Tillamook County

DEPARTMENT OF COMMUNITY DEVELOPMENT
BUILDING, PLANNING & ON-SITE SANITATION SECTIONS

1510 – B Third Street
Tillamook, Oregon 97141
www.tillamook.or.us
Building (503) 842-3407
Planning (503) 842-3408
Sanitation (503) 842-3409
FAX (503) 842-1819
Toll Free 1(800) 488-8280

Land of Cheese, Trees and Ocean Breeze

Neskowin Coastal Hazard Area Permit #851-21-000393-PLNG: Rusina

NOTICE TO MORTGAGEE, LIENHOLDER, VENDOR OR SELLER:
ORS 215 REQUIRES THAT IF YOU RECEIVE THIS NOTICE,
IT MUST BE PROMPTLY FORWARDED TO THE PURCHASER

NOTICE OF ADMINISTRATIVE REVIEW
Date of Notice: January 31, 2022

Notice is hereby given that the Tillamook County Department of Community Development is considering the following:

#851-21-000393-PLNG: A request for approval of a Neskowin Coastal Hazard Area Permit for the construction of a deck on a property located within the Unincorporated Community Boundary of Neskowin, zoned Neskowin Low Density Residential (NeskR-1) and within the Neskowin Coastal Hazards Overlay (Nesk-CH) Zone. The subject property is located at 45740 Kinnikinnick Drive, a private road, and designated as Tax Lot 1900 of Section 24BD in Township 5 South, Range 11 West of the Willamette Meridian, Tillamook County, Oregon.

Notice of the application, a map of the subject area, and the applicable criteria are being mailed to all property owners within 250 feet of the exterior boundaries of the subject parcel for which the application has been made and other appropriate agencies at least 14 days prior to this Department rendering a decision on the request.

Written comments received by the Department of Community Development prior to 4:00p.m. on February 14, 2022, will be considered in rendering a decision. Comments should address the criteria upon which the Department must base its decision. A decision will be rendered no sooner than February 15, 2022.

A copy of the application, along with a map of the request area and the applicable standards/criteria for review are available for inspection on the Tillamook County Department of Community Development website: https://www.co.tillamook.or.us/commdev/landuseapps and is also available for inspection at the Department of Community Development office located at 1510-B Third Street, Tillamook, Oregon, 97141.

If you have any questions about this application, please contact Melissa Jenck, CFM, Land Use Planner II at 503-842-3408 x 3301 or by email: mjenck@co.tillamook.or.us.

Sincerely,

Melissa Jenck, CFM, Land Use Planner II

Sarah Absher, CFM, Director

Enc. Applicable Ordinance Standards/Criteria
Maps

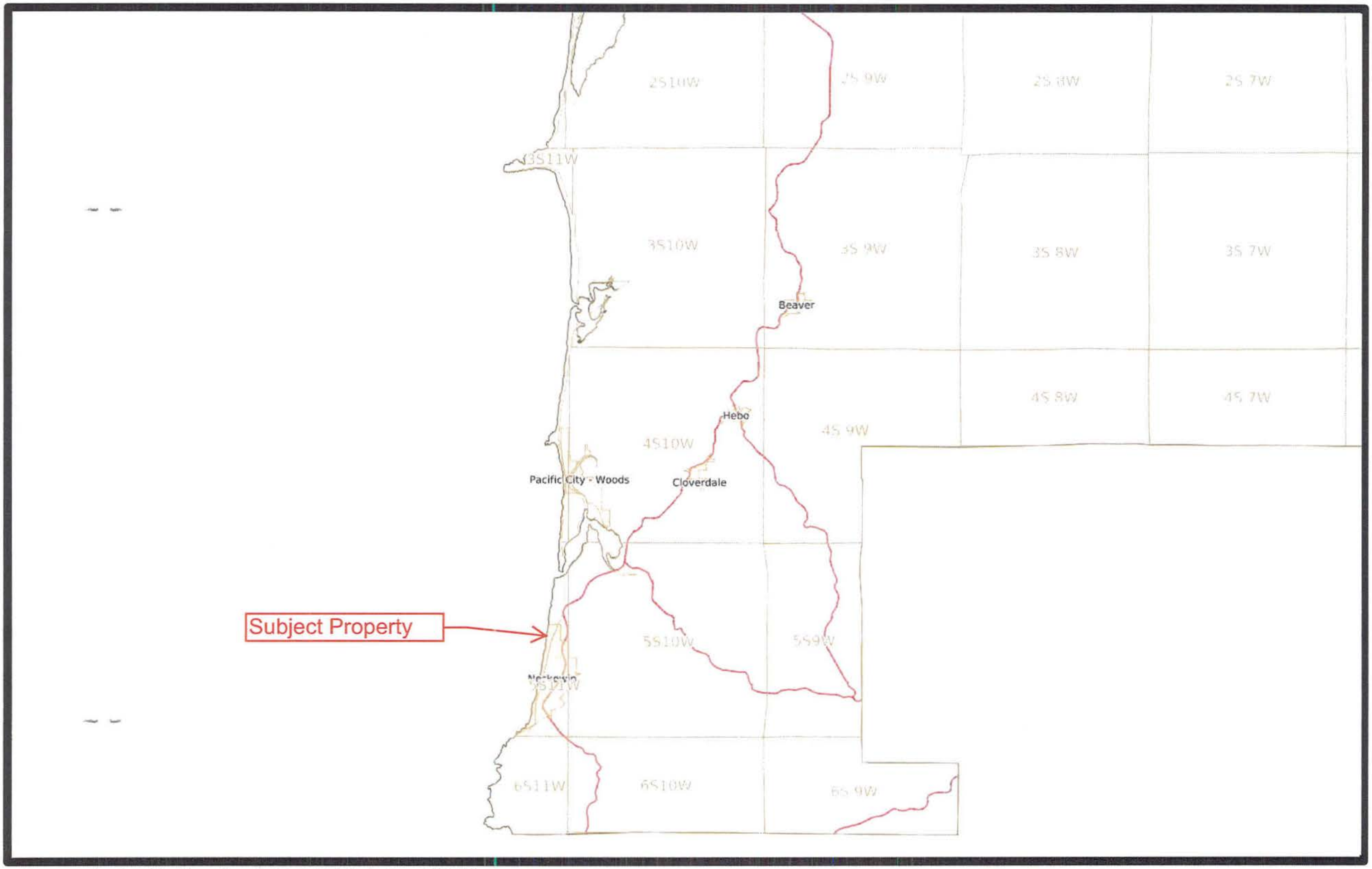
TCLUO SECTION 3.570(4)(e): A decision to approve a Neskowin Coastal Hazard Area Permit shall be based upon findings of compliance with the following standards:

(A) The proposed development is not subject to the prohibition of development on beaches and certain dune forms as set forth in subsection (8) of this section;
(B) The proposed development complies with the applicable requirements and standards of subsections (6), (7), (8), and (10) of this section;
(C) The geologic report conforms to the standards for such reports set forth in subsection (5) of this section;
(D) The development plans for the application conform, or can be made to conform, with all recommendations and specifications contained in the geologic report; and
(E) The geologic report provides a statement that, in the professional opinion of the engineering geologist, the proposed development will be within the acceptable level of risk established by the community, as defined in subsection (5)(c) of this section, considering site conditions and the recommended mitigation.

EXHIBIT A

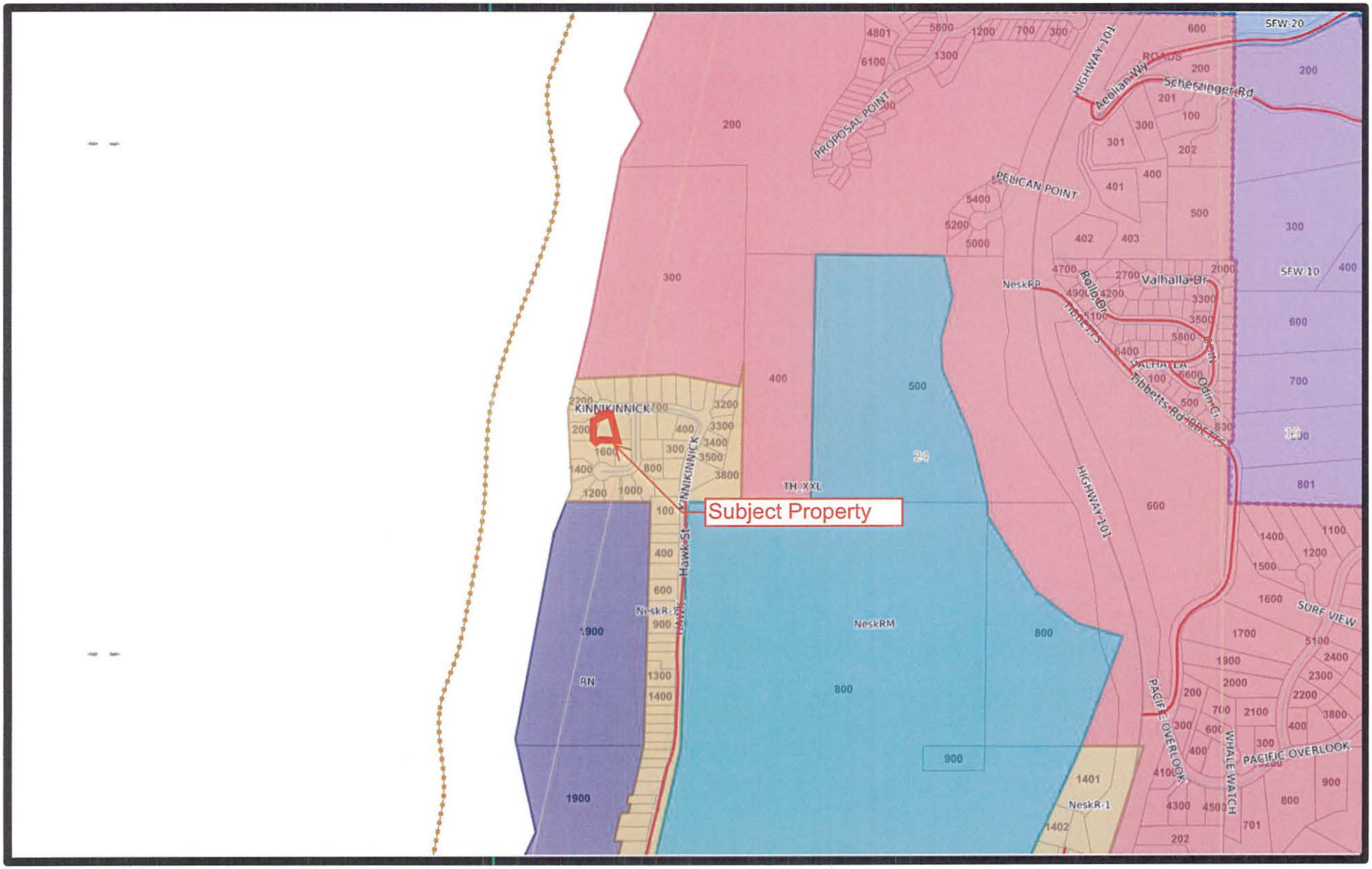
Vicinity Map

MOOSEMAPPING



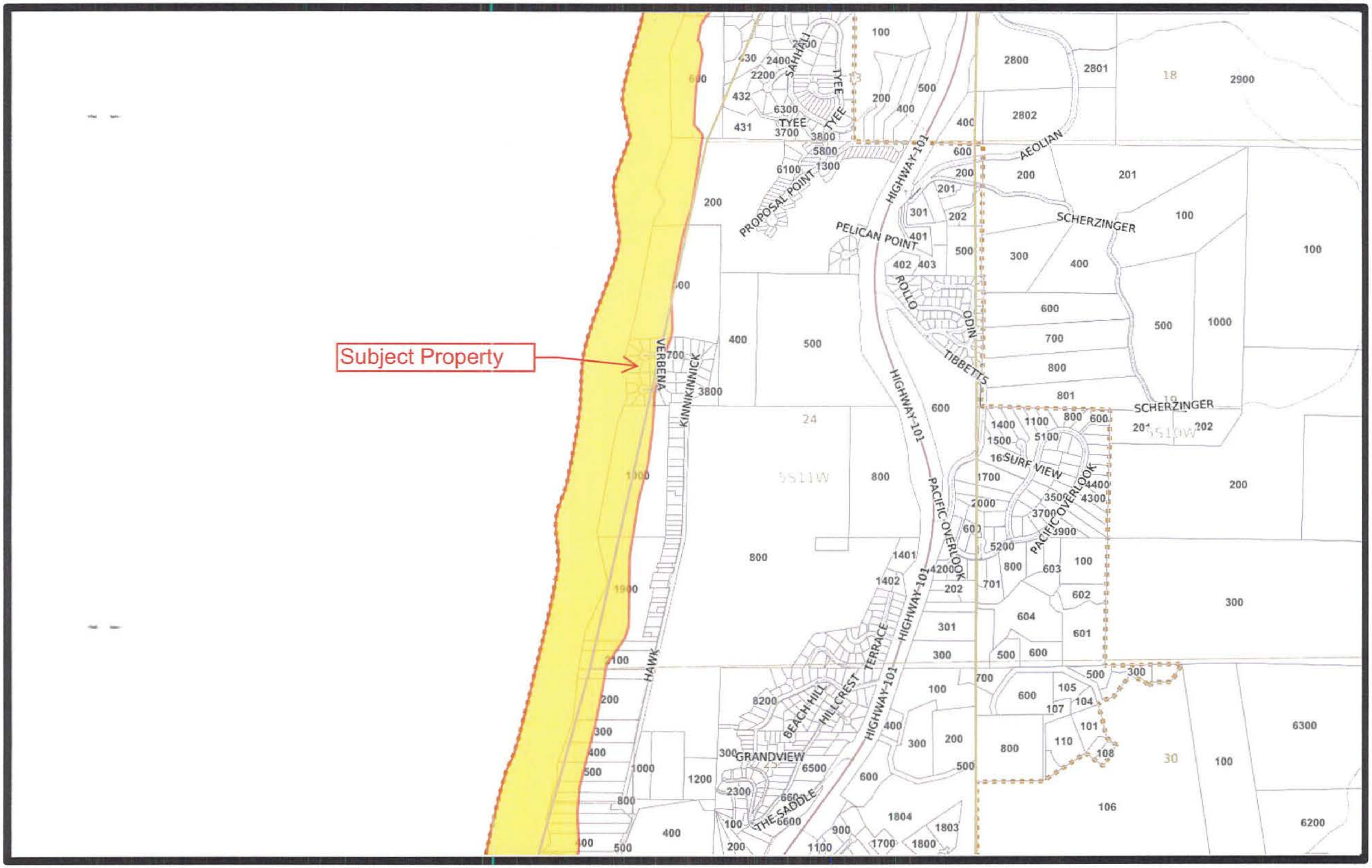
Generated with the GeoMOOSE Printing Utilities

Zoning Map



Generated with the GeoMOOSE Printing Utilities

Nesk-CH Overlay Map



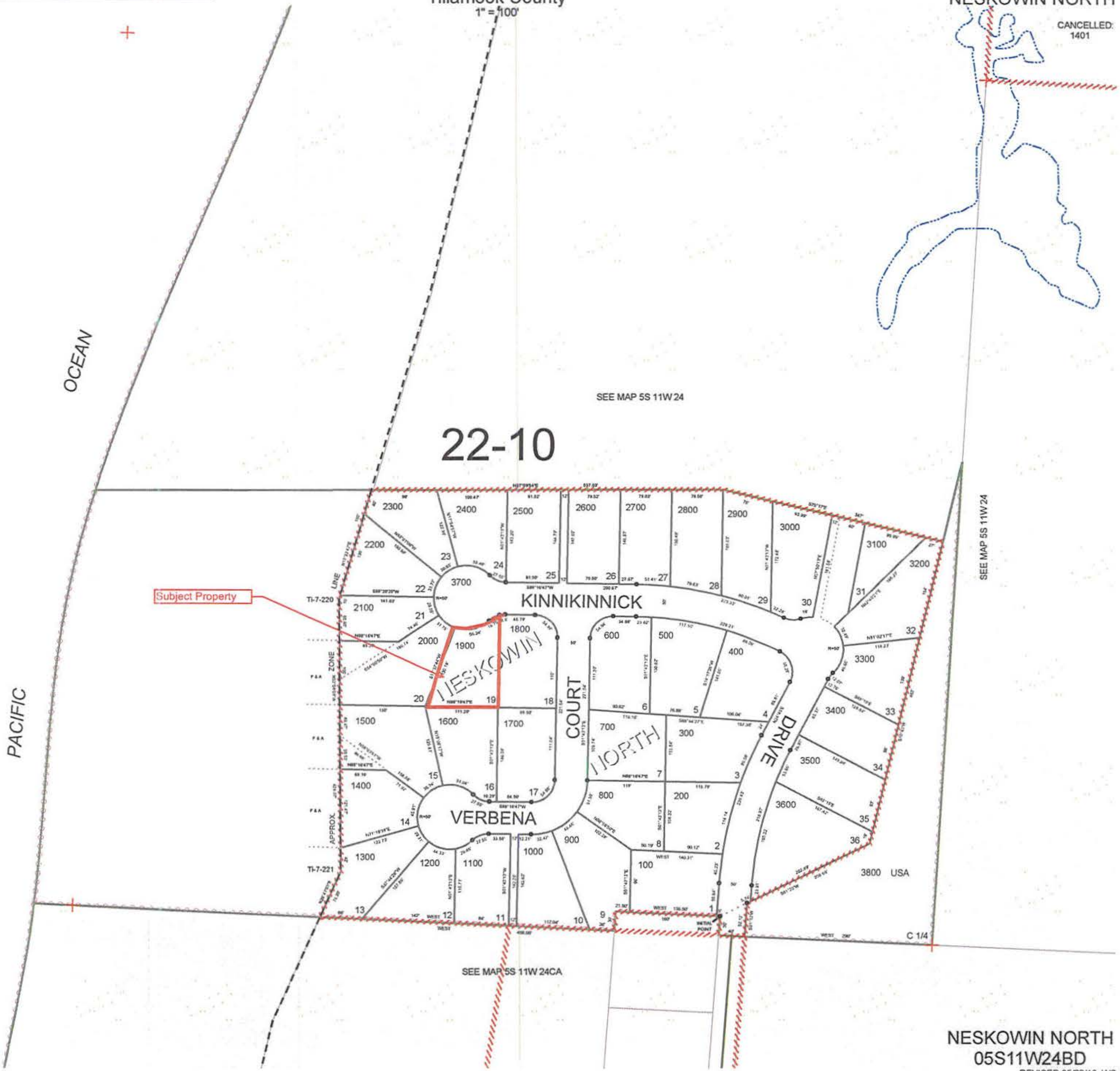
Generated with the GeoMOOSE Printing Utilities

FOR ASSESSMENT AND TAXATION ONLY, NOT SUITABLE FOR LEGAL, ENGINEERING, OR SURVEY PURPOSES

S.E.1/4 N.W.1/4 SEC.24 T.5S. R.11W. W.M.
Tillamook County
1" = 100'

05S11W24BD
NESKOWIN NORTH

CANCELLED:
1401



NESKOWIN NORTH
05S11W24BD
REVISED 05/22/18, WS

TILLAMOOK County Assessor's Summary Report

Real Property Assessment Report

FOR ASSESSMENT YEAR 2021

January 31, 2022 5:27:04 pm

Account #	257331	**Tax Status**	ASSESSABLE
Map #	5S1124BD01900	**Acct Status**	ACTIVE
Code - Tax #	2210-257331	**Subtype**	NORMAL

Legal Descr NESKOWIN NORTH
Lot - 19

Mailing Name	RUSINA, FREDERICK C	**Deed Reference #**	2010-7409
Agent		**Sales Date/Price**	11-24-2010 / $0.00
In Care Of		**Appraiser**	RANDY WILSON
Mailing Address	19686 SUNSHINE WAY BEND, OR 97702		

		MA	SA	NH	Unit
Prop Class	101				
RMV Class	101	09	ST	999	18775-1

Situs Address(s)	Situs City
ID# 1 45740 KINNIKINNICK DR	COUNTY

Value Summary

Code Area		RMV	MAV	AV		RMV Exception	CPR %
2210	Land	232,530			Land	0	
	Impr.	386,780			Impr.	0	
Code Area Total		619,310	483,260	483,260		0	
Grand Total		619,310	483,260	483,260		0	

Land Breakdown

Code Area	ID#	RFPD	Ex	Plan Zone	Value Source	TD%	LS	Size	Land Class	Trended RMV
2210					LANDSCAPE - FAIR	100				500
2210	1	☑		NESKR -1	Market	104	A	0.23		212,330
2210					OSD TYPE B - AVERAGE	100				19,700
						Grand Total		0.23		232,530

Improvement Breakdown

Code Area	ID#	Yr Built	Stat Class	Description	TD%	Total Sq. Ft.	Ex%	MS Acct #	Trended RMV
2210	1	1996	149	Basement First Floor	123	2,108			386,780
				Grand Total		2,108			386,780

Exemptions / Special Assessments / Potential Liability

Code Area 2210

SPECIAL ASSESSMENTS:

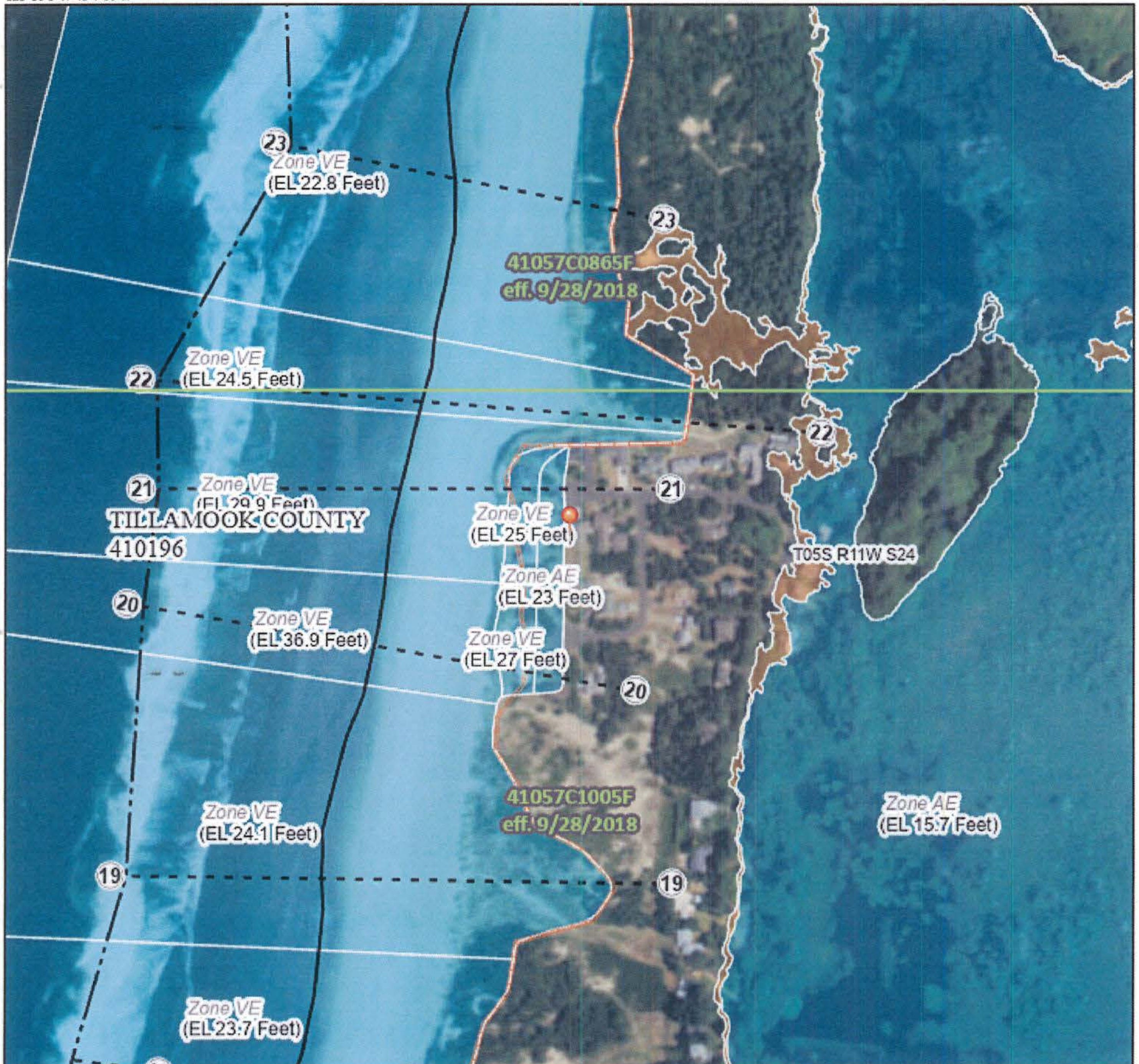
■ SOLID WASTE — **Amount** 12.00 **Acres** 0 **Year** 2021

Comments: 03/02/09 - Phase 1 desk review - corrected STAT class, KL. 5/2014 Reapp. of land/Tabled values. RCW

National Flood Hazard Layer FIRMette

FEMA

123°59'3"W 45°7'39"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

123°58'26"W 45°7'14"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- (B) 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/31/2022 at 8:26 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Rusina

February 1, 2022

Wetlands

Estuarine and Marine Deepwater	Freshwater Emergent Wetland
Estuarine and Marine Wetland	Freshwater Forested/Shrub Wetland
Lake	Freshwater Pond
Other	Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

EXHIBIT B

Tillamook County Department of Community Development
1510-B Third Street. Tillamook, OR 97141 | Tel: 503-842-3408 Fax: 503-842-1819
www.co.tillamook.or.us

PLANNING APPLICATION

OFFICE USE ONLY
Date Stamp: RECEIVED OCT 12 2021 Email
☐Approved ☐Denied
Received by: MJ
Receipt #:
Fees: $1615.00
Permit No: 851-21-000393-PLNG

Applicant ☑ *(Check Box if Same as Property Owner)*

Name: Frederick Rusini Phone: 503 970-2004
Address: 19686 Sunshine Way
City: Bend State: OR Zip: 97702
Email: fredRusino@gmail.com

Property Owner

Name: Phone:
Address:
City: State: Zip:
Email:

Request: A Neskowin Coastal Hazard Area Permit To build an Approx 12'x18' foot Elevated Deck on westside of Residence Attached is HG Schlicker + Ass Geological Report and owner's statement.

Type II	Type III	Type IV
☐ Farm/Forest Review	-☐ Extension of Time	☐ Ordinance Amendment
☐ Conditional Use Review	☐ Detailed Hazard Report	☐ Large-Scale Zoning Map Amendment
☐ Variance	☐ Conditional Use (As deemed by Director)	☐ Plan and/or Code Text Amendment
☐ Exception to Resource or Riparian Setback	☐ Ordinance Amendment	
☐ Nonconforming Review (Major or Minor)	☐ Map Amendment	
☐ Development Permit Review for Estuary Development	☐ Goal Exception	
☐ Non-farm dwelling in Farm Zone		
☐ Foredune Grading Permit Review		
☑ Neskowin Coastal Hazards Area		

Location:

Site Address: 45740 Kinnikinnick Dr. Neskowin, OR
Map Number: 5S (Township) - 11W (Range) - 24BD (Section) 1900 (Tax Lot(s))

Clerk's Instrument #:

Authorization

This permit application does not assure permit approval. The applicant and/or property owner shall be responsible for obtaining any other necessary federal, state, and local permits. The applicant verifies that the information submitted is complete, accurate, and consistent with other information submitted with this application.

Fred Rusina — Property Owner Signature (Required) — Date: 10/12/2021

Applicant Signature — Date

FREDERICK C. RUSINA
19686 SUNSHINE WAY
BEND, OREGON 97702
(503) 970-2004 cell

Email: fredrusina@gmail.com

October 12, 2021
Tillamook County Department of Community Development
1510-B Third Street
Tillamook, OR 97141

RE: Property: 45740 Kinninnick Dr. Neskowin Oregon 9719
Tillamook County Tax Lot 1900, Map 5S-11W-24BD
H.G.Schlicker & Associates Geological Report
Owner Hazard Disclosure Statement

Director,

I am submitting this letter as part of my Application for a Neskowin Coastal Hazard Area Permit to build a deck on a portion of my property as described in the Geological Report.

Referring specifically to NESK-CH (4) (d) (A) Thru (E)
The Geological Report (A)contains the site plans and describes the affected areas.
The Geological Report (B) details all excavation and fill work; (C) identifies any hazard zones; (D) meets the content requirements of subsection (5) and (E) identifies any remedial work.

The following statement is being submitted as required by Section 3.750 NESK-CH 4(d) (F). I state as follows:

(F) (i) I understand that my Property is subject to potential chronic natural hazards and that development thereon is subject to risk of damage from such hazards;

(F) (ii) I have commissioned a Geologic Report for the Property prepared by H.G. Schlicker & Associates dated Sept 30, 2021 submitted with this application and I have reviewed the Geologic Report and have been informed and am aware of the type and extent of hazards present and the risks associated with the development of my Property;

(F) (iii) I acknowledge and accept that I accept and assume all risks of damage from natural hazards associated with the development of the Property.

Respectfully Submitted,

Frederick C. Rusina

Geologic Hazards and Geotechnical Investigation
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive
Neskowin, Tillamook County, Oregon

Prepared for:
Fred Rusina
19686 Sunshine Way
Bend, Oregon 97702

Project #Y214556

September 30, 2021

H.G. Schlicker & Associates, Inc.

H.G. Schlicker & Associates, Inc.
607 Main Street, Suite 200 · Oregon City, Oregon 97045
(503) 655-8113 · FAX (503) 655-8173

Project #Y214556 September 30, 2021

To: **Fred Rusina**
19686 Sunshine Way
Bend, Oregon 97702

Subject: **Geologic Hazards and Geotechnical Investigation**
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive
Neskowin, Tillamook County, Oregon

Dear Mr. Rusina:

The accompanying report presents the results of our geologic hazards and geotechnical investigation for the above subject site.

After you have reviewed our report, we would be pleased to discuss it and to answer any questions you might have.

This opportunity to be of service is sincerely appreciated. If we can be of any further assistance, please contact us.

H.G. SCHLICKER & ASSOCIATES, INC.

J. Douglas Gless, MSc, RG, CEG, LHG
President/Principal Engineering Geologist

JDG:mgb

TABLE OF CONTENTS

Page

1.0 Introduction 1
2.0 Site Description 1
2.1 The history of the site and surrounding areas, such as previous riprap or dune grading permits, erosion events, exposed trees on the beach, or other relevant local knowledge of the site. 2
2.2 Topography, including elevations and slopes on the property itself. 3
2.3 Vegetation cover. 3
2.4 Subsurface materials – the nature of the rocks and soils. 3
2.5 Conditions of the seaward front of the property, particularly for sites having a sea cliff. 3
2.6 Presence of drift logs or other flotsam on or within the property. 3
2.7 Description of streams or other drainage that might influence erosion or locally reduce the level of the beach. 3
2.8 Proximity of nearby headlands that might block the long shore movement of beach sediments, thereby affecting the level of the beach in front of the property. 4
2.9 Description of any shore protection structures that may exist on the property or on nearby properties. 4
2.10 Presence of pathways or stairs from the property to the beach. 4
2.11 Existing human impacts on the site, particularly any that might alter the resistance to wave attack. 4
3.0 Description of the Fronting Beach 4
3.1 Average widths of the beach during the summer and winter. 4
3.2 Median grain size of beach sediment. 4
3.3 Average beach slopes during the summer and winter. 5
3.4 Elevations above mean sea level of the beach at the seaward edge of the property during summer and winter. 5
3.5 Presence of rip currents and rip embayments that can locally reduce the elevation of the fronting beach. 5

TABLE OF CONTENTS (cont.)

Page

3.6 Presence of rock outcrops and sea stacks, both offshore and within the beach zone 5

3.7 Information regarding the depth of beach sand down to bedrock at the seaward edge of the property. 5

4.0 Geologic Hazards Analysis 5

4.1 Subsurface Materials 6

4.2 Geologic Structures 7

4.3 Slopes 7

4.4 Orientation of Bedding Planes in Relation to the Dip of the Surface Slope 7

4.5 Site Surface Water Drainage Patterns 8

4.6 Dune Stability and Erosion 8

4.7 Regional Seismic Hazards 9

4.8 Flooding Hazards 10

4.9 Climate Change 11

4.10 Analyses of Erosion and Flooding Potential 11

4.11 Assessment of Potential Reactions to Erosion episodes 13

5.0 Development Standards and Recommendations 13

5.1 Development Density 15

5.2 Setback 15

5.3 Grading Practices 15

5.4 Vegetation Removal and Re-Vegetation Practices 16

5.5 Foundation Recommendations 16

5.6 Drainage and Stormwater Management 17

5.7 Erosion Control 17

5.8 Flooding Considerations 18

5.9 Seismic Considerations 18

TABLE OF CONTENTS (cont.)

Page

5.10 Plan Review and Construction Observations 19
5.11 Worker Safety 19
6.0 Summary Findings and Conclusions 19
6.1 Proposed Use 19
6.2 Hazards to Life, Property, and the Environment 19
6.3 Off-Site Protection 20
6.4 Stabilization Programs 20
6.5 Conclusions Regarding Hazards and Adverse Environmental Effects 20
6.6 Recommendations for Further Work 20
7.0 Additional Services 20
8.0 Limitations 21
9.0 Disclosure 22
10.0 References Cited 22

FIGURES

Figure 1 – Location Map
Figure 2 – Plat Map
Figure 3 – Site Topographic Map
Figure 4 – Slope Profile A-A'
Figure 5 - Sediment Fence Detail

APPENDICES

Appendix A – Site Photographs
Appendix B – Checklist of Recommended Additional Work, Plan Review, and Site Observations

H.G. Schlicker & Associates, Inc.
607 Main Street, Suite 200 · Oregon City, Oregon 97045
(503) 655-8113 · FAX (503) 655-8173

Project #Y214556 September 30, 2021

To: **Fred Rusina**
19686 Sunshine Way
Bend, Oregon 97702

Subject: **Geologic Hazards and Geotechnical Investigation**
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive
Neskowin, Tillamook County, Oregon

Dear Mr. Rusina:

1.0 Introduction

At your request and authorization, a representative of H.G. Schlicker and Associates, Inc. (HGSA) visited the subject site on August 27, 2021, to complete a geologic hazards and geotechnical investigation of Tax Lot 1900, Map 5S-11-24BD, located in Neskowin, Tillamook County, Oregon (Figures 1 and 2; Appendix A). Based on the provided plans, it is our understanding that you would like to construct an elevated deck attached to the west side of the existing home.

This report addresses the engineering geology and geologic hazards at the site with respect to the proposed construction of an elevated deck. The scope of our work consisted of a site visit, site observations and measurements, subsurface exploration with hand augered borings, a slope profile, limited review of the geologic literature, interpretation of topographic maps, lidar and aerial photography, and preparation of this report of our findings, conclusions and geotechnical recommendations for an addition to the west side of the existing house.

2.0 Site Description

The subject site is an oceanview lot located on a younger stabilized dune in the community of Neskowin, Oregon (Figure 1). The property consists of Tax Lot 1900, Map 5S-11-24BD, 45740 Kinnikinnick Drive, a 0.23-acre lot with an existing one-story house with a basement. The irregularly shaped lot is approximately 120 feet long north to south and approximately 100 feet wide east to west, in the center. An oceanfront protective structure (riprap revetment) is located on the dune slope to the west of the site; this revetment is contiguous with other revetments to the immediate north and south; However, this stretch of revetement is isolated and not connected with the other Neskowin revetments to the south (Figure 3 and Appendix A). The site is bounded to its north by the cul-de-sac of Kinnikinnick Drive, and to its south, east and west by developed lots with houses.

The site gently slopes at approximately a few degrees to the north, and elevations at the site range between approximately 20 to 26 feet (NAVD 88) (Figures 3 and 4).

At the time of our site visit, the site was vegetated with European beachgrass, ornamental plants, and young shore pine trees (Appendix A).

2.1 The history of the site and surrounding areas, such as previous riprap or dune grading permits, erosion events, exposed trees on the beach, or other relevant local knowledge of the site.

According to Tillamook County records, the existing one-story home with a first-floor basement was built in 1996. The west side of the existing house is approximately 175 feet east of the top of the revetment, west of the site. An existing elevated deck is attached to the house's northwest corner near the proposed location of construction (Figures 3 and 4). Based on our review of historical aerial imagery, prior to the residential development, the area of the site was occupied by a dune complex.

The site is located on loose dune sand that is easily eroded by ocean wave activity and wind when devoid of vegetation. During the winters of 1998, 1999, 2000, and 2001 severe storms resulted in substantial ocean wave erosion, which removed active dunes present west of the subject lot and eroded the western part of the dune north of the site. As reported by local residents, up to 10 feet of erosion has been observed in the area during a single storm event. Ocean wave erosion has also resulted in the lowering of the beach elevation by several feet, allowing higher energy waves to impact the dune. The increase in ocean wave erosion observed along much of the Oregon Coast in the recent past is a consequence of the mid- to late 1990s El Niño/La Niña events, which altered ocean currents and transported much of the beach sand offshore. There has been some rebuilding of the beach in the last few years, but this has been a slow process. As a result, nearly all of Neskowin's oceanfront residences have had oceanfront protection installed.

Severe storms in the winter of 2007–2008 partly undermined many of the revetments in the Neskowin area. However, the riprap revetments significantly reduce the potential for erosion at the site.

2.2 Topography, including elevations and slopes on the property itself.

The site is located on a younger stabilized dune that has been modified by past development and construction of a revetment west of the site. Elevations at the site range from approximately 20 to 26 feet (NAVD 88). The site slopes gently to the north at approximately a few degrees (Figures 3 and 4; Appendix A).

The riprap revetments west of the site generally slope down to the beach at approximately 20 to 30 degrees (Figures 3 and 4; Appendix A).

2.3 Vegetation cover.

At the time of our site visit, the site was vegetated with ornamental plants, European beachgrass, salal, and young shore pine trees (Appendix A).

2.4 Subsurface materials – the nature of the rocks and soils.

Subsurface exploration was completed by advancing four hand-augered borings to depths up to approximately 2.5 feet below the ground surface (bgs) in the area for the proposed addition. The borings generally encountered refusal on gravel fill or were terminated due to dry flowing loose sand. Subsurface materials are discussed in detail in Section 4.1.

2.5 Conditions of the seaward front of the property, particularly for sites having a sea cliff.

The seaward front of the oceanfront property west of the subject site is densely vegetated with European beachgrass and a few small shorepines. The riprap revetment appeared to be in generally good condition. The quality of the single armor stone layer used for the construction of the revetment was variable and consisted of a mixture of highly fractured basalt breccia, occasional sandstone, and relatively unfractured basalt (Appendix A). Additional observations are addressed in Section 3.0 and Appendix A.

2.6 Presence of drift logs or other flotsam on or within the property.

At the time of our site visit, we did not observe any recent drift logs or flotsam on or within the property or on the beach to the west of the property.

2.7 Description of streams or other drainage that might influence erosion or locally reduce the level of the beach.

Neskowin Creek and Kiwanda Creek discharge onto the beach approximately 1.6 miles south of the site (Figure 1). Historical satellite imagery from Google Earth indicates that although Neskowin Creek's stream channel meanders approximately 500 feet north and south on the beach, the stream generally enters the ocean near the east side of Proposal Rock and does not typically appear to influence the level of the beach fronting the site.

2.8 Proximity of nearby headlands that might block the long shore movement of beach sediments, thereby affecting the level of the beach in front of the property.

The site is located approximately 2.25 miles feet north of the Cascade Head headlands and approximately 6.4 miles south of Cape Kiwanda. Ocean current interaction with the northern extent of the Cascade Head headland generally removes sand along the beach in the area of the site and reduces the level of the beach.

Proposal Rock is located approximately 1.6 miles south of the site and does not appear to affect the subject site substantially.

2.9 Description of any shore protection structures that may exist on the property or on nearby properties.

An existing riprap revetment is present west of the subject and is connected to other oceanfront revetments immediately to the north and south.

2.10 Presence of pathways or stairs from the property to the beach.

An improved pathway or stairs is not present from the western portion of the site to the beach. However, an unimproved path is present at the end of the cul-de-sac near the site.

2.11 Existing human impacts on the site, particularly any that might alter the resistance to wave attack.

Human impacts are not contributing to the alteration of the resistance of the riprap revetment to wave attack at this site.

3.0 Description of the Fronting Beach

Kiwanda Beach fronts the properties west of the site. Detailed descriptions of the characteristics of the beach are provided below.

3.1 Average widths of the beach during the summer and winter.

The beach near the site has a highly variable width, which is primarily dependent upon tide levels, and it tends to be narrower in the winter than in the summer. Although the beach can be more than 300 feet wide, at high tide, there is often no walkable beach. The beach here is very dynamic and changes morphology frequently, primarily due to rip current formation.

3.2 Median grain size of beach sediment.

During our site visit, we observed fine-grained to medium-grained beach sand.

3.3 Average beach slopes during the summer and winter.

Beach slopes vary from approximately 1 to 5 degrees depending upon recent accretion or erosion. The beaches tend to be flatter in the summer.

3.4 Elevations above mean sea level of the beach at the seaward edge of the property during summer and winter.

Lidar data from 2016 shows the junction between the beach and the revetment was at an elevation of approximately 16 feet (NAVD 88) (Figures 3 and 4). Allan and Hart (2005) surveyed the elevation of the beach/dune junction in 1997, 1998, and 2002 at approximately 25 feet, 19 feet, and 16 feet, respectively. Winter elevations primarily depend on beach profiles formed by storm conditions.

3.5 Presence of rip currents and rip embayments that can locally reduce the elevation of the fronting beach.

Rip currents and rip current embayments commonly contribute to erosion along the oceanfront in Neskowin. Narrow beaches and near-shore relatively deep water conditions contribute to rip current and rip current embayment formation.

During our site visit, we did not observe any rip current embayments in the area of the site; however, rip currents and rip current embayments have developed immediately west of the site, as seen in historical satellite imagery.

3.6 Presence of rock outcrops and sea stacks, both offshore and within the beach zone.

Proposal Rock is located approximately 1.6 miles south of the site.

3.7 Information regarding the depth of beach sand down to bedrock at the seaward edge of the property.

At the time of our site visit, we observed no exposures of bedrock materials near the subject site. Based on mapping completed by Schlicker et al. (1972), bedrock underlying the site consists either of Oligocene to Miocene or Eocene Sedimentary Rocks. Based on our experience with Neskowin sites in the vicinity, we estimate that bedrock lies more than 20 feet below the beach level.

4.0 Geologic Hazards Analysis

Our geologic hazards analysis is presented below.

4.1 Subsurface Materials

The site lies in an area that has been mapped as Pleistocene beach sand (Schlicker et al., 1972). Neskowin lies on a large dune complex, which is approximately 4 miles long, north to south, and extends from the coastline east to the base of the hills. This dune complex consists of numerous individual dunes, which vary in age and stability. The area of the site has been mapped as a younger stabilized dune (open dune sand conditionally stable), which is a dune that has become conditionally stable regarding wind erosion (USDA et al., 1975). The dune consists of tan, loose, fine-grained sand with a very thin, poorly developed topsoil. Schlicker et al. (1972) also mapped the area east of the site as an area of high groundwater. Snavely et al. (1996) mapped the area of the site as Quaternary dune sand with Quaternary beach sand west of the site. Based on recently revised mapping, the site has now been classified as recently stabilized dunes, hummocky terrain, which may be subject to future erosion (Allan, 2020).

At the time of our August 27, 2021 site visit, we completed subsurface exploration with four hand-augered borings logged by a geologist from our office who visually classified the soils encountered according to the Unified Soil Classification System (USCS) as follows:

Boring	Depth (ft.)	USCS	Description
B-1	0.0 – 0.66	SP (FILL)	SAND FILL; light brown, dry, loose.
	0.66 – 0.83	GP (FILL)	GRAVEL FILL; dark grey, dry, loose. With woven landscape fabric. Refusal on rock fragments. Free groundwater was not encountered.
B-2	0.0 – 2.5	SP	SAND; light brown, dry, loose. Terminated due to flowing dry sand. Free groundwater was not encountered.
B-3	0.0 – 1.0	SP (FILL)	SAND FILL; light brown, dry, loose.
	1.0	GP (FILL)	GRAVEL FILL; dark grey, dry, loose. Refusal on rock fragments. Free groundwater was not encountered.
B-4	0.0 – 2.0	SP (FILL)	Gravely SAND FILL; light brown, dry, loose. Terminated due to flowing dry sand. Free groundwater was not encountered.

The borings generally encountered approximately 2 feet of tan, loose, dune sand and gravel fill underlain by loose dry native sands.

4.2 Geologic Structures

Structural deformation and faulting along the Oregon Coast is dominated by the Cascadia Subduction Zone (CSZ), which is a convergent plate boundary extending for approximately 680 miles from northern Vancouver Island to northern California. This convergent plate boundary is defined by the subduction of the Juan de Fuca plate beneath the North America Plate and forms an offshore north-south trench approximately 60 miles west of the Oregon coast shoreline. A resulting deformation front consisting of north-south oriented reverse faults is present along the western edge of an accretionary wedge east of the trench, and a zone of margin-oblique folding and faulting extends from the trench to the Oregon Coast (Geomatrix, 1995).

A northwest-trending strike-slip fault is mapped near the site, extending from Proposal Rock to the southeast approximately 4 miles (Snavely et al., 1996). Based on mapping, the fault appears to offset middle Tertiary geologic units.

A potentially active fault is the Happy Camp Fault (formerly the Netarts Bay fault), which lies at the north end of Netarts Bay, approximately 22 miles north of the site (Geomatrix, 1995). This fault is a west-northwest trending, high angle reverse fault which cuts Miocene basaltic and Pleistocene channel deposits. This fault is believed to have been active approximately 125,000 years ago; however, it does not appear to cut 80,000-year-old marine terrace deposits, which suggests that the fault has not been active for at least 80,000 years (Geomatrix, 1995).

Other mapped potentially active faults are located in the Tillamook Bay fault zone approximately 30 miles north of the site, which are northwest-striking faults that offset the Eocene Tillamook Volcanics on the west flank of the Coast Range. No displacements in Quaternary deposits have been documented, but the fault zone parallels the mountain front that controls the northeastern margin of Tillamook Bay and thus has geomorphic expression consistent with Quaternary displacement (Personius et al., 2003).

4.3 Slopes

Slopes are discussed in detail in Section 2.2 above.

4.4 Orientation of Bedding Planes in Relation to the Dip of the Surface Slope

The site lies in an area mapped as dune sands, which have beds of varying dip related to the surface slope. Based on mapping completed by Schlicker et al. (1972), bedrock underlying the site consists either of Oligocene to Miocene or Eocene Sedimentary Rocks. The sandstone units have been mapped as dipping down to the west-northwest from 5 to 15 degrees, near the site (Snavely et al., 1996). Grades at the subject site are primarily related to past grading and fill activities rather than the orientation of underlying units.

4.5 Site Surface Water Drainage Patterns

Stormwater at the site generally infiltrates into the sandy soils and flows to the west. At the time of our site visit, we observed no streams at or in the immediate vicinity of the site. The nearest stream is Kiwanda Creek, located approximately 0.5 mile southeast of the site, which flows south from Lake Neskowin. Kiwanda Creek discharges onto the beach approximately 1.6 miles south of the site (Figure 1).

4.6 Dune Stability and Erosion

The site is located in an area of loose dune sand, which is easily eroded by ocean wave activity, and wind when devoid of vegetation. During the winters of 1998, 1999, 2000, and 2001 severe storms resulted in substantial ocean wave erosion, which removed active dunes present west of the subject lot and eroded the western part of the dune on which the property lies. As reported by local residents, up to 10 feet of erosion has been observed during a single storm event. Ocean wave erosion has also resulted in the lowering of the beach elevation by several feet, allowing higher energy waves to impact the western dune edge. The increase in ocean wave erosion observed along much of the Oregon Coast in the recent past is a consequence of the mid- to late 1990s El Niño/La Niña events, which altered ocean currents and transported much of the beach sand offshore. There has been some rebuilding of the beach in the last few years, but this has been a slow process. As a result, nearly all of Neskowin's oceanfront residences have had oceanfront protection installed. In the area of this site, the oceanfront has been protected with riprap revetments for hundreds of feet to the north and south.

The existing revetment located on the west of the subject site slopes down to the beach at approximately 20 to 30 degrees and consists of angular basalt boulders approximately 4 to 6 feet diameter on its lower portion and approximately 3 to 5 feet diameter on the upper portion (Figure 3; Appendix A). Severe storms in the winter of 2007–2008 partly undermined the revetments in areas located along Neskowin Beach. The riprap revetment west of the site greatly reduces the potential for erosion when maintained and repaired as necessary.

The western portion of the subject site, including the northwest corner of the existing house and area of the proposed deck addition, is mapped in a zone of high coastal erosion hazard, with the beach and revetment area west of the site mapped in the very high (active) coastal erosion hazard zone (Allan and Priest, 2001). The very high (active) coastal erosion hazard zone is defined as an area that is being actively eroded by ocean waves and the mass movements directly caused by wave action. The high coastal erosion hazard zone is defined as an area having a high probability that it could be affected by active erosion in the next ~ 60 to 100 years (Allan and Priest, 2001). It should be noted that mapping done for the 2001 study was intended for regional planning use, not for site-specific hazard identification.

4.7 Regional Seismic Hazards

Abundant evidence indicates that a series of geologically recent large earthquakes related to the Cascadia Subduction Zone have occurred along the coastline of the Pacific Northwest. Evidence suggests that more than 40 great earthquakes of magnitude 8 and larger have struck western Oregon during the last 10,000 years. The calculated odds that a Cascadia earthquake will occur in the next 50 years range from 7–15 percent for a great earthquake affecting the entire Pacific Northwest, to about a 37 percent chance that the southern end of the Cascadia Subduction Zone will produce a major earthquake in the next 50 years (OSSPAC, 2013; OSU News and Research Communications, 2010; Goldfinger et al., 2012). Evidence suggests the last major earthquake occurred on January 26, 1700, and may have been of magnitude 8.9 to 9.0 (Clague et al., 2000).

There is now increasing recognition that great earthquakes do not necessarily result in a complete rupture along the full 1,200 km fault length of the Cascadia subduction zone. Evidence in the paleorecords indicates that partial ruptures of the plate boundary have occurred due to smaller earthquakes with moment magnitudes (Mw) < 9 (Witter et al., 2003; Kelsey et al., 2005). These partial segment ruptures appear to occur more frequently on the southern Oregon coast, as determined from paleotsunami studies. Furthermore, the records have documented that local tsunamis from Cascadia earthquakes recur in clusters (~250–400 years) followed by gaps of 700–1,300 years, with the higher tsunamis associated with earthquakes occurring at the beginning and end of a cluster (Allan et al., 2015).

These major earthquake events were accompanied by widespread subsidence of a few centimeters to 1–2 meters (Leonard et al., 2004). Tsunamis appear to have been associated with many of these earthquakes. In addition, settlement, liquefaction, and landsliding of some earth materials are believed to have been commonly associated with these seismic events.

Other earthquakes related to shallow crustal movements or earthquakes related to the Juan de Fuca plate have the potential to generate magnitude 6.0 to 7.5 earthquakes. The recurrence interval for these types of earthquakes is difficult to determine from present data, but estimates of 100 to 200 years have been given in the literature (Rogers et al., 1996).

Liquefaction and Settlement

Liquefaction occurs when saturated, cohesionless soils are subjected to ground vibrations, resulting in a decrease in the volume of the soil. If drainage is unable to occur, the tendency to decrease in volume results in an increase in pore water pressure, and if the pore water pressure builds up to the point at which it is equal to the overburden pressure, the effective stress becomes zero, and the soil loses its strength and develops a liquefied state. Liquefaction is most common in saturated, loose, granular soils, sand or silty sand materials. Cohesive soils, such as clayey silt and clay, will generally not liquefy during earthquakes. Older sediments are also more resistant to liquefaction than recently deposited sediments (Idris and Boulanger, 2008).

DOGAMI's HazVu website (https://gis.dogami.oregon.gov/maps/hazvu/) has mapped the area of the site as having a high susceptibility to liquefaction. DOGAMI states: "Buildings and infrastructure sitting on these [liquefiable] soils are likely to be severely damaged in an earthquake."

Settlement can be the result of liquefaction of saturated soils or simply a result of dry soil densifying under vibration (volumetric compression). Volumetric compression during an earthquake results from vibrations of the soil, which causes soil particles to settle into a denser state, decreasing the volume of the soil. The degree of settlement is primarily dependent upon the initial density of the soil and the magnitude and duration of ground vibration (shaking). The settlement caused by liquefaction is commonly differential, and the magnitude of settlement typically varies throughout a site, whereas settlement caused by volumetric compression tends to be more uniform.

4.8 Flooding Hazards

Based on the 2018 Flood Insurance Rate Map (FIRM, Panel #41057C1005F), the western portion of the site lies in an area mapped as a Special Flood Hazard Area (SFHA) Zone AE with Base Flood Elevations determined at 23 feet. The eastern approximately 65 feet of the site lies within Zone X, determined to be an area of minimal flood hazard (Figures 3 and 4).

The beach, revetment and a portion of the area west of the site lies in areas rated as SFHA Zone VE (EL 29.9 feet and 25 feet), which is defined as a coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined. Based upon the FEMA Flood Insurance Rate mapping for this site, the foredune in the western portion of the site is subject to overtopping (Allan et al., 2015).

Based on the Oregon Department of Geology and Mineral Industries mapping (DOGAMI, 2012), the subject site lies within the tsunami inundation zone resulting from an approximately 8.7 and greater magnitude Cascadia Subduction Zone (CSZ) earthquake. The 2012 DOGAMI mapping is based upon five computer-modeled scenarios for shoreline tsunami inundation caused by potential CSZ earthquake events ranging in magnitude from approximately 8.7 to 9.1. The January 1700 earthquake event (discussed in Section 4.7 above) has been rated as an approximate 8.9 magnitude in DOGAMI's methodology. More distant earthquake source zones can also generate tsunamis.

4.9 Climate Change

According to most recent scientific studies, the Earth's climate is changing due to human activities, which are altering the chemical composition of the atmosphere through the buildup of greenhouse gases, primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons (EPA, 1998). Although there are uncertainties about exactly how the Earth's climate will respond to enhanced concentrations of greenhouse gases, scientific observations indicate that detectable changes are underway (EPA, 1998; Church and White, 2006). Global sea level rise, caused by melting polar ice caps and ocean thermal expansion, could lead to flooding of low-lying coastal property, loss of coastal wetlands, erosion of beaches and bluffs, and saltwater contamination of drinking water. Global climate change and the resultant sea level rise will likely impact the subject site through accelerated coastal erosion and more frequent and severe flooding.

4.10 Analyses of Erosion and Flooding Potential

4.10.1 Analysis of DOGAMI beach monitoring data available for the site (if available).

DOGAMI beach monitoring data has been collected for Kiwanda beach, approximately 1,000 feet south of the site, regularly since 1997 however, this particular monitoring site is not protected with a revetment.

A data collection point approximately 1.4 miles south of the site in Neskowin Beach, with a revetment, indicates that following the winter storms of 1998-99 and construction of the revetments along the beach, beach elevations have varied by several feet from minimum to maximum over the monitored period of 1997 to 2021; the riprap revetments have prevented any shoreline change at the 6 meter (~20 ft) elevation contour (Allan and Hart, 2005; Allan and Hart, 2007; Allan and Hart, 2008; Allan et al., 2015; NANOOS, accessed September 2021).

4.10.2 Analysis of human activities affecting shoreline erosion.

We did not observe any human activities along the dune that are affecting the shoreline erosion. See Section 2.11 above.

4.10.3 Analysis of possible mass wasting, including weathering processes, landsliding, or slumping.

The erosive processes affecting the site are discussed in detail in Section 4.6 (above).

4.10.4 Calculation of wave run-up beyond mean water elevation that might result in erosion of the sea cliff or foredune.

Coastal erosion rates and hazard zones (as referenced in Allan and Priest, 2001) were presented in Section 4.6 Dune Stability and Erosion (above). In the dune-backed shoreline recession methodology applicable to the subject site, the total water level produced by the combined effect of wave runup plus the tidal elevation must exceed some critical elevation of the fronting beach, typically the elevation of the beach-dune junction. Wave runup elevation can change with many variables such as changing beach elevations, presence of transient dunes, etc. The dune is protected by the riprap revetment west of the subject site, and this shoreline recession methodology is not appropriate for the site.

4.10.5 Evaluation of frequency that erosion-inducing processes could occur, considering the most extreme potential conditions of unusually high-water levels together with severe storm wave energy.

On this stretch of dune-backed shoreline, erosion-inducing processes are daily in the form of constant wave attack. High water levels and severe storms can cause rip currents, which have the potential to undermine the revetment west of the site.

4.10.6 For dune-backed shoreline, use an established geometric model to assess the potential distance of property erosion, and compare the results with direct evidence obtained during site visit, aerial photo analysis, or analysis of DOGAMI beach monitoring data.

Not applicable to the subject site or nearby area, which is a dune-backed shoreline that has been extensively riprapped; see Sections 4.10.1 and 4.10.4 (above).

4.10.7 For bluff-backed shoreline, use a combination of published reports, such as DOGAMI bluff and dune hazard risk zone studies, aerial photo analysis, and fieldwork, to assess the potential distance of property erosion.

Not applicable to the subject site, which lies in a riprap revetment protected dune-backed shoreline area.

4.10.8 Description of potential for sea level rise, estimated for local area by combining local tectonic subsidence or uplift with global rates of predicted sea level rise.

Based on data from NOAA monitoring stations at South Beach and Garibaldi collected from 1970 to 2020, this general area of Oregon's coastline has a sea level rise of approximately 2.13 mm/year, which includes the combined effects of global rates of sea level rise and landmass elevation changes (NOAA Tides & Currents Sea Level Trends http://tidesandcurrents.noaa.gov/sltrends/). Additional observations are addressed in Section 4.9 of this report.

4.11 Assessment of Potential Reactions to Erosion episodes.

4.11.1 Determination of legal restrictions of shoreline protective structures (Goal 18 prohibition, local conditional use requirements, priority for non-structural erosion control methods).

As previously noted, a riprap revetment is present to the west of the subject site. Lots were generally 'developed' on January 1, 1977; however, this is a legal issue that can have varying interpretations. Most lots in this area, including the subject site, generally meet Oregon's Goal 18 exception requirements to obtain protection when a structure is threatened by erosion.

According to the Ocean Shores Viewer (http://www.coastalatlas.net/oceanshores/, Accessed September 2021), the subject site appears to be Goal 18 eligible due to an exception for an oceanfront protective structure.

4.11.2 Assessment of potential reactions to erosion events, addressing the need for future erosion control measures, building relocation, or building foundation and utility repairs.

Residential development recommendations for the proposed addition of an elevated deck, including erosion control and foundation design recommendations, are presented in Section 5. The potential to move the house and the proposed attached addition will be dependent upon design.

5.0 Development Standards and Recommendations

The main engineering geologic concerns at the site are:

1. The site lies on dune sands, which are poorly consolidated and in an area subject to accretion and erosion from wind and wave attack. Inherent risks of coastal

erosion and future dune sand accretion and movement at this site must be accepted by the owner, future owners, developers, and residents.

2. Loose unconsolidated soils and fill at least 2 feet deep are present. This material is unsuitable for supporting new foundations.

3. A portion of the site lies within a mapped FEMA flood zone and is subject to potential flooding.

4. During construction, disturbed, dry sands may be blown by winds, resulting in the transport and deposition of sands off-site. Therefore, periodic watering or covering exposed areas with a thin layer of rock may be required to control blowing sands during windy conditions.

5. There is an inherent regional risk of earthquakes along the Oregon Coast which could cause harm and damage structures. Ground shaking during an earthquake can cause soils to liquefy, resulting in loss of bearing capacity and structural damage. The site also lies in a mapped tsunami inundation hazard zone. A tsunami impacting the Neskowin area could cause harm, loss of life, and damage to structures. Hazards associated with tsunami flooding resulting from a seismic event cannot economically be completely mitigated. These risks must be accepted by the owner, future owners, developers and residents of the site.

Recommendations

It is our understanding that the proposed deck will be attached to the existing attached deck. We recommend that the lowest horizontal member of the deck's frame be elevated a minimum of one foot above the BFE of 23 feet. If modifications to the existing structure contribute substantially greater loads to the existing foundations, additional geotechnical investigation, analysis, foundation design and construction recommendations may be required.

During construction, disturbed, dry sands may be blown by winds, resulting in the transport and deposition of sands off-site. Therefore, periodic watering or covering of exposed areas may be required to control blowing sands during windy conditions. Vegetation should be removed only as necessary, and exposed areas should be replanted following construction.

Provided the recommendations presented in this report are incorporated into the design and construction, we believe that the proposed structure will be reasonably protected from the described hazards for the life of the structure except for catastrophic hazards presented by large earthquakes and associated tsunamis.

5.1 Development Density

It is our understanding that an elevated attached deck is proposed near the northwest corner of the existing house (Figures 3 and 4).

5.2 Setback

Based on our site observations, the existing riprap revetment west of the site will prevent significant dune erosion at the site with proper maintenance. However, during severe storm events, the revetment may be overtopped by severe wave swash. Areas west of the site are mapped as FEMA VE Zones. We recommend that all foundation elements for the new addition be set back a minimum of 100 feet from the top of the revetment and outside of the FEMA VE zones, whichever is greater. It is our understanding that the addition is proposed to be approximately 150 feet from the top of the revetment, well east of this minimum setback (Figures 3 and 4).

5.3 Grading Practices

We recommend the following grading practices:

5.3.1 Site Preparation

All existing loose disturbed soil, fills, and debris should be stripped and removed from footing areas prior to construction so that new foundations and structural fill materials can rest on native sand soils, recompacted non-organic fill sands, or imported granular fills.

The thickness of fill and loose soils at the site is variable, and the depth to suitable non-organic, native firm sandy soils is unknown. We recommend that footing areas be over-excavated and replaced with structural fill per the recommendations provided in section 5.3.2 below. Structural fill underlying footings should extend to depths of 2 times the footing width below the bottom of the footing or a minimum of 3 feet, whichever is greater, and have a width of 2 times the footing width.

5.3.2 Structural Fill

Structural fills supporting building loads should consist of granular material, free of organics and deleterious materials, and contain no particles greater than 1 inch in diameter so that nuclear methods (ASTM D2922 &ASTM D3017) can be easily used for field density testing. Structural fill should be placed and compacted in 8-inch lifts maximum and compacted to a minimum of 92 percent as determined by ASTM D1557, at or near the optimum moisture content. All areas to receive fill should be stripped of all loose soils, organic soils, organic debris, existing fill, disturbed soils, and construction debris.

Proper test frequency and earthwork documentation usually require daily observation during stripping, rough grading, and placement of structural fill. Field density testing should generally conform to ASTM D2922 and D3017, or D1556. To minimize the number of field and laboratory tests, fill materials should be from a single source and of a consistent character. Structural fill should be approved and periodically observed by HGSA and tested by a qualified testing firm. Test results will need to be reviewed and approved by HGSA. We recommend that one density test be performed for at least every 18 inches of fill placed and every 200 cubic yards, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor schedule the testing. Relatively more testing is typically necessary on smaller projects.

STRUCTURAL FILL	
Compaction Requirements	92% ASTM D1557, compacted in 8-inch lifts maximum, at or near the optimum moisture content.

5.4 Vegetation Removal and Re-Vegetation Practices

Vegetation should be removed only as necessary, and exposed areas should be replanted following construction. Disturbed ground surfaces exposed during the wet season (November 1 through April 30) should be temporarily planted with grasses or protected with erosion control blankets or hydromulch. Existing vegetation should be left undisturbed as much as possible.

Exposed sloping areas steeper than 3 horizontal to 1 vertical (3H:1V) should be mulched, seeded, and fertilized to provide erosion protection until permanent vegetation can be established. Erosion control blankets should be installed as per the manufacturer's recommendations.

5.5 Foundation Recommendations

Building loads may be supported on individual spread footings bearing in undisturbed, native, non-organic, firm soils or properly designed and compacted structural fill placed on these soils.

Footings bearing in undisturbed, native, non-organic, firm soils or properly compacted structural fill placed on these soils may be designed for the following:

ALLOWABLE SOIL BEARING CAPACITIES	
Allowable Dead Plus Live Load Bearing Capacity [a]	1,500 psf
Passive Resistance	150 psf/ft embedment depth
Lateral Sliding Coefficient	0.35
[a] Allowable bearing capacity may be increased by one-third for short term wind or seismic loads.	

Recommended foundation footing widths and embedment depths are as follows:

MINIMUM FOOTING WIDTHS & EMBEDMENT DEPTHS	
Number of Stories	One
Minimum Footing Width	16 inches
Minimum Exterior Footing Embedment Depth	24 inches
Minimum Interior Footing Embedment Depth [a]	6 inches
[a] Interior footings should be embedded a minimum of 6 inches below the lowest adjacent finished grade, or as otherwise recommended by our firm. In general, interior footings placed on sloping or benched ground should be embedded or set back in such a manner as to provide a minimum horizontal distance between the foundation component and face of the slope of one foot per every foot of elevation change.	

5.6 Drainage and Stormwater Management

Surface water should be diverted from building foundations and walls to approved disposal points by grading the ground surface to slope away a minimum of 2 percent for at least 6 feet towards a suitable gravity outlet to prevent ponding near the structures.

All roof drains should be collected and tightlined in a separate system independent of the footing drains, or an approved backflow prevention device shall be used. All roof and footing drains should be discharged to an approved disposal point. If water will be discharged to the ground surface, we recommend that energy dissipaters, such as splash blocks or a rock apron, be utilized at all pipe outfall locations. Water collected on the site should not be concentrated and discharged to adjacent properties. We recommend that all collected water be tightlined and discharged to the local stormwater system, splash blocks, or the riprap revetment.

5.7 Erosion Control

As detailed above (Section 5.4), vegetation should be removed only as necessary, and exposed areas should be replanted following construction. Disturbed ground surfaces exposed during the wet season (November 1 through April 30) should be temporarily planted with grasses or protected with erosion control blankets.

A temporary sediment fence should be installed around any disturbed areas of the site until permanent vegetation cover can be established (Figure 5).

As recommended above, exposed sloping areas steeper than 3 horizontal to 1 vertical (3H:1V) should be protected by hydroseeding or the use of rolled erosion control products (RECP's), aka "erosion control blankets," to provide erosion protection until permanent vegetation can be established. Erosion control blankets should be installed as per the manufacturer's recommendations.

Periodic watering of exposed areas may be required during construction to control blowing sands during windy conditions and prevent transport and deposition of disturbed or dry sands off-site.

The riprap revetment west of the site should be maintained and repaired as necessary to ensure its continued performance in reducing the potential for erosion at the site.

5.8 Flooding Considerations

A portion of the site lies in a mapped flood hazards area as described in Section 4.8.

5.9 Seismic Considerations

The structure and all structural elements should be designed to meet current Oregon Residential Specialty Code (ORSC) seismic requirements. Based on our knowledge of subsurface conditions at the site and our analysis using the guidelines recommended in the ORSC, the structure should be designed to meet the following seismic parameters:

SEISMIC DESIGN PARAMETERS	
Site Class	D
Seismic Design Category	D_2
Mapped Spectral Response Acceleration for Short Periods	$S_S = 1.292$ g
Site Coefficients	$F_a = 1.200$ $F_v = 1.700$
Design Spectral Response Acceleration at Short Periods	$S_{DS} = 1.034$ g

5.10 Plan Review and Construction Observations

Prior to construction, we should be provided the opportunity to review all site development, foundation, drainage, erosion control, and grading plans to assure conformance with the intent of our recommendations (Appendix B). All site plans, details, and specifications should clearly show that the above recommendations have been implemented into the design.

A representative of HGSA should observe all footing excavations prior to placing structural fill, and/or forming and pouring concrete to assure that suitable bearing materials have been reached (Appendix B). Please provide us with at least 5 (five) days' notice prior to any needed site observations. There will be additional costs for these services.

5.11 Worker Safety

All construction activities should be completed in accordance with OSHA standards and all State and local laws, rules, regulations, and codes.

6.0 Summary Findings and Conclusions

HGSA certifies that all applicable content requirements of Tillamook County Land Use Ordinance Section 3.570(5) have been addressed above, and it is the undersigned engineering geologist's professional opinion that the proposed development will be within the acceptable level of risk established by the community, considering the site conditions and the above recommendations.

Our summary findings and conclusions are presented below:

6.1 Proposed Use

The proposed project consists of constructing an attached elevated deck in a mapped flood zone. The proposed location of the addition at the northwest corner of the existing house is within an area that will cause minimal additional exposure to risks from coastal hazards to the existing home. No adverse impacts are anticipated to occur on adjacent lots as a result of the development of this site, provided that the recommendations detailed in this report are adhered to.

6.2 Hazards to Life, Property, and the Environment

Geologic hazards to life, property, and the environment associated with this proposed use include stormwater erosion, ocean wave erosion, seismic hazards, and possibly flooding. Recommendations for mitigation of erosion and seismic hazards have been incorporated into this report. Please note that the risk of these hazards is inherent with development and construction in this part of Neskowin and must be assumed by the owner, future owners, developers, and residents.

6.3 Off-Site Protection

Adverse effects of this development on surrounding areas will be minimized when all the stormwater, foundation, vegetation, and erosion control recommendations detailed in this report are adhered to.

6.4 Stabilization Programs

Stabilization programs for this site include vegetation and erosion stabilization as addressed in Sections 5.4 and 5.8 of this report, surface water collection as addressed in Section 5.7 of this report, and maintenance of the riprap revetment as addressed in Section 5.8 of this report.

6.5 Conclusions Regarding Hazards and Adverse Environmental Effects

Adverse environmental effects will be minimized by following the recommendations detailed in this report during the design and construction of the proposed project.

6.6 Recommendations for Further Work

Assuming all the recommendations above are adhered to, no additional investigation or analysis is required by our firm other than review of site development plans, and observation of foundation excavations as detailed in Section 5.11 and Appendix B of this report.

7.0 Additional Services

Design Review

This report pertains to a specific site and development. It is not applicable to adjacent sites, nor is it valid for types of development other than that to which it refers. Any variation from the site or development plans necessitates a geotechnical review in order to determine the validity of the design concepts evolved herein.

HGSA's review of final plans and specifications is necessary to determine whether the recommendations detailed in this report for the site have been properly interpreted and incorporated in the design and construction documents. At the completion of our review, we will issue a letter of conformance to the client for the plans and specifications.

Construction Monitoring

Because of the judgmental character of geotechnics, as well as the potential for adverse circumstances arising from construction activity, observations during site preparation, excavation, and construction will need to be carried out by a representative of HGSA or our designate. These observations may then serve as a basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein to the benefit of the project. Field observations become increasingly important should earthwork proceed during adverse weather conditions.

8.0 Limitations

The Oregon Coast is a dynamic environment with inherent unavoidable risks to development. Landsliding, erosion, tsunamis, storms, earthquakes, and other natural events can cause severe impacts to structures built within this environment and can be detrimental to the health and welfare of those who choose to place themselves within this environment. The client is warned that, although this report is intended to identify the geologic hazards causing these risks, the scientific and engineering communities' knowledge and understanding of geologic hazards processes are not complete.

Our investigation was based on engineering geological reconnaissance, limited review of published information, and our subsurface exploration and analyses. The data presented in this report are believed to be representative of the site. The conclusions herein are professional opinions derived in accordance with current standards of professional practice and budget constraints. No warranty is expressed or implied. The performance of the site during a seismic event has not been evaluated. If you would like us to do so, please contact us.

The boring logs and related information depict generalized subsurface conditions only at these specific locations, and at the particular time the subsurface exploration was completed. Soil, rock, and groundwater conditions at other locations may differ from the conditions at these boring locations. Also, the passage of time may result in a change in the soil and groundwater conditions at the site.

This report pertains to the subject site only and is not applicable to adjacent sites, nor is it valid for types of development other than that to which it refers. Geologic conditions, including materials, processes, and rates, can change with time, and therefore, a review of the site and/or this report may be necessary as time passes to assure its accuracy and adequacy. This report may only be copied in its entirety.

9.0 Disclosure

H.G. Schlicker & Associates, Inc. and the undersigned Certified Engineering Geologist have no financial interest in the subject site, the project, or the Client's organization.

10.0 References Cited

Allan, J. C. and Hart, R., 2005, A geographical information system (GIS) data set of beach morphodynamics derived from 1997, 1998, and 2002 LIDAR data for the central to northern Oregon coast: Technical Report to the Oregon Department of Land Conservation and Development: Oregon Department of Geology and Mineral Industries, Open-File Report O-05-09, 16 pages.

Allan, J. C., and Hart, R., 2007, Assessing the temporal and spatial variability of coastal change in the Neskowin littoral cell: developing a comprehensive monitoring program for Oregon beaches: Technical Report to the Oregon Department of Land Conservation and Development: Oregon Department of Geology and Mineral Industries, Open-File Report O-07-01, 27 pages.

Allan, J.C., and Hart, R., 2008, Oregon beach and shoreline mapping and analysis program: 2007-2008 beach monitoring report: Oregon Department of Geology and Mineral Industries Open file report O-08-15, 60 p.

Allan, J.C., Ruggiero, P., Garcia, G., O'Brien, F. E., Stimely, L. L., and Roberts, J. T., 2015, Coastal Flood Hazard Study, Tillamook County, Oregon: Oregon Department of Geology and Mineral Industries Special Paper 47, 274 p.

Allan, J. C., and Priest, G. R., 2001, Evaluation of coastal erosion hazard zones along dune and bluff backed shorelines in Tillamook County, Oregon: Cascade Head to Cape Falcon: Oregon Department of Geology and Mineral Industries, Open-File Report O-01-03, 126p., maps.

Allan, J. C., 2020, Temporal and Spatial Changes in Coastal Morphology, Tillamook County, Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-20-04, 27 p. report, geodatabase, metadata

Church, J. A., and White, N. J., 2006, A 20th century acceleration in global sea-level rise; Geophysical Research Letters, v. 22, LO1601, 4 p.

Clague, J. J., Atwater, B. F., Wang, K., Wang, Y., and Wong, I., 2000, Penrose Conference 2000 - Great Cascadia Earthquake Tricentennial, Programs Summary and Abstracts: Oregon Department of Geology and Mineral Industries, Special Paper 33, 156 p.

DOGAMI, 2012, Tsunami inundation maps for Neskowin, Tillamook County, Oregon: Oregon Department of Geology and Mineral Industries, TIM-Till-14, maps.

EPA, 1998, Climate Change and Oregon: Environmental Protection Agency, EPA 236-98-007u, 4 p.

Geomatrix Consultants, 1995, Seismic design mapping, State of Oregon, final report: Prepared for the Oregon Department of Transportation, Project No. 2442.

Goldfinger, C., Nelson, C. H., Morey, A. E., Johnson, J. E., Patton, J. R., Karabanov, E., Gutiérrez-Pastor, J., Eriksson, A. T., Gràcia, E., Dunhill, G., Enkin, R. J., Dallimore, A., and Vallier, T., 2012, Turbidite event history—Methods and implications for Holocene paleoseismicity of the Cascadia subduction zone: U.S. Geological Survey Professional Paper 1661–F, 170 p.

Hart, R., and Peterson, C., 1978, Episodically Buried Forests in the Oregon Surf Zone; Oregon Geology, v. 59, number 6, November/December 1997.

Idris, I. M., and Boulanger, R. W., 2008, Soil Liquefaction During Earthquakes: Earthquake Engineering Research Institute, 243 p.

Kelsey, H. M., Nelson, A. R., Hemphill-Haley, E., and Witter, R. C., 2005, Tsunami history of an Oregon coastal lake reveals a 4600 yr record of great earthquakes on the Cascadia subduction zone: Geological Society of America Bulletin, v. 117, no. 7/8, p. 1009-1032.

Leonard, L. J., Hyndman, R. D., and Mazzotti, S., 2004, Coseismic subsidence in the 1700 great Cascadia earthquake: Coastal estimates versus elastic dislocation models: Geological Society of America Bulletin, May/June 2004, v. 116, no. 5/6, pp. 655–670.

NANOOS, Beach Monitoring Data, http://nvs.nanoos.org/BeachMapping, Oct 1997 to April 2021

Oregon Seismic Safety Policy Advisory Commission (OSSPAC), February 2013, The Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami—Report to the 77th Legislative Assembly: State of Oregon Office of Emergency Management, 341 p.

OSU News and Research Communications, May 24, 2010, Odds are 1-in-3 that a huge quake will hit Northwest in next 50 years: Oregon State University, Corvallis http://oregonstate.edu/ua/ncs/archives/2010/may/odds-huge-quake-Northwest-next-50-years

Personius, S. F., Dart, R. L., Bradley, L-A, Haller, K. M., 2003, Map and data for Quaternary faults and folds in Oregon: U.S. Geological Survey, Open-File Report 03-095, 556 p., map.

Rogers, A. M., Walsh, T. J., Kockelman, J., and Priest, G. R., 1996, Earthquake hazards in the Pacific Northwest - an overview: U.S. Geological Survey, Professional Paper 1560, p. 1- 54.

Schlicker, H. G., Deacon, R. J., Beaulieu, J. D., and Olcott, G. W., 1972, Environmental geology of the coastal region of Tillamook and Clatsop Counties, Oregon: Oregon Department of Geology and Mineral Industries, Bulletin 74, 164 p., maps.

Snavely, P. D., Niem, A., Wang, F. L., MacLeod, N. S., and Calhoun, T. K., 1996, Geologic map of the Cascade Head Area, Northwestern Oregon Coast Range (Neskowin, Nestucca Bay, Hebo, and Dolph 7.5 minute Quadrangles): U.S. Geological Survey, Open-File Report 96-0534, 16 p., maps.

USDA Soil Conservation Service, and Oregon Coastal Conservation and Development Commission, 1975, Beaches and dunes of the Oregon Coast: 161 p.

Witter, R. C., Kelsey, H. M., and Hemphill-Haley, E., 2003, Great Cascadia earthquakes and tsunamis of the past 6700 years, Coquille River estuary, southern coastal Oregon: Geological Society of America Bulletin, v. 115, p. 1289-1306.

It has been our pleasure to serve you. If you have any questions concerning this report or the site, please contact us.

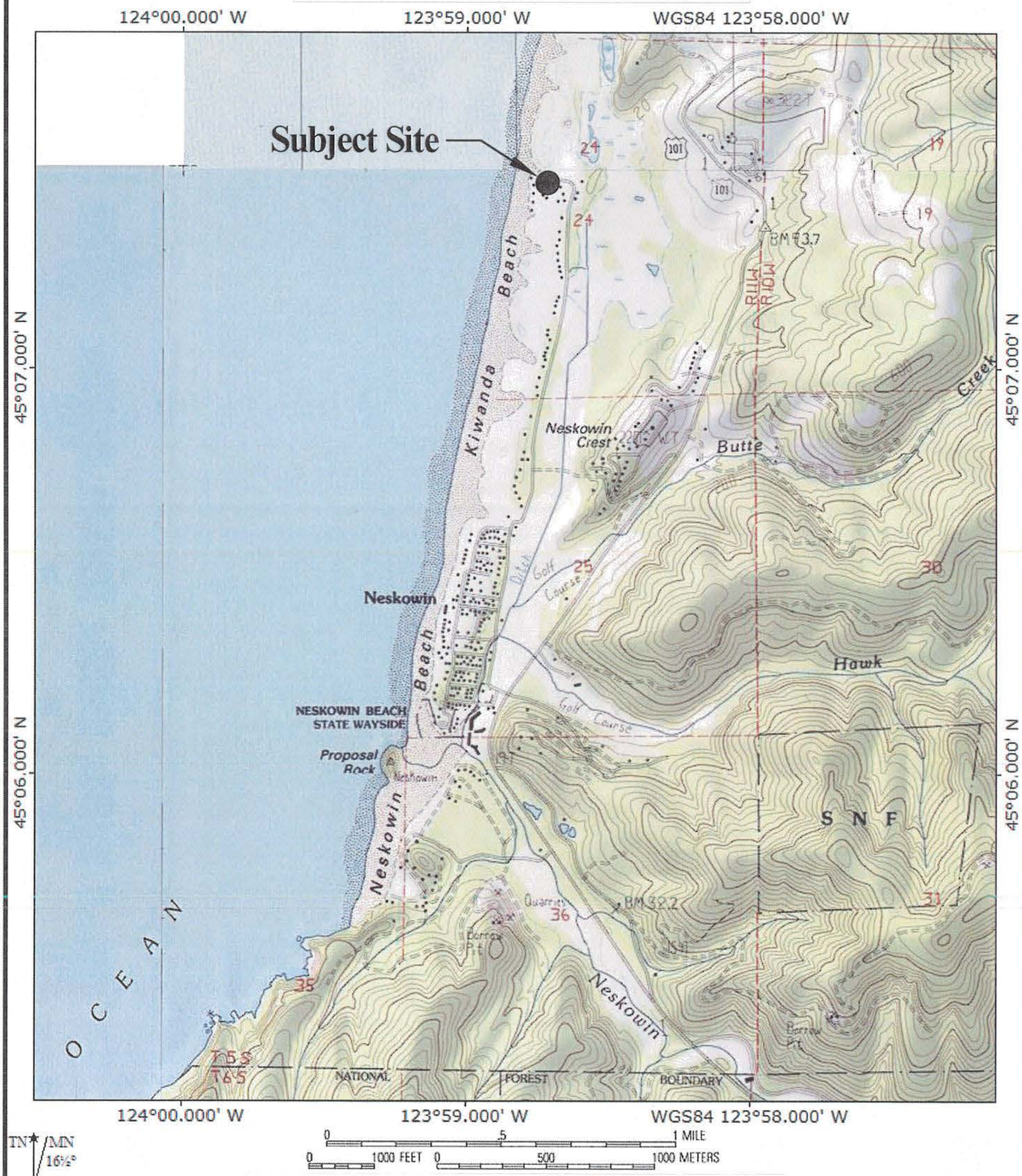
Respectfully submitted,

H.G. SCHLICKER AND ASSOCIATES, INC.

EXPIRES: 10/31/2022

J. Douglas Gless, MSc, RG, CEG, LHG
President/Principal Engineering Geologist

JDG:mgb



Date: 09/30/2021	**Project #Y214556**	Prepared by: MGB
Scale: 1" = 2,000'		Approved by: JDG

Location Map
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive, Neskowin, Tillamook County, Oregon

H.G. Schlicker & Associates, Inc.

Figure 1

Date: 09/30/2021	Project #Y214556	Prepared by: MGB
Scale: 1" = 100'		Approved by: JDG

Plat Map

Tax Lot 1900, Map 5S-11W-24BD

45740 Kinnikinnick Drive, Neskowin, Tillamook County, Oregon

H.G. Schlicker & Associates, Inc.

Figure 2

Modified from the Tillamook County assessor's plat
5S-11W-24BD
All locations and dimensions are approximate.

A—A' = Approximate trend of profile line

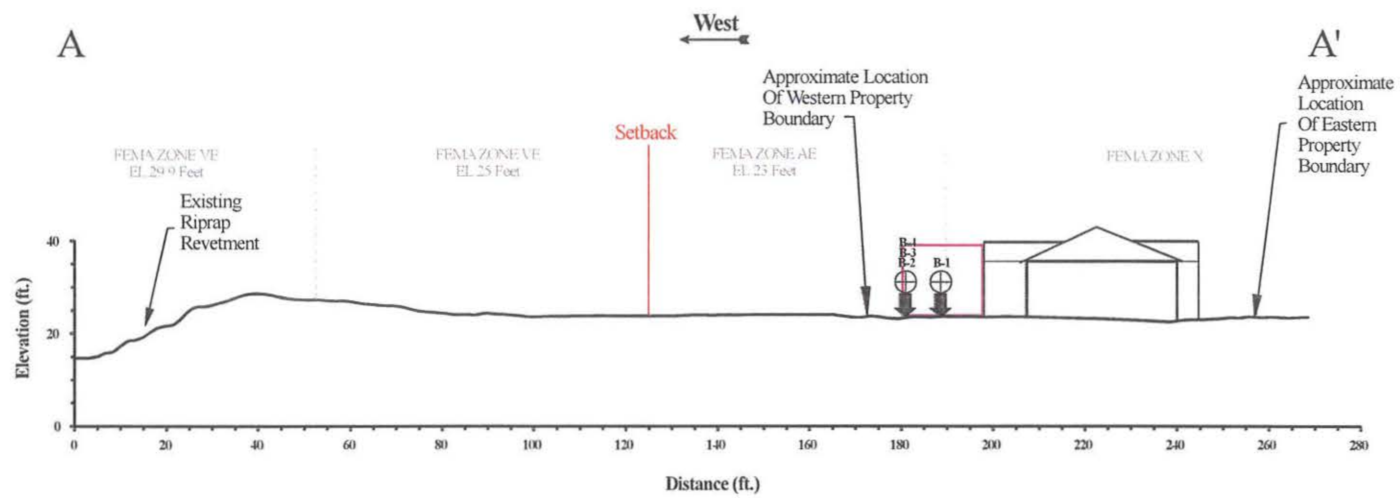
= Approximate Location of Proposed Elevated Deck Addition

= Approximate Location of Existing House

B-1 = Approximate location of boring

Imagery provided Bing.
Topographic data derived from West_Coast_2016_El_Nino Lidar data from NOAA.
All locations and dimensions are approximate.

Date: 09/30/2021	Project #Y214556	Prepared by: MGB	Site Topographic Map Tax Lot 1900, Map 5S-11W-24BD 45740 Kinnikinnick Drive, Neskowin, Tillamook County, Oregon	H.G. Schlicker & Associates, Inc.	Figure 3
Scale: 1" = 20'		Approved by: JDG			



B-1 = Approximate location of boring

= Approximate Location of Proposed Elevated Deck Addition

= Approximate Location of Existing House

All dimensions, elevations and locations are approximate.
Slope profile derived from West_Coast_2016_El_Nino Lidar data from NOAA.

Date: 09/30/2021	**Project #Y214556**	Prepared by: MGB
Scale: 1" = 20'		Approved by: JDG

Slope Profile, A-A'
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive, Neskowin, Tillamook County, Oregon

H.G. Schlicker & Associates, Inc.

Figure 4

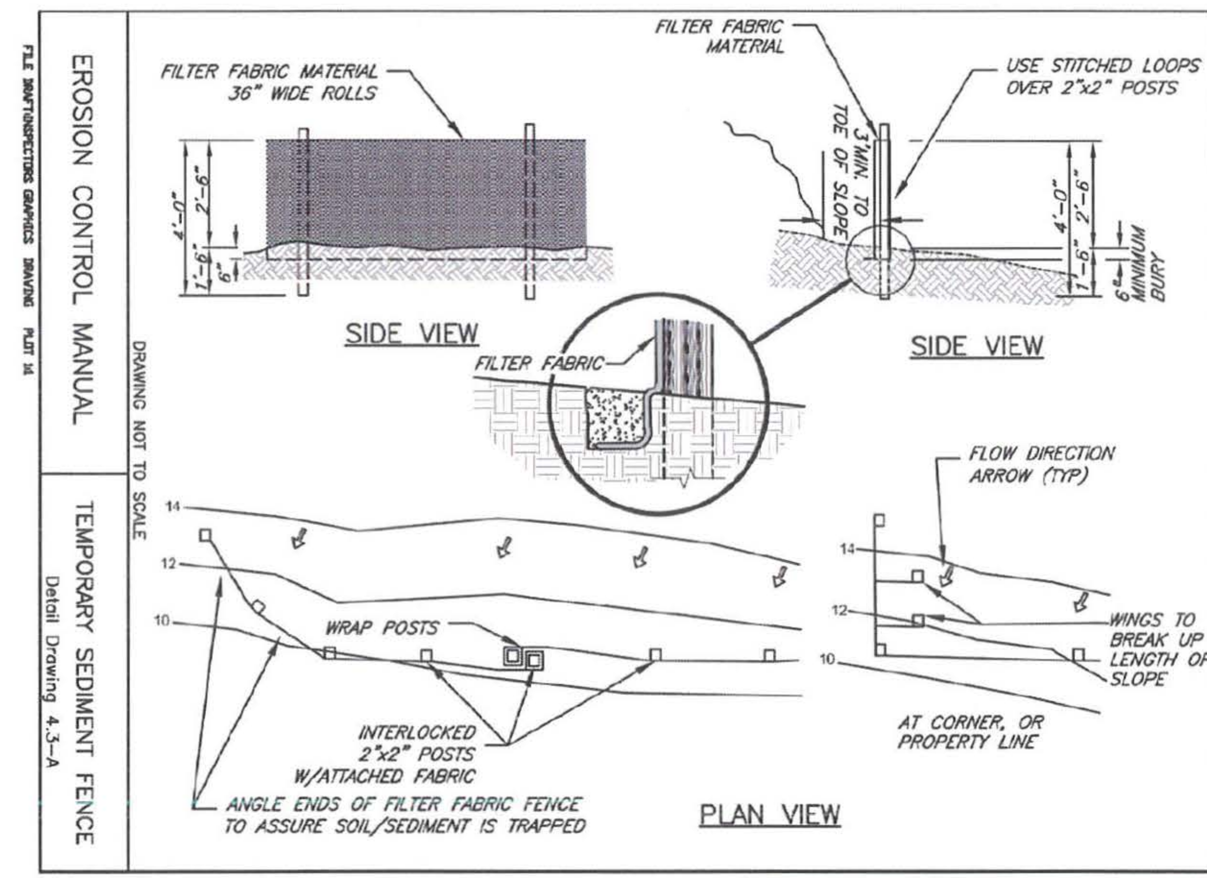


Figure 4.3-A Temporary Sediment Control (Silt) Fence

Date: 09/30/2021	Project #Y214556	Prepared by: AML
Scale: As Shown		Approved by: JDG

Sediment Fence Detail
Tax Lot 1900, Map 5S-11W-24BD
45740 Kinnikinnick Drive, Neskowin, Tillamook County, Oregon

H.G. Schlicker & Associates, Inc. **Figure 5**

Drawing modified from Erosion and Sediment Control Manual, City of Portland Bureau of Environmental Services, 2008.

Refer to Original Source for Design Criteria/ Specifications

Project #Y214556

Appendix A
- Site Photographs –

Photo 1 – Southerly view of the existing house at the site.

Photo 2 – Northerly view of the western side of the existing house towards the location of the proposed deck.

Photo 3 – View of the existing deck at the northwest corner of the house and the location of the proposed new elevated deck.

Photo 4 – Southerly view of the location of the proposed deck.


Photo 5 – Westerly view from the location of the proposed deck.


Photo 6 – Easterly view of the existing rip rap revetment exposed west of the site.

Photo 7 – View of the sand typical of the materials encountered in the borings.

Photo 8 – Close-up view of the existing deck.

Project #Y214556

Appendix B

- Checklist of Recommended Additional Work, Plan Reviews and Site Observations -

Project #Y214556

APPENDIX B

Checklist of Recommended Additional Work, Plan Reviews and Site Observations To Be Completed by a Representative of H.G. Schlicker & Associates, Inc.

Item No.	Date Done	Procedure	Timing
1*		Review site development, foundation, drainage, grading, and erosion control plans.	Prior to permitting and construction.
2*		Observe foundation excavations and setbacks.	Following excavation of foundations, and prior to placing fill, and forming and pouring concrete.**
3*		Review Proctor (ASTM D1557) and density test results for all fills placed at the site.	Following compaction, and prior to forming and pouring.

* There will be additional charges for these services.

** Please provide us with at least 5 days' notice prior to all site observations.