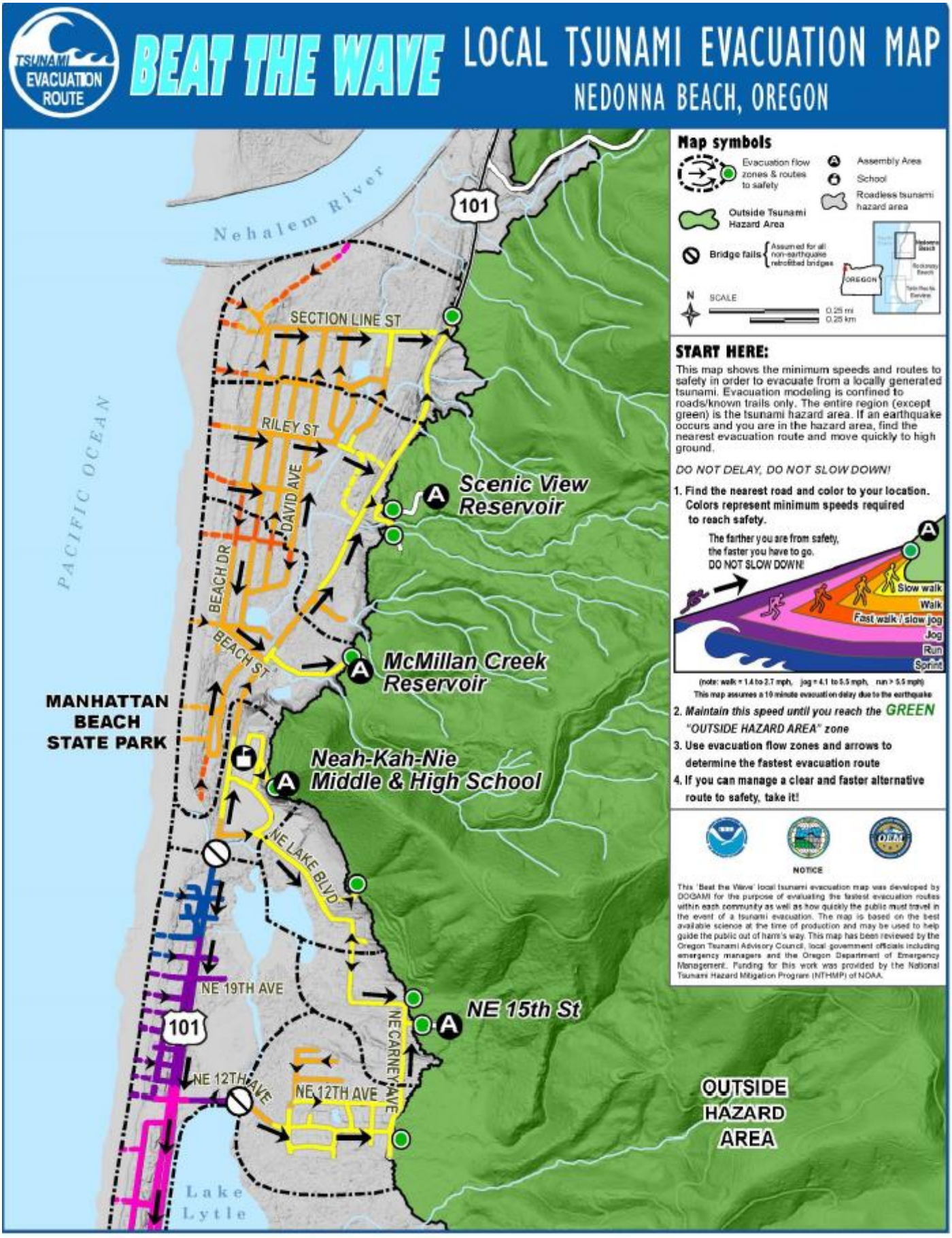
South Rockaway Beach

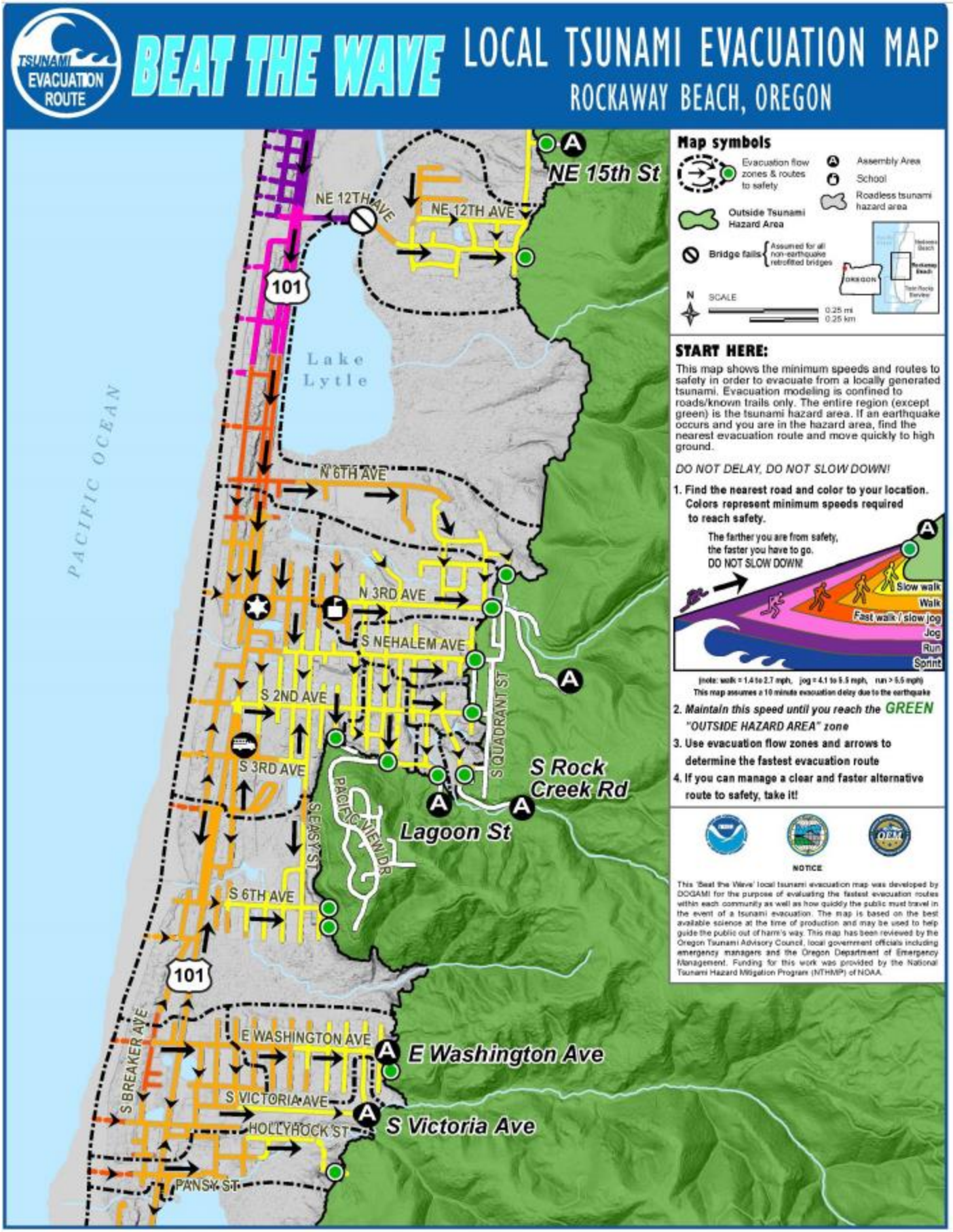


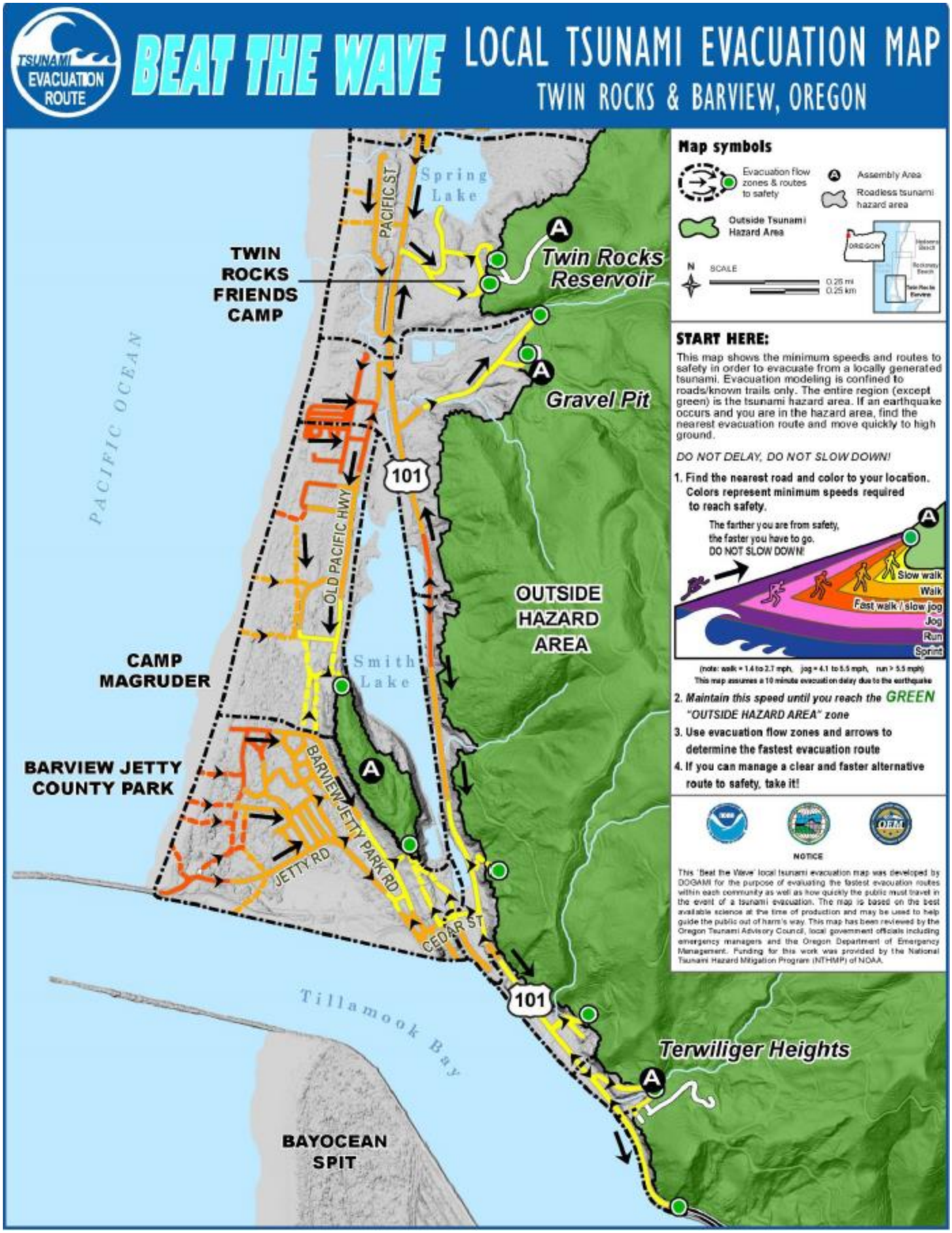
Twin Rocks and Barview



Appendix 3 - Beat the Wave Maps and Wave Arrival Times




TSUNAMI EVACUATION ROUTE
BEAT THE WAVE
LOCAL TSUNAMI EVACUATION MAP
ROCKAWAY BEACH, OREGON
Map symbols
Evacuation flow zones & routes to safety
Assembly Area
School
Roadless tsunami hazard area
Outside Tsunami Hazard Area
Bridge fails
Assumed for all non-earthquake retrofitted bridges
OREGON
N
SCALE
0.25 mi
0.25 km
START HERE:
This map shows the minimum speeds and routes to safety in order to evacuate from a locally generated tsunami. Evacuation modeling is confined to roads/known trails only. The entire region (except green) is the tsunami hazard area. If an earthquake occurs and you are in the hazard area, find the nearest evacuation route and move quickly to high ground.
DO NOT DELAY, DO NOT SLOW DOWN!
1. Find the nearest road and color to your location. Colors represent minimum speeds required to reach safety.
The farther you are from safety, the faster you have to go. DO NOT SLOW DOWN!
Slow walk
Walk
Fast walk / slow jog
Jog
Run
Sprint
(note: walk = 1.4 to 2.7 mph, jog = 4.1 to 5.5 mph, run > 5.5 mph)
This map assumes a 10 minute evacuation delay due to the earthquake
2. Maintain this speed until you reach the GREEN "OUTSIDE HAZARD AREA" zone
3. Use evacuation flow zones and arrows to determine the fastest evacuation route
4. If you can manage a clear and faster alternative route to safety, take it!
NOTICE
This 'Beat the Wave' local tsunami evacuation map was developed by DOGAMI for the purpose of evaluating the fastest evacuation routes within each community as well as how quickly the public must travel in the event of a tsunami evacuation. The map is based on the best available science at the time of production and may be used to help guide the public out of harm's way. This map has been reviewed by the Oregon Tsunami Advisory Council, local government officials including emergency managers and the Oregon Department of Emergency Management. Funding for this work was provided by the National Tsunami Hazard Mitigation Program (NTHMP) of NOAA.
PACIFIC OCEAN
Lake Lytle
NE 15th St
NE 12TH AVE
NE 12TH AVE
101
N 6TH AVE
N 3RD AVE
S NEHALEM AVE
S 2ND AVE
S 3RD AVE
S QUADRANT ST
S Rock Creek Rd
PACIFIC VIEW DR
Lagoon St
S SEASIDE ST
S 6TH AVE
101
S BREAKER AVE
E WASHINGTON AVE
E Washington Ave
S VICTORIA AVE
HOLLYHOCK ST
S Victoria Ave
PANSY ST


TSUNAMI EVACUATION ROUTE
BEAT THE WAVE
LOCAL TSUNAMI EVACUATION MAP
TWIN ROCKS & BARVIEW, OREGON
Map symbols
Evacuation flow zones & routes to safety
Assembly Area
Roadless tsunami hazard area
Outside Tsunami Hazard Area
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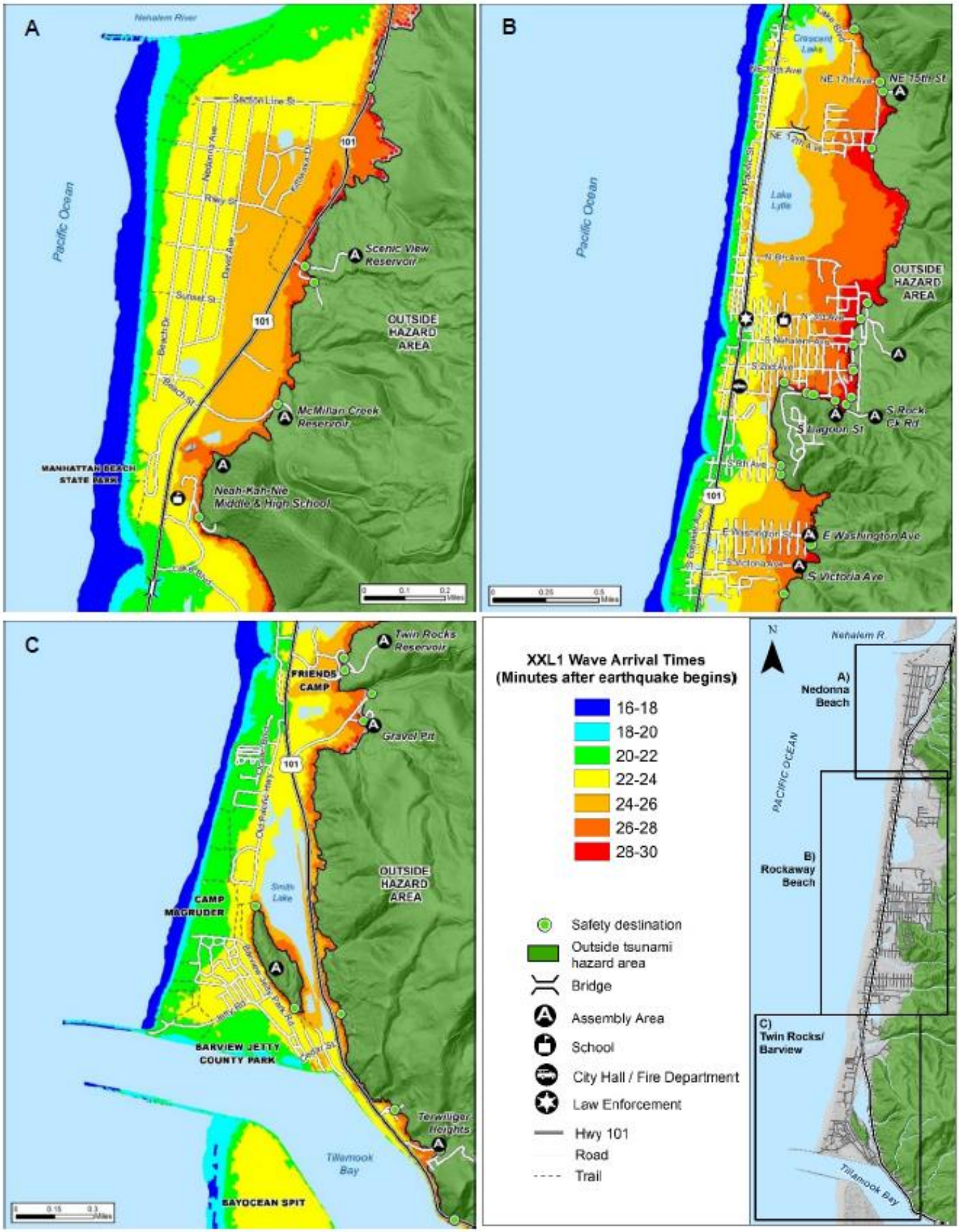
Spring Lake
PACIFIC ST
TWIN ROCKS FRIENDS CAMP
Twin Rocks Reservoir
Gravel Pit
PACIFIC OCEAN
101
OLD PACIFIC HWY
OUTSIDE HAZARD AREA
CAMP MAGRUDER
Smith Lake
BARVIEW JETTY COUNTY PARK
BARVIEW JETTY PARK RD
JETTY RD
CEDAR ST
Tillamook Bay
Terwiliger Heights
BAYOCEAN SPIT


A
Nehalem River
Pacific Ocean
Scenic View Reservoir
OUTSIDE HAZARD AREA
McMillan Creek Reservoir
MANHATTAN BEACH STATE PARK
Neah-Kah-Nie Middle & High School
B
Pacific Ocean
Lake Lytle
OUTSIDE HAZARD AREA
S Rockaway Ck Rd
S Lagoon St
E Washington Ave
S Victoria Ave
C
Twin Rocks Reservoir
FRIENDS CAMP
Gravel Pit
OUTSIDE HAZARD AREA
CAMP MAGRUDER
Smith Lake
BARVIEW JETTY COUNTY PARK
Terwilliger Heights
Tillamook Bay
BAYOCEAN SPIT
XXL1 Wave Arrival Times
(Minutes after earthquake begins)
16-18
18-20
20-22
22-24
24-26
26-28
28-30
Safety destination
Outside tsunami hazard area
Bridge
Assembly Area
School
City Hall / Fire Department
Law Enforcement
Hwy 101
Road
Trail
N
Nehalem R
A) Nedonna Beach
PACIFIC OCEAN
B) Rockaway Beach
C) Twin Rocks/ Barview
Tillamook Bay

Appendix 4 - Tsunami Resilience Comprehensive Plan Provisions

This document includes a set of plan policies related to this effort and a tsunami related text section that will be included within the Goal 7 (Natural Hazards) section of Rockaway Beach's Comprehensive Plan. Its intent is to provide general information related to community tsunami risk, preface the applicable tsunami plan policies, and support the community's land use resilience program

0.0 Tsunami

0.01 Description of the Hazard: The Oregon coast is well known for its spectacular scenery and natural resources. However, because the coast lies at the interface between land and the Pacific Ocean, it also is a zone of great instability and vulnerability. Over time, we have gained a greater awareness of our coast's geologic hazards and its risks to people and property.

Coastal Oregon is not only vulnerable to chronic coastal hazards such as coastal erosion from winter storms and sea level rise, but it is also subject to the potentially catastrophic effects of a Cascadia earthquake event and related tsunami. These types of powerful and devastating earthquakes of magnitude 9+ are generated at the Cascadia Subduction Zone where the eastward-moving Juan de Fuca tectonic plate dives under the westward-moving North American plate just off the Oregon coast. These large earthquakes will occur under the ocean just offshore of our coast and will produce extremely destructive tsunamis that can strike the coast as soon as 15 minutes after the earthquake, leaving devastation in their path. It is likely that in most Oregon coast communities, including Rockaway Beach, the only warning of an approaching tsunami will be the earthquake itself.

The geologic record shows that the largest of these large Cascadia Subduction Zone earthquakes and accompanying tsunamis occur about every 500 years, plus or minus 200 years. The last such earthquake and tsunami occurred over 300 years ago, on the evening of January 26th, 1700. This means that we are in the time window where a destructive Cascadia earthquake and tsunami could occur and the probability of that occurrence will continue to increase over time. This time the stakes are much higher as the great earthquake and catastrophic tsunami could occur when tens of thousands of Oregonians and visitors are enjoying coastal beaches and towns. To address this increasing risk and substantially increase resilience within our community, the City of Rockaway Beach is proactively addressing tsunami preparedness and mitigation within its land use program. Land use planning that addresses tsunami risk is an essential tool to help increase resilience to a potentially catastrophic tsunami event within the City.

0.02 Tsunami Hazard Maps: The Department of Geology and Mineral Industries (DOGAMI) has developed Tsunami Inundation Maps (TIMs) which provide the essential information for defining tsunami risk along the Oregon coast. The City of Rockaway Beach has adopted the TIM's applicable to the Rockaway Beach, and its urban growth boundary, as a part of its comprehensive plan hazard

inventory. These maps are also referenced within this natural hazards element of the comprehensive plan and are the basis for establishing the boundaries of Rockaway Beach's Tsunami Hazard Overlay Zone. The TIMs are referenced in the tsunami related plan policies and within the overlay zone for purposes of differentiating between areas of higher versus lower risk.

0.03 Tsunami Related Policies: The City has adopted a set of comprehensive plan policies related to tsunami preparedness and recovery that are included within this and other applicable sections of the comprehensive plan. These policies have been developed to address the resilience goals of Rockaway Beach. They are designed to support the City's resilience efforts within the comprehensive plan and implementing codes.

0.04 Zoning: Tsunami Hazard Overlay Zone (THO): Rockaway Beach has adopted an overlay zone which utilizes the applicable DOGAMI Tsunami Inundation Maps (TIMs). The overlay zone includes all areas identified as subject to inundation by the largest (XXL) local source tsunami event which ensures that life safety and evacuation route planning and development are adequately addressed. Other land use resilience strategies and requirements included within the overlay zone, which are not life safety or evacuation related, are applied within a subset of the overlay to smaller inundation scenario areas. These measures are included within the overlay zone provisions and reflect the community's risk tolerance, application of mitigation measures, and ORS 455.446-447 requirements. The overlay zone boundary has been adopted as an amendment to the official zoning map for Rockaway Beach.

0.05 Evacuation Route Plan Maps: The City, as part of its land use program for tsunami preparedness, has also adopted a comprehensive Tsunami Evacuation Facilities Improvement Plan (TEFIP). The Tsunami Evacuation Facilities Improvement Plan identifies designated evacuation routes, assembly areas and other components of the local evacuation system. The plan is a key component of the City's efforts to reduce risk to life safety by planning for a comprehensive evacuation system and developing the detailed information necessary to establish land use requirements to implement evacuation measures and improvements. This plan and associated map(s) have been incorporated into the City [*comprehensive plan natural hazard element/ transportation system plan*].

Comprehensive Plan Tsunami Related Policies

This section includes comprehensive plan policies related to tsunami preparedness and recovery that will be included within the Goal 7 (Natural Hazards) section, and other applicable sections of the Rockaway Beach's comprehensive plan.

Goal 7: Areas Subject to Natural Hazards

General Policies

To protect life, minimize damage and facilitate rapid recovery from a local source Cascadia Subduction Zone earthquake and tsunami, the City will:

1. Support tsunami preparedness and related resilience efforts.
2. Take reasonable measures to protect life and property to the fullest extent feasible, from the impact of a local source Cascadia tsunami.
3. Use the Oregon Department of Geology and Mineral Industries (DOGAMI) Tsunami Inundation Maps applicable to City to develop tsunami hazard resiliency measures.
4. Adopt a Tsunami Hazard Overlay Zone for identified tsunami hazard areas to implement land use measures addressing tsunami risk.
5. Enact design or performance implementing code components in identified tsunami hazard areas.
6. Identify and secure the use of appropriate land above a tsunami inundation zone for temporary housing, business and community functions post event
7. As part of a comprehensive pre-disaster land use planning effort, consistent with applicable statewide planning goals, identify appropriate locations above the tsunami inundation for relocation of housing, business and community functions post event.

Evacuation Policy Concepts

To facilitate the orderly and expedient evacuation of residents and visitors in a tsunami event, the City will:

1. Adopt a Tsunami Evacuation Facilities Improvement Plan that identifies current and projected evacuation needs, designates routes and assembly areas, establishes system standards, and identifies needed improvements to the local evacuation system.
2. Identify and secure the use of appropriate land above a tsunami inundation zone for evacuation, assembly, and emergency response.
3. Ensure zoning allows for adequate storage and shelter facilities.
4. Provide development or other incentives to property owners that donate land for evacuation routes, assembly areas, and potential shelters.
5. Require needed evacuation route improvements, including improvements to route demarcation (way finding in all weather and lighting conditions) and vegetation management, for new development and substantial redevelopment in tsunami hazard areas.
6. Work with neighboring jurisdictions to identify inter-jurisdictional evacuation routes and assembly areas where necessary.
7. Provide for the development of vertical evacuation structures in areas where reaching high ground is impractical.
8. Evaluate multi-use paths and transportation policies for tsunami evacuation route planning.
9. Encourage suitable structures to incorporate vertical evacuation capacity in areas where evacuation to high ground is impractical.
10. Install signs to clearly mark evacuation routes and implement other way finding technologies (e.g. painting on pavement, power poles and other prominent features) to ensure that routes can be easily followed day or night and in all weather conditions.
11. Prepare informational materials related to tsunami evacuation routes and make them easily available to the public.

Policies Related to Reducing Development Risk in High Tsunami Risk Areas

The City will:

1. Consider the impacts to evacuation needs created by comprehensive plan or zone map amendments that would result in increased residential densities or more intensive uses in tsunami hazard areas unless adequate mitigation is implemented. Mitigation measures should focus on life safety and tsunami resistant structure design and construction.
2. Encourage open space, public and private recreation and other minimally developed uses within the tsunami inundation zone area.
3. Prohibit the development of those essential facilities and special occupancy structures identified in ORS 455.446 and ORS 455.447 within the L tsunami inundation area.
4. Encourage, through incentives, building techniques that address tsunami peak hydraulic forces which will minimize impacts and increase the likelihood that structures will remain in place.
5. Protect and enhance existing dune features and coastal vegetation to promote natural buffers and reduce erosion.

Hazard Mitigation Planning

The City will:

1. Address tsunami hazards and associated resilience strategies within the community's FEMA approved hazard mitigation plan.
2. Incorporate and adopt relevant sections of the hazard mitigation plan by reference into the comprehensive plan.
3. Ensure hazard mitigation plan action items related to land use are implemented through the comprehensive plan and implementing ordinances.

Tsunami Awareness Education and Outreach

The City will:

1. Encourage and support tsunami education and outreach, training, and practice.
2. Implement a comprehensive and ongoing tsunami preparedness community education and outreach program.
3. Collaborate with local, state and federal planners and emergency managers for the purpose of developing a culture of preparedness supporting evacuation route planning and other land use measures that minimize risk and maximize resilience from tsunami events.

Debris Management

The City will:

1. Identify and work to secure the use of suitable areas within the Tsunami Inundation Zone for short and long-term, post-disaster debris storage, sorting and management.
2. Work with other public and private entities to establish mutual aid agreements for post-disaster debris removal and otherwise plan for needed heavy equipment in areas which may become isolated due to earthquake and tsunami damage.

Hazardous Materials

The City will:

1. Limit or prohibit new hazardous facilities as defined in ORS 455.447 within tsunami inundation zones. Where limiting or prohibiting such facilities is not practical, require adequate mitigation measures consistent with state and federal requirements.

Goal 11: Public Facility and Services

The City will:

1. Consider and address tsunami risks and evacuation routes and signage when planning, developing, improving, or replacing public facilities and services.
2. Update public facility plans to plan, fund, and locate future facilities outside of the tsunami inundation zone, whenever possible.

Goal 12: Transportation

The City will:

1. Develop multi-use paths that both enhance community livability and serve as tsunami evacuation routes.
2. Coordinate evacuation route and signage planning in conjunction with existing or proposed transportation system plan pedestrian and bicycle route planning efforts.
3. Locate new transportation facilities outside the tsunami inundation zones where feasible.
4. Where feasible design and construct new transportation facilities to withstand a Cascadia event earthquake and be resistant to the associated tsunami.

Goal 14: Urbanization

The City will:

1. Limit the allowable uses on property in the tsunami hazard area vacated as the result of an urban growth boundary expansion to relocate existing development. Such limitations shall include permitting only low risk uses, or requiring uses which implement adequate protection or mitigation measures for seismic and tsunami hazards.
2. Plan for the location or relocation of critical facilities outside of tsunami hazard area when conducting the land needs analysis.
3. Include pre- and post-tsunami disaster planning as part of urban reserve planning processes.

Map Amendments

The comprehensive plan and development code text amendments need to be accompanied by associated map amendments. These maps should be adopted or otherwise incorporated into the appropriate elements of the local comprehensive plan and implementing regulations. Note – these maps will be created and adopted along with the Tsunami Hazard Overlay Zone code amendment and the TEFIP.

a. **DOGAMI Tsunami Inundation Map (TIM)**: Communities should adopt the map, or maps in the DOGAMI Tsunami Inundation Map (TIM) Series applicable to their jurisdiction as a part of the comprehensive plan inventory, as they provide the essential information for defining tsunami risk. The TIMs include five inundation scenario areas including small, medium, large, extra-large, and extra extra-large tsunami events. The TIMs will typically be referenced in the natural hazards element of the comprehensive plan, and will also be used as the basis for establishing the boundaries of a Tsunami Hazard Overlay zone. The TIMs may also be referenced in plan policies and/or the overlay zone for purposes of differentiating between areas of higher versus lower risk.
b. **Tsunami Hazard Overlay Zone Map (THO):** The overlay zone map(s) should be developed using the applicable DOGAMI Tsunami Inundation Maps or TIMs. In developing the overlay map it is recommended that the overlay area include all five inundation scenarios identified on the TIMs (S, M, L, XL, and XXL) which would ensure that life/safety and evacuation route planning and development are adequately addressed. The map(s) should be adopted in the form of an amendment to the official zoning map for the community.
c. **Evacuation Route Plan Maps**: The Tsunami Evacuation Facilities Improvement Plan will typically include a map or maps that identify designated evacuation routes, assembly areas and other components of the local evacuation system. This map would be included in the adoption of the overall Tsunami Evacuation Facilities Improvement Plan. The Tsunami Evacuation Facilities Improvement Plan should, in turn, be incorporated into the community's comprehensive plan or transportation system plan, as appropriate.

Appendix 5 – Tsunami Risk and Vulnerability Assessment

Introduction

The City of Rockaway Beach, Oregon is at risk of experiencing tsunami waves generated by multiple sources, including a distant seismic event (e.g., a large earthquake in Japan or from elsewhere in the Pacific Ocean) or a local event caused by a Cascadia Subduction Zone (CSZ) earthquake. Rockaway Beach is characterized by above-average populations of residents over 65 years of age and large tourist and visitor populations – especially during the spring and summer months. Additionally, much of the city lies within the potential inundation zone from an XXL tsunami event.

This risk and vulnerability assessment is designed to identify gaps in preparedness, mitigation, and response efforts required to ensure residents and visitors have feasible means to evacuate prior to a tsunami inundation.

Methodology

Document and Data Review

The majority of the findings in this vulnerability assessment were determined based upon the review of existing documents and data. A thorough review of pertinent documents and data was performed to provide a better understanding of the geographies, locations, and populations of concern. The sources utilized and/or referenced in this task include:

- Tillamook County Natural Hazard Mitigation Plan
- 2013-2017 American Community Survey (ACS) Data
- DOGAMI Beat the Wave mapping and data

Stakeholder Feedback

Prior to the development of this vulnerability assessment, an online survey was developed to gather feedback from residents, business owners, and frequent visitors within Rockaway Beach. The findings have been incorporated into the assessment to document local perception of risk, determine barriers to evacuation, and recommendations for improvement planning provided by the public. The survey was completed by 109 individuals, a small representation of the overall number of residents, with homes and businesses within and outside of the inundation zones. 71% of those surveyed indicated their home within the inundation zone, 19% lived outside of the inundation zone, and 10% were unsure of their proximity to the inundation zone.

Methodology Constraints

- The conducted survey was completed by less than 10% of Rockaway Beach residents, and as such the results may not be representative of the community at-large.
- Because population estimates are based on census data, only resident populations are reflected and not transient populations. Rockaway Beach has a large number of hotels, motels, and short-term rental housing which host many visitors, especially during spring and summer months.

Hazards

For the purposes of this project, a risk assessment was performed to identify considerations related specifically to individuals' ability to evacuate. Therefore, findings related to tsunami damage were not taken into account. As an example, a risk assessment within a Hazard Mitigation Plan may consider the hazard location as the area in which tsunami inundation is expected. However, this risk assessment identifies location considerations that may adversely affect one's ability to safely evacuate (e.g., bridges, roadways running parallel to the coastline, etc.). *Refer to the Tillamook County Natural Hazards Mitigation Plan for additional risk assessment findings.*

Hazard Description

The hazard being addressed by this assessment is a tsunami event that results in the need for community evacuation. A tsunami affecting Rockaway Beach would be the result of an earthquake from one of two categories:

- Local Tsunami: Generated by an earthquake immediately offshore of the Oregon Coast (e.g., a CSZ earthquake) and would result in a tsunami arriving onshore within 16-18 minutes after earthquake shaking begins.
- Distant Tsunami: Generated by a distant earthquake (e.g., large event occurring off a distant coastline such as Japan) and would result in a tsunami coming onshore 4 hours or more following an earthquake. Distant tsunami wave arrival is on the order of 4 hours for an earthquake off of the Alaska coast and 9 to 11 hours for an earthquake off of the Japanese coast.

Cascading Hazards

A local earthquake resulting in a tsunami is likely to generate additional hazards that may further hinder an individual's ability to evacuate and may increase the time needed to evacuate. Such examples include:

- Damage to buildings: Severe shaking, especially in areas of poor soils, will damage buildings, making it difficult to evacuate. Homes built before 1974 may not be tied to foundations and can shift off foundations. Unreinforced masonry buildings and under-reinforced concrete buildings will be severely damaged or collapsed. Furnishings and equipment not securely fastened can cause injuries. Mobile homes are also more likely to sustain significant damage during an earthquake.
- Damage to infrastructure: Severe shaking and areas of poor soils will result in infrastructure failures. Infrastructure systems that may cause barriers to evacuation are water, wastewater, and stormwater facilities; liquid fuel and natural gas tanks and lines; electrical systems; bridges; and embankments and roads. Shaking damage may result in fallen electrical lines, damaged gas lines, tank and pipeline failures and leaks, and bridge failures, as well as physical interruptions in the surface transportation system due to slope failures and ground failures.
- Landslides: Landslides and ground movement may present added barriers to evacuation resulting in blocked roads, bridges, and walking trails.
- Fires: Fires from damaged electrical lines or propane may result in injuries that hinder an individual's ability to evacuate, as well as block key evacuation corridors.

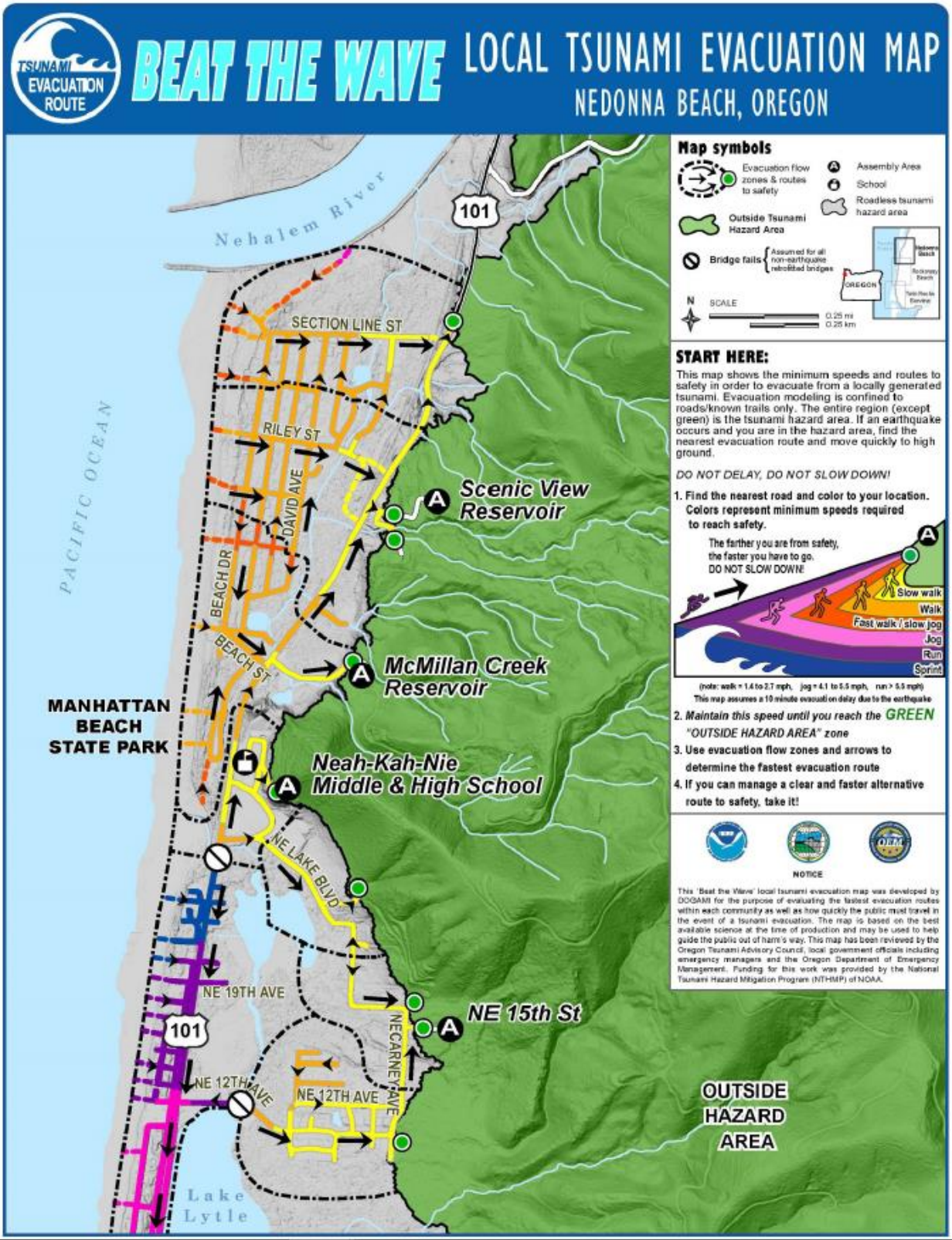
- Liquefaction: Similar to landslides, liquefied soils may result in damaged and unstable roads, bridges, and walking trails that present added barriers to an individual's ability to evacuate, especially those who experience access and functional needs populations.
- Vehicular accidents and traffic jams: Individuals may attempt to evacuate in personal vehicles in en masse and push their vehicles to cover unusual terrain either due to damaged infrastructure or in an attempt to bypass typical infrastructure to save time. This may result in accidents and traffic jams that prevent individuals from reaching higher ground. Vehicular evacuation is not recommended and likely will not be possible following a local earthquake and tsunami event.

Geography

Low-lying areas are inherently at a greater risk of experiencing tsunami inundation and a hindered ability for individuals to evacuate prior to a tsunami arrival. The following characteristics of Rockaway Beach's geography increase the risk of evacuation-related concerns.

- Buildings: The XXL model indicates that 2,333 buildings in Rockaway Beach are within the tsunami inundation zone.
- Bridges: A CSZ earthquake may lead to damaged or collapsed bridges, leading to the creation of transportation "islands". Tsunami evacuation routes near Lake Lytle and Crescent Lake in Rockaway Beach rely heavily upon the structural integrity of bridges. In addition, the risk of unaware drivers attempting to cross a damaged bridge to evacuate must be considered in the development of effective preparedness and mitigation efforts. Two bridges in Rockaway Beach are at risk of failure during an earthquake (Highway 101 Crescent Creek Crossing and NE 12th Avenue over Lake Lytle).
- Low-lying terrain: Much of Rockaway Beach is characterized by low-lying terrain that increases the distance required to be traveled to safely exit the inundation zone, though most of the area is within less than a mile of high ground in the hills to the east.
- Landslides: While the nearby hills provide an important high ground safety area in the event of an evacuation, some areas of the hillside are at risk for landslides during an earthquake. Slides in the areas near Nedonna Beach, Pacific View, and Barview could make a number of important high ground and assembly areas inaccessible.

DOGAMI Beat the Wave maps indicate that most of Rockaway Beach, along with the communities of Nedonna Beach, Twin Rocks and Barview, and the surrounding area may be required to be evacuated following a CSZ event.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BEAT THE WAVE
LOCAL TSUNAMI EVACUATION MAP
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Nehalem River
PACIFIC OCEAN
101
SECTION LINE ST
RILEY ST
DAVID AVE
BEACH DR
BEACH ST
Scenic View Reservoir
McMillan Creek Reservoir
MANHATTAN BEACH STATE PARK
Neah-Kah-Nie Middle & High School
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NE 19TH AVE
101
NE 12TH AVE
NE 12TH AVE
NECARNEY AVE
NE 15th St
OUTSIDE HAZARD AREA
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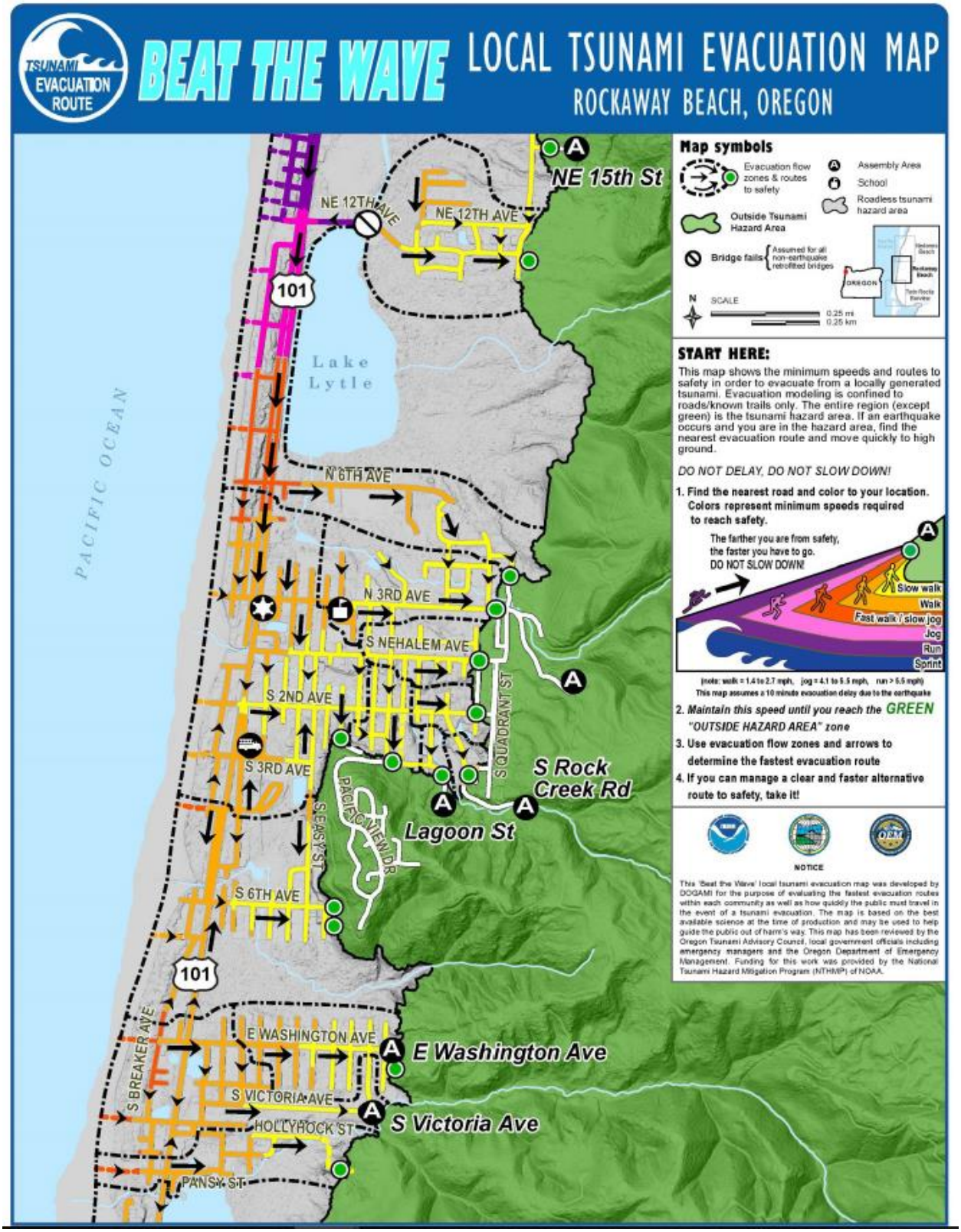
TSUNAMI EVACUATION ROUTE
BEAT THE WAVE
LOCAL TSUNAMI EVACUATION MAP
ROCKAWAY BEACH, OREGON
PACIFIC OCEAN
Lake Lytle
NE 15th St
NE 12TH AVE
NE 12TH AVE
101
N 6TH AVE
N 3RD AVE
S NEHALEM AVE
S 2ND AVE
S 3RD AVE
S EASY ST
PACIFIC VIEW DR
SQUADRANT ST
S Rock Creek Rd
Lagoon St
S 6TH AVE
101
S BREAKER AVE
E WASHINGTON AVE
E Washington Ave
S VICTORIA AVE
S Victoria Ave
HOLLYHOCK ST
PANSY ST
Map symbols
Evacuation flow zones & routes to safety
Assembly Area
School
Roadless tsunami hazard area
Outside Tsunami Hazard Area
Bridge fails
Assumed for all non-earthquake retrofitted bridges
OREGON
N
SCALE
0.25 mi
0.25 km
START HERE:
This map shows the minimum speeds and routes to safety in order to evacuate from a locally generated tsunami. Evacuation modeling is confined to roads/known trails only. The entire region (except green) is the tsunami hazard area. If an earthquake occurs and you are in the hazard area, find the nearest evacuation route and move quickly to high ground.
DO NOT DELAY, DO NOT SLOW DOWN!
1. Find the nearest road and color to your location. Colors represent minimum speeds required to reach safety.
The farther you are from safety, the faster you have to go.
DO NOT SLOW DOWN!
Slow walk
Walk
Fast walk / slow jog
Jog
Run
Sprint
(note: walk = 1.4 to 2.7 mph, jog = 4.1 to 5.5 mph, run > 5.5 mph)
This map assumes a 10 minute evacuation delay due to the earthquake
2. Maintain this speed until you reach the GREEN "OUTSIDE HAZARD AREA" zone
3. Use evacuation flow zones and arrows to determine the fastest evacuation route
4. If you can manage a clear and faster alternative route to safety, take it!
NOTICE
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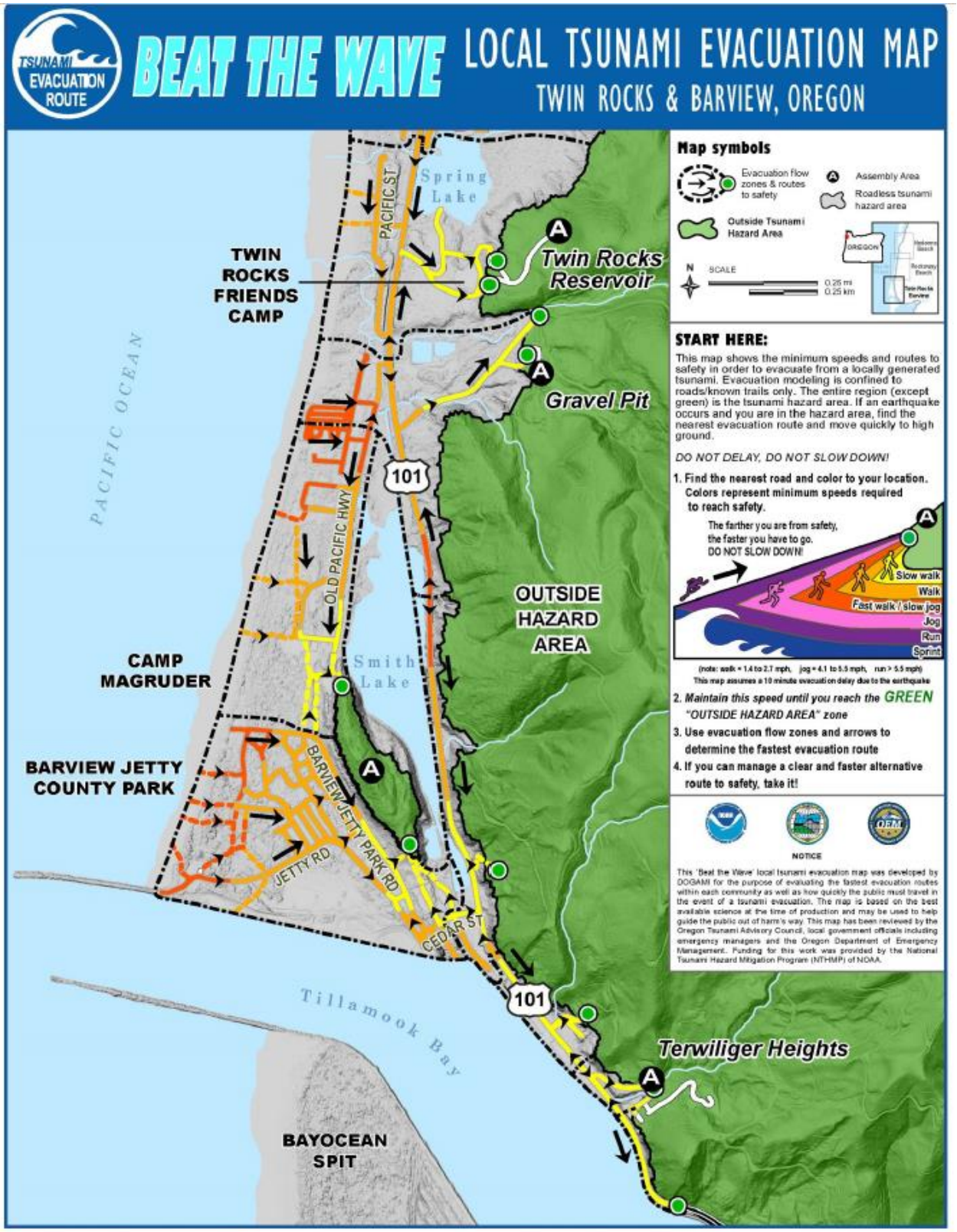
TSUNAMI EVACUATION ROUTE
BEAT THE WAVE
LOCAL TSUNAMI EVACUATION MAP
TWIN ROCKS & BARVIEW, OREGON
Map symbols
Evacuation flow zones & routes to safety
Assembly Area
Roadless tsunami hazard area
Outside Tsunami Hazard Area
OREGON
N
SCALE
0.25 mi
0.25 km
START HERE:
This map shows the minimum speeds and routes to safety in order to evacuate from a locally generated tsunami. Evacuation modeling is confined to roads/known trails only. The entire region (except green) is the tsunami hazard area. If an earthquake occurs and you are in the hazard area, find the nearest evacuation route and move quickly to high ground.
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PACIFIC OCEAN
Spring Lake
PACIFIC ST
TWIN ROCKS FRIENDS CAMP
Twin Rocks Reservoir
Gravel Pit
101
OLD PACIFIC HWY
OUTSIDE HAZARD AREA
CAMP MAGRUDER
Smith Lake
BARVIEW JETTY COUNTY PARK
BARVIEW JETTY PARK RD
JETTY RD
CEDAR ST
101
Tillamook Bay
Terwiliger Heights
BAYOCEAN SPIT

Critical/Essential Facilities

Category	Locations	Within Inundation Zone?
Public Facilities and Infrastructure	Neah-Kah-Nie School District & Preschool	Yes
	Neah-Kah-Nie Middle School & High School	Yes
	Rockaway Beach City Hall	Yes
	Rockaway Beach Public Works	Yes
	Rockaway Beach Fire Department	Yes
	Rockaway Beach Police Department	Yes
	Rockaway Beach Water Treatment Plant	Yes

People

Access and Functional Needs Populations

Access and Functional Needs populations (also referred to as vulnerable populations and special needs populations) are members of the community who experience physical, mental, or medical care needs and who may require assistance before, during, and after an emergency incident after exhausting their usual resources and support network. In the case of evacuations, examples of individuals who have access and functional needs that may make evacuation challenging include, but are not limited to:

- Individuals who experience mobility challenges (e.g., those with physical disabilities, the elderly, children)
- Individuals who are blind or have low vision
- Individuals with limited-English proficiency
- Individuals who are deaf or hard of hearing

Tsunami evacuation requires the ability to move from the inundation zone to high ground (or safety) in a timely matter. Due to this short onset time, individuals who experience access and functional needs may lack the resources to travel such distances. While there are no facilities that serve these populations within the inundation zone, it is highly probable that access and functional needs populations live and work within the inundation zone in Rockaway Beach and surrounding communities.

Mobility Challenges

Within mobility disabilities, there are several subcategories that should be considered when planning for tsunami evacuations including:

- Wheelchair Users: challenges include needing adequate spaces to maneuver wheelchair, steep paths, rough or uneven surfaces, and negotiating steps.
- Ambulatory Mobility Disabilities: this includes people who can walk, but with difficulty as well as individuals who lack coordination, or use additional support such as crutches, canes, walkers, braces, etc. These individuals may experience difficulty climbing steps, walking, or standing for long periods of time. Elderly populations are of significant concern and according to the ACS

2017 5-Year Survey, 27% of Rockaway Beach residents are over 65 years of age. This is significantly higher than the 17.1% of Oregon residents over 65 years of age.

- Respiratory Issues: challenges include dizziness, nausea, breathing difficulties, and concentration issues. These individuals may require rest breaks during evacuation.
- Young Children: challenges may include difficulty walking far distances and inability to evacuate without adult support. According to the ACS 2017 5-Year Survey, 2.6% of Rockaway Beach residents are under 5 years of age. This is lower than the 5.7% of Oregon residents under 5 years of age.

Vision Impairment

Individuals who experience partial or total vision loss, including night vision challenges, rely on their sense of touch and hearing to perceive their environment. After a CSZ event, when physical obstructions such as debris, road or sidewalk damage, and liquefaction changes the lay of the land, those who experience vision impairment may find it difficult to navigate to a location outside the tsunami zone without assistance.

Limited English Proficiency

Key to an individual's ability to evacuate is access to information. Individuals with limited English proficiency may require additional guidance in their native language. According to the ACS 2016 5-Year Survey, approximately 0.01% of Rockaway Beach households speak English "less than very well", indicating a very small vulnerable population. However, due to the high numbers of visitors in the area, it is likely that some people who are visiting Rockaway Beach may speak a language other than English.

Deaf or Hard of Hearing

Individuals who are deaf or hard of hearing may not respond to verbal direction or hear warning sirens. Though the numbers of those who are deaf or hard of hearing in Rockaway Beach are not available, according to the National Institute of Deafness and Other Communication Disorders (NIDCD), 14% of adults aged 20 to 69 have hearing loss (2011-2012).[1]

Using Key Locations as a Proxy

Specific information about where or how many access and functional needs populations would need assistance in an evacuation is not available; however, by identifying key locations that can be used as a proxy for access and functional needs, we can extrapolate where those individuals may be in a CSZ event

Schools, Youth Organizations, and Childcare Facilities

Schools, youth organizations, and childcare facilities are used as a proxy for the location of children. The following facilities are within the XXL tsunami hazard zone:

- Neah-Kah-Nie High School and Middle School
- Neah-Kah-Nie School District and Preeschool
- Twin Rocks Friends Camp
- Camp Magruder

[1] https://www.nidcd.nih.gov/sites/default/files/Documents/health/hearing/NewHearingLossStudy_Infographic_12_13_16.pdf

Hospitals and Medical Centers

Hospitals and medical centers are used as a proxy for the location of medically-fragile individuals.

A search indicated there are no hospitals or medical centers in the inundation zone.

Senior Facilities

Senior Centers and Assisted Living Centers are used as a proxy for the location of the elderly.

A search indicated there are no senior facilities in the inundation zone.

Impoverished/Homeless or At-Risk Facilities

Outreach services are used as a proxy for the location of individuals who are at risk or experience poverty or homelessness.

A search indicated there are no impoverished/homeless or at-risk facilities in the inundation zone.

Hotels, Second Homes, and Vacation Rental Homes

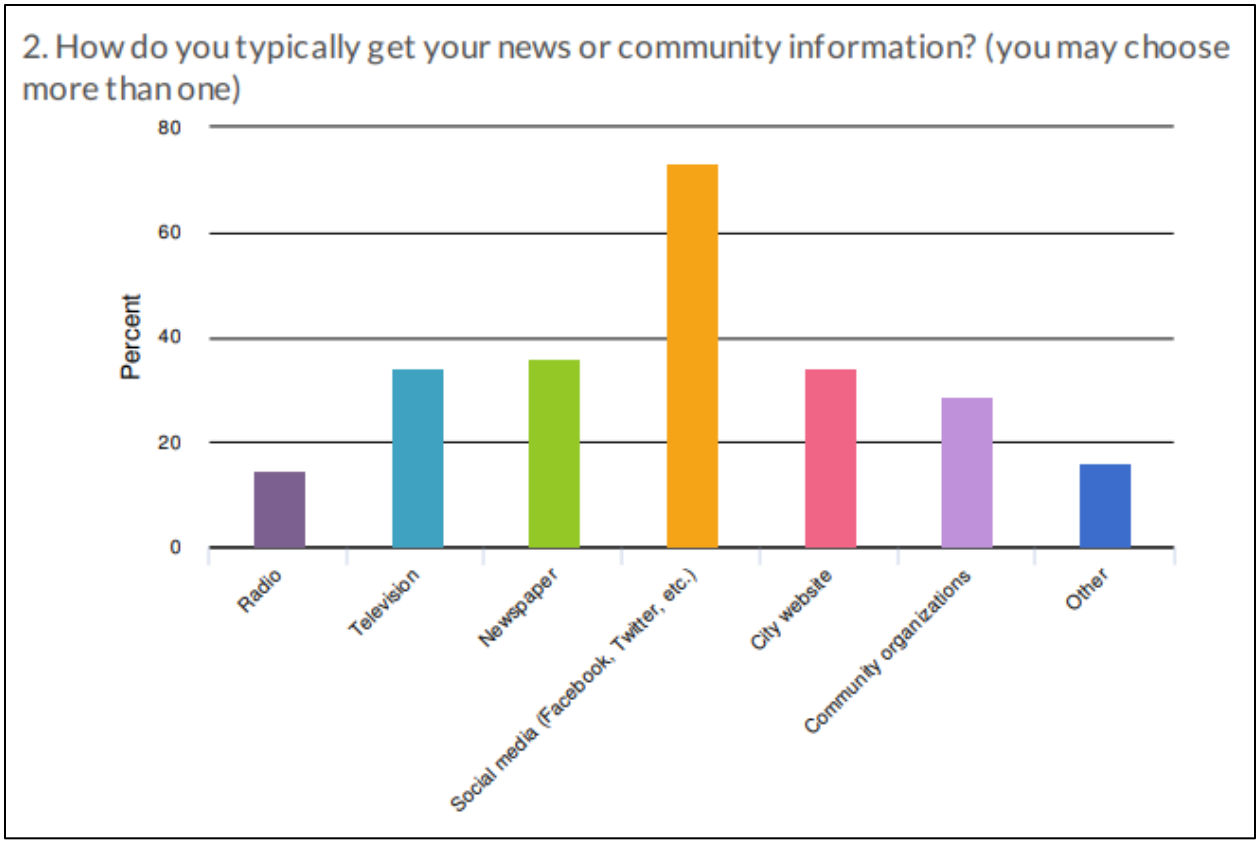
Out of area visitors and tourists represent a potentially highly vulnerable population that may lack an awareness of the risk of tsunamis and access to evacuation information. There are 134 motel rooms in the City, and DOGMAI estimates as many as 1,312 homes are used seasonally, as second homes or short term vacation rentals.

Communication

Individuals rely upon timely information to respond to the impacts of impending hazards. This information is ideally provided pre-incident (e.g., evacuation mapping, personal preparedness materials), but also must include post-incident guidance (e.g., tsunami sirens, road signage, media reports). The following table identifies potential sources of public information in the Rockaway Beach area.

News, Websites, and Social Media

Within the conducted survey, respondents were asked to identify sources used to access news. Over 73% of respondents indicated they relied upon social media, 35.8% on newspaper, and 34.1% on the City's website. All three sources may be used for pre-incident information sharing, while radio may be the best sources for post-incident guidance. In a CSZ event, widespread electrical interruptions are expected which will limit the ability to communicate and spread news in a timely fashion. The Rockaway Beach Emergency Preparedness Leadership team currently manages an Emergency Communications
(EMCOM) network of personal radio operators, trained to communicate with fellow operators and first responders after an emergency.



Evacuation Signage

Effective signage is critical to saving the lives of visitors and tourists, but it is equally important for the awareness of residents in a crisis. *See Section XXX of the TEFIP for a list and maps of existing signage.*

Within the conducted survey, respondents were asked a variety of questions to determine their knowledge of existing signage. The following table indicates various measures of this knowledge.

Survey Question	Percent Responding with Uncertainty
What is the nearest Assembly Point to your home?	9.2% (I'm not sure)
Do you feel that the current tsunami escape route signage is sufficient in the daytime?	54% (No)
Do you feel that the current tsunami escape route signage is sufficiently visible at night?	83% (No)

Community Awareness

The following information reiterates the importance of public information and education in the City.

Awareness of the Inundation Zone

Within the conducted survey, participants were asked questions about their awareness

of their risk in Tsunami:

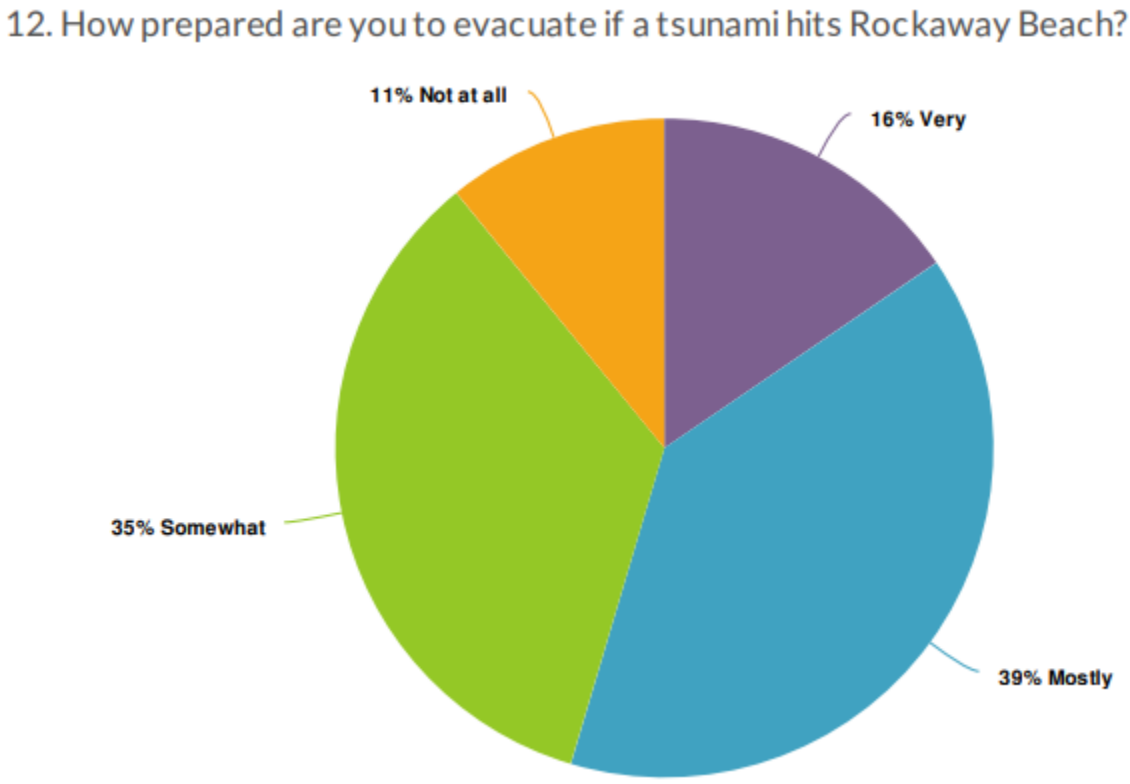
- 10% did not know if their home was located in a tsunami inundation zone.
- 7% did not know where the nearest high ground was to evacuate to after an earthquake and 9% said that they would not know what to tell friends and family who were visiting from out of town.

Self-Assessment of Time to Evacuate

Within the conducted survey, 63% of those surveyed indicated they could reach high ground in under 20 minutes, 20% indicated they could reach high ground in 20-30 minutes, and 14% were unsure of how much time would be needed to evacuate. *See the Beat the Wave maps and report for more detailed evacuation times for specific locations*.

Personal Preparedness

64% of the individuals surveyed have a tsunami backpack ready to take with them in the event of an evacuation. Only 16% of respondents considered themselves "very" prepared to evacuate, while 11% considered themselves "not at all" prepared.



Findings and Areas of Concern

The following areas of concern were identified through the Risk and Vulnerability Assessment:

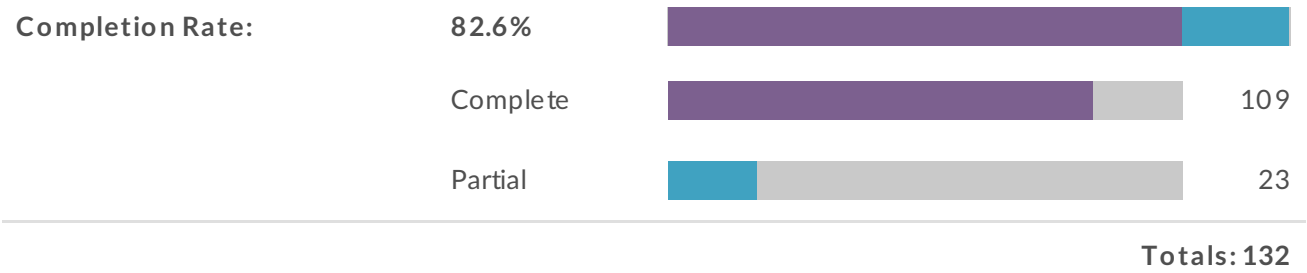
- Evacuation awareness of existing residents (e.g., high ground, assembly points)
- Communicating pre-incident information to visitors and short-term residents

- Visibility, quantity, and quality of existing tsunami evacuation signage (e.g., daytime, nighttime, vision impairment, clear understanding by non-English speakers)
- Individuals who experience mobility challenges
- Gaps in available tsunami evacuation routes (e.g., few connections across Lake Lytle and Crescent Lake, likely bridge failure, landslides and other cascading hazards)

Appendix 6 - Online Survey Results

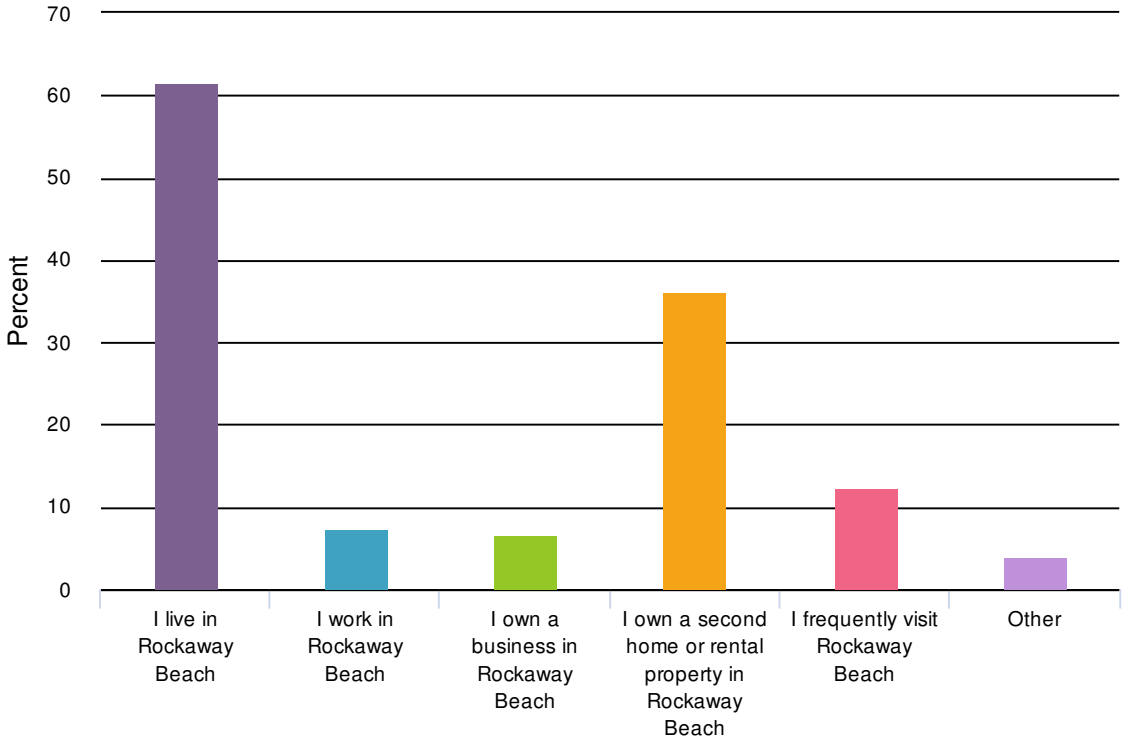
Report for Rockaway Beach Tsunami Evacuation Planning Community Survey

Response Counts



Totals: 132

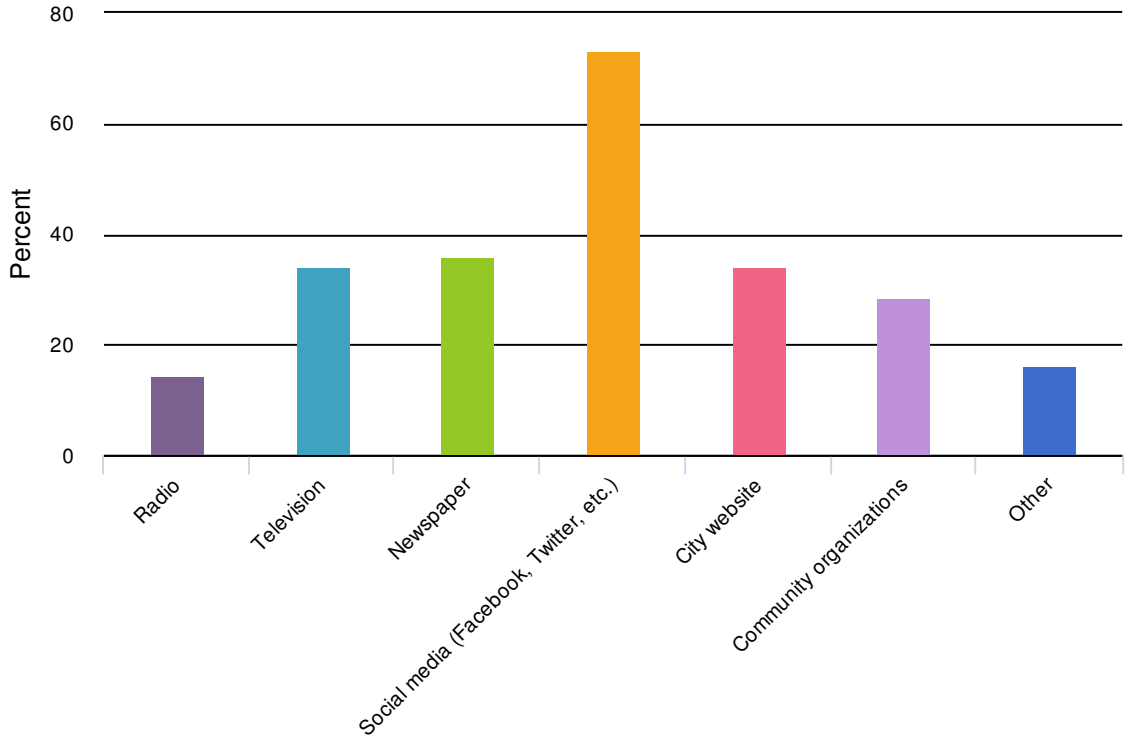
1. What is your relationship to Rockaway Beach? (you may choose more than one)



Value	Percent	Responses
I live in Rockaway Beach	61.5%	75
I work in Rockaway Beach	7.4%	9
I own a business in Rockaway Beach	6.6%	8
I own a second home or rental property in Rockaway Beach	36.1%	44
I frequently visit Rockaway Beach	12.3%	15
Other	4.1%	5

Other	Count
Elderly parents live there	1
I live south in Garibaldi	1
I spend 1/2 my time in Rockaway	1
Manage a condominium	1
Volunteer fire fighter and ems	1
Totals	5

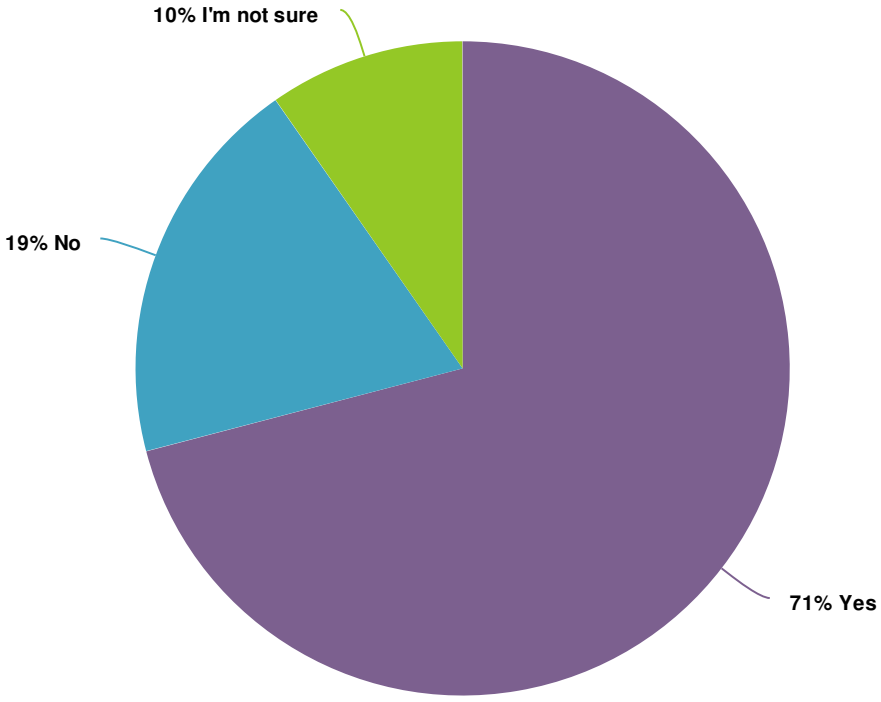
2. How do you typically get your news or community information? (you may choose more than one)



Value	Percent	Responses
Radio	14.6%	18
Television	34.1%	42
Newspaper	35.8%	44
Social media (Facebook, Twitter, etc.)	73.2%	90
City website	34.1%	42
Community organizations	28.5%	35
Other	16.3%	20

Other	Count
Manager	2
yellow radio	2
Friends who live in RB.	1
Ham Radio	1
Ham Radio, Yellow Radio	1
Internet	1
Locals I talk to	1
News websites, neighbors	1
We have a weather alert system	1
Word of mouth	1
city mailings	1
emails	1
neighbors	1
neighbors in RB	1
online news sources	1
online newspapers	1
talking to people, email	1
Totals	19

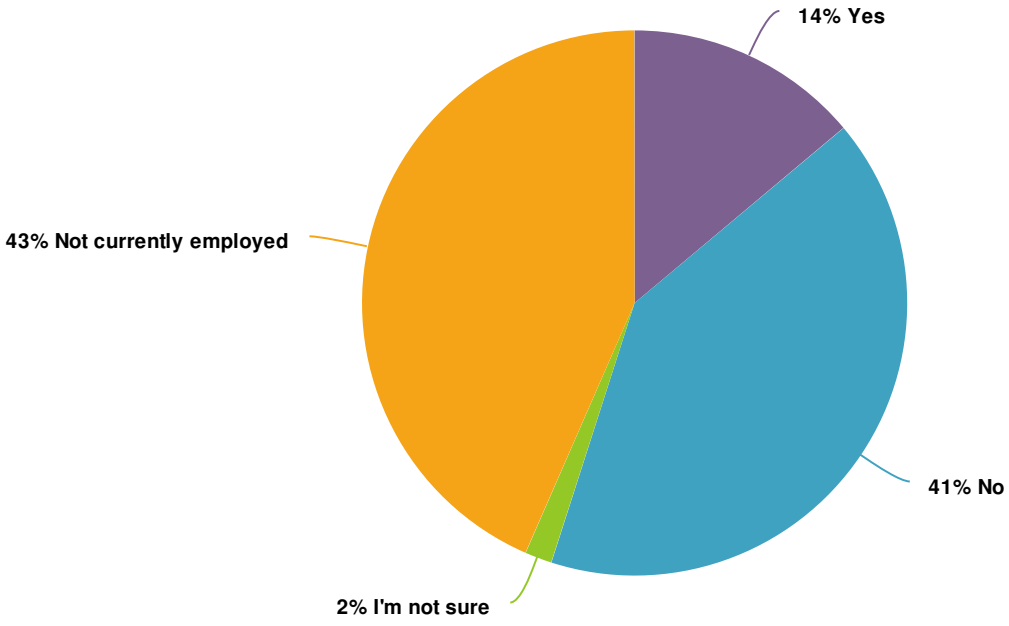
3. Is your home in the tsunami zone?



Value	Percent	Responses
Yes	71.0%	88
No	19.4%	24
I'm not sure	9.7%	12

Totals: 124

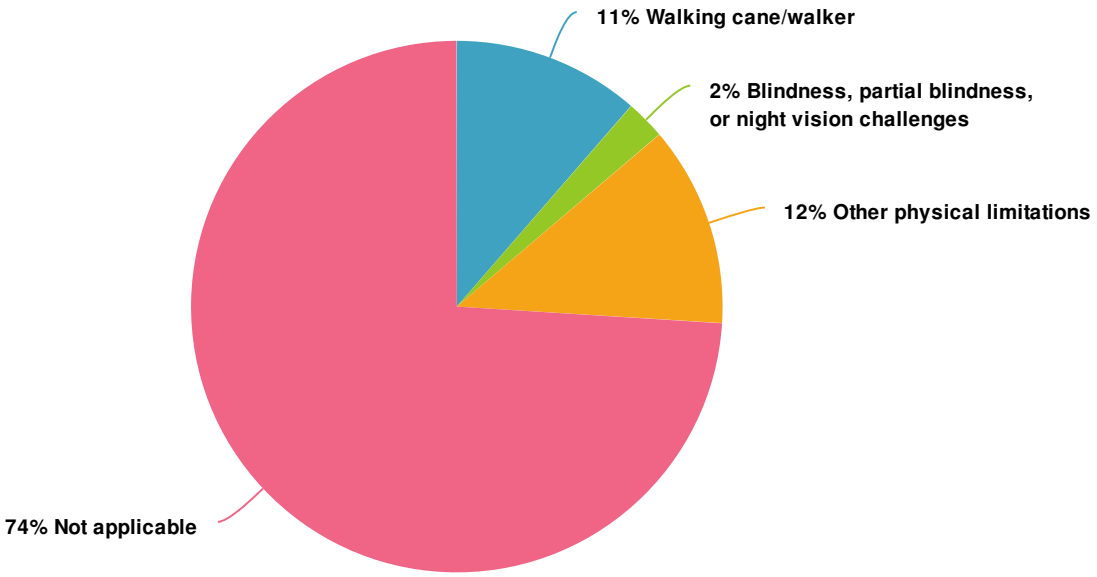
4. Is your work in the tsunami zone?



Value	Percent	Responses
Yes	13.9%	17
No	41.0%	50
I'm not sure	1.6%	2
Not currently employed	43.4%	53

Totals: 122

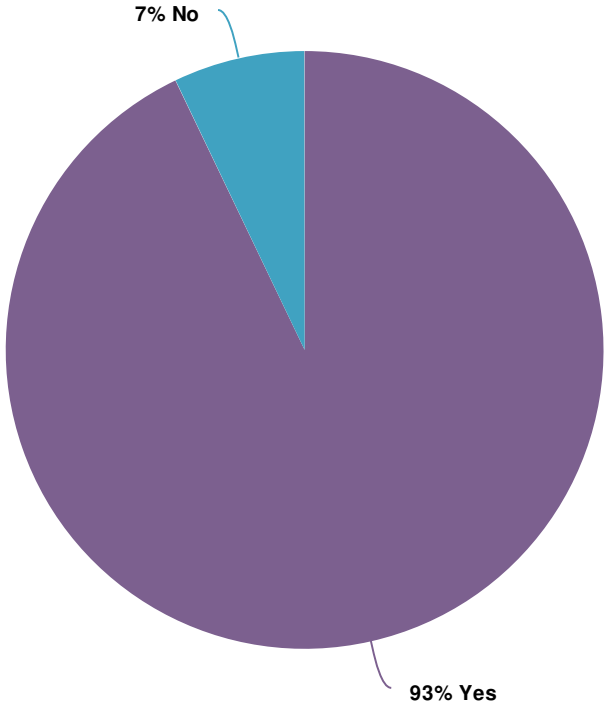
5. Does anyone in your home have mobility or visual impairment challenges that would make it difficult to reach a location outside the tsunami zone?



Value	Percent	Responses
Walking cane/walker	11.4%	14
Blindness, partial blindness, or night vision challenges	2.4%	3
Other physical limitations	12.2%	15
Not applicable	74.0%	91

Totals: 123

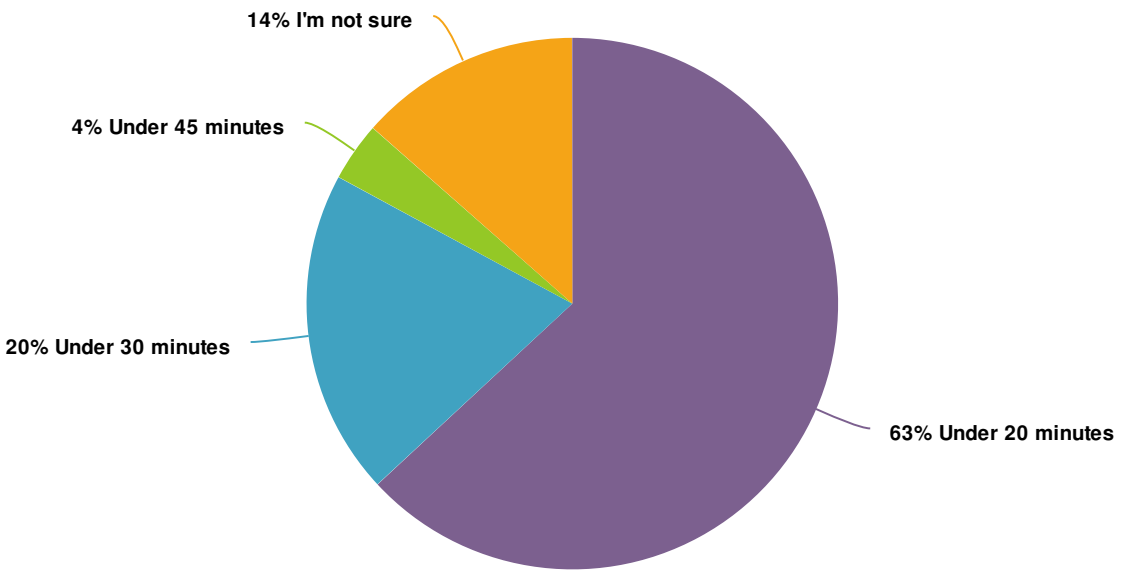
6. Do you know where the nearest high ground is to evacuate to after an earthquake?



Value	Percent	Responses
Yes	92.9%	104
No	7.1%	8

Totals: 112

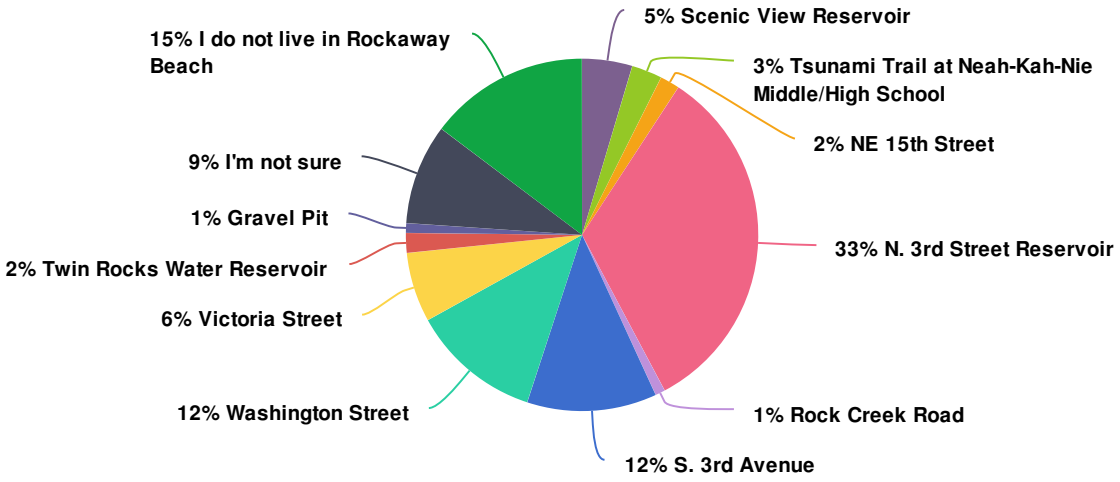
7. How quickly can you make it to the nearest high ground by walking or running?



Value	Percent	Responses
Under 20 minutes	63.1%	70
Under 30 minutes	19.8%	22
Under 45 minutes	3.6%	4
I'm not sure	13.5%	15

Totals: 111

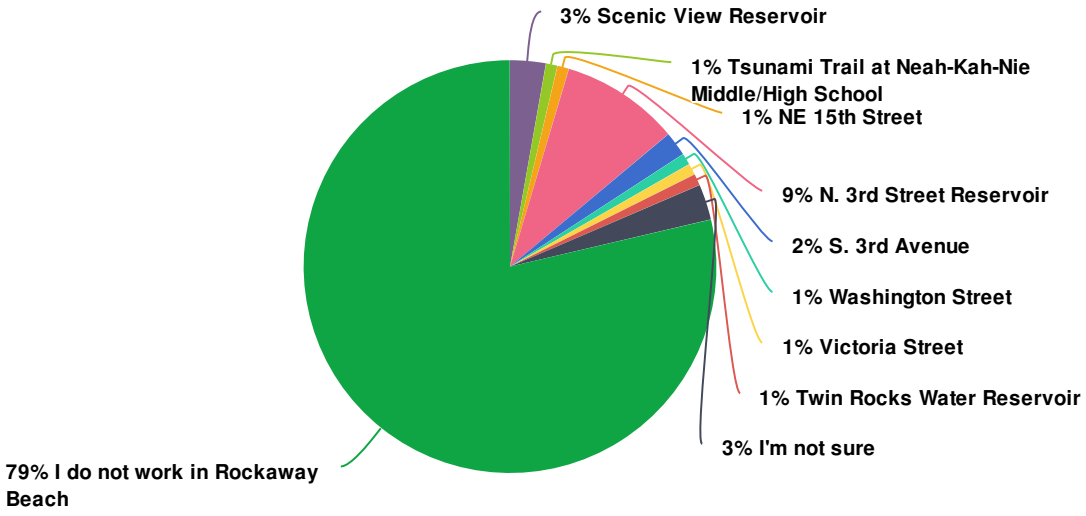
8. If you live in Rockaway Beach, where is the nearest Assembly Point to your home?



Value	Percent	Responses
Scenic View Reservoir	4.6%	5
Tsunami Trail at Neah-Kah-Nie Middle/High School	2.8%	3
NE 15th Street	1.8%	2
N. 3rd Street Reservoir	33.0%	36
Rock Creek Road	0.9%	1
S. 3rd Avenue	11.9%	13
Washington Street	11.9%	13
Victoria Street	6.4%	7
Twin Rocks Water Reservoir	1.8%	2
Gravel Pit	0.9%	1
I'm not sure	9.2%	10
I do not live in Rockaway Beach	14.7%	16

Totals: 109

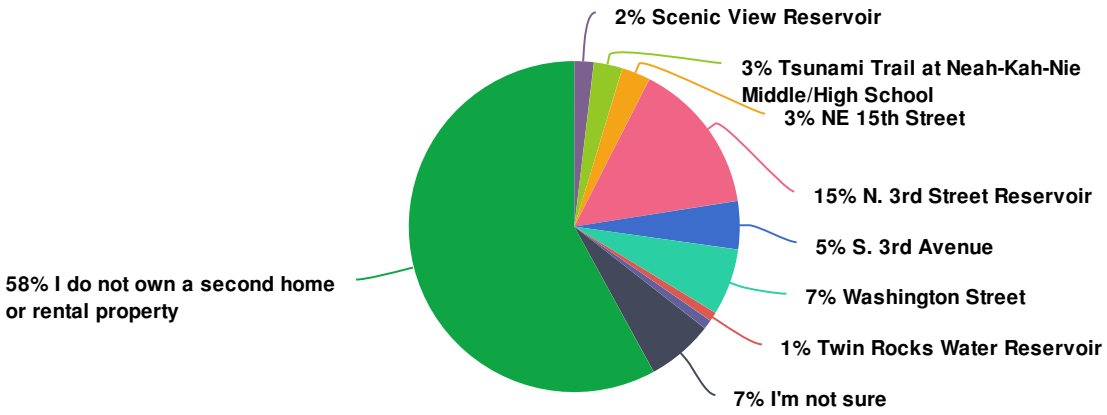
9. If you work in Rockaway Beach, where is the nearest Assembly Point to your work?



Value	Percent	Responses
Scenic View Reservoir	2.8%	3
Tsunami Trail at Neah-Kah-Nie Middle/High School	0.9%	1
NE 15th Street	0.9%	1
N. 3rd Street Reservoir	9.3%	10
S. 3rd Avenue	1.9%	2
Washington Street	0.9%	1
Victoria Street	0.9%	1
Twin Rocks Water Reservoir	0.9%	1
I'm not sure	2.8%	3
I do not work in Rockaway Beach	78.5%	84

Totals: 107

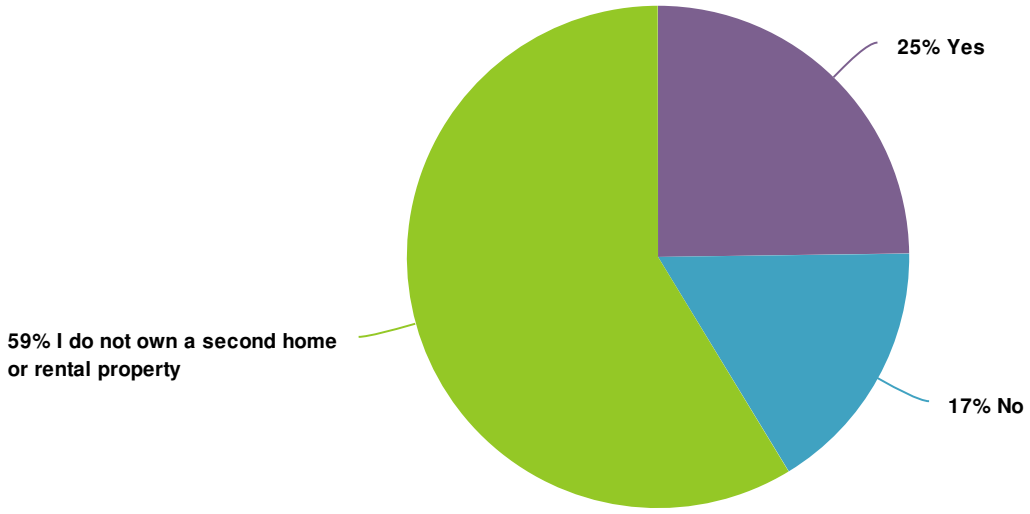
10. If you own a second home or rental property in Rockaway Beach, what is the nearest Assembly Point?



Value	Percent	Responses
Scenic View Reservoir	1.9%	2
Tsunami Trail at Neah-Kah-Nie Middle/High School	2.8%	3
NE 15th Street	2.8%	3
N. 3rd Street Reservoir	15.0%	16
S. 3rd Avenue	4.7%	5
Washington Street	6.5%	7
Twin Rocks Water Reservoir	0.9%	1
Gravel Pit	0.9%	1
I'm not sure	6.5%	7
I do not own a second home or rental property	57.9%	62

Totals: 107

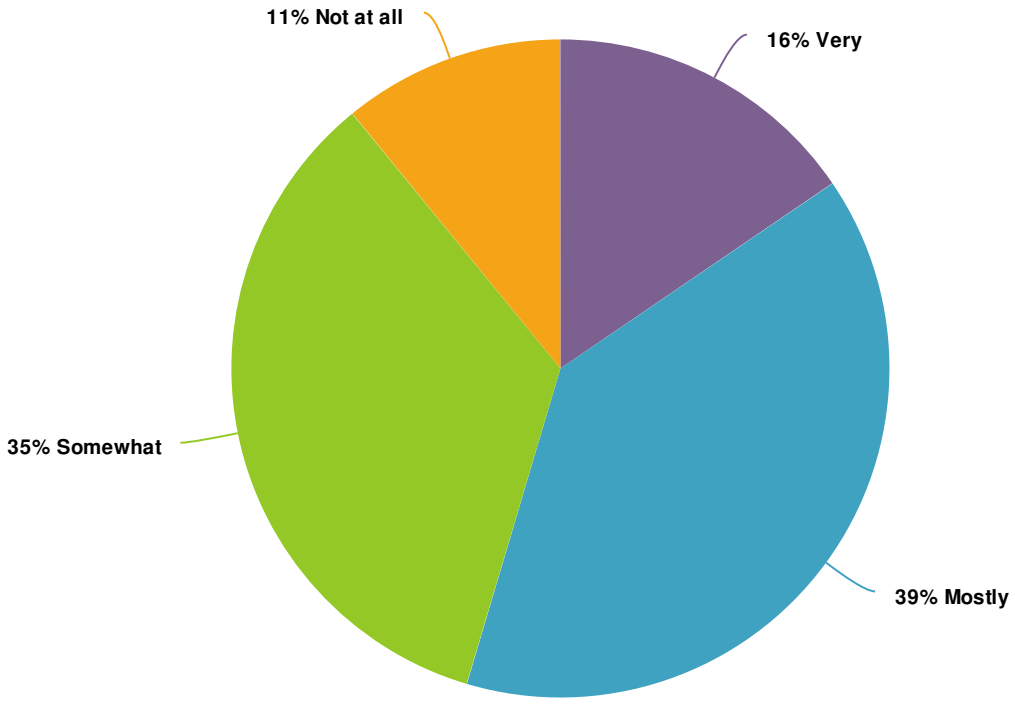
11. If you own a rental or second home, is tsunami evacuation information posted in the home?



Value	Percent	Responses
Yes	24.8%	27
No	16.5%	18
I do not own a second home or rental property	58.7%	64

Totals: 109

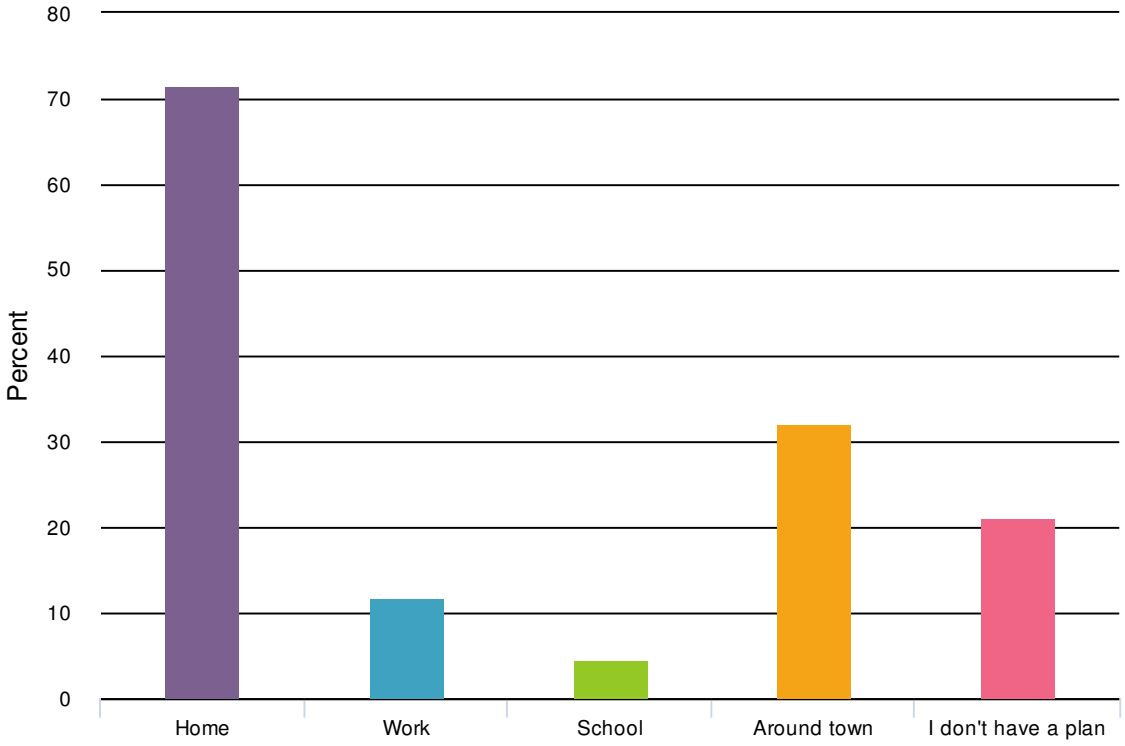
12. How prepared are you to evacuate if a tsunami hits Rockaway Beach?



Value	Percent	Responses
Very	15.5%	17
Mostly	39.1%	43
Somewhat	34.5%	38
Not at all	10.9%	12

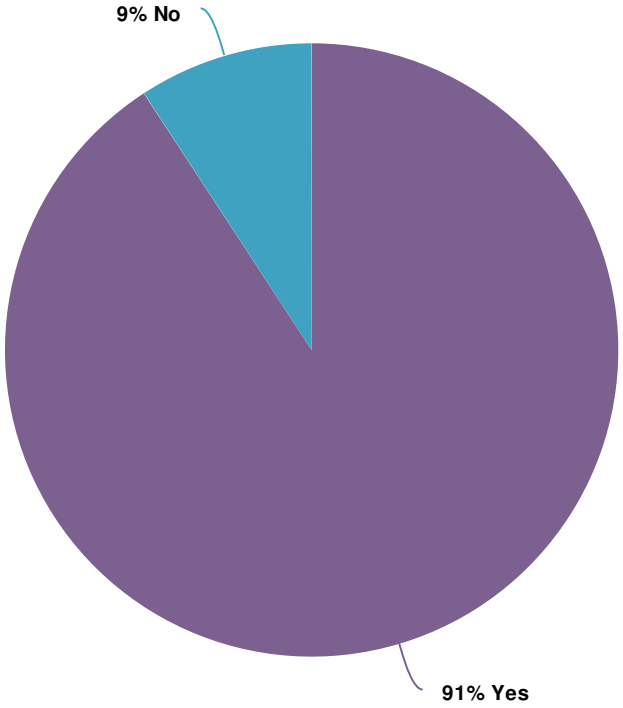
Totals: 110

13. Do you have a tsunami evacuation plan from any of the following areas? (you may choose more than one)



Value	Percent	Responses
Home	71.6%	78
Work	11.9%	13
School	4.6%	5
Around town	32.1%	35
I don't have a plan	21.1%	23

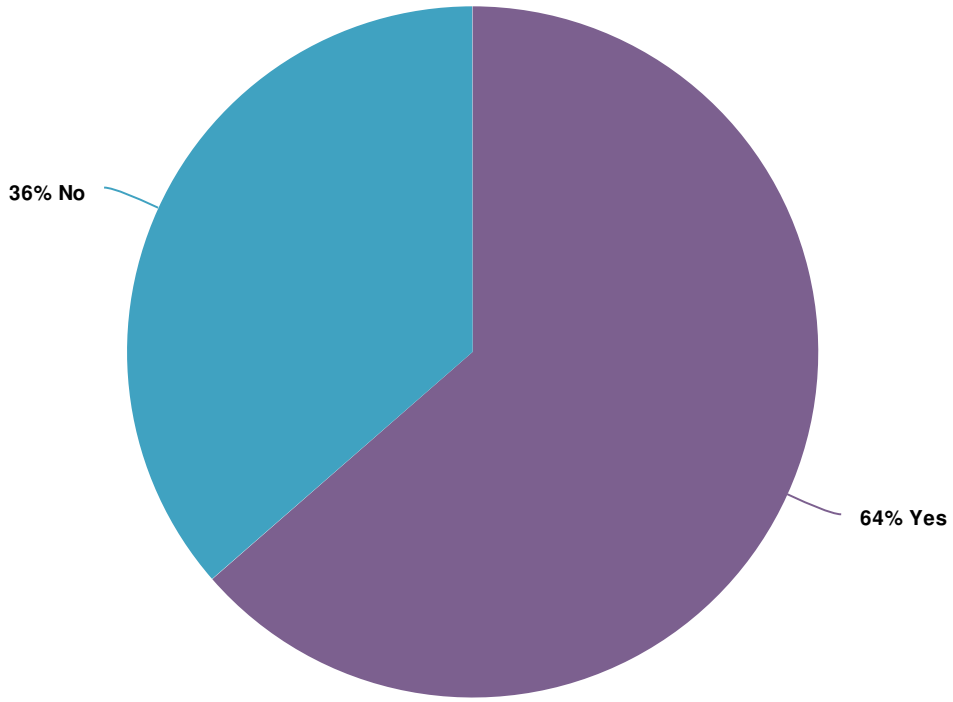
14. If you had friends or family visiting from out of town, would you be able to tell them where to run in order to reach safety in the event of an earthquake and tsunami?



Value	Percent	Responses
Yes	90.8%	99
No	9.2%	10

Totals: 109

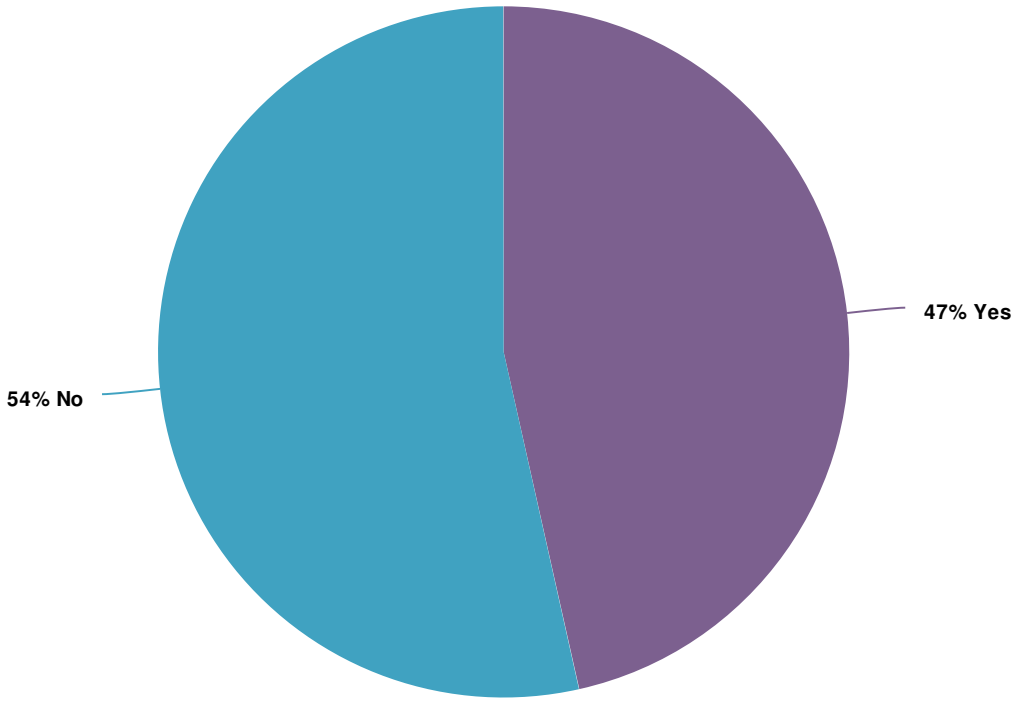
15. Do you have a tsunami emergency backpack to take with you in the event of an evacuation?



Value	Percent	Responses
Yes	63.6%	70
No	36.4%	40

Totals: 110

16. Do you feel that the city's current tsunami escape route signage is sufficient in the daytime?



Value	Percent	Responses
Yes	46.5%	46
No	53.5%	53

Totals: 99

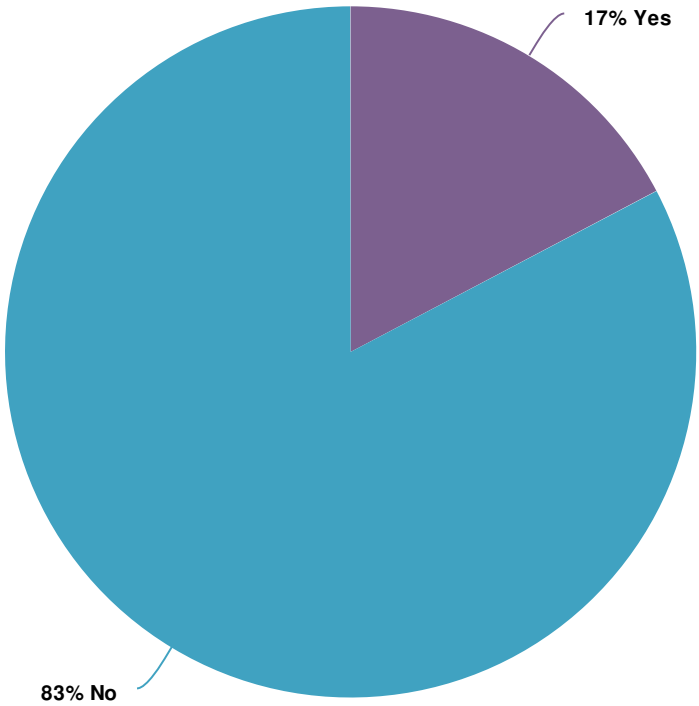
17. Do you have recommendations for signage improvement in the daytime?

ResponseID	Response
7	Purchase signs via OEM grant and place throughout town.
11	More signs in neighbwith directions and arrows pointing to the correct direction to go.orhoods
12	More signs are currently applied for.
13	More signs with arrows pointing along every route.
15	The 'Gravel Pit' does not have clear signage visible from US101.
16	Have larger signs.
17	Larger and more visible.
21	More signage is better. If I drive 2-3 blocks, I should see signage.
24	More signs are needed and also should inform people when they reach a safe zone.
25	Pathways like Manzanita
27	Larger signs and also multiple along the route
28	No
30	No clue when I am actually IN an assembly area. Please post instruction on what to do next

ResponseID	Response
31	Assembly area is on map, but not marked when you arrive.
32	Banding all street/stop signs with reflective tape... Red in the zone, yellow outside the zone, should be reinstated.
36	More and more prominent signs, especially to get up towards the east end of South Second
37	little larger signs and a few more directing people to the location nearest to them.
38	Put up Additional signage - you have very little.
43	Reflective for night. Marks on the road/ground on the route. Signs marking the evacuation spots, next step instructions and assembly instructions.
45	1) Painted signage on roadways and sidewalks pavement 2) Large street and sidewalk pole signage in more visible colors, such as safety orange or green, rather than the current blue white
51	Putting signs on highway 101 at all access streets
60	Maybe just more signage.
62	Sign with arrow at Hwy 101 and streets leading uphill to evacuate sites
63	Signs need to be bigger. You should add an option of "somewhat" to a few of these questions :)
65	There's gaps in the signage. It points you in one direction but when you get to a T there's no guidance on which way to go from there.
69	Painted walking path or lone striping indicating the safe path
76	No
85	Trail on Washington street needs lots of work
87	Establish signs so you can tell when you leave the zone.
89	Consistent color in signs
93	no
96	Signs designated in each evacution route with a stand out post board indicating route locations
97	More signage in beach areas

ResponseID	Response
99	Bright Blue posts for the route, paint is fine. Flag at top, blue. Visable signage along 101 on BOTH sides of the hiway.,
100	None
101	More signage to direct people from their streets
104	Put some up - coming into Rockaway from the south there are 2 signs! Coming from the North I don't see any. There is one at Pacific View Estates but no one will pay any attention as it points downhill. Difficult to know when you get to the assembly area as there are no signs
105	I would appriciate signige to the highest point closest to the S. 3rd St meeting site
112	More, bigger
123	Bigger/ bolder signage.
136	Increase amount of signage
137	Painted on streets

18. Do you feel that the city's current tsunami escape route signage is sufficiently visible at night?



Value	Percent	Responses
Yes	17.3%	17
No	82.7%	81

Totals: 98

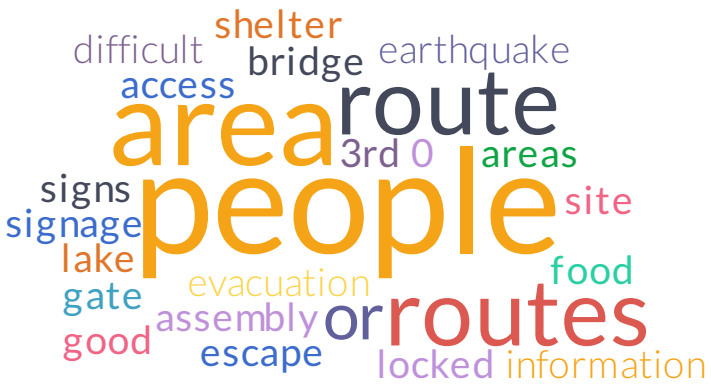
19. Do you have recommendations for signage improvement at night?

ResponseID	Response
7	Make sure signage has reflective components to it.
11	I'm not sure how to address this issue.
12	Reflective signs on pavement.
13	More signage along routes.
15	Reflective signs visible from US101 (in particular, the 'Gravel Pit' evacuation site.
16	Add solar lights.
17	Larger and more visible.
21	Bigger reflective signs
24	Street refective arrows. Lighted evacuation signs.
25	More visible
27	Not sure
28	No
30	Solar lighting
31	Anything that helps is better than current situation. Maybe solar signs?

ResponseID	Response
32	As above with the reflective tape.
36	Larger and more reflective signs
37	same as above
38	put up more signage and make sure it shows up without headlights on it as folks are not going to be driving.
43	Reflective
45	1) Pole signage placed under street lights 2) Highly reflective paint signage painted on roadways and sidewalks pavements
50	Lighting
51	"
57	Love the darkness of our small town, but can also be improved
58	Signs that would light up during an emergency
60	Again, maybe just more signage
62	Same as day.
63	They need to be bigger. But they would most likely fall anyway.
65	See previous note
74	The evacuation stairs in nedonna beach are hidden, not signed well and rickety. And where to go from the top at hwy 101 is unclear
76	No
77	Perhaps a solar light showing the entrance to the escape trail
87	Make them reflective.
88	Not really. Larger, more reflective maybe?
89	Solar power to light Assembly area zign
93	na
96	Rather a flashing light over head to sign with guidance indicating area

ResponseID	Response
97	Lighting that can work w/o electricity
99	Flouresent sign painted to map out the route, glow in the dark. Bright solar light a top a 4 x 4 post that comes on at dusk at assembly area. Off at dawn Path cleared, and markers at entry, again, solar lights and flourecent paint on posts to outline it along the road. At least six feet in both directions. Maybe reflective street signs with the blue directional arrows if budget would .allow.
100	Solar lights on the signs. Emergency lights at assembly areas. Probably have no power in city. Probably lose current location on emergency generators storage.
101	More lighting on main streets (like N. 3rd) all the way to the evacuation point. Maybe solar powered signs with lighting in case of outages.
104	First you need to have some signs. Second take a clue from road signs - they are not blue and white- moreover there won't be any street lights at this point. There must be some material that would hold heat/light during the day and be viewable in the dark
105	no
112	Better, uninterruptible system
118	light it up
123	Bigger/ bolder/ reflective signage to be seen at night
130	Not sure.
134	The trail on the Washington St at Juniper St. needs maintenance. The trail needs to be better defined
136	Increase amount of signage
137	Florescent paint on streets

20. Where do you see gaps in existing tsunami evacuation routes? Please be as specific as possible.

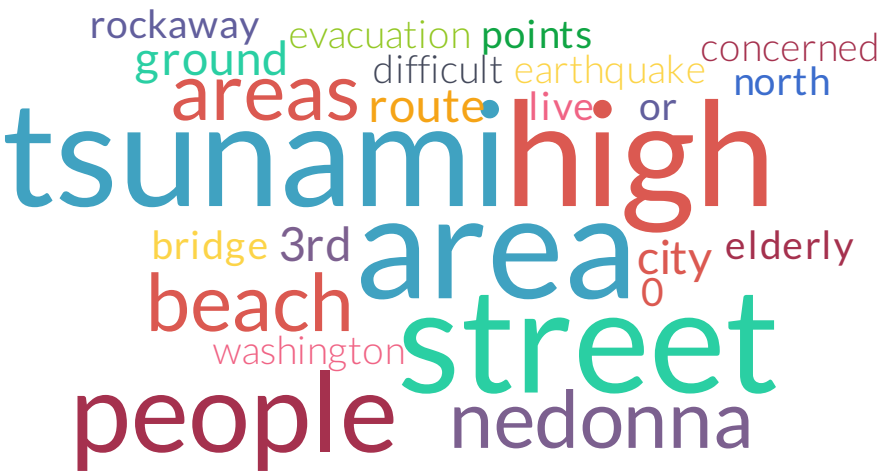


ResponseID	Response
10	People in town do not know where to go whi are not local.
12	Some routes are not easily navigated. The sites are too small. No shelter or food.
13	Again. Signage needs to be increased along current routes. All streets need to be signed to their respective safe areas.
16	S. 6th is in the middle of a large gap.
19	S 3rd Ave evacuation site appears to be in a landslide zone. Also access to the site appears to be blocked by landslides. Reference SLIDO map layers. Given a significant Tsunami would necessarily indicate a significant earthquake which would trigger the landslides thus comprising the assembly site.
21	Engage the businesses to provide information to visitors. Practice drills for the community
24	My escape route is very difficult to navigate....too steep and not enough improvements on the route.
25	More signage in neigborhoods, not just on main streets
26	In the Nedonna Beach area - the stairs to go up to the railroad tracks are often slippery and in disrepair. Neighbours try to fix them regularly. The worst stairs are at Section Line Rd.
27	I think the routes are good

ResponseID	Response
30	North 3 has no clear assembly area. No shelter. A locked gate with a pedestrian bypass.
31	Locked gate on north 3rd might prevent emergency vehicles. No INSTRUCTIONS, shelter, water, food, medical at assembly area.
36	Fro example, signs showing exactly how to get from City Hall to an assembly point
38	There is absolutely no signage that informs you that you are there.
40	I do not ee one in our area at all/
42	People across railroad tracks by ocean have no route if running towards Lake Lytle. The bridge maybe out
43	Some do not have enogh room
45	1) There are not enough evacuation routes 2) The current routes are too far apart- slow citizens cannot access them 3) Routes need to be added that do not require people to cross a bridge which may collapse 4) There needs to be paths (not streets) connecting all the evacuation sites 5) Few people talk about this, but the greatest issue with the evacuation routes and sites is that they are located in high slide areas. if there is a close earthquake, all of the evacuation routes and slides will be buried in a landslide.
52	I know to run up the hill, but then what? Is there somewhere to stay? Somewhere that information will be sent? Will I even know I'm there when I get there?
62	None
63	The routes I know of at the end of both Washington and Victoria are treacherous. I am assuming there would also be trees and power lines down to make it even worse. Plus the chances of getting to your evacuation pack would be unlikely as you escape out a window or whatever so it would be nice if there was a container in the twin rocks area such as what is up 3rd street for people to store things in.
72	Too difficult
77	The trail is pretty steep Older folks or handicapped might have trouble getting up there. I haven't gone up the trail for more than a year, but maybe a rope or something to help pull yourself up would help;
80	My tsunami escape route is blocked by a gate.
81	on out escape route there is a bridge on NE 12th that could fall during the earthquake.
85	Not safe for handicapped people

ResponseID	Response
86	When money allows it would be nice to have containers at each site for additional storage of extra water/food. Also hopefully people could use the containers to keep out of the elements when needed, if possible.
93	na
96	Central part of the town toward the hights
97	At the beaches
99	I have a document detailing my concerns and can submit it through email, upon request.
100	Plan has always assumed Evan by foot with no provision for shelter or housing, sanitation or protection of evacuees. Probably be on our own for 2 weeks as an earthquake driven tsunami may take out both coast road and hwy 6. School district field was designated helicopter landing site. Do not know if ball field affected that. Anticipating 1/3 of city damaged including city hall fire and police svc
101	Haven't studied it. People with physical impairments would have difficulties because of the terrain in most areas.
109	Not enough signs along route, where meeting area is, storage for supplies, some access difficult to navigate.
112	Higher ground is far away and the higher ground is rather abrupt.
119	more signs
123	I don't see that the areas of N Pacific st/ 5th-10th street have very good options. Either 3rd street in town, or Neakahnie HS area, are options, none of which can be accessed very quickly. Realizing Lake Lyle inhibits access up.
124	My wife and I are middle aged and pretty good shape. It was difficult for us to climb the trail at the end of Washington street. Our older neighbors would not be able to make it up that trail.
130	I think the gaps lie mostly with people and their willingness to be prepared. When we bought our second home in RB we made an effort to walk our evacuation route and time it. It was a realistic exercise for us, and an eye opener. I know our go-bag could be more robust. I believe it is by education that people will be most prepared. This survey was a good example. Thanks for taking this topic seriously.
131	concern about the resiliency of the bridge over the creek from Lake Lytle both the roadway and the trestle
137	There are not enough evacuation routes, routes are mostly on locked logging roads, needs supply storage buildings, needs information easily displayed

21. Are there areas within the City that you are most concerned about in terms of tsunami evacuation success? Please be as specific as possible.



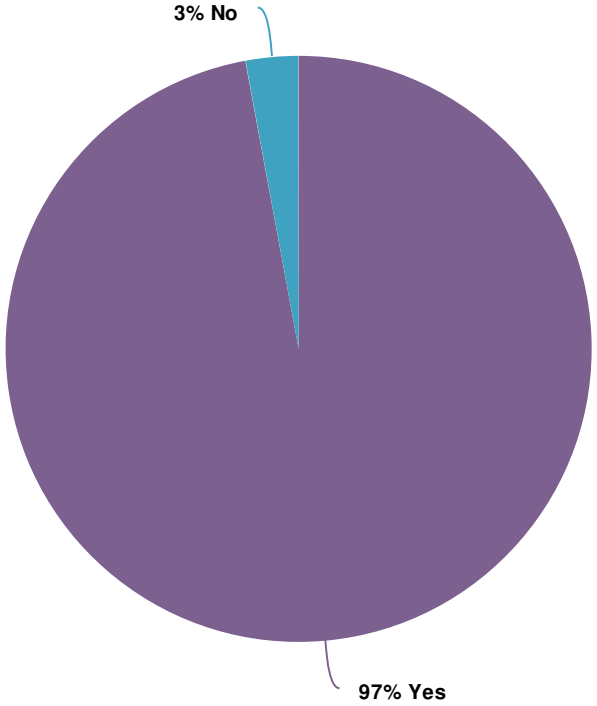
ResponseID	Response
7	Concerned about Nedonna Beach area and the beach itself.
12	Nedonna
13	All low lying areas along 101. Especially the elderly and infirm.
16	Washington Street is not a great route due to overgrowth and mid. Victoria St is not much better.
19	All assembly sites should be checked against the SLIDO map layers. Some of the sites may be in landslide map zones.
24	I think the assembly areas in thenorth section of town are a long ways from some of the homes north of the high school.
25	Beachfront areas
26	The biggest concern is that we have no notification system for incoming tsunamis. I wish the siren that I frequently hear could be used. I think people know that if they feel an earthquake, to run for the hills. But if the earthquake isn't felt on land - unless you happen to hear the news - you'd have no way to know that there's a big wave heading in.
27	I don't understand what happens after the gates on the north 3rd route. I worry people with limited mobility will struggle and it is not clear how far to go.
30	Nedonna

ResponseID	Response
31	Nedonna
32	The Fire Station is the LAST place to go.
36	When there is a magnitude 9 earthquake the tsunami will strike in 10 - 15 minutes. Roads and streets may well be impassable, so getting from Hwy 101 to high ground in a short time will be difficult.
38	There are very few signs - if something happened in the summer, visitors would be lost as to where to go. There should be signs down by the beach. The sign going up to Pacific View Estates points the opposite way- down. Visitors and even those living in Rockaway will not follow that and will scramble up the hill assuming it has not been blocked.
40	The one off Washington St would be way too difficult to get to for the elderly people I know.
43	Routes that rely on bridges
45	1) the areas requiring bridge access 2) The school complex area 3) The school administration building also house a pre-school (N. 3rd Street) 4) All the police and emergency equipment is located in both a tsunami and a slide area 5) In general, I am concerned about accessibility for the many elderly people who live in the city
54	We do have a house on s 6th and lots of older folks live permanently on that street. S 3rd or Washington are a ways away for meeting points.
56	Twin Rocks, Pine Beach Loop neighborhood. The neighborhood is trapped between ocean and Smith Lake. Evacuation route not marked well.
61	would like to have an evacuation plan mailed with out, perhaps with city newsletter or water bill that gives the evacuation route. I would post at my 2nd home. Sometimes we have relatives and friends stay there who may not be familiar or know what to do in an emergency. Perhaps this has already been done, but maybe it would be good to do it yearly.
62	If it happens during busy times... we're screwed.
63	I am not sure. I do not believe our City should be advertising that we are Tsunami prepared as I do not believe we are. I am happy there is a group working on this.
86	it is necessary to get to high ground and hopefully people will be able to maneuver elevation easily.
87	WAshington Street site. Hard to access.
89	Nedonna

ResponseID	Response
93	no
94	Some simple signs on each street/road heading East into high ground marking the most likely extent of a major tsunami; still confused about what areas are in the tsunami flood zone. Maps posted on sites are often too small to read.
96	Plans for the disabled is there a response team
97	Beaches
99	North 3rd street leads into an area that you can't find an easy way out of. it does not have exit to Quadrant. They get down in there and can't get out with any safe means. Walk it.
100	See previous
104	The whole downtown and the area from Washington street to south second
105	I feel that we need to be directed to the highest points closest to where we live, and I would like to know that there are stored survival supplied for our use for Rockaway proper above the tsunami water level
107	Beach
112	The whole "lower" area.
119	down town
122	Washington/Juniper St pathway is too steep and difficult for those with mobility issues.
123	I do not believe signage is as visible as it could be. It would be nice to know where all Warning Sirens are located and if they are in working order. I've heard some on N Pacific are no longer working. Cannon Beach uses an interesting tsunami warning system with the cow signals, and practice sessions are done regularly / monthly? If Rockaway Beach does have working Tsnmai sirens, other than the fire dept in town, perhaps considering something similar.
124	Maybe there can be a joint project with the city where volunteers could get together and help make improvements to the evaluation routes. For example, it would be great if there were stairs at then end of Washington but I understand the material and labor costs would be quite high. Perhaps the trail could have more switchbacks to make it easier to climb.
125	Concerned about having to cross bridge that may no longer be in place following an earthquake

ResponseID	Response
127	The survivability of a tsunami that is not proceed by a nearby strong earthquake is high. If however it is triggered by a local strong quake I am expecting most of the area along 101 from the Nehalem to Tillamook Bays to liquify with building and road collapses making if impossible to get to higher ground. I don't think there is anything that can be done to mitigate that.
128	Very Steep Climb to most of them.
130	I think if it was a busy summer weekend, many people would not have a clue where to go, thereby making it difficult for everyone else.
137	1) There are no connection routes between the evacuation routes. 2) The downtown area has the greatest population with not enough evacuation information or supplies. 3) All logging roads are locked and the key is not easily accessible. 4) The bridge by the high school may collapse leaving the school stranded.

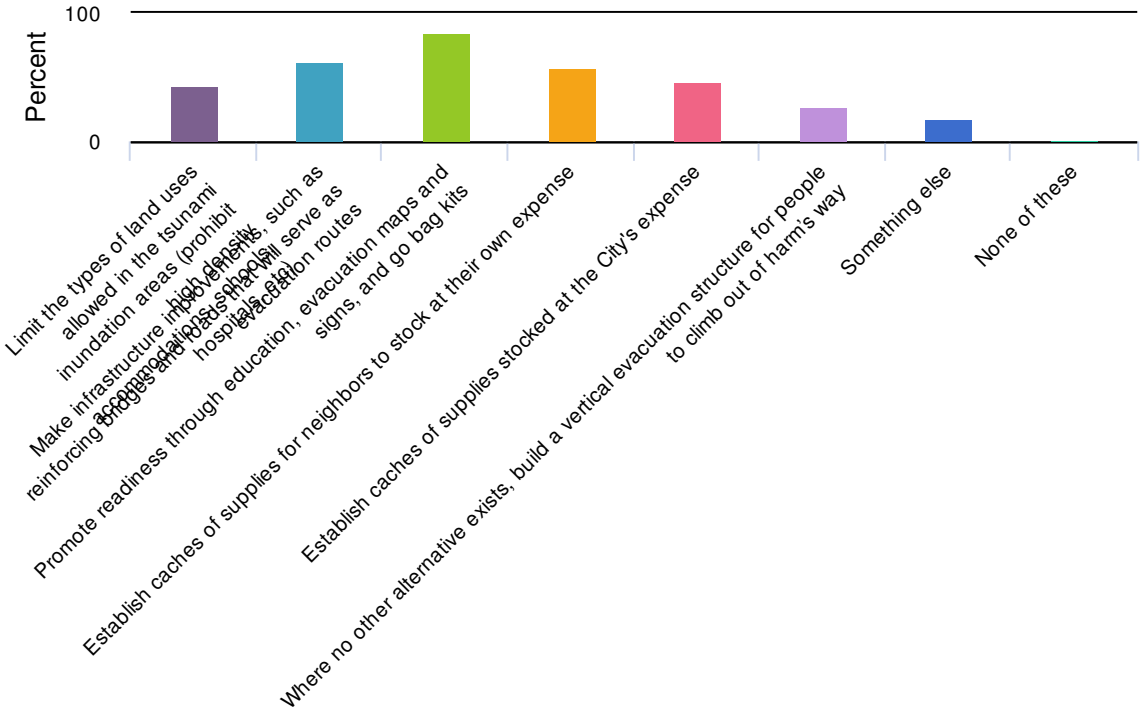
22. Would you support efforts by the City to improve tsunami evacuation facilities?



Value	Percent	Responses
Yes	97.1%	100
No	2.9%	3

Totals: 103

23. Which of the following tsunami preparedness efforts would you like for the City to pursue? (you may choose more than one)



Value	Percent	Responses
Limit the types of land uses allowed in the tsunami inundation areas (prohibit high density accommodations, schools, hospitals, etc)	43.8%	46
Make infrastructure improvements, such as reinforcing bridges and roads that will serve as evacuation routes	61.9%	65
Promote readiness through education, evacuation maps and signs, and go bag kits	84.8%	89
Establish caches of supplies for neighbors to stock at their own expense	58.1%	61
Establish caches of supplies stocked at the City's expense	47.6%	50
Where no other alternative exists, build a vertical evacuation structure for people to climb out of harm's way	27.6%	29
Something else	18.1%	19
None of these	1.9%	2

Something else	Count
Have we ever had a "practice run"	1
Buy and develop safe assembly spot with shelters and supplies and alternative fire, police and public works suoport areas and supplies and equipment.	1
City emergency facilities - fire and police stations - are going to be under water within 15 minutes of a large earthquake. They are not located safely.	1
Construct more evacuation routes and sites	1
Get grants for shelters and supplies.	1
Hire a full time emergency preparedness manager	1
Improve the actual evacuation routes once they leave a road.	1
Improve trails so old folks can get up them.	1
Our evacuation route is behind a locked gate - not conducive to handicap in event of evacuation - look at remediation options	1
Print maps showing the areas that will be most effected by a tsunami with elevations	1
Provide evacuation facilities.	1
Provide storage containers for locals to store food at their expense in the event of tsunami, water storage at evacuation locations.	1
Rebuild and consolidate emergency services at a higher elevation to ensure their functionality in a natural disaster.	1
See previous	1
help for citizens to establish where the highest ground is most quickly accsessed in case of an emergency	1
improvements to evacuation routes where they are physically challanging (i.e. Washington Street)	1
make sure that City communication efforts can be operated by those close to the communications shack and not be dependent on 1 or 2 people who may not be able to get there.	1
more clarity on how we will be notified in an emergency	1
Totals	18

Appendix 7 - Tsunami Evacuation Facilities Workshop with Emergency Management Committee

January 15, 2018

Notes from Maps and Discussion

Group Discussion

- Need supplies for 2 months of survival at assembly areas, based on Tillamook County recommendations
- Need shelters at assembly areas or accessible post-disaster, with signage to direct people to shelter areas
- Who will lead implementation of these projects once we have funding? City emergency manager position, police, fire?
- Who controls supplies before/after disaster?

South Map Group 1

- Victoria assembly area easier to access than Washington area, easier to build shelters here, but there is less room
- Need connection between Washington and Victoria assembly areas, creek crossing could be challenging
- Creeks as water sources
- Washington assembly area not easily accessible – is steep, need to use rope
- Area that will evacuate to Washington and Victoria assembly areas has a higher population density of full-timers than other areas of the city
- Will culverts hold up? Culverts at intersections of Highway 101 and S 6th, Nehalem
- Emergency radio center and water tower at top of hill behind Pacific View Estates
- Signage needed at intersections along Highway 101
- Potential slide area on north side of Pacific View Estates hill
- Do water towers need to be reinforced?
- Trails between assembly areas
- Do water towers need to be reinforced?
- Space for shelters at 3rd Street Reservoir, Rock Creek assembly areas
- Strategies for communication with tourists – signage in short term rentals or motel rooms?
- Make sure Camp Magruder and Twin Rocks Friends Camp have the resources they need
- Need for collaboration between Planning and Emergency Management

Central Map Group 1

- Retrofit bridges on Highway 101 and 12th street
- Possible tie-in with Salmonberry Trail project at 101 bridge?
- Signage needed at each intersection along Highway 101
- Trail connectivity between assembly areas
- School district owned land above 17th St assembly area
- Streams identified as water source

- Who owns assembly areas?
- Shelters and supplies - how many people to plan for?
- Are logging roads maintained/accessible for evacuation? Can they be mapped?

North Map Group 1

- Signage and information needs to be accessible for people who speak a language other than English
- Emergency services need to be located outside inundation areas
- Crossing highway danger
- Vehicle evacuation vs. pedestrians on Highway 101
- Community improvements on trails out of Nedonna Beach
- Planned emergency access road at top of Adah Hidy? Flatter terrain, easier access for older people
- Only one vehicle access point to Nedonna
- Community has set up storage for supplies at reservoirs – bring your own supplies
- What to use for shelters? RV park/storage?
- Shelters at school assembly area?
- Schools can be used as shelters, if still standing
- Communication with school district? HAM radios?
- 2,000-gallon propane tank on school grounds

South Map Group 2

- After event "traffic" plan: where/how/direction in order to consolidate
- Mark power lines
- Shelter and cache at 3rd street reservoir
- Use mapped neighbors and grids and zones (from CERT)

Central Map Group 2

- Shelter at 17th st assembly area? Need places for people to sit down at the shelters.
- Trails in "green" between assembly areas?
- Replace/retrofit bridge on 12th. Pedestrian bridge?
- Water reservoir was built in 2009 so may survive the earthquake. Stores 2 million gallons.
- Integrate evacuation route maps with logging road maps for post-disaster traveling.
- Area at 3rd and Palisades is the spot the City is looking at for the relocation of the Police and Fire Stations.

North Map Group 2

- Solar lighting along evacuation routes, reflective
- Pedestrian bridge, retrofit 101 bridge
- Stairs have been built by Homeowners associations in this area to cross Highway 101