Pacific County Planning Commission
And
Leadbetter Farms
Zoning Workshop
Rural Small-Scale Recreational Tourist Uses

February 2, 2017

Agenda

1. Recap of Planning Commission Study Session of October 6, 2016

   - WAC 365-196-425 Rural Element
   - GMA authority for Type 2 LAMIRDs – Small-scale tourist or recreational uses
   - Not required to designate on future land use map
   - "may allow them as a conditional use"

2. Planning Commission questions for further research

   a) Experience of Jefferson, Island, Skagit and San Juan counties
   b) Unintended consequences?
   c) Neighborhood compatibility?

3. Proposed Zoning Code Amendment

   a) Modeling Jefferson County
   b) Jefferson County recommendation to utilize net acreage unencumbered by critical areas and buffers

4. Zoning Code §21 G EXCEPTIONS TO HEIGHT REGULATIONS – tsunami shelter

Tab A

January 24, 2017
To: Alan Wallace
Re: CAM17-00041 Small Scale Recreation and Tourism Code
From: Joel Peterson, Associate Planner, Jefferson County Department of Community Development

Discussion of JCC 18.20.350 Small-Scale Recreation and Tourist Uses

Jefferson County hasn't had many Small-Scale Recreation and Tourist (SRT) use applications. Examples of projects we've reviewed include developments for kayak rentals, equestrian trails, outdoor shooting range and rental cabins. There has been recent interest in agritourism, which is regulated under our Agricultural Activities and Accessory Uses portion of the code (JCC 18.20.030)

There is one comment that I would like to emphasize regarding the functionality of our regulations and a possible improvement to consider: In Jefferson County Code (JCC) at 18.20.350 (9) *Rural Recreational Lodging or Cabins for Overnight Rental and Recreational Cultural or Religious Conference Center/Retreat Facilities*, the calculation for the allowed square footage for cabin rental space based on parcel size doesn't take Critical Areas into consideration. For example, with a 20-acre site, a proposal would allow up to 12,000 square feet gross floor area for up to 30 cabins (JCC 18.20.350(9)(b)). In one proposal we reviewed, a large portion of the project's parcel was encumbered by wetlands, a geologically hazardous area, and concomitant buffers and building setbacks. The critical areas and site topography created a situation where—to avoid critical areas—the applicant moved all the proposed cabins into the remaining buildable areas, creating a relatively high cabin density, and high intensity of use, on one area of the site. It raised public concern. <u>It may be worth considering using a net acreage, after critical areas are removed from the calculation, to determine allowable square footage of cabin space</u>.

Regarding public involvement, Jefferson County citizens seem to be actively interested in SRT projects and planners often have various viewpoints to consider.

Our use table (JCC 18.15.040), performance and use standards (Chapter 18.20 JCC), and development standards (Chapter 18.30 JCC), all reflect standards to protect the rural character of Jefferson County, which is articulated well in our Comprehensive Plan. The code sections pertaining to SRT standards are sensitive to intensity of use and nuisance factors. Concerns by neighboring landowners are addressed through SEPA substantive authority and through the conditions placed on the conditional use permit from the development regulations.

With few exceptions, the SRT is permitted through a conditional use permit process. As you see in the use table, the SRT use typically is not permitted in smaller commercial zones or the rural industrial districts, but is often in the rural residential districts.

We don't classify SRT projects necessarily as a LAMIRD. See in JCC 18.20.350(2) that the SRT code says a project must be consistent with RCW 36.70A.070(5)(d), an RCW which describes LAMIRDS and limitations on establishing them. With this perspective, not every rural development or small-scale recreation development would be at the scale of a LAMIRD, and if so, it would need to have an additional analysis of establishing a Logical Outer Boundary and avoiding induced sprawl. "The county shall establish the logical outer boundary of an area of more intensive rural development" (36.70A.070 (5)(d)(iv). Jefferson County has not seen any Small-Scale Recreation and Tourist proposals which would

possibly create a new LAMIRD. We do have a couple of Master Planned Resorts, which is another kettle of fish.

Jefferson County has gone through the process of identifying Logical Outer Boundaries for all of our LAMIRDS based on above & below-ground infrastructure in place at July 1, 1990 (RCW 36.70A.070 (5)(d)(v)). Early in Jefferson County's GMA planning, we had to respond to a Petition for Review through the Growth Management Hearing's Board because some of the LAMIRDS were thought to be oversized. Jefferson County responded by tightened-up all the LAMIRD Logical Outer Boundaries—even creating a lot of split zoned parcels so as not to include areas that were not served by infrastructure in order to comply.

The development standards we see in Jefferson County Code possibly would not allow a SRT project to reach that level of development intensity that would necessitate designating a LAMIRD, thereby preserving our rural character.

Since Jefferson County is entirely a rural county, with exception of the Port Townsend UGA and the Irondale/Port Hadlock UGA, close attention is given to maintain rural character (viz. 36.70A.030 (15)), as documented in our Comprehensive Plan and through use standards and development standards.

The Path through our Code (with some annotations)

Chapter 18.15 JCC Land Use Districts

Jefferson County created two overlay zones of Brinnon and the west side of Jefferson County to provide expanded rural-compatible employment opportunities in these sparsely populated rural areas. The provisions allow additional latitude for cottage industry and home business proposals in these economically challenged areas. (See JCC 18.15.455 Remote Rural Overlay Districts for the West End Planning Area and the Brinnon Planning Area.)

Similarly, there are SRT overlays for these two planning areas. Note that, as an artifact of code revisions, the SRT provisions for the West End Planning Area is tacked onto the aforementioned home business/cottage industry overlay district and is found at JCC 18.15.470, while the SRT Overlay District is found in JCC 18.15.572 and addresses only Wa Wa Point from the Brinnon Sub-Area Plan.

Chapter 18.20 JCC Performance and Use-Specific Standards

18.20.350 Small-scale recreation and tourist uses.

Applicability: "Small-scale recreational and tourist uses rely on a rural location and setting and provide opportunities to diversify the economy of rural Jefferson County by utilizing the county's abundant recreational opportunities and scenic and natural amenities in an environmentally sensitive manner consistent with the rural character of the county." Refer to the full code text.

JCC 18.20.350(3) Any SRT project must also meet the following standards:

18.20.140 Commercial Uses—Standards for Site Development

18.20.290 Recreational Developments
Chapter 18.22 Critical Areas
Chapter 18.25 Shoreline Master Program, if applicable

Chapter 18.30 JCC Development Standards

Any SRT proposal, by nature of being a commercial development would also need to comply with all the general development standards and lighting, landscaping/screening, stormwater, et cetera. These development standards also address setbacks

Permit Case Summary

Case Number: Search Help

Case Number: ZON16-00015	Case Status: Pending	Date Received: 5/23/2016 5:49:20 PM
Description: Delaware North proposes to construct rural recreational overnight lodging on the property currently known as Sea Crest. The project proposal is to build 24 additional 1 bedroom luxury cabins for public use as short term rentals under provisions of the Small Scale Recreation and Tourist Uses, Jefferson County Code 18.20.350. Required approvals include a Reasonable Economic Use Variance, Conditional (discretionary) Use Permit, and Lot Consolidation to combine parcels for the required acreage (approximately 20 acres) to accommodate the number of cabins and total gross floor area proposed. The project will be subject to environmental review under State Environmental Policy Act (SEPA). The proposal is located in the Remote Rural Overlay District for the West End Planning Area.		Date Issued:
Applicant: DEREK ZWICKEY		Expiration Date:
Site Address: 153573 HWY 101		Case Finaled:
Parcel No: 413273002- Other Cases Parcel Data Map It Parcels		

Case Actions

Below is a list of actions that have been taken by staff for this permit case. They are sorted based on the date they were added to the database with most recent actions at the top. A value in the "Date Completed" field indicates that the action has been completed.

Description: A Clock Interrupt
Date Completed:
Disposition:

Description: Additional Info Request-DRD
Date Completed:
Disposition:

Description: DCD Review Time
Date Completed: 7/14/2016
Disposition:

Description: DRD Reviewer Letter (F)
Date Completed: 7/1/2016
Disposition: DONE

Description: Ntc of App +14-Publish-U
Date Completed: 7/1/2016
Disposition: DONE


SEA CREST

Forks

Tab B

SECTION 21 - SUPPLEMENTARY DISTRICT REGULATIONS

R-L and R-R

Z. ~~18.20.350~~ **Small-scale recreation and tourist uses.**

(1) Small-Scale Recreation and Tourist Uses. Small-scale recreational and tourist uses rely on a rural location and setting and provide opportunities to diversify the economy of rural ~~Jefferson~~ Pacific County by utilizing the county's abundant recreational opportunities and scenic and natural amenities in an environmentally sensitive manner consistent with the rural character of the county. Upon approval pursuant to this code, these types of uses may be conducted in the land use districts ~~specified in Table 3-1 in JCC 18.15.040 and as provided for in small-scale recreation and tourist (SRT) overlay districts under JCC 18.15.572. Agritourism on designated agricultural lands is regulated in JCC 18.20.030, agricultural activities and accessory uses.~~ The following list of uses is not intended to be exhaustive, but rather is intended to be illustrative of the types of small-scale recreation or tourist uses:

(a) Aerial recreational activities such as balloon rides, glider and parachute events;

(b) Animal preserves and game farms;

(c) Equestrian centers, on parcels 10 acres or larger in size;

(d) Campgrounds and camping facilities;

(e) Commercial fishing ponds;

(f) Cultural festivals;

(g) Miniature golf, not to exceed a gross use area of one acre;

(h) Model hobby parks and sites on parcels 10 acres or larger in size;

(i) Outdoor recreational equipment rental and/or guide services;

(j) Outdoor shooting and archery ranges;

(k) Private hunting or fishing camps;

(l) Public display gardens;

(m) Recreational off-road vehicle (ORV) and all terrain vehicle (ATV) parks and recreational areas on parcels 20 acres or larger in size;

(n) Recreational, cultural or religious conference center/retreat facilities on parcels 10 acres or larger in size;

(o) Recreational vehicle parks, travel trailer parks, and commercial campgrounds on parcels at least five acres in size;

(p) Rural restaurants, only when associated with a primary recreational or tourist use; and

(q) Rural recreational lodging or cabins for overnight rental on parcels 10 acres or larger in size.

(2) Unnamed Small-Scale Recreation or Tourist Uses. Other uses not specifically named above may be classified as small-scale recreational and tourist uses by the administrator, subject to the provisions of this section, upon documentation by the applicant that the proposed use is dependent upon a particular rural location or setting and is consistent with the intent and application of RCW 36.70A.070(5)(d) and the ~~Jefferson~~ Pacific County Comprehensive Plan.

(3) A small-scale recreation or tourist use shall meet the requirements of this code ~~(except as provided for in SRT overlay districts per JCC 18.15.572)~~, including the provisions of ~~JCC 18.20.290, Recreational developments, JCC 18.20.140, Commercial uses - Standards for site development~~; and the following standards: Section 21

(a) Small-scale recreation or tourist uses may include limited and commensurately scaled commercial facilities intended to serve those small-scale recreational or tourist uses (e.g., a gift shop, delicatessen, convenience store, or associated retail sales and services); provided, that the applicant can demonstrate the following to the satisfaction of the approving authority that:

(i) The principal demand for the commercial facilities is derived from the principal recreational or tourist use and not the existing and projected rural population;

(ii) The associated commercial activities shall be clearly accessory to and dependent upon the primary recreational or tourist uses;

(iii) The associated commercial activities, in addition to the principal recreational or tourist use, will not have a measurable detrimental traffic, noise, visual or public safety impact on adjacent properties;

(iv) The use and associated structure is clearly appropriate and compatible in scale, size, design and function with surrounding uses and environment;

(v) The use will not constitute new urban development in a rural area;

(vi) The public facilities and services provided are limited to those necessary to serve the associated commercial activities and the principal small-scale recreational or tourist use in a manner that does not permit low-density sprawl; and

(vii) All other applicable requirements and standards in this UDC are met.

(b) Unless a larger parcel size is specified, minimum lot size shall be ten net five acres, except that no minimum lot size is required for parcels that include a historic site, structure or landmark.

(c) Only one small-scale recreational or tourist use shall be allowed per legal lot of record, with the exception of rural restaurants.

(d) Only those buildings or areas specifically approved by the county may be used in the conduct of the business.

(e) Parking shall be contained on-site and provided in conformance with this code, including ~~JCC 18.30.100 and 18.30.130~~. Section 21.

calculated by subtracting all critical areas and their buffers,

(f) All activities shall, at a minimum, be screened from the view of adjacent residential uses subject to the landscaping and screening requirements of ~~JCC 18.30.130~~ Section 21 and set back a sufficient distance from all rear and side property lines to protect the character of adjacent and surrounding properties and uses. The approving authority may authorize variations to the setbacks established in ~~Table 6-1 in JCC 18.30.050~~ in order to ensure that any small-scale recreation or tourist use or structure, when proposed in or adjacent to a rural residential (RR) R-L and R-R Districts district, shall be compatible with and not disruptive to the character of existing and anticipated future uses in the district.

(g) All small-scale recreation or tourist uses shall utilize local access or minor collector roads for primary access whenever practicable. Access off of state routes, arterials, or major collector roads may be allowed if access improvements or a traffic analysis assures mobility is not degraded.

(h) Structures shall comply with the landscape, lighting, site coverage, and design standards set forth in ~~Chapter 18.30 JCC.~~ Section 21.

(i) Any small-scale recreational or tourist use development allowed under this section that proposes to include permanent occupancy on-site residential development may only be permitted subject to:

(i) The underlying rural residential density;

(ii) A master planned resort (MPR) district designation subject to a legislative action to amend the Comprehensive Plan; or

(iii) That necessary for on-site management (e.g., a caretaker's residence).

(j) For any small-scale recreation or tourist use, the county shall impose such reasonable conditions (e.g., location and size restrictions, design standards, landscape buffers, setbacks, etc.) as are found necessary by the approving authority to ensure that the activity or use, due to proximity, location or intensity:

(i) Is compatible with the rural character of adjacent lands and shorelines, including forestry, agriculture, and mineral lands of long-term commercial significance;

(ii) Does not disrupt the character of any surrounding permitted uses;

(iii) Is adequately served by public facilities and services (including roadway level of service and minimum fire flow requirements) without the need to extend those services in a manner that promotes low density sprawl;

(iv) Adequately protects environmentally sensitive areas including surface and groundwater resources; and

(v) Would not cumulatively, in combination with the effects of existing development (or given the probable development of subsequent projects with similar effects) in the vicinity (i.e., within one mile) of the proposed use, create a development pattern that constitutes low density sprawl; require the extension of public facilities or expansion of public services in a

manner that promotes low density sprawl; or be otherwise incompatible with or injurious to the rural character of the area;

~~(vi) For designated agricultural lands, converts as little land with prime agricultural soils as practicable into nonagricultural use.~~

(k) If the preceding conditions (in subsection (3)(j) of this section) cannot be met to the satisfaction of the approving authority, the use shall be denied.

(4) Expansion of Existing Small-Scale Recreational and Tourist Facilities.

(a) Where alteration, modification, or expansion of existing small-scale recreation and tourism facilities would increase the scope, scale or intensity of the use or facilities (e.g., adding meal service or new recreational facilities, adding new conference or lodging facilities), the proposal shall be subject to a conditional use permit and must demonstrate that the expansion of the existing use or location is reliant upon a rural location and setting.

(b) The approving authority may attach reasonable performance standards and/or conditions to ensure that alteration and expansion of such uses have minimal adverse impacts on surrounding areas and uses, maintains the rural character of the area; does not constitute low density sprawl, and is in compliance with RCW 36.70A.070(5)(d).

(c) Any alteration, modification or expansion of an existing small-scale recreation or tourist use shall require site plan approval consistent with the standards and requirements of this code.

(5) Aerial Recreational Activities. Aerial recreational activities may be approved as a small-scale recreation use provided the following standards are met:

(a) No permanent structures or improvements are required to carry out the activity;

(b) The proposal will comply with all FAA regulations;

(c) For recreational aerial activities on designated agricultural resource land, the proposal will not remove lands from agricultural production or substantially interfere directly or indirectly with the continued agricultural use of the parcel; and

(d) Minimum lot size may be increased by the administrator based on the site area required to safely undertake the activity.

~~(6) Recreational Vehicle (RV) Park, Travel Trailer Park, or Commercial Campground:~~

(a) The use of any parcel for an RV/campground park and any modifications to an existing RV/campground park shall comply with the following standards and requirements:

(i) The minimum parcel area for an RV/trailer park or commercial campground shall be five acres. The maximum area of any parcel devoted to the principal RV/travel trailer or commercial campground use shall not exceed 20 acres;

(ii) The maximum density of any RV/travel trailer or commercial campground approved ~~under this code shall not exceed 60 spaces;~~

~~(iii) No RV shall be located anywhere but in an RV space and only one RV shall be located~~ within any RV space;

(iv) All RV, travel trailer, recreational park trailer and campground uses in new RV/travel trailer and commercial campgrounds (approved after the effective date of this UDC) shall be limited to a temporary occupancy not to exceed nine months;

(v) The minimum width for a parcel containing an RV park shall be 300 feet, except that portions of the parcel intended only for general vehicular entrances and exits may be as narrow as 50 feet;

(vi) No part of any RV/campground park shall be used for the parking or storage of any heavy equipment;

(vii) No home occupation or business shall be operated from an RV/campground park except for the resident manager and as allowed in subsection (3)(a) of this section;

(viii) A responsible caretaker, owner, or manager shall be placed in charge of any RV/campground park to keep all grounds, facilities and equipment in a clean, orderly, and sanitary condition, and shall be answerable to the owner for any violation of the provisions of this title or any other ordinance;

(ix) An on-site caretaker or manager's residence is allowed; and

(x) Allowable accessory uses and improvements may include facilities for:

(A) Picnicking;

(B) Boating;

(C) Fishing;

(D) Swimming;

(E) Outdoor games;

(F) Miniature golf courses;

(G) Mechanical amusements; and

(H) Other sports and activities.

(b) Layout and Design Specifications. The following layout and design specifications shall apply to any RV/campground park:

(i) A buffer area shall be provided immediately within all boundaries. The required buffer area shall be a minimum of 100 feet in depth within all common property boundaries or public streets. Variable width buffers may be considered based upon topography and design considerations;

~~(ii) No RV or camp site may be located within a buffer area;~~

~~(iii) No building or structure may be erected or placed within a buffer area, except a sign or~~ fence;

(iv) No refuse disposal area shall be located within a buffer area;

(v) No plant materials may be deposited or removed within a buffer area except as a part of a recognized landscaping scheme or except for emergency access;

(vi) Only roads which cross the buffer, are as close to right angles as practicable, and connect directly with the road system contained within the remainder of the park shall be permitted within a buffer area; no road shall traverse the buffer area and give direct access from any public road to any RV space or camp site;

(vii) The road system shall comply with the standards and specifications for roads pursuant to Chapter 18.30 JCC;

(viii) Adequate off-street parking spaces shall be provided;

(ix) Each RV space shall have sufficient unobstructed access to, or frontage on, an RV park road, so as to permit the movement of RVs;

(x) No structural addition to any RV shall be permitted;

(xi) All refuse containers shall have an animal-proof lid and shall be maintained in a clean and sanitary condition. Garbage and refuse shall be disposed of in such a manner to control flies, rodents and odors;

(xii) All utilities, including electrical power and telephone lines, shall be installed underground;

(xiii) All roads, walkways, grouped-bay parking and service areas shall be provided with lighting adequate to ensure the safety of vehicular and pedestrian traffic;

(xiv) Central comfort stations and similar central facilities may be permitted;

(xv) Adequately sized wastewater disposal facilities shall be required and must be approved ~~by the Jefferson County environmental health department.~~

(6) ~~(7)~~ Equestrian Center. Uncovered and covered facilities for commercial boarding, training, teaching, breeding and rental of horses including facilities for shows and competitive events, and riding trails. This does not include stables used solely for breeding or boarding of horses. An equestrian center may be permitted when the following standards are met:

(a) All setbacks to the stable structure (does not include facilities for riding, training or exercising horses, such as a riding arena) shall be at least 50 feet from any property line and 100 feet from any existing residence, except the owner's or caretaker's dwelling(s);

(b) Facilities for riding, training or exercising horses shall be at least 25 feet from any property line and at least 100 feet from any existing residence except the owner's or caretaker's dwelling (s);

(c) Riding trails are not considered riding, training or exercising facilities and are not subject to this standard;

(d) The administrator may authorize a reduced setback for equestrian facilities; provided, that the county may impose conditions of approval to mitigate any adverse impacts which may result from granting the reduced setback;

(e) An animal waste management plan shall accompany the application. The plan shall be prepared in consultation with the Natural Resource Conservation Service (NRCS), local conservation district, or similar agency;

(f) Adequate parking, traffic management, and dust management shall be provided for horse shows with stables with more than 20 stalls;

(g) Public address systems using loud speakers shall only be used between 10:00 a.m. and 8:00 p.m.;

(h) A tack shop may be provided when it is only for the use of owners of horses boarded at the stable or event participants;

(i) An on-site caretaker or manager's residence is allowed; and

(j) A parcel size of not less than 10 acres shall be required.

(7)(8) Outdoor Shooting Ranges. Outdoor shooting ranges are subject to the following standards:

(a) They shall be located, designed, constructed and operated to prevent the likelihood of discharge of ammunition beyond the boundaries of the parcel where they occur;

(b) The National Rifle Association's Range Manual shall be consulted and used in the development and operation of ranges; Articles 1, 2, and 3 of the safety recommendations for outdoor shooting ranges shall be used as minimum guidelines in the design and construction of shooting ranges;

(c) Warning and trespass signs advising of the range operation shall be placed on the perimeter of the property at intervals no greater than 50 feet;

(d) The shooting areas shall be surrounded by an eight-foot-high noise barrier in the form of an earth berm or wall, or be located in a minimal eight-foot deep depression;

(e) The minimum lot size for an outdoor rifle, trap, skeet or pistol range used by an organization shall be 10 acres. For an outdoor archery range used by an organization, minimum lot size shall be five acres;

(f) No structure or shooting areas associated with a shooting range shall be located closer than 100 feet to any lot line;

(g) A minimum location of 500 feet is required from any occupied dwelling other than the dwelling of the owner;

(h) All shooting areas must be completely fenced; and

(i) In the consideration of an application for permit, the approval authority shall take into account both safety and noise factors, and may prescribe additional conditions with respect thereto.

(8) ~~(9)~~ Rural Recreational Lodging or Cabins for Overnight Rental and Recreational Cultural or Religious Conference Center/Retreat Facilities. Rural recreational lodging or cabins for overnight rental and conference retreat facilities are subject to the following standards:

(a) Minimum parcel size is 10 net acres;

(b) Fifteen built cabins or bedrooms for overnight lodging comprising up to 6,000 square feet of gross floor area are allowed for every 10 acres of parcel size, up to a maximum of 30 rooms or cabins comprising no more than 12,000 square feet of total building area over the entire site, excluding a caretaker's or manager's residence;

(c) Lodging operators may not allow any person to occupy overnight lodging on the premises for more than three months in any year;

(d) New residential development shall not be permitted. New residential development includes the subdivision or sale of land for year-round or second-home residential housing that is owner-occupied or rented;

(e) An on-site caretaker or manager's residence is allowed;

(f) A conditional use permit ~~subject to a Type III approval process~~, which includes a public hearing, shall be required.

(9) ~~(10)~~ Rural Restaurants. Rural restaurants may be allowed as small-scale recreational and tourist uses, subject to the following standards:

(a) Only when associated with and subordinate to a primary recreational or tourist use;

(b) Indoor dining facilities shall not exceed a total of 50 seats, including outdoor seating, unless it can be demonstrated that a larger capacity facility is needed to serve the demand generated by the primary recreational or tourist use;

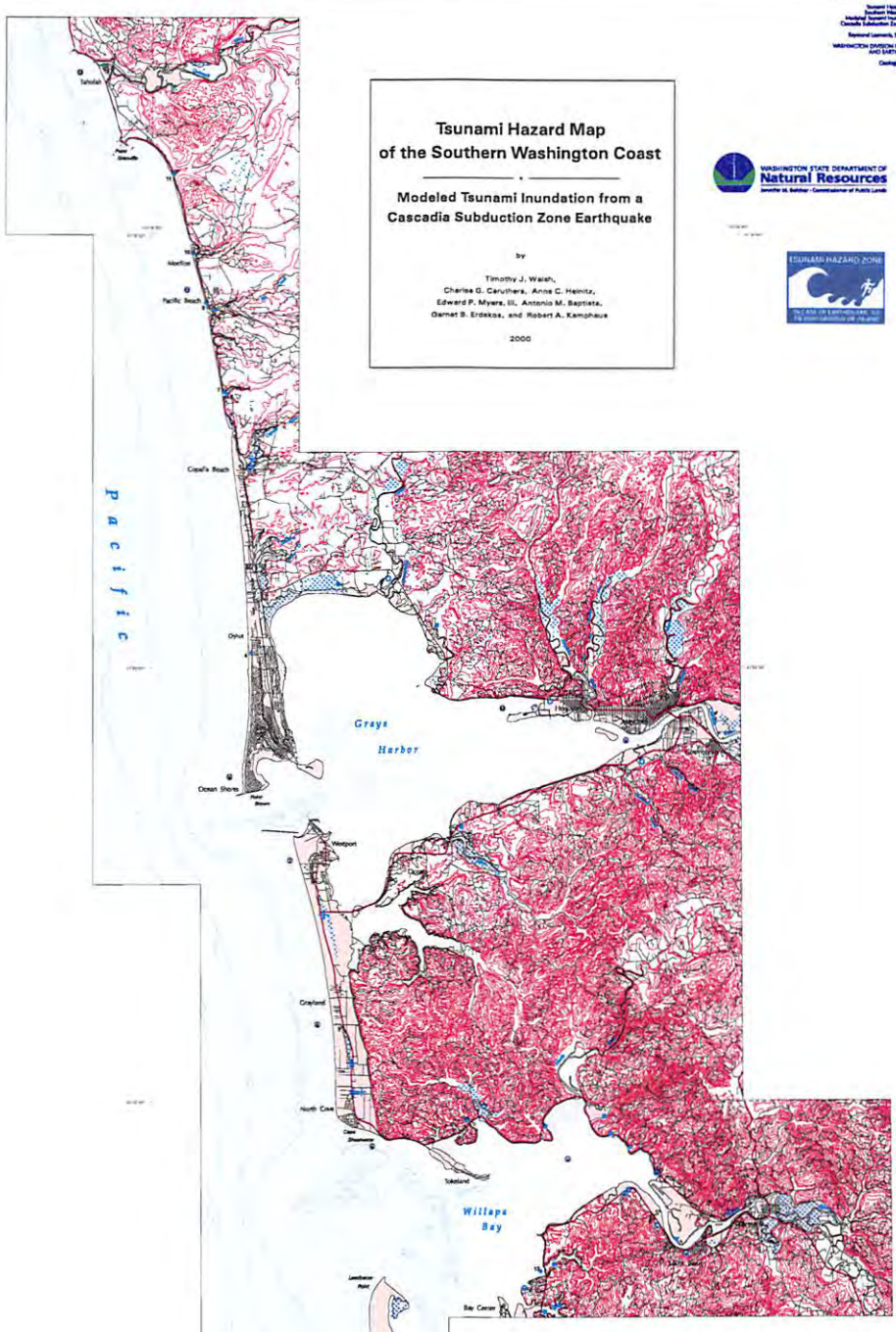
(c) The structure shall constitute no greater than 5,000 square feet of gross floor area;

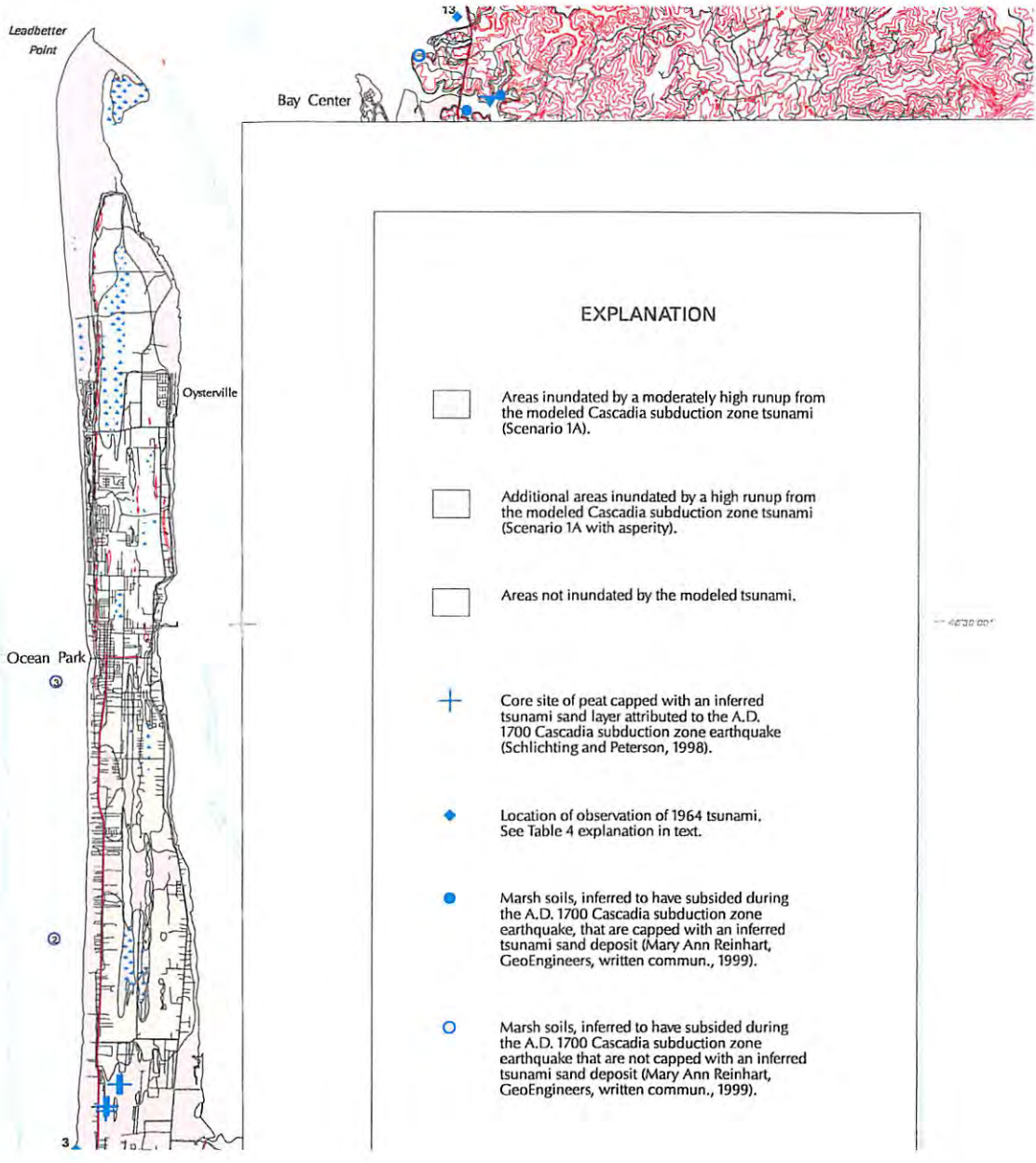
(d) Drive-through food service is prohibited. This does not include espresso stands. [Ord. 13-12 § 1; Ord. 8-06 § 1]

Tab C

Add following sentence to § 21G at p. 112 of 158:

A structure of concrete or steel frame construction located in coastal areas designated by the state as a tsunami hazard area may be a height of up to eight stories above the average finished ground level adjoining the building at exterior walls to provide refuge from a tsunami event.


Tsunami Hazard Map
of the Southern Washington Coast
Modeled Tsunami Inundation from a
Cascadia Subduction Zone Earthquake
by
Timothy J. Walsh,
Charles G. Caruthers, Anne C. Heinitz,
Edward P. Myers, III, Antonio M. Baptista,
Garnet S. Erdakos, and Robert A. Kamphaus
2000
WASHINGTON STATE DEPARTMENT OF
Natural Resources
TSUNAMI HAZARD ZONE
Tahola
Moclips
Pacific Beach
Copalis Beach
Ocean Shores
Oyhut
Hoquiam
Aberdeen
Westport
Cosmopolis
Grayland
North Cove
Tokeland
Raymond
South Bend
Lebetter Point
Bay Center
Oysterville
Ocean Park
Long Beach
Seaview
Ilwaco
Cape Disappointment
Pacific
Grays
Harbor
Willapa
Bay
Ocean
Scale: 1:100,000
Washington
Location of Map Area
EXPLANATION
Areas inundated by a moderately high runup from the modeled Cascadia subduction zone tsunami (Scenario 1A).
Additional areas inundated by a high runup from the modeled Cascadia subduction zone tsunami (Scenario 1A with assertion).
Areas not inundated by the modeled tsunami.
Core site of peat capped with an inferred tsunami sand layer attributed to the A.D. 1700 Cascadia subduction zone earthquake (Schlichting and Peterson, 1998).
Location of observation of 1964 tsunami. See Table 4 explanation in text.
Marsh soils, inferred to have subsided during the A.D. 1700 Cascadia subduction zone earthquake, that are capped with an inferred tsunami sand deposit (Mary Ann Reinhart, Carolingineers, written commun., 1999).
Marsh soils, inferred to have subsided during the A.D. 1700 Cascadia subduction zone earthquake that are not capped with an inferred tsunami sand deposit (Mary Ann Reinhart, Carolingineers, written commun., 1999).
Location of a tsunami wave time history. See explanation in text.
Archeological site, abandoned after the A.D. 1700 Cascadia subduction zone earthquake, that is capped with a sand deposit (Atwater, 1992; Atwater and Hemphill-Haley, 1997).
Archeological site, abandoned after the A.D. 1700 Cascadia subduction zone earthquake, that is not capped with a sand deposit (Atwater, 1992; Atwater and Hemphill-Haley, 1997).


Leadbetter Point
Bay Center
Oysterville
Ocean Park
Ocean
EXPLANATION
Areas inundated by a moderately high runup from the modeled Cascadia subduction zone tsunami (Scenario 1A).
Additional areas inundated by a high runup from the modeled Cascadia subduction zone tsunami (Scenario 1A with asperity).
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Marsh soils, inferred to have subsided during the A.D. 1700 Cascadia subduction zone earthquake that are not capped with an inferred tsunami sand deposit (Mary Ann Reinhart, GeoEngineers, written commun., 1999).

"*Tsunami* hazard areas" are coastal areas and large lake shoreline areas susceptible to flooding and inundation as the result of excessive wave action derived from seismic or other geologic events.

A new 'how-to' for tsunami-safe buildings: 'We're trying to save lives'

Originally published September 27, 2016 at 5:15 pm *Updated September 30, 2016 at 1:43 pm*

1 of 8 Waves from a tsunami hit homes after a powerful earthquake struck March 11, 2011, in Natori, Miyagi prefecture, Japan. (The Associated Press)

New design standards created by a group of engineers would require that hospitals, police stations and schools be strong and tall enough to survive a tsunami and provide shelter.

By Sandi Doughton
Seattle Times science reporter

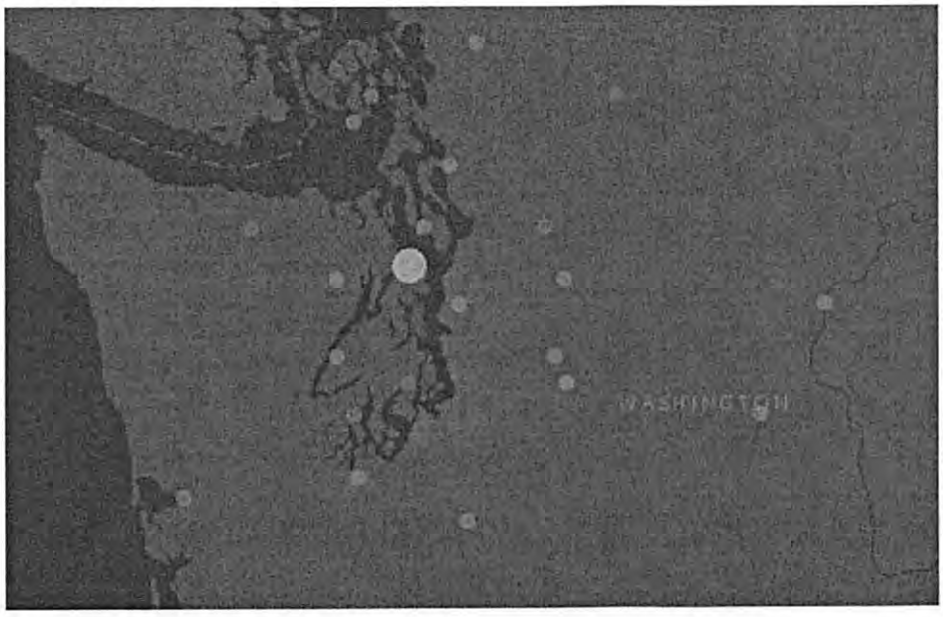
The current strategy for surviving a Cascadia Subduction Zone tsunami can be summed up in three words: Run like hell.

Scientists and emergency managers have estimated wave heights and arrival times and mapped out the shortest routes to high ground, but residents will be on their own in the chaotic aftermath of an offshore megaquake.

In some places, like Washington's Long Beach Peninsula or Ocean Shores, even the fleetest runners could never make it to safety in time and few — if any — buildings are likely to survive the wall of water that will hit after the shaking stops.

That grim outlook inspired a group of leading engineers to create the nation's first design standards for tsunami-safe structures. If incorporated into building codes as the engineers hope, the standards would require that new, critical facilities like hospitals, police stations and schools in vulnerable areas be strong enough to withstand the tsunami and tall enough that occupants won't be swept away.

Seismic Neglect



"We're basically trying to save lives," said Gary Chock, chair of the American Society of Civil Engineers' (ASCE) subcommittee that drew up the standards. "The idea that you would essentially write off whole communities is not acceptable."

The standards, which would also apply in coastal areas of California, Hawaii and Alaska, will be unveiled Wednesday in Portland at the ASCE's annual convention.

But their fate is already uncertain, due to a broader challenge from building industry groups, including the National Association of Homebuilders.

Writing the tsunami standards was a five-year process, Chock said. "Before this, tsunamis were essentially ignored in design."

While some Northwest communities hope to move schools and other critical facilities to high ground, that's not always practical or affordable, Chock pointed out. But if new facilities in the tsunami zone are built to the standards, not only would they remain usable after the disaster, but they could also provide safe havens to escape the water, he said.

Real-life and lab studies

Chock and other engineers visited Japan and Chile to detail building damage from recent, massive tsunamis. They conducted laboratory experiments, including at Oregon State University's O.H. Hinsdale Wave Research Laboratory, to estimate the force exerted by fast-moving water laden with debris. Scientists at the National Oceanic and Atmospheric Administration's Center for Tsunami Research and the University of Washington used computer models to simulate thousands of possible tsunami scenarios.

Chock said some of the most valuable insights came from Japan's Tohoku coast, where the 2011 tsunami killed more than 15,000 people. In some places, the water was so powerful it blasted through reinforced concrete walls, shoved multistory buildings onto their sides or scoured away foundations.

But many buildings constructed of steel or concrete remained standing.

"Tens of thousands of people survived by going into these buildings," Chock said.

Only one building in the United States was designed to serve as a tsunami refuge. Ocosta Elementary School on the Washington coast near Westport dedicated its new gymnasium this summer, with external stairways for quick access and

room on the roof for 2,000 people. Architects and engineers worked closely with Chock and his team to be sure the gym met the new standards.

Officials at Oregon State University say a $50 million marine science building planned for the waterfront in Newport will also be designed according to the new standards.

To establish how tall buildings need to be to avoid being overtopped, NOAA and UW tsunami modeler Yong Wei and his colleagues relied on computer simulations to estimate the largest tsunami likely to strike in a 2,500-year period. On the Washington and Oregon coast, that translates into surges that could range from 16 to 100 feet high, depending on the local terrain.

The standards also cover areas like the Seattle waterfront, which could be flooded with 20 feet of water if the Seattle Fault, which passes under Puget Sound, ruptures.

Researchers at Lehigh University in Pennsylvania suspended a 3.5-ton shipping container by cables and slammed it into a wall to estimate the force exerted on buildings by the huge amounts of debris swept up in tsunamis. At OSU's wave tank, scientists created artificial tsunamis and cityscapes to validate estimates of water speed and depth, and worked with scale models of shipping containers to study the way debris slams into buildings.

"It was really cool to be part of something that's going to make a difference for our communities," said OSU engineering professor Dan Cox.

Resistance over costs

The standards are included in the new, 2018 version of the International Building Code. But it's up to individual states and counties to decide which provisions of the international code to adopt, Chock explained.

If the process goes smoothly, he estimates the tsunami standards could take effect by 2020.

But ASCE's entire package of new standards, which includes measures to strengthen roofs in hurricane-prone parts of the country and bolster the seismic safety of buildings in the Midwest, faces objections from building groups that argue some of the provisions are too costly.

If that challenge is upheld, then the tsunami standards would remain on hold, ASCE's Ronald Hamburger wrote in an email.

Even if adopted, the standards would apply only to the small subset of buildings considered critical or essential, like power plants and fire stations, or structures like auditoriums or convention centers where large numbers of people gather. It would not apply to single-family homes, condos, apartments or most hotels.

But communities would have the option of applying the standards to other types of buildings, like parking structures that could double as tsunami refuges, Chock pointed out.

Tsunami-safe buildings do cost more, but Chock estimates the premium would amount to only about 1 percent to 3 percent of the total building price tag in most places.

"From a local jurisdiction standpoint, these standards provide some powerful tools to think about the outcome you want to have after one of these tsunamis," Chock said. "Do you want to have people survive? Do you want to have a core of buildings, like your hospital, survive — or are you basically saying: We give up?"

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Guidelines for Design of Structures for Vertical Evacuation from Tsunamis

Second Edition

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FEMA

NOAA

levels are predicted to reach three meters. The 18 municipal governments in Aomori, Iwate, Miyagi and Chiba prefectures had designated a total of 88 buildings as vertical evacuation sites.

Figure 2-23 and Figure 2-24 show the designated evacuation area on the roof of a coastal building in Minamisanriku. This building was built as a residential structure, but with specific vertical evacuation attributes as part of the design. Access to the roof level evacuation area was provided by external elevator and staircase accessible without entering the rest of the building. The evacuation area measured a total of 660 square meters and was surrounded by a well-braced 2 meter high guard fence. Even though this building was overtopped by 0.7 meters, those who sought refuge on the roof survived the tsunami.

Figure 2-23 Minamisanriku designated coastal evacuation building – note tsunami trace on sign (photo courtesy of I. Robertson, ASCE, 2012).

Unfortunately, many of the designated vertical evacuation buildings were not tall enough for the flow depths encountered during this tsunami. An unknown number of people who sought refuge in these structures did not survive the inundation, even though the structures remained intact. It is therefore paramount that structures designated for vertical evacuation refuge be tall and strong enough to keep the refugees safe even during tsunami events that exceed the maximum considered event.

resistance to progressive collapse was effective at preventing local member failures from precipitating disproportionate structural collapse.

A number of low-rise reinforced concrete buildings in Minamisanriku survived complete inundation (Figure 2-26). Many of these buildings had solid concrete walls facing the ocean, exposing them to the maximum possible hydrodynamic loading. A nearby reinforced concrete building with shear walls framing the lower two floors, and concrete cantilever columns supporting a steel truss roof, suffered complete collapse of the top story (Figure 2-27). The large quantity of trees as debris in the flow, and the susceptibility of cantilever columns to flexural failure, likely contributed to this failure.

Figure 2-26 Surviving and damaged reinforced concrete buildings in Minamisanriku (photo courtesy of I. Robertson, ASCE, 2012).

The harbor town of Onagawa experienced a tsunami surge of approximately 18+ meters that overtopped nearly all buildings in the area except for those on a central hillside. Outflow velocities following this initial tsunami run-up were particularly high. Despite this, many low-rise steel and concrete buildings survived. Among the failed structures were more than a half-dozen overturned and displaced whole buildings, nearly structurally intact from foundation to roof. These buildings were either floated by hydrostatic forces and carried away, or overturned by hydrodynamic forces of the tsunami inflow or outflow, or a combination of both effects. The contribution of these

4.2.6 School Facilities

Similar to community facilities, public and private school facilities have the benefit of providing useful and essential services to the communities in which they reside. Ongoing construction of schools provides an opportunity and potential funding mechanism for co-located tsunami vertical evacuation structures. This has the added benefit of possible additional public support for projects that increase the safety of school-age children. Obviously these buildings must be tall enough or sited on high ground so that they are useful as tsunami refuge areas.

4.2.7 Existing Buildings

Historic damage patterns suggest that many structures not specifically designed for tsunami loading can survive tsunami inundation and provide areas of refuge. It is possible that some existing structures could serve as vertical evacuation structures or could be made more tsunami-resistant with only minor modifications. An assessment of both the functional needs and potential structural vulnerabilities would be required to determine if an existing building can serve as a vertical evacuation structure.

In some situations, providing some level of protection is better than none. An example of this concept is shown in Figure 4-6. In a tsunami evacuation map for Waikiki, it is noted that "structural steel or reinforced concrete buildings of six or more stories provide increased protection on or above the third floor", and are identified as potential areas of refuge.

Figure 4-6 Evacuation map for Waikiki, Hawaii, indicating use of existing buildings for vertical evacuation.