



Oregon

Theodore R. Kulongoski, Governor

Department of Land Conservation and Development

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Salem, OR 97301-2540

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NOTICE OF ADOPTED AMENDMENT

02/25/2013

TO: Subscribers to Notice of Adopted Plan  
or Land Use Regulation Amendments

FROM: Plan Amendment Program Specialist

SUBJECT: City of Newport Plan Amendment  
DLCD File Number 005-12

The Department of Land Conservation and Development (DLCD) received the attached notice of adoption. Due to the size of amended material submitted, a complete copy has not been attached. A Copy of the adopted plan amendment is available for review at the DLCD office in Salem and the local government office.

Appeal Procedures\*

DLCD ACKNOWLEDGMENT or DEADLINE TO APPEAL: Wednesday, March 13, 2013

This amendment was submitted to DLCD for review prior to adoption pursuant to ORS 197.830(2)(b) only persons who participated in the local government proceedings leading to adoption of the amendment are eligible to appeal this decision to the Land Use Board of Appeals (LUBA).

If you wish to appeal, you must file a notice of intent to appeal with the Land Use Board of Appeals (LUBA) no later than 21 days from the date the decision was mailed to you by the local government. If you have questions, check with the local government to determine the appeal deadline. Copies of the notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR Chapter 661, Division 10). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

\*NOTE: The Acknowledgment or Appeal Deadline is based upon the date the decision was mailed by local government. A decision may have been mailed to you on a different date than it was mailed to DLCD. As a result, your appeal deadline may be earlier than the above date specified. NO LUBA Notification to the jurisdiction of an appeal by the deadline, this Plan Amendment is acknowledged.

Cc: Derrick Tokos, City of Newport  
Gordon Howard, DLCD Urban Planning Specialist  
Patrick Wingard, DLCD Regional Representative  
Matt Spangler, DLCD Regional Representative

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FORM 2

DLCD

# Notice of Adoption

In person  electronic  mailed

DATE  
STAMP

DEPT OF

FEB 21 2013

LAND CONSERVATION  
AND DEVELOPMENT

For Office Use Only

This Form 2 must be mailed to DLCD within **20-Working Days after the Final Ordinance is signed** by the public Official Designated by the jurisdiction and all other requirements of ORS 197.615 and OAR 660-018-000

Jurisdiction: **City of Newport**

Local file number: **3-CP-12**

Date of Adoption: **2/19/2013**

Date Mailed: **2/20/2013**

Was a Notice of Proposed Amendment (Form 1) mailed to DLCD?  Yes  No Date: 12/14/2012

Comprehensive Plan Text Amendment

Comprehensive Plan Map Amendment

Land Use Regulation Amendment

Zoning Map Amendment

New Land Use Regulation

Other:

Summarize the adopted amendment. Do not use technical terms. Do not write "See Attached".

Revision to the Urbanization and Public Facilities elements of the Newport Comprehensive Plan to update standards against which a Urban Growth Boundary amendment is evaluated (i.e. implementation of Goal 14, effective 2006), establish that it is city policy to acquire lands within its municipal watershed, acknowledge structural deficiencies in the city municipal water reservoirs, and outline steps the city will take to resolve the deficiencies.

Does the Adoption differ from proposal? Yes, Please explain below:

Clarified finding in Urbanization element to note that goal compliance is required, unless an exception is taken to a particular goal requirement. Revised Public Facilities element to include policy direction to establish a water quality buffer consistent with the recommendations in a DEQ/OHD source water assessment report.

Plan Map Changed from:

to:

Zone Map Changed from:

to:

Location:

Acres Involved:

Specify Density: Previous:

New:

Applicable statewide planning goals:

1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19

Was an Exception Adopted?  YES  NO

Did DLCD receive a Notice of Proposed Amendment...

35-days prior to first evidentiary hearing?

Yes  No

DLCD File No. 005-12 (19633) [17365]

If no, do the statewide planning goals apply?

Yes  No

If no, did Emergency Circumstances require immediate adoption?

Yes  No

**DLCD file No.** \_\_\_\_\_

Please list all affected State or Federal Agencies, Local Governments or Special Districts:

Lincoln County

Local Contact: **Derrick I. Tokos, AICP**

Phone: (541) 574-0626 Extension:

Address: **169 SW Coast Highway**

Fax Number: **541-574-644**

City: **Newport**

Zip: **97365-**

E-mail Address: **d.tokos@newport.oregon.gov**

## ADOPTION SUBMITTAL REQUIREMENTS

**This Form 2 must be received by DLCD no later than 20 working days after the ordinance has been signed by the public official designated by the jurisdiction to sign the approved ordinance(s)**

**per ORS 197.615 and OAR Chapter 660, Division 18**

1. This Form 2 must be submitted by local jurisdictions only (not by applicant).
2. When submitting the adopted amendment, please print a completed copy of Form 2 on **light green paper if available**.
3. **Send this Form 2 and one complete paper copy (documents and maps) of the adopted amendment to the address below.**
4. Submittal of this Notice of Adoption must include the final signed ordinance(s), all supporting finding(s), exhibit(s) and any other supplementary information (ORS 197.615).
5. Deadline to appeals to LUBA is calculated **twenty-one (21) days** from the receipt (postmark date) by DLCD of the adoption (ORS 197.830 to 197.845).
6. In addition to sending the Form 2 - Notice of Adoption to DLCD, please also remember to notify persons who participated in the local hearing and requested notice of the final decision. (ORS 197.615).
7. Submit **one complete paper copy** via United States Postal Service, Common Carrier or Hand Carried to the DLCD Salem Office and stamped with the incoming date stamp.
8. Please mail the adopted amendment packet to:

**ATTENTION: PLAN AMENDMENT SPECIALIST  
DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT  
635 CAPITOL STREET NE, SUITE 150  
SALEM, OREGON 97301-2540**

9. **Need More Copies?** Please print forms on **8½ -1/2x11 green paper only if available**. If you have any questions or would like assistance, please contact your DLCD regional representative or contact the DLCD Salem Office at (503) 373-0050 x238 or e-mail **plan.amendments@state.or.us**.

**CITY OF NEWPORT**

**ORDINANCE NO. 2049**

**AN ORDINANCE REPEALING AND REPLACING THE PUBLIC  
FACILITIES AND URBANIZATION ELEMENTS OF THE NEWPORT  
COMPREHENSIVE PLAN ORIGINALLY ADOPTED  
BY ORDINANCE NO. 1621  
(Newport File No. 3-CP-12)**

**Summary of Findings:**

1. On December 10, 2012 the Newport Planning Commission initiated amendments to the “Public Facilities” and “Urbanization” elements of the Newport Comprehensive Plan to update standards against which an Urban Growth Boundary (UGB) amendment is evaluated; establish policies to acquire lands and protect water quality within the city’s municipal watershed; acknowledge structural deficiencies in the City’s municipal water reservoirs; and outline steps the City will take to resolve the structural deficiencies.
2. Newport City Council desires to expand the UGB to include Big Creek Reservoir #1 and Big Creek Reservoir #2, which are the City’s primary storage facilities for its domestic water supply. This expansion is desirable because placing the land under a “Public” Comprehensive Plan and zoning designation will make it easier for the City to modify its water infrastructure in response to known structural deficiencies at the reservoirs and to construct a future regional park as envisioned in the 1993 Park System Master Plan.
3. Repealing and replacing the “Public Facilities” element of the Newport Comprehensive Plan sets the table for an expansion proposal. Preliminary geotechnical analysis, prepared by HDR Consultants, describes the nature of structural deficiencies inherent to Big Creek Reservoir #1 and Big Creek Reservoir #2, and supports the adoption of policies describing how the City should respond to this threat to its domestic water supply. Proposed policies provide direction for completing necessary engineering studies to ascertain the full scope of the problem, financing future construction and land acquisition, and protecting water quality consistent with a source water assessment performed by the Oregon Department of Environmental Quality and Oregon Health Department.
4. Similarly repealing and replacing the “Urbanization” element of the Newport Comprehensive Plan sets the table for an expansion proposal and is necessary because it updates outdated criteria for evaluating such requests to that the standards conform to current state law, namely Statewide Planning Goal 14, amended April of 2006.

5. The Newport Comprehensive Plan element entitled “Administration of the Plan” lists factors that must be met to amend the document, such factors being listed explicitly in the Planning Staff Memorandum dated, January 23, 2013 and incorporated herein.

- a. The revised “Public Facilities” element satisfies the listed factors in that it updates technical inventories related to the structural integrity of Big Creek Reservoir #1 and Big Creek Reservoir #2 and the quality of the water within the municipal watershed, and puts in place policies and implementation strategies that respond to the new information.
- b. The revised “Urbanization” element satisfies the listed factors in that it updates the City’s criteria for evaluating UGB amendment proposals to be consistent with current state law.

6. Repealing and replacing the “Public Facilities” and “Urbanization” elements of the Newport Comprehensive Plan are consistent with applicable Statewide Planning Goals in that the changes:

- a. Have been developed and vetted with the City of Newport Planning Commission and its Advisory Committee consistent with Statewide Planning Goal 1, Public Involvement; and
- b. Update the Newport Comprehensive Plan’s technical inventory (with respect to the condition of the reservoirs and water quality) and criteria (with respect to UGB amendments) that facilitate a land use planning process and policy framework that provides an adequate factual basis for decision making consistent with Statewide Planning Goal 2, Land Use Planning; and
- c. Ensure that the Newport Comprehensive Plan contains accurate information about the condition of the City’s water infrastructure as encouraged by Statewide Planning Goal 11, Public Facilities and Services; and
- d. Put in place standards for amending the Newport Urban Growth Boundary consistent with ORS 197.298 and the following factors (1) efficient accommodation of identified land needs; (2) orderly and economic provision of public facilities and services; (3) comparative environmental, energy, economic and social consequences; and (4) compatibility of the proposed urban uses with nearby agricultural and forest activities occurring on farm and forest land outside the UGB, as set out in Statewide Planning Goal 14, Urbanization.

7. No other Statewide Planning Goals are applicable to the proposed changes to the “Public Facilities” and “Urbanization” sections of the Newport Comprehensive Plan.

8. The Newport Planning Commission reviewed the proposed changes to the “Public Facilities” and “Urbanization” sections of the Newport Comprehensive Plan, as they were

being developed, at work sessions on October 8, 2012, October 22, 2012, November 26, 2012, and December 10, 2012. The Planning Commission held a public hearing on January 28, 2013, and voted to recommend adoption of the amendments.

9. The City Council held a public hearing on February 19, 2013 regarding the question of the proposed revisions, and voted in favor of their adoption after considering the recommendation of the Planning Commission and evidence and argument in the record.

10. Information in the record, including affidavits of mailing and publication, demonstrate that appropriate public notification was provided for both the Planning Commission and City Council public hearings.

**THE CITY OF NEWPORT ORDAINS AS FOLLOWS:**

**Section 1.** The Public Facilities element of the Newport Comprehensive Plan, originally adopted by Ordinance No. 1621 (as amended) is repealed and replaced with the text at Exhibit A, attached to this Ordinance.

**Section 2.** The Urbanization element of the Newport Comprehensive Plan, originally adopted by Ordinance No. 1621 (as amended) is repealed and replaced with the text at Exhibit B, attached to this Ordinance.

**Section 3.** The document titled "Big Creek Dam No. 1 and No. 2, Preliminary Geotechnical Investigation and Seismic Evaluation" and prepared by HDR Consultants in February of 2013, attached as Exhibit C, is included as support for this ordinance.

**Section 4.** The Planning Staff Memorandum dated January 23, 2013, attached as Exhibit D, is included as support for this ordinance.

**Section 5.** This Ordinance shall take effect 30 days after passage.

Date adopted and read by title only: February 19, 2013

Signed by the Mayor on February 20, 2013.

Sandra Roumagoux  
Sandra Roumagoux, Mayor

ATTEST:

Margaret M. Hawker  
Margaret M. Hawker, City Recorder

## GOALS AND POLICIES PUBLIC FACILITIES ELEMENT

### GENERAL

**Goal: To assure adequate planning for public facilities to meet the changing needs of the City of Newport urbanizable area.**

Policy 1: The city shall develop and maintain public facilities master plans (by reference incorporated herein). These facility plans should include generalized descriptions of existing facilities operation and maintenance needs, future facilities needed to serve the urbanizable area, and rough estimates of projected costs, timing, and probable funding mechanisms. Public facilities should be designed and developed consistent with the various master plans.

Policy 2: In order to assure the orderly and cost efficient extension of public facilities, the city shall use the public facilities master plans in the capital improvement planning.

Policy 3: The city shall work with other providers of public facilities to facilitate coordinated development.

Policy 4: Essential public services should be available to a site or can be provided to a site with sufficient capacity to serve the property before it can receive development approval from the city. For purposes of this policy, essential services shall mean:

- > Sanitary Sewers
- > Water
- > Storm Drainage
- > Streets

Development may be permitted for parcels without the essential services if:

- > The proposed development is consistent with the Comprehensive Plan; and
- > The property owner enters into an agreement, that runs with the land and is therefore binding upon future owners, that the property will connect to the essential service when it is reasonably available; and
- > The property owner signs an irrevocable consent to annex if outside the city limits and/or agrees to participate in a local improvement district for the essential service.

Policy 5: Upon the annexation of territory to the City of Newport, the city will be the provider of water and sewer service except as specified to the contrary in an urban service agreement or other intergovernmental agreement.

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## WATER

**Goal: To provide the City of Newport with a high quality water system that will supply residents and businesses with adequate quantities for consumption and fire protection.**

Policy 1: The city will comply with state and federal laws concerning water quality and will take appropriate steps consistent with those laws to protect and maintain drinking water source areas.

Implementation Measure 1: The City shall work to establish a source water protection buffer in the Big Creek Watershed. The City declares the Big Creek Watershed a public facility consistent with the definition of Public Facility Systems in OAR 660-011-0005(7)(a)(A). The City will work to establish a source water protection buffer that is consistent with the findings of the Oregon Department of Environmental Quality / Oregon Health Department source water assessment report (PWS #4100566).

Policy 2: The water system will be designed and developed to satisfy the water demand of the various users under normal and predictable daily and seasonal patterns of use, and at the same time provide sufficient supplies for most emergency situations.

Policy 3: The city may extend water service to any property within the city's urban growth boundary, and may extend water service beyond the urban growth boundary if the extension of service is not inconsistent with an urban service agreement or other intergovernmental agreement. The city may require a consent to annexation as a condition of providing water service outside the city limits.

Policy 4: The city will acquire lands within the municipal watershed when available or necessary to protect water quality or improve its water system.

Policy 5: The city will reconstruct its municipal raw water storage and distribution facilities to address identified structural deficiencies to Big Creek Dam #1 and Big Creek Dam #2.

Implementation Measure 1: The city shall conduct necessary and appropriate engineering studies to determine the safest and most cost-effective approach to ensure the integrity of the municipal water supply. The studies shall identify the cost and timing of needed capital projects to address identified structural deficiencies and comply with Policy 2 of this section.



Implementation Measure 2: The city shall explore financing mechanisms, and prepare a financing plan to fund construction needed to resolve the structural deficiencies by 2030.

Implementation Measure 3: The city shall use data and findings from Implementation Measures 1 and 2 of this section to update the Water Supply section of the Public Facilities element of the Newport Comprehensive Plan to reflect new information as a result of the engineering and finance studies.

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### WASTEWATER

**Goal:** To provide a wastewater collection and treatment system with sufficient capacity to meet the present and future needs of the Newport urbanizable area in compliance with State and Federal regulations.

Policy 1: On-site sewer systems shall not be allowed unless the city's sanitary sewer system is greater than 250 feet away. In any case, a subsurface permit from the Lincoln County Sanitarian must be obtained prior to any development that will rely on an on-site sewer system.

Policy 2: City wastewater services may be extended to any property within the urban growth boundary. Except for the very limited circumstances allowed by state law and regulations, the city will not generally provide wastewater services outside the urban growth boundary. The city may require a consent to annexation as a condition of providing wastewater service outside the city limits. Nothing in this policy obligates the City to provide wastewater services outside of the city limits. For property outside the city limits but within the urban growth boundary, wastewater services may be provided at the City's discretion only for:

- a) residentially zoned lands as allowed by county zoning without full services, and
- b) commercial and industrial zoned lands to existing lawful uses as of the date (9/4/07) of this amendment.

Policy 3: The city will design and develop the wastewater collection and treatment system in a way that addresses the demands of the various users under normal and predictable daily and seasonal patterns of use.

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**TRANSPORTATION**

Transportation Goals and Policies repealed by Ordinance No. 1802 (January 4, 1999).

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**STORM WATER DRAINAGE**

**Goal: To provide a storm water drainage system with sufficient capacity to meet the present and future needs of the Newport urbanizable area.**

Policy 1: The city will comply with state and federal laws concerning water quality.

Policy 2: The city will use existing, natural drainage systems to the greatest extent possible.

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**AIRPORT**

**Goal: To provide for the aviation needs of the City of Newport and Lincoln County.**

Policy 1: The city will ensure through zoning and subdivision ordinance provisions that the airport will be able to operate safely and efficiently.

Policy 2: The city will cooperate with state and federal agencies in the development of the airport.

## **URBANIZATION**

The Newport urban area includes lands within the city limits. It becomes necessary, however, to identify lands outside those limits that will become available for future growth. With that in mind, the City of Newport and Lincoln County have agreed upon a site specific boundary that limits city growth until the year 2031.

The urban growth boundary (UGB) delineates where annexations and the extension of city services will occur. Converting those county lands within the UGB requires coordination between the county, the property owners, and the city. This section provides the framework and the policies for those conversions and service extensions. The decision makers can also use this section as a guide for implementation of the urbanizing process.

The city and county made the policies of this section as part of a coordinated effort. Involved in the process were the governing bodies and planning commissions of both jurisdictions. The Citizen's Advisory Committee, concerned citizens, and other affected agencies also participated in the process.

### **Newport Urban Growth Areas:**

Land forms are the most important single determinant of the directions in which Newport can grow. Newport is bounded on the west by the Pacific Ocean and on the east by the foothills of the Coast Range. In addition, the city is divided by Yaquina Bay. The only suitable topography for utility service and lower cost urban development is along the narrow coastal plain. Some development has occurred in the surrounding foothills and along the Yaquina River and creek valleys, but this is generally rural development of low density without urban utilities. The following inventory describes areas evaluated as to their suitability to accommodate expected growth.

#### **A. Agate Beach Area (North Newport/390 Acres):**

**Inventory.** This study area consists of both urbanized and undeveloped land (see map on page 283). Of the 390 acres available for residential development, 225 lie within the unincorporated area of the UGB, and 165 acres are within Newport's city limits. (The urbanized area contains approximately 60 acres.)

The urbanized area was platted in the 1930's, with growth occurring gradually since that time. The area is primarily residential and has a mixture of houses, mobile homes, trailers, and some limited commercial uses along U.S. Highway 101. The area was previously served by the Agate Beach Water System, which frequently failed to meet federal water quality standards and had inadequate line size and pressure to serve existing customers and projected growth. The City of Newport rebuilt the water system and installed a sewer system at the cost of approximately \$1.4 million.

The unincorporated portions of this study area have been included in Newport's UGB to help meet anticipated need for residential land. The land is relatively level, water services

and road access are immediately adjacent, and sewer is available. The area has been urbanized to a degree already and is suitable for continued residential development. Much of this area has been platted into 5,000 square foot lots, which are both suitable for mobile home placement and "buildable" as sewer is extended.

**Analysis.** Because most of this area has been previously platted into 50 x 100 foot lots, land costs can be expected to be lower than in newly platted areas of the city. Many mobile homes and trailers currently exist in this area, and smaller lots are appropriate for mobile homes.

**Finding.** This area is suitable for continued residential development and is designated residential. In addition, because of the smaller lot sizes and the existence of many mobile homes in the area, a mobile home overlay zone is desirable and compatible with existing uses. Areas of larger acreage on both the east and west side are suitable for high density residential use with the mobile home overlay so that new mobile home parks may be built in the area as outright uses, as well as allowing apartments. Existing commercial development along U.S. Highway 101 should be allowed to remain.

**B. Agate Beach Golf Course and Little Creek Drainage Area (North Newport/93 acres):**

**Inventory.** This area lies south and east of the golf course, west of the west line of Section 33, and east of Highway 101, all of which is within the city limits (see map on page 283). The area is generally undeveloped, and it slopes steeply toward Little Creek.

The area has been planned to be served by city water and sewer and a major new road. It is zoned for low and high density residential development.

**Analysis.** Because of the steep slopes, this is the type of area where a planned development is often appropriate. It borders a mobile home park to the south and is geographically well separated from other areas of conventional housing; therefore, mixed residential development can be considered for the property with little possible conflict.

**Finding.** Because of the topography, either low density residential development with a planned development overlay or high density residential development would be appropriate designations. However, the former would insure more open space in the long range.

**C. West Big Creek Drainage Area (North Newport/40 acres):**

**Inventory.** This area lies south of the Pacific Beach Club, east of U.S. Highway 101, and west of Lakewood Hills (see map on page 283). It has not yet been developed.

**Analysis.** Much of the area is in a flood plain. However, it has been studied for a planned development and is suitable for high density residential use.

**Finding.** High density residential will be the designation for this property. The land may be suitable for a planned unit development.

**D. East Big Creek Drainage Area (City Reservoir):**

**Inventory.** This area drains into the city reservoir, and the city owns the majority of the land (see map on page 283). There are several smaller private parcels with houses and livestock.

**Finding.** This area could eventually be used as a large city park or residential area once the reservoir is no longer used for the city water supply. During the planning period, this area should be protected from further residential development.

That land which is not needed for public park land shall be considered for return to the private sector for housing.

**E. Jeffries Creek Drainage Area (Northeast Newport/220 Acres):**

**Inventory.** This area is south of the city reservoir, north of Old Highway 20, east of Harney Street, and west of the eastern half of Section 4 (see map on page 283). This area contains the Terrace Heights, Virginia Additions, Kewanee Addition, and the Beaver State Land property. There is very little development in the area as yet. Fifty-five acres lie within Newport's city limits.

**Analysis.** Platted around the turn of the century, this area has long been planned for low density residential development. Little has occurred so far due to more accessible development closer to Newport. This is no longer the case, and this land is now needed for housing.

**Finding.** This area has steep slopes, no existing utilities as yet, and will be expensive to develop. However, much of the property will have ocean or bay view. The area is appropriate for low density development.

**F. Harbor Heights Area (Southeast Newport/267 Acres):**

**Inventory.** This study area lies east of Harbor Heights to the urban growth boundary and north of Bay Road to the urban growth boundary (see map on page 283). Of its 267 acres, approximately 44 are within Newport's city limits.

**Analysis.** This is an area where lot sizes might well be raised to a higher minimum to encourage the maintenance of the vegetation that helps stabilize the entire area. This would be a high cost housing area with very low density development.

**Finding.** The area is steep with some slide potential. Dotted with residential uses, the area commands a view of the bay and is in heavy demand. A low density residential designation is appropriate for this area.

**G. Idaho Point Area (South Beach/120 Acres):**

**Inventory.** This area stretches from South Bay Street to the Idaho Point Marina and from S.E. 32nd Street south to the forest lands (see map on page 283).

**Analysis.** The existing water system is inadequate and is being replaced, along with city sewer. Some of the area is in demand for its bay view, and much of the land could be developed for medium to high cost housing. The topography varies from flat to steeply sloping, with most in the in between category; therefore, development costs will vary.

**Finding.** The topography in the area varies from flat to steeply sloping, with most of it moderately sloping. The existing water system is inadequate and sewer is not yet available. Some low density residential uses currently exist, and the area has been planned for a mix of low and high density residential.

**H. South Beach (South of Newport/560 Acres):**

**Inventory.** The area extends from S.E. 32nd Street to the southern boundary of the Newport Municipal Airport and from the southerly extension of Bay Street to U.S. Highway 101 (see map on page 283).

**Analysis.** The area has long been planned for urban development and is currently coming along in that manner. Newport has planned for many years to encourage industrial development in South Beach.

**Finding.** It is the only area for which the city has planned industrial development that would allow non-water related or non-water dependent industrial development. The area will need city sewer and other city services.

**I. Wolf Tree Destination Resort (South of Newport/1,000 Acres):**

**Inventory.** The city extended its urban growth boundary and the city limits to include about 1,000 acres for the Wolf Tree Destination Resort consistent with Goal 8 (see map on page 284). The area includes about 800 acres south of the Newport Municipal Airport, with another 200 acres lying east of the airport. The region has a special plan and zoning designation that limits the land for a destination resort.

**Analysis.** Currently undeveloped except for a few scattered residences, the area has been planned for a destination resort since 1987. The south area is presently in the city limits, but the easterly 200 acres is not. The Wolf Tree property was brought into the UGB and annexed to the city only after a Goal 8 Destination Resort analysis and a limitation on

the property to the development of a destination resort. Many state and federal agencies were involved in the process that brought this property into the UGB and the city limits.

**Finding.** The project complies with Goal 8/"Destination Resort." The property cannot be developed except as a destination resort consistent with state and city law.

**Finding.** The City of Newport has established its urban growth boundary as indicated on the city's Comprehensive Plan Map (available in the city's Planning Department office), in accordance with the following findings and as demonstrated in the inventory:

- > The projected population growth requirements of the City of Newport, as demonstrated in the inventory, cannot be met within the existing city limits.
- > In order to provide adequate housing opportunities and needed employment and to plan for a livable environment, there is a need for additional acreage beyond that currently available within the Newport city limits.
- > The City of Newport has planned for the urbanization of the UGB area based upon the city's long-range plan and capacity to extend needed facilities and service during the planning period.
- > In determining the most appropriate and efficient land uses and densities within the UGB, the City of Newport has considered current development pattern limitations posed by land forms, as well as the city's needs during the planning period.
- > In establishing its UGB, the City of Newport has considered and accounted for environmental, energy, economic, and social consequences as demonstrated in the inventory.
- > There are no agricultural lands adjacent to the Newport urban growth boundary.
- > What alternative locations within the area have been considered for the proposed needs.

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**GOALS/POLICIES/IMPLEMENTATION MEASURES**  
**URBANIZATION**

**Goal: To promote the orderly and efficient expansion of Newport's city limits.**

Policy 1: The City of Newport will coordinate with Lincoln County in meeting the requirements of urban growth to 2031.

Implementation Measure 1: The adopted urban growth boundary for Newport establishes the limits of urban growth to the year 2031.

- 1.) City annexation shall occur only within the officially adopted urban growth boundary.
- 2.) The official policy shall govern specific annexation decisions. The city, in turn, will provide an opportunity for the county, concerned citizens, and other affected agencies and persons to respond to pending requests for annexation.
- 3.) Establishment of an urban growth boundary does not imply that all included land will be annexed to the City of Newport.

Policy 2: The city will recognize county zoning and control of lands within the unincorporated portions of the UGB.

Implementation Measure 2: A change in the land use plan designations of urbanizable land from those shown on the Lincoln County Comprehensive Plan Map to those designations shown on the City of Newport Comprehensive Plan Map shall only occur upon annexation to the city.

- 1.) Urban development of land will be encouraged within the existing city limits. Annexations shall address the need for the land to be in the city.
- 2.) Urban facilities and services must be adequate in condition and capacity to accommodate the additional level of growth allowed in the city's plans. Those facilities must be available or can be provided to a site before or concurrent with any annexations or plan changes.

Policy 3: The city recognizes Lincoln County as having jurisdiction over land use decisions within the unincorporated areas of the UGB.

Implementation Measure 3: All such decisions shall conform to both county and city policies.

- 1.) Unincorporated areas within the UGB will become part of Newport; therefore, development of those areas influences the future growth of the city. Hence, the city has an interest in the type and placement of that growth. Lincoln County shall notify the city of any land use decision in the UGB lying outside the city limits. The county shall consider recommendations and conditions suggested by the city and may make them conditions of approval.
- 2.) The city shall respond within 14 calendar days to notifications by the county of a land use decision inside the adopted UGB. The county may assume the city has comments only if they are received inside of that 14 days.



Policy 4: The development of land in the urban area shall conform to the plans, policies, and ordinances of the City of Newport.

Implementation Measure 4a: The City of Newport may provide water and wastewater services outside the city limits consistent with the policies for the provision of such services as identified in the applicable Goals and Policies of the Public Facilities Element of the Comprehensive Plan.

Implementation Measure 4b: Amendments to UGB Boundaries or Policies. This subsection delineates the procedure for joint city and county review of amendments to the urban growth boundary or urbanization policies as the need arises.

1.) Major Amendments:

a.) Any UGB change that has widespread and significant influence beyond the immediate area. Examples include:

- (1) Quantitative changes that allow for substantial changes in the population or development density.
- (2) Qualitative changes in the land use, such as residential to commercial or industrial.
- (3) Changes that affect large areas or many different ownerships.

b.) A change in any urbanization policy.

2.) Minor Boundary Line Adjustments: The city and county may consider minor adjustments to the UGB using procedures similar to a zone change. Minor adjustments focus on specific, small properties not having significant impact beyond the immediate area.

3.) Determination of Major and Minor Amendments: The planning directors for the city and county shall determine whether or not a change is a minor or major amendment. If they cannot agree, the planning commissions for the city and county shall rule on the matter. The request shall be considered a major amendment if the planning commissions cannot agree.

4.) Initiation, Application, and Procedure: Individual or groups of property owners, agencies that are

affected, the planning commissions, or the city or county governing bodies may initiate amendments. Applicants for changes are responsible for completing the necessary application and preparing and

submitting the applicable findings with the application. The planning commissions for the city and county shall review the request and forward recommendations to the Newport City Council and the Lincoln County Board of Commissioners.

The city and county governing bodies shall hold public hearings on the request. Amendments become final only if both bodies approve the request.

- 5.) Findings shall address the following:
  - a.) Land Need: Establishment and change of urban growth boundaries shall be based on the following:
    - 1.) Demonstrated need to accommodate long range urban population, consistent with a 20-year population forecast coordinated with affected local governments; and
    - 2.) Demonstrated need for housing, employment opportunities, livability or uses such as public facilities, streets and roads, schools, parks and open space, or any combination of the need categories in this subsection;
  - b.) Boundary Location: The location of the urban growth boundary and changes to the boundary shall be determined by evaluating alternative boundary locations consistent with ORS 197.298 and with consideration of the following factors:
    - 1.) Efficient accommodation of identified land needs;
    - 2.) Orderly and economic provision of public facilities and services;
    - 3.) Comparative environmental, energy, economic, and social consequences; and
    - 4.) Compatibility of the proposed urban uses with nearby agricultural and forest activities occurring on farm and forest land outside the UGB.
  - c.) Compliance with applicable Statewide Planning Goals, unless an exception is taken to a particular goal requirement.
- 6.) Correction of Errors: Occasionally an error may occur. Errors such as cartographic mistakes, misprints, typographical errors, omissions, or duplications are technical in nature and not the result of new information or changing policies. If the Newport City Council and the

Lincoln County Board of Commissioners become aware of an error in the map or text of this adopted urbanization program, either body may cause an immediate amendment to correct the error. Both bodies must, however, agree that an error exists. Corrections shall be made by ordinance after a public hearing. The governing bodies may refer the matter to their respective planning commissions, but that is not required.

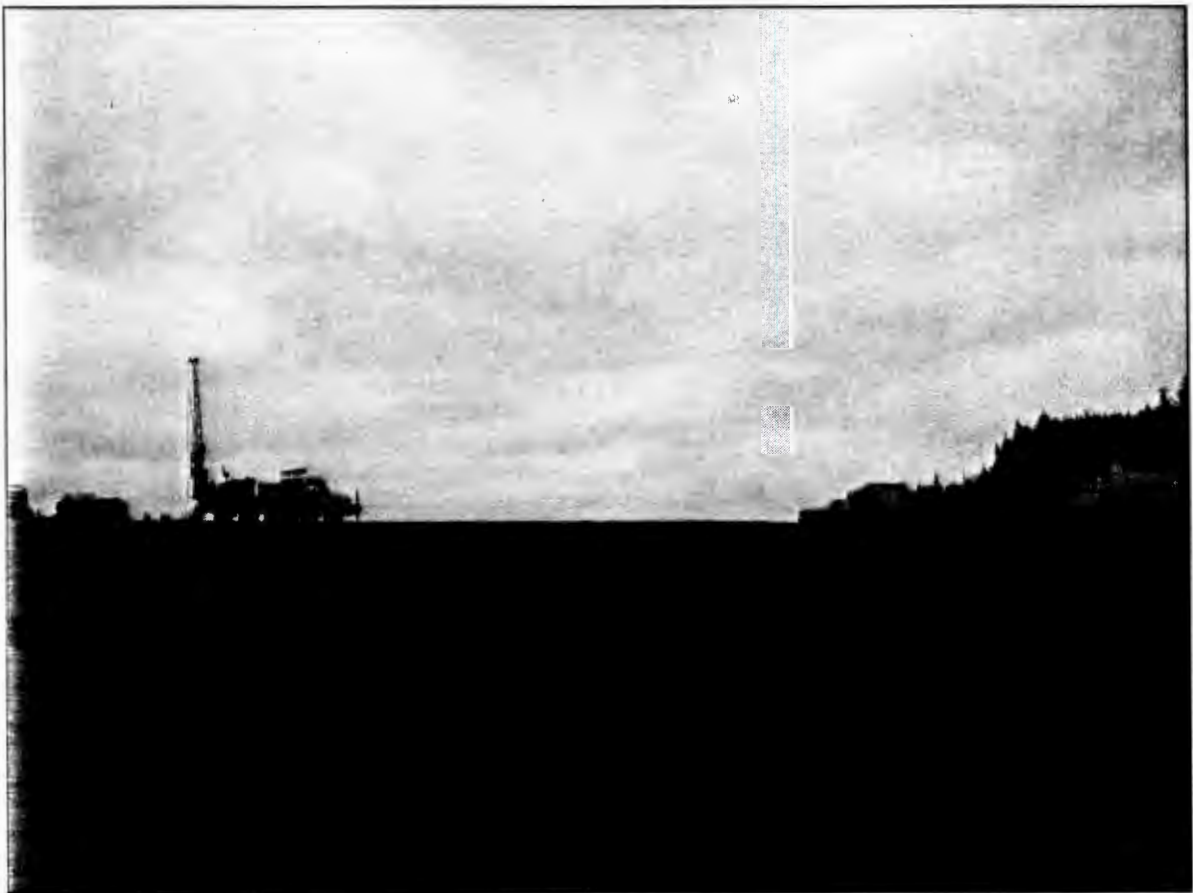
Policy 5: The city is responsible for public facilities planning within its urban growth boundary.

# FINAL

## Big Creek Dam No. 1 and No. 2

### Preliminary Geotechnical Investigation and Seismic Evaluation

City of Newport, Oregon



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## LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
BC	Big Creek
bpf	blows per foot
BOSC	Board of Senior Consultants
$B_q$	normalized pore pressure ratio
C-L	clay-like
cm/sec	centimeters/per second
CPTu	cone penetrometer test with pore pressure measurement
CRR	Cyclic Resistance Ratio
CSR	Cyclic Stress Ratio
CSZ	Cascadia Subduction Zone
DOGAMI	Oregon Department of Geology and Mineral Industries
EL	elevation
FLAC	fast lagrangian analysis of continua
FOS	factors of safety
ft/s	feet per second
g	acceleration due to gravity
$I_c$	soil behavior type index
km	kilometer(s)
ksf	kips per square foot
$k_v$	vertical permeability
$k_h$	horizontal permeability
LL	liquid limit
M	magnitude
MH	elastic silt (high plasticity)
ML	silt (low plasticity)
MSF	Magnitude Scaling Factor
MSL	Means Sea Level
NAVD88	North American Vertical Datum of 1988
NGA	Northwest Geophysical Associates, Inc.
$N_k$	cone factor
NP	nonplastic
OH	organic silt
OWRD	Oregon Water Resources Department
pcf	pounds per cubic foot
PEER	Pacific Earthquake Engineering Research Institute
PGA	peak ground acceleration(s)
PHGA	peak horizontal ground acceleration



PI	plasticity index
psf	pounds per square foot
PSHA	site-specific probabilistic seismic hazard analysis
$q_t$	cone tip resistance
S-L	sand-like
SM	silty sand
SPT	Standard Penetration Test
$S_u$	undrained shear strength
$S_v$	total overburden pressure
$S'_v$	vertical effective stress
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UU	unconsolidated undrained
$V_s$	shear wave velocity



## EXECUTIVE SUMMARY

HDR Engineering, Inc. (HDR) has completed an initial assessment of the static and seismic stability of Big Creek Dam No. 1 (BC No. 1) and Big Creek Dam No. 2 (BC No. 2) for the City of Newport (City). This assessment included a limited site characterization program of 1) seismic hazard evaluation, 2) borings, 3) cone penetration testing, and 4) laboratory testing along with 5) appraisal level engineering analyses. The initial findings from this evaluation are summarized below:

### Regional and Site Geology

The dam sites are at a geologic boundary where normal stream channel and estuarial formation processes have influenced the development of foundation soils above a siltstone bedrock. Initial site characterization studies have shown these soils to be composed of high plasticity silts and sands of low density and prone to a loss of strength when subjected to cyclic loading.

### Seismic Hazards

The dam sites are at a location where their long-term performance can be significantly impacted by several seismic hazard sources including nearby active crustal faults and the Cascadia Subduction Zone (CSZ). The hazard potential of the CSZ is relatively unique in terms of the magnitude of the ground motions (peak ground accelerations) and the duration of strong shaking that can occur. The CSZ hazard will be the controlling event for both dam safety evaluations and any required rehabilitation design going forward. While the understanding of the CSZ hazard has grown significantly over the past 20 years, recent similar hazard events off the coast of Chile and Japan have greatly increased the database of information that can be used to identify ground motion records suitable for detailed seismic response evaluations and design. This information will be available to HDR in the coming months and used to update ground motion information developed as part of this study.

### Subsurface Conditions

Borings and cone penetration testing supported by laboratory test results have shown that the embankment and foundation soils above bedrock and beneath both dams generally consist of relatively low density and high plasticity clayey and very silty sands, sandy and slightly clayey silts, and silts. Alternative potential stratigraphic models of each site have been identified. However, significant uncertainties exist with the models and the corresponding engineering properties of the foundation and embankment soils. Further evaluations are recommended to help refine the subsurface stratigraphic models of the sites, confirm the mineralogical origin of the soils and the corresponding reasons for the low densities, and further refine the understanding of engineering properties of the soils for engineering analyses and design.

### Seepage and Stability Analysis Results

BC No. 1 – Records indicate that this dam was originally constructed with a limited internal drainage system. Subsequently, a berm of soil was added over the downstream toe area. Results of both seepage and stability evaluations indicate that both these features are important in providing for the safety and performance of the downstream slope of the dam during an earthquake event. Additional evaluations are indicated to determine if the internal drainage system is functioning. The post-earthquake factors of safety suggest that the overall safety of the dam is marginal. Additional site characterization and engineering evaluations may indicate that only minor modifications are required to retain the benefit of this structure in the Newport water supply system. Alternatively and as discussed with the City, it may be



desirable to transfer a portion, or all of the storage in this facility to the upper dam if significant costs are required to rehabilitate the dam and associated water supply structures and pipes.

BC No. 2 – Results of seepage and stability evaluations indicate that a significant safety deficiency exists and that modification of the dam and related hydraulic structures is required to increase post-earthquake stability factors of safety and limit deformations during and immediately following a large earthquake event. Similar to the findings at the lower dam, additional site characterization and engineering evaluations are recommended to refine the stratigraphic and engineering models of the structure, reduce uncertainties related to engineering properties, and identify the most reasonable and cost effective modification requirements.

## Recommendations

Supplemental Site Characterization – A program of supplemental site characterization including an update of the appropriate ground motions for engineering evaluation and design, cone penetration tests, borings with undisturbed and disturbed sampling, laboratory testing, along with some groundwater monitoring instrumentation is recommended to further refine stratigraphic models of the structures, reduce uncertainties related to engineering properties and to support preparation of alternative rehabilitation design concepts.

Update of Time Histories for Engineering Evaluations – HDR has held initial meetings with the Pacific Earthquake Engineering Research Institute (PEER) at Berkeley, California and will be updating ground motions for future engineering evaluations based on information from recent similar hazard earthquakes in Japan and Chile. Use of updated ground motion records for detailed seismic response evaluations and design will provide for the most up-to-date safety evaluation and decision making by the City.

Laboratory Testing - Supplemental laboratory testing should include petrographic examination and testing of the embankment and foundation soils, and bedrock materials at the site to further evaluate the root cause of the low density of the soils; index; consolidation; direct and cyclic simple shear; and triaxial shear.

Engineering Analyses – Safety concerns and any rehabilitation design completed during subsequent engineering evaluations should include both simplified assessments based on empirically based seismic response models and more complex numerical simulations using advanced computer models such as FLAC (fast lagrangian analysis of continua).

Corrective Actions – A broad range of design and construction methods may be suitable to achieve the desired post-earthquake factors of safety and limited deformations of the dams and structures during earthquake events. The next phase of evaluation should evaluate a range of rehabilitation concepts and methods including removal and replacement of materials, stability berms, and insitu densification and strengthening.



## 1.0 INTRODUCTION

HDR Engineering, Inc. began working with the City of Newport in 2009 on the design and construction of a new water membrane filtration treatment plant. The water treatment plant is supplied with water stored in two man-made reservoirs in Big Creek, denoted BC No. 1 and BC No. 2. BC No. 1 is adjacent to the new treatment plant, and BC No. 2 is located approximately 1 mile upstream. These reservoirs were formed by the construction of an earthen dam at each location.

During construction of the new plant, geotechnical explorations were performed for design of a new intake structure located in the BC No. 1 reservoir. Borings were drilled on the dam crest near the intake structure and near the downstream toe of the dam. The borings indicated the subsurface soils consist of very loose, saturated silty sand and sandy silt, which exhibits the potential for liquefaction during a seismic event.

As a result of this discovery, the City requested HDR perform a seismic evaluation of the embankment dams for both BC No. 1 and No. 2 reservoirs. This evaluation consisted of a limited site investigation to characterize the dams' earthen and foundation materials, a probabilistic seismic hazard analysis (PSHA), a geologic hazard assessment, and geotechnical analyses to determine the stability of the dams in the event of potential seismic events.

The site investigation consisted of a site visit by geotechnical engineers from HDR, exploratory borings, laboratory testing, and a surface geophysical survey. A limited topographic survey was performed to locate the field explorations and determine the dam cross-section at one location for each dam.

The PSHA was performed to evaluate the regional seismicity and potential ground motions at the dam sites. Information from the PSHA was used in soil liquefaction analyses and to evaluate the seismic stability of the dams.



## 2.0 SITE CONDITIONS

The reservoirs are located at the western foot of the Coast Range east of Highway 101 near the northern end of the City of Newport as shown on Figure 1 (all figures provided at the end of the report). The upper and lower reservoirs (BC No. 2 and No. 1, respectively) were formed by construction of the two dams within Big Creek. Big Creek meanders through the Coast Range generally from east to west and is fed by Blattner Creek, as well as numerous smaller drainages. The banks of Big Creek are covered with vegetation ranging from grass and low growing brush to alder and fir trees generally less than 12 inches in diameter.

### 3.0 DESCRIPTION OF EXISTING DAMS

#### 3.1 BC No. 1

A plan view and typical cross-section of the original BC No. 1 dam design is shown on Figure 2. Based on the 1978 inspection report prepared by the Oregon Water Resources Department (OWRD, 1978), the dam was constructed in 1951 using clayey soil obtained from the stream channel immediately upstream of the dam. The elevations shown on Figure 2 are relative to mean sea level (MSL). At this location, MSL is 3.3 feet lower than the North American Vertical Datum of 1988 (NAVD88) that is used for vertical control datum in the United States. The pertinent data for the dam from the inspection report includes:

Pertinent Data for BC Dam No. 1	
Minimum Crest Length	315 feet
Crest Elevation (EL)	42.3 feet MSL (45.6 NAVD88)
Height from Original Ground	21 feet
Crest Width	12 feet
Side Slopes	3V:1H upstream 2V:1H downstream
Type of Construction	Modified homogeneous earthen fill dam
Internal Drainage	Filter blanket at downstream toe
Principal Spillway EL	38.0 feet MSL 41.3 feet NAVD88 (4.3 feet below dam crest)
Emergency Spillway EL	40.8 feet MSL (44.1 NAVD88)

Source: OWRD, 1978

Based on the limited topographic survey performed as part of this investigation, the dam crest is at about EL 47.1 feet (NAVD88); this is 1.5 feet higher than the original construction. A comparison of the original dam cross-section to the current cross-section is shown on Figure 3. The current profile is shown on Figure 4. Based on the current dam topographic survey, the dam is about 19 feet high relative to the reservoir bottom elevation along the upstream toe of the dam, but only about 14 feet high relative to the ground surface elevation along the downstream toe of the dam. Based on this cross-section, it appears about 8 feet of fill was placed on the downstream toe of the dam sometime after dam construction. This fill is detrimental to the operation of the dam since it prevents the exit of seepage from the blanket drain and creates the potential for developing excess pressures at the base of the dam. The impact of this is discussed in Section 11.0.

Based on the original design, the reservoir storage at normal pool is about 190 acre feet. The normal pool elevation is the principal spillway elevation of 41.3 feet NAVD88.



### 3.2 Big Creek No. 2

The BC No.2 dam was originally constructed in 1968 to a crest elevation of 73.0 feet MSL; a typical section through the dam centerline for the original construction is shown on Figure 5. In 1976, the embankment was raised to EL 87 to 88 feet MSL as shown on Figure 6 based on the 1978 inspection report (OWRD, 1978). The current cross-section and profile are shown on Figure 7 and Figure 8, respectively. The dam is a zoned embankment with the embankment fill materials for the dam raise derived from siltstone from access road and spillway excavations. The original dam was constructed from clayey silt and sandy silt from a borrow area upstream from the dam. The pertinent data for the BC No. 2 dam from the inspection report includes:

Pertinent Data for BC Dam No. 2	
Crest Length	455 feet
Crest EL	88.0 feet MSL (91.2 NAVD88)
Height from Natural Ground	56 feet (as measured from the foundation of the dam)
Crest Width	20 feet
Side Slopes	3V:1H upstream 2V:1H downstream
Internal Drainage	Inclined and horizontal graded gravel filters
Principal Spillway EL	80.1 feet MSL (83.4 NAVD88)
Emergency Spillway EL	84.0 feet MSL (87.3 NAVD88)

Source: OWRD, 1978

Based on the limited topographic survey performed as part of this investigation, the dam crest is at about EL 91 feet NAVD88; this is essentially the same elevation as the construction completed in 1976. The height of the dam relative to the downstream toe is about 41 feet and relative to the upstream toe the dam height is 31 feet. It appears about 15 feet of sediment has accumulated in the reservoir. Based on the typical embankment cross-section in the 1978 inspection report, the dam height relative to the downstream toe is about 41 feet and 46 feet to the upstream toe when measured from the lowest portion of the foundation excluding the cutoff trench.

Based on the expanded embankment size, the estimated reservoir storage at normal pool is about 970 acre feet. The normal pool elevation is at the principal spillway elevation, 7.9 feet below the dam crest.



## 4.0 FIELD EXPLORATION

The field investigation consisted of three components: geotechnical drilling (mud rotary and hollow stem auger), cone penetrometer testing, and a surface geophysical survey. The exploration locations are shown on Figure 9 and Figure 10 for BC No. 1 and BC No. 2, respectively.

### 4.1 Geotechnical Drilling

One boring was drilled at the BC No. 1 dam (BC1-B-1) and three borings were drilled at the BC No. 2 dam (BC2-B-1 through BC2-B-3) from December 12 through December 15, 2011 and on January 5, 2012 by Western States Drilling. The exploration locations were surveyed by Ward Northwest, Inc. and the survey data is shown in Table 3; exploration completion depths are also shown.

The boreholes were advanced using a combination of truck- and track-mounted drill rigs using mud rotary and hollow stem auger drilling techniques. The borings were advanced through the existing dams using the hollow stem auger technique to prevent the possibility of hydraulic fracturing of the embankment. The borings were continued using the mud rotary techniques beneath the embankment. Boring logs are included in Appendix B.1.

Samples were obtained at 5-foot intervals within the embankment dams and at 2.5-foot intervals thereafter. Disturbed samples were obtained with a standard penetration test (SPT) split-spoon sampler in accordance with Unified Soil Classification System (USCS) American Society for Testing and Materials (ASTM) D1586. The hammer energy for the SPT driving system was measured for each drilling rig to obtain the actual energy transfer ratio for the driving system (GeoDesign, 2012). The SPT N-value blow counts (as defined in ASTM D1586) were obtained for each sample and recorded on the boring log; the corrected blow counts (i.e., 60% efficiency) based on the measured energy transfer ratio is also shown on the logs. As shown on the boring logs, undisturbed soil samples were obtained with 3-inch-diameter thin-walled Shelby tube samples at selected depths in the borings in accordance with ASTM D1587. HQ wire-line coring methods were used in boring BC2-B-1 to core the siltstone bedrock in accordance with ASTM D2113. HQ (96 mm outside diameter) wire line coring consists of a 2.5-inch inner diameter triple-walled core barrel advanced in maximum 5-foot runs. Core samples were boxed and retained for further review.

As shown on Figure 9, boring BC1-B-1 at BC No. 1 was drilled from the dam crest, approximately 150 feet from the southern end, near the deepest section of the original creek channel. The purpose of this boring was to evaluate the strength and consistency of the fill material within the dam and soils underlying the dam. The boring was drilled to a depth of 85 feet where decomposed siltstone bedrock was encountered, then drilled to a depth of 86.5 feet; the interpreted depth to and corresponding elevation of the siltstone bedrock is shown in Table 4.

Borings BC2-B-1 and BC2-B-2 were drilled from the dam crest as shown on Figure 10. The purpose of these borings was to establish the consistency and depth of the embankment fill, and evaluate the soils underlying the dam. BC2-B-1 was drilled at the estimated deepest section of the original channel and BC-B-2 was drilled approximately 140 feet from the northern end of the dam; borings BC2-B-1 and BC2-B-2 were drilled to depths of 80 and 71.5 feet, respectively.

BC2-B-3 was drilled to a depth of 41.5 feet near the southern end of the dam, at the downstream toe approximately 100 feet from the dam centerline. The purpose of this boring was to establish the depth of fill and determine the properties of the alluvial soils that underlie the dam. Decomposed siltstone was encountered at a depth of 30 feet.



The boreholes were continuously logged during drilling. The boring logs in Appendix B.1 were prepared based on a review of the field logs, an examination of the soil samples, and results of the laboratory testing.

## 4.2 Cone Penetration Testing

Four cone penetration test with pore pressure measurements (CPT<sub>u</sub>) soundings were advanced at the BC No. 1 dam (BC1-CPT-1 through BC1-CPT-4) and three were advanced at the BC No. 2 dam (BC2-CPT-1 through BC2-CPT-3). The location of the CPT tests are shown on Figure 9 and Figure 10 and summarized in Table 3.

The CPT tip resistance, sleeve friction, and pore water pressure was measured at 2-inch increments as the CPT instrument was pushed at a constant rate of 2 centimeters/second (ASTM D5778). Shear wave velocity and pore water pressure dissipation measurements were conducted at selected depths in BC1-CPT-3, BC1-CPT-4, BC2-CPT-1, and BC2-CPT-2. All CPTs were terminated in decomposed to highly weathered siltstone. BC2-CPT-2 was advanced approximately 20 feet into the siltstone, whereas the other CPTs were typically advanced 5 to 10 feet into the siltstone.

BC1-CPT-1 and BC1-CPT-2 were advanced near the downstream toe of the BC No. 1 dam to a depth of approximately 50 feet; BC1-CPT-3 and BC1-CPT-4 were advanced from the crest of the dam to a depth of approximately 83 feet. BC1-CPT-3 was located adjacent to boring BC1-B-1 to provide a correlation with the soil boring information.

All CPTs at BC No. 2 were advanced from the dam crest. BC2-CPT-1 was located adjacent to boring BC1-B-1 to provide a correlation with the soil boring information and extended to a depth of 85 feet. BC2-CPT-2 was located near the center of the dam, and extended to a depth of 95 feet and BC2-CPT-3 was located about 80 feet from the northern end of the dam and extended to a depth of 63 feet.

CPT data for each sounding, shear wave velocity plots, and pore pressure dissipation plots are included in Appendix B.2.

## 4.3 Geophysical Testing

A seismic refraction geophysical survey was conducted at the BC No. 1 and BC No. 2 sites on December 20 and 21, 2011 by Northwest Geophysical Associates, Inc. (NGA, 2012). The purpose of the survey was to estimate the depth to bedrock and define the bedrock sub-surface profile.

The surface seismic refraction survey was performed using a seismograph to record data and sledge hammer to generate a seismic compression wave at regular intervals along and at the end of each line. The time required for a seismic wave to travel from a source to a receiver was measured, and the seismic velocity and depth to the underlying soil and rock strata were estimated based on this time period.

The locations of the seismic lines are shown on Figure 9 and Figure 10 for BC No. 1 and 2, respectively. A total of three seismic lines were performed; one at BC No. 1 and two at BC No. 2. Seismic line 1 (SL-1) was run on the crest of BC No. 1. SL-2 and SL-3 were run in opposing orientations radiating outward from the downstream toe at BC No. 2 due to conflicts with the stream, fish ladder, and wetlands.

In general, relatively slow compression or P-wave velocities of 700 to 1,200 feet per second (ft/s) were recorded to a depth of 42 feet at BC No. 1, which suggest relatively weak soil material below the dam crest. At a depth of about 42 feet, a seismic wave velocity of 3,700 ft/s was measured. The NGA report states that this zone is likely representative of sediments that are saturated to a greater degree than the



overlying sediment. This is the most plausible explanation of this faster velocity zone since BC1-B-1 and CPTu soundings BC1-CPT-3 and BC1-CPT-4 encountered siltstone at depths ranging from 82 to 85 feet. In addition, the NGA geophysicist stated that the short seismic line length and the low signal to noise ratio may have limited the ability to detect bedrock at depths of 80 feet and generally affected the quality of the survey.

Relatively slow P-wave velocities (800 to 1,100 ft/s) were recorded to a depth of 10 feet at BC No. 2, with faster velocities (4,300 to 5,600 ft/s) recorded below. Again, this is likely representative of sediments that are saturated to a greater degree than the overlying sediment since boring BC2-B-3 encountered siltstone at a depth of about 30 feet at the downstream toe of the dam. In HDR's opinion, and the opinion of NGA, the geophysical survey results were not successful in defining the bedrock profile. Therefore the refraction surveys were not used as part of the geotechnical site characterization.

The geophysical report is included in Appendix B.3.



## 5.0 LABORATORY TESTING

Northwest Geotechnical, Inc. conducted laboratory index testing on selected samples from each of the geotechnical borings. Testing consisted of water content, Atterberg limits, gradation analysis, bulk density, and unconfined compressive strength. The results are included in Appendix C.1. Tables C.1-1 and C.1-2 present data for dams BC No. 1 and BC No. 2, respectively.

Additional soil testing consisting of index, unconsolidated undrained (UU) triaxial compression, one-dimensional consolidation, and monotonic and cyclic simple shear tests were conducted on selected samples by Fugro Consultants, Inc. in Houston, Texas. The results are included in Appendix C.2.

Radiocarbon dating of a wood fragment from Boring BC1-B-1 was performed by Beta Analysis, Inc. in Miami, Florida. The laboratory test results are presented in Appendix C.3 and discussed in the following sections.

## 6.0 GEOLOGIC AND SEISMIC SETTING

### 6.1 Geologic Setting

The Big Creek dams lie at the western margin of the Oregon Coast Range physiographic province which consists of a moderately high mountain range and coastal headlands interspersed with shallow bays, estuaries, beaches, and dunes. The site is located approximately 2 miles north of Yaquina Bay and 0.5 mile inland from Agate Beach. Review of available geologic information indicates the bedrock in the area is Miocene Era Marine Sedimentary Rock. Snavely, MacLeod, Wagner, and Rau (1976) mapped the bedrock formation as Nye Mudstone consisting of sandy siltstone and fine- to medium-grained marine siltstone and sandstone. The marine sedimentary rock is overlain with alluvial streambed material consisting of sands and silts. The bedrock outcrops at the abutments for both dams, and it appears the alluvial sediment is deepest at the location of the current Big Creek stream channel.

The alluvial material found in the borings is generally a silt or clay with varying amounts of sand. Wood fragments and some organics were encountered in some of the borings indicating the material is relatively young geologically. A carbon14 dating test was performed to estimate the age of the sediment. The test results for a wood fragment from a depth of 50 feet from boring BC1-B-1 indicated the age of the sample was about 4,100 years (Appendix C.3). This indicates the alluvial sediments are Holocene in age (i.e., less than 12,000 years). There are some distinct differences between the dam foundations at BC No. 1 and BC No. 2. The BC No. 1 site is geomorphically a drowned stream valley with its base at about EL -40 feet NAVD88. Based on Boring BC1-B-1 the upper 31 feet (EL 23.9 to -7.1 feet NAVD88) of the alluvium consists of primarily high plasticity silt (MH) with varying amounts of sand and clay. The lower 30.5 feet of alluvium from EL -7.1 to -37.6 feet NAVD88 is primarily silty sand (SM) with one interval of low plasticity silt with sand (ML) and one interval of organic silt (OH). The bottom 15 feet of this lower zone of alluvium has scattered coarse sand and rounded gravel. The constituents of the lower zone of alluvium are that of an alluvial depositional environment. The upper zone of alluvium is more indicative of a lower energy near shore depositional environment such as an estuary or delta. In addition to the particle size difference, the high plasticity and moisture content data from the upper 32.5 feet of the alluvium indicate the possible presence of ash or other mineral characteristics typical of high plasticity silt and relatively high insitu void ratios. The sources of ash in Holocene alluvium can vary from the erosion of the local tuffaceous siltstone to syn-depositional volcanic events such as the 7,700-year-old Mazama eruption approximately 200 miles to the southwest. The identification of the source(s) of ash is not as critical as identification of the chemical and structural makeup of this zone of alluvium as these characteristics may be important with respect to behavior during cyclic softening under seismic loading.

At BC No. 2 located about 3,000 feet upstream from BC No. 1 the stream has transitioned to a more typical stream cut valley configuration with bedrock at about EL 0 feet NAVD88. The amount of alluvium at the BC No. 2 site is minimal compared to the BC No. 1 site. Alluvium was drilled in BC2-B-3 from EL 40.1 to 20.1 feet NAVD88 and consists of an upper zone of up to 5 feet of sandy high plasticity silt (MH) then is consistently silty sand (SM) to the top of the bedrock (decomposed siltstone) at EL 20.1 feet NAVD88.

### 6.2 Seismic Setting

The regional tectonic setting of the project area lies within a zone of active convergence between the Juan de Fuca Oceanic plate and the North American Continental plate. Compressive forces on a global scale are forcing the denser Juan de Fuca plate beneath the lighter North American plate. This process is referred to as "subduction." Within this regional tectonic setting there are three general types of earthquakes that could generate ground motions at the site. Two are related to the subduction zone



(interface and intraplate earthquakes), and the third involves shallow crustal earthquakes within the North American plate. Only the interface and crustal earthquakes were found to generate significant seismic shaking. Crustal faults are generally located in the upper 20 miles of the earth's crust and typically have some surface expression related to the movement of the fault. The CSZ interface is generally considered to be located at a depth of 50 to 75 miles below the surface.

Known active faults in the region have been mapped by the United States Geological Survey (USGS, 2012) using information from a number of sources. The location of the faults and information related to them are available through the USGS Earthquake Hazard Program. The Quaternary Fault Map and associated database is available at <http://earthquake.usgs.gov/hazards/qfaults/>. Locations of earthquakes along the central Oregon coast during the period 1841 through 2002 are shown on Figure 1 of the Cornforth "Seismic Review and Ground Motion Development" Report (Cornforth, 2012, Appendix D). The Quaternary faults and folds of the region are shown on Figure 2 of the Cornforth Report. Quaternary faults are faults that have occurred during the last 2.6 million years and are considered potentially active. Two significant sources of seismic hazard were identified for the dam sites. The first source is the Yaquina Fault which is located approximately 1.9 miles north of the two dams. The Yaquina Fault is a crustal fault approximately 8 miles long. The Yaquina Fault has the potential of producing a magnitude (M) 6.1 earthquake. Due to the close proximity of the fault to the dams the peak ground acceleration (PGA) at the site of the dams is expected to range from 0.52g (acceleration due to gravity) to 1.10g with an average of 0.83g for a recurrence interval of 2,475 years. There have been no recorded earthquake events attributed to this fault, but geologic evidence suggests the fault is active. The second source is the CSZ located approximately 14 miles off the coast in the Newport area. The CSZ has the potential of producing a M 9.0 earthquake, but due to its distance the PGA was determined to be 0.56g with a recurrence interval of 2,475 years. The CSZ is believed to have generated an approximate M 9.0 earthquake on January 29, 1700. Geologic evidence suggests that there have been several events related to the CSZ over the last few thousand years, and that the events have been occurring for several million years.

Based on additional information not included in the Cornforth report, recent studies of turbidite deposits along the Cascadia margin indicate the CSZ can be subdivided into a northern and southern section with three potential rupture modes: full length, 50 to 70 percent of the southern section, and smaller seismic events for short reaches of the southern section (Goldfinger, et al., 2012). For a full length rupture, an average return period for a great earthquake has been estimated to be about 500 to 530 years. The average return period for the southern section of the CSZ based on analysis of the turbidite deposits is approximately 240 years. Therefore, a great earthquake on the full length CSZ could be expected to occur within the next 200 years and a large earthquake of a lesser magnitude on the southern section could occur at any time since it has been 300 years since the last recorded CSZ earthquake. Additional discussion of the estimated seismic hazards at the dam sites is provided in Section 8.0.

In addition to evaluation of the earthquake hazard at the site as described above, potential ground motions that would be associated with both the crustal and CSZ sources were recommended as part of the CCI studies (see Section 8.0). Ground motion time histories were not used in explicit seismic response evaluations completed under the current study but will be used for subsequent seismic response evaluations once the site characterization model is at a suitable level of understanding. It should be further noted that a significant effort is underway at the PEER to collect, evaluate and synthesize over 1,000 time history records obtained during the 2011 Tohoku earthquake off the northeastern shore of Japan. Once completed, the database of time histories that can be accessed and used for seismic response analysis of subduction zone earthquake events will be substantially improved. HDR has had discussions with the Executive Director of PEER and will be working with him during the next phase of work to update the evaluation of potential time histories that will be considered for the Newport dams and obtain



the appropriate information needed for input to seismic response models of the CSZ events. The time histories developed and presented in Appendix D will be suitable for use during the next phase of evaluation.

Finalizing the CSZ ground motions early in the next phase of work will be an important step for the project as HDR's experience with the seismic response analyses recently completed at Reclamations nearby Scoggins Dam has shown that the CSZ hazard will control the site response and safety of the dam. Currently, available information suggests that the CSZ earthquake events can have very large durations (100 to 400 seconds) and there can be significantly different remediation concepts and costs associated with this range of ground shaking durations. It is anticipated that the new information from PEER will increase the confidence in the ground motions used for evaluation and design and to help justify the shortest ground motion duration that is reasonable for the site.

### 6.3 Other Geologic Hazards

Given the location of BC No.1 and BC No. 2 near the Oregon coast and within the Oregon Coast Range, the geologic hazards of Tsunami inundation and landslides are possible. However, the Tsunami inundation hazard map (Figure 1) shows the downstream toe of the lower dam east and outside of the inundation line indicating that inundation during a tsunami is not likely to occur. A review of the State Wide Landslide Information Map produced by Oregon Department of Geology and Mineral Industry (DOGAMI, 2012) (<http://www.oregongeology.org/slido/index.html>) shows two landslides within the last 16 years within 1 kilometer of the dam sites. In addition, a large area of highly erodible Quaternary material is mapped adjacent to and north of the dam sites. This area has the potential for producing large volumes of sediment during periods of heavy rainfall. An existing or nascent landslide has the greatest potential to affect the stability of the dams if it occurs within any of the abutments. Another geologic hazard is the presence of liquefiable soils. Non-cohesive silts and silty sands are known to exist in the foundation at both sites. These materials, where they exist, are subject to liquefaction under seismic loading as discussed in Section 6.2.



## 7.0 SUBSURFACE CONDITIONS

### 7.1 Subsurface Stratigraphy

#### BC No. 1

As discussed in Section 4.0, a series of explorations were performed at the BC No. 1 dam site including: one boring and two CPTu soundings from the embankment crest, two CPTu soundings near the downstream toe, and a seismic refraction geophysical survey line across the crest of the dam from abutment to abutment. As previously noted, the seismic refraction surveys were of limited value and not included in development of the subsurface model at the BC No. 1 dam site. As shown on boring log BC1-B-1 in Appendix B.1, clayey silt (MH, defined as elastic silt with high plasticity) embankment fill was encountered from just beneath the dam crest (EL 45.4) to EL 23.5 feet. The embankment fill is underlain by sandy silt and clayey silt (EL 23.5 to -4.6 feet), and silty sand alluvium (EL -4.6 to about EL -37.6 feet) where weathered bedrock consisting of decomposed siltstone was encountered. Unless otherwise indicated, all elevations noted in this report are NAVD88.

Siltstone bedrock outcrops north and south of the embankment dam abutments. Based on the results of the boring, and CPTs (summarized further below), a general concept for a geologic model of the BC No. 1 site was developed. Using this concept, a typical cross-section through the maximum section of the dam was developed and is shown on Figure 3. A subsurface profile along the alignment of the crest of the dam is shown on Figure 4.

Following is a description of the materials (in accordance with the USCS ASTM D2487) encountered in boring BC1-B-1 and drilled from the crest of the dam. It should be noted that the embankment and foundation soils found at the site appear to be similar to materials of volcanic origin and hence display some unusual characteristics (i.e., high void ratio and water contents, moisture contents in excess of the liquid limit) These characteristics are not necessarily indicative of problematic soils but of the need for proper handling, testing, and evaluation procedures as the project progresses through future evaluation and construction phases.

Clayey SILT with some Sand (Dam Fill): The dam fill material generally consists of low to medium plasticity clayey silt with some fine sand. As discussed in Section 3.0, the plans for the original dam construction in 1951 indicate up to 21 feet of clayey silt fill was placed to construct the embankment. This is consistent with the conditions found in boring BC1-B-1 where fill appeared to extend from EL 47.4 to EL 23.9 feet (23.5 feet below the crest of the dam). SPT N-values ranging from 0 to 4 indicate the relative consistency of the fill is very soft to soft. Results of laboratory index testing on selected samples showed a plasticity index (PI) ranging from 20 to 28 (MH), water contents near the liquid limit (LL), and a fines (silt and clay) percentage near 50 percent.

Sandy SILT with some Clay (Alluvium): Alluvial material consisting of low to medium plasticity sandy silt with fine sand was encountered in BC1-B-1 below the dam fill, extending to EL 17.4 feet (depth of 30 feet). SPT N-values ranged from 0 to 5, indicating the relative consistency of the alluvium is very soft to medium stiff. Results of laboratory index testing on selected samples showed a PI of 14, LL of 49 which is a borderline low to high plasticity silt (ML-MH), water content above the LL, and fines percentage of 62 percent.

Clayey SILT with some Sand (Alluvium): This material was encountered from EL 17.4 to -4.6 feet (depth of 30 to 52 feet). Atterberg limit testing results showed this silt has a PI ranging from 14 to 41 (MH), LL





ranging from 54 to 87, and water contents at or slightly below the liquid limit. The SPT N-values recorded in this layer ranged from 0 to 2, indicating the soil is very soft to soft.

Silty SAND (Alluvium): Alluvial material consisting of low plasticity silty sand with isolated lenses of medium plasticity sandy silt and organic silt was encountered beneath the clayey silt from EL -4.6 to EL -37.6 feet (depth of 52 to 85 feet). SPT N-values ranged from 0 to 3, indicating the relative density is very loose. Laboratory testing indicates these soils generally have low plasticity with PI ranging from 0 (non-plastic) to 8 (ML) with few layers ranging from 22 to 28, LL ranging from 42 to 57, and fines percentage ranging from 22 to 53 percent. Scattered organics and wood chips/debris were encountered throughout this layer.

Siltstone (Marine Sedimentary Rock): The boring terminated in decomposed to weathered siltstone. In the decomposed condition, the siltstone consisted of stiff to hard, clayey silt. Results from the CPT penetrations also suggested that decomposed to weathered siltstone was encountered providing a basis to estimate the bedrock surface profile at the BC No. 1 site. The elevation of the siltstone layer that was found in each of the exploration borings or CPT soundings is summarized in Table 4 and shown on Figure 3 and Figure 4. The elevation of the siltstone layer varies from -16 to -38 feet with the lowest elevation near the original creek channel and highest siltstone elevation (i.e., shallowest) occurring beneath the northern and southern ends of the dam. Siltstone bedrock outcrops north and south of the embankment dam were identified in the field and surveyed with a handheld Global Positioning System (GPS) unit.

Soil samples are not obtained with a CPTu sounding; therefore it is generally accepted practice to establish a correlation between at least one soil boring and CPTu soundings during site characterization investigations. BC1-CPT-3 was performed adjacent to boring BC1-B-1 (see Figure 9) to allow a correlation of the CPTu data with the soil boring data, and to use this correlation to interpret the results from the other three CPTu soundings at the BC No. 1 dam site. The correlation with the soil boring is required primarily to determine if the CPTu derived soil classifications (i.e., sandy or clayey soils) match the soil classifications determined from visual classification and laboratory soil sample index testing. SPT N-values measured in the boring also can be compared to the CPTu data as well as laboratory measured undrained shear strength ( $S_u$ ) values to develop a site specific correlation between both SPT and CPT measurements, and the shear strength of the embankment and foundation soils.

For seismic response evaluations, it is important to delineate materials that may be subject to liquefaction verses those that may soften due to cyclic loading. This is typically done by identifying materials that will behave as “sand-like” (potentially liquefiable) from those that will behave as “clay-like” (potentially susceptible to cyclic softening). For purposes of this study, the recommendations of Boulanger and Idriss (2004), and Bray and Sancio (2006) were used to identify these behavior characteristics. The primary soil property used for this characterization is the soil PI. The percentage of silt/clay in the soil matrix is also a consideration in this designation. As discussed in Section 7.0, “sand-like” soils generally have a PI less than 7 and may be potentially liquefiable. “Clay-like” soils generally have a PI equal to or greater than 7 and may be potentially susceptible to cyclic softening. A minimum fines content of between 35 and 50 is also considered for the “clay-like” designation.

Soil categorization based on a specific PI value (i.e., 12) and consideration of fines content is not possible without laboratory soil sample testing. For the purpose of the preliminary seismic evaluation, an attempt was made to use the CPTu soundings to classify soils as “clay-like” and “sand-like”. Additional soil borings and laboratory testing will be required during future study phases and design to determine the PI of the soils and the appropriate soil behavior characteristics during and immediately following an earthquake.



Identification of potentially liquefiable soils that are non-plastic or have low plasticity from more plastic soils using cone penetrometer test data generally can be established using the soil behavior type index. Robertson and Wride (1998) developed this method specifically to evaluate the liquefaction potential of soils based on CPT data. Based on their method, soils are considered to have liquefaction potential if the soil behavior type index ( $I_c$ ) is less than 2.6. With this method, specific PI values for the soil are not addressed.

The  $I_c$  profile for BC1-CPT-3 is plotted on Figure 11. The  $I_c$  values are generally greater than 2.6 below EL 39 feet (depth of 8 ft); therefore, based on this method, the soils should not be potentially liquefiable. However, based on the laboratory index testing results and evaluation of the boring BC1-B-1 drilling log, the silty-sand soils from EL -5 to -37 feet are primarily non-plastic or have a low PI ( $\leq 7$ ), have less than 35 to 50 percent fines, and should be considered potentially liquefiable. As shown on Figure 11, the  $I_c$  values from the CPTu are about 3 to 3.2 for the silty sand layer. In fact, the  $I_c$  values in the silty sand layer are not appreciably different from the  $I_c$  values for the medium plasticity clayey silt soils in BC1-B-1 between EL 20 and -4.6 feet. Based on this comparison,  $I_c$  does not appear to be a good indicator of liquefiable sand-like soil versus non-liquefiable clay-like soil for the soils encountered at the BC No. 1 dam site. Therefore,  $I_c$  was not used as a means to identify soils that are potentially liquefiable ( $PI \leq 7$ ) at this time. As previously noted, the foundation alluvial soils have some unusual characteristics that are similar to materials associated with materials that originate from volcanic ash.  $I_c$  will continue to be considered during future investigation to identify any adjustments that are appropriate for a potential liquefaction designation in the seismic response evaluations

For this project, a simple methodology was established to delineate sand-like soils from clay-like soils by comparing the CPTu cone resistance ( $q_t$ ) to the normalized pore pressure ratio ( $B_q$ ). This method only provides an estimate for this preliminary seismic evaluation and additional borings and laboratory testing will be required to accurately delineate soils with a PI less than or greater than 7. As shown on Figure 12, generally when the  $q_t$  values were relatively low and uniform during penetration through the very soft to soft MH soils and the  $B_q$  was positive, the soils had a higher plasticity as confirmed by Atterberg limit testing of the samples from boring BC1-B-1 (Appendix C.1). There was a discrepancy between the interpretation using this method and boring BC-B-1 between EL +5 and -5 feet. In this interval, the CPTu interpretation would indicate the soils are sand-like, but the laboratory testing indicated the soils were an MH with a PI greater than 7. To be conservative, soils below an elevation of 0 feet were considered as potentially liquefiable in our post-earthquake stability analyses.

This technique was applied to each CPTu profile and the results are shown on Figure 13 and Figure 14 for BC1-CPT-1 and BC1-CPT-4, respectively. Thin apparently sand-like soil layers that occurred within the clayey layers were not differentiated if the sand-like layers were thinner than about 5 feet. The same criterion was applied for thin clayey layers that occurred within a sandy layer.

The  $q_t$  and  $B_q$  values for BC1-CPT-4 are considerably different from the BC1-CPT-3 profile; the CPTu soundings are approximately 100 feet apart along the crest of the dam. The  $q_t$  for BC1-CPT-4 below about EL 0 feet is much less than encountered in BC1-CPT-3. Also, the  $B_q$  values are relatively high for BC1-CPT-4 compared to negative values for BC1-CPT-3. The proximity of BC1-CPT-3 and BC1-B-1 to the original creek channel may explain why these materials appear to be sand-like as compared to BC1-CPT-4.

The results of this evaluation and the stratigraphy interpreted from the explorations are summarized in Table 5. The CPTu soundings indicate the delineation of sand-like and clay-like soils vary across the dam site. For this preliminary seismic evaluation, the soil profile for BC1-B-1/BC1-CPT-3 and the interpreted soil profile for BC1-CPT-4 were used for the seismic evaluation and geotechnical analyses. For the BC1-



B-1/BC1-CPT-3 profile, an elevation of 0 feet was selected for the top of the potentially liquefiable silty sand layer.

#### BC No. 2

A series of explorations were also performed at the BC No. 2 dam site; three borings, three CPTu soundings, and two seismic refraction survey lines. Two of the borings and the three CPTu soundings were performed on the embankment crest. Boring BC2-B-3 was performed near the downstream toe of the embankment. As previously noted, the seismic refraction survey results were of limited value and not used in the development of the subsurface model at the BC No. 2 dam site.

About 67 feet of MH embankment fill was encountered to EL 24.6 feet in boring BC2-B-1. About 42 feet of silty sand (SM) and clayey high plasticity silt (MH) embankment fill was encountered to EL 49.2 feet in boring BC2-B-2. These two borings confirmed information presented on the 1968 construction drawings and preliminary design report for the dam modifications (CH2MHill, 1974), indicating that the alluvium was removed to the top of weathered siltstone bedrock for the construction of the cutoff trench as shown on Figure 8.

A typical cross-section through the dam and foundation compiled from the available design and exploration information obtained during this study is shown on Figure 7. The location of this cross-section is shown on Figure 10. Upstream and downstream of the cutoff trench, the embankment fill is probably underlain by alluvium as represented by the foundation soils encountered in boring BC2-B-3. In general, HDR believes that the embankment fill and alluvial sediment are underlain by decomposed to weathered siltstone bedrock encountered in the borings, CPT soundings, and outcrops north and south of the embankment dam.

The following is a description of the materials encountered in boring BC2-B-1. These descriptions, excluding the reference elevation information, are similar to the materials found in boring BC2-B-2:

Clayey SILT with some Sand (Dam Fill): The dam fill material generally consisted of high plasticity clayey silt with some fine sand that extends to EL 26.6 feet, 65.0 feet below the crest of the dam. The fill is generally stiff to very stiff with typical SPT N-values of 10 to 13; however, lower N-values were obtained to a depth of about 15 feet below the crest of the dam and in the bottom 10 feet of the fill. Laboratory testing on two samples indicates a PI of 10 to 18 (MH), with a water content below the liquid limit.

Silty Sand (Fill): A 2-foot-thick layer/lense of nonplastic silty fine sand was found in the BC2-B-1 embankment fill between EL 26.6 and 24.6 feet. An N-value of 2 indicates the relative consistency of this fill material is very loose.

Siltstone (Marine Sedimentary Rock): Decomposed Siltstone (Clayey silt) was encountered from EL 24.6 feet to the boring termination at EL 11.6 feet. From EL 24.6 to 19.6 feet, the decompressed siltstone is hard with N-values of 30 and 32. The siltstone could be sampled with rock coring methods from EL 19.6 to 11.6 feet. The bedrock in the core samples was generally highly weathered and for the two core runs completed were 100 and 93 percent, respectively.

In boring BC2-B-3 drilled near the downstream toe of the embankment, the following foundation alluvium materials were encountered:

Silty SAND to sandy silt with some clay (Fill): The fill extended to a depth of 10 feet (EL 40 feet). It was unclear whether this fill was placed as part of the original construction or as part of a later dam



modification in 1976. The SPT tests in this layer showed the fill is loose to medium dense with SPT N-values ranging from 4 to 14. Laboratory testing of two samples indicated a USCS designation of ML/SM with a PI ranging from 12 to 14. The fines percentage ranged from 48 to 52 percent. Since the PI is greater than or equal to 7, the material was classified as clay-like for the seismic analyses.

Sandy SILT and Silty SAND (Alluvium): The sandy silt (MH) and silty sand (SM) extended 20 feet below the base of the fill to the surface of decomposed siltstone at EL 20 feet and is generally loose with SPT N-values ranging from 2 to 9. The soil generally has 35 to 64 percent fines content and a PI ranging from non-plastic (i.e., sand-like) to 19.

Siltstone (Marine Sedimentary Rock): Decomposed siltstone extended from EL 20 feet to the termination of the boring at EL 8.6 feet. The siltstone had a stiff consistency and gradationally classified as a borderline ML/MH to SM material. There were some scattered gravel and wood fragments in the siltstone.

## 7.2 Engineering Property Characterization

The following sections summarize the engineering properties of the embankment and foundation soils/bedrock that are required to assess seepage conditions and associated water pressures and gradient in the dam and foundation, along with the potential for liquefaction or cyclic strength degradation and the corresponding shear strength values to be used in slope stability analyses.

### Basic Soil Parameters

The basic soil parameters summarized in Table 6 were developed for input to the geotechnical analyses including the total unit weight and volumetric water content.

### Permeability (K)

An estimate of the steady-state seepage phreatic water surface through the dam and foundation is required for stability and seismic response evaluations. To estimate the location of the phreatic surface, the vertical permeability ( $K_v$ ), horizontal permeability ( $K_h$ ), and the ratio of vertical to horizontal permeability of the embankment and foundation soils at the site are required. Laboratory permeability tests were not performed for this preliminary seismic response evaluation of the Big Creek Dams. Instead, permeability values were selected for the different soil types included in the models based on a variety of published sources of information including values developed through extensive testing for major levee improvements in the Sacramento River basin near Sacramento, California (Board of Senior Consultants [BOSC], 2010). A summary of estimated permeability values for a wide range of soil types adopted for these evaluations are shown in Table 7. The suggested model layer colors also shown in this table were established to provide for consistency in presentation of model layer characteristics as the project progresses.

The soil classifications and fines content determined from laboratory testing of samples obtained from the borings completed at BC No. 1 and BC No. 2 are summarized in Tables C.1-1 and C.1-2, respectively (Appendix C). As noted above, the foundation soils at both sites are predominantly high plasticity silt (MH) and silty fine sand (SM). Embankment materials are predominantly MH materials. In addition to the soil materials in the embankment and foundation, there is a blanket drain in both dams. A review of the available construction documents found that there were no specifications for this material. Further, blanket drain materials were not sampled during the recent site exploration program. For the analyses, HDR has assumed that the blanket drains were constructed from slightly silty fine sand (3 to 7 percent fines).

A summary of the selected permeability values and  $K_v/K_h$  ratios are presented in Table 8. In addition to these presumptive values, permeability values were also estimated based on CPTu pore pressure dissipation tests. One dissipation test performed in BC1-CPT-3 at a depth of 39.7 feet indicated a  $K$  of  $5 \times 10^{-8}$  centimeters per second (cm/sec) in the clayey silt material and a test in the silty sand material at a depth of 59.7 feet yielded a value of  $3 \times 10^{-7}$  cm/sec. These values are lower than the typical values summarized in Table 7 and Table 8, and hence were selected as the lower bound values used in the analyses.

### Soil Strength Parameters

Shear strength parameters for the existing static (pre-earthquake) and post-earthquake loading conditions were selected for each soil type in the typical BC No. 1 and BC No. 2 cross-sections shown on Figure 3 and Figure 7, respectively. For BC No. 1, the static and post-earthquake strength parameters were developed from interpretation of the CPTu data, laboratory testing, and correlations with soil index properties. For BC No. 2, the strength parameters were based on the interpretation of CPTu data, SPT  $N_{1.60}$  values, and strength data included in the CH2MHill preliminary design report (1974).

As discussed further in Section 8.0, below, an evaluation of the SPT  $N_{1.60}$  values and liquefaction potential of the sand-like soils at both dam sites indicates that SM and ML materials will liquefy due to an earthquake on either the Yaquina faults (M6.1) or CSZ (M9.0). These materials have reasonably good strength under static loading conditions, however, they will lose significant strength during an earthquake event. Similarly, there will be cyclic softening and loss of strength of some of the “clay-like” MH embankment and foundation soils during and immediately following either earthquake loading condition.

### BC No. 1 Dam

For BC No. 1 dam, information from boring BC1-B-1 and the four CPTu soundings were used to assess the static and post-earthquake shear strength of the soils used in stability evaluations as summarized below.

Static Shear Strength. Estimated minimum factors of safety (FOS) for the static loading condition (long-term steady state seepage conditions), were performed using estimates of drained (effective stress) strength parameters (e.g., USACE, 2003). The effective stress friction angle for the clayey-silt soils were estimated based on laboratory PI determinations (Mitchell, 1976). For an average PI of 30 for the clayey silt embankment soils in BC1-B-1, a drained friction angle of 28 degrees was selected. For the silty sand foundation soils in boring BC1-B-1, the drained friction angle was estimated using equivalent  $N_{1.60}$  values estimated from the CPTu profiles. For an average  $N_{1.60}$  of 4 blows per foot (bpf), a drained friction angle of 28 degrees was also estimated (Mayne et al, 2001). A cohesion of 0.1 kips per square foot (ksf) was included for both the embankment and foundation soils to reflect the expected curvature of the failure envelope in the low effective stress range and minimize the influence of shallow (infinite slope) failure surfaces on the estimates of the location and minimum FOS during stability analyses. A summary of the drained shear strength parameters used for BC No. 1 static stability evaluations is presented in Table 9.

Post-Earthquake Strength. Post-earthquake strengths were developed in a two-step process. First, a general determination was made on an expected “sand-like” or “clay-like” behavior as previously discussed. For those embankment and foundation materials that are expected to have a “clay-like” behavior, estimates of the peak undrained shear strength ( $S_u$ ) of the embankment and foundations soils were made based on the results from the CPTu tests (see Figure 15 and Figure 16). Using the estimates of peak strength and results of laboratory cyclic simple shear tests, an estimate of the amount of strength degradation was made to establish the “post-earthquake” shear strength input to the stability analysis models. For the foundation materials that are estimated to have a more “sand-like” response to



earthquake loads, the post-earthquake residual strength (also referred to as post-earthquake steady state strength) for the potentially liquefiable sand-like soils was estimated using the relationship proposed by Seed and Harder (1990) as shown on Figure 17. Seed (2010) calculated a least squares fit through the Seed and Harder (1990) data, and this relationship (red dashed curve) was used to estimate the post-earthquake strength of the sand-like soils ( $PI < 7$ ). The CPTu derived  $N_{1.60}$  values adjusted for fines content were used with the Seed and Harder (1990) relationship to estimate the post-earthquake undrained strength as shown on Figure 18 for BC1-CPT-3. A value of 0.2 ksf (200 pounds per square foot) was selected for the post-earthquake stability analyses of BC No. 1.

As shown on Figure 15 and Figure 16, shear strength values for MH embankment and foundation materials encountered in the BC1-CPT-3 and BC1-CPT-4 soundings were estimated using the CPTu  $q_t$  values and a cone factor ( $N_k$ ) of 15.  $N_k$  can vary from about 10 to 20; however, a value of 15 is typically used for estimating the shear strength for these soil types (Robertson, 2009). The interpreted  $S_u$  values for BC1-B-1/BC1-CPT-3 and BC1-CPT-4 are summarized in Table 10 and Table 11, respectively.

The interpreted undrained shear strength for both the BC-1 soundings generally decreased with depth. The  $S_u$  value for the embankment fill is about 1 ksf. For BC1-CPT-3, the  $S_u$  value decreases to about 0.75 ksf and for BC-CPT-4 it decreased to about 0.5 ksf. The  $S_u$  values below EL -25 feet for BC1-CPT-4 were considerably less than what would be expected for a normally consolidated soil with an  $S_u/S'_v$  ratio of 0.22 ( $S'_v$  is the vertical effective stress) and a normal range of void ratio and corresponding effective stress. The  $S_u/S'_v$  ratio is based on an average PI of 30 for the MH soils in BC1-B-1. This relatively low strength however, is reasonably consistent with the high void ratios (low unit weights) encountered, particularly in the foundation soils at the site. The relatively high normalized pore pressure ratios and low  $q_t$  values for BC1-CPT-4 (Figure 14) may indicate some influence of an artesian groundwater pressure near the top of the siltstone layer.

For the clayey silt soil, results from the laboratory static and cyclic simple shear tests were used to develop strength reduction factors to apply to the insitu CPTu strengths to account for the loss in strength due to cyclic loading. The result for the cyclic simple shear test for the undisturbed clayey silt soil sample from BC1-B-1 is shown on Figure 19. The test was performed at a cyclic strength ratio of 0.8 and the sample failed after 27 cycles of loading. As shown, the test result agrees with the published data presented by Boulanger and Idriss (2007).

Immediately after completion of the cyclic test, a monotonic simple shear test was performed to determine the post-cyclic undrained shear strength. This test showed that the undrained shear strength of the clayey soil was reduced by 33 percent due to the effects of cyclic loading. Therefore, the  $S_u$  profiles shown on Figure 15 and Figure 16 were reduced by 33 percent to account for the effect of cyclic loading; these values are included in Table 10 and Table 11 for profiles from BC1-CPT-3 and BC1-CPT-4, respectively.

## **BC No. 2**

**Static Shear Strength.** As discussed in Section 7.1, the soils for BC No. 2 consisted of the clayey-silt fill soil within the embankment and cut-off trench and the alluvial soils outside the cut-off trench as represented by boring BC2-B-3. Estimated minimum FOS for the static loading condition (long-term steady state seepage conditions), were also performed using estimates of drained (effective stress) strength parameters (e.g. USACE, 2003). Estimates of the drained shear strength properties for the various embankment and foundation soils were obtained from the CH2MHill 1974 preliminary design report and are summarized in Table 12. A conservative value of 35 degrees was assumed for the gravel filters and a relatively low total unit weight of 82.4 pounds per cubic foot (pcf) with zero strength was assumed for the approximate 15 foot thickness of reservoir sediment.



Post-Earthquake Strength. The undrained shear strength parameters used as part of the CH2MHill 1974 preliminary design are shown in Table 13.

The estimated peak undrained shear strength based on three CPTu sounding results are shown for “clay-like” soils on Figure 20 through Figure 22. The interpreted values are somewhat erratic; however, the undrained shear strength values are generally between 1 and 3 ksf.

The post-earthquake strength values used for BC No. 2 were selected based on the results of the liquefaction and cyclic softening analyses discussed in Section 8.0, below. As shown in Table 13, the post-earthquake undrained shear strength for the clay-like embankment dam soils soundings was reduced to 66 percent of the pre-earthquake strength if the factor of safety against cyclic softening was less than 1.2. For boring BC2-B-3, post-earthquake residual undrained (steady state) shear strength was calculated for the liquefiable sand-like soils based on SPT blowcounts as described for BC No. 1.



## 8.0 SEISMIC HAZARDS AND GROUND MOTIONS

As previously noted in Section 6.2, above, a seismic hazard evaluation including the identification of representative of ground motions for the dam sites was performed as part of these studies (Cornforth, 2012) and is included in Appendix D. Specifically, this portion of the current study included the following:

- Identification of the principal seismic sources that contribute to the seismic hazard,
- Development of site specific response spectra,
- PSHA to identify peak ground accelerations as a function of recurrence interval for the identified seismic sources, and
- Identification of representative time histories for the identified seismic sources to use in seismic response evaluations.

### 8.1 Seismic Sources

The primary seismic sources identified that could impact the dam sites are the shallow crustal earthquakes within the North American tectonic plate and the CSZ. As shown in Table 1 of the Cornforth (2012) report, the Yaquina fault located 2.4 km (1.5 miles) from the site can generate a M 6.1 earthquake and the CSZ located about 24 km (15 miles) can generate a megathrust M 9.0 earthquake. These hazard sources are applicable to both dams since the distance of the sources to the dams is similar.

Several earthquakes about M 4.9 or smaller have occurred in the vicinity of the Big Creek dams in the last 170 years. In addition, recent research has strongly suggested a notable estimated M 9.0 megathrust (interface) earthquake event that occurred around January of 1700 on the CSZ.

### 8.2 Probabilistic Seismic Hazard Analysis (PSHA)

A PSHA was performed to develop estimates of peak ground motions at the dam sites that correspond to return periods of 475 to 2,475 years utilizing the USGS 2008 Interactive Deaggregation's web site. As shown in Table 2A of the Cornforth report, the CSZ would contribute 67 percent and the Yaquina fault 33 percent to the PGA hazard (0.0 second) for an earthquake with a return period of 2,475 years. Based on the USGS deaggregation, the magnitude and distance for the principal seismic sources are provided in Table 1 (all tables are provided at the end of this report):

### 8.3 Ground Motions

A number of factors need to be considered in the selection of the ground motion return period for safety evaluations and design including: regulatory requirements, potential loss of life, economic damage, and the need to maintain water supply after the seismic event. For purposes of these evaluations, ground motions for a 2,475-year return period were selected for the initial seismic evaluation of the BC No. 1 and BC No. 2 dams; this corresponds to a 2 percent probability of exceedance for a 50-year time interval.

The deaggregated earthquake ground motion hazards determined from the analysis for a 2,475-year return period and the corresponding PGAs are shown in Table 2.

The PGA values were determined using attenuation relationships applicable to each seismic source. The 84<sup>th</sup> percentile ground motion corresponds to the value that is one standard deviation above the mean value. For the Yaquina fault source earthquake, this resulted in estimated PGA values of 0.52g to 1.10g



for the different attenuation relationships with an average of 0.83g for a M 6.1 reverse fault rupture event. For the CSZ interface-megathrust source, four attenuation relationships were used and a weighted average was applied to estimate the 0.56 PGA value that would occur in the 0.4- to 2-second period range. The average response spectra for the 2,475-year return period are shown in Figure 23 and Figure 24 for the Yaquina and CSZ seismic sources, respectively.

## 8.4 Ground Motion Time Histories

Available records were searched to select appropriate ground motion time histories that can be used in explicit seismic response evaluations. The selection of an appropriate time history is typically based on similar geologic conditions, earthquake magnitudes, fault mechanism, and distance to fault rupture. The selected time histories were provided in Excel format and accompanied the Cornforth (2012) report. For the CSZ earthquakes, a limited database of ground motions are available; however, as previously noted, numerous seismic records from the recent Tohoku, Japan, and Chili subduction zone earthquake are being evaluated by the PEER. This is important because the duration of intense ground shaking during a CSZ event is uncertain and evaluation of time histories from a similar subduction type earthquake will improve this understanding and the basis for updated safety evaluations and design.



## 9.0 SEISMIC RESPONSE

### 9.1 Evaluation Procedure

Evaluating the potential response of embankment dams to significant ground shaking events is a complex process and requires an understanding of the seismic hazard, site characteristics, and the corresponding material properties of the embankment and foundation relative to static and seismic loading conditions as discussed in the preceding sections of this report. Experience has shown that the most difficult aspect of predicting the response of structures to seismic loading is characterizing the shear strength of foundation and embankment materials, particularly if they are of low density (contractive) and subject to the loss of strength under rapid loading conditions that are typical during large earthquake events.

The standard of care for completion of seismic response evaluations generally consists of a series of increasingly complex site investigations, laboratory testing, and seismic response evaluations. Initial evaluations tend to be more conservative. If these initial evaluations determine that the structures will respond favorably to seismic loads, safety evaluations can be terminated with relatively simple and inexpensive evaluations. However, if the initial (and simplified) evaluations identify potential safety concerns or deficiencies, supplemental site characterization and seismic response evaluations are typically undertaken to reduce the conservatism of the simplified evaluation procedures. Supplemental investigations and evaluations typically result in either; 1) elimination of safety concerns, or 2) minimization of the safety modification requirements and costs should a deficiency be confirmed.

The simplified evaluation completed for this initial evaluation of the Big Creek Dams consisted of the following:

1. Development of simplified geologic model of the sites including representative dam axis profiles and cross-sections for engineering evaluation (Sections 2 through 7).
2. Identification of the seismic hazards at the site (Section 6.2 and 8.0)
3. Estimation of engineering properties including permeability and shear strength of the various embankments and foundation materials in the cross-section models (Section 7.2).
4. Estimation of any shear strength reduction that may occur during and/or immediately following an earthquake due to liquefaction (typical of loose, contractive "sand-like" material behavior), or cyclic softening (typical of low density, and saturated "clay-like" material; Section 0).
5. Perform steady state seepage and stability analyses using estimated water pressures and drain shear strength properties to estimate minimum static FOS for each dam (Section 10.1).
6. Perform "post-earthquake" stability analyses using any appropriate strength reduction to estimate minimum "post-earthquake" stability FOS (Section 10.2).

Results of the initial site characterization including *insitu* testing, laboratory testing, evaluation of the material characteristics including seepage and shear strength properties of the embankment and foundation materials at each site along with the potential for shear strength reduction have been discussed in previous sections of this report. In the sections that follow, results of additional evaluations of strength reduction potential, particularly of the high plasticity clayey silts found in the dams and dam foundations are presented. The initial site characterization included limited direct sampling and testing for correlation to CPTu results. The one set of cyclic direct simple shear laboratory test results showed cyclic softening and strength reduction. Further evaluation of the CPTu tests discussed below support estimates of strength reduction that may occur in the "clay-like" embankment and foundation soils at the site.

Finally, the results of the steady state (static) stability, and post-earthquake stability analyses (using the estimates of shear strength reduction due to liquefaction or softening) are presented in Section 10.

In a simplified evaluation procedure, the overall safety of the dams is assessed based on the estimated minimum stability FOS under both static and “post-earthquake” conditions. The minimum required FOS under static loading conditions are well established and documented under state and federal dam safety guidelines. In general, a minimum static factor of safety of 1.5 is required for significant and high hazard dams. Guidelines for “post-earthquake” FOS are more variable under state and federal safety guidelines. However, minimum “post-earthquake” FOS values are generally interpreted as follows:

1. Values that are less than 1.0 are indicative of a significant potential for a flow failure of the structure.
2. Values between 1.0 and 1.2 are generally indicative of a potential for large structure deformations. For this condition, additional seismic response evaluations using empirical to advanced numerical modeling methods will likely be required to assess potential deformations, available freeboard following an earthquake, and the potential for either an overtopping or seepage (through cracks) potential failure mode development.
3. Values greater than 1.2 are generally acceptable except for special conditions which may require further evaluation. Such conditions may include dams with limited available freeboard, long duration earthquakes (such as the CSZ events) that may produce abnormally large deformations, or unusual site or design conditions (steep abutments) where cracking could result in development of a failure mode even for relatively small deformations.

## 9.2 Cyclic Softening Evaluation Methodology

Boulanger and Idriss (2006) state that soils with a PI less than 7 may be susceptible to liquefaction while Bray and Sancio (2006) state that soils with a PI less than 12 is susceptible to liquefaction. Bray and Sancio include an additional condition that the ratio of water content to liquid limit should be greater than 0.85 for the soils to be susceptible to liquefaction. For purposes of this study, materials with a PI less than 7 were considered as sand-like and potentially liquefiable. All other soils with a PI greater than 7 to 12 were considered as subject to cyclic softening.

A discussion of the materials in the dams and foundations that are “sand-like” and may be subject to liquefaction have been presented in Section 7.0. The associated drained and undrained “post-earthquake” residual (steady state) shear strength for these materials have been estimated based on direct insitu SPT testing or indirect correlations between CPT and SPT blowcounts normalized to an overburden pressure of 1 ton per square foot, a hammer efficiency of 60 percent, and corrected for fines content ( $N_{1,60}$ ). A comparison of the SPT  $N_{1,60}$  values from the soil boring BC1-B-1 or  $N_{1,60}$  values based on the CPTu  $q_t$  profile in BC1-CPT-3 is shown on Figure 25, Results for BC No. 2 including boring BC2-B-3 are presented in Appendix E. No further evaluations of the sand-like materials were performed to support the estimates of post-earthquake strength reduction that may occur.

For clay-like soils, the potential loss in strength was evaluated using the methodology proposed by Boulanger and Idriss (2007). Their method is based on the original simplified procedure by Seed and Idriss (1982) for estimating cyclic stress ratio (CSR) and comparing this value to the cyclic resistance ratio (CRR) to estimate a factor of safety (FOS) against cyclic softening (also liquefaction) where:

$$\text{FOS} = \text{CRR}/\text{CSR}$$

An FOS less than one indicates softening could occur.



The CSR is used to quantify the stresses that may develop insitu during cyclic earthquake loading based on the following equation:

$$CSR = 0.6 * (a_{max}/g) * (S_{vo}/S'_{vo}) * r_d * K_0 * K_a$$

$a_{max}$  = peak ground acceleration

$g$  = acceleration of gravity

$S_{vo}$  = Total overburden stress

$S'_{vo}$  = Effective overburden stress

$r_d$  = stress reduction coefficient

$K_0$  = Overburden stress correction factor

$K_a$  = Ground slope correction

The CSR values were calculated using the PGA values determined for the Yaquina M 6.1 and CSZ M 9.0 deaggregated earthquake motions.

The procedure also requires an estimate of the CRR of the soils. To estimate CRR, first an estimate of the  $CRR_{(M=7.5)}$  for clay-like soil is made from the following equation:

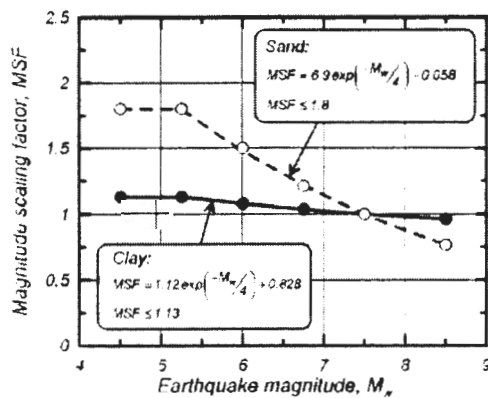
$$CRR_{(M=7.5)} = 0.8 * S_u/S'_{vo}$$

The CRR value is then adjusted for the earthquake magnitude as follows:

$$CRR = CRR_{(M=7.5)} * MSF$$

MSF = Magnitude scaling factor

The MSF is estimated based on the graph provided below. As can be seen, the MSF values for clay-like soils are less dependent on earthquake magnitude than sand-like soils.





### **9.3 BC No. 1**

The FOS against cyclic softening for BC1-CPT-4 is shown on Figure 28. The FOS is acceptable to a depth of about 15 feet within the embankment, but decreases significantly in the relatively soft clay-like alluvial soils. This was expected based on the relatively low undrained shear strength values derived from the CPTu profile.

### **9.4 BC No. 2**

The FOS against cyclic softening for BC2-CPT-1 is shown on Figure 29. The upper part of the embankment appears to be acceptable, but the lower portion above the siltstone has a relatively low factor of safety.



## 10.0 EMBANKMENT SEEPAGE AND SLOPE STABILITY ANALYSIS RESULTS

### 10.1 Embankment Seepage Analysis Results

The seepage analyses of BC No. 1 and BC No. 2 were performed using the finite element GeoStudio 2007 version 7.17 computer program. The purpose of these analyses was to estimate the location of the phreatic surface in the steady-state condition for use in slope stability and for yield acceleration analyses. To obtain the sensitivity of the phreatic line to the hydraulic conductivities, the seepage analyses were performed for the combination of the lower bound and upper bound permeabilities (referred to as hydraulic conductivity in Appendix F) of the foundation and embankment materials.

#### Analysis Cases

The seepage analyses were performed for the idealized cross-sections based on the results of CPTu borings BC1-CPT-3 and BC1-CPT-4, and geotechnical boring BC2-B-1, as previously discussed. The long-term or steady state seepage study cases are presented in Table 15. Due to the uncertainties in the functionality of the buried toe drain at BC No. 1, the seepage analysis was conducted for two cases of with and without toe drain. The toe drain for the BC No. 2 was assumed to be functional. A more detailed presentation and discussion of the analysis study cases and results are included in Appendix F.

#### Geometry and Boundary Conditions

The geometry of the embankment and soil stratification was developed from the current topography maps and geotechnical investigation of the project. The reservoir water levels in the models are summarized in Table 15. The potential seepage boundary condition with zero flux is applied to the downstream face of the embankment as well as the ground surface downstream of the toe of the dam in all models.

#### Material Properties

The material properties selected for the different material types are discussed in Section 7.0 and presented in Tables 2 through 5 in Appendix F. The material types are identified by color on the model cross-sections on Figures 1 through 6 in Appendix F.

The permeability curves of the partially saturated materials such as embankment and foundation soils were estimated using the Fredlund and Xing method in the SEEP/W manual (GeoSlope, 2010) up to a maximum matrix suction of 10,000 psf. The residual water content of the materials was also estimated using the method indicated in the SEEP/W 2007 manual.

#### SEEP/W Results

The output plots of the analysis are presented in Appendix F on Figures 7 through 14 for BC No. 1 and Figures 15 and 16 for BC No. 2. Analysis results indicate that the location of the phreatic surface would be similar for the lower and upper bound permeability values used in the analyses. The results also indicate that a functioning toe drain for the BC No. 1 dam would have a significant impact on the location of the phreatic surface (see Figures 9, 10, 13, and 14 in Appendix F). The pore water pressure values from the SEEP/W analyses were transferred to SLOPE/W models for estimating the slope stability FOS.

### 10.2 Embankment Stability Analysis Results

Slope stability analyses were performed using the GeoStudio 2007 version 7.17 computer program to estimate the FOS for static and post-earthquake loading conditions for BC No. 1 and BC No. 2. Static and post-earthquake shear strength values presented in Section 7.0 and discussed further in Section 9.0 above

were utilized. The Spencer's method of slices was used to perform the analyses since it satisfied both force and moment equilibrium of each slice. The geometry of the stability analysis models were the same as the geometry of the models used in the seepage analyses.

#### BC No. 1

The results of the stability analysis are summarized in Table 16. The minimum FOS values, estimated for the static loading conditions at BC No. 1, exceed 1.5 for both Study Case 1 (without toe drain) and Study Case 2 (with toe drain). An example of the results for the downstream slope at the BC1-CPT-4 cross section for Study Case 2 and drained strength parameters are shown on Figure 31.

Post-earthquake analysis results using reduced shear strength values are also summarized in Table 13. Undrained Strength Values for Post-Earthquake Slope Stability Analyses used in 1974 analyses by CH2MHill, Dam BC No. 2. As can be seen, the minimum post-earthquake FOS values are significantly lower than the static values. The greatest reduction in the estimated minimum FOS occurs using the cross-section characteristics and reduced shear strength values for BC1-CPT-3. The most critical potential failure surface corresponding to the estimated minimum FOS of 1.08 is shown on Figure 31 and extends into the liquefiable, sand-like soil foundation soils. The failure surface extends to a daylight location below the reservoir water surface elevation suggesting that an overtopping failure mode could develop if deformations become large enough. The minimum post-earthquake FOS results using the cross-section and reduced strength values for BC1-CPT-4 are 1.44. The critical potential failure surface corresponding to this minimum FOS value is shown on Figure 33. These results are also highlighted yellow. In both cases, the results suggest that additional evaluations of the downstream slope of BC No. 1 should be performed to further refine the cross-section properties and estimate deformations of the structure using more advanced numerical modeling methods to determine the potential for an overtopping or a cracking/seepage related failure mode to develop during a large earthquake event. Based on our experience, HDR believes that the ground motions associated with a CSZ M 9.0 megathrust event will be the critical safety and design event for this dam.

One of the significant characteristics of subduction zone earthquakes around the world is the occurrence of significant after shock events a relatively short time after the primary event occurs. The strength reduction to the clay-like soils associated with the BC1-CPT-4 cross section would likely occur during the initial and primary earthquake event. Pore water pressures that would develop in the high plasticity clayey silt materials in the embankment and foundation of the dam would not likely dissipate for several weeks allowing a corresponding return to a higher shear strength and minimum FOS conditions. Hence, any subsequent earthquake response would begin at the condition of reduced shear strength and additional significant deformations may be induced to the structure.

To make an initial assessment of this concern, a pseudostatic seismic analysis was performed to estimate the yield acceleration (i.e., FOS=1.0) for each case using the reduced shear strength parameters. The results for the downstream slope using strength values for BC1-CPT-3 are shown on the upper portion of Figure 34. The estimated yield acceleration for BC1-CPT-3 is about 0.006g (upper graph). This low yield acceleration (the acceleration to cause additional structure deformation) is expected because the post-earthquake minimum FOS was only 1.06. For BC1-CPT-4 conditions, (lower graph), the yield acceleration is only 0.04g, even though the post-earthquake minimum FOS was 1.49. These results suggest that aftershocks will be a significant consideration in the assessment of the overall safety of BC No. 1 and design of any remediation treatments.



## BC No. 2

The results of the stability analysis are summarized in Table 17. The minimum FOS value of 1.83 estimated for the static loading condition of the downstream slope of BC No. 2 also exceed 1.5. The critical potential failure surface associated with this minimum FOS is shown on Figure 35.

Post-earthquake analysis results using reduced shear strength values are also summarized in Table 17. As can be seen, the minimum post-earthquake FOS value of 0.4 is less than 1.0 suggesting a significant potential for a stability failure of the structure during a large earthquake. The location of the critical failure surface associated with this minimum FOS value is shown on Figure 36. The failure surface daylights substantially below the reservoir and sediment levels strongly suggest the corresponding development of an overtopping failure mode releasing the full contents of the reservoir at the time of the earthquake. The minimum FOS value for the downstream slope results are highlighted red in Table 17. It should be noted that the minimum FOS value for the upstream slope is well above 2.0 suggesting that only the safety of the downstream slope requires further evaluation and corrective action. Similar to BC No. 1, based on our experience, HDR believes that the ground motions associated with a CSZ M 9.0 megathrust event will be the critical safety and design event for this dam.



## 11.0 CONCLUSIONS AND RECOMMENDATIONS

### 11.1 Conclusions

#### BC No. 1

The minimum FOS identified for BC No 1 (lower) indicates that this structure meets acceptable stability criteria and is stable under static loading conditions using the estimated static strength of the soils.

The BC No. 1 clay-like embankment soils are not well compacted, and the relatively loose sand-like and clay-like foundation soils extend up to 60 feet below the embankment. Based on the limited geotechnical explorations that were performed for this preliminary seismic evaluation, liquefaction of the relatively loose sand-like soils would result in a considerable loss of soil shear strength during a large earthquake event. The strength of the clay-like embankment and foundation soils would also be reduced in a seismic event. Simplified post-earthquake stability analysis results using the estimated reduced shear strength of these materials (that would occur during an earthquake) indicated that BC No. 1 could be susceptible to damage due to a large seismic event originating on either the Yaquina fault or CS Z. The dam may be subject to further and significant damage associated with aftershocks. Either fault system can generate large earthquakes, but the CSZ is of greater concern because of the relatively long duration of strong shaking from subduction-type earthquakes.

Field studies completed as part of this evaluation identified that the discharge end of the drainage blanket under the downstream embankment slope is not exposed as originally designed and constructed. This drain appears to be covered by up to 8 feet of clay-like soil fill (Figure 3). While the soils covering the drain discharge may slightly enhance the stability of the downstream slope, the drain is likely not functioning resulting in an increase in the water pressures in the dam and foundation materials beneath the downstream slope. The available records do not indicate when and why this fill was placed. Restoration of the drainage blanket function should be considered as part of future evaluation and remediation designs.

#### BC No. 2

The minimum FOS value identified for BC No. 2 (upper) indicates that this structure meets acceptable stability criteria and is stable under static loading conditions using estimated static strength of the soils.

As simplified analysis results indicated, however, the downstream slope of BC No. 2 is susceptible to significant damage and would likely experience a stability failure due to a seismic event originating on either the Yaquina fault or CSZ. Either fault system can generate large earthquakes, but the CSZ is of greater concern because of the relatively long duration of strong shaking from subduction type earthquakes. The critical potential failure surface identified in these evaluations suggest that an overtopping breach of the dam would occur releasing the full contents of the reservoir.

The BC No. 2 clay-like embankment soils are generally well compacted; however, loss in strength of some of the clay-like embankment soils, particularly in the lower portions of the embankment and cutoff trench could still occur because of the intensity of ground shaking that is possible. Based on the available design and construction records, it appears that most of the alluvial soils were removed for construction of the cutoff trench; however, outside of the relatively narrow cutoff trench the embankment dam was constructed on the alluvial foundation soils that also appear to have the potential for significant strength loss during earthquake loading. One boring drilled near the downstream toe of the embankment dam (BC2-B-3) also revealed a relatively loose layer of potentially liquefiable sand-like soil. Liquefaction of this relatively loose layer of sand-like soil would also result in a considerable loss of soil strength.



## 11.2 Recommendations

The preliminary seismic evaluation of the BC No. 1 and BC No. 2 dams presented in this report has indicated significant safety concerns with each dam. It is noted however, that these evaluations were based on limited site characterization information and a simplified analyses procedure. Safety concerns as well as any remediation design are sensitive to the characterization of the embankment dam and foundation soils. The differentiation between the sand-like liquefiable soils and the clay-like soils and the corresponding post-earthquake strength of materials that may be susceptible to liquefaction or cyclic softening is a critical consideration and is dependent on the density and PI of the soils. The loss of strength of sand-like soils due to liquefaction during seismic loading is the more acute consideration at the site.

Based on the results of this evaluation and experience on similar projects including the nearby Scoggins Dam evaluations underway by the U.S. Bureau of Reclamation, HDR recommends that an additional phase of site characterization studies including additional sampling and testing of the embankment and foundation soils along with correlation of soil properties to existing and additional CPT soundings be completed. Further, we recommend that more advanced numerical modeling of the dams be performed to support the safety assessment and for development of remediation concepts. Laboratory testing of soil samples is the only means to reliably classify the soil as either sand-like or clay-like and to support the development of estimates of peak and reduced undrained shear strength.

### **Additional Field Exploration and Laboratory Testing**

To properly characterize the soils, HDR recommends drilling three additional borings at BC No. 1 and four additional borings at BC No. 2. Each boring would be drilled at least 10 feet into the decomposed/weathered siltstone. Since the foundation soils are highly variable, soil samples spaced on 2.5-foot intervals is required. At each boring location, a boring will be drilled utilizing the SPT sampler to obtain disturbed samples to determine the soil PI. Based on the field classification of the soils, a companion boring will be drilled next to the SPT boring to obtain undisturbed samples with a hydraulic fixed-piston sampler. This will provide the highest quality undisturbed samples for laboratory testing. Such a program will target samples from the optimum depth and will result in the minimum number of required undisturbed samples and laboratory testing. Laboratory testing of the undisturbed samples should include consolidation, static triaxial, and static and cyclic direct simple shear.

### **Dam Repair Alternatives Analysis**

The seismic evaluation of each dam would be revised based on the results of the additional boring and laboratory test data. If these results indicate that the dams are still vulnerable to damage during a seismic event, repair alternatives should be developed. Based on the workshop held at HDR's Portland office on August 2, 2012, it is understood that the City of Newport may not want to repair BC No. 1 even if the analysis indicates the dam could fail during a seismic event. HDR recommends that alternatives be developed for BC No. 1 that include a conceptual design and cost estimate to allow the City to then decide if the cost to repair BC No.1 is prohibitive and if storage from the BC No. 1 reservoir should be moved to BC No. 2 with a corresponding enlargement of that dam and reservoir.

### **Repair of BC No. 1 Drainage Blanket**

As previously noted, restoration of the downstream embankment drainage blanket function should be considered as part of future evaluation and remediation designs.

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**PLANNING STAFF MEMORANDUM**  
**FILE No. 3-CP-12**

**I. Applicant:** City of Newport. (Initiated pursuant to authorization of the Newport Planning Commission).

**II. Request:** Revisions to the Urbanization and Public Facilities elements of the Newport Comprehensive Plan to update standards against which an Urban Growth Boundary amendment is evaluated (i.e. implementation of Goal 14, effective 2006), establish that it is city policy to acquire lands and protect water quality within its municipal watershed, acknowledge structural deficiencies in the city municipal water reservoirs, and outline steps the city will take to resolve the deficiencies.

**III. Planning Commission Review and Recommendation:** The Planning Commission will review the proposed amendments and provide a recommendation to the City Council. At a later date, the City Council will hold an additional public hearing prior to any decision on the amendments.

**IV. Findings Required:** The Newport Comprehensive Plan Section entitled "Administration of the Plan" (p. 287-288) requires findings regarding the following for the proposed amendments:

- A. **Data, Text, Inventories or Graphics:** (1) New or updated information.
- B. **Conclusions:** (1) Change or addition to the data, text, inventories, or graphics which significantly affects a conclusion that is drawn for that information.
- C. **Goals and Policies:** (1) A significant change in one or more conclusion; or (2) a public need for the change; or (3) a significant change in community attitudes or priorities; or (4) a demonstrated conflict with another plan goal or policy that has a higher priority; or (5) a change in a statute or statewide agency plan; or (6) applicable statewide planning goals.
- D. **Implementation Strategies:** (1) a change in one or more goal or policy; or (2) a new or better strategy that will result in better accomplishment of the goal or policy; or (3) a demonstrated ineffectiveness of the existing implementation strategy; or (4) a change in the statute or state agency plan; or (5) a fiscal reason that prohibits implementation of the strategy.

These findings are addressed in the proposed ordinance, attached to this report.

**V. Planning Staff Memorandum Attachments:**

Attachment "A"	Draft of the proposed Ordinance, with exhibits
Attachment "B"	Dam Assessment PowerPoint, prepared by HDR, dated August 2012
Attachment "C"	DEQ/OHD Source Water Assessment Summary (PWS # 4100566)
Attachment "D"	Statewide Planning Goal 14, Urbanization, effective April 2006
Attachment "E"	1993 Park System Master Plan Reservoir Regional Park Concept
Attachment "F"	Notice of Public Hearing
Attachment "G"	Markup copy of revisions to Public Facilities and Urbanization Elements of the Newport Comprehensive Plan

**VI. Notification:** Notification for the proposed amendments included notification to the Department of Land Conservation & Development (DLCD) in accordance with the DLCD requirements on December 14, 2012. Notice of the Planning Commission hearing was published in the Newport News-Times on January 16, 2013 (Attachment "F").

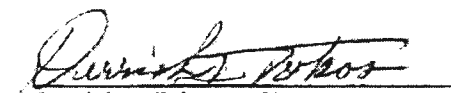
**VII. Comments:** As of January 23, 2013, no written comments have been submitted on the proposed amendments. Staff met with representatives from DLCD on January 7, 2013 to review the proposed changes. They advised that the agency didn't have any issues with the revisions at that time.

**VIII. Discussion of Request:** Revisions to the Public Facilities element of the Newport Comprehensive Plan were initiated by the Planning Commission in response to a Dam Assessment, performed by HDR consultants, which identifies structural deficiencies in the City of Newport's Big Creek #1 and Big Creek #2 domestic water storage reservoirs (Attachment B). This new information is not addressed in the City's Water System Master Plan, which was last amended in 2008. While the full extent of the deficiencies is not yet known, it is evident from the analysis that the City will need to reconstruct one or both of its reservoirs. Proposed policies describe how the City should respond to this threat to its domestic water supply, including strategies for completing necessary engineering studies to ascertain the full scope of the problem, financing future construction and land acquisition, and protecting water quality consistent with a source water assessment performed by the Oregon Dept. of Environmental Quality/Oregon Health Department (Attachment C). A policy referencing an outdated Public Facility Plan from 1990 is being deleted.

A second set of amendments are proposed to the Urbanization element of the Newport Comprehensive Plan. This section of the Comprehensive Plan sets out the process and criteria for amending the Newport Urban Growth Boundary (UGB). Changes to a municipal UGB must comply with Statewide Planning Goal 14 (Attachment D). That statewide planning goal was updated in April of 2006. The City Council has expressed an interest in expanding the Newport UGB to include the reservoirs under urban "public" zoning that would make it easier for the City to modify its water infrastructure in response to the reservoir structural issues and to construct a future regional park called for in the 1993 Park System Master Plan (Attachment E). To efficiently accomplish this objective, the Commission felt it prudent for the City to update its standards for evaluating UGB amendments to comport with current state law before considering an expansion proposal involving the reservoirs. Proposed revisions include changes to the text of the section to reflect that the City's official population forecast has been updated to 2031, clarification regarding areas that have been studied for potential future inclusion into the Newport UGB, and amendments to the required findings section that set out the needs analysis required under the current (2006) version of Goal 14.

A markup copy of the specific changes is enclosed (Attachment G). A placeholder for a detailed geotechnical examination of the reservoirs is included in the draft ordinance. That report, which is in draft form, builds upon the analysis contained in the HDR PowerPoint presentation.

**IX. Conclusion and Recommendation:** The Planning Commission should review the proposed amendments and make a recommendation to the City Council. As this is a legislative process, the Commission may recommend changes to the amendments if the Commission chooses to do so. The City Council may also make changes to the proposal prior to adoption of a final decision.

  
Derrick I. Tokos AICP  
Community Development Director  
City of Newport

January 23, 2013

**Draft Minutes**  
**City of Newport Planning Commission**  
**Regular Session**  
**Newport City Hall Council Chambers**  
**Monday, January 28, 2013**

**Commissioners Present:** Jim McIntyre, Rod Croteau, Glen Small, Mark Fisher, and Gary East.

**Commissioners Absent:** Jim Patrick and Bill Branigan (*both excused*).

**City Staff Present:** Community Development Director Derrick Tokos and Executive Assistant Wanda Haney.

**A. Roll Call.** In the absence of the Chair, Vice-Chair Small presided over the meeting. Small called the meeting to order in the Council Chambers of Newport City Hall at 7:06 p.m. On roll call, McIntyre, Croteau, Small, Fisher, and East were present. Patrick and Branigan were absent but excused.

**B. Approval of Minutes.**

1. Approval of the Planning Commission work session and regular session meeting minutes of January 14, 2013.

**MOTION** was made by Commissioner Fisher, seconded by Commissioner Croteau, to approve the Planning Commission minutes as presented. McIntyre had noted some wording that he thought might be incorrect; but upon reviewing it, he found it to be okay and withdrew his comment. The motion carried unanimously in a voice vote.

**C. Citizen/Public Comment.** No comments on non-agenda items.

**D. Consent Calendar.** Nothing on the consent calendar.

**E. Public Hearings.**

**Legislative Actions:**

1. **File No. 3-CP-12:** Consideration of proposed text amendments to the Urbanization and Public Facilities elements of the Newport Comprehensive Plan to update standards against which a Urban Growth Boundary amendment is evaluated (i.e. implementation of Goal 14, effective 2006), establish that it is city policy to acquire lands within its municipal watershed, acknowledge structural deficiencies in the city municipal water reservoirs, and outline steps the city will take to resolve the deficiencies. The Planning Commission will make a recommendation to the City Council on this matter.

Vice-Chair Small opened the public hearing for File No. 3-CP-12 at 7:10 p.m. He read the summary of the action from the agenda. He noted that this was a legislative hearing and asked the Commissioners for declarations of any conflicts of interest; and nothing was declared. He called for objections to any of the Planning Commissioners or the Commission as a whole hearing these matters; and no objections were raised. Small called for the staff report. Tokos noted that this was a legislative hearing where the Commission is considering amendments to two elements of the Comprehensive Plan. One is the Urbanization element for the rules by which the City evaluates changes to the UGB. The other is the Public Facilities element, which includes the policies on infrastructure. The changes to the Urbanization element are updates to the City standards so they are current with the most current State law on how a jurisdiction goes about doing UGB amendments. He noted that the packet included a draft ordinance with exhibits and a series of attachments. There was a "Dam Assessment" presentation provided by HDR. Attachment 'C' was the DEQ Source Water Assessment. Attachment 'D' was Statewide Planning Goal 14 (Urbanization), which was adopted in 2006 and is the current standards for urbanization. Attachment 'E' was part of the '93 Parks System Master Plan. Attachment 'F' was the public notice information. Attachment 'G' was the markup copies showing where the two different elements were modified. The Urbanization amendments bring that up to the current State law, which has a needs assessment requirement for evaluating when a jurisdiction can expand the UGB. We need to demonstrate the need to bring in public facilities, housing, or whatever urban-type use it might be. We have to show that there is no alternative to accommodate that use. Then if there is no alternative site, is there some rural exception land that could be used. Then it goes to Timber zones. There are standards that require us to demonstrate compliance with Statewide Planning Goals. Tokos noted that there was a recommended change to language in the proposal. That was on the one-piece memo that was distributed to the Commissioners tonight. In the proposed findings that have to be made, finding 5(c) currently states: "Statewide Planning Goal 2 exception criteria." The City Attorney is recommending that should be changed to: "Compliance with applicable Statewide Planning Goals, unless an exception is taken to a particular goal requirement." The modified language is more consistent with OAR 660-024-0020, which lists requirements for amending urban growth boundaries. Tokos said this is something that is important in terms of the change. He said that in our view, the Administrative Rule is very clear that cities have the right to seek exception to Statewide Planning Goals, and that is a path for



expanding the UGB. This is an alternative path. Tokos said that the changes to the Public Facilities element incorporate or acknowledge work done since the last master plan in 2008. For Big Creek Reservoir, there has been enough analysis done by HDR that we understand it will require work if we have any kind of earthquake. What these changes do is acknowledge that this is a new condition we didn't know about to begin with. We will work to fully understand the full range of options and come up with a plan to address that over time; including not only what the solution is, but how to finance the solution and things of that nature. There is also the acknowledgment that it is the City's policy to acquire lands within its watershed, which is not a policy now. The City is going to take the steps it can to protect water quality in the watershed. DEQ says to do that we should be targeting land within 1,000 feet of the reservoirs. Tokos said that is the nature of the proposed revisions, and they really do set the table for what we are planning to bring forward; the proposal the Planning Commission authorized to be initiated in order to bring in the reservoir property. Small asked if this was driven by the analysis of the condition of the reservoirs. Tokos said the changes to the public facilities are driven by that.

Small read the statement of rights and relevance and called for testimony.

**Proponents:** Patrick Wingard, Northwest Regional Representative for DLCD, 4301 3<sup>rd</sup> St, Tillamook, Oregon, spoke in support of the proposed amendments but not exactly to the criteria. He thought that staff has been very patient. DLCD has shared their opinion on much of the work the Commission is looking at tonight; but more for next month's hearing. Wingard said staff did a good job of modernizing Goal 14 rules. His department has reviewed this and has no objections to anything in the findings for text amendments. DLCD supports everything except one particular section. He said that the memo Tokos had provided makes the language somewhat better; but in DLCD's opinion it is not necessary. They feel they are additional findings that are not required; not alternative findings. It is their understanding that the City would have to make findings against all of those if seeking goal exception. He said that is probably the only thing he would raise at this point. He said that hopefully over the next couple of weeks they will provide the City with comment on the actual UGB proposal. As far as what the Commission is doing tonight, DLCD supports it and thinks it is a very good idea. What it offers is an easier path than what the old Goal 14 had where goal exceptions were part of the old rule. Wingard said that in conversation with his colleagues, they feel that one of the reasons for changing from the old Goal 14 rules to the new rules in 2006 was to remove the requirement to have to go through the exception process. He noted that the City's view may be that there is an opportunity if the local government so chooses to apply for goal exception; but he said that DLCD's viewpoint is different. They think that applies to other rules, like Goal 7 or Goal 16. He said that is their understanding but doesn't affect their support tonight.

Tokos said that the City's and the City Attorney's view is that applies to Goal 14 also. He said that in our view, the value of having language in there that says that complies with applicable Statewide Goals unless exception is taken is that we have more than one path to pursue the UGB amendment. We have the avenue of taking an exception. Wingard said that is the City's prerogative so long as Goal 14 is met. Tokos said that the language for finding 5(c) before the Planning Commission is almost verbatim in the OAR. Wingard thought that language was better, although DLCD would offer that it is not necessary at all. In answer to a question from Croteau, Wingard said that the way it was explained to him by their urban specialist is that the new rules in 2006 removed that exception to be taken. If an exception were taken, it would be for another aspect of the Statewide Planning Goals; not the needs assessment, which is mandatory. Wingard mentioned that the State is working on this issue because they realize that UGB amendments are challenging.

There were no other proponents wishing to testify.

**Opponents or Interested Parties:** There were no opponents or interested parties wishing to testify.

Small closed the hearing at 7:29 p.m. for Commissioner deliberation. McIntyre said that he had reviewed it all and the Commission has discussed this for some time now. He said it looks fine to him. Croteau said this sets essential ground work. He said it was sensible and he was comfortable with it. Fisher and East agreed. Small agreed also. He said this puts the framework into place to move ahead and address the real concerns and must be addressed.

**MOTION** was made by Commissioner Croteau, seconded by Commissioner McIntyre, to forward a favorable recommendation to the City Council on File No. 3-CP-12 involving revisions to the Urbanization and the Public Facilities elements of the Newport Comprehensive Plan with the language change to finding 5(c) that Tokos provided in his memo. The motion carried unanimously in a voice vote.

**F. New Business.** No new business items to discuss.

**G. Unfinished Business.** No unfinished business.

**H. Director's Comments.**

1. LCDC action on Territorial Sea Plan (TSP). Tokos noted that, as mentioned in work session, LCDC took action on January 24<sup>th</sup> on proposed amendments to the TSP to facilitate wave energy off the coast of Oregon within the territorial sea (3 miles out). What they adopted allowed a little broader use for wave energy than recommended. He noted that, with Newport having the grid-

connected testing facility and the non-grid test facility, our territorial sea should be reserved for test use only and not commercial deployment.

2. Teevin Bros/Port Taskforce Update. Tokos said that Teevin Bros. Logging has their Traffic Impact Analysis (TIA) submitted, and it is out for public comment until February 1<sup>st</sup> at 5:00 p.m. He has been collecting public comments. He said we have to be clear that TIA comments should be directed toward approval criteria and traffic generated. Comments about whether it is a good idea or not are not suitable. This is a permitted use, so that question has been answered for this site. The question is if the roads are in a condition capable of handling additional truck traffic or if they can be mitigated to handle it. He said that Teevin is working on changes to their submittal to address the identified deficiencies. A decision will be prepared that is subject to appeal to the Planning Commission and beyond that to the City Council. He said he would not be surprised if that is appealed. There are strong feelings on both sides.

3. Memo of Understanding (MOU) with OMSI. Tokos said he will work on a MOU with OMSI where the City spells out to what degree they need to do public road improvements for their project. Public Works helps get improvements in place that benefit other properties, not only OMSI. Tokos said this isn't dealing with what the Planning Commission deals with on a day-to-day basis, but he will be happy to bring this information to a work session.

Fisher asked about Safe Haven Hill accessibility. Tokos explained that the interim improvements are pretty much finished. Just to have basic accessibility, the City crews graveled the access, cleared out dead fall, and took out homeless camps. Actual permanent improvements would include path extensions along Abalone, forest trails, sidewalk along 101, actual paved access to the top, a pad at the top for a storage unit to hold emergency supplies, and wiring for power. The City submitted for a FEMA grant for that, and it has been months into FEMA for review. Tokos received an email today from our liaison with emergency management that the grant is in the formal moving process. There should be an agreement in the next few weeks to get that money obligated so we can do the phase 1 work. There is a lot of geo-technical work. By authorizing phase 1, they will automatically do phase 2 as well.

Croteau noted that at work session, the Commission had talked about the workforce housing issue. He said there had been other things the Commission had looked at to get entry level costs for houses. Tokos said there were regulatory things the Commission had talked about looking at; such as skinny streets, reducing minimum lot size, allowing park models, and accessory dwellings. Croteau asked if there was any hope of adjusting SDCs, which are a big chunk of the cost. Tokos said that formally changing SDCs to account for square footage would help significantly. That will have to be on the table if we open up changes to the SDCs. He noted that SDCs are a very small fraction of the funding for capital projects, but they are still a viable source for that kind of work.

I. Adjournment. Having no further business to discuss, the meeting adjourned at 7:40 p.m.

Respectfully submitted,

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Wanda Haney  
Executive Assstant



# Oregon's Statewide Planning Goals & Guidelines

## GOAL 14: URBANIZATION

### OAR 660-015-0000(14)

*(Effective April 28, 2006)*

**To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.**

#### **Urban Growth Boundaries**

Urban growth boundaries shall be established and maintained by cities, counties and regional governments to provide land for urban development needs and to identify and separate urban and urbanizable land from rural land. Establishment and change of urban growth boundaries shall be a cooperative process among cities, counties and, where applicable, regional governments. An urban growth boundary and amendments to the boundary shall be adopted by all cities within the boundary and by the county or counties within which the boundary is located, consistent with intergovernmental agreements, except for the Metro regional urban growth boundary established pursuant to ORS chapter 268, which shall be adopted or amended by the Metropolitan Service District.

#### **Land Need**

Establishment and change of urban growth boundaries shall be based on the following:

(1) Demonstrated need to accommodate long range urban population, consistent with a 20-year

population forecast coordinated with affected local governments; and

(2) Demonstrated need for housing, employment opportunities, livability or uses such as public facilities, streets and roads, schools, parks or open space, or any combination of the need categories in this subsection (2).

In determining need, local government may specify characteristics, such as parcel size, topography or proximity, necessary for land to be suitable for an identified need.

Prior to expanding an urban growth boundary, local governments shall demonstrate that needs cannot reasonably be accommodated on land already inside the urban growth boundary.

#### **Boundary Location**

The location of the urban growth boundary and changes to the boundary shall be determined by evaluating alternative boundary locations consistent with ORS 197.298 and with consideration of the following factors:

(1) Efficient accommodation of identified land needs;

(2) Orderly and economic provision of public facilities and services;

(3) Comparative environmental, energy, economic and social consequences; and

(4) Compatibility of the proposed urban uses with nearby agricultural and forest activities occurring on farm and forest land outside the UGB.

### **Urbanizable Land**

Land within urban growth boundaries shall be considered available for urban development consistent with plans for the provision of urban facilities and services. Comprehensive plans and implementing measures shall manage the use and division of urbanizable land to maintain its potential for planned urban development until appropriate public facilities and services are available or planned.

### **Unincorporated Communities**

In unincorporated communities outside urban growth boundaries counties may approve uses, public facilities and services more intensive than allowed on rural lands by Goal 11 and 14, either by exception to those goals, or as provided by commission rules which ensure such uses do not adversely affect agricultural and forest operations and interfere with the efficient functioning of urban growth boundaries.

### **Single-Family Dwellings in Exception Areas**

Notwithstanding the other provisions of this goal, the commission may by rule provide that this goal does not prohibit the development and use of one single-family dwelling on a lot or parcel that:

- (a) Was lawfully created;
- (b) Lies outside any acknowledged urban growth boundary or unincorporated community boundary;
- (c) Is within an area for which an exception to Statewide Planning Goal 3 or 4 has been acknowledged; and
- (d) Is planned and zoned primarily for residential use.

### **Rural Industrial Development**

Notwithstanding other provisions of this goal restricting urban uses on rural

land, a county may authorize industrial development, and accessory uses subordinate to the industrial development, in buildings of any size and type, on certain lands outside urban growth boundaries specified in ORS 197.713 and 197.714, consistent with the requirements of those statutes and any applicable administrative rules adopted by the Commission.

## **GUIDELINES**

### **A. PLANNING**

1. Plans should designate sufficient amounts of urbanizable land to accommodate the need for further urban expansion, taking into account (1) the growth policy of the area; (2) the needs of the forecast population; (3) the carrying capacity of the planning area; and (4) open space and recreational needs.

2. The size of the parcels of urbanizable land that are converted to urban land should be of adequate dimension so as to maximize the utility of the land resource and enable the logical and efficient extension of services to such parcels.

3. Plans providing for the transition from rural to urban land use should take into consideration as to a major determinant the carrying capacity of the air, land and water resources of the planning area. The land conservation and development actions provided for by such plans should not exceed the carrying capacity of such resources.

4. Comprehensive plans and implementing measures for land inside urban growth boundaries should encourage the efficient use of land and the development of livable communities.

### **B. IMPLEMENTATION**

1. The type, location and phasing of public facilities and services are factors

which should be utilized to direct urban expansion.

2. The type, design, phasing and location of major public transportation facilities (i.e., all modes: air, marine, rail, mass transit, highways, bicycle and pedestrian) and improvements thereto are factors which should be utilized to support urban expansion into urbanizable areas and restrict it from rural areas.

3. Financial incentives should be provided to assist in maintaining the use and character of lands adjacent to urbanizable areas.

4. Local land use controls and ordinances should be mutually supporting, adopted and enforced to integrate the type, timing and location of public facilities and services in a manner to accommodate increased public demands as urbanizable lands become more urbanized.

5. Additional methods and devices for guiding urban land use should include but not be limited to the following: (1) tax incentives and disincentives; (2) multiple use and joint development practices; (3) fee and less-than-fee acquisition techniques; and (4) capital improvement programming.

6. Plans should provide for a detailed management program to assign respective implementation roles and responsibilities to those governmental bodies operating in the planning area and having interests in carrying out the goal.

## NOTICE OF A PUBLIC HEARING

The City of Newport City Council will hold a public hearing on Tuesday, February 19, 2013, at 7:00 p.m., or shortly thereafter, in the City Hall Council Chambers to review a Comprehensive Plan text amendment (File No. 3-CP-12). The proposed legislative amendment is to the "Urbanization" and the "Public Facilities" elements of the Newport Comprehensive Plan to update standards against which a Urban Growth Boundary amendment is evaluated (i.e. implementation of Goal 14, effective 2006), establish that it is city policy to acquire lands within its municipal watershed, acknowledge structural deficiencies in the city municipal water reservoirs, and outline steps the city will take to resolve the deficiencies. The Newport Comprehensive Plan Section entitled "Administration of the Plan" requires findings regarding the following for the proposed amendment: A. Data, Text, Inventories or Graphics Amendment: 1) New or updated information. B. Conclusions Amendment: 1) Change or addition to the data, text, inventories, or graphics which significantly affects a conclusion that is drawn for that information. C. Goal and Policy Amendments: 1) A significant change in one or more conclusions; or 2) A public need for the change; or 3) A significant change in community attitudes or priorities; or 4) A demonstrated conflict with another plan goal or policy that has a higher priority; or 5) A change in a statute or statewide agency plan; and 6) All the Statewide Planning Goals. Testimony and evidence must be directed toward the request above or other criteria, including criteria within the Comprehensive Plan and its implementing ordinances, which the person believes to apply to the decision. Testimony may be submitted in written or oral form. Oral testimony and written testimony will be taken during the course of the public hearing. The hearing may include a report by staff, testimony from proponents, testimony from opponents, and questions and deliberation by the City Council. Written testimony sent to the Community Development (Planning) Department, City Hall, 169 SW Coast Hwy, Newport, OR 97365, must be received by 5:00 p.m. the day of the hearing to be included as part of the hearing or must be personally presented during testimony at the public hearing. Material related to the proposed amendment may be reviewed or a copy purchased at the Newport Community Development (Planning) Department (address above). Please note that this is a legislative public hearing process and changes to the proposed amendment may be recommended and made through the public hearing process and those changes may also be viewed or a copy purchased. Contact Derrick Tokos, AICP, Newport Community Development Director, (541) 574-0626, email address [d.tokos@newportoregon.gov](mailto:d.tokos@newportoregon.gov) (mailing address above).

*(For Publication Once on Wednesday, February 6, 2013)*







DEPT OF

FEB 21 2013

LAND CONSERVATION  
AND DEVELOPMENT



City of Newport  
169 SW Coast Hwy  
Newport, OR 97365

TO

ATTN: PLAN AMENDMENT SPECIALIST  
DEPT. OF LAND CONSERVATION & DEVELOPMENT  
635 CAPITOL STREET, NE SUITE 150  
SALEM, OREGON 97301-2540

