From:	<u>Wiser, Sonja</u>
To:	Hermen, Matt
Subject:	FW: Please Note Correction: SEPA DNS & Checklist: Clark County CPZ2018-00021
Date:	Thursday, October 25, 2018 4:01:45 PM

From: Andrea Smith [mailto:andrea@swca.org]
Sent: Thursday, October 25, 2018 4:01 PM
To: Wiser, Sonja
Subject: RE: Please Note Correction: SEPA DNS & Checklist: Clark County CPZ2018-00021

The Southwest Washington Contractors Association is in support of removing the comprehensive plan and zoning urban holding overlay surrounding properties along the I-5/179th Street area. We recognize that urban development is necessary for Clark County but would urge the Planning Commission and County Council to consider a mixed-use land-use and zoning designation moving forward. We believe that while housing is of importance, the County cannot forget that commercial and light-industrial zones are essential for living-wage job growth.

Thank you, Andrea Smith Marketing & Government Relations Director Southwest Washington Contractors Association 7017 NE Hwy 99 | Suite 214 | Vancouver, WA 98665 0: 360.694.7922 | C: 360.852.733 | Contractor Chat podcast | Newsletter Facebook . Linkedin . Twitter . Instagram

Advancing construction through advocacy, education, & partnership. Join the movement now! <u>Click here.</u>

From: Wiser, Sonja <Sonja.Wiser@clark.wa.gov>
Sent: Thursday, October 18, 2018 10:10 AM
Subject: Please Note Correction: SEPA DNS & Checklist: Clark County CPZ2018-00021

From: Hermen, Matt Sent: Thursday, October 18, 2018 9:38 AM To: Wiser, Sonja Subject: RE: SEPA DNS & Checklist: Clark County CPZ2018-00021

Please note correction...

CPZ2018-00021 Urban Holding I-5/179th Street Area, Phase 2:

Comments are Due by: Thursday, November 1, 2018 The proposal will remove the comprehensive plan and zoning urban holding overlay. The proposed comprehensive plan map amendment will occur on six properties (181581000, 181548000, 181466000, 181580000, 181701000, and 181702000). These properties are designated with Mixed Use Single Family Residential Land Use and Zoning. The approximate area of the proposal is 143 acres

More information can be viewed on the following link: https://www.clark.wa.gov/community-planning/planningcommissionhearingsand-meeting-notes

Thanks,



Matt Hermen, AICP CTP Planner III COMMUNITY PLANNING

564.397.4343



This e-mail and related attachments and any response may be subject to public disclosure under state law.

August 14, 2018

Dr. Oliver Orjiako Director Clark County Department of Community Planning Public Services Building Vancouver, Washington 98660

RE: Determination of Non-Significance Amend Comprehensive Plan to remove Urban Holding Overlay near the I5/179th Street interchange Phase I

Sent via e-mail pdf to Oliver.Orjiako@clark.wa.gov

Dear Dr. Orjiako:

I am submitting these comments as an individual and not on behalf of any particular group, political party or organization. These comments assert that a checklist and DNS is an inadequate environmental review in this case for the reasons stated below. "Non-project" proposals are subject to SEPA, the lead agency cannot conduct an environmental review of a non-project proposal under the assumption that there will be no direct and/or indirect environmental impacts, including potential cumulative impacts from the "non-project" action. When a action such as this one is proposed, it should still be subject to a comprehensive review of potential environmental impacts from reasonably foreseeable developments, especially where the action to be taken will increase the intensity of developments in areas that specifically restricted developments until certain prerequisites for removal of the overlay have been met.

First, the area in Urban Holding subject to this review is in Urban Holding due to lack of infrastructure available for development of the underlying zoning, in this case Mixed Use zoning. I believe, and can supplement the record, that this holding was put in place as part of the original comprehensive plan from 1994. The current overlay covers a large swath of area surrounding the 179th Street/I5 interchange.

It appears that this "non-project" action is the County's initial attempt to remove the current overlay in a piecemeal fashion with no comprehensive plan for the entire area subjected to the Urban Holding Overlay. It even designates this "non-project" action as "Phase I" and therefore, it is clear that the County anticipates specific growth, and specific cumulative actions, but anticipates them occurring in a piecemeal basis. It is Dr. Oliver Orjiako Page 2 August 14, 2018

assumed that the County seeks to allow certain developers, pursuant to development agreements that may or may not be subject to public review, the ability to consume any existing capacities that may exist for smaller "cut-out" projects without considering the overlay as a whole, which would selectively allow some development while excluding other developments leading to disparate treatment of landowners in the area and could cause greater expense to landowners who are forced into plans previously approved by the Council pursuant to the piecemeal development agreements.

Second, this "non-project" action involves a modification of an existing environment designated under the Growth Management Act planning process by a proposal to amend the comprehensive plans and to, at least partially, remove the overlay on this area but does not discuss the development of new transportation plans along with potential new ordinances, rules, and regulations and environmental impacts that will be concomitant to the piecemeal implementation of these development agreements.

Third, according to the checklist, this SEPA (which claims no impacts to the environment) fails to consider the impacts of the the proposed development but states that the action is based upon "the execution of a development agreement" that, at this stage, does not exist or has not been put into the public record. Thus, it is clear that there will be impacts (at least a minimum of 402 trips per day) and it is impossible for the public to comment on the proposal's impact on the environment if there is no discussion of the development under the propose

Moreover, a recent work session with the Council exhibited that there were many other possible projects and development agreements being proposed in the impacted area around the 179th street interchange. Based upon a review of the materials presented to the county, the following have/are being proposed:

Killian 60,000 Sq. Ft. Retail (DA Approved Phase 1)

- Killian Three Creeks North Phase 1– (DA in progress)
- Killian remainder Phase 2 NE 179th Street Commercial Center (DA Approved Phase 2)
- Holt Mill Plain PUD (606 homes/99 townhomes)
- Hinton Property (129 homes)
- Wollam Property (220 homes)

See The Grid Materials from 7/11/18 WS and audio of that work session all of which are incorporated into these comments by reference¹.

¹ It is unclear, to me at this point if this current SEPA is for one of those proposed developments.

Dr. Oliver Orjiako Page 3 August 14, 2018

However, there has been no comprehensive analysis of traffic impacts or the impacts of the contemplated infrastructure and developments on the existing environment as required by SEPA and, if one has been completed, it has not been adopted by the County and is not incorporated into this SEPA document.

Therefore, this SEPA review for this non-project actions fails in many ways including failing to consider conduct a comprehensive analysis of the reasonably foreseeable impacts, failing to address the cumulative impacts of all of these developments that are being proposed, failing to consider any possible alternatives and failing to outline any potentially successful mitigation measures.

Fourth, the DNS/Checklist lists no other actions that have been taken by the County regarding the Urban Holding in general and this parcel specifically. Presumably, there have been other determinations, and reviews of those determinations by the Growth Management Hearings Board(s). If other decisions, papers, determinations, environmental reviews etc. have been completed by the County regarding this parcel specifically, and the overlay in general, then those documents should be made a part of and/or referenced in the environmental review for this proposed Comprehensive Plan amendment. If those do exist, the DNS/Checklist does not, but should, list the other relevant environmental documents/studies/models that have been done regarding the Urban Holding area since it was placed under the Urban Holding overlay. For example, a county's EIS for its comprehensive plan may have information relevant to the Urban Holding Overlay. In addition, there should be other county, Growth Board and/or appellate court references to the Urban Holding Overlay and the reason(s) that it has not been removed over the years.

Fifth, there is no description of any alternatives much less a range of alternative or preferred alternative or any description of if a particular alternative was fully implemented (including full build-out development, redevelopment, changes in land use, density of uses, management practices, etc.), any description of where and how it would direct or encourage demand on or changes within elements of the human or built environment, as well as the likely affects on the natural environment. In addition, the document fails to identify where the change or affect or increased demand might or could constitute a likely adverse impact, or any description of any further or additional adverse impacts that are likely to occur as a result of those changes and affects.

Sixth, this checklist cannot serve as an environmental analysis for later project reviews because it has been created in a way that does not anticipate any such projects where, in contrast, the county definitely is contemplating such projects. The more detailed and complete the environmental analysis is during the "non-project" stage, the less review will needed during project review and, therefore, any project review can focus on those environmental issues not adequately addressed during the "non-project" stage. The current checklist and DNS fails to provide any analysis that could be utilized later at a proposed project phase and fails to give notice to the citizen of the real potential Dr. Oliver Orjiako Page 4 August 14, 2018

environmental impacts that will occur once the Urban Holding Overlay is lifted and projects can proceed.

Currently, given the potential development agreements listed above, along with others that may not be in the public realm, there is ample ability for the lead agency to anticipate and analyze the likely environmental impacts of taking this action and the failure to do so creates an inadequate SEPA document (for example a minimum of 2500 peak hour trips if the developers' numbers are to be believed in the documents that they submitted in the July work session). Failure to conduct a full environmental review at this juncture allows for the removal of the overlay while precluding the public to speak to the removal of the overlay at all. Plus, once this overlay is removed, the question arises as to whether the removal of all the other portions of the overlay must be removed either piecemeal or as a whole through this "non-project" action that has no real environmental review or input from the public.

Although an environmental checklist can act as a first step in an environmental process, including Part D, Supplemental Sheet for "non-project" activities it should not stand in the way of a more comprehensive environmental impact statement, especially in this case given the large areas under the urban holding overlay that are obviously intended to be subject to removal only upon meeting specific prerequisites. Further, there has been no analysis of the traffic impacts on 179th street, 15th Avenue and/or the 179th street intersection by the current proposal(s) by the lead agency. A full environmental review, that includes all known proposed projects, along with the impact of full build-out should the entire overlay be removed, should be conducted prior to the removal of any portion of the overlay.

These comments assert that this "non-project" SEPA proposal review should also 1) consider all existing regulations, 2) set forth the underlying rational behind the fact that there is an Urban Holding Overlay in existence, 3) the reason for the overlay being placed on the area, 4) remove it from the overlay and 5) the requirements that are required to remove the overlay as well as and 6) any other development under consideration. Plus the environmental review should include an analysis of the potential impacts of the entire area once the overlay is lifted in the larger area surrounding the 179th Street interchange, there will be a plethora of impacts, including but not limited to traffic impacts.

Therefore, this "nonproject" action involves a comprehensive plan amendment, or similar proposal governing future project development, and the probable environmental impacts that would be allowed for the future development need to be considered. The environmental analysis should analyze the likely impacts of the of buildout of all the underlying zones covered by the overlay when determining the efficacy of allowing this one "non-project" to have the overlay removed. In addition, the proposal should be described in terms of alternative means of accomplishing an objective. Dr. Oliver Orjiako Page 5 August 14, 2018

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Thank you for your consideration of these comments. Please submit them for the record.

Best Regards, Dura T. M. Donal David McDonald

FRIENDS OF CLARK COUNTY PO BOX 156 VANCOUVER, WASHINGTON 98642-0156 info@friendsofclarkcounty.org

November 15, 2018

Clark County Planning Commission % Dr. Oliver Orjiako Director of Community Planning Public Services Building 1300 Franklin Street Vancouver, Washington 98660

Via pdf and e-mail to Oliver.Orijako@clark.wa.gov

Re: CPZ2018-00021 AMENDMENT OF COMPREHENSIVE PLAN AND ZONING MAPS TO REMOVE URBAN HOLDING OVERLAY– PHASE 2

Dear Dr. Orjiako:

This letter is filed for the record by Friends of Clark County (FOCC) in support of the DENIAL finding in the Staff Report on this project dated November 15, 2018. We agree with the Staff's conclusion regarding the inadequacy of the infrastructure and inadequacy of funding for future infrastructure.

In support of our endorsement of the DENIAL of this project, we reserve our right to add additional concerns once the Planning Commission has reviewed the matter and raise those issues with the Council. In addition, we have attached an excerpt from the original Final Decision and Order in *Achen et al*, *v. Clark County*, 95-2-0067. As was made clear by the original FDO,

> The stated goal of these two concepts (urban holding and contingent zoning) was to prohibit urban growth within the urban growth area until sufficient infrastructure was in place or assured, or until annexation took place.

The Growth Board decision made it clear that:

We do not perceive that there exists a recognizable "right" to develop property for the maximum profit regardless of the short-term and/or long-term impact to Planning Commission % Dr. Oliver Orjiako Page 2 November 15, 2018

the taxpayer. Nor has petitioner shown that even if such a "right" existed that the mere fact this area is the only one burdened by the contingent zone concept is in and of itself an arbitrary and discriminatory decision. The record is clear that the area in question, of which petitioner owns but a small portion, has significant inadequacies in public facilities. The correction of these deficiencies prior to further urbanization follows exactly what GMA requires. (emphasis supplied)

The UH overlay should remain until such time as the appropriate infrastructure is available.

Sincerely 6 David T. McDonald On Behalf of Friends of Clark County

Cc: Sonja Wiser

Excerpt from Final Decision and Order, Achen et al, v. Clark County, 95-2-0067

Urban Holdings/Contingency Zoning

As part of its concurrency requirement, Clark County adopted policies in its comprehensive plan for "urban holding districts" and "contingent zoning" provisions. At page 12.4 of the CP, these concepts were explained as follows:

"The comprehensive plan map contemplates two land use methods to assure the adequacy of public facilities needed to support urban development within urban growth areas (1) Contingent Zoning which applies an "X" suffix with the urban zone and (2) applying an Urban Holding District combined with urban zoning."

The stated goal of these two concepts was to prohibit urban growth within the urban growth area until sufficient infrastructure was in place or assured, or until annexation took place. Clark County used these two concepts within the UGA to support the concurrency goals and requirements of the Act and to provide a mechanism for tiering of urban growth.

Petitioner CCNRC contended that the urban holding district was invalid because the Act prohibits allowing an area to be included in the UGB that is not able to be served with public facilities and services in the 20-year planning period. Secondly, CCNRC pointed out, annexation of these urban holding areas would not necessarily resolve the problem of lack of concurrent public facilities and services. Petitioner Holsinger contended that the contingent zoning area was applied in an "arbitrary and discriminatory" manner to the 179th Street/I-5 area where his property is located.

The urban holding residential areas have minimum lot sizes of 1 du/10 acres. Industrial urban holding zones have a minimum lot sizes of 1 du/20 acres. Unlike the urban reserve areas, which are located outside the UGA, the urban holding areas are definitionally located within the

boundary. Each holding area is identified in the CP at page 12.5 and 6 for each individual city. Each area is required to maintain the "holding" designation until the city can assure adequate provisions are in place or will be made if the area is to be annexed. While we are unsure of how the County could enforce such a requirement if annexation did occur, we do not find a violation of the GMA on the basis of that possibility alone. The concept of the urban holding area within an urban growth area furthers the concurrency goals and requirements of the Act. The use of such a concept is in the discretion afforded to local decision makers.

It is accurate to say that the CP provides for contingent zoning restrictions only in the 179th Street/I-5 area as petitioner Holsinger claims. It is also true that that area provides the most significant reason for the adoption of the contingent zoning concept. In order to show a violation of Goal 6, a petitioner must first show that a "right" of a landowner has been violated. This has not been done by Holsinger. We do not perceive that there exists a recognizable "right" to develop property for the maximum profit regardless of the short-term and/or long-term impact to the taxpayer. Nor has petitioner shown that even if such a "right" existed that the mere fact this area is the only one burdened by the contingent zone concept is in and of itself an arbitrary and discriminatory decision. The record is clear that the area in question, of which petitioner owns but a small portion, has significant inadequacies in public facilities. The correction of these deficiencies prior to further urbanization follows exactly what GMA requires. We find no violation.





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November 14, 2018

Mr. Steve Morasch, Chair Clark County Planning Commission c/o Sonja Wiser, Program Assistant Clark County Community Planning PO Box 9810 Vancouver, WA 98666-9810

Dear Chair Morasch and Planning Commissioners:

Subject: Comments on the Urban Holding Removal – Phase II and the 2018 Biannual Code Amendments.

Sent via email to: sonja.wiser@clark.wa.gov

Thank you for the opportunity to comment on the Urban Holding Removal - Phase II and the 2018 Biannual Code Amendments. While we support some of the amendments, we have concerns about certain amendments discussed below.

Futurewise works throughout Washington State to support land-use policies that encourage healthy, equitable and opportunity-rich communities, and that protect our most valuable farmlands, forests, and water resources. Futurewise has supporters throughout Washington State including Clark County.

Please do not recommend removal of the Urban Holding Overlay until the necessary transportation funding is assured.

The Staff Report for this proposal documents that the Clark County Transportation Improvement Plan (TIP) does not ensure reasonable funding for the critical links and intersection modifications needed to lift the Urban Holding Overlay in this area.¹ Clark County's 20-year transportation facility plan has a \$158,104,000 deficit.² So other County transportation funding is not available to pay for these transportation facilities. Therefore, we urge the Planning Commission not to recommend removal of the Urban Holding Overlay until the necessary additional transportation funding is assured.

¹ Staff Report to the Clark County Planning Commission Subject: CPZ2018-00021 Amendment of Comprehensive Plan and Zoning Maps to Remove Urban Holding Overlay – Phase 2 p. 2 of 10 (Nov. 15, 2018) accessed on Nov. 13, 2018 at: <u>https://www.clark.wa.gov/sites/default/files/dept/files/community-planning/CPZ2018-</u>00021%20UH%20Holt%20Homes%20Staff%20Report%20Final.pdf

² Clark County Comprehensive Growth Management Plan 2015-2035 Chapter 5, Transportation p. 160 accessed on Nov. 13, 2018 at: <u>https://www.clark.wa.gov/community-planning/documents</u>

Clark County Planning Commission November 14, 2018 Page 2

Allow attached and internal Accessory Dwelling Units (ADUs) without requiring that they be counted towards the maximum allowed residential density. Only allow freestanding ADUs and guest houses outside of urban growth areas if they meet the minimum density requirements. Please see the 2018 Fall Biannual code amendments Attachment "A" Planning Commission review pp. 1 – 3 of 33

Futurewise supports allowing internal and attached accessory dwelling units (ADUs) in rural areas without requiring that they be counted towards the maximum allowed residential density. These are ADUs located inside or attached to a house or in an accessory building, such as a garage, located close to the house. Detached or freestanding ADUs outside urban growth areas count towards and must comply with the maximum allowed density.³ Detached or freestanding refers to separate dwelling units constructed on the same lot a primary dwelling. A county should analyze existing conditions, future projections, the need for ADUs, the impacts of future ADUs on public facilities and services, and the impacts of future ADUs on shorelines, critical areas, and resource lands before adopting development regulations that authorize ADUs outside of urban growth areas.⁴ We have the same concern about guest houses, they must meet the minimum lots size and density requirements outside urban growth areas.

Allowing freestanding ADUs and guest houses without requiring that the meet the minimum lot size and density requirements effectively doubles the allowed rural density. The Washington State Department of Ecology (Ecology) has determined that "[t]here is limited water available for new uses in [Water Resource Inventory Area] WRIA 27" the Lewis River Watershed and "much of the water in the Lewis River Watershed has already been spoken for."⁵ The situation is the same in the Salmon-Washougal Watershed, WRIA 28. "There is limited water available for new uses ..." and "much of the water in this watershed has already been spoken for."⁶ In fact, water is in such short supply that there is already evidence that the overdevelopment of rural lands has caused farm wells to run dry.⁷

⁵ Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Lewis River Watershed*, WRLA 27 p. 1 (Publication Number: 11-11-031 Revised Nov. 2016) accessed on Nov. 13, 2018 at:

https://fortress.wa.gov/ecy/publications/summarypages/1111031.html and enclosed with this letter. ⁶ Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Salmon-Washougal Watershed, WRLA 28* p. 1 (Publication Number: 11-11-032 Revised Nov. 2016) accessed on Nov. 13, 2018 at: https://fortress.wa.gov/ecy/publications/summarypages/1111032.html and enclosed with this letter.

³ Pierce County Neighborhood Association v. Pierce County (PNA II), CPSGMHB Case No. 95-3-0071, Final Decision and Order (March 20, 1996), at *18 – 19 accessed on Jan. 18, 2018 at:

http://www.gmhb.wa.gov/Global/RenderPDF?source=casedocument&id=1923; Friends of the San Juans, Lynn Bahrych and Joe Symons, et al. v. San Juan County, WWGMHB Case No. 03-2-0003c Corrected Final Decision and Order and Compliance Order p.*1, 2003 WL 1950153 p. *1 (April 17, 2003). "The Thurston County Superior Court upheld the Board's ruling regarding the requirement that a freestanding ADU must be counted as a dwelling unit for the purposes of calculating density on a resource parcel. See Friends of the San Juans v. Western Washington Hearings Board, Thurston County Cause No. 03-2-00672-3 (January 9, 2004) at 10 and 11." Friends of the San Juans, Lynn Bahrych and Joe Symons v. San Juan County, WWGMHB Case No. 03-2-0003c, Compliance Order 2005 (July 21, 2005), at 12 of 22, 2005 WL 2288088, at 7 accessed on Nov. 13, 2018 at: http://www.gmhb.wa.gov/Global/RenderPDF?source=casedocument&id=277 4 Friends of the San Juans, Lynn Bahrych and Joe Symons, et al., v. San Juan County, WWGMHB Case No.: 03-2-0003c Corrected

⁴ Friends of the San Juans, Lynn Babrych and Joe Symons, et al., v. San Juan County, WWGMHB Case No.: 03-2-0003c Corrected Final Decision and Order and Compliance Order p.*1, 2003 WL 1950153 p. *1 (April 17, 2003).

⁷ Val Alexander Letter to Clark County p. *1 (May 24, 2016) enclosed with this letter.

Clark County Planning Commission November 14, 2018 Page 3

When Ecology adopted the instream flow rules for WRIAs 27 and 28, Ecology established reserves for future domestic uses.8 The reserves in Clark County can serve another 4,859 new households or occupied housing units.9 However, Clark County currently has 5,042 existing vacant lots in the rural areas and on resource lands as of 2014.10 Clark County Utilities prepared a map identifying potential water source for tax lots outside the urban growth areas. That map identified 6,175 vacant lots outside of urban growth areas not adjacent to public water mains.¹¹ So the County already has more lots than can be supported by the surface and ground water resources available in the rural areas and on resource lands. Allowing detached ADUs and guest houses without requiring that they meet the minimum lot size and density requirements will not protect surface and ground water quality and quantity as the Growth Management Act requires in RCW 36.70A.070(1) and (5)(c)(iv). In addition, RCW 36.70A.590 provides that "[d]evelopment regulations must ensure that proposed water uses are consistent with RCW 90.44.050 and with applicable rules adopted pursuant to chapters 90.22 and 90.54 RCW when making decisions under RCW 19.27.097 [deciding building permits] and 58.17.110 [deciding subdivisions]." The instream flow rules for WRIAs 27 and 28 were adopted pursuant to chapters 90.22 and 90.54 RCW. So, Clark County's development regulations must ensure that proposed water uses are consistent with those rules. Allowing more lots than can be served with available water resources does not comply with this requirement.

The increased impervious surfaces allowed by freestanding ADUs and guest houses will also harm water quality. Research by the University of Washington in the Puget Sound lowlands has shown that when total impervious surfaces exceed five to 10 percent and forest cover declines below 65 percent of the basin, then salmon habitat in streams and rivers is adversely affected.¹² There are no limits preventing lots with detached ADUs from exceeding these thresholds. This will violate RCW 36.70A.070(1) and (5)(c)(iv) of the GMA.

⁸ Washington State Department of Ecology Water Resources Program, *Focus on Water Availability Lewis River Watershed*, *WRLA 27* p. 1 (Publication Number: 11-11-031 Revised Nov. 2016); Washington State Department of Ecology Water Resources Program, Focus on Water Availability *Salmon-Washougal Watershed*, *WRLA 28* p. 2 (Publication Number: 11-11-032 Revised Nov. 2016).

⁹ Spreadsheet "WRIA 27-28 Reservations ESTIMATES w Totals for Clark County by Category" enclosed with this letter.

¹⁰ Clark County Buildable Lands Report p. 13 (Revised 2017) and enclosed in a sperate email with the filename: "061015WS_2015BUILDABLE_LANDS_REPORT.pdf."

¹¹ Clark County Public Utilities, *Water Sources for Tax Lots Outside UGAs* accessed on Nov. 13, 2018 at: <u>https://www.clark.wa.gov/sites/all/files/community-planning/2016-</u>

update/Plan%20Adoption/07%20Water%20Sources%20for%20Taxlots%20Outside%20UGA.pdf and enclosed in a sperate email with the filename: "07 Water Sources for Taxlots Outside UGA.pdf."

¹² Christopher W. May, Richard R. Horner, James R. Karr, Brian W. Mar, Eugene B. Welch, *The Cumulative Effects of Urbanization on Small Streams in the Puget Sound Lowland Ecoregion* pp. 19 – 20 of 26 (University of Washington, Seattle Washington) enclosed in a separate email with the filename: "chrisrdp.pdf." This report was identified as best available science in Washington State Office of Community Development. *Citations of Best Available Science for Designating and Protecting Critical Areas* p. 17 (March 2002) accessed on Nov. 13, 2018 at:

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiMgKWj2dLeAhViLH0K HXfdBBoQFjAAegQICBAC&url=https%3A%2F%2Fwww.ezview.wa.gov%2FDesktopModules%2FDocuments2%2F View.aspx%3FtabID%3D36890%26alias%3D1949%26mid%3D68545%26ItemID%3D4092&usg=AOvVaw0UCCoZh WjqD2uPnyKdnsnY. A copy of this report is enclosed in a separate email with the filename: "GMS-BAS-Citations-Final.pdf."

Clark County Planning Commission November 14, 2018 Page 4

We support the amendment to UDC Subsections 40.520.010.E.1.b.(5) and 40.520.020.8.4.h. Please see the 2018 Fall Biannual code amendments Attachment "A" Planning Commission review pp. 6 – 8 of 33

While certain exemptions to the requirement to subdivide land exempt those land divisions from the subdivision process, to be legal those lots must comply with the County's other development regulations. As the court of appeals wrote in *Estate of Telfer* "we emphasize that our holding is not to be understood as intimating that the parcels resulting from the division are exempt from any other land use regulations" other than the requirement to go through the short subdivision process.¹³ The clarifying amendments proposed by staff makes this clear and reduces the potential that property owners will inadvertently create unbuildable lots. Therefore, we support the proposed clarifications.

Thank you for considering our comments. If you require additional information, please contact me at telephone 206-343-0681 Ext. 102 and email: <u>tim@futurewise.org</u>.

Very Truly Yours,

Tim Trohimovich, AICP Director of Planning & Law

Enclosures

¹³ Estate of Telfer v. Bd. of Cty. Comm'rs of San Juan Cty., 71 Wn. App. 833, 837, 862 P.2d 637, 639 (1993) review denied Estate of Telfer v. Bd. of Cty. Comm'rs of San Juan Cty., 123 Wn.2d 1028, 877 P.2d 695 (1994).

Focus on Water Availability



Water Resources Program

Lewis River Watershed, WRIA 27

This focus sheet provides information on the availability of water for new uses in the Lewis River Watershed. This information provides a starting point for potential water users in determining the best strategies

This watershed consists of the Lewis River and numerous tributary creeks and streams. The lower Lewis Watershed is one of the most intensely farmed basins in western Washington. The annual precipitation in the Lewis Watershed ranges from 40 inches to over 150 inches per year. Most of this precipitation arrives during the winter months when overall water demands are the lowest. During the summer, snow pack is gone, there is little rain, and naturally low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest.

Factors affecting water availability

There is limited water available for new uses in WRIA 27, especially given that river levels need to be maintained to ensure adequate water quality and fish migration. Additionally, Pacificorp has senior water rights to maintain reservoir levels in Lake Merwin and Yale Lake, and as a result, much of the water in the Lewis River Watershed has already been spoken for. Increased demands from population growth, low summer and early fall streamflow levels, and impacts from climate change add to the challenge of finding new water supplies in WRIA 11, especially during the summer months.

<u>Chapter 173-527 WAC</u> is the instream flow rule for the Lewis River Watershed, including the Kalama, the North Fork of the Lewis River, and the East Fork of the Lewis River, and associated creeks. This rule establishes:

- Instream flows on streams (See <u>Chapter 173-527-060 WAC).</u>
- Closes all streams (See Chapter 173-527-070 WAC).

Reserves are established in subbasins for future domestic uses. To access these reserves for new appropriations, applicants must meet the mitigation requirements of the WRIA 27 established guidelines.

Revised November 2016



Definitions

Instream flows: Flow levels adopted into an administrative rule that create a water right for the stream to protect fish, wildlife, stock watering, recreational uses, and other instream uses and values. Typical instream flow rules now include broader water management strategies.

Mitigation Plan: A

scientifically-sound plan to offset the impacts of a proposed water use.

Permit-exempt well: RCW

90.44.050 allows for use of small amounts of groundwater for specific uses without going through the regular permitting process. While exempt from the permitting process, these withdrawals are still subject to all other state water laws.

WRIA: Water Resources Inventory Area; also known as a watershed or river basin. For environmental administration and planning purposes, Washington is divided up into 62 major watersheds, or WRIAs.

Revised November 2016

Water Resources Program

For information on the mitigation requirements, contact your county permitting department.

Applicants seeking new water appropriations for other uses will likely need to mitigate for the impacts their proposed water use will have on surface water bodies.

Water supply available for new uses

Accessing municipal supplies or larger private water supply companies is the fastest and simplest option for obtaining a water supply.

All land west of Interstate 5, north of the east Fork of the Lewis River, and east of the Lewis River mainstem, and all lands west of Interstate 5, north of the Lewis River mainstem, and within the Lower Lewis subbasin are considered part of a "regional groundwater supply area" (per WAC 173-527-090) and is considered to be a location where water is potentially available on a year-round basis.

Additional options for finding a water supply include processing a water right application through the Cost Reimbursement Program. www.ecy.wa.gov/pubs/0511016.pdf. Reserves are established in the instream flow rule. Applicants may need to develop mitigation to offset the impacts of their water use to surface water if their new use is not for domestic supply. In addition the Lower Columbia mitigation guidance requirements will apply.

The groundwater permit exemption allows certain users of small quantities of ground water (most commonly single residential well owners) to construct wells and develop their water supplies without obtaining a water right permit from Ecology. For more information about the groundwater permit exemption, refer to www.ecy.wa.gov/pubs/fwr92104.pdf.

For more information on these and other options, refer to "Alternatives for Water Right Application Processing" http://www.ecy.wa.gov/pubs/1111067.pdf

Pending water right applications in this watershed

Washington water law is based on the "prior appropriation" system, often called "first in time, first in right." Applications for water from the same source must be processed in the order they are received.

Ecology asks anyone who needs a water right (new, change, or transfer) to submit the pre-application consultation form and meet with us to review your water supply needs and project proposal.

- Apply for a New Water Right • http://www.ecy.wa.gov/programs/wr/rights/newrights.html
- Apply to Change or Transfer a Water Right or Claim http://www.ecy.wa.gov/programs/wr/rights/change transfer use.html



Water Resources Program

Revised November 2016

The map in this document shows some of the factors that will be considered when evaluating water right permit applications. Here are some information sources to assist you with your research:

- Locate and research water rights on land parcels anywhere in the state (Water Resource Explorer) ٠ http://www.ecy.wa.gov/programs/wr/info/webmap.html
- Pending Water Right Applications by County http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html
- Subscribe to a water right application RSS feed for a county or WRIA • http://www.ecy.wa.gov/programs/wr/rights/wr_app_rss.html
- WRIA map showing the total number of water right claims, certificates, permits and applications http://www.ecy.wa.gov/programs/wr/rights/Images/pdf/waterright-wria-maps.pdf
- Search and view well reports using a variety of search tools • https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx

For more information

Ecology Southwest Regional Office 300 Desmond Drive Lacey, WA 98503 360-407-6300

If you need this document in a version for the visually impaired, call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341







Focus on Water Availability



Water Resources Program

Salmon-Washougal Watershed, WRIA 28

This focus sheet provides information on the availability of water for new uses in the Salmon-Washougal Watershed. This information provides a starting point for potential water users in determining the best strategies for securing water for a future project or proposal in this area.

The Salmon-Washougal Watershed is located in southwest Washington, and includes Salmon Creek, Washougal River and numerous tributary creeks and streams. Annual precipitation in the watershed ranges from 40 to 80 inches. Most of this precipitation arrives during the winter months when water demands are the lowest, and only a fraction becomes available for human and economic uses. Little of the Salmon-Washougal Watershed benefits from snowpack so during the summer when there is little rain naturally, low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest.

Factors affecting water availability

This watershed is one of the most intensely populated basins in western Washington, and as a result much of the water in this watershed has already been spoken for. There is limited water available for new uses, especially given that river and stream levels need to be maintained to ensure adequate water quality and fish migration. Increased demands from population growth, declining summer and early fall streamflow levels, and impacts from climate change add to the challenge of finding new water supplies in WRIA 28.

<u>Chapter 173-528 WAC</u> is the instream flow rule for the Salmon Creek and Washougal River watershed, including: Rock Creek, Fifth Plain Creek, Lacamas Creek, Little Washougal River, West Fork of the Washougal River, and associated creeks. Additionally, Gibbons, Lawton, Duncan, Hardy, Hamilton, and Green Leaf creeks, located east of the Washougal River watershed are considered part of this watershed. **Revised November 2016**



Definitions

Instream flows: Flow levels adopted into an administrative rule that create a water right for the stream to protect fish, wildlife, stock watering, recreational uses, and other instream uses and values. Typical instream flow rules now include broader water management strategies.

Mitigation: A plan intended to avoid impairment to existing water rights or provide offsets to surface water depletion.

Water Resource Inventory Area (WRIA): one of 62 watershed areas in Washington State typically containing one or more river basins.

Water Resources Program

The instream flow rule:

- Establishes instream flows on streams (See WAC 173-528-060).
- Closes all streams (See WAC 173-528-070).
- Creates reserves for future domestic uses.

To access the reserves for new appropriations, contact your county permitting department.

Applicants seeking new water appropriations for other uses will likely need to provide mitigation to offset the impacts their proposed water use will have on surface water bodies.

Water supply available for new uses

Potential water supply in the Salmon-Washougal Watershed includes municipal suppliers and private water supply companies. New individual homes may access water through a permit-exempt well for indoor use. (See RCW 90.44.050 for information on permit-exempt groundwater withdrawals.).

If an applicant is not able to connect to an existing water system or more water is needed than can be obtained from a permit-exempt well, then the water right application may be processed through the <u>Cost</u> <u>Reimbursement Program</u>.

For more information on these and other options, refer to "<u>Alternatives for Water Right Application</u> <u>Processing</u>."

Pending water right applications in this watershed

Washington water law is based on the "prior appropriation" system, often called "first in time, first in right." Applications for water from the same source must be processed in the order they are received.

Ecology asks anyone who needs a water right (new, change, or transfer) to submit the pre-application consultation form and meet with us to review your water supply needs and project proposal.

- Apply for a New Water Right <u>http://www.ecy.wa.gov/programs/wr/rights/newrights.html</u>
- Apply to Change or Transfer a Water Right or Claim <u>http://www.ecy.wa.gov/programs/wr/rights/change_transfer_use.html</u>

The map in this document shows some of the factors that will be considered when evaluating water right permit applications. Here are some information sources to assist you with your research:

• Locate and research water rights on land parcels anywhere in the state (Water Resource Explorer) <u>http://www.ecy.wa.gov/programs/wr/info/webmap.html</u>



Revised November 2016

Water Resources Program

- Pending Water Right Applications by County http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html
- Subscribe to a water right application RSS feed for a county or WRIA http://www.ecy.wa.gov/programs/wr/rights/wr_app_rss.html
- WRIA map showing the total number of water right claims, certificates, permits and applications <u>http://www.ecy.wa.gov/programs/wr/rights/Images/pdf/waterright-wria-maps.pdf</u>
- Search and view well reports using a variety of search tools <u>https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx</u>

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Val Alexander 2404 NW Coyote Ridge Rd La Center, WA 98629

May 24, 2016

The Honorable Marc Boldt, Council Chair Clark County Board of County Councilors PO Box 5000 Vancouver, Washington 98666-5000

Mr Steve Morasch, Chair Clark County Planning Commission Clark County Community Planning

Attn[.] 2016 Comp Plan Record PO Box 9810 Vancouver, Washington 98666-9810

Dear Council Chair Boldt, Councilors Madore, Mielke, Olson, and Stewart, Planning Commission Chair Morasch, and Planning Commissioners Wright, Blom, Quiring, Barca, Johnson, and Bender[.]

I have lived on my property NW of La Center for more than 50 years. I have seen many changes through the years, as lots were developed around me. Almost all of them were 5 acre lots, so that was quite a few new wells to be drilled. I had a good supply of water from my first well, until more and more houses were allowed. Suddenly, my well dried up.

I did everything I could to bring it back, had it fracked and some other techniques used then, in the 70's to assist well output, but nothing worked. By this time I had bought some other property around me and so I had to pipe water from another well at the south end to the northern property where I had a house. I am one of the lucky ones, since I could do that. Most other people do not have that option.

For those of you who will be deciding on which option to choose, I'm hoping you will take seriously the damage that will be done to existing rural residents if you allow 8024 new families to establish homes in rural Clark County. There is a crisis in the ground water supply in the county as indicated by Dennis Dykes, a hydrologist, and Ecology. To take the risk that many existing homes will lose their water supply is incredibly irresponsible. Try to put yourself in that situation. Some would have to move away, abandon their homes, since one couldn't easily sell a lot without a water supply. You will have to choose between protecting the present rural residents or trying to please a small group of vocal, greedy landowners who want to profit from land sales.

One of your responsibilities is to protect farmland, and farmers cannot make a living by having to pay for public water.

Please study the water situation as described by Ecology and Dennis Dykes, before you ignore the needs of present residents who have no access to public water.

Thank you,

Val Alexander

Wed 10/14/2015 3:59 PM Hoff, Tryg (ECY) < THOF461@ECY.WA.GOV> RE: Q about remaining water reserves for residential uses in WRIAs 27 and 28 in Clark Co To Tim Trohimovidh You forwarded this message on 10/14/2015 5:21 PM. Message WRIA 27-28 Reservations ESTIMATES.xlsx (14 KB) Bing Maps + Get more apps Here are our estimates at the end of June this year Let me know if you have any questions. Tryg

WRIA 27-28 as of June 2015

	Reservation Benefit (CFS)	Households Served	New Water Wells (ecv)	Public est* svstems(doh)	CFS Permitted	TOTAL	RESERVATION Cap % Used
Kalama River Subbasin	× /			, , ,			
Kalama	1.92	1551				0	0.0%
Small Community Water Systems - Cowlitz Co.	0.37	299	1	L		1	0.3%
Domestic Wells - Cowlitz Co. NA 141 0.52 0.16 0.00 0.16	0.16	432	48	3		48	11.1%
North Fork Lewis River Subbasin							
Small Community Water Systems - Cowlitz Co.	0.37	299	1	L		1	0.3%
Small Community Water Systems - Clark Co.	0.75	606	3	3		3	0.5%
Small Community Water Systems - Skamania Co.	0.4	323	0)		0	0.0%
Domestic Wells - Cowlitz Co.	0.07	189	82	2		82	43.4%
Domestic Wells - Clark Co.	0.12	324	81	L		81	25.0%
Domestic Wells - Skamania Co.	0.4	1080	0)		0	0.0%
Commercial - Skamania County	0.21		0)		0	
Ridgefield (Not applicable, due to location in tidally influenced area. (8)							
East Fork Lewis River Subbasin							
CPU, Battle Ground and Ridgefield	4.4	3554			0.	67 0	15.2%
Small Community Water Systems - Clark Co.	0.37	299	2	2 19	9	21	7.0%
Small Community Water Systems - Skamania Co.	0	0	0)		0	0.0%
Domestic Wells - Clark Co.	0.47	1269	122	2		122	9.6%
Domestic Wells - Skamania Co.	0.02	54	0)		0	0.0%
Salmon Creek Subbasin							
CPU, Battle Ground and Ridgefield	0.25	202	7	7		7	3.5%
Small Community Water Systems - Clark Co.	0	0	0)		0	
Domestic Wells - Clark Co.	0.12	324	92	2		92	28.4%
Burnt Bridge Creek Subbasin							
Vancouver	0	0	()		0	0.0%
Small Community Water Systems - Clark Co.	0	0	()		0	0.0%
Domestic Wells - Clark Co.	0	0	()		0	0.0%
Lacamas Creek Subbasin							
Camas	1	808				0	0.0%
Clark Public Utilities (CPU)	0.6	485				0	0.0%
Small Community Water Systems - Clark Co.	0.37	299	3	3	8	11	3.7%
Domestic Wells - Clark Co. NA	0.17	459	71	L		71	15.5%
Washougal River Subbasin							
Washougal	0	0				0	0.0%
Small Community Water Systems - Clark Co.	0.37	299		1	0	10	3.3%
Small Community Water Systems - Skamania Co.	0.2	162				0	0.0%
Domestic Wells - Clark Co.	0.17	459	32	2		32	7.0%
Domestic Wells - Skamania Co.	0.64	1728	26	5		26	1.5%
Columbia River Tributaries Subbasin							
Small Community Water Systems - Clark Co.	0.21	170	()		0	0.0%
Small Community Water Systems - Skamania Co.	0.21	170	3	3		3	1.8%
Domestic Wells - Clark Co.	0.12	324	14	ļ		14	4.3%
Domestic Wells - Skamania Co.	0.12	324	10)		10	3.1%
Total	14.58	16,490					

Cities in Clark County **CPU** for Cities Clark Public Utilities (CPU) Small Community Water Systems - Clark Co. Domestic Wells - Clark Co. Total Outside Cities

Rem

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acity					
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1,551 298					
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0					
0 289					
162					
427					
1,702					
170					
167					
310 314					
15,855					
808					
3,749 485					
1,627					
2,747					
4,859					



Board of Commissioners David Madore, Chair Tom Mielke Jeanne Stewart

County Manager Mark McCauley

Clark County Community Planning

Oliver Orjiako, Director Gordy Euler, Program Manager Gary Albrecht, Planner II

Clark County Information and Technology Jon Levitre

Community Planning would like to thank:

Clark County GIS Ken Pearrow Barbara Hatman

EXECUTIVE SUMMARY

The Growth Management Act (GMA) requires the county and its cities to provide sufficient land to accommodate specific population and employment targets. This is the third buildable lands report since 1990. It presents a series of basic, quantifiable indicators in Clark County and tracks how they are changing each year.

Clark County coordinated with its cities to compile data that shows the progress of each community's comprehensive plan toward the goals of sprawl reduction and concentrated urban growth identified in the Growth Management Act. Each community collects development data, which is forwarded to the county and added to a central database located at this webpage: <u>http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity</u>

The primary sources of data are new commercial, industrial and residential building permits from July 1, 2006 through December 31, 2014. Clark County's Geographic Information System (GIS) was used to associate new building permits issued with city and urban growth area boundaries, Vacant Buildable Land Model (VBLM), employment, assessor information, and constrained land.

Following are the major observations presented in this report:

- Residential development within urban growth areas of Clark County consumed 1,245 acres with a density of 4.7 dwelling units per acre. Based on the VBLM, there are 7,513 net buildable acres that can accommodate 51,436 households. At 2.66 persons per household urban growth areas can accommodate 136,820 persons.
- There were 1,387 building permits issued in the rural area on 7,799 acres. Given the underlying zoning, the total vacant and development potential in the rural area is 9,390 lots. Assuming 2.66 persons per household, there is potential for additional rural capacity of 24, 977 persons. Overall, the county can accommodate 161,797 persons.
- Review of development indicates that 43% of all residential development occurred on land with some environmental constraint. More importantly, this percent does not imply that development is occurring on lands with critical areas, because in general environmentally constrained lands are not being developed.
- Building permit review and evaluation has indicated that commercial and industrial development in the UGAs during the period consumed 3,372 acres of land. Commercial uses consumed 2,704 acres and industrial uses consumed 668 acres. Based on the 2015 VBLM inventory there are 2,057 net buildable commercial acres and 3,982 net buildable industrial acres.

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Introduction

The Growth Management Act (GMA) requires the county and its cities to provide sufficient land to accommodate specific population and employment targets. This report responds to and satisfies the review and evaluation requirements of the Washington State Growth Management Act (GMA) in RCW 36.70A.215, commonly referred to as the "buildable lands" statute. The report was prepared by county staff and the cities using the Clark County Community Framework process, the county's adopted multi-jurisdictional process for GMA issues.

The Comprehensive Plan indicates the Buildable Lands Program, at a minimum should answer the following questions:

- What is the actual density and type of housing that has been constructed in UGA's since the last comprehensive plan was adopted? Are urban densities being achieved within UGA's? If not, what measures could be taken, other than adjusting UGA's, to comply with the GMA?
- How much land was actually developed for residential use and at what density since the comprehensive plan was adopted? Based on this and other relevant information, how much land would be needed for residential development during the remainder of the 20-year comprehensive planning period?
- To what extent have capital facilities, critical areas, and rural development affected the supply of land suitable for development over the comprehensive plan's 20-year timeframe?
- Is there enough suitable land in Clark County and each city to accommodate countywide population growth for the 20-year planning period?
- Does the evaluation demonstrate any inconsistencies between the actual level of residential, commercial, and industrial development that occurred during the review period compared to the vision contained in the county-wide planning policies and comprehensive plans and the goals and requirements of the GMA?
- What measures can be taken that are reasonably likely to increase consistency during the subsequent eight-year period, if the comparison above shows inconsistency?

Process

Clark County, in consultation with each city, has been working cooperatively to address the requirements of Section 215. In 2005, Community Planning received a grant from Washington State Department of Commerce formerly known as Community Trade and Economic Development (CTED). That grant provided a valuable opportunity to unify buildable lands data into one system and make collection and analysis easier for individual cities and the county. Through that process, a methodology was developed for collecting the buildable land data in the link below (see Data Transfer Protocols and Monitoring of Growth Management Trends). http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity

The data collection methods and procedures were developed through the Clark County Growth Management Act (GMA) Technical Advisory Committee (TAC). An Amendment to the countywide planning policies was adopted by reference as Ordinance 2000-12-16 by the Board of County Commissioners.

The Ordinance amended language in the Community Framework Plan to comply with the requirements of RCW 36.70A.215. The Growth Management Act requires Clark County to compile data that shows the process of each community's comprehensive plan toward the goals of the Growth Management Act. Each community collects development data, which is forwarded to the county and added to a central database. The web site draws data from that database. It allows citizens, interest groups, elected officials and advisory boards the most comprehensive source of development data.

Methodology

Following the first Buildable Lands report, the county met with each building official and city staffs to refine how data was to be compiled in the future. Each month, staff in each jurisdiction (except Yacolt) forwards an electronic spreadsheet to the county with updated development data such as permit types, parcel numbers, numbers of units, etc. Staff performs a quality assurance check to ensure data has permit number, permit type, parcel number, number of units, building square feet for non-commercial permits, and issue dates. They look for duplicates and check for errors with parcel numbers, addresses, number of units and square feet.

If data is missing or incorrect, staff contacts the respective jurisdiction. Staff also adds missing parcel numbers by using the parcel match option in Clark View.

Information Technology extracts permit data for Clark County and Yacolt, and transfers the files to a server. The server completes the following steps: normalize and read data, translate data, import data, obtain GIS data, generate reports in PDF format, and generates an exception report. The exception report contains permits that are not recognized by the server. If the error rate is greater than one to three percent per jurisdiction for the total number of permits, the county contacts the jurisdiction to correct the discrepancy. County staff also performs a visual check to confirm that the data has merged into the database correctly. The county runs another program that creates a report and a PDF file that is automatically placed on the web.

The primary sources of data were from new commercial, industrial and residential building

permits issued from July 1, 2006 through December 31, 2014. Clark County's Geographic Information System (GIS) was used to link parent parcel serial numbers taken from new building permits issued to identify parcels within city and urban growth area boundaries, acreage and critical lands coverage.

Baseline Assumptions

The 2007 Comprehensive Plan planning assumptions have to do with growth rates, population, and persons per household, and are listed below:

- No more than 75 percent of any product type of detached/attached housing
- Average residential densities in urban areas would be 8 units per net acre for Vancouver, 6 for Battle Ground, Ridgefield, Camas, Washougal, 4 units per net acre for La Center, and no minimum for the town of Yacolt
- Infrastructure factor of 27.7 percent for residential development and 25 percent for industrial and commercial development
- 2.59 persons per household
- 20 employees per commercial acre; 9 employees per industrial acre
- A total population of 584,310 by 2024, from an annual growth rate of 2.0 percent, with 2.2 percent assumed in 2004-2010 for capital facilities planning purposes

COUNTYWIDE TRENDS, 2007-2014

Housing and Job Totals

Background and Relevance

Tracking the number of people who live and work in the community is a fundamental measure of how fast the community is growing and what additional land may be needed to accommodate future growth. A goal of growth management is to encourage the development of housing in proximity to job growth. The strategy of balancing housing and job growth is intended to reduce the need for long commutes, and to keep living and working communities easily accessible to each other. However, when housing growth occurs it often takes several years for sufficient job growth to occur in the area and vice-versa. Reduced vehicle trips result in less demand on the existing street infrastructure.

Under the GMA, Clark County and its cities are required to plan for a total population projection as provided by the state Office of Financial Management. Clark County's population forecast for the 20-year planning period ending 2035 is 578,391 in 2035. Since 2007, the County's population has increased by 34,139 persons or by 1.13 percent annually.

Data Collection

Official population estimates as of January 1st for all cities and counties are produced annually by Clark County GIS. Employment estimates were provided by the local office of the Washington Department of Employment Security (ESD). Employment data includes workers

covered by state employment insurance, not including self-employed workers. On the following page, table 1 shows the estimated population trends of urban growth areas in Clark County from 2007 to 2014. Table 2 illustrates Clark County household and job patterns from 2007 to 2014.

Urban Growth Areas	2007	2008	2009	2010	2011	2012	2013	2014	2007-2014 Growth Rate
Battle Ground	18,654	18,867	19,297	19,479	19,851	20,052	20,163	20,871	1.60%
Camas	20,015	20,311	20,626	21,073	21,588	21,911	22,049	22,843	1.89%
LaCenter	3,017	3,069	3,010	3,050	3,220	3,135	3,163	3,209	0.88%
Ridgefield	5,015	5,112	5,175	5,402	5,608	5,741	6,150	6,575	3.87%
Vancouver	293,973	296,859	300,055	300,525	302,108	304,262	307,767	315,460	1.01%
Washougal	14,003	14,722	14,862	15,007	15,328	15,249	15,502	15,932	1.84%
Woodland	88	88	89	88	92	91	88	89	0.19%
Yacolt	1,535	1,578	1,613	1,636	1,645	1,644	1,653	1,661	1.13%
Rural County	58,408	58,840	59,642	59,689	60,049	60,280	60,112	62,205	0.90%
Total	414,708	419,445	424,368	425,949	429,490	432,365	436,647	448,847	1.13%

Table 1Annual Population Estimates for Clark County, 2007-2014

SOURCE: Clark County Department of GIS

NOTE: A portion of the City of Woodland is in Clark County.



Chart 1 Components of Population Change 1995-2014

SOURCE: Washington State Office of Financial Management, http://www.ofm.wa.gov/
Year	Households	Jobs	Jobs Per Household
2007	162,715	137,500	0.85
2008	164,796	137,300	0.83
2009	165,755	131,800	0.80
2010	166,989	130,400	0.78
2011	168,148	131,600	0.78
2012	169,467	134,400	0.79
2013	172,715	138,500	0.80
2014	173,827	144,300	0.83
Annual Average			
Percent change	0.94%	0.69%	

Table 2Clark County Household & Jobs, 2007-2014

SOURCE: Clark County GIS and ESD.

Observations

- Population growth has three components: births, deaths and migration. Migration is the most volatile and has not recovered to pre-recession levels.
- Births and deaths have remained relatively constant over the last 20 years however deaths have been trending slightly higher due to the aging population
- During this period, 6,800 new jobs and 11,112 new households were added to Clark County.

Employment

The GMA does not mandate a source that must be considered in planning for future employment. However, in this report the county uses ESD to make comparisons between employment and employment densities. In 2007, commercial and industrial employment assumptions were 20 and 9 jobs per acre, respectively, to plan for future employment.

Observations

- From 2007 to 2014, Clark County added 11,112 new households, an annual average change of 0.94%; for the same period job growth was 0.69%.
- National recession starting in 2008 reversed a period of fast economic growth and low unemployment, resulting in significant layoffs and unemployment rates increasing to 11% by February 2013 in Clark County.

GROWTH TARGETS AND CAPACITY

In 1992, Clark County began the VBLM analysis to determine the potential capacity of urban growth areas to accommodate projected growth for the next 20 years to the year 2012. County staff met with interested parties from the development and environmental community to collectively examine criteria to be used to compute the supply of land available for development within each urban growth boundary. From the process, a methodology was developed using Clark County's Department of Geographic Information System (GIS) as the primary data source.

The evaluation component of the RCW 36.70A.215 Review and Evaluation Program, at a minimum, shall: "Determine whether there is sufficient suitable land to accommodate the countywide population projection established for the county pursuant to RCW 43.62.035 and the subsequent population allocations within the county and between the county and its cities and the requirements of RCW 36.70A.110."

The amount of land needed to accommodate projected growth through the 2035 planning horizon is the subject of this section. The amount of buildable land needed will be instrumental in the update of the comprehensive plan and provides a framework for addressing the land supply needs of a new 20-year planning horizon.

Tables 3 below and Table 4 on the following page indicate the amount of residential land needed to accommodate the projected population based on (1) the 2015 Comprehensive Growth Management Plan baseline assumptions; and (2) the densities observed since 2006. Each table provides the 2015 population (January 1st), the remaining population for planning horizon 2035, and the residential units and acres needed.

Jurisdiction	2015	Remaining	Residential	Assumed	Residential	Deficit	Surplus	2015 Vacant
	Population	Population for	units	units per	acres			Buildable
		planning	needed	net	needed			Land
		horizion 2035						Inventory
Battle Ground	20,871	15,972	5,169	6	862		208	1,070
Camas	22,843	11,255	3,868	6	645		248	892
La Center	3,209	3,233	1,089	4	272		101	373
Ridgefield	6,575	13,087	4,377	6	729		280	1,009
Vancouver	315,460	52,786	21,723	8	2,715		907	3,622
Washougal	15,932	6,023	2,247	6	375		102	477
Woodland	89	229	83	4	21		5	25
Yacolt	1,661	303	88	4	22		22	44
Total	386,640	102,890	38,643		5,640			7,513

Table 32035 Urban Growth Residential Land Need

Source: Clark County Community Planning. Note: Land needs are based on the VBLM2015 model using net acres.

Table 42035 Urban Growth Residential Land Need Based on Observed Density

Jurisdiction	2015	Remaining	Residential	Observed	Residential	Deficit	Surplus	2015 Vacant
	Population	Population for	units	units per	acres			Buildable
		planning	needed	acre	needed			Land
		horizon 2035						inventory
Battle Ground	20,871	15,972	5,169	4.2	1,231	-161		1,070
Camas	22,843	11,255	3,868	3.8	1,018	-125		892
La Center	3,209	3,233	1,089	1.9	573	-200		373
Ridgefield	6,575	13,087	4,377	5.2	842		168	1,009
Vancouver	315,460	52,786	21,723	7	3,103		519	3,622
Washougal	15,932	6,023	2,247	6.6	341		136	477
Woodland	89	229	83	4	21		5	25
Yacolt	1,661	303	88	3.4	26		18	44
Total	386,640	102,890	38,643		7,154			7,513

Source: Clark County Community Planning. Note: Land needs are based on the VBLM 2015 model using net acres. Observed densities are based on actual development in urban areas. City densities are within city limits, except for Vancouver which uses full UGA density. Residential units needed is based on person per household from the 2013 ACS data. Additional population not included in the vacant land model is 15,224 persons; bringing the 2035 estimate to 118,114.

Summary

- The observed unit per acre does not include existing platted, yet vacant lots or potential densities based upon maximum lot sizes und current zoning of vacant or underutilized land. The model relies on building permit data, not platted development data. A conclusion under GMA that a jurisdiction has a surplus or deficit in lands available within a jurisdiction to accommodate a planned population within a defined planning period, can only be concluded through a thorough analysis of the underlying zoning, site constraints, site infrastructure and platting patterns.
- Based on the 2015 VBLM there are 7,513 net buildable acres. At a potential of 7 dwelling units per acre and 2.66 persons per household, this land area will accommodate 136,820 persons. The Urban Growth estimate is 118,114 persons, and the January 1, 2015 Clark County population estimate is 448,845. Therefore, the 2015 VBLM has capacity to accommodate the anticipated Urban Growth population estimate.
- Based on the 2015 VBLM, there are 2,057 net buildable commercial acres and 3,982 net buildable industrial acres. Thus, there is potential job capacity of 76,978 plus the public sector jobs that are not included in the vacant and buildable lands model, and including 16,775 jobs that will occur from redevelopment totaling 101,153 potential jobs.
- Based on the existing zoning, the total vacant and development potential in the rural area is approximately 9,390 lots. Assuming 2.66 persons per household, there is capacity to add 24,977 persons in the rural areas.
- See Appendix D for the City of Ridgefield's planning consultants reply, Elizabeth Decker, on the observed density surplus.

In conclusion, based on observed density and the 2015 VBLM, Battle Ground, Camas and La Center show small deficits. If residential development continues to develop at the observed densities, then this deficit might become true by 2035. It is important to note that the observed densities occurred at a period of a deep recession having a significant impact to development occurring in the housing sector. However, Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal and Clark County have adopted local development regulations that may reflect higher density development within the planning horizon.

Commercial and Industrial Needs Analysis

In 2014, the Board of County Commissioners chose to plan for a total of 91,200 net new jobs. The County has an estimated capacity of 101,153 jobs as follows: The 2015 VBLM, indicates a capacity of 76, 978 jobs. The cities of Battle Ground, La Center, and Ridgefield, have indicated they have additional capacity to accommodate 16, 755 jobs. Publicly owned land is not included in the model, therefore we assume that the 7,400 new public sector jobs estimated by ESD will occur on existing publicly owned facilities.

Residential Capacity Analysis

Tables 5-7 on the following pages provide the vacant buildable lands per urban growth area in the residential, commercial and industrial areas based on the 2015 VBLM. Countywide there are 7,513 net buildable residential acres with a capacity of 136,820 residents. See Appendix C for the Vacant Buildable Lands Model planning assumptions.

Jurisdiction	Gross	Net	House	Population	Average			
	Acres	Acres	holds	Capacity	Density			
					per Net			
					Acre			
Battle Ground								
City	1,620.6	737.8	4,427	11,774	6			
UGA	750.9	332.0	1,992	5,299	6			
Total	2,371.5	1,069.8	6,419	17,073	6			
Camas								
City	1,561.3	700.2	4,201	11,174	6			
UGA	432.2	192.2	1,153	3,067	6			
Total	1,993.5	892.3	5,354	14,242	6			
La Center								
City	574.4	251.4	1,006	2,675	4			
UGA	314.1	121.8	487	1,296	4			
Total	888.5	373.2	1,493	3,971	4			
Ridgefield								
City	1,583.2	654.0	3,924	10,438	6			
UGA	858.2	355.2	2,131	5,669	6			
Total	2,441.3	1,009.2	6,055	16,108	6			
Vancouver								
City	1,208.4	567.1	4,536	12,067	8			
UGA	6,764.4	3,055.4	24,443	65,019	8			
Total	7,972.8	3,622.5	28,980	77,086	8			
Washougal								
City	578.6	255.2	1,531	4,074	6			
UGA	499.2	221.4	1,328	3,533	6			
Total	1,077.8	476.6	2,860	7,606	6			
Yacolt								
City	65.1	36.4	146	388	4			
UGA	16.4	7.3	29	77	4			
Total	81.6	43.7	175	465	4			
Woodland								
City	5.8	2.0	8	21	4			
UGA	88.9	23.3	93	247	4			
Total	94.8	25.2	101	269	4			
URBAN TOTAL	16,921.7	7,512.6	51,436	136,820	7			
Urban Growth Estimate 118,114								

Table 5Residential Capacity Analysis, 2015

Source: Clark County Community Planning and VBLM 2015

Note: Residential market factor is included in the land capacity target.

Comprehensive	Confe	orming Vac	ant Lots	Undersized	Total	Rural
Plan Designation				Vacant Lots	Potential	Capacity
		_		(no minimum	Vacant	
		Potential		lot size)	Lots	
	Current	Dividable	Total			
R-5	1,203	2,648	3,851	1,470	5,321	14,154
R-10	146	536	682	475	1,157	3,078
R-20	19	33	52	70	122	325
FR-40	34	90	124	643	767	2,040
FR-80	21	609	630	307	937	2,492
AG-20	156	432	588	498	1,086	2,889
Total Rural	1,579	4,348	5,927	3,463	9,390	24,977

Table 6Rural Capacity Analysis, 2014

Source: Clark County GIS

Jurisdiction	COMMERCIAL INDUSTRIAL				AL.		
	Gross	Net		Gross	Net		
	Acres	Acres	Jobs	Acres	Acres	Jobs	Total Jobs
Battle Ground							
City	591.4	372.5	7,449	335.3	177.3	1,596	9,045
UGA	59.0	39.5	790	28.8	10.9	98	888
Total	650.4	411.9	8,239	364.1	188.3	1,694	9,933
Camas							
City	514.3	337.2	6,744	846.1	456.9	4,112	10,856
UGA	0.0	0.0	0	76.7	36.2	326	326
Total	514.3	337.2	6,744	922.8	493.1	4,438	11,182
La Center							
City	63.6	44.2	884	83.3	48.2	434	1,318
UGA	0.0	0.0	0	1.1	0.7	6	6
Total	63.6	44.2	884	84.4	48.8	440	1,324
Ridgefield							
City	270.1	179.3	3,587	942.0	506.2	4,556	8,143
UGA	17.8	12.2	245	65.5	35.6	321	565
Total	287.9	191.6	3,831	1,007.4	541.8	4,877	8,708
Vancouver							
City	519.9	369.1	7,383	2,706.5	1,391.1	12,520	19,903
UGA	868.3	604.2	12,083	1,861.1	1,022.4	9,202	21,285
Total	1,388.3	973.3	19,466	4,567.7	2,413.5	21,722	41,188
Washougal							
City	83.8	56.3	1,126	167.8	62.9	566	1,693
UGA	45.5	31.8	635	343.0	205.2	1,847	2,482
Total	129.3	88.1	1,762	510.8	268.1	2,413	4,175
Yacolt							
City	14.1	10.6	211	9.7	6.5	59	270
UGA	0.0	0.0	0	39.6	21.9	198	198
Total	14.1	10.6	211	49.2	28.5	256	468
Woodland							
City	0.0	0.0	0	0.0	0.0	0	0
UGA	0.0	0.0	0	0.0	0.0	0	0
Total	0.0	0.0	0	0.0	0.0	0	0
Urban Job Total	3,047.8	2,056.9	41,138	7,506.4	3,982.2	35,840	76,978
Public Sector							7,400
Redevelopment						16,775	
Employment Grov	vth Targe	et					101,153

 Table 7

 Commercial and Industrial Capacity Analysis

Source: Clark County Community Planning and VBLM 2015. Note: In February 2014, Clark County received an application for the establishment of an Industrial Land Bank on 601 acres with a potential of 5,400 jobs.

DEVELOPMENT TRENDS, 2006-2014

Residential

Monitoring building permits provides a measure of the level of construction activity and the rate at which residential land is being developed. Table 8 on the following page shows the number of new single-family and multi-family building permits issued, and the single-family and multi-family split from July 1, 2006 to December 31, 2014 for each of the Urban Growth Areas. Single family includes single-family residential, accessory dwelling units (ADU), and mobile homes (on individual lots). Multi-family includes multi-family residential, duplexes, and new mobile home parks. For the residential split, Countywide Planning Policy 1.1.12 in the 2007 Clark County Comprehensive Plan specifies that no more than 75 percent of new dwelling units to be a specific product type (i.e. single-family housing). See Appendix C for an annual breakdown of each jurisdiction's building permits.

Table 8

Single- and Multi-Family Building Permits, 2006-20	14
--	----

Jurisdiction		Sir	ngle-Fa	mily	M	ulti-Fan	nily	Total		
		Units	%SF	Acres	Units	%MF	Acres	Units	Acres	Units/
		0////0	<i>,</i>	/ 10/00	0////0	/0111	/ 10/00	0////0	/ 10100	Acre
Battle Ground										
	City	506	64%	175.1	280	36%	11.8	786	187	4.2
	UGA	45	100%	62.2	0	0%	0	45	62	0.7
Sub Total		551	66%	237.3	280	34%	11.8	831	249	3.3
Camas										
	City	803	72%	267.9	306	28%	20.7	1,109	289	3.8
	UGA	21	100%	9.3	0	0%	0	21	9	2.3
Sub Total		824	73%	277.2	306	27%	20.7	1,130	298	3.8
La Center										
	City	66	100%	34	0	0%	0	66	34	1.9
	UGA	7	100%	13.2	0	0%	0	7	13	0.5
Sub Total		72	100%	47.2	0	0%	0	73	47	1.5
Ridgefield										
	City	680	99%	130.3	4	1%	0.2	684	131	5.2
	UGA	5	100%	62	0	0%	0	5	62	0.1
Sub Total		685	99%	192.3	4	1%	0.2	689	193	3.6
Vancouver										
	City	1,728	38%	271.5	2,838	62%	135	4,566	406	11.2
	UGA	4,534	79%	1006	1,220	21%	51.8	5,754	1,058	5.4
Sub Total		6,262	61%	1277	4,058	39%	186.9	10,320	1,464	7
Washougal										
	City	547	77%	99	163	23%	7.9	710	107	6.6
	UGA	7	100%	40.4	0	0%	0	7	40	0.2
Sub Total		554	77%	139.4	163	23%	7.9	717	147	4.9
Yacolt										
	City	51	100%	15	0	0%	0	51	15	3.4
	UGA	0	0%	0	0	0%	0	0	0	0
Sub Total		51	100%	15	0	0%	0	51	15	3.4
Clark County Rural		1,383	100%	7785.8	5	0%	15.6	1,388	7,801	0.2
Total Cities		4,381	55%	992.7	3,591	45%	175.7	7,972	1,168	6.8
Total UGAs		4,619	79%	1193.1	1,220	21%	51.8	5,839	1,245	4.7
Grand Total		9,000	65%	2185.8	4,811	35%	227.5	13,811	2,413	5.7

Source: Clark County Community Planning,

Chart 2 and chart 3 below show single-family and multi-family development by City from 2006 to 2014.



Chart 2 New Single-Family Development Density by City, 2006-2014



New Multi-Family Development Density by City, 2006-2014



Between 2006 and 2014:

- City of Vancouver achieved a density of 11.2 units per acre.
- City of Battle Ground's multi-family residential land developed at 23.7 dwelling units per acre.
- Overall, observed density on Single- & Multi-family residential dwelling units per acre is 5.7.
- The unincorporated portion of the Vancouver UGA achieved a 79% single-family and 21% multi-family residential split which exceeds the County-wide planning policy of no more than 75% of the new housing stock of a single product type.
- The VUGA reported average of 7.0 units per acre appears to have been reduced by a very small number of developments on existing large properties in the Urban Holding zone and other properties with extensive critical areas. Data indicates new single family lots are becoming smaller. The median size of new residential lots in urban density zones created since 2007 was 5,400 sq.ft. within the City of Vancouver, 5,900 sq.ft. within the unincorporated Vancouver UGA.

Non-residential

Data on commercial building permits issued from July 1, 2006 through December 31, 2014 was collected (Table 9). Tenant improvements were excluded unless the improvement resulted in an increase of building square footage. The parcel serial number from each building permit was linked to a GIS coverage to determine the parcel size, geography and critical area. Commercial building permits include commercial, industrial and multi-family development. Table 10 below reflects industrial building permits sorted by comprehensive plan designation for industrial uses. The Department Information and Technology provided information for both tables below that are shown as net acres. See Appendix B for Commercial and Industrial Building Permits by Year and Jurisdiction.

UGA	Number of	Acre	Critical	Percent	
	Permits		Acres	Critical	
Battle Ground	63	224.8	168.1	75%	
Camas	27	102.8	16.9	16%	
La Center	2	4.5	0.3	7%	
Ridgefield	6	33.5	12.6	38%	
Vancouver	293	1,539.2	547.9	36%	
Washougal	2	2.2	1.1	50%	
Yacolt	1	1.1	0.0	0%	
Total	394	1,908.0	747.0	39%	
Rural	19	795.7	552.6	69%	
County Total	413	2,703.6	1,299.6	48%	

Table 9Commercial Building Permits by UGA

Table 10Industrial Building Permits by UGA

UGA	Number of	Acres	Critical	Percent
	Permits		Acres	Critical
Battle Ground	2	2.2	1.4	66%
Ridgefield	4	26.1	10.7	41%
Vancouver	68	465.6	222.0	48%
Washougal	1	1.2	1.2	101%
Total	75	495.0	235.2	48%
Rural	4	173.4	130.1	75%
County Total	79	668.3	365.4	55%

Observations

• Based on commercial building permits issued, development occurred on 2,703.6 acres of commercially designated land and 668.3 acres of industrial designated land.

Employment Density Methodology

Information for employment below is based on new construction permits from July 1, 2006 to June 30, 2014. The building permit information was matched to parcels and employment locations to obtain acres and employment. In table 11, a total of 224 records matched between the new construction permits and the employment records. Commercial values include the following permit types: commercial, institutional, office and retail permit types. Industrial values include industrial permit types.

	Urban Growth Area											
		Battle	Camas	LaCenter	Ridgefield	Vancouver	Washougal	Yacolt	Rural	Grand		
		Ground								Total		
Commercial	Employees	882	127	22	223	15,523	0	0	195	16,972		
	Acres	79	11	5	14	1,462	0	0	249	1,819		
	Employees per Acre	11.1	11.7	4.7	16.3	10.6	0.0	0.0	0.8	9.3		
	Employees	21	0	0	12	3,043	7	0	10	3,093		
Industrial	Acres	1	0	0	2	273	1	0	7	284		
	Employees per Acre	23.7	0.0	0.0	6.0	11.1	6.0	0.0	1.4	10.9		

Table 11Commercial and Industrial Employment Density

Source: Clark County GIS

Observations

A caveat of the observations below is that they are from a limited set of employment data.

- The planning assumptions applied in 2007 were based on employees per net acre; twenty (20) for commercial and nine (9) for industrial. The result is that the observed densities are lower than the 2007 planning assumptions.
- From 2006 to 2014, new permits show employees per net acre for commercial at 9.3 employees per acre and industrial at 10.9 employees per net acre.
- Clark County has seen employment gains from 2006 to 2014. It is likely that some businesses have added employees, which would not require new building permits and may account for the low employment density reported.

Development on Constrained Parcels

Background and Relevance

Tracking development on parcels with critical lands provides an indicator of impacts from growth to the environment and illustrates the general effectiveness of environmental protection measures. It is also an indicator of land demand. When there is a high demand for land, development tends to occur more frequently on areas that are more difficult to develop. Critical lands are identified in Clark County code Title 40 Unified Development.

Data Collection

Only the constrained portion of a parcel is identified in the VBLM. Table 12 illustrates the percent of vacant and underutilized constrained land that converted to built by UGA for residential, commercial and industrial land from 2007 to 2014. The critical layer is based on best available science, and includes a new slopes layer and the most recent habitat and species information. See Appendix C for a description of constrained acres.

Urban Growth		Residential			Commercia	l	Industrial			
Area	Total	Of Total Built-		Total	Of Total Built-		Total	Of Total Built-		
	Converted	Converted		Converted	Converted		Converted	Converted		
	to Built	w/Constraints	Percent Built	to Built	w/Constraints	Percent Built	to Built	w/Constraints	Percent Built	
	(Acres)	(Acres)	w/Constraints	(Acres)	(Acres)	w/Constraints	(Acres)	(Acres)	w/Constraints	
Battle Ground	286	190	66.5%	105	74	70.3%	105	91	86.2%	
Camas	366	228	62.4%	13	5	40.1%	124	82	66.0%	
La Center	23	7	29.2%	5	4	82.7%	0	0	0.0%	
Ridgefield	322	162	50.4%	16	10	62.3%	189	87	46.2%	
Vancouver	1,577	526	33.3%	338	96	28.6%	626	237	37.8%	
Washougal	152	65	42.7%	11	4	34.6%	83	46	55.0%	
Woodland	0	0	0.0%	0	0	0.0%	0	0	0.0%	
Yacolt	14	6	40.7%	1	0	0.0%	0	0	0.0%	
Total UGAs	2,739	1,183	43.2%	489	193	39.6%	1,126	542	48.1%	

Table 12Vacant and Underutilized Land Converted to Built, 2007-2014

Source: Community Planning and Clark County GIS

Observations

Between 2007 and 2014:

- 1,183 acres of residential development occurred on parcels with some constrained areas, or 43.2%.
- 193 acres of commercial development occurred on parcels with some constrained areas or 39.6%.
- 542 acres of industrial development occurred on parcels with some constrained areas or 48.1%

Infrastructure Analysis

Background and Relevance

Land used for infrastructure is not available for housing or employment development. It is important to know the amount of available land that will be needed to provide the necessary infrastructure for development. This indicator will help calculate the amount of land needed for growth.

Data Collection

The 2007 Comprehensive Growth Management Plan assumed infrastructure will consist of 27.7 percent for residential development and 25 percent for industrial and commercial development. The Vacant Buildable land model comparison report provides a breakdown of easements & infrastructure by residential, industrial, and commercial land. Table 13 below shows percentages of residential, commercial and industrial portions of vacant and underutilized land that converted to infrastructure from January 1, 2007 to December 31, 2014.

Easement & Infrastructure	Residential Acres	Percent of Residential Converted to Infrastructure	Commercial Acres	Percent of Commercial Converted to Infrastructure	Industrial Acres	Percent of Industrial Converted to Infrastructure
Vacant & Underutilized Land (2007)	2,739.4		488.7		1,126.4	
Easements & Right of Way	213.8	7.8%	46.8	9.6%	66.4	5.9%
Schools	10.2	0.4%	0.0	0.0%	0.0	0.0%
Public Lands (Except Right of Way)	171.0	6.2%	29.4	6.0%	123.8	11.0%
Greenway (Public & Private)	339.0	12.4%	19.6	4.0%	51.9	4.6%
Easement & Infrastructure Total	733.9	26. 8%	95.7	19.6%	242.2	21.5%

Table 13Infrastructure Summary

Source: Clark County Community Planning and Clark County GIS.

Note: In 2012, the County acquired the Leichner industrial properties of 120.96. It was not included in this table as it is under remedial action through a consent decree under the Jurisdiction of Washington State Department of Ecology.

Observations

From January 1, 2007 to December 31, 2014, Residential easements and infrastructure consumed less than the assumed 27.7 percent of development. About 734 acres or 26.8 percent of residential vacant and underutilized land converted to infrastructure in all UGAs. For commercial, almost 96 acres or 19.6% converted to infrastructure. Industrial had 242 acres converted to infrastructure or 21.5%. There have been recent changes to Stormwater regulations that may lead to more land being set aside for the retention of stormwater. However, there is insufficient development data under the new regulations to warrant a change to the planning assumptions. This is an area we will continue to monitor and update, as necessary.

The data collected for this report is available online at

<u>http://www.clark.wa.gov/planning/comp_plan/monitoring.html#capacity</u> or via CD-ROM from Clark County Community Planning.

APPENDIX A – Residential Building Permits by Year and Jurisdiction

The following residential tables are reported by year from July 1, 2006 to December 31, 2014 for each jurisdiction and assembled by Clark County Community Planning.

Clark County		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	I 2006-20)14
Single Family	Units	Acres	Units	Unit	Acres	Units	Unit	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Unit	Acres	Units/	Unit	Acres	Units/	Units	Acres	Units
		Used	/Acre	s	Used	/Acre	s	Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre	s	Used	Acre	s	Used	Acre		Used	/Acre
Rural	198	1,268.2	0.2	286	1,501.2	0.2	150	872.8	0.2	105	644.5	0.2	109	520.8	0.2	85	412.3	0.2	112	681.2	0.2	168	894.8	0.2	171	989.9	0.2	1,384	7,785.8	0.2
Multi-Family																														
Rural	0			0			0			0			0			1	0.9		1	5.3		1	3.2		2	6.2		5	15.6	0.3
Total Rural	198			286	1,501.2	0.2	150	872.8	0.2	105	644.5	0.2	109	520.8	0.2	86	413.2	0.2	113	686.5	0.2	169	898.0	0.2	173	996.1	0.2	1,389	7,801.4	0.2

Table 1Rural Annual Residential Development

Table 2Battle Ground Annual Residential Development

Battle Ground		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	1 2006-20)14
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	23	7.5	3.1	86	17.6	4.9	66	38.4	1.7	47	16.6	2.8	59	21.3	2.8	32	8.9	3.6	41	19.6	2.1	70	22.4	3.1	82	22.8	3.6	506	175.1	2.9
UGA	4	7.1	0.6	7	7.2	1.0	2	2.2	0.9	3	3.1	1.0	7	8.0	0.9	5	6.8	0.7	6	9.6	0.6	7	10.7	0.7	4	7.6	0.5	45	62.2	0.7
Multi-Family																														
City	0			20	1.4	14.6	4	0.4	10.5	80	4.3	18.5	0			24	0.8	30.3	30	1.0	30.3	122	4.0	30.7	0			280	11.8	23.7
Total UGA	27	14.7	1.8	113	26.1	4.3	72	40.9	1.8	130	23.9	5.4	66	29.3	2.3	61	16.5	3.7	77	30.2	2.6	199	37.1	5.4	86	30.4	2.8	831	249.1	3.3

Table 3Camas Annual Residential Development

Camas		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	1 2006-	2014
Single Family	Units	Acres Used	Units /Acre	Unit s	Acres Used	Units /Acre	Unit s	Acres Used	Units/ Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Units	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre	Unit s	Acres Used	Units/ Acre	Unit s	Acres Used	Units/ Acre	Units	Acres Used	Units /Acre
City	59	24.8	2.4	91	86.2	1.1	58	10.5	5.5	65	17.3	3.8	127	37.7	3.4	60	12.7	4.7	68	15.8	4.3	116	30.0	3.9	159	32.8	4.8	803	267.6	3.0
UGA	0			0			0			1	1.1	1.0	0			3	1.0	2.9	3	0.5	6.5	5	0.7	7.7	9	6.1	1.5	21	9.3	2.3
Multi-Family																														
City	20	1.4	14.1	23	1.9	12.4	25	1.6	16.1	11	0.6	18.3	63	3.6		0			67	6.09	11.0	10	0.5	19.6	87	5.1	17.1	306	20.8	14.7
Total UGA	79	26.2	3.0	114	88.0	1.3	83	12.0	6.9	77	19.0	4.1	190	41.3	4.6	63	13.8	4.6	138	22.3	6.2	131	31.1	4.2	255	44.0	5.8	1130	297.7	3.8

Table 4 La Center Annual Residential Development

La Center		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	1 2006-20	14
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	2	5.3	0.4	14	5.5	2.6	6	1.3	4.7	4	0.6	6.6	12	1.94	6.2	6	6.2	1.0	5	1.0	5.2	11	11.2	1.0	6	1.06	5.7	66	34.0	1.9
UGA	0			1	1.5	5	0			0			0			2	7.5	0.3	2	2.0	1.0	1	1.2	0.9	1	1.0	1.0	7	13.2	0.5
Multi-Family																														
City	0			0			0			0			0			0			0			0			0			0		
Total UGA	2	5.3	0.4	15	7.0	2.2	6	1.3	4.7	4	0.6	6.6	12	1.9	6.2	8	13.7	0.6	7	3.0	2.3	12	12.3	1.0	7	2.1	3.4	73	47.2	1.5

Table 5Ridgefield Annual Residential Development

Ridgefield		2006	-		2007			2008	,'		2009			2010			2011			2012			2013			2014		Tota	al 2006-20)14
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	59	28.0	2.1	49	8.1	6.1	26	13.0	2.0	27	4.4	6.1	77	10.3	7.5	55	10.9	5.1	117	16.1	7.3	174	24.4	7.1	96	15.1	6.4	680	130.3	5.2
UGA	1	39.4		1	4.3	,	0	/		0			1	10.8		0			1	5.1	0.2	1	2.4	0.4	0			5	62.0	0.1
Multi-Family															\square															
City	0			4	0.2	′	0	/		0			0			0			0			0			0			4	0.2	18.2
Total UGA	60	67.4	0.9	54	12.6	4.3	26	13.0	2.0	27	4.4	6.1	78	21.1	3.7	55	10.9	5.1	118	21.2	5.6	175	26.8	6.5	96	15.1	6.4	689	192.5	3.6

Table 6Vancouver Annual Residential Development

Vancouver		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	1 2006-20	14
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	148	38	3.9	418	50	8.4	222	40	5.5	120	20	5.9	127	19	6.6	92	14	6.4	182	31	6.0	216	31	7.0	203	28	7.2	1,728	271.2	6.4
UGA	464	80	5.8	953	190	5.0	449	69	6.5	317	55	5.7	401	87	4.6	233	65	3.6	397	88	4.5	646	182	3.5	674	190	3.5	4,534	1,006.2	4.5
Multi-Family																														
City	403	15	26.8	445	33	13.6	237	12	19.8	73	7	10.2	67	2	40.4	92	2	37.2	305	15	20.9	615	28	21.9	601	21	28.2	2,838	135.1	21.0
UGA	5	0	13.5	127	2	53.1	29	1	56.3	2	0	13.3	18	1	21.7	206	3	61.3	163	10	16.9	583	25	22.9	87	9	9.4	1,220	52.0	23.5
Total UGA	1020	133	7.7	1943	275	7.1	937	122	7.7	512	83	6.2	613	108	5.7	623	85	7.3	1047	143	7.3	2060	267	7.7	1565	249	6.3	10,320	1,464.5	7.0

Table 7Washougal Annual Residential Development

Washougal		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	2006-2	2014
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	0			122	24.0	5.1	69	11.1	6.2	22	3.9	5.6	45	7.6	5.9	61	9.3	6.5	49	9.3	5.3	101	18.6	5.4	78	15.3	5.1	547	99.0	5.5
UGA	0			2	2.4		0			0			0			1	1.4		1	1.5	0.7	1	5.0	0.2	2	30.1		7	40.4	0.2
Multi-Family																														
City	0			144	6.9		19	1.0		0			0			0			0			0			0			163	7.9	20.6
Total UGA	0			268	33.2	8.1	88	12.2	7.2	22	3.9	5.6	45	7.6	5.9	62	10.7	5.8	50	10.8	4.6	102	23.6	4.3	80	45.4	1.8	717	147.3	4.9

Table 8Yacolt Annual Residential Development

Yacolt		2006			2007			2008			2009			2010			2011			2012			2013			2014		Tota	1 2006-2	2014
Single Family	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units	Units	Acres	Units/	Units	Acres	Units/	Units	Acres	Units
		Used	/Acre		Used	Acre		Used	Acre		Used	Acre		Used	/Acre		Used	Acre		Used	/Acre		Used	Acre		Used	Acre		Used	/Acre
City	15	4.8		7	1.8	3.9	14	4.9	2.9	5	1.3	3.9	8	1.8	4.4	1	0.2	5.6	0			0			1	0.2	4.3	51	15.0	3.4
Total UGA	15	4.8		7	1.8	3.9	14	4.9	2.9	5	1.3	3.9	8	1.8	4.4	1	0.2	5.6	0			0			1	0.2	4.3	51	15.0	3.4

APPENDIX B – Commercial & Industrial Building Permits by Year and Jurisdiction

The following commercial and industrial tables are reported by year for each jurisdiction from July 1, 2006 to December 31, 2014, and are from Clark County Information Technology.

Battle Ground UGA	Year	Number	Acres	Critical	Percent
	Issued	of		Acres	Critial
		Permits			
	2006	7	15.3	13.3	87%
	2007	15	84.4	70.3	83%
	2008	17	40.9	28.6	70%
	2009	2	10.2	9.7	95%
Commercial	2010	6	23.9	20.4	85%
	2011	1	10.0	9.5	95%
	2012	2	1.5	1.3	86%
	2013	8	31.7	11.5	36%
	2014	5	6.9	3.7	53%
Commercial Total		63	224.8	168.1	75%
Industrial	2013	1	0.9	0.1	15%
	2014	1	1.3	1.3	100%
Industrial Total		2	2.2	1.4	66%

Table 1Battle Ground Annual Commercial and Industrial Permits

Table 2
Camas Annual Commercial Permits

Camas UGA	Year	Number	Acres	Critical	Percent
	Issued	of		Acres	Critical
		Permits			
	2007	3	3.2	0.2	5%
	2008	4	16.3	0.6	4%
	2009	2	22.8	1.9	8%
Commercial	2010	2	16.6	5.7	34%
	2011	6	22.8	0.2	1%
	2013	2	18.4	8.4	46%
	2014	8	2.7	0.0	0%
Commercial Total		27	102.8	16.9	16%

La Center UGA	Year Issued	Number of Permits	Acres	Critical Acres	Percent Critical
Commercial	2007	1	4.2	0.3	8%
	2013	1	0.2	0.0	0%
Commercial Total		2	4.5	0.3	7%

Table 3La Center Annual Commercial Permits

Table 4
Ridgefield Annual Commercial and Industrial Permits

Ridgefield UGA	Year	Number	Acres	Critical	Percent
	Issued	of		Acres	Critical
		Permits			
	2006	3	14.0	11.0	79%
Commercial	2013	1	5.7	0.4	7%
	2014	2	13.8	1.1	8%
Commercial Total		6	33.5	12.6	38%
Industrial	2007	1	2.3	1.5	65%
	2008	3	23.8	9.2	39%
Industrial Total		4	26.1	10.7	41%

Vancouver UGA	Year	Number	Acres	Cricial	Percent
	Issued	of		Acres	Critical
		Permits			
	2006	34	67.9	24.1	36%
	2007	53	338.0	101.6	30%
	2008	49	230.0	81.3	35%
	2009	25	226.5	59.4	26%
Commercial	2010	32	99.1	14.0	14%
	2011	27	142.2	110.5	78%
	2012	24	57.9	5.7	10%
	2013	15	119.4	11.6	10%
	2014	34	258.2	139.7	54%
Commercial Total		293	1,539.2	547.9	36%
	2006	7	15.0	0.2	1%
	2007	15	41.2	17.6	43%
	2008	13	215.7	91.5	42%
	2009	7	50.5	17.1	34%
Industrial	2010	3	5.1	0.0	0%
	2011	6	43.9	25.7	59%
	2012	8	43.8	27.9	64%
	2013	4	38.7	38.5	100%
	2014	5	11.8	3.5	30%
Industrial Total		68	465.6	222.0	48%

Table 5Vancouver Annual Commercial and Industrial Permits

Table 6
Washougal Annual Commercial and Industrial Permits

Washougal UGA	Year	Number	Acres	Critical	Percent
	Issued	of		Acres	Critical
		Permits			
Commercial	2010	1	1.1	1.1	100%
	2014	1	1.1	0.0	0%
Commercial Total		2	2.2	1.1	50%
Industrial	2014	1	1.2	1.2	100%
Industrial Total		1	1.2	1.2	100%

Yacolt UGA	Year Issued	Number of Permits	Acres	Cricial Acres	Percent Critical
Commercial	2012	1	1.1	0.0	0%
Commercial Total		1	1.1	0.0	0%

Table 7Yacolt Annual Commercial Permits

Table 8
Rural Clark County Commercial and Industrial Permits

Rural Clark County	Year	Number	Acres	Cricial	Percent
	Issued	of		Acres	Critical
		Permits			
	2006	3	6.0	3.7	62%
	2007	3	212.5	170.1	80%
	2009	3	46.4	32.2	69%
Commercial	2010	2	9.5	5.5	58%
	2011	3	316.5	192.6	61%
	2013	4	202.3	148.5	73%
	2014	1	2.5	0.0	0%
Commercial Total		19	795.7	552.6	69%
Industrial	2007	1	7.3	7.1	97%
	2009	2	15.0	4.9	33%
	2011	1	151.1	118.2	78%
Industrial Total		4	173.4	130.1	75%

APPENDIX C – VACANT BUILDABLE LANDS MODEL

The Vacant Buildable Lands Model (VBLM) is a planning tool developed to analyze residential, commercial, and industrial lands within urban growth areas. The model serves as a tool for evaluating urban area alternatives during Clark County 20-year Comprehensive Growth Management Plan updates and for monitoring growth patterns during interim periods. The VBLM analyzes potential residential and employment capacity of each urban growth area within the county based on vacant and underutilized land classifications. This potential capacity is used to determine the amount of urban land needed to accommodate projected population and job growth for the next 20 years during plan updates and to analyze land consumption or conversion rates on an annual basis for plan monitoring purposes.

In 1992, Clark County began evaluating vacant lands as part of the initial 20-year growth management plan. At that time, County staff met with interested parties from development and environmental communities to examine criteria and establish a methodology for computing potential land supply available for development. A methodology relying on the Clark County Assessor's database and Geographic Information System (GIS) as primary data sources was developed. As a result the VBLM is a GIS based model built on geoprocessing scripts.

In the spring of 2000, the Board of Clark County Commissioners appointed a technical advisory committee consisting of local government agencies, Responsible Growth Forum members, and Friends of Clark County to revisit this process. They reviewed definitions for each classification of land and planning assumptions for determining potential housing units and employment.

Another comprehensive review of the VBLM criteria and assumptions was undertaken in 2006 as part of the growth management plan update. This review compared the 1996 prediction to the 2006 model. This review demonstrated that for the most part the model was a good predictor of what land would develop. However, changes were made to the model based on results of this review. Important changes to the model include:

- Underutilized land determination for all models was changed to a building value per acre criteria.
- The industrial model and commercial model now have consistent classifications. The industrial model was revised to match the commercial process.
- Environmental constraints methodology changed from applying assumptions to parcels based on percentage of critical land to simply identifying constrained and non constrained land by parcel and applying higher deductions to constrained lands.

Example Map of Constrained Lands



Benefits of the current improvements are more consistency and easier monitoring of the model. Better accounting for private open space, constrained lands, and exempt port properties. And calculations for underutilized lands are more dynamic.

Model Classifications

The model classifies lands into three urban land use categories--residential, commercial, and industrial. Lands are grouped into land use codes based on comprehensive plan designations for model purposes. Lands designated as parks & open space. public facility, mining lands, or airport within the urban growth areas are excluded from available land calculations. Additionally, all rural and urban reserve designated lands are excluded from the model. Table 1 lists a breakdown of the land use classes.

Table 1: Land Use Classes

	Comprehensive Plan	
LU	Classification	VBLM Model
1	Urban Low Density Residential	Residential – Urban Low
1	Single-Family_Low	Residential – Urban Low
1	Single-Family_Medium	Residential – Urban Low
1	Single-Family_High	Residential – Urban Low
2	Urban Medium Density	
	Residential	Residential – Urban High
2	Urban High Density Residential	Residential – Urban High
2	Multi-Family_Low	Residential – Urban High
2	Multi-Family_High	Residential – Urban High
3	Neighborhood Commercial	Commercial
3	Community Commercial	Commercial
3	General Commercial	Commercial
3	City Center	Commercial
3	Regional Center	Commercial
3	Downtown	Commercial
3	Commercial	Commercial
4	Mixed Use	Commercial
4	Town Center	Commercial
5	Office Park/Business Park	Commercial
5	Light industrial/Business park	Commercial
5	Employment Campus	Commercial
6	Light Industrial	Industrial
6	Heavy Industrial	Industrial
6	Railroad Industrial	Industrial
6	Industrial	Industrial
33	Mixed use - Residential	Residential
34	Mixed use - Employment	Commercial

The model classifies each urban parcel as built, vacant, or underutilized by the three major land uses. Additionally lands with potential environmental concerns and/or geologic hazards as consistent with the applicable section of the Clark County and other municipal codes are classified as constrained (critical lands) lands. Constrained lands are identified by parcel in the model.

Constrained lands include:

- 100 year floodplain or flood fringe
- Wetlands inventory (NWI, high quality, permitted, modeled) with 100 foot buffer
- Slopes greater than 15 percent (>25% for City of Vancouver)
- Land slide area that has active or historically unstable slopes
- Designated shorelines

- Hydric soils with 50 foot buffer
- Habitat areas with 100 foot buffer
- Species areas with 300 foot buffer
- Riparian stream buffers by stream type (Table 2)

Table 2: Riparian Buffers

Stream Type	Countywide	Vancouver Exception
Type S (Shoreline)	250 Feet	175 Feet
Type F (Fish Bearing)	200 Feet	175 Feet
Type NP (Non-fish		
bearing, perennial)	100 Feet	150 Feet
Type NP (Non-fish		
bearing, seasonal)	75 Feet	100 Feet

Residential Model

Important residential classifications include vacant, vacant critical, underutilized, and underutilized critical. These classes are used to determine gross acres available for development. Vacant exempt, vacant lots less than 5,000 square feet and all other classes are excluded from available land calculations. Table 3 lists all residential classes.

Table 3: Residential	Classifications
----------------------	-----------------

RESCLASS	Description
0	Not Residential
1	Built
2	Unknown
3	Vacant
4	Underutilized
5	Roads and Easements
6	Mansions and Condos
12	Built Exempt
13	Vacant Exempt
14	Vacant Critical
18	Underutilized Critical
19	Less than 5,000 square feet
20	Private Open Space
21	Parks and Open Space

Criteria for classifying residential lands are as follows:

- Residential Vacant Criteria
 - Building value less than \$13,000

- Not tax exempt
- Not an easement or right of way
- Not a state assessed or institutional parcel
- Not a mobile home park
- Parcel greater than 5,000 square feet
- Underutilized
 - Same as Vacant except building value criteria is replaced with a building value per acre criteria.
 - Building value per acre of land is below the 10th percentile of building value per acre for all residential parcels within all UGAs. The 10th percentile is calculated by the model for each year and for each UGA alternative.
 - Parcel size greater than 1 acre
- Mansions and Condos
 - Parcel size greater than 1 acre
 - Building value per acre greater than the 10th percentile.
- Residential Exempt
 - Properties with tax exempt status
- Easements and right of ways
- Constrained (Critical lands)
 - All classifications may be subdivided into constrained vs. not constrained. Constrained lands are described above.

Commercial and Industrial Models

Commercial and industrial lands are classified using consistent criteria with one exception; industrial classes include exempt port properties in the current model.

Important commercial classes for determining gross acres available for development include vacant, vacant critical, underutilized, and underutilized critical. Vacant exempt and vacant lots less than 5,000 square feet are excluded from available land calculations. Table 4 lists all commercial classes.

Table 4: Commercial Classifications

COMCLASS	Description
0	Not Commercial
1	Built
2	Vacant
3	Underutilized
5	Vacant Lot less than 5,000 sq feet
7	Vacant Critical
9	Underutilized Critical
10	Vacant Exempt

Important industrial classes for determining gross acres available for development include vacant, vacant critical, exempt vacant port property, exempt vacant port property critical, underutilized, underutilized critical, exempt underutilized port property critical. All exempt not port properties are excluded in the available land calculations. Table 5 lists all industrial classes.

Table 5: Industrial Classifications

INCLASS	Description
0	Not Industrial
1	Vacant
2	Underutilized
3	Vacant Critical
4	Underutilized Critical
6	Built
7	Exempt Vacant Port Property
8	Exempt Vacant Not Port
9	Exempt Vacant Port Property Critical
10	Exempt Underutilized Port
11	Exempt Underutilized Port Critical
12	Exempt Underutilized Not Port
15	Easements

Commercial and industrial models classify vacant and underutilized land as follows:

- Vacant land
 - Building value less than \$67,500
 - Not "Assessed With"- Some parcels are assessed with other parcels. These parcels are often parking lots, or multiple parcels comprising a single development. All assessed with parcels are considered built.
 - Not Exempt.
 - Port property is exempt, and is included as a separate classification in the Industrial land model.

- Not an Easement or right of way
- Parcel greater than 5,000 square feet
- Not a state assessed or institutional parcel
- Underutilized Lands
 - Same as vacant except building value criteria is replaced with a building value per acre criteria of less than \$50,000.
- Constrained (Critical lands)
 - All classifications may be subdivided into constrained vs. not constrained. Commercial and industrial constrained lands are defined the same as residential constrained lands and are listed above.
- Exempt Port Properties in the Industrial Model
 - Includes lands that are under port ownership and available for development. Buildable exempt port properties are included in available land calculations.
 - Port properties can be classified as vacant, underutilized, or constrained.

The model produces a summary of gross residential, commercial, and industrial acres available for development. Gross acres are defined as the total raw land available for development prior to any deductions for infrastructure, constrained lands, and not to convert factors.

Planning Assumptions

The next step in the buildable lands process is applying planning assumptions to the inventory of vacant and underutilized gross acres in order to arrive at a net available land supply. These assumptions account for infrastructure, reduced development on constrained land, and never to convert factors. Use factors along with employment and housing units per acre densities are applied to derived net acres to predict future capacities.

Residential Model Planning Assumptions:

- 27.7% deduction to account for both on and off-site infrastructure needs.
 20% infrastructure deduction for mixed use lands.
- Never to convert factor
 - 10% for vacant land
 - 30% for underutilized
- 50% of available constrained (critical) land will not convert
- 60% of mixed use land will develop as residential, 85% residential for Battle Ground mixed use - residential and 25% residential for mixed use employment.

Commercial and Industrial Model Planning Assumptions

- 25% infrastructure factor applied for both commercial and industrial lands.
- 20% of available constrained (critical) commercial and mixed use land will not convert
- 50% of available constrained (critical) industrial land will not convert
- 40% of mixed use land will develop as commercial, 15% commercial for Battle Ground mixed use - residential and 75% commercial for mixed use employment.

Employees and unit per acre density assumptions are applied to net developable acres to predict future employment and housing unit capacities. Densities are set by the Current Planning staff based on observed development and comprehensive plan assumptions for each UGA.

Applied residential densities vary by UGA. Table 6 lists the units per acre by UGA.

Table 6: Residential units per Acre

Urban Growth Area	Applied Housing Units per Net Developable Acre
Battle Ground	6
Camas	6
La Center	4
Ridgefield	6
Vancouver	8
Washougal	6
Woodland	6
Yacolt	4

Applied employment densities vary by land use as well. Commercial classes which includes commercial, business park, and mixed use categories apply 20 employees per acre while industrial classes apply 9 employees per acre.

Applying residential and employment planning assumptions to the VLM results produce housing units and employment carrying capacity estimates for urban growth areas. These estimates help monitor growth on an annual basis and is part of the criteria used for setting UGA boundaries during growth management plan updates. Current model layers and reports are available for viewing in Clark County's GIS Maps Online web application at:

http://gis.clark.wa.gov/vblm/

Underutilized land classes are grouped with vacant classes by land use in Maps Online and on other map products. Table 7 lists the group classes used for mapping. *Table 7: Group Classes*

GRPCLASS	Description
1	Built
2	Built w/Critical
3	Residential Vacant
4	Residential Vacant w/Critical
5	Commercial Vacant
6	Commercial Vacant w/Critical
7	Industrial Vacant
8	Industrial Vacant w/Critical
9	Public Facilities
10	Public Facilities w/Critical
11	Parks and Open Space
12	Parks and Open Space w/Critical
13	Roads and Easements

For more information on the model inputs, structure and outputs, please contact Clark County Community Planning at (360) 397-2280 or Clark County Geographic Information System (GIS) at (360) 397-2002.

APPENDIX D – ASSESSMENT OF REASONABLE MEASURES

Clark County and the incorporated cities within the county have completed review under RCW 36.70A.215 which includes comparisons between development that has occurred and the original planning assumptions and targets.

In summary, several of the cities have addressed their reasonable measures by adopting local development regulations. However, these changes in regulations may not immediately reflect higher density development within the time reviewed (2006-2014). The market and economy might regulate development and density, which may delay development with higher densities. These adopted measures will likely be reflected in the next buildable lands evaluation report. If cities do not increase their densities, then county-wide planning policies will need to be amended possibly before the next Buildable Lands Report is completed.

The following actions were previously identified as necessary revisions to local development regulations. These revisions were to be incorporated into the update process and adopted in an ordinance or resolution to ensure compliance with the GMA. These measures reflect changes in regulation that would gradually allow for higher density development within the planning horizon.

City of Battle Ground

- The City of Battle Ground Comprehensive Plan, 2004, Chapter 3: Land Use Element, reviewed the ratio of zoned land to density goals, assuring the plan is implementing current countywide density goals and housing type mix.
- Battle Ground has developed a mixed-use ordinance, Ord. 04-024 § 20 (part), 2004. Their updated 2006 development code, Title 17, Chapter 17.101.040 and 2004 Comprehensive Plan, examine minimum densities in certain districts as tools to achieve density goals.
- Battle Ground Comprehensive Plan, 2004, contains a growth management element that addresses annexation and sub-area planning in four growth management goals, listed below.

Growth Management Goal 1: The City will seek a sustainable rate of growth

<u>Objectives</u>

GMO1.1 The City will coordinate its growth projections and growth goals with other jurisdictions.

GMO1.2 The City will balance its growth with other City goals.

GMO1.3 The City will strive to grow at a rate that maintains its small town character.

GMO1.4 The City will work to provide adequate urban services concurrently with development.

GMO1.5 The City will encourage efficient growth within the existing city limits before pursuing additional annexations.

GMO1.6 The City will coordinate with Battle Ground School District during annexation processes to maintain District service standards

Growth Management Goal 2: Future growth is to occur primarily to the west and south of the current city limits and in all directions consistent with the 50-year vision.

Objectives

GMO2.1 The City will primarily focus future planning efforts to the south and west of the current city limits.

GMO2.2 The City will focus secondary planning efforts for future growth to the north and east.

Growth Management Goal 3: The City will encourage the efficient and sustainable expansion of the City through the Urban Growth Areas.

Objectives

GMO3.1 The City will seek to achieve desirable growth patterns through annexations.

GMO3.2 The City will seek to achieve a jobs/housing balance through annexations.

Growth Management Goal 4: The City will work with the County and other jurisdictions in determining growth policies for the Area of Influence.

<u>Objectives</u>

GMO4.1 The City will seek to preserve the Area of Influence for future urban growth patterns anticipated by the Vision.

City of Camas

• The City of Camas designated and zoned land, consistent with the 2007 Clark County Framework Plan, 52% of the land for single-family residential and 7% for multifamily with a range of densities such that the average density for new development can yield six units per acre. The City has designated the remaining area for 20% to industrial development, 12% for Light Industrial/Business Park development, and 9% for Commercial development.



- According to the County's 2035 projections, the City must accommodate 3,868 additional housing units within the 20-year planning horizon. The City has approximately 3,607 vacant, platted or approved lots/multi-unit complexes within the existing city limits. There are also development agreements within vacant lands that will provide an additional 583 units. Notwithstanding lands within the UGB that have not been annexed, this combined data provides the city with 4,190 future residential units—a surplus of 322 units within the 20-year planning horizon. A study in 2013 for the purpose of updating the City's transportation impact fees in 2013, forecasted that the City can accommodate a total of 7,002 additional housing units within the 20 year planning horizon. Both methods of factoring future units conclude that there will be a surplus of residential units within the planning horizon and densities in excess of 6 units per acre.
- The City of Camas adopted development standards that encourage density and efficient development of land. The following regulations in Camas Municipal Code (CMC) allow for flexible lot sizes and dimensions, to include: the Planned Residential Development code (CMC Chapter 18.23); Accessory Dwelling Units code (CMC Chapter 18.27); Mixed Use codes (CMC Chapters 18.22 and 18.24); and Flexible Development codes (CMC Chapter 18.26).
- The City has approximately 2,854 acres designated for employment (combined commercial and industrial lands), or 41% of the overall acreage. The County estimates that there is 1,279 gross acres of vacant and underutilized employment land, with a potential for creating 12,157 additional jobs.

City of La Center

- In 2006, the City La Center adopted new density requirements with single family zoning (LDR-7.5) at a minimum density of four (4) dwelling units per acre. Ninety percent of all new parcels in this district must average within 10 percent of 7,500 square feet as a total development and any phase within the development. LCMC18.130.080.
- In 2006, the City of La Center's medium density residential (MDR-16) set a minimum requirement of eight units per net acre, and a maximum density of 16 units per net acre. LCMC 18.140.010
- In 2007, the City of La Center adopted critical area development regulations that prohibit the creation of lots in wetlands or wetland buffers, allowing the city to achieve a higher net density. LCMC 18.300.050.4.f.iii.
- In 2010, La Center amended their municipal code Title 18 Subdivision Provisions to mandate applicants remainder lost must contain at least 50 percent buildable area, and that the remainder lot is capable of being developed to urban density standards. LCMC 18.210.100.
- See City of La Center's correspondence to their observed density.

La Center Correspondence

From:	Eric Eisemann
To:	Albrecht, Gary; Orjiako, Oliver; Lebowsky, Laurie
Cc:	Jeff Sarvis; "Elizabeth Decker"; Naomi Hansen
Subject:	Buildable land report - Remedial action
Date:	Friday, May 08, 2015 11:58:15 AM
Attachments:	BLR Subdivivision table v2.docx
	MulitFamilyHousingMap.pdf

Hello Gary,

I response to the recent iteration of the Buildable Land Report (BLR) the City of La Center would like to add the attached information in the County record and make the following comments.

<u>Residential Land Supply</u>. La Center, like every other jurisdiction in Clark County, experienced a dramatic run-up of housing activity in the early 2000s and an equally dramatic crash of housing starts as a result of the great recession. The City is recovering slowly, more so than Ridgefield or Camas. During the run-up, from 2005 – 2008, La Center approved 305 new single family lots. Each of the preliminary plats met the City's 4 DU/NET ACRE standard. Two subdivisions reached Final Plat (Hanna's Farm and Gordon Crest), however, 40% of their combined lots remain vacant as a result of the recession. Five (5) additional subdivisions, totaling 188 lots, were moving forward but abruptly stopped. Now, two are very close to final plat approval (Kays and Gordon Crest II) and two more have awakened and are moving forward. Earlier this year the City conducted a preapplication conference for Sunset Terrace, a new 121 lots subdivision along NE 339th St. Given this 'ground-truthing' information, it is highly unlikely that La Center has a surplus of residential land.

<u>County-approved subdivision in La Center UGA</u>. During the recession, Clark County approved the subdivision of approximately 75 acres of land within the La Center UGA creating 13 new lots. The average density of these new developments is 1 DU/5 acres. It is difficult to imagine how these lands in the La Center UGA will develop to urban densities during the 20-year planning horizon. I encourage you to consider the effect Countyapproved 5 acre lots has on La Center's density performance. (These lots at the City boundary limits and along arterial streets were approved with septic service. La Center requires all dwellings built on newly created land to connect to City sanitary sewer.)

<u>Net Density</u>. In La Center new subdivisions must achieve 4 DU/<u>NET</u> acre. 90% of all new subdivision lots must be within 10% of 7,500 S.F. The maximum allowable lot is 10,000 S.F. and the minimum 6,000SF. Like other jurisdictions La Center has an abundant supply of critical lands. The City prohibits the creation of lots in wetlands or wetland buffers. (LCMC 18.300.050.4.f.iii.) Consequently the city is able to achieve a higher net density.

<u>Multi-family dwellings</u>. La Center has 56 multi-family units in the City limits. See attached map. The Residential Professional (RP) zoning district allows single family development (4 DU/acre), multi-family units (8-16 units/acre), and retail/office uses. The Timmen Mixed Use (MX) zoning district allows single family development (4 DU/acre), multi-family units (8-16 units/acre), and retail/office uses. In the MX zone no single use may be less than 25 percent, nor more than 50 percent, of the net acreage. Regrettably, the multi-family and mixed use market has not yet found La Center a favorable location.

We recognize that the BLR is a general model. That is why we are pleased to provide this information to you in hopes that the model will more accurately tell the story of what is happening in La Center.

If you have any questions, please contact me directly.

Thank you. Eric Eric Eisemann E2 Land Use Planning, LLC 215 W. 4th Street, Suite # 201 Vancouver, WA 98660 360.750.0038 e.eisemann@e2landuse.com
Attachment: BLR Subdivivision table v2.docx

Subdivision	PIN	Location	File	Gross Acres	Lots
		La Center UGA	Approved by Clark County		
East Fork Estates (Goode Cluster)	986028830	1514 NW 339 th St. La Center, WA	PLD2010-00008 Final plat 2010	40+	10
Perrott Short Plat	209062000	2219 NE 339 th St. La Center, WA	PLD-2008-0005 Final Plat in 2009	35+	3
Totals			5.7 DU/Acre	75+	13
		City of La Center	Approved by City of La Center	Gross Acres *	Lots
Hanna's Farm	258905000 62965040 258924000 62965094	North of NW Pacific Highway	2005-001-SUB 21 vacant lots	17.07	57
Gordon Crest	258894000 258896000 258943000	West of Aspen Ave	2005-007-SUB 26 vacant lots	18.19	60
Total Final Plats			3.31 DU/ <u>Gross</u> ac.	35.26	117
Approved Preliminary Plats					
Kays	209488000	South West of NW Pacific Highway	2008-016-SUB	11.8	37
Gordon Crest II	258892000	West of Aspen Ave	2006-012-SUB	6.74	26
Highland Terrace	258636000 258644000 258702000 258703000 258704000 258727000 258763000	East of NW Pacific Highway	2006-019 SUB	25.3	100
Dana Heights	62647000	North of East 7 th Street	2006-002-SUB	3.87	14
Sargent	258717000	34102 NW 9th Avenue	2006-033-SUB	5.3	11
Preliminary Plat Total			3.55 DU/ <u>Gross</u> ac.	53.01	188

La Center Buildable Land Report Comments: 2005 – 2014

5/8/2015

* **Note**: New subdivisions must achieve 4 DU/<u>Net</u> acre. New plats must achieve 7,500 S.F. average lot size. The maximum lot size, allowable at the perimeter of the City Limits, is 11,000 S.F.

Attachments: MulitFamilyHousingMap.pdf



Ridgefield Correspondence

 From:
 Elizabeth Decker

 To:
 Albrecht, Gary; Orjiako, Oliver; Eric Eisemann; Jeff Niten

 Subject:
 VBLM remedial actions for Ridgefield Date:

 Friday, May 08, 2015 5:13:20 PM
 VBLM_PreliminaryPlatInfo.docx

Hi Gary,

I had a few comments to submit regarding the recent version of the Buildable Lands Report for the City of Ridgefield, and would like to have these comments included in the record.

<u>Residential Land Supply</u>: A couple of things I want to put in the record for the VBLM report for Ridgefield since the change in methodology shows the City with a 63 acre surplus for residential land, when the previous versions showed Ridgefield with a significant deficit. The City, as have most areas, suffered a tremendous downturn in development activity during the great recession. We have several hundred lots platted preliminarily and those lots still exist, and are going through the final plat process and/or being constructed now at a rapid pace. Several subdivisions and PUDs I want to bring to your attention include Ridgefield Woods which just received signatures on the final plat last week and contains 34 single family home lots. Canterbury Trails received preliminary plat approval in 2006 and is now going through the process to finalize the plat. Canterbury Trails will provide for 69 single family home lots. Pioneer Canyon Phases 3 and 4 are rapidly coming on-line and will provide both single family and multi family home sites. Bella Noche is coming forward with a revised preliminary plat that will provide 30 lots. Hawks Landing was preliminary platted recently and will move forward with 57 lots in the near future. A dditionally, the

with a revised preliminary plat that will provide 30 lots. Hawks Landing was preliminary platted recently and will move forward with 57 lots in the near future. Additionally, the Kemper subdivision was approved in 2007 for a total of 200 single family homes sites, none of which have been constructed at this time. In total, Ridgefield knows of 444 single and multifamily lots that will be coming forward within a year for final plat or have been final platted within the past month.

We estimate an additional 290 lots may move forward to final plat within the coming years, based on existing preliminary plat approvals, for a total of 734 lots on over 200 acres of residential land. These lots have already been committed to development and should not be calculated and vacant and buildable in the County's report.

Another factor that will impact the development potential of the residential land in the City's UGA is the City's strong commitment to parks. The City requires 25% of residential land be dedicated to park and open space during the development approval process. While up to half of that dedication may contain critical areas, the other half must contain active usable space. An override for the standard infrastructure deduction would be an appropriate remedy to accurately reflect the residential land Ridgefield has available for future development. We would suggest an additional 12.5% of gross acres be deducted from the VBLM totals to account for active usable space required for parks use, assuming that the critical areas have already been accounted for in the VBLM standard deduction.

A final consideration is that some of the residential land within Ridgefield's UGA has already been developed as large lot subdivisions under County standards, which will make it unlikely and difficult for that land to be developed at urban densities.

<u>Multifamily Targets</u>: The City currently has sufficient low and medium density residential land to achieve a 75/25 split for new development, however, the market for single-family development has moved more quickly than multifamily development. While on-the-ground supply of multifamily housing does not yet meet the 25% split, the City will comply at full build-out as proposed in the 20-year plan. Further, there are additional opportunities for higher density residential development in the City's commercial and mixed-use zones.

The City is under taking several major planning efforts including the 45th and Pioneer subarea plan which is expected to provide up to 2,000 dwelling units during the planning horizon along with commercial uses. Ridgefield Junction sub-area and the Downtown/Waterfront sub-area are expected to promote additional dwelling units as well.

The VBLM can't, unfortunately, take into account what is planned for in our current boundary and only recognizes what is on the ground at a moment in time. However, I think this e-mail should provide the county policy makers with the appropriate information to determine that the 63 acre surplus is not reflective of the development activity occurring now, or expected to occur over the next several years. Additionally, the model or the staff discussion of the model should take into account the additional ways in which Ridgefield can satisfy its 75/25 housing split with future mixed use development.

Thank you,

Elizabeth

Elizabeth Decker City of Ridgefield Consulting Planner 503.705.3806 edecker@jetplanning.net

Technical information: Supplemental VBLM Information City of Ridgefield

The following are active preliminary plats with potential to be final platted.

Subdivision Name	Assessor serial	Location	Number of lots
	number		
Ridgefield Woods	986036007	45 th and Pioneer	34 (has been recorded
			on GIS now)
Canterbury Trails	213958000	N 45 th Ave and Pioneer	69
Kemper	213745000	Pioneer and Bertsinger	200
Bella Noche	213707000	Pioneer and N 35 th Ave	30
Hawks Landing	215825000	HIIlhurst and S 35 th	57
		Place	
Pioneer Canyon Phase 3	986027692	Pioneer and N 40 th Ave	54 (final plat approved
			by Council April 23)
Pioneer Canyon Phase 4	986027694	NW corner of N 45 th	50 (estimated)
	and	Ave and Pioneer	
	surrounding		
Taverner Ridge Phases 7-9	220025000,	Hillhurst and Great	105 (estimated)
	220034000,	Blue Rd	
	220032114,		
	216032010,		
	216032005,		
	216032015		
Garrison Ridge Phase 2	121105000	Hillhurst and S Refuge	15 (estimated)
		Rd	
Stephenson Manor	220016000	Hillhurst and Great	30 (estimated)
		Blue Rd	
Columbia Acres	213710000	Reiman and N 10 th St	30 (estimated)
Cedar Creek	213713000	N 35^{th} Ave and N 10^{th} St	30 (estimated)
Pioneer Place	213800000,	N 35^{th} Ave and N 10^{th} St	30 (estimated)
	213798000		
	444		
	290		
	734		

THE CUMULATIVE EFFECTS OF URBANIZATION ON SMALL STREAMS IN THE PUGET SOUND LOWLAND ECOREGION

Christopher W. May Richard R. Horner James R. Karr Brian W. Mar Eugene B. Welch

University of Washington Seattle Washington

BACKGROUND

The Pacific Northwest (PNW), like many areas of North America, is experiencing an increase in urban development that is rapidly expanding into areas containing much of the remaining natural aquatic ecosystems. In the Puget Sound lowland (PSL) ecoregion, the natural resources most directly affected by the current pattern of watershed land use, are small streams and associated wetlands. These stream ecosystems are critical spawning and rearing habitat for several species of native salmonids (both resident and anadromous) including cutthroat trout (*Oncorhynchus clarki*), steelhead trout (*O. mykiss*), coho salmon (*O. kisutch*), chum salmon (*O. keta*), chinook salmon (*O. tshawytscha*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*). These fish, especially the salmon species, hold great ecological, cultural, and socio-economic value to the peoples of the PNW. Despite this value, the wild salmonid resource is in considerable jeopardy of being lost to future generations (Figure 1). Over the past century, salmon have disappeared from about 40% of their historical range and many of the remaining populations (especially in urbanizing areas) are severely depressed (Nehlsen et al. 1991). There is no one reason for this decline. The cumulative effects of land-use practices including timber-harvest, agriculture, and urbanization have all contributed significantly to this widely publicized "salmon-crisis".



Figure 1: Representative data showing the decline in salmon stocks in the Puget Sound lowland (PSL) region using **1978 as the base year** for spawner counts (Washington State Department of Fisheries data).

The effects of watershed urbanization on streams are well-documented (Leopold 1968; Hammer 1972; Hollis 1975; Klein 1979; Arnold et al. 1982; Booth 1991) and include extensive changes in basin hydrologic regime, channel morphologic features, and physio-chemical water quality. The cumulative effects of these alterations has produced an instream habitat structure that is significantly different from that in which salmonids and associated fauna have evolved. In addition, development pressure has a negative impact on riparian forests and wetlands that are essential to natural stream functioning. Considerable evidence of these effects exists from studies of urban streams in the PNW (Perkins 1982; Richey 1982; Steward 1983; Scott et al. 1986; Booth 1990; Booth and Reinelt 1993; Taylor 1993). Nevertheless, most previous work has fallen short of establishing cause-effect relationships among physical and chemical variables resulting from urbanization and the response of aquatic biota.

The most obvious manifestation of urban development is the increase in impervious cover and the corresponding loss of natural vegetation. Land clearing, soil compaction, riparian corridor encroachment, and modifications to the surface water drainage network all typically accompany urbanization. Watershed urbanization is most often quantified in terms of the proportion of basin area covered by impervious surfaces (Schueler 1994; Arnold and Gibbons 1996). Although impervious surfaces themselves do not generate pollution, they are the major contributor to the change in basin hydrologic regime that drives many of the physical changes affecting urban streams. Basin imperviousness and runoff are directly related (Schueler 1994). The two most common measures of imperviousness are total impervious area (%TIA) and effective impervious area (%EIA). The distinction between the two lies in the linkage between the impervious surface and the drainage network. Effective impervious surfaces are those which are directly connected to the surface drainage system. Total and effective basin impervious fractions are typically proportional to each other (Alley and Veenhuis 1983; Beyerlein 1996). In previous studies, an impervious level (%TIA) of about 10% has been identified as the level at which stream ecosystem impairment begins (Klein 1979; Steedman 1988; Schueler 1992; Booth and Reinelt 1993). Recent studies also suggest that this potential threshold may apply to wetlands as well (Reinelt and Horner 1991; Taylor 1993; Horner et al. 1996).

STUDY DESIGN

A key objective of the Puget Sound lowland (PSL) stream study was to identify the linkages between landscape-level conditions and instream environmental factors, including defining the functional relationships between watershed modifications and aquatic biota. The goal was to provide a set of stream quality indices for local resource managers to use in managing urban streams and minimizing resource degradation due to development pressures. In this scenario, there would be a reasonable expectation that a goal of maintaining given populations or communities of organisms (native salmonids) at a specified level could be met by sustaining a certain set of habitat characteristics, which in turn depend on an established group of watershed conditions. A part of this overall objective was to

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identify any thresholds of watershed urbanization as related to instream salmonid habitat and aquatic biota. The study was designed to establish the linkages between landscape-level conditions, instream habitat characteristics, and biotic integrity. A conceptual model of this design is illustrated below:

Watershed and RiparianInstream HabitatAquatic Biota=> Characteristics=> Conditions

A sub-set (22) of small-stream watersheds was chosen to represent a range of development levels from relatively undeveloped (reference) to highly urbanized (Figure 2). Total impervious surface area (% TIA), because of its integrative nature, was used as the primary measure of watershed urbanization. The attributes of the stream catchments were established using standard watershed analysis methods including geographic information system (GIS) data, aerial photographs, basin plans, and field-surveys. Impervious surface coverage, riparian integrity, instream physical habitat characteristics, chemical waterquality constituents, and aquatic biota were analyzed on both watershed and stream-segment scales. Discharge was continuously monitored by local agencies on ten of the study streams. Chemical waterquality monitoring (baseflow and storm events) was conducted at 23 sites on 19 of the study streams. Biological sampling (macroinvertebrates) was performed in 31 reaches on 21 of the study streams. Extensive surveys of instream physical habitat and riparian zone characteristics were made on 120 stream-segments on all 22 PSL streams, each representing local physiographic, morphologic, and subbasin land use conditions from the headwaters to the mouth of each stream. Salmonid abundance data were obtained from public, private, and tribal sources.



Figure 2: Puget Sound Lowland (PSL) Ecoregion

All streams were third-order or smaller, ranging in basin area from 3 to 90 km2, with headwater elevations less than 150 meters. Stream gradients were less than 3.5% (most were < 2%). The study watersheds represented the two general types of geologic and soil conditions found in the Puget Sound region. The underlying geology and soil types are mainly a result of the last glacial period (15,000 years ago). All but three of the watersheds were dominated by poorly-drained glacial till soils, with the remaining basins dominated by glacial outwash soil types (moderately well-drained). In the undisturbed, natural forested condition, PSL catchments are capable of providing adequate natural precipitation storage in the surficial "forest-duff" layer with little runoff resulting. Therefore, in natural PSL watersheds a subsurface flow hydrologic regime dominates. Development typically strips away this absorbent forest soil layer and compacts the underlying soil and exposes the underlying till layer. Also lost is a significant amount of interception storage as well as evapo-transpiration potential provided by the regionally dominant coniferous forest. The typical suburban development in the PNW has been estimated to have roughly 90% less storage capacity than under naturally forested conditions (Wigmosta

et al. 1994). The latest (1990) stormwater mitigation and best-management practices (BMPs) have the potential to recover only about 25% of the original storage capacity (Barker et al. 1991). Because these standards affected very little new development that occurred between 1990 and the start of this study in 1994, the basin conditions observed largely reflected the pre-1990 situation with little effective stormwater control present. Therefore, no significant conclusions could be drawn about the effectiveness of current stormwater controls (BMPs) and regulations during this research.

RESULTS AND DISCUSSION

Watershed Conditions

Watershed imperviousness ranged from undeveloped (% TIA < 5%) to highly urbanized (% TIA > 45%). Imperviousness (% TIA) was the primary measure of watershed development; however, other measures of urbanization were investigated. Calculating impervious surface area can be costly, especially if computerized methods like GIS are utilized. In addition, the land-use data required for calculation of % TIA may be unavailable or inaccurate. As part of this study, a low-cost alternative to imperviousness was also investigated. Analysis demonstrated that the relationships to be discussed were very similar if development is alternatively expressed as road-density (Figure 3). This is especially relevant in that the transportation component of imperviousness often exceeds the "rooftop" component in many land-use categories (Schueler 1994). A recent study in the Puget Sound region has shown that the transportation component typical accounts for over 60% of basin imperviousness in suburban areas (City of Olympia 1994).

Watershed urbanization results in significant changes in basin hydrologic regime (Leopold 1968; Hollis 1975; Booth 1991). This was confirmed for streams in the PSL study. The ratio of modeled 2-year stormflow to mean winter baseflow (Cooper 1996), was used as an indicator of development-induced hydrologic fluctuation (Figure 4). This discharge ratio is proportional to the relative stream power, and thus is representative of the hydrologic stress on instream habitats and biota exerted by stormflow relative to baseflow conditions. The modified basin hydrologic regime was found to be one of the most influential changes resulting from watershed urbanization in the PSL region.

In addition to an increase in basin imperviousness and the resulting stormwater runoff, urbanization also affects watershed drainage-density (km of stream per km2 of basin area). This was first investigated by Graf (1977). Natural, pre-development drainage-density (DD) was calculated using historic topographic maps. This was compared to the current, urbanized DD which included both the loss of natural stream channels (mostly first-order and ephemeral channels lost to grading or construction) and the increase in artificial "channels" due to road-crossings and stormwater outfalls. The ratio of urban to natural DD was used as an indicator of urban impact (Figure 5).

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Figure 3: Relationship between urbanization (%TIA) and sub-basin road-density in Puget Sound lowland (PSL) streams.



Figure 4: Change in basin hydrologic regime with urbanization in Puget Sound lowland (PSL) streams as indicated by the ratio of 2- **year stormflow to winter baseflow.**

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Figure 5: Change in watershed drainage-density (DD) due to the effects of urbanization on the stream channel network.

Riparian Conditions

The natural riparian corridors along PNW streams are among the most diverse, dynamic, and complex ecosystems in the region. Natural riparian integrity in the PNW is characterized by wide buffers, a near-continuous corridor, and mature, coniferous forest as the dominant vegetation. Riparian corridors are key landscape features with significant regulatory control on environmental conditions in stream ecosystems (Naiman 1992). The extent of the riparian zone, the level of control that the riparian forest exerts on the stream environment, and the diversity of functional attributes are mainly determined by the size of the stream and the longitudinal position within the drainage network (Naiman et al. 1993). Well developed, morphologically complex floodplains are often an integral part of riparian corridors in PNW streams and rivers (Naiman 1992). The riparian corridor is frequently disturbed by flooding events, creating a naturally complex landscape. Ecological diversity in riparian zones is maintained by the natural disturbance regime (Naiman et al. 1993).

Not surprisingly, riparian conditions were also strongly influenced by the level of development in the surrounding landscape. The impact of development activities on riparian corridors can vary widely depending on the type and intensity of land-use, the degree of disturbance to streamside vegetation, and the residual integrity of the riparian zone. Under past land-use practices, increased development has led to a loss of riparian buffer width, a fragmentation of the riparian corridor, and an overall degradation in riparian quality. In general, until recently (1993), development regulations in the PNW did not specifically address riparian buffer requirements. Sensitive area ordinances, now in effect in most local municipalities, typically require riparian buffers of 30-50 meters (100-150 feet) in width. These recently adopted regulations had little influence on the urbanized streams in the PSL study. In general, wide riparian buffer needed to protect the ecological integrity of the stream system is difficult to establish (Schueler 1995). In most cases, minimum buffer width "required" depends on the resource or beneficial use of interest and the quality of the existing riparian vegetation (Castelle et al. 1994).

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Figure 6: Relationship between riparian buffer width and basin urbanization (%TIA) in Puget Sound lowland (PSL) streams.

Encroachment into the riparian buffer zone is pervasive, continuous, and extremely difficult to control. At the same time, riparian forests and wetlands, if maintained, appear to have a significant capacity to mitigate some of the adverse effects of development. A buffer width of less than 10 meters is generally considered functionally ineffective (Castelle et al., 1994). The fraction of riparian buffer less than 10 meters in width was used as a measure of riparian zone encroachment. In general, only streams in natural, undeveloped basins (% TIA < 10%) had less than 10% of their buffer in a non-functional condition. As watershed urbanization (% TIA) increased, riparian buffer encroachment also increased proportionally. The most highly urbanized streams (% TIA > 40%) in this study, generally had a large portion (upwards of 40%) of their buffers in a non-functional condition.

The longitudinal continuity or connectivity of the riparian corridor is at least as important as the lateral riparian buffer width. A near-continuous riparian zone is the typical natural condition in the PNW (Naiman 1992). Fragmentation of the riparian corridor in urban watersheds can come from a variety of human impacts; the most common and potentially damaging being road crossings. In the PSL stream study, the number of stream crossings (roads, trails, and utilities) increased in proportion to basin development intensity. All but one undeveloped stream (% TIA < 10%) had, on average, less than one riparian break per km of stream. Of the highly urbanized streams (% TIA > 40%), all but one had greater than two breaks per kilometer. Based on current development patterns in the PSL, only rural land use consistently maintained breaks in the riparian corridor to < 2 per kilometer of stream length. In general, the more fragmented and asymmetrical the buffer, the wider it needs to be to perform the desired functions (Barton et al. 1985).

The riparian zone was also examined on a qualitative basis. Mature forest, young forest, and riparian wetlands were considered "natural" as opposed to residential or commercial development. From an ecological perspective, mature forest or riparian wetlands are the two most ecologically functional riparian conditions in the PNW (Gregory et al. 1991). In the 22 PSL streams, riparian maturity was also found to be strongly influenced by watershed development. Only the natural streams (%TIA < 5%) had a

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substantial portion of their riparian corridor as mature forest (40% or greater), while urban streams consistently had little mature riparian area (Figure 7). In addition, none of the urbanized PSL streams retained more than 25% of their natural floodplain area.



Figure 7 : Relationship between watershed urbanization (%TIA) and riparian quality (maturity) in Puget Sound lowland (PSL) streams.

Chemical Water Quality

Chemical water quality constituents were monitored under baseflow and stormflow conditions. Baseflow conductivity (μ S/cm) was found to be strongly related to the level of basin development (Figure 8). Coal Creek was a confirmed outlier due to the residual effects of historic coal-mining in its headwaters. While conductivity is a non-specific chemical parameter, it is a surrogate for total dissolved solids and alkalinity, and an excellent indicator of the cumulative effects of urbanization (Olthof 1994). Storm event mean concentrations (EMC) of several chemical constituents were found to be related to both storm size (magnitude and intensity) and basin imperviousness (Bryant 1995). However, water quality criteria were rarely violated except in the most highly urbanized watersheds (% TIA > 45%). Figure 8 shows total zinc (TZn) as a representative storm EMC. Total phosphorus (TP) and total suspended solids (TSS) also showed similar relationships. Sediment zinc and lead also indicated a relationship with urbanization, again showing the highest concentrations in the most developed basins, although all were still below sediment quality guidelines. As with other recent studies (Bannerman et al. 1993; Pitt et al. 1995), these findings indicate that chemical water quality of urban streams is generally not significantly degraded at the low impervious levels, but may be a more important factor in streams draining highly urbanized watersheds.

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Instream Salmonid Habitat Characteristics

Large woody debris (LWD) is a ubiquitous component in streams of the PNW. There is no other structural component as important to salmonid habitat, especially in the case of juvenile coho (Bisson et al. 1988). LWD performs critical functions in forested lowland streams, including dissipation of flow energy, streambank protection, streambed stabilization, sediment storage, and providing instream cover and habitat diversity (Bisson et al. 1987; Masser et al. 1988; Gregory et al. 1991). Although the influence of LWD may change over time, both functionally and spatially, its overall importance to salmonid habitat is significant and persistent. Both the prvalence and quantity of LWD declined with increasing basin urbanization (Figure 9). At the same time, measures of salmonid rearing habitat, including % pool area, pool size, and pool frequency, were strongly linked to the quantity and quality of LWD in PSL streams. While LWD quantity and quality were negatively affected by urbanization, even many of the natural, undeveloped streams also had a lack of LWD (especially very large LWD). This deficit appears to a residual effect of historic timber-harvest and "stream-cleaning" activities. Nevertheless, with few exceptions (habitat restoration sites), high quantities of LWD occurred only in streams draining undeveloped basins (%TIA < 5%). It appears that stream restoration in the PSL should include enhancement of instream LWD, including addressing the long-term LWD recruitment requirements of the stream ecosystem.

An intact and mature riparian zone is the key to maintenance of instream LWD (Masser et al. 1988; Gregory et al. 1991). The lack of functional quantities of LWD in PSL streams was significantly influenced by the loss of riparian integrity (Figure 10). In general, except for restoration sites, higher quantities of LWD were found only in stream-segments with intact upstream riparian corridors. In addition, LWD quality was strongly influenced by riparian integrity. Very large, stable pieces of LWD (greater than 0.5 meter in diameter) were found only in stream-segments surrounded by mature, coniferous riparian forests. This natural LWD historically provided stable, long-lasting instream structure for salmonid habitat and flow mitigation (Masser et al. 1988).

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Figure 9: LWD quantity and watershed urbanization (%TIA) in Puget Sound lowland (PSL) streams.



Figure 10: LWD quantity and riparian integrity in Puget Sound lowland (PSL) streams.

The stream bottom substratum is critical habitat for salmonid egg incubation and embryo development, as well as being habitat for benthic macroinvertebrates. Streambed quality can be degraded by deposition of fine sediment, streambed instability due to high flows, or both. Although, the redistribution of streambed particles is a natural process in gravel-bed streams, excessive scour and aggradation often result from excessive flows. Streambed stability was monitored using bead-type scour monitors installed in salmonid spawning riffles in selected reaches (Nawa and Frissell 1993). Figures 11a and 11b illustrate these devices. As would be expected, larger scour and/or fill events normally

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resulted from larger storms and the resultant higher flows. The available stream power and basal shear stress may be the most significant factors with regard to the potential for streambed instability. Stream power is proportional to discharge and slope. Since flows tend to increase with urbanization, it would generally be expected that stream power would increase as urbanization does, all else being equal. Cooper (1996) found this to be the case for the PSL study streams. Shear stress is dependent on slope, flow velocity, and bed-roughness. It is the critical basal shear stress that determines the onset of streambed particle motion and the magnitude of scour and/or aggradation. In that local slope and streambed roughness are highly variable, it is not surprising that scour and fill are also variable and that no significant relationship was noted between the 2-Year stormflow to winter-baseflow ratio and any of the scour monitor measurements. This tends to emphasize the local nature of scour and aggradation events. Nevertheless, basin urbanization in PSL streams was found to have the potential to cause locally excessive scour and fill. Urban streams in the PSL with gradients greater than 2% and lacking in LWD, were found to be more susceptible to scour than their undeveloped counterparts.



Figure 11a: Sliding-bead type scour monitors.

Streambank erosion was also far more common in urbanized PSL streams than in streams draining undeveloped watersheds. Using a survey protocol similar to Booth (1996), all stream-segments were evaluated for streambank stability. Stream segments with >75% of the reach classified as stable were given a score of 4. Between 50% and 75% stable banks were scored as a 3, 25-50% as a 2, and <25% as a 1. Artificial streambank protection (rip-rap) was considered a sign of bank instability and graded accordingly (1). Only two undeveloped, reference (%TIA < 5%) stream-segments had a stability rating less than 3. In the 5-10% basin imperviousness (% TIA) range, the streambank ratings were generally 3 or 4. Between 10-30% sub-basin impervious area (%TIA), there was a fairly even mixture of streambank conditions from stable and natural to highly eroded or artificially "protected". Above a sub-basin %TIA of 30%, there were no segments with a streambank stability rating of 4 and very few with a rating of 3. These outliers were found only in segments with intact and wide riparian corridors. Artificial streambank protection (rip-rap) was a common feature of all highly-urbanized (%TIA > 45%) streams. Overall, the streambank stability rating was inversely correlated with cumulative upstream basin %TIA and even more closely correlated with development within the segment itself, perhaps reflecting the local effects of construction and other human activities. Streambank stability is also influenced by the condition of the riparian vegetation surrounding the stream. In this study, the streambank stability rating

was strongly related to the width of the riparian buffer and inversely related to the number of breaks in the riparian corridor. While not completely responsible for the level of streambank erosion, basin urbanization and loss of riparian vegetation, contribute to the instability of streambanks. Besides vegetative cover, other stream corridor characteristics, such as soil-type and valley hillslope gradient, also contribute to the stability potential and current condition of the banks.



Figure 10b: Streambed scour and fill as measured by a sliding-bead scour monitor.

- (a) Scour monitor installed in streambed near salmonid redd
- (b) Maximum streambed scour at peak flow during a large storm
 - * Scoured beads slide down to the end of the wire
 - * Deep enough scour may wash out salmonid redd
- (c) Post-storm sediment aggradation buries scour monitor wire
- (d) Measurement of scour and fill (aggradation) (modified from Nawa and Frissell, 1993)

Results of fine sediment sampling (McNeil method) indicated that urbanization can result in degradation of streambed habitat. Fine sediment levels (% fines) were related to upstream basin urban

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development, but the variability, even in undeveloped reaches, was quite high (Wydzga 1997). Nevertheless, % fines did not exceed 15% until %TIA exceeded 20%. In the highly urbanized basins (% TIA > 45%), the % fines were consistently > 20% except in higher gradient reaches where the sediment was presumably flushed by high stormflows.

The intragravel dissolved oxygen (IGDO) was also monitored as an integrative measure of the deleterious effect of fine sediment on salmonid incubating habitat. IGDO monitors were installed in artificial salmonid redds and monitored throughout the coho incubation period (Figures 12). A significant impact of fine sediment on salmonids is the degradation of spawning and incubating habitat (Chapman 1988). The incubation period represents a critical and sensitive phase of the salmonid lifecycle. The typical mortality during this period in natural streams can be quite high (>75%). A high percentage of fine sediment can effectively clog the interstitial spaces of the substrata and reduce water flow to the intragravel region. This can result in reduced levels of IGDO and a buildup of metabolic wastes, leading to even higher mortality. In extreme situations, sediment can form a barrier to alevin emergence, resulting in entombment and death. Elevated fine sediment levels can also have various sublethal effects on developing salmonids which may reduce the odds of survival in later life-stages (Steward 1983). While low IGDO levels are typically associated with fine sediment intrusion into the salmonid redd, local conditions can have a strong influence on intragravel conditions as well as the distribution of fine sediment (Chapman 1988). Spawning salmonids themselves can also reduce the fine sediment content of the substrata, at least temporarily. Measurement of instream DO coincident with IGDO allowed for the calculation of a IGDO/DO interchange ratio (Figure 13). In all but one case, the mean interchange ratio was > 80% in the undeveloped reaches (%TIA < 5%). As basin development (% TIA) increased above 10%, there was a great majority of the reaches in which the mean interchange ratio was well below 80% (as low as 30%). While these DO levels are not lethal, low IGDO levels during embryo development can reduce survival to emergence (Chapman 1988). Several urbanized stream-segments had unexpectedly high (>80%) IGDO concentrations (Figure 12). All of these segments were associated with intact riparian corridors and upstream riparian wetlands. Generally, these reaches also had stable streambanks and adequate levels of instream LWD.

Coho salmon rely heavily on small lowland streams and associated off-channel wetland areas during their rearing phase (Bisson et al. 1988). They are the only species of salmon that over-winter in the small streams of the PSL. Cutthroat trout are commonly found in almost all small streams in the PNW. Cutthroat and coho are sympatric in many small streams in the PNW and as such are potential competitors (adult cutthroat also prey on juvenile coho). In general, habitat, rather than food, is the limiting resource for most salmonids in the PNW region (Groot and Margolis 1991). In urban streams of the PSL, rearing habitat appears to be limiting. This study found all but the most pristine (% TIA < 5%) lowland streams had significantly less than 50% of stream habitat area as pools. In addition, the fraction of cover on pools decreased in proportion to sub-basin development. Coho rear primarily in pools with high habitat complexity, abundant cover, and with LWD as the main structural component (Bisson et al. 1988). Urbanization and loss of riparian forest area significantly reduced pool area, habitat complexity, and LWD in PSL streams.



Figure 11: Architecture of a typical salmonid redd with intragravel dissolved oxygen (IGD0) monitor installed.
(A) Streambed topography near pool-tailout. Likely spawning area is marked with "X" (area of flow into gravel)
(B) Redd construction creates a low-flow zone, facilitating egg deposition and fertilization (fine sediment flushed from pocket)
(C) Egg-pocket covered by upstream digging activity and downwelling flow maximized by redd topography. Induced flow flushes fines, provided oxygenated surface water to developing embryos, and removes metabolic wastes.



(modified from Bjornn and Reiser, 1991)

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Figure 13: Relationship between urbanization (%TIA) and mean intragravel dissolved oxygen (IGDO) to instream dissolved oxygen (**DO**) in **Puget Sound lowland (PSL) streams.**

Biological Integrity

The biological condition of the benthic macroinvertebrate community was expressed in terms of a multi-metric PSL Benthic Index of Biotic Integrity (B-IBI) developed by Kleindl (1995) and Karr (1991). The abundance ratio of juvenile coho salmon to cutthroat trout (Lucchetti and Fuerstenberg 1993) was used as a measure of salmonid community integrity. Figure 13 shows the direct relationship between urbanization (% TIA) and biological integrity, using both measures. Only undeveloped reaches (% TIA < 5%) exhibited an B-IBI of 32 or greater (45 being the maximum possible score). There also appears to be rapid decline in biotic integrity with the onset of urbanization (% TIA < 10%). At the same time, it appears unlikely that streams draining highly urbanized sub-basins (% TIA > 45%) could maintain a B-IBI greater than 15 (minimum B-IBI is 9). B-IBI scores between 25 and 32 were associated with reaches having a % TIA < 10%, with eight notable exceptions (Figure 14). These eight reaches had sub-basin % TIA values in the 25-35% (suburban) range and yet each had a much higher biological integrity than other streams at this level of development. All eight had a large upstream fraction of intact riparian wetlands and all but one had a large upstream fraction of wide riparian buffer (> 70% of the stream corridor with buffer width > 30 m). These observations indicate that maintenance of a wide, natural riparian corridor may mitigate some of the effects of watershed urbanization.

Urbanization also appears to alter the relationship between juvenile coho salmon and cutthroat trout. In this study, coho tended to dominate in undeveloped (% TIA < 5%) streams, while cutthroat were more tolerant of conditions found in urbanized streams. Figure 14 shows the ratio of coho to cutthroat abundance ratio in those PSL study streams (11) where data were available for the period of the study. Natural coho dominance (cutthroat:coho ratio > 2) was seen only at very low watershed development levels (% TIA < 5%). Due to the lack of data, a more specific development threshold could not be established. Nevertheless, it is significant that both salmonid and macroinvertebrate data indicate that a substantial loss of biological integrity occurs at a very low level of urbanization. These results confirmed the findings of earlier regional studies (Perkins 1982; Steward 1983; Scott et al. 1986; Lucchetti and Fuerstenberg 1993).

Given that relationships were identified between basin development conditions and both instream habitat characteristics and biological integrity, it is reasonable to hypothesize that similar direct associations exist between physical habitat and biological integrity. As a general rule, instream habitat conditions (both quantity and quality) correlated well with the B-IBI and the coho:cutthroat ratio. Measures of spawning and rearing habitat quality were closely related to the coho:cutthroat ratio. As might be expected, measures of streambed quality were also closely related to the B-IBI (benthic macroinvertebrates). Chemical water quality may also influence aquatic biota at higher levels of watershed urbanization.

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Figure 14: Relationship between watershed urbanization (%TIA) and biological integrity in Puget Sound lowland (PSL) streams. Benthic **index of biotic integrity (B-IBI) and the abundance ratio of juvenile** coho salmon to cutthroat trout used as indices of biological integrity.

In addition to the quantitative habitat measures, a multi-metric Qualitative Habitat Index (QHI) was also developed for PSL streams. This index assigns scores of poor (1), fair (2), good (3), and excellent (4) to each of 15 habitat-related metrics, then sums all 15 metrics for a final reach-level score (minimum score of 15 and maximum score of 60). The QHI is similar in design to that which is used in Ohio (Rankin 1989) and as part of the US EPA Rapid Bioassessment Protocol (Plafkin et al. 1989). As was expected, biological integrity was directly proportional to instream habitat quality (Figure 15). Coho dominance is consistent with a B-IBI > 33 and a QHI > 47; conditions found only in natural (% TIA < 5%), undeveloped streams. These results were consistent with the findings of a similar study in Delaware (Maxted et al. 1994). The QHI has the advantage of being simpler (less-costly) than more quantitative survey protocols, but may not meet the often rigorous (quantitative) requirements of resource managers. However, as a screening tool, it certainly has merit.

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Figure 15: Relationship between instream habitat quality and biotic integrity. Benthic **index of biotic integrity (B-IBI) and the ratio of** juvenile coho salmon to cutthroat trout are **used as indices of** biological integrity in Puget Sound lowland (PSL) streams..

A major finding of this study was that wide, continuous, and mature-forested riparian corridors appear to be effective in mitigating at least some of the cumulative effects of adjacent basin development. Using the B-IBI as the primary measure of biological integrity, Figure 16 illustrates how the combination of riparian buffer condition and basin imperviousness explains much of the variation in stream quality. These observations suggest a set of possible stream quality zones similar to those proposed by Steedman (1988). Excellent (natural) stream quality requires a low level of watershed development and a substantial amount of intact, high-quality riparian corridor. If a "good" or "fair" stream quality is acceptable, then greater development may be possible with an increasing amount of protected riparian buffer required. Poor stream quality is almost guaranteed in highly urbanized watersheds or where riparian corridors are impacted by human activities such as development, timberharvest, grazing, or agriculture. Because of the mixture of historical development practices and resource protection strategies included in this study, it was difficult to make an exact judgment as to how much riparian corridor is appropriate for each specific development scenario. More intensive research is needed in this area.

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Figure 16: Relationship between basin development, riparian buffer width, and biological integrity in PSL streams

SUMMARY

Results of the PSL stream study have shown that physical, chemical, and biological characteristics of streams change with increasing urbanization in a continuous rather than threshold fashion. Although the patterns of change differed among the attributes studied and were more strongly evident for some than for others, physical and biological measures generally changed most rapidly during the initial phase of the urbanization process as %TIA above the 5-10% range. As urbanization progressed, the rate of degradation of habitat and biologic integrity usually became more constant. There was also direct evidence that altered watershed hydrologic regime was the leading cause for the overall changes observed in instream physical habitat conditions.

Chemical water quality constituents and concentrations of metals in sediments did not follow this pattern. These variables changed little over the urbanization gradient until imperviousness (%TIA) approached 40%. Even then water column concentrations did not surpass aquatic life criteria, and sediment concentrations remained far below freshwater sediment guidelines. As urbanization (%TIA) increased above the 50% level, with most pollutant concentrations rising rapidly at that point, it is likely that the role of water and sediment chemical water quality constituents becomes more important biologically.

It is also apparent that, for almost all PSL streams, large woody debris quantity and quality must be restored for natural instream habitat diversity and complexity to be realized. Of course, prior to undertaking any habitat enhancement or rehabilitation efforts, the basin hydrologic regime must be restored to near-natural conditions. Results suggest that resource managers should concentrate on preservation of high-quality stream systems through the use of land-use controls, riparian buffers, and

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protection of critical habitat. Enhancement and mitigation efforts should be focused on watersheds where ecological function is impaired but not entirely lost.

Biological community alterations in urban streams are clearly a function of many variables representing conditions in both the immediate and more remote environment. In addition to urbanization level, a key determinant of biological integrity appears to be the quantity and quality of the riparian zone available to buffer the stream ecosystem, in some measure, from negative influences in the watershed (Figure 16). Instream habitat conditions also had a significant influence on instream biota. Streambed quality, including fine sediment content and streambed stability, clearly affected the benthic macroinvertebrate community (as measured by the B-IBI). The composition of the salmonid community was also influenced by a variety of instream physio-chemical attributes. In the PSL region, management of all streams for coho (and other sensitive salmonid species) may not be feasible. Management for cutthroat trout may be a more viable alternative for streams draining more highly urbanized watersheds. The apparent linkage between watershed, riparian, instream habitat, and biota shown here supports management of aquatic systems on a watershed scale.

The findings of this research indicate that there is a set of necessary, though not by themselves sufficient, conditions required to maintain a high level of stream quality or ecological integrity (physical, chemical, and biological). If maintenance of that level is the goal, then this set of enabling conditions constitutes standards that must be achieved if the goal is to be met. For the PSL streams, imperviousness must be limited (< 5-10 % TIA), unless mitigated by extensive riparian corridor protection and BMPs. Downstream changes to both the form and function of stream systems appear to be inevitable unless limits are placed on the extent of urban development. Stream ecosystems are not governed by a set of absolute parameters, but are dynamic and complex systems. We cannot "manage" streams, but instead should work more as "stewards" to maintain naturally high stream quality. Preservation and protection of high-quality resources should be a priority. Engineering solutions in urban streams have utility in some situations, but in most cases cannot fully mitigate the effects of development. Rehabilitation and enhancement of aquatic resources will almost certainly be required in all but the most pristine watersheds. In order to support natural levels of stream quality, the following recommendations are proposed:

- Reduce watershed imperviousness, especially targeting transportation-related surfaces and compacted pervious areas.
- Preserve at least 50% of the total watershed surface area as natural forest cover.
- Maintain urbanized stream system drainage-density to within 25% of pre-development conditions (i.e. urban/natural DD ratio < 1.25).
- Continuously monitor streamflow and maintain 2-year stormflow/baseflow discharge ratio much less than 20.
- Allow no stormwater outfalls to drain directly to the stream without first being treated by stormwater quality and quantity control facilities.
- Replace culverted road-crossings with bridges or arched-culverts with natural streambed

material.

- Retrofit existing BMPs or replace with regional (sub-basin) stormwater control facilities with the goal of restoring the natural hydrologic regime.
- Limit stream-crossings by roads or utility-lines to less than 2 per km of stream length and strive to maintain a near-continuous riparian corridor.
- Ensure that at least 70% of the riparian corridor has a minimum buffer width of 30 m and utilize wider (100 m) buffers around more sensitive or valuable resource areas.
- Limit encroachment of the riparian buffer zone through education and enforcement (< 10% of the riparian corridor should be allowed to have a buffer width < 10 m).
- Actively manage the riparian zone to ensure a long-range goal of at least 60% of the corridor as mature, coniferous forest.
- Allow no development in the active (100-year) floodplain area of streams. Allow the stream channel freedom of movement within the floodplain area.
- Protect and enhance headwater wetlands and off-channel riparian wetland areas as natural stormwater storage areas and valuable aquatic habitat resources (buffers).
- Adopt a set of regionally specific stream assessment protocols including standardized biological sampling (e.g., B-IBI).
- Under low-moderate basin development, chemical water quality monitoring should be used sparingly, if a chemical pollutant is suspected or in situations where biological monitoring indicates a problem. For highly urbanized streams, sampling should be more frequent, but should still be focused on specific constituents of concern.
- Monitoring of instream physical conditions should be tailored to the specific situation. Salmonid habitat surveys should include a measure of rearing habitat (LWD and/or pools) and a measure of spawning/incubating habitat (% fines and/or IGDO). In addition, standard channel morphological characteristics should be measured (BFW, BFD, pebble-count, and streambank condition). Scour monitoring should be used to evaluate local streambed stability in association with specific development activity.
- The complexity and diversity of salmonid life-cycles and stream communities, along with our limited understanding of them, should engender caution in proposing any simple solutions to reverse the cumulative effects of urbanization in streams of the PSL region as well as other regions.
- The following instream salmonid habitat target conditions are also proposed for urban, lowland streams in the PNW:

Instream Habitat Parameter	Salmonid Life-Phase Influenced	Indication of Poor Habitat Quality	Target for Fair Habitat Quality	Target for Good Habitat Quality
% Pool Habitat (Surface Area)	Rearing	< 30%	30-50%	> 50%
1	1	1	1	

Pool Frequency (BFW- Spacing)	Rearing	>4 BFWs	2-4 BFWs	< 2 BFWs
LWD Frequency (BFW- Spacing)	Rearing	< 1/BFW	1-2/BFW	> 2/BFW
% Key LWD (Dia. > 0.5 m)	Rearing	< 20%	20-40%	> 40%
Pool Cover (%)	Rearing	< 25%	25-50%	> 50%
IGDO/DO Interchange (%)	Spawning and Incubating	< 60%	60-80%	> 80%
Pebble-Count D10 (mm)	Spawning and Incubating	< 3 mm	3-5 mm	> 5 mm
Fine Sediment (% < 0.85 mm)	Spawning and Incubating	> 20%	15-20%	< 15%

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ETG R&D Page

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| Dissertation Recommendations Sections | Dissertation Conclusion |



Citations of Recommended Sources of Best Available Science



For Designating and Protecting Critical Areas



Office of Community Development Providing financial and technical resources to build livable and sustainable communitie

Cover Photo

This publication will help local governments designate and protect critical areas in Washington State.

OCD Photo of Tieton River/Rita R. Robison

Citations of Recommended Sources of Best Available Science For Designating and Protecting Critical Areas

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To obtain this publication in alternative format, please contact the Washington State Office of Community Development at P.O. Box 48350, Olympia, Washington 98504-8350 or call (360) 725-3000.

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Introduction

The Washington State Growth Management Act (GMA) requires every county and city in Washington to adopt policies and development regulations that designate and protect critical areas. Critical areas are defined as:

- (a) Wetlands
- (b) Areas with a critical recharging effect on aquifers used for potable water
- (c) Frequently flooded areas
- (d) Geologically hazardous areas
- (e) Fish and wildlife habitat conservation areas

While the GMA does not set specific state or regional development standards for critical areas protection, it requires local governments to designate them and protect them through the adoption of comprehensive plan policies and development regulations to carry out the plan policies.

In 1995 the Legislature added a new section to the GMA that raised the standard for designating and protecting critical areas and protecting anadromous fisheries. RCW 36.70A.172 clarifies the state's goals and policies for protecting critical areas' functions and values by requiring that local governments include the "best available science" when designating and protecting them.

The best available science or valid science is often represented as research conducted by qualified individuals using documented methodologies that lead to verifiable results and conclusions. It is important for elected officials to understand how to identify valid science and how best to integrate it into policymaking. The responsibility for including the best available science into GMA policies and development regulations rests with the legislative authority of the county or city. However, when feasible, counties and cities should consult with a qualified scientific expert or team of experts to help identify and determine the best available scientific information and assess its applicability to the relevant critical areas. State agencies can also assist local governments with guidance and identifying additional resources.

Best Available Science Guidance

The Washington State Office of Community Development (OCD) adopted administrative rule guidance in August 2000 (Chapters 365-195-900 through 925 WAC) to assist cities and counties in determining what is the best available science, where to obtain it, how to include it in land use management policies and regulations, and what to do if there is no available valid scientific information.

Scientific information can be produced only through a valid scientific process. To ensure that the best available science is being included in policies and regulations, a county or city should consider the "characteristics" of a valid scientific process and common sources of scientific information [see Chapter 365-195-905(5) WAC]. In the

context of critical areas protection, a valid scientific process is one that produces reliable information useful in understanding the consequences of a local government's regulatory decisions.

Chapter 365-195-905(2) WAC states that OCD will make available a list of resources that state agencies have identified as meeting the characteristics of the best available science. This publication, *Citations of Recommended Sources of Best Available Science for Designating and Protecting Critical Areas*, meets that requirement. However, because science is a dynamic process and new science and new interpretation of existing work occur continually, it is impossible to present all of the science in a single document that may be appropriate for use in decision making. This publication is the product of a multistate agency effort to provide current information that may be used as the best available science. OCD plans to update this information annually.

How to Use This Report

This report provides local governments with a list of valid scientific information that the state has identified to represent current sources of the best available science. As previously stated, when feasible, counties and cities should consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant issues. Local governments must substantively include the best available science in the process of developing their policies and regulations to protect the functions and values of critical areas. In addition, citations to the best available science must be presented in the record when local plans and regulations are being considered.

This report is organized into six sections and two appendices. Five sections cover the five critical areas topics and an additional section includes information on special consideration for anadromous fisheries that is useful for local planning and permitting efforts. Appendix A provides contact names from state agencies that may be helpful in providing additional localized information. Appendix B offers the relevant statutory and administrative codes for easy reference.

The citations are alphabetized by author's name and are not prioritized. They are not an exclusive list of all the best available science currently published, but offer a set of scientifically valid sources in one place. Other details about the citations are as follows:

- The critical areas information follows the topics provided in OCD's Minimum Guidelines to Classify Critical Areas, Chapter 365-190-080 WAC.
- The citations are organized into two general topic areas, critical areas classification information and critical areas guidance information.
- Much of the information relates to specific geographic areas and may not have applicability to other locations. OCD attempted to ensure that the citations met

characteristics of the best available science. Where data was outdated or was site specific, this was noted.

If publications are available through the Internet, the hyperlink site is noted. State agency libraries or the Washington State Library can also be a source for these reports and studies.

Some critical area mapping information was developed for purposes other than land use planning. For example, information presented here for tsunami areas was developed primarily for emergency management preparation. Similarly, flood maps provided from the Federal Emergency Management Agency provide important information for planning flood hazard mitigation and receiving grants from the Flood Control Assistance Account Program, but do not address aquatic habitats or other ecological information about the value of riparian functions.

For your convenience, *Citations of Recommended Sources of Best Available Science for Designating and Protecting Critical Areas* is posted on the Web site: <u>http://www.ocd.wa.gov/growth</u>

Section 1: Wetlands

The citations identified are not an exclusive list of all the best available science currently published on wetlands, but offer a principal source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Identification and Delineation

1. Washington Department of Ecology. 1997. Washington State wetlands identification and delineation manual. Publication #96-94.

The manual describes methods to be used for delineating the jurisdictional boundary of a wetland using the three parameters: water regime/hydrology, soils, and vegetation. It is required to be used by all state and local jurisdictions (RCW 36.70A.175) and produces the same boundary as the U.S. Army Corps of Engineers 1987 manual.

2. Washington Department of Natural Resources. Updated annually. GIS Data Set. Washington Natural Heritage Program.

> This data set provides geographic information system (GIS) coverage available for licensed use. The Washington Natural Heritage Program GIS includes locations and information regarding mapping high-quality wetland ecosystems in Washington State. The Natural Heritage Information System functions as a central repository of information on high quality aquatic and wetland ecosystems.

Classification

3. Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. U.S. Army Engineer Waterways Experiment Station. Technical Report WRP-DE-4.

This publication describes a wetland classification system that is used to separate different wetland types for the purpose of assessing their functions. Wetlands are grouped into different categories based on their geomorphic setting, their water source, and differences in the fluctuations of water levels.

 Cowardin, L. M., Carter, V., Golet, F. C., and LaRoe, E. T. 1979. Classification of wetlands and deepwater habitats of the United States. Office of Biological Services, U.S. Fish and Wildlife Service, U.S. Department of the Interior. FWS/OBS-79/31. 103 pp. This publication describes classification of wetlands based on the types of plants present, soils, and frequency of flooding. It was developed by the U.S. Fish and Wildlife Service to inventory wetlands across the U.S. from aerial photographs.

5. Kunze, Linda M. 1994. Preliminary classification of native, low elevation, freshwater wetland vegetation in Western Washington. Washington Natural Heritage Program, Department of Natural Resources.

This study is a result of ten years of wetland inventory and a review of the literature. It classifies and describes native wetland plant community types, provides references, and includes an appendix translating it to the Cowardin et al. (1979) classification. This preliminary classification includes native, undisturbed wetlands found in the lowlands of Western Washington. It includes impounded, semi-impounded, and tidal freshwater wetland plant communities.

Rating System

6. Washington Department of Ecology. 1991. Washington State wetland rating system for Eastern Washington. Publication #91-58.

The Washington State wetland rating system is a method for grouping wetlands into one of four categories based on their sensitivity to disturbance, whether they can be easily replaced, the presence of highly valued characteristics (such as threatened and endangered species), and habitat structure. It is often used as the basis for setting buffer requirements when development occurs in, or near, wetlands. The rating system for Eastern Washington is intended to be used in wetlands on the east side of the Cascade crest.

7. Washington Department of Ecology. 1993. Washington State wetland rating system for Western Washington. Publication #93-74.

The Washington State wetland rating system is a method for grouping wetlands into one of four categories based on their sensitivity to disturbance, whether they can be easily replaced, the presence of highly valued characteristics (such as threatened and endangered species), and habitat structure. It is often used as the basis for setting buffer requirements when development occurs in, or near, wetlands. The rating system for Western Washington is intended to be used in wetlands on the west side of the Cascade crest.

Function Assessment

 Bartoldus, C. C. 1999. A comprehensive review of wetland assessment procedures: A guide for wetland practitioners. Environmental Concern Inc., St. Michaels, Maryland. 196 pp.

This manual provides a compendium of current wetland assessment procedures that wetland practitioners can use to: (a) learn the steps, approaches, and terminology of a method, and (b) identify a procedure that meets their specific needs. A non-profit corporation devoted to wetlands research and restoration prepared this report.

9. Hruby, T. 1999. Assessments of wetland functions: What they are and what they are not. Environmental Management, vol. 23, pp. 75-85.

This scientific journal article describes the technical basis and limitations of current rapid methods for assessing wetland functions.

 Washington Department of Ecology. 2000. Methods for assessing wetland functions volume II: Depressional wetlands in the Columbia Basin for Eastern Washington – parts 1 and 2. Publication #00-06-47.

> The methods provide relatively rapid, scientifically valid procedures for assessing how well wetlands perform functions, such as improving water quality, reducing floods, and providing wildlife habitat. The methods described in this volume can be used in depressional wetlands of the Columbia Basin. The Washington Department of Ecology recommends that these methods be used only by people who have completed the five-day training workshop offered by Ecology.

 Washington Department of Ecology. 1999. Methods for assessing wetland functions volume I: Riverine and depressional wetlands in the lowlands of Western Washington – parts 1 and 2. Publication #99-115.

> The methods provide relatively rapid, scientifically valid procedures for assessing how well wetlands perform functions, such as improving water quality, reducing floods, and providing wildlife habitat. The methods described in this volume can be used in riverine and depressional wetlands in Western Washington that are in the lowlands and the foothills of the Olympic and Cascade Mountains. The Washington Department of Ecology recommends that these methods be used only by people who have completed the five-day training workshop offered by Ecology.

 Washington State Department of Transportation. 2000. Wetland functions characterization tool for linear projects. Environmental Affairs Office. 28 pp. Available at: <u>http://www.wsdot.wa.gov/eesc/environmental/programs/biology/docs/bpjtool.</u> pdf

> The Washington State Department of Transportation's method is a qualitative tool designed for rapid documentation of functions present or absent in wetlands throughout the state. It uses the best professional judgment of the qualified user to characterize the functions provided by a wetland.

Mitigation

 Kentula, M. E., et al. 1992. An approach to improving decision making in wetland restoration and creation. U.S. Environmental Protection Agency. EPA/600/R-92/150.

> A summary of strategies that can be used by resource managers to determine the appropriate mitigation for wetland impacts. This is a technical document that addresses management concerns, such as site selection and how to develop design criteria.

 National Research Council. 1996. Guidelines for the development of wetland replacement areas. National Cooperative Highway Research Program, Transportation Research Board. National Academy Press, Washington, D.C. Report 379.

This publication is a comprehensive review of wetland mitigation. It covers function assessment, setting goals and objectives, site selection, site design and construction, and developing conceptual and final mitigation plan. The appendices cover specific wetland elements (hydrology, soils, vegetation, and cost estimating) in more detail.

15. Washington Department of Ecology. 2000. Washington State wetland mitigation evaluation study, phase 1: Compliance. Publication #00-06-016.

A report that summarizes the results from visits to 45 wetlands that were created, restored, and/or enhanced in Washington to compensate for impacts to existing wetlands. This report from the first phase of the study assessed the compliance of the projects with the conditions in their development permits.

16. Washington Department of Ecology. 2001. Washington State wetland mitigation evaluation study phase 2: Success. Publication #02-06-09.

A report that summarizes the results from visits to 24 wetlands that were created, restored, and/or enhanced in Washington to compensate for impacts to existing wetlands. This second phase study assesses the overall success of compensatory mitigation projects in the state of Washington.

17. Washington Department of Ecology. 1994. Guidelines for developing freshwater wetlands mitigation plans and proposals. Publication #94-29.

This report provides guidance for those planning to undertake restoration, creation, or enhancement of freshwater wetlands to compensate for unavoidable impacts. It describes an outline that should be followed when submitting plans and proposals.

18. Washington Department of Ecology. 1992. Wetland mitigation replacement ratios: Defining equivalency. Publication #92-08.

The report summarizes and evaluates the information available before 1992 for setting the ratios needed to offset losses due to filling or other impacts to wetlands through compensatory mitigation.

Buffers

 Desbonnet, A., Pogue, P., Lee, V., and Wolff, N. 1994. Vegetated buffers in the coastal zone: A summary review and bibliography. Coastal Resources Center, University of Rhode Island Graduate School of Oceanography, Narragansett, Rhode Island. Technical Report No. 2064. 72 pp.

This report summarizes the scientific literature up to 1994 on the effectiveness of different buffer widths at maintaining the functions of aquatic resources. It also summarizes the functions provided by different buffer widths.

20. McMillan, A. 2000. The science of wetland buffers and its implications for the management of wetlands. Master's Thesis. The Evergreen State College.

This report summarizes the scientific literature on wetland buffers up to 1999. It also explores the meaning of the phrase "best available science" found in the Growth Management Act, outlines the essential provisions in buffer regulation, and recommends specific regulatory language. For information on this report, contact the author, Andy McMillan, at (360) 407-7272.

21. Washington Department of Ecology. 1992. Wetland buffers: Use and effectiveness. Publication #92-10.

This report was developed to assist those developing policies and standards for wetland protection. Specifically, the report summarizes and assesses information available before 1992 related to the use and effectiveness of wetland buffers.

General Wetland Resources

22. Azous, A. L. and Horner, R. R., editors. 1997. Wetlands and urbanization: Implications for the future. Final report of the Puget Sound Wetlands and Stormwater Management Research Program. Available at: <u>http://splash.metrokc.gov/wlr/basins/weturban.htm</u>

Also published as: Amanda L. Azous and Richard R. Horner, editors. 2001. Wetlands and urbanization, implications for the future. Lewis Publishers, New York.

A compendium of research covering hydrology, water quality, soils, vegetation, invertebrates, and wildlife communities (amphibians, birds, and small mammals) in 19 wetlands carried out over a ten-year period. The report describes the research program and characterizes the baseline physical and chemical conditions and biological communities of these wetlands. The report further describes how these characteristics changed with differing intensities of urbanization. Guidelines for better management of wetlands to minimize detrimental impacts to the abiotic and biotic conditions from watershed development are also presented.

23. Mitsch, W. J. and Gosselink, J. G. 2000. Wetlands. 3rd ed. Van Nostrand Reinhold, New York.

This is the basic textbook on wetlands used by many colleges and universities. It provides a good summary of the chemistry, geology, hydrology, and biology of wetlands.

24. National Academy of Sciences. 1995. Wetlands: Characteristics and boundaries. National Research Council, Washington, D.C.

This book presents the results of a national scientific committee on the issues of defining wetlands, characterizing them, and delineating them. It contains information on the scientific basis of wetland delineation, the regulatory framework for managing wetlands, and wetland functions.

 Schneider, C. B. and Sprecher, S. W. 2000. Wetlands management handbook. U.S. Army Engineer Research and Development Center. ERDC/EL SR-00-16. This document addresses the wetlands facet of natural resource management from a U.S. Army Corps of Engineers perspective. The purpose is to provide land managers with general guidance on basic ecological and regulatory issues that must be considered in wetland protection and management.

Section 2: Critical Aquifer Recharge Areas

The citation identified is not an exclusive list of all the best available science currently published for critical aquifer recharge areas, but offers a source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Guidance

Washington Department of Ecology. July 2000. Guidance document for establishment of critical aquifer recharge area ordinance. Water Quality Program. Publication #97-30.

This document provides guidance on what is considered a technically valid delineation of a critical aquifer recharge area boundary and to what extent additional characterization should be required for a given land use activity once a jurisdiction makes an initial determination. This document is revised and updated as new scientific information is recognized.

Section 3: Frequently Flooded Areas

The citations identified are not an exclusive list of all the best available science currently published for frequently flooded areas, but offer a source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Floodplains

Classification

1. Federal Emergency Management Agency. Flood Insurance Rate Maps.

Federal Emergency Management Agency 130-228th S.W. Bothell, WA 98021-9796 (425) 487-4678 Or 1-800-358-9616 for the FEMA map service center

Federal Emergency Management Agency (FEMA) flood maps (flood insurance rate maps) are a good resource that can help local governments classify and designate frequently flooded areas. These maps delineate the flood ways and the floodplains. These maps are used by a local government that participates in the National Flood Insurance Program (NFIP). Counties and cities must, at a minimum, include the 100-year floodplain designated by FEMA and the NFIP when designating floodways and floodplains. Maps identifying floodplains for most rivers and streams are available. The greatest detail is on the most developed or developing areas. The scale of the maps is as follows: cities (1:3,600 or 6,000); counties (1:12,000); rural areas (1:12,000). These maps show the elevation within the floodplain at which building is permitted. Local governments with shorelines should also evaluate the potential for flooding that can result from high tides combined with strong winds, tsunami resulting from oceanic seismic activity, and increases in sea level because of global warming.

Guidance

2. Bolton, S. and Shellberg, J. 2001. Ecological issues in floodplains and riparian corridors. Center for Streamside Studies, University of Washington. 150 pp.

This report, or white paper, addresses the state of the knowledge about impacts of development and land management activities on aquatic habitats including fish and shellfish habitats. This synthesis document focuses on the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. It includes an overview and the assessment of the state of the knowledge on ecological issues in floodplain and riparian corridors, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. Available at: <u>http://www.wa.gov/wdfw/hab/ahg/floodrip.htm</u>

3. Washington Department of Ecology. 1991. Comprehensive planning for flood hazard management. Publication #91-44. 106 pp.

This guidebook assists local governments in preparing a comprehensive flood hazard management plan (CFHMP) to comply with state laws and to enable communities to receive grant funds through the Flood Control Assistance Account Program (FCAAP). The guidebook provides an introduction to FCAAP, discusses the process for initiating a FCAAP, discusses the elements of the comprehensive plan, presents recommendations in preparing a CFHMP, and includes an appendix of brief descriptions of regulatory reform programs.

4. Federal Emergency Management Agency. 1999. Executive summary: Riverine erosion hazard areas, mapping feasibility study. Technical Services Division, Hazard Study Branch. 11 pp.

The purpose of this study is to determine whether it is technologically feasible to map riverine erosion hazards areas. The study includes sections regarding riverine erosion, evaluation of channel changes, literature review, assessment of technical feasibility, cost, implementations, and conclusions. Available at: http://www.fema.gov/mit/tsd/ft_reha.htm

Increased Impervious Surfaces and Stormwater

1. Arnold, C. L. and Gibbons, C. J. 1996. Impervious surface coverage: The emergence of a key environmental indicator. Journal of the American Planning Association, vol. 62, no. 2, pp. 243-258.

This article documents the importance of impervious surface coverage as an environmental indicator and its usefulness in protecting the health of local water resources. The author explains the relationship between imperviousness and changes in hydrologic processes then provides a number of examples and alternative approaches for applying these principles.

 Booth, Derek B. and Jackson, Rhett. 1997. Urbanization of aquatic systems: Degradation thresholds, stormwater detection, and the limits of mitigation. Journal of the American Water Resources Association, vol. 33, #5, pp. 1077-1090. This paper focuses on the impact of urbanization on the hydrology and stability of stream channels and discusses the limited effectiveness of the traditional detention pond approach to solving those problems.

 Horner, Richard R. 1999. Regional study supports natural land cover protection as leading best management practice for maintaining stream ecological integrity. Conference paper. Comprehensive Stormwater and Aquatic Ecosystem Management, First South Pacific Conference, Auckland, New Zealand. February 22-26, 1999. ISBN 1-877134-18-X. Vol. 1, pp. 233-247.

The study's intent was to produce a knowledge base for managing land with reference to ecological protection goals. The study conducted on streams in the Puget Sound region produced a set of conditions necessary to preserve the highest levels of biological integrity or avoid the lowest. A follow-up study is in progress to assess the influence of structural and non-structural best management practices on the same ecological communities. Results to date demonstrate that retention of a wide, nearly continuous riparian buffer in native vegetation has greater and more flexible potential than other options to uphold biological integrity when development increases. Upland forest retention also offers valuable benefits, especially in managing any development occurring in previously undeveloped or lightly developed areas. While circumstances differ in other settings, the methods used and general conclusions likely have wide applicability.

 May, Christopher W., Welch, E. B., Horner, R. R., Karr, J. R., and Mar, B. W. 1997. Quality indices for urbanization effects on Puget Sound Iowland streams. University of Washington, Civil Engineering Department, Water Resources Series, Technical Report No. 154.

This report examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of calculating total impervious area as a measure of urbanization and stream health. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments. Companion papers available at: http://www.stormwatercenter.net/Practice/18-Effects of Urbanization on Small Streams.pdf and http://pluto.apl.washington.edu/etg/chrisrdp.html

 Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: <u>http://www.stormwatercenter.net/Practice/1</u> <u>Importance%200f%20Imperviousness.pdf</u> This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low levels of development. The article also outlines techniques for mitigating or avoiding these impacts.

 Washington Department of Ecology. 2001. Stormwater management manual for Western Washington. Vols. I-V. Available at: <u>http://www.ecy.wa.gov/programs/wg/stormwater/index.html</u>

> This manual establishes the technical standards and recommended practices for stormwater management in Western Washington. The standards and practices address both new development and redevelopment and aim to protect and restore aquatic habitats and natural hydrologic processes throughout the region.

Climate Change

1. Canning, D. J. 2001. Climate variability, climate change, and sea level rise in Puget Sound: Possibilities for the future. Puget Sound Action Team. Puget Sound Research, 2001 Proceedings.

This paper discusses historical sea level rise and possible anthropogenic climate changes as it relates to Puget Sound and climate variation due to El Nino and La Nina. It also reviews current scientific and management questions.

2. Craig, D. 1993. Preliminary assessment of the sea level rise in Olympia, Washington: Technical and policy implications. Policy and Program Development Division, Olympia Public Works Department.

> This report examines the potential impact of sea level rise in the City of Olympia over the next 100 years. The document studies the increased risk of higher flood tides, higher water table, and diminished surface drainage. The focus of this paper is on Olympia's long-range planning for land uses and facilities. This document could be useful to low lying coastal communities in gaining a better understanding of potential impacts and possible responses to long-term sea level rise due to global warming.

<u>Tsunami</u>

Most of these documents regarding tsunami hazard areas are site specific and can be useful in critical area designation. Tsunami maps were designated to assist with emergency evacuation planning efforts.

- Preuss, J. and Hebenstreit, G. T. 1998. Integrated tsunami-hazard assessment for a coastal community, Grays Harbor, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, v. 2, pp. 517-536.
- Walsh, T. J., Caruthers, C. G., Heinitz, A. C., Myers, E. P., III, Baptista, A. M., Erdakos, G. B., and Kamphaus, R. A. 2000. Tsunami hazard map of the Southern Washington coast – modeled tsunami inundation from a Cascadia subduction zone earthquake. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-49, 1 sheet, scale 1:100,000, p. 12.

Section 4: Geologically Hazardous Areas

The citations are not an exclusive list of all the best available science currently published for geologically hazardous areas, but offer a principal source of scientifically valid information useful for local governments planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

The following references can be useful in critical area mapping and designation, but some mapping information was designed for emergency management purposes and may have limited utility for land use planning.

General

- 1. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio. King County. Vol. 1.
- Manson, C. J., editor. 2001. Digital bibliography of the geology and mineral resources of Washington State, 1798-2000. Division of Geology and Earth Resources, Washington Department of Natural Resources. CD-ROM.

The file contains the citations and indexing for more than 35,000 items and includes both the items listed in the Department of Natural Resources' printed bibliographies and those non-Washington items located in its library. The CD-ROM disc contains search software and runs on Windows 3.1 or higher; it does not run on Macintosh computers or over a local area network (LAN). The software allows searching by author, date, title, publisher, county or formation name, call number, or subject, with Boolean combinations. Search results can then be sorted by any of the fields, and the user can print in several different report forms. The CD-ROM disc is updated every January and is free to local governments and educators in Washington State.

 Washington Department of Ecology. 1978-1980. Slope stability maps and Coastal Zone Atlas. Vols. 1-12, maps, scale 1:24,000. Available at: <u>http://www.ecy.wa.gov/programs/sea/landslides/maps/maps.html</u>

These maps of Puget Sound coastal areas are intended to educate the public about Washington's shoreline and to guide regional land use decisions. The Washington Department of Ecology (Ecology) recommends that these maps should not be used as a substitute for site-specific studies carried out by qualified, licensed geologists and engineers.

This mapping represents conditions observed in the early and mid-1970s. Shorelines and steep slopes are dynamic areas and many landslides have occurred since that time that are not reflected on these maps. Subsequent human activities may have increased or decreased the stability of some areas. Ecology can make no warranty of the accuracy, completeness, or fitness for use of this information.

Mapping in the Coastal Zone Atlas only extends 2000 feet inland from the shoreline. Mapping was carried out only in those areas under direct state shoreline jurisdiction and therefore did not include federal military installations or tribal jurisdictions.

 Washington Department of Natural Resources. 2001. Publications of the Washington Division of Geology and Earth Resources. Division of Geology and Earth Resources. 38 pp. Available at: <u>http://www.wa.gov/dnr/htdocs/ger/publist.htm</u>

This publication provides a list of publications available through the Washington Department of Natural Resources regarding Washington State earth resources. The publication includes: reports, bulletins, geologic maps, topographic maps, report investigations, information circulars, open file reports, miscellaneous publications, author index, subject index, and Washington geology article index.

Erosion Hazard Areas

Federal Emergency Management Agency. 1999. Executive summary: Riverine erosion hazard areas, mapping feasibility study. Technical Services Division, Hazard Study Branch. 11 pp. Available at: <u>http://www.fema.gov/mit/tsd/ft_reha.htm</u>

The purpose of this study is to determine whether it is technologically feasible to map riverine erosion hazards areas. The study includes sections regarding riverine erosion, evaluation of channel changes, literature review, assessment of technical feasibility, cost, implementations, and conclusions.

Landslide and Marine Bluff Hazard Areas

Most of these documents regarding landslide hazards areas are site specific and can be useful in critical area designation.

 Baum, R. L., Harp E. L., and Hultman, W. A. 2000. Map showing recent and historic landslide activity on coastal bluffs of Puget Sound between Shilshole Bay and Everett, Washington. U.S. Geological Survey. Miscellaneous Field Studies Map MF-2346, 1 sheet, scale 1:24,000.

- Deeter, J. D. 1979. Quaternary geology and stratigraphy of Kitsap County, Washington. Western Washington University Master of Science thesis, 175 pp., 2 plates.
- Easterbrook, D. J. 1976. Map showing slope stability in Western Whatcom County, Washington. U.S. Geological Survey Miscellaneous Investigations Series Map I-854-C, 1 sheet, scale 1:62,500.
- 4. Gerstel, W. J. and Brunengo, M. J. 1994. Mass wasting on the urban fringe. Washington Geology, v. 22, no. 2, pp. 11-17.
- Gerstel, W. J., Brunengo, M. J., Lingley, W. S., Jr., Logan, R. L., and Walsh, T. J. 1997. Puget Sound bluffs: The where, why, and when of landslides following the holiday 1996/97 storms. Washington Geology, vol. 25, no. 1, pp. 17-31.
- 6. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio. King County. V 1.
- Shipman, Hugh. 2001. Coastal landsliding on Puget Sound: A review of landslides occurring between 1996 and 1999. Washington Department of Ecology. Report #01-06-019. 87 pp.

The report provides documentation of major episodes of landsliding during the 1996-97 and 1998-99 winter seasons, and uses this information to better understand how local governments and agencies might reduce the risks from coastal landslides in the future.

- Thorsen, G. W. 1989. Landslide provinces in Washington. In Galster, R. W., Chairman. Engineering Geology in Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Bulletin 78, v. I, pp. 71-89.
- Thom, Ronald M. and Williams, Gregory D. 2001. Marine and estuarine shoreline modification issues. Battelle Marine Sciences Laboratory, Sequim, Washington. 136 pp. Available at: <u>http://www.wa.gov/wdfw/hab/ahg/marnrsrc.htm</u>

The state-of-the-knowledge white paper on marine and estuarine shoreline modification addresses design and ecological considerations associated with hard and soft structural shoreline stabilization (bulkheads, rock revetments, groins, jetties, beach nourishment, and biotechnology), non-structural stabilization (setbacks, vegetation management, and ground/surface water management), estuary and shoreline restoration, tidegates, outfalls, and artificial reefs.

- 10. Tubbs, D. W. 1974. Landslides in Seattle. Division of Geology and Earth Resources, Washington Department of Natural Resources. Information Circular 52, 15 pp., 1 plate.
- U.S. Geological Survey. 1975. Slope map of part of west-central King County, Washington. U.S. Geological Survey. Miscellaneous Investigations Series Map I-852-E, 1 sheet, scale 1:48,000.
- 12. Washington Department of Ecology. 1978-1980. Slope stability maps and Coastal Zone Atlas. Vols. 1-12, maps, scale 1:24,000. Available at: <u>http://www.ecy.wa.gov/programs/sea/landslides/maps/maps.html</u>

Mapping in the Coastal Zone Atlas only extends 2000 feet inland from the shoreline, and does not include tribal or federal jurisdictions.

These maps are intended to educate the public about Washington's shoreline and to guide regional land use decisions. The Washington Department of Ecology recommends that these maps should not be used as a substitute for site-specific studies carried out by qualified, licensed geologists and engineers.

Seismic Hazard Areas

Many of these documents regarding seismic hazard areas are site specific and can be useful in critical area designation.

- Chleborad, A. F. and Schuster, R. L. 1998. Ground failure associated with the Puget Sound region earthquakes of April 13, 1949, and April 29, 1965. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 373-440.
- Dragovich, J. D. and Pringle, P. T. 1995. Liquefaction susceptibility for the Sumner 7.5-minute quadrangle, Washington, with a section on liquefaction by S. P. Palmer. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-44, 1 sheet, scale 1:24,000, p. 26.
- Grant, W. P., Perkins, W. J., and Youd, T. L. 1998. Evaluation of liquefaction potential in Seattle, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, pp. 441-473.
- 4. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio King County, December 1990. Vol. 1.

- Kockelman, W. J. 1998. Techniques for reducing earthquake hazards. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 479-496.
- May, P. J. 1998. Earthquake risk-reduction prospects for the Puget Sound and Portland, Oregon, areas. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 497-515.
- Palmer, S. P. 1992. Preliminary maps of liquefaction susceptibility for the Renton and Auburn 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Open File Report 92-7, 24 pp., 2 plates.
- Palmer, S. P. 1994. Revision to the 1994 Uniform Building Code seismic zone map for Washington and Oregon. Washington Geology, vol. 22, no. 2, p. 35.
- Palmer, S. P., Schasse, H. W., and Norman, D. K. 1994. Liquefaction susceptibility for the Des Moines and Renton 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-41, 2 sheets, scale 1:24,000, p. 15.
- Palmer, S. P., Walsh, T. J., and Gerstel, W. J. 1999. Geologic folio of the Olympia-Lacey-Tumwater urban area, Washington – Liquefaction susceptibility map. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-47, 1 sheet, scale 1:48,000, p. 16.
- Palmer, S. P., Walsh, T. J., Logan, R. L., and Gerstel, W. J. 1995. Liquefaction susceptibility for the Auburn and Poverty Bay 7.5-minute quadrangles, Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-43, 2 sheets, scale 1:24,000, p. 15.
- Perkins, J. B. and Moy, K. K. 1998. Liability for earthquake hazards or losses and its impacts on the cities and counties of Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, pp. 543-545.

- Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R. 1996. Map showing known or suspected faults with quaternary displacement in the Pacific Northwest. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, Plate 1, scale 1:2,000,000.
- Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. 1998. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey Professional Paper 1560, vol. 2, 545 pp., 6 plates.
- 15. Shannon & Wilson Inc. 1993. Evaluation of liquefaction potential Tacoma, Washington. Final technical report. Vol. 1.
- Youd, T. L. 1996. Liquefaction hazard maps for the Portland quadrangle, Oregon, and comparison of hazard with performance during past earthquakes [abstract]. Geological Society of America Abstracts with Programs, vol. 28, no. 5, pp. 127-128.

Mine Hazard Areas

- 1. King County Parks, Planning, and Resources Department. 1990. Sensitive areas map folio King County, December 1990. Vol. 1.
- 2. Walsh, T. J. 1994. Growth management planning for abandoned coal mines. Washington Geology, vol. 22, no. 2, pp. 33-34.
- Walsh, T. J. and Bailey, M. J. 1989. Coal mine subsidence at Renton, Washington. In Galsters, R. W., chairman. Engineering Geology in Washington. Division of Geology and Earth Resources, Washington Department of Natural Resources. Bulletin 78, v. II, pp. 703-712.

Note: The Division of Geology and Earth Resources, Washington Department of Natural Resources also maintains a large collection of maps showing the underground workings of Western Washington coal mines.

Volcanic Hazard Areas

The following documents provide general information on volcanic hazards in Washington.

- 1. Pringle, P. T. 1994. Volcanic hazards in Washington A growth management perspective. Washington Geology, vol. 22, no. 2, pp. 25-33.
- 2. Waldron, H. H. 1989. Volcanic hazards in Washington. In Galster, R. W., chairman. Engineering Geology in Washington. Division of Geology and

Earth Resources, Washington Department of Natural Resources. Bulletin 78, vol. I, pp. 91-96.

Most of these documents regarding volcanic hazards are site specific and can be useful in critical area designation.

- Gardner, C. A., Scott, K. M., Miller, C. D., Myers, B., Hildreth, W., and Pringle, P. T. 1995. Potential volcanic hazards from future activity of Mount Baker, Washington. U.S. Geological Survey. Open-File Report 95-498, 16 pp., 1 plate. Available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html
- Hoblitt, R. P., Walder, J. S., Driedger, C. L., Scott, K. M., Pringle, P. T., and Vallance, J. W. 1998. Volcano hazards from Mount Rainier, Washington, revised 1998. U.S. Geological Survey. Open-File Report 98-428, 2 plates, 11 pp. Available at: <u>http://vulcan.wr.usgs.gov/Publications/hazards_reports.html</u>
- Hoblitt, R. P., Miller, C. D., and Scott, W. E. 1987. Volcanic hazards with regard to siting nuclear power plants in the Pacific Northwest. U. S. Geological Survey. Open-File Report 87-297. Available at: <u>http://vulcan.wr.usgs.gov/Publications/hazards_reports.html</u>
- Scott, W. E., Iverson, R. M., Vallance, J. W., and Hildreth, W. 1995. Volcano hazards in the Mount Adams region, Washington. U.S. Geological Survey. Open-File Report 95-492, 2 plates, p. 11. Available at: <u>http://vulcan.wr.usgs.gov/Publications/hazards_reports.html</u>
- U.S. Geological Survey. 1995. Washington State On-Line Spatial Data Sets 1995. Available at: <u>http://vulcan.wr.usgs.gov/Hazards/DataSets/Washington/framework.html</u>

These 1995 digital data sets provide Arc-Info Coverage of volcano hazards in Washington State. Twenty GIS data sets have been created that represent hazard information from the U.S. Geological Survey hazard assessments of Mount Adams, Mount Baker, Glacier Peak, Mount Rainier, and Mount St. Helens. Also available at: http://vulcan.wr.usgs.gov/Publications/hazards_reports.html

- Waitt, R. B., Mastin, L. G., and Beget, J. E. 1995. Volcanic-hazard zonation for Glacier Peak volcano, Washington. U.S. Geological Survey. Open-File Report 95-499, 2 plates, p. 9. Available at: <u>http://vulcan.wr.usgs.gov/Publications/hazards_reports.html</u>
- Wolfe, E. W. and Pierson, T. C. 1995. Volcanic-hazard zonation for Mount St. Helens, Washington, 1995. U.S. Geological Survey. Open-File Report 95-497, 1 plate, p. 12. Available at: <u>http://vulcan.wr.usgs.gov/Publications/hazards_reports.html</u>

Tsunami Hazard Areas

- Preuss, Jane and Hebenstreit, G. T. 1998. Integrated tsunami-hazard assessment for a coastal community, Grays Harbor, Washington. In Rogers, A. M., Walsh, T. J., Kockelman, W. J., and Priest, G. R., editors. Assessing earthquake hazards and reducing risk in the Pacific Northwest. U.S. Geological Survey, Professional Paper 1560, vol. 2, pp. 517-536.
- Walsh, T. J., Caruthers, C. G., Heinitz, A. C., Myers, E. P., III, Baptista, A. M., Erdakos, G. B., and Kamphaus, R. A. 2000. Tsunami hazard map of the Southern Washington coast – modeled tsunami inundation from a Cascadia subduction zone earthquake. Division of Geology and Earth Resources, Washington Department of Natural Resources. Geologic Map GM-49, 1 sheet, scale 1:100,000, p. 12.

Guidance

3. Menashe, E. 1993. Vegetation management: A guide for Puget Sound bluff property owners. Shorelands and Coastal Zone Management Program, Washington Department of Ecology. Publication #93-31.

This booklet provides some general information concerning the use of existing vegetation on steep slopes around Puget Sound. The booklet discusses reducing soil mass surface and soil erosion by vegetation management. The booklet does not deal with issues such as shoreline armoring.

 Myers, R. D., Michele, L., and Myers, J. N. 1995. Surface water and groundwater on coastal bluffs: A guide for Puget Sound property owners. Shorelands and Water Resources Program, Washington Department of Ecology. Publication #95-107.

> This publication provides general information pertaining to water management techniques and drainage control programs on coastal slope areas.

Section 5: Fish and Wildlife Habitat Conservation Areas

The citations identified are not an exclusive list of all the best available science currently published for fish and wildlife habitat conservation areas, but offer a principal source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Endangered, Threatened, and Sensitive Species and Habitats

Classification

1. Cullinan, T. 2001. Important bird areas of Washington. Audubon Washington. 170 pp.

This publication presents the initial results or first phase of the Important Bird Area (IBA) program in Washington. It is intended to be updated as new information is submitted and scientifically reviewed using biological criteria and expert ornithologists' review for IBA status. IBAs represent both terrestrial and aquatic sites that are critically important to birds during breeding, wintering, and migration. Copies can be obtained by contacting Audubon Washington, P.O. Box 462, Olympia, Washington 98507.

2. Washington Department of Fish and Wildlife. Maps and digital information. Available at: <u>http://www.wa.gov/wdfw/hab/release.htm</u>

The Washington Department of Fish and Wildlife (WDFW) maintains a GIS database that contains information on important fish and wildlife species that can be useful in land use decisions and activities. WDFW provides maps and reports that answer the most common questions concerning the presence of important fish and wildlife species. The data available from WDFW documents include known important wildlife resources. The materials covered on the maps include information from several databases, including Priority Habitats and Species, Wildlife Heritage, National Wetlands Inventory, and the Washington Rivers Information System. Information on specific locations of some fish and wildlife species is considered sensitive and access to that information is restricted by WDFW policy.

Washington Department of Fish and Wildlife species of concern lists are available at: <u>http://www.wa.gov/wdfw/wlm/diversty/soc/concern.htm</u>

Washington Natural Heritage Program rare plant species lists are available at: <u>http://ww.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm</u>

3. Washington Department of Natural Resources. 1997. Endangered, threatened and sensitive vascular plants of Washington with working lists of rare nonvascular species. Washington Natural Heritage Program. 62 pp.

> This publication reflects the most current information available on the rare plants of Washington. The information was compiled from amateur and professional botanists. The purpose of this publication is to promote the conservation of rare plant species in Washington by serving as the most current reference on the status of Washington's rare plant species; help focus conservation attention on those species most in need of special consideration; and assist land and resource managers and planners in determining which species of concern might occur within their management jurisdiction. Visit the Department of Natural Resources' Natural Heritage Program online reference desk at:

http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm

Guidance

4. Bolton, S. and Shellberg, J. 2001. White Paper: Ecological issues in floodplains and riparian corridors. Center for Streamside Studies, University of Washington. 150 pp.

> This report on ecological issues in floodplain and riparian corridors addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and identifies potential mitigation measures from these impacts. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. Available at: http://www.wa.gov/wdfw/hab/ahg

5. Carrasquero, J. 2001. White Paper. Over-water structures: Freshwater issues. Herrera Environmental Consultants. 116 pp.

This report on over-water structures and freshwater issues addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and

shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. Available at: <u>http://www.wa.gov/wdfw/hab/ahg</u>

 Knutson, K. L. and Naef, V. L. 1997. Management recommendations for Washington's priority habitats: Riparian. Washington Department of Fish and Wildlife. 181 pp. Available at: http://www.wa.gov/wdfw/hab/ripxsum.htm

> This synthesis from the Washington Department of Fish and Wildlife provides statewide riparian management recommendations based on the best available science. Riparian habitat provides a vital and important resource to Washington's fish and wildlife. This document presents a synthesis of more than 1,500 pieces of literature to develop land use recommendations that accommodate riparian-associated fish and wildlife.

- Kondolf, Nathias G., Smeltzer, M., and Kimball, L. 2001. White Paper. Freshwater gravel mining and dredging issues. Prepared for the Aquatic Habitat Guidelines Steering Committee and jointly published by the Washington State Departments of Ecology, Fish and Wildlife, and Transportation. Available at: <u>http://www.wa.gov/wdfw/hab/ahg</u>
- Larson, E. M. and Nordstrom, N., editors. 2000. Management recommendations for Washington's priority species, volume IV: Birds. Available at: <u>http://www.wa.gov/wdfw/hab/phs/vol4/birdrecs.htm</u>

This document provides information on each species' geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

 Larson, E. M. and Morgan, J. T. 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife. 37 pp. Available at: <u>http://www.wa.gov/wdfw/hab/oaksum.htm</u>

> This document provides management recommendations for the priority habitat of the Oregon white oak woodlands. Oregon white oak woodlands supply a wide variety of habitats for many wildlife species. This document discusses definitions, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

 Larson, E. M., editor. 1997. Management recommendations for Washington's priority species, volume III: Amphibians and reptiles. Washington Department of Fish and Wildlife. 122 pp. Available at: <u>http://www.wa.gov/wdfw/hab/vol3.htm</u> This guidance document provides information on each organism's geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

 Larson, E. M., Rodrick, E., and Milner, R, editors. 1995. Management recommendations for Washington's priority species, volume I: Invertebrates. Washington Department of Fish and Wildlife. 82 pp. Available at: <u>http://www.wa.gov/wdfw/hab/val1.htm</u>

> The document contains species management recommendations and includes most terrestrial and freshwater invertebrates on the Priority Habitats and Species list. This guidance document provides information on each organism's geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

12. May, Christopher W. 2000. Kitsap Peninsula salmonid habitat refugia study. 282 pp.

This Kitsap County sponsored study provides a helpful watershed model for identifying and prioritizing areas for fish habitat conservation, enhancement, and restoration efforts at the water resource inventory area level. Available at: www.kitsapgov.com/download/Refugia_body.pdf

13. Miller, D. E., Skidmore, P. G., and White, D. J. 2001. White Paper. Channel Design. Inter-Fluve Inc. 109 pp.

This report on channel design addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State. Available at: <u>http://www.wa.gov/wdfw/hab/ahg</u>

14. Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

This document is an annotated bibliography from Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS

program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best available science. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

 Nightingale, B. and Simenstad, C. 2001. White Paper. Over-water structures: Marine issues. Wetland Ecosystem Team, School of Aquatic and Fishery Sciences, University of Washington. 159 pp. Available at: <u>http://www.wa.gov/wdfw/hab/ahg</u>

This report on over-water structures addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts from over-water structures. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography.

 Poston, T. 2001. White Paper. Treated wood issues associated with over-water structures in marine and freshwater environments. Battelle. 90 pp. Available at: <u>http://www.wa.gov/wdfw/hab/ahg</u>

This report on treated wood issues associated with over-water structures in marine and freshwater environments addresses the current state of the knowledge of impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of the knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography.

17. Rodrick, E. and Milner, R., editors. 1991. Management recommendations for Washington's priority habitats and species. Wildlife Management, Fish Management, and Habitat Management Divisions, Washington Department of Fish and Wildlife.

> This publication provides management recommendations for forest associated priority species. The recommendations are intended for site specific discussions with landowners to encourage retention of enhancement of suitable wildlife habitat. This guidance document provides information on each species' geographic distribution, habitat requirements, and limiting factors. A bibliography of literature and a summary of habitat requirements and management recommendations for each species are also provided.

18. Washington Department of Fish and Wildlife. 1999. Priority habitats and species list. Habitat Program. 32 pp.

This publication is a catalog of habitats and species considered to be priorities for conservation and management. This documents list 18 habitat types, 140 vertebrate species, 28 invertebrate species, and 14 species groups currently on the Priority Habitat and Species list. Priority species include state endangered, threatened, sensitive, and candidate species. Priority habitats include habitat types with unique or significant value to a wide range of species.

19. Williams, G. D. and Thom, R. M. 2001. White Paper. Marine estuarine shoreline modification issues. Battelle Marine Sciences Laboratory, Pacific Northwest National Laboratory. 121 pp.

This report on marine estuarine shoreline modification issues addresses the current state of the knowledge of shoreline structures and the impacts of development and land management activities on aquatic habitat and potential mitigation measures of these impacts. It includes an overview of the guidelines project, an overview of the subject white paper, an assessment of the state of the knowledge, a summary of existing guidance, recommendations for future guidance documents, a glossary of technical terms, and a bibliography. The focus of the document is to protect and promote fully functional fish and shellfish habitat through the comprehensive and effective management of activities affecting aquatic ecosystems in Washington State.

The following citations have not been annotated, but might be helpful references to species specific issues. Reports can be obtained through the Washington Department of Fish and Wildlife.

- 20. Almack, J. 1995. Washington Grizzly Bear and Gray Wolf Research Project 1981-1995. Vols. 1-6.
- Dobler, F. C., Eby, J., Perry, C., Richardson, S., and Vander Haegen, M. 1996. Status of Washington's shrub steppe ecosystem: Extent, ownership, and wildlife/vegetation relationships.
- 22. Dunn, P. and Ewing, K., editors. 1997. Ecology and conservation of the South Puget Sound prairie landscape. The Nature Conservancy of Washington, Seattle, Washington, 289 pp.
- 23. Hallock, M. and Mongillo, P. E. 1998. Washington State status report for the pygmy whitefish. Washington Department of Fish and Wildlife.

- 24. Hayes, G. E. and Buchanan, J. B. 2001. Draft Washington State status report for the peregrine falcon. Washington Department of Fish and Wildlife. 108 pp.
- 25. Hays, D. 1997. Washington State status report for the Aleutian Canada goose. Washington Department of Fish and Wildlife.
- Hays, D., McAllister, K. R., Richardson, S. A., and Stinson, D. W. 1999. Washington State recovery plan for the western pond turtle. Washington Department of Fish and Wildlife. 66 pp.
- 27. Hays, D., Tirhi, M., and Stinson, D. 1998. Washington State status report for the sharp-tailed grouse. Washington Department of Fish and Wildlife.
- 28. Hays, D., Tirhi, M., and Stinson D. 1998. Washington State status report for the sage grouse. Washington Department of Fish and Wildlife.
- Johnson, D. H. and O'Neil, T. A., directors. 2001. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 768 pp.
- 30. Lewis, J. C. and Stinson, D. W. 1998. Washington State status report for the fisher. Washington Department of Fish and Wildlife.
- 31. Littlefield, C. D. and Ivey, G. L. 2001. Draft Washington State recovery plan for the sandhill crane. Washington Department of Fish and Wildlife. 62 pp.
- 32. McAllister, K. R. 1995. Distribution of amphibians and reptiles in Washington State. Northwest Fauna, No. 3. 81 pp.
- 33. McAllister, K. R. and Leonard, W. P. 1997. Washington State status report for the Oregon spotted frog. Washington Department of Fish and Wildlife.
- 34. Mongillo, P. E and Hallock, M. 1998. Washington State status report for the margined sculpin. Washington Department of Fish and Wildlife.
- Potter, A., Fleckenstein, J., Richardson, S., and Hays, D. 1999. Washington State status report for the mardon kipper. Washington Department of Fish and Wildlife. 39 pp.
- 36. Pruitt, L. 2000. Loggerhead shrike status assessment. U.S. Fish and Wildlife Service, Bloomington, Indiana. 169 pp.
- 37. Richardson, S. and Allen, H. 2000. Draft Washington State recovery plan for the sea otter. Washington Department of Fish and Wildlife. 67 pp.
- Richardson, S., Hays, D., Spencer, R., and Stofel, J. 1997. Washington State status report for the common loon. Washington Department of Fish and Wildlife. 53 pp.
- Ruggiero, L. F., Aubry, K. B., Buskirk, S. W., Koehler, G. M., Krebs, C. J., McKelvey, K. S., and Squires, J. R. 1999. Ecology and conservation of lynx in the United States. U.S. Forest Service, Rocky Mountain Research Station. GTR RMRS-GTR-30WWW.
- 40. Stinson, D. W. 2001. Washington State recovery plan for the lynx. Washington Department of Fish and Wildlife. 78 pp. plus five maps.
- 41. Stinson, D. W., Watson, J. W., and McAllister, K. R. 2001. Draft Washington State status report for the bald eagle. Washington Department of Fish and Wildlife. 90 pp.
- 42. U.S. Fish and Wildlife Service. 2001. Western snowy plover (Charadrius alexandrinus nivosus). Pacific Coast population draft recovery plan. Portland, Oregon. 630 pp.
- 43. Vander Haegen, W. M., Dobler, F. C., and Pierce, D. J. 2000. Shrubsteppe bird response to habitat and landscape variables in Eastern Washington, U.S.A. Conservation Biology, vol. 14, pp. 1145-1160.
- 44. Richardson, S. 1997. Washington State status report for the gray whale. Washington Department of Fish and Wildlife.
- 45. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the pygmy rabbit.
- 46. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the upland sandpiper.
- 47. Washington Department of Fish and Wildlife. 1995. Washington State recovery plan for the snowy plover.
- 48. Washington Department of Fish and Wildlife. 1996. Washington State recovery plan for the ferruginous hawk.
- 49. Washington Department of Fish and Wildlife. 1993. Washington State status report for the steller sea lion.
- 50. Washington Department of Fish and Wildlife. 1993. Washington State status report for the larch mountain salamander.

51. Washington Department of Fish and Wildlife. 1993. Washington State status report for the Oregon silverspot butterfly.

Shellfish Areas

Shellfish Sanitation and Growing Area Designations

1. May, C. W., Horner, R. R., Karr, J. R., Mar, B. W., and Welch, E. B. 1997. Effects of urbanization on small streams in the Puget Sound lowland ecoregion. Watershed Protection Techniques, vol. 2, no. 4, pp. 483-494.

This article examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of calculating total impervious area as a measure of urbanization and stream health. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments. Companion paper available at: http://pluto.apl.washington.edu/etg/chrisrdp.html Also available at: http://www.stormwatercenter.net/Practice/18-Effects%200f%20Urbanization%200m%20Small%20Streams.pdf

 Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: <u>http://www.stormwatercenter.net</u>

Also available at: <u>http://www.stormwatercenter.net/Practice/1-</u> Importance%20of%20Imperviousness.pdf

This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low levels of development. The article also outlines techniques for mitigating or avoiding these impacts. Although the research focuses on stream environments, the concepts linking development with the health of aquatic systems are transferable to shellfish watersheds and shoreline environments.

 U.S. Food and Drug Administration. 2000. National shellfish sanitation program model ordinance. 134 pp. Available at: <u>http://vm.cfsan.fda.gov/~ear/nsspotoc.html</u> This document provides guidance and sets national standards on the safe and sanitary growing, processing, and shipping of molluscan shellfish.

 Washington State Department of Health. 2001. 2000 annual inventory of commercial and recreational shellfish areas of Puget Sound. 30 pp. Available at: <u>http://www.doh.wa.gov/ehp/sf/sfpubs.htm</u>

> This report provides general information on the state's shellfish resources and an overview of the Washington State Department of Health's shellfish programs. The report also includes an accompanying map of the state's shellfish growing areas.

5. Washington State Department of Health. 2001. Shellfish programs 2000 annual reports. 384 pp.

These annually updated assessments provide information on the location and status of all commercial shellfish growing areas in the state. The reports include maps of the classified growing areas and summary water quality data for all monitoring stations.

 Washington State Department of Health and others. 1999. Public shellfish sites of Puget Sound. 41 pp. Available at: <u>http://www.doh.wa.gov/ehp/sf/sfpubs.htm</u>

> This booklet provides advice on recreational shellfish harvesting plus maps and other information on the location of public beaches, access sites, and shellfish resources around Puget Sound.

7. Washington State Department of Health. 1990 to present. Shellfish growing area sanitary surveys.

These documents are prepared periodically for all commercial shellfish growing areas in the state (the survey data will be less than 12 years old). The surveys describe the sanitary conditions of the growing areas and provide the rationale for determining the appropriate classifications.

Water Quality and Habitat Protection

8. Aquatic Habitat Guidelines Project Web site is located at: http://www.wa.gov/wdfw/hab/ahg

> This Web site contains a suite of state-of-the-knowledge white papers that synthesizes the scientific and technical literature on a variety of topics. The purpose of the papers is to provide a basis for development of future guidance materials for fisheries issues. The Aquatic Habitat Guidelines project is a joint venture of the Washington State Departments of Ecology,

Fish and Wildlife, and Transportation. In July 2001, the U.S. Army Corps of Engineers, Seattle District, joined the Aquatic Habitat Guidelines Steering Committee.

9. Arnold, C. L. and Gibbons, C. J. 1996. Impervious surface coverage: The emergence of a key environmental indicator. Journal of the American Planning Association, vol. 62, no. 2, pp. 243-258.

This article documents the importance of impervious surface coverage as an environmental indicator and its usefulness in protecting the health of local water resources. The author explains the relationship between imperviousness and changes in hydrologic processes then provides a number of examples and alternative approaches for applying these principles.

 Bremerton-Kitsap County Health District. 1999. Manual of protocol: Fecal coliform bacteria pollution identification and correction projects. Version Eight. 24 pp.

> This manual describes the local health department's techniques and standards for identifying and correcting nonpoint sources of fecal contamination in Kitsap County. The program serves as a model for resolving nonpoint pollution problems in shellfish watersheds.

 Determan, T. 2001. Status and trends in fecal coliform pollution in Puget Sound embayments year 2000. A report for the Puget Sound Ambient Monitoring Program, Washington State Department of Health. 81 pp.

This report describes the status of fecal coliform pollution in 43 growing areas around Puget Sound (focusing on central Puget Sound and Hood Canal) from January 1999 through March 2000. The document provides a short summary for each of the 26 of the growing areas suffering significant pollution impact. Each summary includes fecal coliform trends and actions undertaken to protect and restore water quality.

 Determan, T. 2000. 1999 status and trends in fecal coliform pollution in Puget Sound embayments. A report for the Puget Sound Ambient Monitoring Program, Washington State Department of Health. 104 pp.

> This report describes the status of fecal coliform in 45 growing areas around Puget Sound (focusing on north Puget Sound and the Strait of Georgia) from January 1998 through March 1999. The document provides a short summary of each of the 19 growing areas suffering significant pollution impact. Each summary includes fecal coliform trends and action undertaken to protect and restore water quality. The report helps link water quality trends with changing conditions in the adjacent watersheds.

 Determan, T. 1993. Nonpoint remedial action in Puget Sound watersheds: The effort to clean up contaminated shellfish beds, 1983 to 1990. Washington Department of Ecology. Publication #93-66. 46 pp.

> This report assesses efforts to protect and restore water quality in seven Puget Sound watersheds between 1983 and 1990. Although slightly dated, the analysis outlines useful findings related to the control of pollution from agricultural sources and on-site sewage systems in rural and urbanizing watersheds.

 Fletcher, M., Verity, P. G., Frischer, M. E., Maruya, K. A., and Scott, G. I. Not dated. Microbial indicators, phytoplankton, and bacterial communities as evidence of contamination caused by changing land use patterns. South Atlantic Bight Land Use Coastal Ecosystem Study (LUCES), South Carolina Sea Grant Consortium. Available at: http://inlet.geol.sc.edu/luces2/fletcher.html

> Information on LUCES available at: http://www.baruch.sc.edu/luces2/luces/LUCES_1.HTML

This publication is a state-of-the-knowledge report of the LUCES. It examines the use of microbial, phytoplankton, and contaminant indicators and their relationship with land use practices in adjacent areas. The report lays a foundation for refining these indicators and improving their use in evaluating the impact of changing land uses on water quality in coastal areas.

15. Mallin, M. A., Williams, K. E., Esham, E. C., and Lowe, R. P. 2000. Effect of human development on bacteriological water quality in coastal watersheds. Ecological Applications, vol. 10, no. 4, pp. 1047-1056.

This article examines the effects of human development on water quality in five estuarine watersheds in North Carolina over a four-year period. The analysis identifies a strong correlation between levels of bacterial contamination and watershed populations and an even stronger correlation between contamination and percentages of developed lands within the watersheds. The authors conclude that health risks and environmental impacts can be reduced in urbanizing watersheds by using sound land use planning to minimize impervious surfaces while maximizing the passive water treatment function of natural and constructed wetlands, grassy swales, and other "green" areas. Abstract available at:

http://www.esajournals.org/esaonline/?request=get-abstract&issn=1051-0761&volume=010&issue=04&page=1047 16. May, C. W., Horner, R. R., Karr, James R., Mar, B. W., and Welch, Eugene B. 1997. Effects of urbanization on small streams in the Puget Sound lowland ecoregion. Watershed Protection Techniques, vol. 2, no. 4, pp. 483-494. This article examines the relationships between watershed urbanization and the physical, chemical, and biological characteristics of streams. The authors assess the conditions and factors involved in this relationship, including the importance of total impervious area as a measure of urbanization and stream health. Companion paper available at: http://pluto.apl.washington.edu/etg/chrisrdp.html

> Also available at: <u>http://www.stormwatercenter.net/Practice/18-</u> Effects%20of%20Urbanization%20on%20Small%20Streams.pdf

17. Pacific Coast Shellfish Growers Association. 2001. Environmental codes of practice for the West Coast shellfish industry.

The codes serve as guidelines to ensure that shellfish operations are managed in ways that protect the natural marine environment. The document outlines objectives, strategies, and performance measures designed to address potential habitat, water quality, and other environmental changes associated with shellfish aquaculture. The document also provides the means for monitoring compliance in implementing the strategies. A comprehensive literature review and an evaluation of environmental regulations related to shellfish aquaculture are included.

 Sargeant, D. 1999. Fecal contamination source identification methods in surface water. Washington Department of Ecology. Publication #99-345. 17 pp. Available at: <u>http://www.ecy.wa.gov/pubs/99345.pdf</u>

> This literature review examines optional approaches and methods for identifying and differentiating sources of human and animal fecal contamination.

 Schueler, T. R. 1994. The importance of imperviousness. Watershed Protection Techniques, vol. 1, no. 3, pp. 100-111. Available at: <u>http://www.cwp.org/Articles/importance_of_imperviousness.htm</u> Also available at: <u>http://www.stormwatercenter.net/Practice/1-</u> Importance%20of%20Imperviousness.pdf

> This article outlines the significance of impervious surfaces as a measure of the potential impact of land development on aquatic systems. Specifically, the article correlates changes in imperviousness with changes in the hydrology, habitat structure, water quality, and bio-diversity of aquatic systems, concluding that significant degradation occurs at relatively low

levels of development. The article also outlines techniques for mitigating or avoiding these impacts.

 Schueler, T. R. 1999. Microbes and urban watersheds: Concentrations, sources, and pathways. Watershed Protection Techniques, vol. 3, no. 1, pp. 554-565. Available at: <u>http://www.stormwatercenter.net/Practice/17-</u> <u>Microbes%20in%20Urban%20Watersheds.pdf</u>

> This article characterizes contamination problems associated with bacteria and other microorganisms in developed watersheds. Among other conclusions, the author points out that "it is exceptionally difficult to maintain beneficial uses of water in the face of even low levels of watershed development" and "if a watershed manager has a beach, shellfish bed, or drinking water intake to protect, they can expect that even a modest amount of development is likely to restrict or eliminate that use."

 Scott, G. I. 1998. The impacts of urbanization on shellfish harvesting waters: Development of techniques to identify coliform pollution sources. Abstracts of Technical Papers presented at the International Conference on Shellfish Restoration, 1998. Journal of Shellfish Research, vol. 17, no. 4, pp. 1312-1313.

> This abstract explains how urbanization in areas adjacent to estuarine ecosystems has resulted in significant bacterial and chemical contamination in the Southeastern United States. The author points out that these findings "clearly indicate that fecal coliform bacteria pollution is associated with urbanization and that closure of shellfish harvesting waters may be perhaps the most significant, quantifiable impact from urbanization."

22. University of Washington. 1998. Abstracts from the Salmon in the City Conference. Center for Urban Water Resources Management. 65 pp. Available at: <u>http://www.depts.washington.edu/cuwrm/research/sitc.pdf</u>

These abstracts discuss the effects of urbanization on lowland streams and salmon habitat in the Puget Sound basin. Among the findings, the papers point out that streams are generally damaged at relatively low levels of development and impacts increase significantly at higher levels of impervious surface cover.

23. U.S. Environmental Protection Agency. 2000. Low impact development: A literature review. Office of Water. EPA-841-B-00-005, 35 pp. Available at: <u>http://www.epa.gov/owow/nps/lid.pdf</u>

This publication provides background information on key issues associated with low impact development (LID) and assesses available data and

literature describing the effectiveness of LID practices in controlling surface runoff and reducing pollution loadings to receiving waters.

24. Washington Department of Ecology. 2001. Stormwater management manual for Western Washington. Vols. I-V. Available at: <u>http://www.ecy.wa.gov/programs/wq/stormwater/index.html</u>

> This manual establishes the technical standards and recommended practices for stormwater management in Western Washington. The standards and practices address both new development and redevelopment and aim to protect and restore aquatic habitats and natural hydrologic processes throughout the region.

25. Washington Department of Fish and Wildlife. 1999. Priority habitats and species list. 31 pp. Available at: <u>http://www.wa.gov/wdfw/hab/phslist.pdf</u>

This list identifies fish and wildlife resources, including shellfish species and habitats, that are priorities for management and conservation because of their population status, sensitivity to habitat alteration, or commercial, recreational, or tribal importance.

26. Washington Department of Fish and Wildlife. Not dated. Species of concern list. Available at: <u>http://www.wa.gov/wdfw/wlm/diversty/soc/soc.htm</u>

> This list identifies fish and wildlife species that are designated by the state as either endangered, threatened, sensitive, or candidate, as well as species listed or proposed for listing by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

27. Washington State Department of Health. 2001. List of approved systems and products. 45 pp. Available at: <u>http://www.doh.wa.gov/ehp/ts/Approved_Systems_List_May-2001.PDF</u>

This document outlines the list of conventional, alternative, and proprietary on-site wastewater technologies approved for use in Washington State. Conditions for the use of these systems and products are described in the Recommended Standards and Guidance published by the Washington State Department of Health. The most recently published edition of these documents are available at:

http://www.doh.wa.gov/ehp/ts/pubs.htm#wastewater

 Weiskel, P. K., Howes, B. L., and Heufelder, G. R. 1996. Coliform contamination of a coastal embayment: Sources and transport pathways. Environmental Science and Technology, vol. 30, no. 6, pp. 1872-1881. This article documents the effects of bacterial contamination on a coastal embayment in Massachusetts.

Kelp and Eelgrass Beds

Classification

- Berry, H. D., Harper, J. R., Mumford, Jr., T. F., Bookheim, B. E., Sewell, A. T., and Tamayo, L. J. 2001. The Washington State shorezone inventory user's manual. Nearshore Habitat Program, Washington Department of Natural Resources.
- 2. Nearshore Habitat Program. 2001. The Washington State shorezone inventory. Washington Department of Natural Resources. CD-ROM.

This CD-ROM disc is a good resource for designating near shore habitat. It characterizes many biotic and physical aspects of the shoreline over a large geographic area but is limited on site-specific uses. The inventory was collected by helicopter and was not designed to capture small features.

 Dethier, Megan N. 1990. A marine and estuarine habitat classification system for Washington State. Washington Natural Heritage Program, Washington Department of Natural Resources.

Herring and Smelt Spawning Areas

Fact Sheets

- Washington Department of Fish and Wildlife. Not dated. Washington State sand lance fact sheet. Forage Fish Unit. Available at: <u>http://www.wa.gov/wdfw/fish/forage/forage.htm</u>
- Washington Department of Fish and Wildlife. Not dated. Puget Sound herring fact sheet. Forage Fish Unit. Available at: <u>http://www.wa.gov/wdfw/fish/forage/forage.htm</u>
- Washington Department of Fish and Wildlife. Not dated. Washington State surf smelt fact sheet. Forage Fish Unit. Available at: <u>http://www.wa.gov/wdfw/fish/forage/forage.htm</u>

Classification

 Penttila, D. E. 2001. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Snohomish County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This document depicts all currently known spawning areas for the Pacific herring, surf smelt, and Pacific sand lance within the area of Snohomish County, Washington. These type of forage fish species are an important part of the local marine nearshore food web. The spawning beaches designated in these documents include: the Kayak Point areas, Southern Port Gardner, the Picnic Point area, the Edmonds-Richmond Beach area, and the Tulalip Bay area.

Guidance

5. Lemberg, N. A., O'Toole, M. F., Penttila, D. E., and Stick, K. C. 1997. 1996 forage fish stock status report. Washington Department of Fish and Wildlife.

This 1994 report provides the status of marine forage fish stocks in Washington which include the Pacific herring (clupea), surf smelt (hypomesus), Pacific sand lance (ammodytes), and northern anchovy (engraulis mordax).

6. Penttila, D. E. and Moulton, L. L. 2001. Field manual: For sampling forage fish spawn in intertidal shore regions. First edition.

This is a field manual for sampling forage fish spawn in intertidal shores regions within San Juan County. This document was development as part of the San Juan Forage Fish Assessment Project and includes sections on study design descriptions, assessment, quality assurance, quality control, data reporting, and references.

 Penttila, D. E. 2000. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in East Jefferson County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This document charts all the known spawning grounds and beaches of the Pacific herring, surf smelt, and Pacific sand lance within Jefferson County and was complied from various Washington Department of Fish and Wildlife reports from 1995-1999.

8. Penttila, D. E. 2000. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Skagit

County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This paper documents the spawning beaches areas of the Pacific herring, surf smelt, and Pacific sand lance in Skagit County, Washington.

 Penttila, D. E. 1999. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Hood Canal, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

> This 1999 paper documents all known spawning beaches of the surf smelt and Pacific sand lance in the Hood Canal region.

 Penttila, D. E. 1999. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Clallam County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

> This 1999 document charts all the known spawning beaches of the surf smelt and Pacific sand lance within Clallam County, including the La Push area, the Deep Creek area, the Twin Rivers area, the Lyre River area, Dungeness Bay, Port Angeles Harbor, Sequim Bay, and Discovery Bay.

 Penttila, D. E. 1999. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in Island County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 paper documents the spawning beaches within Island County for the Pacific herring, surf smelt, and Pacific sand lance.

 Penttila, D. E. 1999. Documented spawning areas of the Pacific herring (clupea), surf smelt (hypomesus), and the Pacific sand lance (ammodytes) in San Juan County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report.

This 1999 paper charts the spawning beaches of the Pacific herring, surf smelt, and Pacific sand lance in San Juan County.

 Penttila, D. E. 1996. Documented spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Whatcom County, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Revised, 1997. This document depicts all currently known spawning areas for the surf smelt and Pacific sand lance within Whatcom County, Washington. These type of forage fish species area an important part of the local marine nearshore food web. The spawning beaches designated in this document include: Point Roberts Peninsula, the Semiahmoo Bay area, the Birch Point area, the Point Whitehorn area, Cherry Point, the Portage Bay area, the Southern Bellingham Bay area, and the Northern Bellingham area.

 Penttila, D. E. 1995. Baitfish resource and habitats of Fidalgo Bay, Skagit County, Washington. Baitfish Unit, Washington Department of Fish and Wildlife. Manuscript Report.

This report reviews studies conducted in and around Fidalgo Bay between 1972-1995. It summarizes the local life histories and spawning habitats and ecology. The report also includes other marine resources observed during the study.

 Penttila, D. E. 1995. Known spawning beaches of the surf smelt (hypomesus) and the Pacific sand lance (ammodytes) in Southern Puget Sound, Washington (Pierce, Thurston, and Mason Counties), as of March 1995. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Charts updated and revised, 1999.

> This document depicts all currently known spawning areas for the surf smelt and Pacific sand lance within Southern Puget Sound including Pierce, Thurston, and Mason Counties. These type of forage fish species are an important part of the local marine nearshore food web.

 Penttila, D. E. 1995. Spawning areas of the Pacific herring (clupea), surf smelt, (hypomesus), and Pacific sand lance (ammodytes) in Central Puget Sound, Washington. Marine Resource Division, Washington Department of Fish and Wildlife. Manuscript Report. Charts updated and revised. 1999.

This document depicts all currently known spawning areas for the Pacific herring, surf smelt, and sand lance within Central Puget Sound. The report summarizes pertinent Pacific elements of the life history of baitfish species in the marine waters north from the Tacoma Narrows Bridge to a line connecting Edmonds and Kingston, including the inlet systems on the east shore of the Kitsap Peninsula.

 Penttila, D. E. 1995. Effects of shading upland vegetation on egg survival for summer spawning surf smelt on upper intertidal beaches in Puget Sound. Marine Resources Division, Washington Department of Fish and Wildlife. CD-ROM. This study investigates how shading effects surf smelt mortalities in the northern Puget Sound.

 Washington Department of Fish and Wildlife. 1998. Forage fish management plan: A plan for managing the forage fish resources and fisheries of Washington.

Adopted by the Washington Fish and Wildlife Commission on January 24, 1998, this document contains a plan for the management of forage fish resources and fisheries in Washington State. This guidance document is used to guide resource management decisions and establish priorities regarding forage fish, such as Pacific herring, eulachon, northern anchovy, Pacific sand lance, surf smelt, sardine, and longfin smelt.

19. Washington Department of Fish and Wildlife. 1999. Documented spawning beaches of the surf smelt (hypomesus) and Pacific sand lance (ammodytes) in Hood Canal, Washington.

This briefing report documents surf smelt spawning seasons throughout the Puget Sound basin. The entire surf smelt spawning habitat survey record of the Washington Department of Fish and Wildlife, 1972-1999, was examined and spawning dates of individual broods of eggs estimated.

Naturally Occurring Ponds (Under 20 Acres)

Guidance

Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

This document is an annotated bibliography from the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best scientific information available. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

Waters of the State

Classification

Washington, State of. WAC 222-16-030 defines water types and a water typing system.

Waters of the state are defined in Title 222 WAC, the forest practices rules and regulations. Counties and cities should use the classification system established in WAC 222-16-030 to classify waters of the state. Waters of the state are to be classified according to the new Department of Natural Resources stream typing method (Type S, F, and N waters), in cooperation with the Departments of Ecology and Fish and Wildlife and in consultation with affected tribal governments. The mapping is based on a multiparameter, field-verified GIS logistic regression model. This model is habitat-driven and uses geomorphic parameters. Until these water type maps are available, an interim five stream typing system should be used. Fish habitat water types are to be updated every five years based on observed field conditions. Chapter 365-190-080(5)(vi) WAC describes how jurisdictions may consider further factors when classifying waters of the state as fish and wildlife habitats.

Water, Including Lakes, Ponds, Streams, and Rivers Where Finfish Have Been Released and Lands Where Shellfish Have Been Planted

Local governments should consult with the local tribal entity and the Washington Department of Fish and Wildlife for the latest finfish release information.

> Northwest Indian Fisheries Commission 6730 Martin Way E. Olympia, WA 98512 (360) 438-1180

Columbia River Intertribal Fisheries Commission 729 N.E. Oregon, Suite 200 Portland, OR 97232 (503) 238-0667

Washington Department of Fish and Wildlife, Fish Program 600 Capital Way N. Olympia, WA 98501-1091 (360) 902-2700

Designation

 Washington Department of Fish and Wildlife. 2001. Spring hatchery trout stocking plan for Washington lakes and streams – Annual Report. #FPA 01-02.

This publication is helpful to anglers who are looking for information on trout planting in the state and where the best opportunities for catching fish might be. Annually updated, this report can be obtained by calling the Washington Department of Fish and Wildlife at (360) 902-2700.

2. Washington Department of Fish and Wildlife. 2000. Steelhead harvest summary report.

This annually updated report offers the previous year's planting data for steelhead in the state of Washington. This report gives anglers information on where steelhead are being planted and caught in the previous year.

Guidance

3. Morgan, J. T. 1998. Annotated bibliography for Washington's priority habitats: Freshwater wetlands and fresh deepwater. Washington Department of Fish and Wildlife.

> This document is an annotated bibliography from the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) Program. The PHS program develops management recommendations for the state's priority habitat and species through a review and synthesis of the best scientific information available. The bibliography includes a wetlands bibliography and a bibliography reference organized by PHS headings that includes: definition, rationale, distribution, habitat description, fish and wildlife use, impact of land use, and management recommendations.

State Natural Areas Preserves and Natural Resources Conservation Areas

1. Washington Department of Natural Resources. 2001. State of Washington natural heritage plan. Washington Natural Heritage Program. Available at: www.wa.gov/dnr/htdocs/fr/nhp

As required by Chapter 79.70 RCW, this plan presents the criteria for the selection and approval of natural areas and lists the natural heritage resources to be considered for protection. In addition, the plan identifies priorities for protection and the roles for various agencies and groups in natural area protection.

Washington Natural Heritage Program

Washington Department of Natural Resources 1111 Washington Street S.E. P.O. Box 47014 Olympia, WA 98504-7014

2. Washington Department of Natural Resources. 1997. Endangered, threatened, and sensitive vascular plants of Washington with working lists of rare, nonvascular species. Washington Natural Heritage Program. 62 pp.

> This publication reflects the most current information available on the rare plants of Washington. The information was compiled by amateur and professional botanists. The purpose of this publication is to promote the conservation of rare plant species in Washington by serving as the most current reference on the status of Washington's rare plant species; help focus conservation attention on those species most in need of special consideration; and assist land and resource managers and planners in determining which species of concern might occur within their management jurisdiction.

 Washington Department of Natural Resources. 1992. State of Washington natural resources conservation areas: Statewide management plan. 33 pp.

> The Natural Resources Conservation Areas Statewide Management Plan guides the management of conservation areas within Washington State, based upon Chapter 79.71 RCW. Currently there are 27 natural resource conservation areas that total more than 85,000 acres statewide. Conservation areas are designated to maintain, enhance, or restore ecological systems and habitat for threatened, endangered, and sensitive plants and animals, while providing opportunities for education and low impact use. Maintaining exceptional scenic landscapes is also a high priority. The statewide plan sets the standard for a program that will combine site protection and low impact public use.

4. Natural area preserves publications are available through Natural Areas Program, Washington Department of Natural Resources. Additional Information about Natural Area Preserves and Natural Resource Conservation Areas is available by contacting:

> Natural Areas Program Lands and Resources Division Washington Department of Natural Resources P.O. Box 47016 Olympia, WA 98504-7016 (360) 902-1340

For a list of individual region Natural Areas managers in seven statewide offices, call the number listed above or consult the Washington Department of Natural Resources Web site at: http://www.wa.gov/dnr/base/exectione.htm

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Section 6: Special Consideration For Anadromous Fish Life Cycles

The citations listed are not an exclusive list of all the best available science currently published on anadromous fish, but offer a source of scientifically valid information useful for local planning and permitting efforts. Local governments are encouraged to consult with qualified scientific experts or teams of experts to help identify and determine if more current valid scientific information exists and assess its applicability to the relevant critical areas.

Special Consideration for Anadromous Fisheries

1. Aquatic Habitat Guidelines Project Web site: <u>http://www.wa.gov/wdfw/hab/ahg</u>

This Web site contains a suite of state-of-the-knowledge white papers that synthesize the scientific and technical literature on a variety of topics. The purpose of the papers is to provide a basis for development of future guidance materials for salmon issues. The Aquatic Habitat Guidelines project is a joint venture of the Washington Departments of Ecology, Fish and Wildlife, and Transportation. In July 2001, the U.S. Army Corps of Engineers, Seattle District, joined the Aquatic Habitat Guidelines Steering Committee.

 Cederholm, C. J., Johnson, D. H., Bilby, R. E., Dominguez, L., G., Garrett, A. M., Graeber, W. H., Greda, E. L., Kunze, M. D., Marcot, B. G., Palmisano, J. F., Plotnikoff, R. W., Pearcy, W. G., Simenstad, C.A., and Trotter, P. C. 2000. Pacific salmon and wildlife-ecological contexts, relationships, and implications for management. Special Edition Technical Report, Prepared for D. H. Johnson and T. A. O'Neil, Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife.

This special edition technical report synthesizes fundamental and crucial information linking salmon and wildlife species and the broader aquatic and terrestrial realms in which they co-exist. Readers will find that this report will greatly strengthen the collective understanding of the role that salmon play in the populations of Pacific Northwest wildlife species and the ecology of freshwater ecosystems, and how management activities – such as hatcheries – and harvest can impact this. Copies of this report can be acquired by contacting:

David H. Johnson Washington Department of Fish and Wildlife Habitat Program 600 Capitol Way N. Olympia, WA 98501-1091 3. Spence, B. C., Lomnicky, G. A., Hughes, R. M., and Novitzki, R. P. 1996. An ecosystem approach to salmonid conservation. ManTech Environmental Research Services Corporation. TR-4501-96-6057.

Available from the National Marine Fisheries Service, Portland, Oregon. Available at:

http://www.nwr.noaa.gov/1habcon/habweb/ManTech/front.htm#References

This document provides the technical basis from which government agencies and landowners can develop and implement an ecosystem approach to habitat conservation planning, protection, and restoration of aquatic habitat on nonfederal lands. The report also describes a process for developing, approving, and monitoring habitat conservation plans, pre-listing agreements, and other conservation agreements for nonfederal lands to be consistent with the mandates of applicable legal requirements. An appendix lists information resources that landowners and agencies may find useful in developing and evaluating habitat conservation plans. More than 1,100 sources are cited in this document.

4. National Research Council. 1996. Upstream: Salmon and society in the Pacific Northwest. Committee on Protection and Management of Pacific Northwest Anadromous Salmonids, National Academy of Science. 472 pp.

This publication can be viewed and purchased through National Academy of Science publication Web site at: http://www.nap.edu/books/0309053250/html/index.html

The report deals with anadromous forms of the seven species of the genus oncorhynchus, including: chinook, chum, coho, pink, and sockeye salmon and the anadromous forms of rainbow and cutthroat trout – steelhead and sea-run cutthroat. The Committee on Protection and Management of Pacific Northwest Anadromous Salmonids was asked to "evaluate options for improving the prospects for long-term sustainability of the stocks, and to consider economic and social implications of such changes." They were asked to perform the following tasks: assess the status of the salmon stocks, analyze the causes of declines, and analyze options for intervention. The committee considered all stages of salmon life histories and options for intervention and likely effectiveness.

 Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. Washington State Salmon and Steelhead Stock Inventory (SASSI). Washington Department of Fish and Wildlife. 212 pp. SASSI is now called Salmon Stock Inventory (SaSI). The Salmon Stock Inventory is a standardized, uniform approach to identifying and monitoring the status of Washington's salmonid fish stocks. The inventory is a compilation of data on all wild stocks and a scientific determination of each stock's status as: healthy, depressed, critical, unknown, or extinct. SaSI thus is a basis for prioritizing recovery efforts and for measuring the results of future recovery actions. SaSI is a cooperative product of the Washington Department of Fish and Wildlife and the tribal co-managers.

To learn more about the SaSI program, contact: <u>http://www.wa.gov/wdfw/fish/sassi/intro.htm</u>

6. Washington State Conservation Commission. Salmonid habitat limiting factors reports.

These individual watershed-scaled reports are available at: http://www.conserver/prg/salmon/index.phps

Habitat limiting factors reports are developed for each water resource inventory area (WRIA) in Washington State. Check the referenced Web site for a current listing of completed reports. The reports identify habitat conditions that limit the ability of habitats to fully sustain populations of salmonids. The results of assessing habitat-limiting factors will be used to help develop strategies for salmon recovery and identify gaps in existing information. Maps illustrating the known extent of salmonid distribution in individual streams are included at a scale of 1:24,000.

- 7. Washington Department of Fish and Wildlife. Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP). Available at: <u>http://www.wa.gov/wdfw/hab/sshiap/</u>
- 8. Washington Department of Fish and Wildlife. Salmon and Steelhead Statistical Inventory (SASSI). Available at: <u>http://www.wa.gov/wdfw/hab/release.htm</u>
- 9. Washington Department of Fish and Wildlife. Information about requesting maps from WDFW. Available at: <u>http://www.wa.gov/wdfw/hab/release.htm</u>
- Joint Natural Resources Cabinet. 2001. Guidance on watershed assessment for salmon. 54 pp. Available at: <u>http://www.governor.wa.gov/esa/watershed/watershed.htm</u>

While this guidance document focuses on salmon habitat, the key activities and products discussed have a broader utility to other initiatives, such as water quality and water supply assessments. For further updated information, contact:

Governor's Salmon Recovery Office P.O. Box 43135 Olympia, WA 98504-3135 (360) 902-2231

Appendix A: State Agency Contacts

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties				
Department of Ecology											
Department of Ecology, Shorelands and Environmental Assistance	Adelsman, Hedia	GMA Coordinator	(360) 407-6222	(360) 407-6902	hade461@ecy.wa.gov	Statewide	Statewide				
Department of Ecology, Shorelands and Environmental Assistance	Boeholt, Ann	Environmental Specialist	(360) 407-6221	(360) 407-6305	aboe461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Clallam, Jefferson, Mason, Pierce, Thurston				
Department of Ecology, Shorelands and Environmental Assistance	Canning, Doug	Environmental Specialist / Geologically Hazardous Areas, Regulation, and Technical Support	(360) 407-6781	(360) 407-6902	<u>dcan461@ecy.wa.gov</u>	Statewide	Statewide				
Department of Ecology, Shorelands and Environmental Assistance	D'Acci, Tim	Floodplain Lead, Policy and Regulations / Floods, Policy, Regulations	(360) 407-6796	(360) 407-6902	tdac461@ecy.wa.gov	Statewide	Statewide				
Department of Ecology, Shorelands and Environmental Assistance	Driscoll, Lauren	Environmental Specialist / Mitigation Banking	(360) 407-6861	(360) 407-6902	<u>ldri461@ecy.wa.gov</u>	Statewide	Statewide				
Department of Ecology, Shorelands and Environmental Assistance	Granger, Teri	Environmental Planner / Best Available Science, Project Coordinator	(360) 407-6857	(360) 407-6902	tgra461@ecy.wa.gov	Statewide	Statewide				

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology, Shorelands and Environmental Assistance	Hruby, Tom	Senior Ecologist / Best Available Science	(360) 407-7274	(360) 407-6902	<u>thru461@ecy.wa.gov</u>	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Keys, Penny	Environmental Technician / GMA Document Coordinator	(360) 407-6927	(360) 407-6902	pkey461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Lund, Perry	Section Manager	(360) 407-7260	(360) 407-6305	plun461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Grays Harbor, Pacific
Department of Ecology, Shorelands and Environmental Assistance	McMillan, Andy	Policy Lead / Wetlands Policy and Regulation, Best Available Science	(360) 407-7272	(360) 407-6902	anmc461@ecy.wa.gov	Statewide	Statewide
Department of Ecology, Shorelands and Environmental Assistance	Merker, Chris	Environmental Specialist	(509) 456-6174	(509) 456-6175	<u>cmer461@ecy.wa.gov</u>	Wetlands, Critical Area Ordinances	Adams, Asotin, Columbia, Garfield, Grant, Ferry, Franklin, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman
Department of Ecology, Shorelands and Environmental Assistance	Meyer, Susan	Environmental Specialist	(425) 649-7168	(425) 649-7098	sume461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Island, Skagit, Whatcom
Department of Ecology, Shorelands and Environmental Assistance	Murphy, Brad	Environmental Specialist	(360) 407-7273	(360) 407-6305	bmur461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Clark, Cowlitz, Lewis, Skamania, Wahkiakum

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Ecology, Shorelands and Environmental Assistance	Olson, Ted	Environmental Engineer / Floodplain Issues	(509) 456-2862	(509) 456-6175	tols461@ecy.wa.gov	Eastern Regional Office	Adams, Asotin, Columbia, Garfield, Grant, Ferry, Franklin, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman
Department of Ecology, Shorelands and Environmental Assistance	Reed, Catherine	Environmental Specialist	(509) 575-2616	(509) 575-2809	<u>craj461@ecy.wa.gov</u>	Wetlands, Critical Area Ordinances	Benton, Klickitat, Kittitas, Yakima
Department of Ecology, Shorelands and Environmental Assistance	Schuppe, Mark	Environmental Specialist	(509) 575-2384	(509) 575-2809	msch461@ecy.wa.gov	Wetlands, Critical Area Ordinances	Chelan, Douglas, Okanogan
Department of Ecology, Shorelands and Environmental Assistance	Sokol, Dan	Environmental Planner / Floodplain Issues	(360) 407-7253	(360) 407-6305	<u>dsok461@ecy.wa.gov</u>	Southwest Regional Office	Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Klickitat, Kittitas, Lewis, Mason, Okanogan, Pacific, Pierce, Skamania, Thurston, Yakima
Department of Ecology, Shorelands and Environmental Assistance	Steele, Chuck	Environmental Planner / Floodplain Issues	(425) 649-7139	(425) 649-7098	<u>chst461@ecy.wa.gov</u>	Northwest Regional Office	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom
Department of Ecology, Shorelands and Environmental Assistance	Stockdale, Erik	Environmental Specialist	(425) 649-7061	(425) 649-7098	esto461@ecy.wa.gov	Watershed Planning and Technical Assistance	Northwest Region
Department of Ecology, Shorelands and Environmental Assistance	Suggs, Sarah	Environmental Specialist	(425) 649-7124	(425) 649-7098	<u>ssug461@ecy.wa.gov</u>	Wetlands, Critical Area Ordinances	King, Kitsap, San Juan, Snohomish

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/	Counties				
Department of Ecology, Water Quality Program	Morgan, Laurie	Hydrogeologist / Aquifer Recharge Areas	(360) 407-6483		lmor461@ecy.wa.gov	Statewide	Statewide				
Department of Fish and Wildlife											
Department of Fish and Wildlife, Habitat Program	Azerrad, Jeff	PHS/GMA Biologist / Fish and Wildlife	(509) 456-4079	(509) 456-4071	azerrjma@dfw.wa.gov	Eastern (Region 1 – Spokane	Ferry, Stevens, Pend Oreille, Lincoln, Spokane, Whitman, Walla Walla, Columbia, Garfield, Asotin				
Department of Fish and Wildlife, Habitat Program	Baxter, Bruce	Area Habitat Biologist / Fish and Wildlife	(360) 249-1228	(360) 664-0689	<u>baxterbab@dfw.wa.gov</u>	Coastal (Region 6 - Montesano)	Grays Harbor				
Department of Fish and Wildlife, Habitat Program	Byrnes, Chris	Area Habitat Biologist / Fish and Wildlife	(360) 417-1426	(360) 417-3302	byrnecjb@dfw.wa.gov	Coastal (Region 6 - Montesano)	Clallam, Jefferson				
Department of Fish and Wildlife, Habitat Program	Carnevali, Debbie	Area Habitat Biologist / Fish and Wildlife	(360) 264-5148	(360) 664-0689	<u>carneddc@dfw.wa.gov</u>	Coastal (Region 6 - Montesano)	Pierce, Thurston				
Department of Fish and Wildlife, Habitat Program	Davis, Jeff	Area Habitat Biologist / Fish and Wildlife	(360) 895-3965	(360) 876-1894	davisjpd@dfw.wa.gov	Coastal (Region 6 - Montesano)	Kitsap, Mason, Pierce				
Department of Fish and Wildlife, Habitat Program	Goldsmith, Mark	PHS/GMA Biologist / Fish and Wildlife	(425) 379-2308	(425) 338-1066	goldsmfg@dfw.wa.gov	North Puget Sound (Region 4 - Mill Creek)	Whatcom, Skagit, Snohomish, King, San Juan, Island				
Department of Fish and Wildlife, Habitat Program	Manlow, Steve	Regional Habitat Program Manager / Fish and Wildlife	(360) 906-6731	(360) 906-6776	manloswm@dfw.wa.gov	Southwest Region (Region 5 - Vancouver)	Clark, Cowlitz, Klickitat, Lewis, Skamania, Wahkiakum				
Department of Fish and Wildlife, Habitat Program	March, Katherine	PHS/GMA Biologist / Fish and Wildlife	(509) 754-4624	(509) 754-5257	marchkcm@dfw.wa.gov	North Central (Region 2 - Ephrata)	Okanogan, Chelan, Douglas, Grant, Adams				

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/	Counties				
						Specialty					
Department of Fish and Wildlife, Habitat Program	McMurry, Key	Area Habitat Biologist / Fish and Wildlife	(360) 249-4628	(360) 664-0689	mcmurklm@dfw.wa.gov	Coastal (Region 6 - Montesano)	Pacific, Grays Harbor				
Department of Fish and Wildlife, Habitat Program	Nauer, Don	Area Habitat Biologist / Fish and Wildlife	(253) 863-7979	(253) 863-7979	nauerdcn@dfw.wa.gov	Coastal (Region 6 - Montesano)	King, Pierce				
Department of Fish and Wildlife, Habitat Program	Rogers, Gloria	Area Habitat Biologist / Fish and Wildlife	(360) 495-3068	(360) 664-0689	rogergsr@dfw.wa.gov	Coastal (Region 6 - Montesano)	Grays Harbor, Mason				
Department of Fish and Wildlife, Habitat Program	Schirato, Margie	Area Habitat Biologist / Fish and Wildlife	(360) 427-2179	(360) 432-8707	schirmms@dfw.wa.gov	Coastal (Region 6 - Montesano)	Mason, Thurston (marine waters only)				
Department of Fish and Wildlife, Habitat Program	Shaffer, Anne	Area Habitat Biologist / Fish and Wildlife	(360) 457-2634	(360) 417-3302	<u>shaffjas@dfw.wa.gov</u>	Coastal (Region 6 - Montesano)	Clallam, Jefferson (marine waters only)				
Department of Fish and Wildlife, Habitat Program	Small, Doris	Area Habitat Biologist / Fish and Wildlife	(360) 895-4756	(360) 876-1894	<u>smalldjs@dfw.wa.gov</u>	Coastal (Region 6 - Montesano)	Kitsap, Mason				
Department of Fish and Wildlife, Habitat Program	Teske, Mark	PHS/GMA Biologist / Fish and Wildlife	(509) 962-3421	(509) 925-4702	teskemst@dfw.wa.gov	South Central (Region 3 - Yakima)	Kittitas, Yakima, Benton, Franklin				
Department of Fish and Wildlife, Intergovernmental Policy	Deusen, Millard	Land Use Policy Coordinator / Fish and Wildlife	(360) 902-2562	(360) 902-2947	<u>deusemsd@dfw.wa.gov</u>	Statewide	Statewide				
Department of Natural	Department of Natural Resources										
Department of Natural Resources	Kurowski, Stan	Project Section Manager	(360) 856-3500	(360) 856-2150	stanley.kurowski@wadnr.gov	Northwest Region	Snohomish, Skagit, Whatcom, San Juan, Island				

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Natural Resources, Asset Management and Protection	Sharar, Anne	Environmental Planner	(360) 902-1739	(360) 902-1776	anne.sharar@wadnr.gov	Headquarters	Statewide
Department of Natural Resources, Aquatic Resources Division	Flores, Hugo	Environmental Planner / Shoreline Management Act	(360) 902-1126	(360) 902-1786	hugo.flores@wadnr.gov	Headquarters	Statewide – Aquatic Resources
Department of Natural Resources, Growth Management Program	Huestis, Roger	Growth Management Coordinator	(509) 684-7474	(509) 684-7484	roger.huestis@wadnr.gov	Northeast Region	Okanogan, Ferry, Stevens, Pend Oreille, Spokane
Department of Natural Resources, Growth Management Program	Wedin, Dick	Growth Management Coordinator	(509) 925-8510	(509) 925-8522	dick.wedin@wadnr.gov	Southeast Region	Chelan, Douglas, Kittitas, Klickitat, Yakima, Skamania (part), Grant, Benton, Franklin, Lincoln, Adams, Walla Walla, Garfield, Asotin, Whitman, Columbia
Department of Natural Resources, Public Lands	Johnson, Bob	District Manager	(360) 748-2383	(360) 274-4196	johnson.bob@wadnr.gov	Central	
Department of Natural Resources, State Lands	Hotvedt, Jim	State Land Assistant Regional Manager	(360) 740-6803	(360) 748-2387	jim.hotvedt@wadnr.gov	Central	Grays Harbor, Pacific, Lewis, Thurston
Department of Natural Resources, State Lands	McClelland, Douglas	Asset Operations Manager	(360) 825-1631	(360) 825-1672	doug.mcclelland@wadnr.gov	South Puget Sound Region	King
Department of Natural Resources, Washington Natural Heritage Program	Caplow, Florence	Rare Plant Botanist	(360) 902-1793	(360) 902-1789	florence.caplow@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Chappell, Chris	Vegetation Ecologist	(360) 902-1671	(360) 902-1789	chris.chappell@wadnr.gov	Western Washington	

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Department of Natural Resources, Washington Natural Heritage Program	Crawford, Rex	Vegetation Ecologist	(360) 902-1749	(360) 902-1789	rex.crawford@wadnr.gov	Eastern Washington	
Department of Natural Resources, Washington Natural Heritage Program	Farone, Steve	Information Manager	(360) 902-1349	(360) 902-1789	steve.farone@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Fleckenstein, John	Zoologist / Rare Bats and Butterflies	(360) 902-1674	(360) 902-1789	john.fleckenstein@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Gamon, John	Program Leader / Lead Scientist	(360) 902-1661	(360) 902-1789	john.gamon@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Hallock, Lisa	Herpetologist	(360) 902-1670	(360) 902-1789	lisa.haddock@wadnr.gov	Statewide	
Department of Natural Resources, Washington Natural Heritage Program	Swope Moody, Sandy	Environmental Review Coordinator / Information Requests	(360) 902-1667	(360) 902-1789	sandra.moody@wadnr.gov	Statewide	
Office of Community D	evelopment						
Office of Community Development, Growth Management Services	Andersen, David	Senior Planner	(360) 725-3049	(360) 753-2950	davida@cted.wa.gov	N/A	Chelan, Douglas, Ferry, Grant
Office of Community Development, Growth Management Services	Babineau, Patrick	Senior Planner	(360) 725-3045	(360) 753-2950	patrickb@cted.wa.gov	N/A	Island, Mason, Pacific
Office of Community Development, Growth Management Services	Caputo, Dee	Senior Planner	(360) 725-3068	(360) 753-2950	deeca@cted.wa.gov	N/A	Columbia, Garfield, Kittitas, Spokane, Walla Walla, Pend Oreille
Office of Community Development, Growth Management Services	Gadbaw, Holly	Senior Planner and Review Manager	(360) 725-3048	(360) 753-2950	hollyg@cted.wa.gov	N/A	Clark, Whatcom

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Office of Community Development, Growth Management Services	Gage, Ted	Senior Planner	(360) 725-3049	(360) 753-2950	tedg@cted.wa.gov	N/A	Adams, Benton, Cowlitz, Franklin, Okanogan, Stevens, Yakima
Office of Community Development, Growth Management Services	Nwankwo, Ike	Senior Planner and Technical and Financial Assistance Programs Manager	(360) 725-3056	(360) 753-2950	iken@cted.wa.gov	N/A	King, Pierce
Office of Community Development, Growth Management Services	Ojennus, Matt	Assistant Planner	(360) 725-3057	(360) 753-2950	matthewo@cted.wa.gov	N/A	Thurston
Office of Community Development, Growth Management Services	Parsons, Chris	Senior Planner	(360) 725-3058	(360) 753-2950	<u>chrisp@cted.wa.gov</u>	N/A	Skagit, Kitsap
Office of Community Development, Growth Management Services	Peters, Doug	Senior Planner	(360) 725-3046	(360) 753-2950	douglasp@cted.wa.gov	N/A	Clallam, Jefferson
Office of Community Development, Growth Management Services	Riley, Peter	Senior Planner	(360) 725-3067	(360) 753-2950	peterr@cted.wa.gov	N/A	Snohomish, San Juan, Lewis
Puget Sound Water Qu	ality Action Tea	m					
Puget Sound Water Quality Action Team	Broadhurst, Ginny	Local Liaison	(360) 738-6122	(360) 736-6122	gbroadhurst@psat.wa.gov	N/A	San Juan
Puget Sound Water Quality Action Team	Cambalik, John	Local Liaison	(360) 582-0575	(360) 582-0575	jcambalik@psat.wa.gov	N/A	Kitsap, Jefferson, Clallam

Agency	Name	Title	Work Phone	Fax Number	E-mail Address	Region/ Specialty	Counties
Puget Sound Water Quality Action Team	Drinkwin, Joan	Local Liaison	(360) 848-0924	(360) 848-0924	jdrinkwin@psat.wa.gov	N/A	Island, Snohomish
Puget Sound Water Quality Action Team	Glascoe, Stuart	Local Liaison	(360) 407-7319	(360) 407-7333	sglascoe@psat.wa.gov	N/A	Whatcom, Skagit
Puget Sound Water Quality Action Team	Ransom, Tim	Local Liaison	(360) 407-7323	(360) 407-7333	transom@psat.wa.gov	N/A	Thurston, Mason
Puget Sound Water Quality Action Team	Taylor, Kathy	Local Liaison	(253) 333-4920	(360) 407-7333	ktaylor@psat.wa.gov	N/A	King, Pierce

Appendix B: Statutory and Administrative Code References

GROWTH MANAGEMENT ACT – RCW 36.70A References to Critical Areas Policies and Development Regulations

RCW § 36.70A.020. Planning goals

The following goals are adopted to guide the development and adoption of comprehensive plans and development regulations of those counties and cities that are required or choose to plan under RCW 36.70A.040. The following goals are not listed in order of priority and shall be used exclusively for the purpose of guiding the development of comprehensive plans and development regulations:

(1) Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.

(2) Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.

(3) Transportation. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.

(4) Housing. Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.

(5) Economic development. Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.

(6) Property rights. Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.

(7) Permits. Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.

(8) Natural resource industries. Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.

(9) Open space and recreation. Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks.

(10) Environment. Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

(11) Citizen participation and coordination. Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.

(12) Public facilities and services. Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.

(13) Historic preservation. Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance.

RCW § 36.70A.050. Guidelines to classify agriculture, forest, and mineral lands and critical areas

(1) Subject to the definitions provided in RCW 36.70A.030, the department shall adopt guidelines, under chapter 34.05 RCW, no later than September 1, 1990, to guide the classification of: (a) Agricultural lands; (b) forest lands; (c) mineral resource lands; and (d) critical areas. The department shall consult with the department of agriculture regarding guidelines for agricultural lands, the department of natural resources regarding forest lands and mineral resource lands, and the department of ecology regarding critical areas.

(2) In carrying out its duties under this section, the department shall consult with interested parties, including but not limited to: (a) Representatives of cities; (b) representatives of counties; (c) representatives of developers; (d) representatives of builders; (e) representatives of owners of agricultural lands, forest lands, and mining lands; (f) representatives of local economic development officials; (g) representatives of environmental organizations; (h) representatives of special districts; (i) representatives of the governor's office and federal and state agencies; and (j) representatives of Indian tribes. In addition to the consultation required under this subsection, the department shall conduct public hearings in the various regions of the state. The department shall consider the public input obtained at such public hearings when adopting the guidelines.

(3) The guidelines under subsection (1) of this section shall be minimum guidelines that apply to all jurisdictions, but also shall allow for regional differences that exist in Washington State. The intent of these guidelines is to assist counties and cities in

designating the classification of agricultural lands, forest lands, mineral resource lands, and critical areas under RCW 36.70A.170.

(4) The guidelines established by the department under this section regarding classification of forest lands shall not be inconsistent with guidelines adopted by the department of natural resources.

RCW § 36.70A.060. Natural resource lands and critical areas – Development regulations

(1) Each county that is required or chooses to plan under RCW 36.70A.040, and each city within such county, shall adopt development regulations on or before September 1, 1991, to assure the conservation of agricultural, forest, and mineral resource lands designated under RCW 36.70A.170. Regulations adopted under this subsection may not prohibit uses legally existing on any parcel prior to their adoption and shall remain in effect until the county or city adopts development regulations pursuant to RCW 36.70A.040. Such regulations shall assure that the use of lands adjacent to agricultural, forest, or mineral resource lands shall not interfere with the continued use, in the accustomed manner and in accordance with best management practices, of these designated lands for the production of food, agricultural products, or timber, or for the extraction of minerals. Counties and cities shall require that all plats, short plats, development permits, and building permits issued for development activities on, or within five hundred feet of, lands designated as agricultural lands, forest lands, or mineral resource lands, contain a notice that the subject property is within or near designated agricultural lands, forest lands, or mineral resource lands on which a variety of commercial activities may occur that are not compatible with residential development for certain periods of limited duration. The notice for mineral resource lands shall also inform that an application might be made for mining-related activities, including mining, extraction, washing, crushing, stockpiling, blasting, transporting, and recycling of minerals.

(2) Each county and city shall adopt development regulations that protect critical areas that are required to be designated under RCW 36.70A.170. For counties and cities that are required or choose to plan under RCW 36.70A.040, such development regulations shall be adopted on or before September 1, 1991. For the remainder of the counties and cities, such development regulations shall be adopted on or before March 1, 1992.

(3) Such counties and cities shall review these designations and development regulations when adopting their comprehensive plans under RCW 36.70A.040 and implementing development regulations under RCW 36.70A.120 and may alter such designations and development regulations to insure consistency.

(4) Forest land and agricultural land located within urban growth areas shall not be designated by a county or city as forest land or agricultural land of long-term commercial significance under RCW 36.70A.170 unless the city or county has

enacted a program authorizing transfer or purchase of development rights.

RCW § 36.70A.160. Identification of open space corridors – Purchase authorized

Each county and city that is required or chooses to prepare a comprehensive land use plan under RCW 36.70A.040 shall identify open space corridors within and between urban growth areas. They shall include lands useful for recreation, wildlife habitat, trails, and connection of critical areas as defined in RCW 36.70A.030. Identification of a corridor under this section by a county or city shall not restrict the use or management of lands within the corridor for agricultural or forest purposes. Restrictions on the use or management of such lands for agricultural or forest purposes imposed after identification solely to maintain or enhance the value of such lands as a corridor may occur only if the county or city acquires sufficient interest to prevent development of the lands or to control the resource development of the lands. The requirement for acquisition of sufficient interest does not include those corridors regulated by the interstate commerce commission, under provisions of <u>16 U.S.C. Sec. 1247(d)</u>, <u>16 U.S.C. Sec. 1248</u>, or <u>43 U.S.C. Sec. 912</u>. Nothing in this section shall be interpreted to alter the authority of the state, or a county or city, to regulate land use activities.

The city or county may acquire by donation or purchase the fee simple or lesser interests in these open space corridors using funds authorized by RCW 84.34.230 or other sources.

RCW § 36.70A.170. Natural resource lands and critical areas – Designations

(1) On or before September 1, 1991, each county, and each city, shall designate where appropriate:

(a) Agricultural lands that are not already characterized by urban growth and that have long-term significance for the commercial production of food or other agricultural products;

(b) Forest lands that are not already characterized by urban growth and that have long-term significance for the commercial production of timber;

(c) Mineral resource lands that are not already characterized by urban growth and that have long-term significance for the extraction of minerals; and

(d) Critical areas.

(2) In making the designations required by this section, counties and cities shall consider the guidelines established pursuant to RCW 36.70A.050.

RCW § 36.70A.172. Critical areas – Designation and protection – Best available science to be used

(1) In designating and protecting critical areas under this chapter, counties and cities shall include the best available science in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities shall give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

(2) If it determines that advice from scientific or other experts is necessary or will be of substantial assistance in reaching its decision, a growth management hearings board may retain scientific or other expert advice to assist in reviewing a petition under RCW 36.70A.290 that involves critical areas.

Review of Policies Relating to RCW 36.70A.172 can be found in the following Court of Appeals case and in the Law Review Article:

If a city or county chooses to adopt critical areas policies, the board has jurisdiction, pursuant to RCW 36.70A.280, to review such policies, but only for purpose of determining whether the policies are in compliance with the requirement of this section to include the best available science in the process of developing a policy. Honesty in Envtl. Analysis & Legislation v. Central Puget Sound Growth Mgt. Hearings Bd., 96 Wn. App. 522, 979 P.2d 864 (1999).

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Including best available science in the designation and protection of critical areas under the growth management act. <u>23 Seattle U. L. Rev. 97 (1999).</u>

CHAPTER 190. MINIMUM GUIDELINES TO CLASSIFY AGRICULTURE, FOREST, MINERAL LANDS AND CRITICAL AREAS PART THREE GUIDELINES

WAC § 365-190-080 (2001)

WAC 365-190-080. Critical areas.

(1) Wetlands. The wetlands of Washington State are fragile ecosystems which serve a number of important beneficial functions. Wetlands assist in the reduction of erosion, siltation, flooding, ground and surface water pollution, and provide wildlife, plant, and fisheries habitats. Wetlands destruction or impairment may result in increased public and private costs or property losses.

In designating wetlands for regulatory purposes, counties and cities shall use the definition of wetlands in RCW 36.70A.030(22). Counties and cities are requested and encouraged to make their actions consistent with the intent and goals of "protection of wetlands," Executive Orders 89-10 and 90-04 as they exist on
September 1, 1990. Additionally, counties and cities should consider wetlands protection guidance provided by the department of ecology including the model wetlands protection ordinance.

(a) Counties and cities that do not now rate wetlands shall consider a wetlands rating system to reflect the relative function, value, and uniqueness of wetlands in their jurisdictions. In developing wetlands rating systems, counties and cities should consider the following:

(i) The Washington State four-tier wetlands rating system;

- (ii) Wetlands functions and values;
- (iii) Degree of sensitivity to disturbance;
- (iv) Rarity; and
- (v) Ability to compensate for destruction or degradation.

If a county or city chooses to not use the state four-tier wetlands rating system, the rationale for that decision must be included in its next annual report to department of community development.

(b) Counties and cities may use the National Wetlands Inventory as an information source for determining the approximate distribution and extent of wetlands. This inventory provides maps of wetland areas according to the definition of wetlands issued by the United States Department of Interior – Fish and Wildlife Service, and its wetland boundaries should be delineated for regulation consistent with the wetlands definition in RCW 36.70A.030(22).

(c) Counties and cities should consider using the methodology in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, cooperatively produced by the United States Army Corps of Engineers, United States Environmental Protection Agency, United States Department of Agriculture Soil Conservation Service, and United States Fish and Wildlife Service, that was issued in January 1989, and regulatory guidance letter 90-7 issued by the United States Corps of Engineers on November 29, 1990, for regulatory delineations.

(2) Aquifer recharge areas. Potable water is an essential life sustaining element. Much of Washington's drinking water comes from ground water supplies. Once ground water is contaminated it is difficult, costly, and sometimes impossible to clean up. Preventing contamination is necessary to avoid exorbitant costs, hardships, and potential physical harm to people.

The quality of ground water in an aquifer is inextricably linked to its recharge area. Few studies have been done on aquifers and their recharge areas in Washington State. In the cases in which aquifers and their recharge areas have been studied, affected counties and cities should use this information as the base for classifying and designating these areas.

Where no specific studies have been done, counties and cities may use existing soil and surficial geologic information to determine where recharge areas are. To determine the threat to ground water quality, existing land use activities and their potential to lead to contamination should be evaluated.

Counties and cities shall classify recharge areas for aquifers according to the vulnerability of the aquifer. Vulnerability is the combined effect of hydrogeological susceptibility to contamination and the contamination loading potential. High vulnerability is indicated by land uses that contribute contamination that may degrade ground water, and hydrogeologic conditions that facilitate degradation. Low vulnerability is indicated by land uses that do not contribute contaminants that will degrade ground water, and by hydrogeologic conditions that do not facilitate degradation.

(a) To characterize hydrogeologic susceptibility of the recharge area to contamination, counties and cities may consider the following physical characteristics:

- (i) Depth to ground water;
- (ii) Aquifer properties such as hydraulic conductivity and gradients;
- (iii) Soil (texture, permeability, and contaminant attenuation properties);

(iv) Characteristics of the vadose zone including permeability and attenuation properties; and

(v) Other relevant factors.

(b) The following may be considered to evaluate the contaminant loading potential:

- (i) General land use;
- (ii) Waste disposal sites;
- (iii) Agriculture activities;
- (iv) Well logs and water quality test results; and
- (v) Other information about the potential for contamination.
- (c) Classification strategy for recharge areas should be to maintain the quality of the

ground water, with particular attention to recharge areas of high susceptibility. In recharge areas that are highly vulnerable, studies should be initiated to determine if ground water contamination has occurred. Classification of these areas should include consideration of the degree to which the aquifer is used as a potable water source, feasibility of protective measures to preclude further degradation, availability of treatment measures to maintain potability, and availability of alternative potable water sources.

(d) Examples of areas with a critical recharging effect on aquifers used for potable water, may include:

(i) Sole source aquifer recharge areas designated pursuant to the Federal Safe Drinking Water Act.

(ii) Areas established for special protection pursuant to a ground water management program, chapters 90.44, 90.48, and 90.54 RCW, and chapters 173-100 and 173-200 WAC.

(iii) Areas designated for wellhead protection pursuant to the Federal Safe Drinking Water Act.

(iv) Other areas meeting the definition of "areas with a critical recharging effect on aquifers used for potable water" in these guidelines.

(3) Frequently flooded areas. Floodplains and other areas subject to flooding perform important hydrologic functions and may present a risk to persons and property. Classifications of frequently flooded areas should include, at a minimum, the 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program.

Counties and cities should consider the following when designating and classifying frequently flooded areas:

(a) Effects of flooding on human health and safety, and to public facilities and services;

(b) Available documentation including federal, state, and local laws, regulations, and programs, local studies and maps, and federal flood insurance programs;

(c) The future flow floodplain, defined as the channel of the stream and that portion of the adjoining floodplain that is necessary to contain and discharge the base flood flow at build out without any measurable increase in flood heights;

(d) The potential effects of tsunami, high tides with strong winds, sea level rise resulting from global climate change, and greater surface runoff caused by increasing impervious surfaces.

(4) Geologically hazardous areas.

(a) Geologically hazardous areas include areas susceptible to erosion, sliding, earthquake, or other geological events. They pose a threat to the health and safety of citizens when incompatible commercial, residential, or industrial development is sited in areas of significant hazard. Some geological hazards can be reduced or mitigated by engineering, design, or modified construction or mining practices so that risks to health and safety are acceptable. When technology cannot reduce risks to acceptable levels, building in geologically hazardous areas is best avoided. This distinction should be considered by counties and cities that do not now classify geological hazards as they develop their classification scheme.

(b) Areas that are susceptible to one or more of the following types of hazards shall be classified as a geologically hazardous area:

(i) Erosion hazard;

(ii) Landslide hazard;

(iii) Seismic hazard; or

(iv) Areas subject to other geological events such as coal mine hazards and volcanic hazards including: Mass wasting, debris flows, rockfalls, and differential settlement.

(c) Counties and cities should classify geologically hazardous area as either:

(i) Known or suspected risk;

(ii) No risk;

(iii) Risk unknown – data are not available to determine the presence or absence of a geological hazard.

(d) Erosion hazard areas are at least those areas identified by the United States Department of Agriculture Soil Conservation Service as having a "severe" rill and inter-rill erosion hazard.

(e) Landslide hazard areas shall include areas potentially subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include any areas susceptible because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors. Example of these may include, but are not limited to the following:

(i) Areas of historic failures, such as:

(A) Those areas delineated by the United States Department of Agriculture Soil Conservation Service as having a "severe" limitation for building site development;

(B) Those areas mapped as class u (unstable), uos (unstable old slides), and urs (unstable recent slides) in the department of ecology coastal zone atlas; or

(C) Areas designated as quaternary slumps, earthflows, mudflows, lahars, or landslides on maps published as the United States Geological Survey or department of natural resources division of geology and earth resources.

(ii) Areas with all three of the following characteristics:

(A) Slopes steeper than fifteen percent; and

(B) Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and

(C) Springs or ground water seepage;

(iii) Areas that have shown movement during the holocene epoch (from ten thousand years ago to the present) or which are underlain or covered by mass wastage debris of that epoch;

(iv) Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;

(v) Slopes having gradients steeper than eighty percent subject to rockfall during seismic shaking;

(vi) Areas potentially unstable as a result of rapid stream incision, stream bank erosion, and undercutting by wave action;

(vii) Areas that show evidence of, or are at risk from snow avalanches;

(viii) Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding;

(ix) Any area with a slope of forty percent or steeper and with a vertical relief of ten or more feet except areas composed of consolidated rock. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least ten feet of vertical relief.

(e) Seismic hazard areas shall include areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, settlement, soil liquefaction, or surface faulting. One indicator of potential for future earthquake

damage is a record of earthquake damage in the past. Ground shaking is the primary cause of earthquake damage in Washington. The strength of ground shaking is primarily affected by:

(i) The magnitude of an earthquake;

- (ii) The distance from the source of an earthquake;
- (iii) The type of thickness of geologic materials at the surface; and
- (iv) The type of subsurface geologic structure.

Settlement and soil liquefaction conditions occur in areas underlain by cohesionless soils of low density, typically in association with a shallow ground water table.

(f) Other geological events:

(i) Volcanic hazard areas shall include areas subject to pyroclastic flows, lava flows, debris avalanche, inundation by debris flows, mudflows, or related flooding resulting from volcanic activity.

(ii) Mine hazard areas are those areas underlain by, adjacent to, or affected by mine workings such as adits, gangways, tunnels, drifts, or air shafts. Factors which should be considered include: Proximity to development, depth from ground surface to the mine working, and geologic material.

(5) Fish and wildlife habitat conservation areas. Fish and wildlife habitat conservation means land management for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created. This does not mean maintaining all individuals of all species at all times, but it does mean cooperative and coordinated land use planning is critically important among counties and cities in a region. In some cases, intergovernmental cooperation and coordination may show that it is sufficient to assure that a species will usually be found in certain regions across the state.

(a) Fish and wildlife habitat conservation areas include:

(i) Areas with which endangered, threatened, and sensitive species have a primary association;

(ii) Habitats and species of local importance;

- (iii) Commercial and recreational shellfish areas;
- (iv) Kelp and eelgrass beds; herring and smelt spawning areas;

(v) Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat;

(vi) Waters of the state;

(vii) Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity; or

(viii) State natural area preserves and natural resource conservation areas.

(b) Counties and cities may consider the following when classifying and designating these areas:

(i) Creating a system of fish and wildlife habitat with connections between larger habitat blocks and open spaces;

(ii) Level of human activity in such areas including presence of roads and level of recreation type (passive or active recreation may be appropriate for certain areas and habitats);

(iii) Protecting riparian ecosystems;

(iv) Evaluating land uses surrounding ponds and fish and wildlife habitat areas that may negatively impact these areas;

(v) Establishing buffer zones around these areas to separate incompatible uses from the habitat areas; and

(vi) Restoring of lost salmonid habitat.

(c) Sources and methods

(i) Counties and cities should classify seasonal ranges and habitat elements with which federal and state listed endangered, threatened, and sensitive species have a primary association and which, if altered, may reduce the likelihood that the species will maintain and reproduce over the long term.

(ii) Counties and cities should determine which habitats and species are of local importance. Habitats and species may be further classified in terms of their relative importance.

Counties and cities may use information prepared by the Washington department of wildlife to classify and designate locally important habitats and species. Priority habitats and priority species are being identified by the department of wildlife for all lands in Washington State. While these priorities are those of the department, they and the data on which they are based may be considered by counties and cities.

(iii) Shellfish areas. All public and private tidelands or bedlands suitable for shellfish harvest shall be classified as critical areas. Counties and cities should consider both commercial and recreational shellfish areas. Counties and cities should at least consider the Washington department of health classification of commercial and recreational shellfish growing areas to determine the existing condition of these areas. Further consideration should be given to the vulnerability of these areas to contamination. Shellfish protection districts established pursuant to chapter 90.72 RCW shall be included in the classification of critical shellfish areas.

(iv) Kelp and eelgrass beds; herring and smelt spawning areas. Counties and cities shall classify kelp and eelgrass beds, identified by department of natural resources aquatic lands division and the department of ecology. Though not an inclusive inventory, locations of kelp and eelgrass beds are compiled in the *Puget Sound Environmental Atlas, Volumes 1 and 2.* Herring and smelt spawning times and locations are outlined in WAC 220-110-240 through 220-110-260 and the *Puget Sound Environmental Atlas.*

(v) Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat.

Naturally occurring ponds do not include ponds deliberately designed and created from dry sites, such as canals, detention facilities, wastewater treatment facilities, farmponds, temporary construction ponds (of less than three years duration), and landscape amenities. However, naturally occurring ponds may include those artificial ponds intentionally created from dry areas in order to mitigate conversion of ponds, if permitted by a regulatory authority.

(vi) Waters of the state. Waters of the state are defined in Title 222 WAC, the forest practices rules and regulations. Counties and cities should use the classification system established in WAC 222-16-030 to classify waters of the state.

Counties and cities may consider the following factors when classifying waters of the state as fish and wildlife habitats:

(A) Species present which are endangered, threatened or sensitive, and other species of concern;

(B) Species present which are sensitive to habitat manipulation;

- (C) Historic presence of species of local concern;
- (D) Existing surrounding land uses that are incompatible with salmonid habitat;
- (E) Presence and size of riparian ecosystems;

- (F) Existing water rights; and
- (G) The intermittent nature of some of the higher classes of waters of the state.

(vii) Lakes, ponds, streams, and rivers planted with game fish.

This includes game fish planted in these water bodies under the auspices of a federal, state, local, or tribal program or which supports priority fish species as identified by the department of wildlife.

(viii) State natural area preserves and natural resource conservation areas. Natural area preserves and natural resource conservation areas are defined, established, and managed by department of natural resources.

Statutory Authority: RCW 36.70A.050. 91-07-041, § 365-190-080, filed 3/15/91, effective 4/15/91.

GROWTH MANAGEMENT ACT – PROCEDURAL CRITERIA FOR ADOPTING COMPREHENSIVE PLANS AND DEVELOPMENT REGULATIONS PART FOUR INVENTORIES AND REVIEWS

WAC 365-195-410. Critical areas.

(1) *Requirements*. Prior to the development of comprehensive plans, cities and counties ought to have designated critical areas and adopted regulations protective of them. Such areas are defined to include:

- (a) Wetlands;
- (b) Areas of critical recharging effect on aquifers used for potable water;
- (c) Fish and wildlife habitat conservation areas;
- (d) Frequently flooded areas; and
- (e) Geologically hazardous areas.

The previous designations and regulations shall be reviewed in the comprehensive plan process to ensure consistency.

(2) *Recommendations for meeting requirements*. Much of the analysis which is the basis for the comprehensive plan will come later than the initial identification and regulation of critical areas. The result may be plan features which conflict with the previous critical area provisions.

(a) The department has issued guidelines for the classification of critical areas

which are contained in chapter 365-190 WAC.

(b) Critical areas should be designated and protected wherever the applicable natural conditions exist, whether within or outside of urban growth areas.

(c) The review of existing designations should, in most cases, be limited to the question of consistency with the comprehensive plan, rather than a revisiting of the entire prior designation and regulation process. However, to the extent that new information is available or errors have been discovered, the review process should take this information into account.

(d) In connection with critical area protection, the department recommends that planning jurisdictions identify the policies by which decisions are made on when and how police powers will be used (regulation) and when and how other means will be employed (purchases, development rights, etc.).

Statutory Authority: RCW 36.70A.190 (4)(b). 92-23-065, § 365-195-410, filed 11/17/92, effective 12/18/92.

PROCEDURAL CRITERIA FOR ADOPTING COMPREHENSIVE PLANS AND DEVELOPMENT REGULATIONS

PART NINE DEVELOPMENT REGULATIONS

WAC 365-195-900. Background and purpose.

(1) Counties and cities planning under RCW 36.70A.040 are subject to continuing review and evaluation of their comprehensive land use plan and development regulations. Every five years they must take action to review and revise their plans and regulations, if needed, to ensure they comply with the requirements of the Growth Management Act. RCW 36.70A.130.

(2) Counties and cities must include the "best available science" when developing policies and development regulations to protect the functions and values of critical areas and must give "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. RCW 36.70A.172(1). The rules in WAC 365-195-900 through 365-195-925 are intended to assist counties and cities in identifying and including the best available science in newly adopted policies and regulations and in this periodic review and evaluation and in demonstrating they have met their statutory obligations under RCW 36.70A.172(1).

(3) The inclusion of the best available science in the development of critical areas policies and regulations is especially important to salmon recovery efforts, and to other decision-making affecting threatened or endangered species.

(4) These rules are adopted under the authority of RCW 36.70A.190 (4)(b) which

requires the department of community, trade, and economic development (department) to adopt rules to assist counties and cities to comply with the goals and requirements of the Growth Management Act.

WAC 365-195-905. Criteria for determining which information is the "best available science."

(1) This section provides assessment criteria to assist counties and cities in determining whether information obtained during development of critical areas policies and regulations constitutes the "best available science."

(2) Counties and cities may use information that local, state, or federal natural resource agencies have determined represents the best available science consistent with criteria set out in WAC 365-195-900 through 365-195-925. The department will make available a list of resources that state agencies have identified as meeting the criteria for best available science pursuant to this chapter. Such information should be reviewed for local applicability.

(3) The responsibility for including the best available science in the development and implementation of critical areas policies or regulations rests with the legislative authority of the county or city. However, when feasible, counties and cities should consult with a qualified scientific expert or team of qualified scientific experts to identify scientific information, determine the best available science, and assess its applicability to the relevant critical areas. The scientific expert or experts may rely on their professional judgment based on experience and training, but they should use the criteria set out in WAC 365-195-900 through 365-195-925 and any technical guidance provided by the department. Use of these criteria also should guide counties and cities that lack the assistance of a qualified expert or experts, but these criteria are not intended to be a substitute for an assessment and recommendation by a qualified scientific expert or team of experts.

(4) Whether a person is a qualified scientific expert with expertise appropriate to the relevant critical areas is determined by the person's professional credentials and/or certification, any advanced degrees earned in the pertinent scientific discipline from a recognized university, the number of years of experience in the pertinent scientific discipline, recognized leadership in the discipline of interest, formal training in the specific area of expertise, and field and/or laboratory experience with evidence of the ability to produce peer-reviewed publications or other professional literature. No one factor is determinative in deciding whether a person is a qualified scientific expert. Where pertinent scientific information implicates multiple scientific disciplines, counties and cities are encouraged to consult a team of qualified scientific ascientific experts representing the various disciplines to ensure the identification and inclusion of the best available science.

(5) Scientific information can be produced only through a valid scientific process. To ensure that the best available science is being included, a county or city should consider the following:

(a) *Characteristics of a valid scientific process.* In the context of critical areas protection, a valid scientific process is one that produces reliable information useful in understanding the consequences of a local government's regulatory decisions and in developing critical areas policies and development regulations that will be effective in protecting the functions and values of critical areas. To determine whether information received during the public participation process is reliable scientific information, a county or city should determine whether the source of the information displays the characteristics of a valid scientific process. The characteristics generally to be expected in a valid scientific process are as follows:

1. *Peer review.* The information has been critically reviewed by other persons who are qualified scientific experts in that scientific discipline. The criticism of the peer reviewers has been addressed by the proponents of the information. Publication in a refereed scientific journal usually indicates that the information has been appropriately peer-reviewed.

2. *Methods.* The methods that were used to obtain the information are clearly stated and able to be replicated. The methods are standardized in the pertinent scientific discipline or, if not, the methods have been appropriately peer-reviewed to assure their reliability and validity.

3. Logical conclusions and reasonable inferences. The conclusions presented are based on reasonable assumptions supported by other studies and consistent with the general theory underlying the assumptions. The conclusions are logically and reasonably derived from the assumptions and supported by the data presented. Any gaps in information and inconsistencies with other pertinent scientific information are adequately explained.

4. *Quantitative analysis.* The data have been analyzed using appropriate statistical or quantitative methods.

5. *Context.* The information is placed in proper context. The assumptions, analytical techniques, data, and conclusions are appropriately framed with respect to the prevailing body of pertinent scientific knowledge.

6. *References.* The assumptions, analytical techniques, and conclusions are well referenced with citations to relevant, credible literature, and other pertinent existing information.

(b) *Common sources of scientific information.* Some sources of information routinely exhibit all or some of the characteristics listed in (a) of this subsection. Information derived from one of the following sources may be considered scientific information if the source possesses the characteristics in Table 1. A county or city may consider information to be scientifically valid if the source possesses the

characteristics listed in (a) of this subsection. The information found in Table 1 provides a general indication of the characteristics of a valid scientific process typically associated with common sources of scientific information.

Table 1	CHARACTERISTICS					
SOURCES OF SCIENTIFIC INFORMATION	Peer Review	Methods	Logical conclusions and reasonable inferences	Quantitative analysis	Context	References
A. Research. Research data collected and analyzed as part of a controlled experiment (or other appropriate methodology) to test a specific hypothesis.	x	x	x	x	x	x
B. Monitoring. Monitoring data collected periodically over time to determine a resource trend or evaluate a management program.		x	x	У	x	x
C. Inventory. Inventory data collected from an entire population or population segment (e.g., individuals in a plant or animal species) or an entire ecosystem or ecosystem segment (e.g., the species in a particular wetland).		x	x	у	x	x
D. Survey. Survey data collected from a statistical sample from a population or ecosystem		x	X	У	X	X
E. Modeling. Mathematical or symbolic simulation or representation of a natural system. Models generally are used to understand and explain occurrences that cannot be directly observed.	x	x	x	x	x	x
F. Assessment. Inspection and evaluation of site-specific information by a qualified scientific expert. An assessment may or may not involve collection of new data.		x	X		x	x
G. Synthesis. A comprehensive review and explanation of pertinent literature and other relevant existing knowledge by a qualified scientific expert.	x	x	X		x	x
H. Expert Opinion. Statement of a qualified scientific expert based on his or her best professional judgment and experience in the pertinent scientific discipline. The opinion may or may not be based on site-specific information.			x		x	x

- **x** = characteristic must be present for information derived to be considered scientifically valid and reliable
- y = presence of characteristic strengthens scientific validity and reliability of information derived, but is not essential to ensure scientific validity and reliability

(c) *Common sources of nonscientific information.* Many sources of information usually do not produce scientific information because they do not exhibit the necessary characteristics for scientific validity and reliability. Information from these sources may provide valuable information to supplement scientific information, but it is not an adequate substitute for scientific information. Nonscientific information should not be used as a substitute for valid and available scientific information. Common sources of nonscientific information include the following:

(i) Anecdotal information. One or more observations which are not part of an organized scientific effort (for example, "I saw a grizzly bear in that area while I was hiking").

(ii) Nonexpert opinion. Opinion of a person who is not a qualified scientific expert in a pertinent scientific discipline (for example, "I do not believe there are grizzly bears in that area").

(iii) Hearsay. Information repeated from communication with others (for example, "At a lecture last week, Dr. Smith said there were no grizzly bears in that area").

(6) Counties and cities are encouraged to monitor and evaluate their efforts in critical areas protection and incorporate new scientific information, as it becomes available.

WAC 365-195-910. Criteria for obtaining the best available science.

(1) Consultation with state and federal natural resources agencies and tribes can provide a quick and cost-effective way to develop scientific information and recommendations. State natural resource agencies provide numerous guidance documents and model ordinances that incorporate the agencies' assessments of the best available science. The department can provide technical assistance in obtaining such information from state natural resources agencies, developing model GMA-compliant critical areas policies and development regulations, and related subjects. The department will make available to interested parties a current list of the best available science determined to be consistent with criteria set out in WAC 365-195-905 as identified by state or federal natural resource agencies for critical areas.

(2) A county or city may compile scientific information through its own efforts, with or without the assistance of qualified experts, and through state agency review and the Growth Management Act's required public participation process. The county or city should assess whether the scientific information it compiles constitutes the best available science applicable to the critical areas to be protected, using the criteria set out in WAC 365-195-900 through 365-195-925 and any technical guidance provided by the department. If not, the county or city should identify and assemble

additional scientific information to ensure it has included the best available science.

WAC 365-195-915. Criteria for including the best available science in developing policies and development regulations.

(1) To demonstrate that the best available science has been included in the development of critical areas policies and regulations, counties and cities should address each of the following on the record:

(a) The specific policies and development regulations adopted to protect the functions and values of the critical areas at issue.

(b) The relevant sources of best available scientific information included in the decision-making.

(c) Any nonscientific information – including legal, social, cultural, economic, and political information – used as a basis for critical area policies and regulations that depart from recommendations derived from the best available science. A county or city departing from science-based recommendations should:

(i) Identify the information in the record that supports its decision to depart from science-based recommendations;

(ii) Explain its rationale for departing from science-based recommendations; and

(iii) Identify potential risks to the functions and values of the critical area or areas at issue and any additional measures chosen to limit such risks. State Environmental Policy Act (SEPA) review often provides an opportunity to establish and publish the record of this assessment.

(2) Counties and cities should include the best available science in determining whether to grant applications for administrative variances and exemptions from generally applicable provisions in policies and development regulations adopted to protect the functions and values of critical areas. Counties and cities should adopt procedures and criteria to ensure that the best available science is included in every review of an application for an administrative variance or exemption.

WAC 365-195-920. Criteria for addressing inadequate scientific information.

Where there is an absence of valid scientific information or incomplete scientific information relating to a county's or city's critical areas, leading to uncertainty about which development and land uses could lead to harm of critical areas or uncertainty about the risk to critical area function of permitting development, counties and cities should use the following approach:

(1) A "precautionary or a no risk approach," in which development and land use activities are strictly limited until the uncertainty is sufficiently resolved; and

(2) As an interim approach, an effective adaptive management program that relies on scientific methods to evaluate how well regulatory and nonregulatory actions achieve their objectives. Management, policy, and regulatory actions are treated as experiments that are purposefully monitored and evaluated to determine whether they are effective and, if not, how they should be improved to increase their effectiveness. An adaptive management program is a formal and deliberate scientific approach to taking action and obtaining information in the face of uncertainty. To effectively implement an adaptive management program, counties and cities should be willing to:

(a) Address funding for the research component of the adaptive management program;

(b) Change course based on the results and interpretation of new information that resolves uncertainties; and

(c) Commit to the appropriate timeframe and scale necessary to reliably evaluate regulatory and nonregulatory actions affecting critical areas protection and anadromous fisheries.

WAC 365-195-925. Criteria for demonstrating "special consideration" has been given to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

(1) RCW 36.70A.172(1) imposes two distinct but related requirements on counties and cities. Counties and cities must include the "best available science" when developing policies and development regulations to protect the functions and values of critical areas, and counties and cities must give "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. Local governments should address both requirements in RCW 36.70A.172(1) when developing their records to support their critical areas policies and development regulations.

(2) To demonstrate compliance with RCW 36.70A.172(1), a county or city adopting policies and development regulations to protect critical areas should include in the record evidence that it has given "special consideration" to conservation or protection measures necessary to preserve or enhance anadromous fisheries. The record should be developed using the criteria set out in WAC 365-195-900 through 365-195-925 to ensure that conservation or protection measures necessary to preserve or enhance anadromous fisheries are grounded in the best available science.

(3) Conservation or protection measures necessary to preserve or enhance

anadromous fisheries include measures that protect habitat important for all life stages of anadromous fish, including, but not limited to, spawning and incubation, juvenile rearing and adult residence, juvenile migration downstream to the sea, and adult migration upstream to spawning areas. Special consideration should be given to habitat protection measures based on the best available science relevant to stream flows, water quality and temperature, spawning substrates, instream structural diversity, migratory access, estuary and nearshore marine habitat quality, and the maintenance of salmon prey species. Conservation or protection measures can include the adoption of interim actions and long-term strategies to protect and enhance fisheries resources.

Statutory Authority: RCW 36.70A.190 (4)(b). 00-16-064, § 365-195-925, filed 7/27/00, effective 8/27/00.

From:	Hermen, Matt
То:	<u>"Dean H.";</u> <u>Wiser, Sonja</u>
Subject:	RE: CPZ2018-00021 Urban Holding I-5/179th Street Area, Phase 2
Date:	Tuesday, November 13, 2018 11:47:00 AM

Thank you for your comment Mr. Hergesheimer. We will include your comment in the record for the Planning Commission to consider.

Thanks,



Matt Hermen, AICP CTP Planner III COMMUNITY PLANNING

564.397.4343



From: Dean H. [mailto:dljhg@msn.com]
Sent: Tuesday, November 13, 2018 11:45 AM
To: Wiser, Sonja
Cc: Hermen, Matt
Subject: CPZ2018-00021 Urban Holding I-5/179th Street Area, Phase 2

Gentlemen:

I want to go on record that I agree with the Staff Report recommendation of "Denial" for this proposal as it is premature due to the lack of adequate public facilities and services at this time.

Dean Hergesheimer 4404 NE 174th Street Vancouver, WA 98686

dljhg@msn.com

CLARK COUNTY: Economic Feasibility Study for I-5/179th Interchange Area Development



Prepared for: Clark County Public Works

May 2018

E. D. Hovee & Company, LLC

Economic and Development Services



AT-A-GLANCE SUMMARY

As the last interchange on Interstate 5 to be upgraded in Clark County, 179th Street offers opportunity to serve as an economic catalyst for an employment-focused Discovery Corridor – extending across five interchanges from the I-5/I-205 junction north to the Clark County line. Funded by the Washington State Community Economic Revitalization Board (CERB), this feasibility study outlines a strategy offering realistic prospects for improved community economic vitality for above median wage jobs for the 179th interchange area and for the full Discovery Corridor. Key findings from this report follow.

The I-5/179th Interchange. The geography of the I-5/179th full study area comprises 5,300 acres extending on both sides of I-5 from 139th Street north to 219th Street. Of this area, 2,100 acres are currently covered by an Urban Holding (UH) designation, meaning that further development cannot proceed until 179th Street interchange and supporting infrastructure improvements are completed.

Based on the Clark County Vacant Buildable Lands Model (VBLM), 1,114 acres are identified as located within an urban growth area (UGA) and suitable for residential or employment development. The UH area has the bulk of the full study area's buildable land and housing potential; the rest of the study area is pivotal for creating a critical mass of family wage job opportunity for Clark County residents.

In addition to transportation infrastructure needs, 85-90% of parcels with buildable lands are affected – at least in part – by critical land constraints. A major share of new residential development will require intensified use of partially developed sites – also a factor with business development. Due to the fragmented nature of existing ownerships, considerable assembly of smaller parcels will be required to achieve significant employment potential on properties zoned for light industrial and business park use.

Economic & Fiscal Assessment. Based on current zoning and land suitable for development, at full build-out the full I-5/179th Study area offers opportunity for:

- **5,550 added jobs directly in the study area** with a full economic multiplier impact including indirect and induced effects of 7,670 added jobs county-wide
- 5,650 new housing units including single-family, multi-family and mixed-use development
- **\$2.9 billion in construction value** yielding \$239 million in one-time sales tax and real estate excise tax (REET) revenues to the State of Washington and local jurisdictions in Clark County
- \$34 million in on-going annual tax revenue from REET, property and sales tax sources

Market Analysis. Demographic, economic, and industrial site considerations are all well suited for the I-5/179th area to support the development of county-wide **industry clusters** for computers and electronics, clean tech, software, metals and machinery and life sciences – for a mix of local and outside investment, especially for firms requiring **immediate access** to I-5 corridor transport and labor force.

Market Strategy. Five **activity clusters** are identified as pivotal to creating an I-5/179th full-service jobs eco-system – for employment center, commercial/mixed use, entertainment/event, business/ commerce and surrounding residential uses. A 3-step **action agenda** includes recommendations to: 1) proceed with ready-to-build public-private partnership projects, 2) recruit private investment for the best available development and CERB-supported capital funding proposal; and 3) prepare a cooperative, multi-jurisdictional 20-year Discovery Corridor strategic plan.

CERB MINIMUM REQUIREMENTS

This I-5/179th interchange area feasibility study is aimed to outline a clear strategy offering realistic prospects for improved community economic vitality in unincorporated north Clark County. What follows is a summary statement of responses to the following **minimum requirements** that this planning study is to address with future CERB application for the Prospective Development Construction Program. For each CERB item specified, reference also is made to the portion of the report in which the topic is discussed in more detail.

a. A product market analysis linked to economic development.

Detailed components of a product market analysis are provided by the Section IV Market Analysis portion of this economic feasibility study report and Section V Market Strategy components of this analysis. More so than other developed or as-yet emerging areas of Clark County, the I-5/179th study area offers the unique opportunity to create what is described in this feasibility study report as a *full-service jobs eco-system*.

As described and mapped with the Section V Market Strategy, the five key activity clusters associated with this economic development concept include:

- Employment center focused on light industrial and business park uses north of 179th Street as a primary though not the only source for generating family wage jobs
- Commercial & mixed use the most immediate catalyst per current developer interest
- Entertainment & events anchored by the Clark County fairgrounds and amphitheater
- Business & commerce clustered along a newly improved NE 10th Avenue corridor south of 179th Street
- Surrounding residential encompassing and supporting the I-5/179th economic clusters

b. A market strategy containing action elements linked to timelines.

As noted, Section V of this report covers the recommended market strategy – beginning with the overall concept, followed by discussion of activity clusters, economic feasibility, partnership opportunities and resulting action agenda. The action agenda involves three pivotal steps:

- **Proceeding with ready-to-build public-private partnership (P3) projects** with lifting of Urban Holding as supported by committed infrastructure capacity (starting this year)
- Recruiting for the best available economic development catalyst project with an above median wage (or family wage) private employment investment (next 2-3 years)
- **Preparing a cooperative, multi-jurisdictional, 20-year Discovery Corridor strategic plan** – encompassing all five I-5 interchange areas extending from the I-5/I-205 junction to the Clark County line (within the next 3-5 years)

c. Identification of targeted industries

As the state-designated Associate Development Organization (ADO) for Clark County, the Columbia River Economic Development Council (CREDC) has identified five targeted industry clusters for business development and recruitment:

- Computers and electronics
- Clean tech
- Software
- Metals and machinery
- Life sciences

As described by the Section IV Market Analysis, the study area presents definite opportunity to support and strengthen the life sciences hub that has emerged in the adjoining Salmon Creek/139th interchange area – anchored by major employers including WSU-Vancouver, Legacy Salmon Creek Medical Center, and Vancouver Clinic.

With unparalleled interstate freeway access for local and regional distribution, the Discovery Corridor is also well positioned to support Clark County and regionally based computer/electronic, clean-tech and software firms that depend on or otherwise benefit from the corridor's university research and life science attributes. And the corridor may be well situated for specialized metals and machinery manufacturing – both larger end users that want to own their own sites and for smaller niche players seeking an affordable, accessible industrial or business park location.

Added sources of family wage job growth may comprise a mix of professional and business, financial services, and the higher wage portions of the education/health services sector. Business activity should cover both tightly niched small as well as large employers. This mix can be accommodated with a combination of large sites for major corporate and branch facilities together with multi-tenant business parks for a diversity of small firms.

d. Identification of the group responsible for implementing the marketing strategy. Describe the group's capacity to complete the responsibility.

As described by the Section V Market Strategy, this feasibility study recommends that Clark County take the lead role for implementation and coordination of all three action agenda items. Clark County will pursue opportunities for cooperative marketing to secure an economic development catalyst project with the Columbia River Economic Development Council (CREDC) as the state-recognized Associate Development Organization for Clark County.

Clark County can also pursue creation of a working partnership with affected jurisdictions – including affected cities, port districts, tribal interests, and other public service providers in preparing and then implementing a 20-year Discovery Corridor strategic plan.

e. The site's appropriateness by addressing, at minimum, appropriate zoning, affect to the state or local transportation system, environmental restrictions, cultural resource review, and the site's overall adequacy to support the anticipated development upon project completion.

The capacity of the I-5/179th interchange for both employment and residential development is addressed by the Section II I-5/179th Interchange Area discussion which profiles the Urban Holding, local revitalization funding (LRF) and Discovery Corridor geographies of the full study area. This analysis relies on the Clark County Vacant Buildable Lands Model (VBLM) which quantifies capacity for added employment and residential development as consistent with current urban growth area (UGA) boundaries, comprehensive plan and zoning considerations and environmental restrictions as quantified with critical land exclusions.

The Urban Holding (UH) area in the immediate vicinity of the interchange is of particular importance – as development is conditioned on securing transportation infrastructure adequate to serve planned development. The Urban Holding overlay zone accounts for 2,100 acres of the total 5,300 full study area. Lands subject to Urban Holding constitute the bulk of the full study area's housing potential; the rest of the study area is more pivotal for creation of employment offering above median wage job opportunities.

f. A location analysis of other adequately served vacant industrial land.

The significance of the I-5/179th interchange area in relation to the full I-5/Discovery Corridor and the rest of Clark County is addressed by the industrial lands discussion with the Section IV Market Analysis. Of 56 potential employment sites (of 20+ acres) in Clark County, 17 sites are in the Discovery Corridor including five sites situated in or immediately adjacent to the I-5/179th study area.

The Discovery Corridor sites are advantageous for firms that value convenient access to I-5, notably for convenient freight service to the Puget Sound region. Of the Discovery Corridor sites, those in the I-5/179th study area offer the added advantages of central proximity to county-wide and regional workforce in what is planned as a *full-service jobs eco-system* with ready access to commercial services, mixed use and residential development.

g. Total funding for the public facilities improvements is secured or will be secured within a given time frame.

As described by the Introduction (Section I) to this economic feasibility study, the anticipated cost of improving the I-5/179th interchange is estimated at \$35 million. Upgrading county arterials could cost an added \$29 million. While the 2015 Legislature provided \$50 million for the project, currently programmed state funds will not be available until 2023-25. Due to the critical nature of the project for the region's economic future, the 2018 Legislature approved \$500,000 to begin project scoping and design work. The County is also interested in securing separate funds to augment or state transportation funding, especially for projects that serve a catalyst role in creating family wage job opportunities.

h. An analysis of how the project will assist local economic diversification efforts.

This analysis is provided by the Section V Market Strategy – beginning with a 10-point concept for this I-5/179th interchange set in the context of the greater five interchange Discovery Corridor as a major source of future Clark County family wage employment growth. For the I-5/179th study area, the concept includes identification of five key activity clusters as described by item (a) above. This analysis further addresses economic feasibility, partnership opportunities and a 5-year action agenda.

i. Indicate the specific issues that will be addressed.

The two issues most pivotal to sustained economic competitiveness consistent with the Section V Market Strategy and with any future proposed CERB capital projects are:

- Funding of required transportation and related infrastructure investments, first, to support lifting of the Urban Holding designation in the immediate vicinity of the interchange and, second, to support employment center development for above median wage jobs both south and north of the interchange area.
- The need for aggressive business development marketing to secure a lead or anchor family wage employer investment at the I-5/179th interchange and, more broadly, to pursue preparation of a cooperative 20-year strategic plan encompassing all five north county I-5 interchanges of the Clark County Discovery Corridor.

j. List one or more economic outcomes that you expect from the proposed CERB project.

Economic outcomes anticipated **with build-out** of the I-5/179th interchange study area are detailed by the Section III Economic & Fiscal Assessment portion of this report – including:

- **5,550 direct jobs** covering industrial, commercial, and entertainment sectors important to Clark County's economic vitality
- **5,650 housing units** as a mix of single attached/detached and multi-family workforce housing in support of the Discovery Corridor employment center.
- \$239 million in construction related and \$34 million per year in on-going tax revenues – to benefited state and local jurisdictions.
- Achieving an above median wage -- in excess of the approximately \$20 per hour current county-wide median viewed as a minimum threshold for CERB infrastructure funding.

The #1 objective for any proposed CERB capital grant/loan request will be achieving a wage profile for benefited employer(s) in excess of the Clark County median wage. This is consistent with the adopted Clark County policy to prioritize assistance to employers who pay above a family wage. Family wage employment has been defined by Clark County as an above average wage for Clark County – similar to though not quiet the same as the median

wage determination by CERB. For purposes of this economic feasibility report, the terms "above median wage" and "family wage" are used interchangeably.

For the already approved LRF, sales and property tax revenue generation for this portion of the I-5/179th study area will also be of considerable importance.

k. Describe the specific, quantifiable measures of the outcome(s) that will indicate success. Describe in measurable terms what you expect to be able to show as progress toward the outcome for each year before the whole outcome has been achieved.

Responses to items (k) - (m) are as outlined by the Section V Market Strategy with discussion of economic outcomes of this economic feasibility report. Output metrics are to be provided consistent with the response to item (i) above.

Key measures are jobs resulting from new development, residential housing units, tax revenues and wage levels. These metrics are proposed to be set in place and measured for the full study area. If CERB or related state economic development funding is provided for one or more specific projects, the same or similar metrics are expected to apply to the benefit area defined for each individual project.

I. Describe what data you will collect to determine whether the outcome is being achieved.

Regularly updated datasets that should be available consistent with the study area boundaries of the I-5/179th interchange area include:

- Square footage of new building space developed for employment, residential and other uses
- Study area employment and wages
- Assessed valuation by use type
- Property tax revenues
- Sales tax revenues (for properties within the LRF)

In the event that CERB funding is secured for a specific project area, Clark County could establish protocols for compilation of similar information for the specific development(s) benefited. This may involve agreements with the affected properties to provide outcome metrics – including payroll information in a manner as may be mutually determined.

m. Describe the data collection procedure including when data will be collected, from whom and by whom.

In the event of CERB capital funding and as outlined by Section V Market Strategy discussion of economic outcomes, Clark County should also be prepared to establish protocols that

include designation of a County department with the overall responsibility for data collection and management together with interagency agreements involving Clark County and the State of Washington for data sets that are within their respective purviews.

Data compilation is proposed to occur consistent with agency reporting cycles on an annual basis. The term of the data collection process is proposed to be for a period of not to exceed 10 years or as otherwise may be mutually agreed with the State of Washington / CERB program.

Anticipated data collection responsibilities are outlined as follows:

- Clark County Auditor or Treasurer's Office for sales tax revenues (as currently maintained for the LRF)
- **Clark County Assessor/GIS** building square footage, valuation of new construction and property taxes by employment, residential and other use.
- State of Washington Employment Security Department (ESD) average and median wage for all work district employment (subject to confidentiality requirements)
- U. S. Census On-The-Map for employment and payroll estimates, if not available from other sources.

ESD data is proposed to be provided in the form of median hourly pay (not currently available except on a county-level for all job sectors combined but not for specific NAICS industrial sectors) as well as for average annual wages (which is currently a part of the normal ESD payroll reporting format).

n. The estimated median hourly wage of the jobs created when development occurs.

A pivotal objective of this CERB infrastructure investment is to leverage economic development that will result in wages exceeding the Clark County median. Ideally, tracking of outcomes is proposed to be through an interagency agreement whereby WA-ESD would provide this data in a form as mutually agreed between the County, ESD and CERB.

For any projects funded with CERB resources, it is understood that the median wage of those employed in the portion of the I-5/179th study area most directly benefitted will exceed the current Clark County median hourly wage (shown by CERB data as \$19.99 per hour).

o. If the project is determined to be feasible, the following information must be provided within the final report:

This feasibility study indicates that build-out of the 1-5/179th study area as a full-service jobs eco-system should be feasible – contingent on funding for transportation and related development infrastructure. In the event that CERB capital funding is secured, information

for items (1)-(9) below will be provided for the portion of the study area most directly benefited.

What follows are preliminary estimates associated with build-out of the full study area.

- 1. Total estimated jobs created (in FTEs). Approximately 5,550 direct jobs within the study area, equating to 7,670 jobs county-wide including economic multiplier effects.
- 2. Describe benefits offered to employees. Information is not available and is not anticipated to be collected for new businesses in the area except for firms that may be directly benefited by CERB capital funding. Clark County has included explicit calculation of benefits as a 25% add-on to the wage portion of employment compensation with substitutability of above threshold wages for benefits as a possibility depending on individual firm practices and procedures.
- 3. Describe the median hourly wage of the new jobs in relation to the median hourly county wage. The feasibility study targets a mix of business types which combined is targeted to pay above the median wage for Clark County. Early non-CERB funded employment development may include a significant component of retail employment that is important as an early development catalyst but likely will not pay above the Clark County median wage. As companies and developers are attracted, employment center build-out will be aimed to achieve a higher wage profile with the objective of exceeding the county-wide median wage for any CRB funded project and for the full study area at build-out.
- 4. The county three-year unemployment rate in relation to the state rate. Over the last three years (2015-17) for which annual average unemployment rates are now available, Clark County's unemployment has dropped from 6.5% to 5.1% averaging 6.0% for the full three-year period. For Washington state, comparable rates have declined from 5.7% to 4.8% over the same time period averaging 5.3% over all three years. While trending downward, Clark County's unemployment has averaged 13% above the statewide rate over the last three years. Additional unemployment rate information for Clark County and the entire state is provided by Appendix C to this report.
- 5. County population change in the last five years. As of 2017, OFM estimates that Clark County has 471,000 residents. From 2012-17, countywide population has increased by 39,750 residents, a gain of 9.2% in the last five years equating to a growth rate averaging 1.8% per year. (See detailed chart with Appendix C to this report).
- 6. The estimated jobs created represent what percentage of the county's labor force. As of 2017, U.S. Bureau of Labor Statistics (BLS) data indicates that Clark County has a resident labor force estimated at 227,400 persons. The 5,550 jobs created directly within the I-5/179th study area at build-out represents 2.4% of the current countywide labor force. With economic multiplier effects included, the county-wide gain of 7,670 jobs would account for 3.4% of the county-wide labor force. These jobs represent opportunity to reduce current commuting for the one-third share of Clark County workers who currently travel to jobs outside the County primarily to Oregon.

- 7. The estimated jobs created represent what percentage of the county's unemployed workers. For 2017, BLS data indicates that there were an estimated 11,600 unemployed resident workers in Clark County. The 5,550 direct job potential represents 48% of the number of unemployed workers in Clark County. With economic multiplier impacts included, the 7,670 jobs added directly and indirectly would represent about 66% of the currently unemployment resident workforce.
- 8. Estimated new annual state and local revenue generated by the private business. State and local sales tax on new construction together with Real Estate Excise Tax (REET) from sales of completed development is estimated at \$239 million, received incrementally over a multi-year period to build-out of the I-5/179th interchange area. At build-out, the study area is expected to generate \$34 million per year in added state and local property, REET and sales tax revenues. *Note:* All revenues are estimated in 2017 dollars and tax rates.
- **9. Estimated private investment generated by project.** The added value of development realized to area build-out is conservatively estimated at \$2.9 billion by build-out (in 2017 dollars), consistent with current Clark County fair market value assessments. Total private investment can be expected to exceed this amount by another 25-35% due to funding of project indirect or soft costs plus furnishings and equipment.

The remainder of this economic feasibility report provides detailed analysis and documentation for the summary statements related to CERB minimum requirements as outlined above. Topics covered by the full report include a profile of the I-5/179th interchange area, economic and fiscal assessment, market analysis, and market strategy together with discussion of market and financial feasibility, marketing and economic outcomes.

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I. INTRODUCTION

This I-5/179th interchange area economic feasibility study is aimed to outline a clear strategy offering realistic prospects for improved community economic vitality while also addressing funding requirements of the Washington State Community Economic Revitalization Board (CERB). This introduction statement begins by describing the project purpose and background, followed by role of the CERB feasibility study, and an outline of the report's organization.¹

PROJECT PURPOSE & BACKGROUND

In addition to briefly describing the project's purpose and background, key elements of this discussion cover project cost and funding, related projects, economic catalyst role of planned improvements, and pivotal role of the 179th Street interchange for the I-5/Discovery Corridor.

Project Purpose

Improve safety, enhance mobility and support job creation at the south end of Clark County's *Discovery Corridor*, an area along I-5 that has been identified for intensive job creation.

Background

The current I-5/NE 179th interchange was built in the 1960s, when north Clark County and the fairgrounds areas were still relatively rural. Vertical clearance under the freeway bridges no longer meets current standards, nor do the bridges comply with modern earthquake standards.

A *pinch point* under the freeway creates a major bottleneck for east-west traffic flow on NE 179th Street. There is little remaining traffic capacity in the corridor. Added job-creating projects are limited or thwarted because of inadequate I-5 and supporting local infrastructure.

Project Cost & Funding

As of 2017, improving the interchange has been estimated to cost \$35 million. Upgrading county arterials near the interchange could cost an added \$29 million. As part of a \$16.1 billion statewide transportation package, the 2015 Legislature provided \$50 million for the project but with state funds not available until 2023-25.

Due to the critical nature of the project for the region's economic future, Clark County requested the Legislature to accelerate construction and provide early state funds for design, engineering and permitting work. The 2018 Legislature approved \$500,000 for project scoping and design work in conjunction with the \$50 million Connecting Washington project.

Related Transportation Projects

Within the project study area, Clark County is currently proceeding with a separate project to extend, widen and improve NE 10th Avenue along the west side of I-5, including construction of a bridge over Whipple Creek. Construction began in 2017 at an expected cost of \$22 million.

The NE 10th Avenue project will improve traffic circulation by closing a gap in the transportation grid, enhance public safety with an alternate route for first responders, increase access to the Event Center at the Clark County Fairgrounds, Sunlight Supply Amphitheater, and other recreational facilities, and support land uses as envisioned in the County's Comprehensive Plan.

Economic Development Catalyst

Consistent with the project purpose, I-5/179th interchange improvements are intended to support job creation in the southern half of Clark County's Discovery Corridor. Extending north from 134th Street to the Clark County line, the Discovery Corridor is planned to serve as a major source of employment growth for southwest Washington for years to come.

As detailed by Appendix B to this report, an earlier August 2015 analysis conducted for area property owners and developers first forecast an opportunity for significant job and tax revenue potential with development near the I-5/179th interchange. Clark County has signed a development agreement, pivotal for traffic improvements for the planned Three Creeks retail and mixed use center, as well as benefitting other planned area development.

Pivotal Role of 179th Interchange

As shown by the map to the right, the Discovery Corridor is served by five major sets of I-5 freeway interchanges:

- 134th / 139th interchange area also serving as the confluence of the I-5 and I-205 freeways – with 139th recently added as a reliever to overcrowding of the in-place 134th Street interchange.
- 179th Street interchange serving the Clark County fairgrounds and largely undeveloped area east and west of I-5 (<u>a focus of this analysis</u>).
- 219th Street Battle Ground (SR 502) interchange – completed in 2016 to provide a direct connection from I-5 via SR 502 to Battle Ground.
- 269th Street Ridgefield (SR 501) interchange – serving the I-5 Junction employment center and population growth of Ridgefield as one of the fastest growing communities in Washington state.



I-5/Discovery Corridor Interchanges

Source: Clark GIS and E. D. Hovee.

• **319th Street / La Center Road interchange** – serving the town of La Center and the ilani tribal casino opened in 2017.

179th Street is the oldest of the I-5/Discovery Corridor interchanges – with no substantial improvements made since its initial construction in the 1960s. In addition to providing for improved safety, mobility and economic expansion, the 179th interchange project will provide an opportunity to re-create the successful state-county partnership experienced with the \$133 million Salmon Creek interchange (134th/139th). The result will be to cooperatively build infrastructure essential to regional competitive advantage, job creation and a robust economy – benefiting the Discovery Corridor and Clark County.

ROLE OF CERB ECONOMIC FEASIBILITY STUDY

CERB funding of this feasibility study represents an important first step in the path to local and county-wide economic recovery. As Washington's strategic economic development resource, CERB is focused on creating family wage, private sector jobs in partnership with local governments by financing infrastructure needed for industrial and office-related employment.

This economic feasibility study is intended to address topics including market analysis and marketing strategy, zoning and land use analysis, identify measurable economic outcomes and data collection processes along with projected employment figures. As specific eligible project activities are identified, this study may also serve as documentation for a Prospective Development Construction Program Application that could be submitted by Clark County for CERB capital funding consideration.

REPORT ORGANIZATION

The remainder of this economic feasibility study is organized to cover the following topics:

- The I-5/179th interchange area describing area planning and zoning followed by a review of build-out potentials for Urban Holding and full study areas, respectively.
- Economic & Fiscal Assessment providing quantitative estimates of direct and economic multiplier employment, payroll and revenue effects together with one-time construction and annualized tax revenue effects to benefited state and local jurisdictions (for both the Urban Holding and full study areas).
- Market Analysis as a review of existing county-wide demographics and economics together with discussion of committed area development, industrial lands and opportunity for this I-5/179th area to be developed as a full-service jobs eco-system.
- Market Strategy beginning with description of a development concept centered around five inter-connected activity clusters, followed by summary discussion of economic feasibility, partnership opportunities, marketing, economic outcomes and a recommended action strategy.

II. THE I-5/179TH INTERCHANGE AREA

Feasibility study discussion begins with an overview of the I-5/179th interchange area – including definition of study areas, comprehensive plan and zoning considerations. This is followed by a review of existing conditions affecting Urban Holding areas and what is described as a full study area – also including Discovery Corridor and Local Revitalization Financing (LRF) geographies.

INTERCHANGE STUDY AREAS

Economic effects of planned improvements are considered at two levels of geographic scale:

- **Urban Holding (UH) Areas** for properties most directly impacted and currently subject to an Urban Holding designation, meaning that further urban development cannot proceed until interchange and supporting infrastructure improvements are completed.
- **Full I-5/179th Study Area** includes but extends beyond the UH area to cover Discovery Corridor and LRF properties also benefitted by planned interchange improvements.

The inter-relationship of these areas is depicted by the map below. The full study area represents the *outermost boundary* of the UH, Discovery Corridor and LRF geographies (as further described in this section).

An approximate 2.100-acre portion of the full study area is subject to a Comprehensive Plan Urban Holding (UH) overlay. UH Properties are shown on the map by the green cross-hatch area extending in a horseshoe shaped pattern around the I-5/179th interchange.



I-5/179th Interchange Full Study Area

Source: Clark GIS and E. D. Hovee. The Discovery Corridor area shown is for the portion of the corridor south of 219th Street.

As described by the updated 2016 Comprehensive Plan: "The Urban Holding Overlay protects areas from premature land division and development that would preclude efficient transition to urban development or large-scale industrial development."

Other properties generally situated in closest proximity both south and north of the interchange are part of the larger full study area. This larger study area also includes some rural property outside of the existing urban growth area (UGA).

For properties not subject to the Urban Holding (UH) designation, development can proceed prior to completion of planned interchange improvements. This includes commercial and public facility property in the immediate interchange area – as well as some industrial land along NE 10th Avenue plus land extending north to the 219th interchange area.

While not directly dependent on an upgraded interchange as a condition of development, non-UH properties of the LRF and Discovery Corridor will indirectly benefit. Improved local transportation and access to the I-5 corridor will serve as an additional impetus to development for commuters to and from area worksites and residences, freight mobility for local companies shipping via truck on I-5, and patronage of area shopping and entertainment/event facilities.

Zoning Designations

Land use planning associated with Clark County's Comprehensive Plan is implemented via property-specific zoning designations. Zoning and related land use regulations are provided by Title 40 of the county's Unified Development Code.

The Urban Holding area is associated with 11 separate zoning districts. The larger full study area encompasses a total of 21 zoning districts. As detailed with the chart (following the map on the next page), applicable zoning designations can be subsumed under broader categories of:

- Resource and rural districts
- Commercial, business, mixed use and industrial districts
- Urban area residential and office-residential districts
- Single-family residential districts
- Parks, open space and wildlife designations

The map on the next page illustrates current zoning designations applicable to the area surrounding the I-5/179th interchange. While the predominant land use designation has been for urban low density residential, properties closest to the interchange are indicated for a range of commercial, industrial, public facility, urban medium density, and mixed-use designations.

Of specific note is that industrial and business park zoning is situated away from the immediate interchange area – either north of 179th or south of the 179th commercial corridor. This means that future employment-focused development will likely depend on transportation and infrastructure investments beyond those anticipated for the immediate 179th Street corridor.


I-5/179th Holding Area & Full Study Area Zoning Districts

Zoning	Overview Description
Resource & Rural Di	stricts:
R-5	Intended for residential living and ag-forestry in rural areas; minimum 5-acre lot
CR-1 Rural	Intended to provide for the location of businesses and services that are sized to
Commercial	serve the rural community; CR-1 is a designation outside rural centers
Commercial, Busine	ss, Mixed Use & Industrial Districts:
IL-Light Industrial	Intended for less-intensive industrial uses which produce little noise, odor and pollution; also provides for compatible resource-based uses and service uses
BP-Business Park	May include limited light manufacturing and wholesale trade, light warehousing, business and professional services, research, business, and corporate offices
PF-Public Facilities	For already developed public parks, open space, and facilities permanently in a specific location, such as schools and other governmental facilities
GC-General Commercial	Provides for a full range of goods and services necessary to serve large areas of the county and the traveling public, including service-industrial uses.
CC-Community Commercial	Provides for the regular shopping and service needs of several adjacent neighborhoods
MX-Mixed Use	Provides for a mix of mutually supporting retail, service, office and residential uses – integrating two or more land uses in a mutually supportive development
Urban Area Residen	tial & Office-Residential Districts:
OR-30	Provides for residential and professional office development, with minimum multifamily/office lot area of 10,000 sq ft (housing density of 18-30 units per acre)
OR-22	As with OR-30 (but at a residential density of 15-22 units per acre)
OR-18	As with OR-30/18 (but at a residential density of 12-18 units per acre)
R-22	Provides for medium/higher density residential development, at minimum lot area of 4,000 square feet (and density of 15-22 units per acre)
R-18	As with R-22, minimum lot area of 4,000 sq ft (density of 12-18 units per acre).
R-12	As with R-12/18, minimum lot area of 4,000 sq ft per unit (at 8-12 units per acre)
Single-Family Reside	ential Districts:
R1-5	Minimum average 5,000 square foot lot area, 4,000 square feet for duplex units; maximum 7,000 square foot lot (or density of 8.7-6.1 units per acre)
R1-6	Minimum average 6,000 square foot lot area, or 5,000 square feet for duplex units, maximum 8,500 square foot lot (or density of 7.3-5.1 units per acre)
R1-7.5	7,500 – 10,500 square foot lot area (or density of 5.8-4.1 units per acre)
R1-10	10,000-15,000 square foot lot area (or density of 4.4-2.9 units per acre)
R1-20	Minimum 20,000-30,000 maximum sq ft lot (density of 2.2-1.4 units per acre)
Parks, Open Space 8	k Wildlife
P/OS	Parks/open space designation for recreation and environmental protection
P/WL	Parks/wildlife designation as shown with zoning map
Notos, Zonos in hald	

Notes: Zones in **bold face** are in Urban Holding areas. These plus other zones are within Discovery Corridor & LRF. Single family residential density ranges are for planned unit developments (PUDs).

Sources: Excerpted from Clark County Unified Development Code, Title 40.

URBAN HOLDING AREA

As illustrated by the following map, the horseshoe shaped Urban Holding (UH) area designation for the 179th Street area comprises approximately 2,100 acres. Urban scale development is effectively precluded pending completion of pertinent interchange improvements.



While within the Urban Growth Boundary (UGB), there are two specific Urban Holding overlays, described by Section 40.250.110 of the Clark County Unified Development Code as follows:

- 1) The Urban Holding-10 overlay (UH-10) situated away from I-5 is applied to protect lands identified within urban growth areas from premature residential development when public policy establishes urbanization criteria such as requiring annexation prior to development. The Urban Holding-10 district is also appropriate where public facilities are inadequate to support development under an urban residential zoning designation.²
- 2) The Urban Holding-20 overlay (UH-20) much of which adjoins I-5 has the same purpose as UH-10 except that the area is intended to be developed for industrial or office-type nonresidential uses; retention in larger lots is to ensure the site is adequate in size to accommodate large industrial or office developments now and in the future.

Holding Area Characteristics by Comprehensive Plan Designation. As illustrated by the graph to the right:

- Urban low residential accounts for the majority (55%) of land within the holding areas; medium density residential adds 8%.
- Industrial comprises 21%; commercial is at only 1% since C-zoned sites at I-5/179th are not directly affected by the holding zone.
- Mixed use zoning covers 13% of the land area, public facilities the remaining 2%.

I-5/179th Urban Holding Areas % Distribution of Land Area Plan Designation



Source: Clark GIS and E. D. Hovee.

Holding Area Characteristics by Zoning. A more detailed look at existing uses is provided for each of 11 zoning designations found in in the UH areas. Both assessor and GIS acreage figures are noted – showing some modest measurement differences:

- R1-20 and R1-10 lower density residential comprise the largest acreage categories, followed by mixed use (MX) and employment (BP/IL) zones.
- Currently, there are just 467 housing units spread across all but the PF zones.
- Total building area is over 943,500 square feet – of which residential zones comprise 64%, employment 29% and MX 7%.

Current 179th Urban Holding Areas Characteristics by Zoning Designation (2017)

	Site Area	(Acres)	Housing	Building
Zoning	Assessor	GIS	Units	Area (SF)
IL	192.16	186.48	62	131,902
BP	267.65	263.85	93	133,583
PF	39.55	38.73	0	0
CC	14.26	13.11	4	12,377
MX	270.14	261.30	27	62,748
OR-22	69.77	67.59	15	40,163
R-12	98.64	97.29	20	43,330
R1-6	54.71	52.37	12	21,387
R1-7.5	314.86	298.48	56	107,180
R1-10	374.48	365.02	98	222,701
R1-20	436.33	427.55	80	168,166
Totals	2,132.55	2,071.79	467	943,537

Source: Clark GIS and E. D. Hovee. See subsequent chart for zone summaries.

Property Valuation. As is detailed by the chart below, total assessed valuation of the I-5/179th holding zone area is estimated at approximately \$163 million as of 2017. Of this, \$70 million (43%) comprises land value with \$92 million (57%) as building valuation. After deducting for tax exemptions, total taxable value of this targeted study area is \$149 million (or 92% of the total assessed amount).

		Assessed	ed Valuation						
Zoning	Land	Buildings	Total	Taxable					
IL	\$10,027,744	\$9,925,801	\$19,953,545	\$18,030,305					
BP	\$7,258,717	\$10,526,784	\$17,785,501	\$16,243,170					
PF	\$1,246,170	\$0	\$1,246,170	\$0					
CC	\$892,445	\$847,592	\$1,740,037	\$1,432,076					
MX	\$6,712,720	\$5,484,065	\$12,196,785	\$9,303,903					
OR-22	\$2,608,355	\$1,860,273	\$4,468,628	\$4,468,628					
R-12	\$3,365,707	\$4,340,506	\$7,706,213	\$7,706,213					
R1-6	\$1,984,302	\$2,944,095	\$4,928,397	\$4,549,461					
R1-7.5	\$8,341,444	\$12,753,168	\$21,094,612	\$19,841,630					
R1-10	\$14,434,426	\$25,059,958	\$39,494,384	\$37,358,356					
R1-20	\$13,479,9 <mark>4</mark> 5	\$18,613,433	\$32,093,378	\$30,432,588					
Totals	\$70,351,975	\$92,355,675	\$162,707,650	\$149,366,330					

I-5/179th Interchange Urban Holding Areas Assessed Valuation (2017)

Sources: Clark GIS and E. D. Hovee.

Land value within the holding zones averages out to \$33,000 per acre (or \$0.76 per square foot). The range of tax assessed land values is from less than \$30,000 per acre for BP, MX and R1-7.5 zoned property up to more than \$50,000 per acre for IL and CC zoned land.

Critical Lands. Clark GIS data indicates that 964 acres or nearly one-half (47%) of the holding area overlays comprise critical areas and are not expected to support future development. Critical lands within the UH overlays are problematic for a greater share (58%) of employment than for residential and mixed use zoned acreage (43%).³

Development Capacity. As depicted by the chart below and to the to the right, the next step in this analysis is to assess build-out capacity for additional housing and employment:

- Build-out is estimated at 4,815 added residential units for over 12,800 residents plus up to an added 2,850 jobs.
- The bulk of net new job potential is on MX, BP and IL zoned land; residential is from generally lower density single family zones, except for MX.

Capacity figures are as estimated via Clark GIS using the Clark County Vacant Buildable Lands Model (VBLM). Estimates represent capacity for additional development – above and beyond what is already built.

	Added Co	ipacity @ Bui	ld-Out
Zoning	Housing Units	Population	Jobs
IL	0	0	536
BP	0	0	917
PF	0	0	0
CC	0	0	85
MX	719	1,912	1,313
OR-22	227	605	0
R-12	363	965	0
R1-6	176	469	0
R1-7.5	993	2,640	0
R1-10	1,029	2,736	0
R1-20	1,308	3,480	0
Totals	4,815	12,807	2,852

I-5/179th Urban Holding Areas Capacity

Source: Clark GIS/VBLM and E. D. Hovee, 2017.

Employment densities with the VBLM model are estimated at 9.0 jobs per acre for net developable industrial land and 20.0 jobs per acre for commercial uses. Although allowed residential densities vary with the zone, VBLM data indicates that net vacant developable land is assumed to develop at an average density of 8.0 dwelling units (DUs) per acre. Actual employment and population will vary depending on densities realized as development occurs.

Added notes regarding development capacity are summarized as follows:

- Of the roughly 2,100 acres of holding zone land, just over 600 acres (or less than 30%) is currently vacant, as defined by the County's VBLM model.⁴ The remaining 70% of land is already improved but often not to full urban development standards meaning that a substantial portion of future development will come from intensified use of previously developed (but underutilized) parcels.
- Reliance on already improved properties is particularly apparent for residential uses. Nearly three-quarters (74%) of the 4,800+ housing units of added residential capacity is expected to come with increased utilization of already partially developed residential lands. In contrast, less than half (46%) of the added 2,850 job capacity forecast is expected to come with intensified use of existing properties.
- Even more striking is the reliance on future development of properties with **critical lands**. Fully 85% of added residential build-out potential is expected to occur on parcels affected by some level of critical land constraints. For employment lands, over 90% of added jobs are expected to occur on sites for which at least a portion of the tax parcel is identified with critical land constraints.

All of the development capacity estimates are based on zoning as of mid-2017 and do not reflect potential future changes to Comprehensive Plan or zoning designations. As an example, the Board of Clark County Councilors has been considering a change to three properties totaling 38.64 acres at the southeast quadrant of the 179th Street and NW 11th Avenue intersection from the Urban Low Density (UL) designation of the adopted 2016 Comprehensive Plan to an Urban Medium Density Residential (UM) plan designation. As changes such as these are approved, this development capacity analysis may be correspondingly modified.⁵

As proposed for this three-parcel site, accompanying zoning would be revised from R1-20 to R-12. Current R1-20 zoning allows for a density of 1.4-2.2 units per acre; potential R-12 zoning could allow a range of 8-12 units per acre.

While residential densities could increase and result in added traffic, the area has previously been modeled at the higher UM density as part of the assumptions used with the NE 179th Street / I-5 interchange analysis – with resulting ability to accommodate the projected densities once planned roadway improvements are made. In the meantime, this property (like others in the holding zone) is subject to Urban Holding until localized critical links and intersection improvements are funded per the 6-year Transportation Improvement Plan or through an approved development agreement.

FULL STUDY AREA

The full study area represents the combination of three geographies of importance to the economic future of the I-5/179th area.

- Urban Holding Areas as previously described with urban development contingent on improved infrastructure including reconstruction of the I-5/179th interchange.
- Discovery Corridor as updated reflecting an area planned for significant added employment stretching north from the 139th Salmon Creek

I-5/179th Full Study Area Geographies

Subarea	Acres
Urban Holding Area	2,132.55
Discovery Corridor	4,442.32
LRF Area	835.02
Total (w/o overlap)	5,287.38

Source: Clark GIS and E. D. Hovee.

interchange area to the 219th Battle Ground interchange (not including the northern part of the Discovery Corridor extending further north to La Center).

 Local Revitalization Funding (LRF) area – an area on both sides of the I-5/179th interchange providing significant long-term commercial development opportunity in conjunction with state funding through CERB plus sale/use and property tax revenues generated within the LRF area.

As shown by the map on the next page, this southern Discovery Corridor area overlaps portions of the UH area and LRF areas. After deducting for overlaps, the combined size of this full study area is approximately 5,287 acres – about 2½ times the size of the UH area alone.



This feasibility report treats the full study area as one combined geography. Having already described the Urban Holding overlay, a brief description is provided for the southern portion of the Discovery Corridor and full LRF area. This is followed by a more complete profile for the combined full study area geography.

Discovery Corridor

Clark County's Discovery Corridor was identified as one of 17 Focused Public Investment Areas (FPIAs) in 2003.⁶ As initially described, the Discovery Corridor was situated about half in Vancouver's UGA and half in unincorporated Clark County – as the second largest FPIA in the county. Total potential industrial/commercial employment capacity with future build-out was estimated at 27,900 jobs with development on approximately 1,465 acres – including 553 acres of vacant land and 912 acres of redevelopment land. This would have included redevelopment of underutilized parcels including mostly single-family homes on 5- or 10-acre lots.

Needed potential infrastructure investments cited at the time were sewer (now provided by CRWWD), water (by CPU), transportation (Clark County and WSDOT), fire protection and emergency services (by local fire districts), addressing substantial stormwater and environmental issues (through Clark County), and electrical infrastructure (CPU).

This initial 2003 report noted that "transportation infrastructure is incomplete and existing roads are designed to serve rural rather than urban development." At the time, investment needs were noted for the NE 134th, 179th, 219th and Ridgefield (269th Street) interchanges. The need was also cited for a "frontage road system adjacent to I-5 to provide local land access."

Most of the interchanges noted have received significant upgrading together with supplemental new interchanges (as at 139th and 219th). The remaining interchange improvement need is for 179th Street which is central to implementation of the full Discovery Corridor concept. The full study area for this I-5/179th area report covers the southern half of the Discovery Corridor, extending from 219th Avenue south to NE 139th Street.

This southern Discovery Corridor area approximates 4,442 acres – including current VBLM capacity for added industrial/commercial capacity of 400 acres. This covers a portion of the 1,465 acres of potentially developable employment land estimated in 2003 for the full corridor which previously also assumed conversion of residential land to industrial and commercial uses.

LRF Area

In 2009, Clark County obtained funding for *local revitalization funding* as a LRF program administered by the Washington State Department of Revenue (DOR). Five of six projects were awarded a state contribution through E2SSB 6609, based on applications in September 2009 for and award during a first come, first serve applications process.

These projects – including a 179th Street Revitalization Area in Clark County – were required to resubmit an application to the Department by September 1, 2010. The projects were then approved after an economic review was conducted by the University of Washington as outlined in E2SSB 6609.

In effect, the LRF program authorizes cities and counties to create "revitalization areas" and allows certain increases in local sales and use tax revenues and local property tax revenues generated from within the revitalization area, additional funds from other local public sources, and a state contribution to be used for payment of bonds issued for financing local public improvements within the revitalization area.

The state contribution is provided through a new local sales and use tax that is credited against the state sales and use tax (sometimes referred to as the "LRF tax"). This tax does not increase the combined sales and use tax rates paid by consumers. The maximum amount of state contribution for each demonstration project is specified in the bill, ranging from \$200,000 to \$500,000 per project.

Due to the Great Recession and ensuing challenges for retail development coupled with need for I-5/179th Street interchange construction, the planned Three Creeks retail center has not yet been developed. While there is no specific timeline for completion of LRF projects, this has been expected to occur in conjunction with renewed north Clark County residential development and with completion of interchange and related local street improvements.⁷

Clark County Local Revitalization Project

Project: 179th Street Revitalization Area Sponsoring Government: Clark County Award Amount: \$500,000

Proposed private development - Killian Pacific, DBA Fisher's Terrace VII LLC, has committed to development of a large regional retail center within the RA at a cost between \$95 and \$100 million. Construction is anticipated to begin in 2013 with the bulk of it taking place in 2014. Opening is anticipated prior to holiday shopping season in 2014. Retail development of this magnitude and regional reach is critical for recapturing Clark County (and state) sales tax revenue lost to Oregon. Killian Pacific hired E.D. Hovee, an economic analysis firm, to examine the extent of sales tax leakage from the area surrounding the 179th Street/I-5 interchange and received an estimate that approximately \$620 million in annual retail sales are lost to Oregon. This new retail center is projected to curtail approximately \$101 to \$114 million of that loss. While Portland will continue to siphon potential retail sales so long as Oregon remains a sales-tax-free state, Clark County can counter a substantial portion of that damaging outflow by providing more convenient and more expansive retail opportunities closer to where residents live.

Proposed public improvements - Construction of a set of multi-lane roundabouts and/or signalized intersection improvements to the west and east of the existing I-5 interchange; reconfiguring the existing on and off ramps to I-5 northbound and southbound; improving approximately one-quarter mile of NE 179th Street between NE Delfel Road and NE 10th Avenue; widening NE 179th Street between NE 10th Avenue and 15th Avenue from two lanes to four lanes (70' wide) with two 12-foot wide travel lanes, two 11-foot wide travel lanes, medians, a 14-foot wide center left turn lane or median, 5-foot wide bicycle lanes, detached sidewalks, and improved storm drainage facilities.

- As described by Washington State Department of Revenue.⁸

Study Area Profile

Comp Plan Lands. The land distribution of the full study area differs from that of the UH area in that greater proportions of this larger area are designated for commercial and public use plus rural lands not found in the UH overlays. Urban medium density lands are in about the same proportion as in the UH area; other uses have smaller shares of the total.

I-5/179th Full Study Area % Distribution of Land Area Plan Designation



Source: Clark GIS and E. D. Hovee.

Full Study Area Characteristics by Zoning. The full I-5/179th study area is covered by 21 different zoning designations – nearly double the 11 designations of the Urban Holding (UH) overlay areas. As shown by

the following chart:

- There is
- considerable difference between assessor and GIS/VBLM acreages, because rural (R-5/CR-1) lands are not included with County GIS/VBLM modeling.
- The full study area comprises just over 4,600 housing units, 10 times the existing housing inventory of the smaller UH area.
- Similarly, the 10.3 million square feet of residential plus commercial and industrial building area is 10 times the existing inventory of less than 1

I-5/179th Full Study Area Land Characteristics by Zoning Designation

	Site Arec	a (Acres)	Housing	Building
Zoning	Assessor	GIS/VBLM	Units	Area (SF)
R-5	1,183.77	-	285	579,091
CR-1	14.17	-	9	23,200
IL	453.95	443.61	98	1,185,562
BP	285.51	282.53	97	139,567
PF	349.70	307.93	0	430,383
GC	203.83	197.37	30	118,617
CC	56.28	54.23	7	438,202
MX	270.14	261.30	26	61,180
OR-18	1.77	1.74	3	2,908
OR-22	69.77	67.59	15	40,081
OR-30	16.90	16.66	1	3,016
R-22	36.92	42.26	659	714,879
R-18	138.67	135.81	681	1,035,154
R-12	141.42	139.51	134	43,330
R1-5	27.39	27.50	110	199,317
R1-6	67.45	65.17	87	130,277
R1-7.5	436.15	427.67	448	954,417
R1-10	925.83	940.85	1,812	3,962,105
R1-20	510.27	477.90	97	221,284
P/OS	36.24	35.72	0	0
P/WL	61.25	62.54	2	9,221
Totals	5,287.38	3,987.89	4,601	10,291,791

Source: Clark GIS and E. D. Hovee. See earlier chart for zone summaries.

million square feet in the UH portion of the full study area.

- While rural R-5 zoned land accounts for more acreage than any other zone, the urban R1-10 zone represents close to 40% of the residential units and total building space of the full study area.
- Lands zoned for industrial and commercial use account for over 1.9 million square feet of existing building area less than 20% of the full study area total.

Property Valuation. As is detailed by the chart on the following page, total assessed valuation of the full study area exceeds \$1.5 billion as of 2017. This is nine times the \$163 million current assessed valuation of the Urban Holding (UH) area.

As it is currently relatively more developed, the full study area also has a higher ratio of improvements to land value than is the case for the UH area alone. Total assessed valuation is \$287,000 per acre across the full study area as compared with \$76,300 for the UH area alone.

		Assessed	l Valuation	
Zoning	Land	Buildings	Total	Taxable
R-5	\$51,089,358	\$59,278,959	\$110,368,317	\$100,641,924
CR-1	\$1,562,600	\$546,800	\$2,109,400	\$2,109,400
IL	\$44,638,530	\$62,545,020	\$107,183,550	\$102,254,534
BP	\$8,149,997	\$10,875,001	\$19,024,998	\$17,482,667
PF	\$25,923,322	\$49,388,120	\$75,311,442	\$0
GC	\$19,954,847	\$9,535,236	\$29,490,083	\$28,087,585
СС	\$25,423,984	\$42,005,955	\$67,429,939	\$59,942,978
MX	\$6,712,720	\$5,484,065	\$12,196,785	\$9,303,903
OR-18	\$513,800	\$0	\$513,800	\$513 <i>,</i> 800
OR-22	\$2,608,355	\$1,860,273	\$4,468,628	\$4,468,628
OR-30	\$4,825,900	\$56,300	\$4,882,200	\$4,882,200
R-22	\$6,579,674	\$82,614,497	\$89,194,171	\$88,862,221
R-18	\$31,956,081	\$84,774,580	\$116,730,661	\$113,433,988
R-12	\$8,217,989	\$18,629,906	\$26,847,895	\$26,847,895
R1-5	\$7,935,436	\$20,889,647	\$28,825,083	\$28,654,353
R1-6	\$7,469,911	\$13,582,831	\$21,052,742	\$20,273,301
R1-7.5	\$46,345,178	\$100,958,506	\$147,303,684	\$144,513,882
R1-10	\$168,370,111	\$447,615,799	\$615,985,910	\$603,563,626
R1-20	\$16,189,248	\$18,613,433	\$34,802,681	\$33,141,891
P/OS	\$307,743	\$0	\$307,743	\$0
P/WL	\$1,257,945	\$2,007,815	\$3,265,760	\$378,615
Totals	\$486,032,729	\$1,031,262,743	\$1,517,295,472	\$1,389,357,391

I-5/179th Full Study Area Assessed Valuation (2017)

Sources: Clark GIS and E. D. Hovee.

Land value for the full I-5/179th study area averages out to nearly \$92,000 per acre – nearly triple the current \$33,000 per acre land value of the UH area. This suggests considerably more value appreciation potential for the UH area – when developed. The current range of tax assessed land values for the full study area is from less than \$30,000 per acre for BP, MX and P/OS zoned property up to more than \$450,000 per acre (or more than \$10 per square foot) for CC zoned land.

Critical Lands. Clark GIS data indicates that 1,858 acres of the full study area comprise critical areas and are not expected to support future development. This equates to 47% of land area in the UGA portion of the full study area, about the same proportion as for the smaller UH area.

Critical areas are problematic for a somewhat greater proportion of employment lands (47%) than for residential and mixed-use lands (43%). However, critical lands appear to be less problematic for employment lands outside than in the more narrowly defined UH Area.

Development Capacity. As detailed by the chart below, the next and final step with this full study area profile has been to assess VBLM build-out capacity for additional housing, population and employment:

- Build-out is estimated as accommodating close to 5,650 added housing units and an added 15,000+ residents. Because much of the remaining developable residential land is in the UH area, the number of new units is only 17% more than the 4,815 unit capacity of the UH portion of the study area. No added development is assigned by the county VBLM to R-5 lands outside of the Urban Growth Area (UGA).
- For employment land, the situation is considerably different. The 5,550 added potential jobs for the full study area is nearly double that which can be realized within the UH portion of the broader study area.

• For the full study area,

		acity @ Build)ut
Zoning	Housing Units	Population	Jobs
R-5	-	-	-
CR-1	-	-	-
IL	-	-	1,132
BP	-	-	1,007
PF	-	-	-
GC	-	-	1,970
СС	-	-	127
MX	719	1,912	1,313
OR-18	9	23	-
OR-22	227	605	-
OR-30	58	154	-
R-22	3	9	-
R-18	91	242	-
R-12	447	1,188	-
R1-5	14	38	-
R1-6	182	483	-
R1-7.5	1,096	2,915	-
R1-10	1,356	3,607	-
R1-20	1,447	3,848	-
P/OS	-	-	-
P/WL	-	-	-
Totals	5,648	15,023	5,550

I-5/179th Study Area Development Capacity

Source: Clark GIS/VBLM and E. D. Hovee, 2017.

added job potential is fairly evenly distributed across the spectrum of urban GC, MX, IL, and BP zones. The only exception is for CC designated lands, which appear to be near build-out capacity.

- Of the roughly 5,300 acres of land in the full study area, close to 1,800 acres (34%) is **currently vacant**, as defined by the County's VBLM model. This includes non-UGA lands which are not factored into VBLM projections of future development.
- As in the UH area, reliance on **already improved** properties is significant for residential uses, accounting for 67% of added housing capacity to build-out. By comparison, only 32% of added employment requires intensified use of already developed lands.

• As in the UH area, as much as 85-90% of future development in the full study area will require development on properties that include some **critical land** area on-site.

Parcel Sizing for Employment Use. A significant issue for light industrial (IL) and business park (BP) zoned buildable lands is that the existing inventory is fragmented across a relatively large number of small property holdings. At close to 238 acres of buildable BP/IL zoned lands on 102 tax parcels, this works out to an average of just 2.3 buildable acres per tax parcel. Of this VBLM identified buildable inventory for **industrial use:**

- Only three parcels have 10 or more buildable acres each (totaling 36 acres buildable)
- Nine parcels have 5-10 acres buildable (totaling 59 acres buildable)
- Over half the buildable inventory consists of parcels with 1-5 acres buildable apiece (totaling 130 acres)
- The remaining 26 parcels have less than one acre buildable area (totaling 13 acres)

There is also considerable fragmentation of GC, CC, and MX zoned parcels identified by the VBLM for commercial employment use. The buildable total of 171 acres works out to an average of just 2.2 buildable acres per tax parcel across 73 parcels. As with light industrially zoned property, there are only three parcels with 10+ buildable acres per tax lot.

However, the situation for **commercially designated** parcels is currently less severe than the numbers might indicate. This is because considerable private sector parcel assembly has already occurred – most notably with the Three Creeks retail and mixed use development planned for the south and north sides of 179th Street, just east of the I-5 interchange.

There is also some added employment that may be generated from **Office-Residential** (OR) zoned properties. The VBLM assigns residential but no employment use to these lands, much of which is highly constrained by critical area. Out of 88 acres per assessor's data, less than 37 acres are indicated as net buildable.

As is further detailed in the Section IV Market analysis, there is at least one possible assemblage of OR-zoned land that has been considered for employment use by the Columbia River Economic Development Council (CREDC). This is a potential 35-acre multi-property assemblage situated on the 179th Street corridor, just east of GC zoned property that comprises the Three Creeks planned development area.

As indicated by this discussion, incentives for property assembly may prove pivotal in achieving a meaningful employment base for the I-5/179th study area. In some cases, re-zoning to create additional BP or IL land may be appropriate to consider where development has been limited to date. Otherwise, future employment uses will likely involve primarily smaller firms with limited employment potential. And absorption demand can be expected to be considerably reduced, resulting in a potentially much longer time period to achieve employment build-out.

III. ECONOMIC & FISCAL ASSESSMENT

A key component of this feasibility study has involved the formulation of an economic model to quantitatively assess the economic and fiscal impacts associated with the I-5/179th interchange project and associated infrastructure improvements. On a preliminary basis, this analysis has been run for the 2,100 acre Urban Holding area and for the nearly 5,300 acre I-5/179th full study area – using assessor and vacant buildable lands model (VBLM) data sets as provided by Clark County GIS.

Key steps in this impact modeling process involve:

- 1. Creation of an assumed development program (or set of input assumptions)
- 2. Estimation of direct and economic multiplier effects
- 3. Estimation of direct fiscal tax revenues for benefitted jurisdictions

Each of these steps is briefly described with results illustrated, in turn – first for the Urban Holding area and then for the full impact area.

URBAN HOLDING AREA IMPACTS

A long-term development program is predicated on Clark County prepared VBLM developable land estimates by zoning designation. To this is added estimates of **one-time** construction related employment, business related revenues and resulting tax revenues – notably real estate excise tax (REET) and sales tax.

Similar calculations are made for annual **on-going** operations (post construction) – with tax revenue estimates expanded to also include property taxes. All economic and fiscal estimates are as of the time of study area development build-out. Tax rates are those in effect as of 2017 (prior to the new state schools levy implemented by the Legislature), leading to a one-year spike in 2018 followed by expected rate moderation thereafter.

Development Program

As shown by the chart on the following page, VBLM results indicate potential for development of more than 830 acres within the urban area. Over 600 acres (72%) of developable area is anticipated for residential uses with 230+ acres (28%) for commercial and industrial use. The majority of industrial development is expected to occur on BP zoned land with the majority of commercial development on MX zoned land.

At build-out, the Urban Holding area will accommodate an added 4,815 housing units plus an estimated added 2,850 jobs – totaling over 12 million square feet of added residential and commercial/industrial building space. Employment potential is split nearly evenly between commercial and industrial uses.

Urban Holding Area Development Program (At Build-Out)

DEVELOPMENT	ZONING DESIGNATION IL BP PF CC MX OR-22 R-12 R1-6 R1-7.5 R1-10 R1-20											
FACTOR									R1-7.5	R1-10	R1-20	Totals
VBLM Developable Ac	reage											
Residential	-	-	-	-	89.86	28.41	45.33	22.04	124.07	128.58	163.54	601.82
Commercial	-	-	-	4.24	65.67	-	-	-	-	-	-	69.91
Industrial	59.60	101.91	-	-	-	-	-	-	-	-	-	161.51
Total	59.60	101.91	-	4.24	155.52	28.41	45.33	22.04	124.07	128.58	163.54	833.23
Density Factors												
Residential DU/Acre												
Per VBLM Outputs	-	-	-	-	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Employees/Acre												
Commercial	-	-	-	20.0	20.0	-	-	-	-	-	-	20.0
Industrial	9.0	9.0	-	-	-	-	-	-	-	-	-	9.0
Planning Outputs												
Housing Units	-	-	-	-	719	227	363	176	993	1,029	1,308	4,815
Population	-	-	-	-	1,912	605	965	469	2,640	2,736	3,480	12,807
Population/Unit	-	-	-	-	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Employment												
Commercial	-	-	-	85	1,313	-	-	-	-	-	-	1,398
Industrial	536	917	-	-	-	-	-	-	-	-	-	1,454
Total	536	917	-	85	1,313	-	-	-	-	-	-	2,852
Building NSF per Unit												
Residential (per DU)	-	-	-	-	850	1,100	1,900	1,800	1,700	2,350	2,800	
Commercial (per job)	-	-	-	500	500	-	-	-	-	-	-	
Industrial (per job)	1,250	750	-	-	-	-	-	-	-	-	-	
New Building Area (NSF)												
Residential	-	-	-	-	611,000	250,000	689,000	317,000	1,687,000	2,417,000	3,663,000	9,634,000
Commercial	-	-	-	42,000	657,000	-	-	-	-	-	-	699,000
Industrial	670,000	688,000	-	-	-	-	-	-	-	-	-	1,358,000
Employment Subtotal	670,000	688,000	-	42,000	657,000	-	-	-	-	-	-	2,057,000
Total All Uses	670,000	688,000	-	42,000	1,268,000	250,000	689,000	317,000	1,687,000	2,417,000	3,663,000	11,691,000
New Building Area (GSF)	670,000	724,000	-	47,000	1,492,000	294,000	766,000	317,000	1,687,000	2,417,000	3,663,000	12,077,000
Net to Gross %	100%	95%	100%	90%	85%	85%	90%	100%	100%	100%	100%	97%

Source: E. D. Hovee from Clark GIS base data and VBLM outputs.

The VBLM density assumption is to be 8.0 units per acre averaged across all residential zones, though each zoning category is associated with its own residential density targets. Consequently, development might occur in portions of the UH overlay area at different densities from this assumed overall average.⁹

Direct & Economic Multiplier Effects

As noted, a second major component of the impact analysis involves the estimation of direct and economic multiplier impacts of added development. Economic variables of primary interest are jobs, payrolls and business revenues.

Some of these estimates (especially business revenues) serve as inputs for subsequent assessment of fiscal impacts. Impacts are evaluated separately for construction activities

followed by on-going operations upon project completion. The chart to the right illustrates results of preliminary calculations for the properties in the Urban Holding area.

- Direct effects are those occurring onsite at affected properties in the study area – identified separately for construction and then for operations.
- Economic multiplier impacts result from indirect business spending plus induced consumer expenditures occurring as *ripple effects* throughout Clark County. Multipliers are specific to the type

Direct & Economic Multiplier Effects (Urban Holding Areas – At Build-Out)

Type of Impact	Estimate	Comments			
Construction (One-Time)					
Direct Jobs	11,758	Measured as job-years			
Direct + Indirect Jobs	16,814	w/ phased construction			
Multiplier	1.43	over a multi-year period			
Direct Payroll	\$793,667,000	Direct payroll is for			
Direct + Indirect Payroll	\$1,015,893,000	construction workers,			
Multiplier	1.28	multiplier for spin-off			
Direct Revenues	\$2,305,319,000	Multiplier covers Clark			
Direct + Indirect Revenues	\$3,158,287,000	County impact over construction duration			
Multiplier	1.37				
Operations (Annual)					
Direct Jobs	2,852	Direct jobs are on-site			
Direct + Indirect Jobs	3,999	as of build-out, mulplier			
Multiplier	1.40	for county-wide impact			
Direct Payroll	\$119,741,000	Pavroll is annual			
Direct + Indirect Payroll	\$162,623,000	average in 2007 dollars			
Multiplier	1.36	for on-going jobs			
Direct Revenues	\$478,734,000	Covers total revenues,			
Direct + Indirect Revenues	\$649,236,000	multiplier is weighted			
Multiplier	1.36	based on use mix			

Source: Multipliers are specific to Clark County per IMPLAN.

of economic activity being evaluated.

Expansion of the study area to include the southern portion of the Discovery Corridor and LRF areas substantially increases the economic development impacts – as detailed in the next section of this report.

Fiscal Effects

Added tax revenues associated with study area development are those associated with direct onsite development. The graphs to the right depict revenues by jurisdiction:

- One-time tax revenues associated with the period of construction are REET (based on land sales and sale of completed buildings) and sales tax (on value of construction).
- Post-construction, on-going annual tax revenues of significance are the added property tax (with development) together with REET (from periodic property re-sales) and sales tax (on taxable business revenues).



The table on the next page provides a more detailed breakout of tax revenues by jurisdiction.

Estimated Tax Revenues by Jurisdiction with Construction & Operations (Urban Holding Areas – At Build-Out)

	Applicable	One Time (w/	On-Going	
Benefited Jurisdiction	Tax Rate	Construction)	(Per Year)	Tax Notes
Property Tax	Rate per \$1,000 TAV			
School M&O	\$2.2095148070		\$2,631,000	Ridgefield School District #122
WA State Schools	\$1.9808714249		\$2,359,000	State of Washington
Fire/EMS (Composite)	\$1.6218032503		\$1,931,000	Fire Districts 6, 11/12 Average
School Debt	\$1.1961595879		\$1,424,000	Ridgefield School District #122
County Roads	\$1.3892465352		\$1,654,000	Clark County
County General Fund	\$1.1367196441	Natavaliashis	\$1,353,000	General Fund
Fort Vancouver Library	\$0.4172146004	with construction	\$497,000	Regional Library
Port of Ridgefield	\$0.1985610231	with construction	\$236,000	General Fund
County Roads Diversion	\$0.1827150739		\$218,000	Fire District 12 Bond
Conservation Future	\$0.0462087995		\$55,000	Clark County
Development Disability	\$0.0133019546		\$16,000	Clark County
Mental Health	\$0.0133019546		\$16,000	Clark County
Veterans Assistance	\$0.0119717513		\$14,000	Clark County
Total Levy	\$10.4175904068		\$12,404,000	Levy without exemptions
Sales Tax	Rate % of Taxable Sales			
State of Washington	6.50%	\$118,068,000	\$4,537,000	
CTRAN	0.70%	\$12,715,000	\$489,000	For PTBA/UGA portion
Clark County	1.00%	\$18,164,000	\$698,000	
County Law & Justice	0.10%	\$1,816,000	\$70,000	
County Mental Health	0.10%	\$1,816,000	\$70,000	
Total All Jurisdictions	8.40%	\$152,579,000	\$5,864,000	On construction + retail Sales
* Noto:	All actimates roug	dod		
	All estimates roun	ueu.		
Real Estate Excise Tax				Assumes 6 yr average turnover
State of Washington	1.28%	\$25,310,000	\$3,365,000	
Clark County	0.50%	\$9,887,000	\$1,314,000	
Total	1.78%	\$35,197,000	\$4,679,000	Same rate for all Clark Co except Yacolt @ 1.53%
Total Property, REET & R	etail Sales Tax	\$187,776,000	\$22,947,000	

Notes: Estimated as of year of build-out using 2017 tax rates and 2017 (uninflated) dollars.

As detailed by the table, anticipated one-time revenues to state and local taxing jurisdictions total an estimated \$188 million. Included are sales tax and REET revenues, which are spreadout over the multi-year duration of construction through to Urban Holding area build-out.

On-going revenues are estimated at just under \$23 million per year – as a combination of property, sales tax and REET (with periodic property resales). Both for one-time and on-going revenues, the state of Washington is the governmental jurisdiction most directly benefitted.

I-5/179TH FULL STUDY AREA IMPACTS

The full study area reflects the combination of the Urban Holding overlay, southern portion of the Discovery Corridor, and LRF areas. As with the holding zone discussion, this analysis begins with a review of build-out development for the full study area – driven by developable land estimates by zoning district as outputs from the County's vacant buildable lands model (VBLM).

To this can be added estimates of one-time construction related employment, business related revenues and resulting tax revenues – notably real estate excise tax (REET) and sales tax. Calculations are then made for annual on-going operations (post construction) – with tax revenue estimates expanded to also include property taxes (based on 2017 rates). All economic and fiscal estimates are as of the time of ultimate study area development build-out.

Development Program

As detailed by the chart on the following page, VBLM results indicate potential for development of nearly 1,115 currently undeveloped acres by build-out. This is 280+ acres (34%) more developable land than is available in the Urban Holding areas alone. Future development is spread across 16 zoning districts for the full study area – as compared with 10 zones for the Urban Holding area.

VBLM land for residential development increases from just over 600 acres for the Urban Holding areas to more than 705 acres with the full study area. This represents a less than 20% increase in developable acreage.

Industrial and commercial land increases from about 230 acres with the Urban Holding areas to nearly 410 acres of potential employment land in the full study area – a better than 75% increase. Industrial (IL) zoned land is much more prominent in the full study area than in the Urban Holding overlay areas. General Commercial (GC) zoning also is more prominent with the full study area – as GC designated property close to the interchange is not in the UH overlay.

At build-out, the full study area can be expected to accommodate nearly 5,650 added residential units. This represents a less than 20% increase in the number of housing units anticipated as compared with just the UH area. As noted, VBLM densities are assumed at 8.0 units per acre across all residential zones. If currently zoned mid-point densities are applied for each residential zone, residential development capacity is increased to about 5,700 units – a less than 1% increase in estimated potential housing build-out capacity.

Employment potential goes from 2,850 Urban Holding jobs at build-out to 5,550 jobs for the full study area. This represents a near doubling of job potential with addition of the Discovery Corridor and LRF areas to the Urban Holding area most directly dependent on I-5/179th interchange improvements. Employment is split 60/40 to commercial versus industrial use.

Build-out capacity of the full study area is 15.7 million square feet of job- and housing-related building area. This is 30% more than the developed square footage for the UH areas alone.

Full Study Area Development Program (At Build-Out)

DEVELOPMENT	ZONING DESIGNATION																
FACTOR	IL	BP	GC	сс	МХ	OR-30	OR-22	OR-18	R-22	R-18	R-12	R1-5	R1-6	R1-7.5	R1-10	R1-20	Totals
VBLM Developable A	creage																
Residential	-	-	-	-	89.86	7.22	28.41	1.07	0.41	11.36	55.84	1.80	22.70	136.99	169.50	180.82	705.98
Commercial	-	-	98.50	6.36	65.67	-	-	-	-	-	-	-	-	-	-	-	170.53
Industrial	125.78	111.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	237.68
Total	125.78	111.90	98.50	6.36	155.52	7.22	28.41	1.07	0.41	11.36	55.84	1.80	22.70	136.99	169.50	180.82	1,114.19
Density Factors																	
Residential DU/Acre																	
Per VBLM Outputs	-	-	-	-	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Employees/Acre																	
Commercial	-	-	20.0	20.0	20.0	-	-	-	-	-	-	-	-	-	-	-	20.0
Industrial	9.0	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0
Planning Outputs																	
Housing Units	-	-	-	-	719	58	227	9	3	91	447	14	182	1.096	1.356	1.447	5.648
Population		-	-	-	1,912	154	605	23	9	242	1,188	38	483	2,915	3,607	3,848	15.023
Population/Unit	-	-	-	-	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Employment																	
Commercial	-	-	1,970	127	1,313	-	-	-	-	-	-	-	-	-	-	-	3,411
	1,132	1,007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,139
Iotai	1,132	1,007	1,970	127	1,313	-	-	-	-	-	-	-	-	-	-	-	5,550
Building NSF per Unit																	
Residential (per DU)	-	-	-	-	850	1,000	1,100	1,250	1,100	1,250	1,900	1,850	1,800	1,700	2,350	2,800	
Commercial (per job)	-	-	500	500	500	-	-	-	-	-	-	-	-	-	-	-	
Industrial (per job)	1,250	750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
New Building Area (NSF)																	
Residential	-	-	-	-	611,000	58,000	250,000	11,000	4,000	114,000	849,000	27,000	327,000	1,863,000	3,187,000	4,050,000	11,351,000
Commercial			985 000	64 000	657.000				-								1 706 000
Industrial	1.415.000	755.000	-	- 04,000	-	-	-	-	_	_	-	_	-	-	-	-	2.170.000
Employment Subtotal	1,415,000	755,000	985,000	64,000	657,000	-	-	-	-	-	-	-	-	-	-	-	3,876,000
Total All Uses	1,415,000	755,000	985,000	64,000	1,268,000	58,000	250,000	11,000	4,000	114,000	849,000	27,000	327,000	1,863,000	3,187,000	4,050,000	15,227,000
New Building Area (GSE)	1 415 000	795 000	1 094 000	71 000	1 492 000	68 000	294 000	12 000	5 000	127 000	849 000	27 000	327 000	1 863 000	3 187 000	4 050 000	15 676 000
Net to Gross %	100%	95%	90%	90%	85%	85%	85%	90%	85%	90%	100%	100%	100%	100%	100%	100%	97%

Source: E. D. Hovee from Clark GIS base data and VBLM outputs.

Direct & Economic Multiplier Effects

As was provided for the Urban Holding areas, evaluation of direct and economic multiplier effects are also estimated for the full study area. Economic variables of primary interest are jobs, payrolls and business revenues.

The chart below and to the right illustrates results of preliminary calculations for the properties of the full study area:

- Direct effects of onsite economic activity include nearly 15,000 job-years spread out over the duration of construction followed by on-going on-site employment of about 5,550 jobs when all business facilities are fully operational.
- Economic multiplier impacts involve an estimated 43% addon to direct construction employment from businesses that serve construction firms and workers throughout Clark County. For resulting on-site businesses, there is an estimated 38% add-on to what happens in the study area spread county-wide.

Direct & Economic Multiplier Effects (Full Study Area – At Build-Out)

Type of Impact	Estimate	Comments
Construction (One-Time)		
Direct Jobs	14,976	Measured as job-years
Direct + Indirect Jobs	21,414	w/ phased construction
Multiplier	1.43	over a multi-year period
Direct Payroll	\$1,010,884,000	Direct payroll is for
Direct + Indirect Payroll	\$1,293,933,000	construction workers,
Multiplier	1.28	multiplier for spin-off
	ća 020 (F0 000	
Direct Revenues	\$2,929,650,000	Multiplier covers Clark
Direct + Indirect Revenues	\$4,013,620,000	County impact over
Multiplier	1.37	construction duration
Operations (Annual)		
Direct Jobs	5,550	Direct jobs are on-site
Direct + Indirect Jobs	7,670	as of build-out, mulplier
Multiplier	1.38	for county-wide impact
Direct Payroll	\$223,044,000	Pavroll is annual
Direct + Indirect Payroll	\$301,478,000	average in 2007 dollars
Multiplier	1.35	for on-going jobs
Direct Revenues	\$862,430,000	Covers total revenues,
Direct + Indirect Revenues	\$1,171,306,000	multiplier is weighted
Multiplier	1.36	based on use mix

Source: Multipliers are specific to Clark County per IMPLAN.

Overall, the full study area is associated with an added 27% impact to **construction-related** jobs, payrolls and business revenues – as compared to what would be expected from the Urban Holding areas alone. When considered from the standpoint of **on-going business operations** post-construction, the economic contribution of the full study area is even greater. The full study area offers potential to deliver nearly double the impact on jobs, payrolls and business revenues as can be expected from the Urban Holding areas alone.

Fiscal Effects

As noted, added tax revenues associated with study area development are limited to those associated with direct onsite development. The graphs to the right depict revenues by jurisdiction:

- One-time REET and sales tax revenues associated with the period of construction are estimated at a cumulative total of \$239 million to all state and local taxing jurisdictions, spread over the multi-year duration of construction
- Post-construction, on-going annual tax revenues are estimated at over \$34 million per year, including property as well as REET and sales tax revenues.

Added Tax Revenues with Development (Full Study Area – At Build-Out)

Construction Effects (Cumulative To Build-Out)



Note: All estimates are in 2017 dollars and tax rates.

The one-time construction-related revenue generated from the full study area is about 27% above what could be expected from development of the Urban Holding areas alone. The gap is even greater with the operating effects – as the non-holding areas have a greater share of the added employment than added residential potential. On-going revenues from the full study area are estimated to be nearly 50% above what might be realized from UH areas alone at full build-out.

More detailed calculations of one-time and on-going tax revenues – by jurisdiction – at buildout are provided by the chart on the following page.

Estimated Tax Revenues by Jurisdiction with Construction & Operations (Full Study Area – At Build-Out)

	Applicable	One Time (w/	On-Going	
Benefited Jurisdiction	Tax Rate	Construction)	(Per Year)	Tax Notes
Property Tax	Rate per \$1,000 TAV			
School M&O	\$2.2095148070		\$3,352,000	Ridgefield School District #122
WA State Schools	\$1.9808714249		\$3,005,000	State of Washington
Fire/EMS (Composite)	\$1.6218032503		\$2,460,000	Fire Districts 6, 11/12 Average
School Debt	\$1.1961595879		\$1,814,000	Ridgefield School District #122
County Roads	\$1.3892465352		\$2,107,000	Clark County
County General Fund	\$1.1367196441	Netsentischis	\$1,724,000	General Fund
Fort Vancouver Library	\$0.4172146004	Not applicable	\$633,000	Regional Library
Port of Ridgefield	\$0.1985610231	with construction	\$301,000	General Fund
County Roads Diversion	\$0.1827150739		\$277,000	Fire District 12 Bond
Conservation Future	\$0.0462087995		\$70,000	Clark County
Development Disability	\$0.0133019546		\$20,000	Clark County
Mental Health	\$0.0133019546		\$20,000	Clark County
Veterans Assistance	\$0.0119717513		\$18,000	Clark County
Total Levy	\$10.4175904068		\$15,801,000	Levy without exemptions
Sales Tax	Rate % of Taxable Sales			
State of Washington	6.50%	\$150,402,000	\$9,758,000	
CTRAN	0.70%	\$16,197,000	\$1,051,000	For PTBA/UGA portion
Clark County	1.00%	\$23,139,000	\$1,501,000	
County Law & Justice	0.10%	\$2,314,000	\$150,000	
County Mental Health	0.10%	\$2,314,000	\$150,000	
Total All Jurisdictions	8.40%	\$194,366,000	\$12,610,000	On construction + retail sales
* Note:	All estimates roun	ded.		
Real Estate Excise Tax				Assumes 6 yr average turnover
State of Washington	1.28%	\$31,994,000	\$4,205,000	
Clark County	0.50%	\$12,497,000	\$1,642,000	
Total	1.78%	\$44,491,000	\$5,847,000	Same rate for all Clark Co except Yacolt @ 1.53%
Total Property, REET & R	etail Sales Tax	\$238,857,000	\$34,258,000	

Notes: Estimated as of year of build-out using 2017 tax rates and 2017 (uninflated) dollars.

As detailed by the table, anticipated one-time revenues to state and local taxing jurisdictions total an estimated \$239 million. More than three-quarters (76%) of one-time tax revenues accrue to the State of Washington with 24% to Clark county and local jurisdictions.

On-going revenues are estimated at more than \$34 million per year. These recurring revenue streams are split nearly 50/50 between the state and local jurisdictions in Clark County.

SUMMARY NOTES

By way of summary, the chart to the right compares key economic impact indicators for the Urban Holding areas with the full study area.

While the Urban Holding areas comprise the bulk of developable land, the ability of the I-5/179th interchange to influence the larger full study area is significant. The added benefit of leveraged development in this greater area is most important for added jobs.

While the I-5/179th full study area adds 34% more developable land overall, this expanded area increases the commercial/ industrial land benefited by 76%. Direct employment is nearly doubled (up by 95%) as the full study area includes both considerable industrial land in the **Discovery Corridor area** (extending north from the UH areas) plus commercial land in the LRF area (to the south of the UH overlay).

One-time construction revenues are up by just 27%. On-going revenues increase much more, particularly for sales tax.

Comparison of UH & Full Study Area Impacts

Description	Urban Holding Are <u>as</u>	Full Study <u>Area</u>	% Chg
DEVELOPMENT PROGRAM			
Land Area (Acres)			
VBLM Developable	833.23	1,114.19	34%
Commercial/Industrial	231.42	408.21	76%
Potential Development			
Added Housing Units	4,815	5,648	17%
Gross Building SF	12,077,000	15,676,000	30%
Development Cost	\$2,305,319,000	\$2,929,650,000	27%
Construction (One-Time)	IIIFLIEK DEINEFIIS		
Direct lobs	11.758	14.976	27%
Direct + Indirect Jobs	16.814	21,414	27%
Multiplier	1.43	1.43	-
Direct Payroll	\$793 667 000	\$1 010 884 000	27%
Direct + Indirect Payroll	\$1,015,893,000	\$1,293,933,000	27%
Multiplier	1 28	1 28	-
	1.20	1.20	
Direct Revenues	\$2,305,319,000	\$2,929,650,000	27%
Direct + Indirect Revenues	\$3,158,287,000	\$4,013,620,000	27%
Multiplier	1.37	1.37	-
Operations (Annual)			
Direct Jobs	2,852	5,550	95%
Direct + Indirect Jobs	3,999	7,670	92%
Multiplier	1.40	1.38	-1%
	<i></i>	6222.044.000	0.00/
Direct Payroll	\$119,741,000	\$223,044,000	86%
Direct + Indirect Payroll	\$162,623,000	\$301,478,000	85%
Multiplier	1.36	1.35	-0%
Direct Revenues	\$478,734,000	\$862,430,000	80%
Direct + Indirect Revenues	\$649,236,000	\$1,171,306,000	80%
Multiplier	1.36	1.36	-
DIRECT TAX EFFECTS			
Construction Revenues			
Sales Tax	\$152,579,000	\$194,366,000	27%
Real Estate Excise Tax	\$35,197,000	\$44,491,000	26%
Total One-Time Revenues	\$187,776,000	\$238,857,000	27%
	642 404 202	645 004 000	270/
Sales Tax	\$12,404,000	\$15,801,000	2/% 1150/
Real Estate Excise Tax	\$3,804,000 \$4,679,000	\$12,010,000	25%
Total Annual Revenues	\$22 947 000	\$34 258 000	49%

IV. MARKET ANALYSIS

The first three sections of this report have focus on conditions and opportunities specific to the I-5/179th interchange area. With this section of the report, the analysis lens is widened to cover broader features of the regional market that clearly affect I-5/179th area potentials.

Following this broader look, it is then possible to combine the interchange area and regional perspectives to arrive at an economic development market strategy – provided in the next and final section of this economic feasibility study.

Topics covered by this market analysis include:

- Comparative demographics for Clark County and Washington State
- **Sources of income** with particular focus on wage and salary income as pivotal to Clark County's economic vitality
- Labor force and employment addressing trends extending from before the Great Recession to the most recent information available (with emphasis on sectors offering the best opportunities for family wage jobs)
- **Committed developments** setting the pace for recent I-5/179th area investments
- Industrial land as an assessment of county-wide and Discovery Corridor site attributes and challenges
- A full-service jobs eco-system outlining a competitive niche that plays to existing and prospective comparative advantages of this highly accessible interchange area as an employment, residential and entertainment/event hub for Clark County going forward

INFORMATION SOURCES

Information is drawn from a range of readily accessible data sources, including:

- Federal agency data notably from the U.S. Census Bureau, U.S. Bureau of Labor Statistics (BLS) and U.S. Bureau of Economic Analysis (BEA).
- **State agency data** from the Office of Financial Management (OFM) and the Washington State Employment Security Department (ESD)
- Local public and non-profit organizations including Clark County and the Columbia River Economic Development Council (CREDC)
- **Private data provider** primarily Environics, a nationally recognized provider of current and trend information (formerly under the auspices of Nielsen/Claritas)

DEMOGRAPHICS

This market analysis begins with a brief review of strategic demographic indicators important for economic growth – all with comparisons between Clark County and Washington state.

As shown by the graphs to the right, Clark County mirrors the state in some ways, but differs in others:

- A key difference is that since 2012, Clark County's **population** is again growing more rapidly than the rest of the state, as indicated by a county-wide average annual growth rate (AAGR) of 1.8% versus 1.4% state-wide.
- At between 38-39 years, the **median age** of Clark County residents is comparable to that of all residents state-wide. However, this median conceals a distribution that is somewhat different. Clark County has a higher proportion of family age adults with children but is underrepresented with young adults age 25-34.
- Clark County workers are well educated compared to the state. Approximately 44% of adults county-wide (age 25+) have at least some college education or degrees, as compared with 38% across Washington state. Clark County is particularly strong with above average rates of adults with some college, no degree or with an Associate's degree – indicating an extremely well technically trained workforce.
- At \$70,300, median household income countywide is somewhat (about 2%) above the statewide median. Clark households are particularly well represented at incomes ranging from \$35,000-\$150,000 – but under-represented in higher incomes categories of \$150,000+.
- Median home values are about 7% less than the statewide median. With stronger incomes and lower cost housing, Clark County residents get more for their money – although recent rapid price escalation is creating greater challenges to maintain affordability both locally and throughout the rest of the state.

Taken together, these and other demographic characteristics indicate a county that is family, work and career oriented. The challenge is that too many residents have to commute out-of-county to work.



Source: OFM and Environics

Strategic Demographics

Population Rich - But Jobs Poor

With recovery from the Great Recession of a decade ago, Clark County has benefitted from considerable job growth in in the last several years. But as demonstrated by the chart to the right, this has not been enough to make up for past employment shortfalls relative to Clark County's resident population.

As of 2016, there are only 0.32 jobs located in Clark County for every resident living in Clark County. By comparison, Washington state employment works out to 0.45 jobs per resident.

Jobs-Population Shortfall (2016)

Job Shortfall Factors	Clark County	Washington State
Employment	149,048	3,214,722
Population	461,010	7,183,700
Jobs/Resident	0.32	0.45
Net Deficiency per Resident	0.12	-
Job Shortfall	57,255	-

Source: Based on Washington State OFM and ESD data.

The resulting shortfall is an estimated 57,255 jobs. With labor force participation on a par with the rest of the state, this means that a sizable share of in-county residents is commuting out-of-county and out-of-state for employment. The regional ESD economist estimates that about one-third of the county's labor force, over 50,000 workers, commutes to Portland (Oregon) on a daily basis, while only 11,000 commute in the opposite direction (into Clark County)."¹⁰

Job Needs with Population Growth

As adopted, Clark County's updated **Comprehensive Plan** has forecast population growth based on a 2012 OFM medium growth forecast. As of late 2017, OFM has released new forecast scenarios (high, medium and low). The adopted and newly released *medium* projections are compared with actual growth since 2000 – as depicted by the graph to the right.



Forecast Population Growth (Medium Scenarios)

From 2010-17, Clark County's population increased at an average rate of 1.84% per year – well above the statewide growth rate of 1.27%. With the currently adopted 2012 OFM medium growth projection, county-wide population growth would slow to a rate averaging just under 1% from 2017-40 – with growth more rapid in the early years of the forecast, then slowing in the out-years closer to 2040. The just-released 2017 provisional forecast would add another 58,400 residents to what was previously projected for Clark County by 2040 – reflecting a 2017-40 growth rate averaging 1.37% per year.

The effects of the population growth forecast for employment are significant. With the earlier 2012 medium forecast, Clark County would need to create close to 113,000 net new jobs. About half of this job need would be to catch-up with the current in-county jobs shortfall and half to serve future added population – assuming that moving toward the statewide average of 0.45 jobs per resident is included as a key planning objective. If the new higher growth alternative suggested by OFM materializes – as consistent with renewed local population growth – the total need could increase to as many as 139,000 added jobs by 2040.

A fundamental premise of this feasibility study is to position the I-5/179th interchange area at the center of action to fulfill the Discovery Corridor vision as a major job engine into the next generation. By no means will this one long-neglected interchange serve as the only or even primary locus for job growth, but it can serve as a useful starting point – due to the area's I-5 corridor accessibility for freight transport and to county-wide/regional labor force.

Unemployment

With strong economic performance of the last several years, unemployment is now reaching new lows – even below rates seen to the recession a decade ago. However, the experience of the last recession demonstrated a disproportionate vulnerability to economic downturns.

As of 2017, Clark County's unemployment rate is just 0.3% points above the statewide average. In the last recession, Clark County unemployment rose more quickly and peaked well above the entire state. In 2009, the Clark County rate averaged 13.3% – 4.1% points above the statewide rate of 9.2% (with the state peaking a year later at 10.0%).

The experience of the last recession illustrates a need for improved local job resiliency. This can occur, in part, by having more of the job base that residents depend on located in Clark County.



Unemployment Trend (2006-17)

SOURCES OF INCOME

As illustrated by the *pie charts* to the right, there are some important differences in the sources of income for residents of Clark County as compared with all residents throughout Washington state:

- Taken together, wages and salaries coupled with transfer payments (including social security and public assistance) account for nearly two-thirds (65%) of all personal income in Clark County as compared with 59% of personal income statewide. In the last decade, reliance on transfer payments has increased while the proportion of incomes received from wages and salaries has declined – more so in Clark County than is the case statewide.
- Only about 35% of Clark County incomes are derived from investments, proprietors and wage supplement income (as retirement contributions) as compared with 41%

Personal Income Distribution (2016)



Source: U.S. Bureau of Economic Analysis (BEA).

22%

44%

12%

statewide. Reliance on wage supplements and proprietors (self-employed) income has declined over the last decade, while the proportion coming from investment income has increased somewhat.

Proprietors

Investment

Payments

Transfer

The relatively strong reliance on wage and salary income fits with other demographic information indicating that Clark County is a work-focused community. However, the erosion of this pivotal income wage and salary source in recent years coupled with the rise in transfer payments (from 13% to 17% of total income) in the last decade and the increased costs of commuting out-of-county serve to reinforce the continuing need to increase the emphasis on local job creation.

LABOR FORCE & EMPLOYMENT

As of 2016, Clark County had a resident labor force of close to 220,800 persons. With an incounty employment base of just over 149,000, there is only about two-thirds (2/3) of a job available locally for every person in the labor force – whether employed or looking for work.

Over the last 11 years, Clark County's resident labor force has increased by only 10.4%, below the statewide labor force increase of 12.1%. This is somewhat surprising since population increased more rapidly within Clark County than for the state over the same time frame. In effect, as mobility to jobs elsewhere in the region becomes more challenging with congestion, the lack of local employment appears to be affecting labor force participation more so than in the past.

Employment & Wage Trend

With this overall job need in mind, this feasibility study analysis turns to a more focused review of employment and wage trends in Clark County over the last decade. As shown by the chart on the following page, Washington State Employment Security Department (ESD) data indicates that there were just over 149,000 jobs in over 13,600 firms in Clark County in 2016 – paying an average wage of over \$48,850 per year. Additional key observations are summarized as follows:

Employment:

- Government is the largest single employment sector, followed by health care and social assistance. Together, these two sectors account for over 47,000 jobs or close to one-third (32%) of all employment in Clark County.
- Taken together, the primarily industrial sectors of mining, utilities, construction, manufacturing, wholesale trade, transportation and warehousing represent 34,000 jobs or less than one-quarter (23%) of county-wide employment.
- Of the other service-related sectors, retail together with accommodations and food services account for over 30,200 (20%) of the county's job base. All other sectors comprise the remaining 25%.

Job Growth:

- Clark County employment has increased by 15% in the last decade a positive number as this reflects change occurring since about the peak of the last economic cycle.
- In percentage terms, the most rapid job growth since 2006 is noted for management of companies (up by 148%) followed by healthcare/social assistance and private educational services.
- In numerical terms, by far the most rapid employment growth has occurred with healthcare and social assistance up by more than 7,000 jobs in 10 years and accounting for 37% of all net job growth in Clark County. Other growing sectors include retail trade (up by 2,900 jobs) and professional and technical services (+2,400 jobs).

• By comparison, there has been virtually no net job growth with industrial activities.

		2016	Annual A	verages	% Change (2006-16)		
NAICS	Industry Sector	# of	# of	Annual	# of	# of	Annual
		Firms	Jobs	Wage	Firms	Jobs	Wage
Total All S	Sectors	13,642	149,048	\$48,852	28%	15%	29%
11	Agriculture, Forestry, Fishing & Hunting	100	636	\$34,653	-19%	-2%	34%
21-22	Mining & Utilities	5	162	\$63,812	-67%	-62%	21%
23	Construction	1,670	11,125	\$53,040	-1%	-5%	32%
31-33	Manufacturing	470	13,215	\$56,387	15%	-3%	20%
42	Wholesale Trade	1,139	6,371	\$71,481	28%	22%	27%
44-45	Retail Trade	840	17,816	\$30,388	11%	19%	17%
48-49	Transportation & Warehousing	288	3,140	\$51,491	22%	-2%	31%
51	Information	198	3,148	\$59,741	75%	4%	11%
52	Finance & Insurance	420	4,949	\$82,381	4%	25%	61%
53	Real Estate, Rental& Leasing	400	2,568	\$46,600	6%	-4%	45%
54	Professional, Scientific & Technical Services	1,446	8,625	\$77,898	67%	39%	18%
55	Management of Companies & Enterprises	45	2,060	\$97,123	7%	148%	35%
56	Administrative & Waste Services	780	7,623	\$37,223	45%	11%	55%
61	Educational Services	160	1,094	\$23,892	78%	71%	19%
62	Healthcare & Social Assistance	3,906	22,760	\$46,913	466%	45%	17%
71	Arts, Entertainment & Recreation	125	2,334	\$21,911	21%	4%	10%
72	Accommodation & Food Services	641	12,428	\$18,169	22%	18%	27%
81	Other Services	904	4,679	\$37,268	-67%	-10%	76%
92	Government	107	24,316	\$55,061	-1%	10%	29%

Clark County Employment & Wage Profile (2006-16)

Notes: NAICS is the acronym for the North American Industry Classification System.

Source: Washington State Employment Security Department (ESD). Employment data is for workers covered by unemployment insurance. Excluded are sole proprietors and others without coverage.

Firm Size:

 Average firm size across all sectors in Clark County is relatively small – at just 11 employees per firm. And with the notable exceptions of retail trade, finance/insurance, firm management, other services and government, average business entity size has generally declined over the last decade. Excluding these exceptions, reduced firm size has occurred as the number of establishments has outpaced job growth.

Wages:

- Across all sectors, the average annual 2016 wage in Clark County was just over \$48,850, 17% below the statewide average (strongly influenced by the Puget Sound region).
- The highest wage sector in Clark County is found with management of companies, at over \$97,100 per year. Other notable high wage sectors are found with wholesale trade and professional, scientific and technical services each paying above \$70,000 per year.

- Overall, industrial activities pay well averaging \$57,700 per job. Industrial wages are up by 27% in the last ten years, close to the overall gain of 29% across all sectors.
- There can be wide variation within subsectors of an overall industry sector. For example, retail wages average less than \$30,400 per year ranging from a low of \$18,600 with service stations to over \$50,000 with motor vehicle and parts dealers.
- Wage growth has been strongest in the otherwise shrinking sector of other services with average wage up by 76% followed by administrative/waste services (+55%).
- Wage growth has been slowest in arts, entertainment and recreation (up by just 10%), information (+11%), retail trade (+17%) and healthcare/social assistance (+17%).

Statewide Comparison:

- Two items are noted. First, job gains of 15% in the last decade for Clark County have outpaced the state for which employment increased by 13%. Compared to the state, local job growth has been particularly strong in construction, wholesale trade, retail trade, finance and insurance, professional services, management of firms, educational services, health care and social assistance, and government. Jobs have lagged the state in manufacturing, information, arts/entertainment, and accommodation/food services.
- Second, wages are not only below state-wide averages but have grown more slowly in recent years. Wage growth (in % terms) has been subpar across most sectors with notable exceptions including finance and insurance, management of companies, administrative/waste services, and transportation/warehousing. Of particular note is that the information sector statewide (concentrated in King County) has experienced rapid job growth and even more rapid wage increases up by 75% statewide to an annual average of over \$159,000 as of 2016. By comparison, the average wage for information workers in Clark County is less than \$60,000.

Employment Outlook

ESD provides employment forecasts on a regional multi-county basis. Southwest Washington covers Clark, Cowlitz, and Wahkiakum Counties. Clark County makes up close to 80% of this region's job base. From 2015-25, ESD forecasts that the region will add 31,200 jobs – with an average job growth rate of about 1.5% per year. As shown by the graph on the following page:

- The most rapid employment growth (in numerical terms) is forecast to be with education and health services (up by 7,000 jobs), followed by professional and business services with professional and business services paying above average wages.
- Taken together, the high paying industrial sectors of natural resources, construction, wholesale trade, transport, warehouse and utilities are forecast to add 5,500 jobs – led by construction and then manufacturing. Within manufacturing, the largest job gains are anticipated with fabricated metals, computer and electronic equipment (up by about 400 and 300 jobs, respectively)
- Government is forecast to add 4,500 jobs with 73% in public educational services.



Southwest Washington Non-Farm Employment Forecast (Job Growth 2015-25)

Note: ESD forecasts include combinations of some 2-digit NAICS categories. For example, professional and business services includes management of companies as well as professional and related services. Financial activities include real estate together with finance and insurance. Source: Washington State Employment Security Department (ESD).

CREDC Industry Clusters

As the state-designated Associate Development Organization for Clark County, the Columbia River Economic Development Council (CREDC) updated its 5-year Clark County Comprehensive Economic Development Plan in 2017. The plan is highlighted by the following vision statement:

Clark County is one of the most inclusive, healthy, and amenity-rich communities in the country. As a result, and with a continued focus on growing a diverse base of community-minded employers, talent (both inside and outside the region) sees greater opportunity here than anywhere else in the country.¹¹

The vision recognizes that "the most efficient way to grow the economic base is to support the existing companies by understanding their barriers to growth and supply chain needs." This is to be accomplished by working to "remove barriers and tactically recruit companies with focus on five identified industry clusters:

- Computers and electronics
- Clean tech
- Software

- Metals and machinery
- Life sciences

Each of these industry clusters represents opportunity for the I-5/179th study area as well as for the greater Discovery Corridor – some more readily than others. The study area presents definite opportunity to support and strengthen the life sciences hub that has emerged in the Salmon Creek area – anchored by major employers including WSU-Vancouver, Legacy Salmon Creek Medical Center, and Vancouver Clinic. As available sites in the Salmon Creek become more scarce, the I-5/179th area offers proximity to conveniently reinforce and expand this cluster that is increasingly pivotal to Clark County's economic as well as physical well-being.

While much of Southwest Washington's region's high-tech industry is clustered in east Clark County, the I-5/Discovery Corridor offers opportunity for firms that support high-tech – as with suppliers for whom I-5 transportation access for local and regional distribution. The Discovery Corridor also is well positioned for computer-electronic, clean-tech and software applications that are dependent on or otherwise benefit from the corridor's university research and life science attributes.

And the corridor may be well situated for metals and machinery manufacturing – whether for larger end users that want to own their own sites or for smaller niche players seeking an affordable, accessible industrial or business park location.

Implications for I-5/179th & Discovery Corridor Development

Five overall implications of this employment and business cluster analysis are important for the economic feasibility and vitality of I-5/179th interchange area development:

- While industrial use as traditionally defined remains an important contributor to economic vitality, it should not be relied on as the sole or even primary driver of family wage employment growth. Manufacturing job growth can be encouraged, especially for advanced technology firms. Distribution and construction support services also may play an important role – playing to the strategic advantages of a central I-5 corridor location.
- Added sources of family wage job growth may comprise a mix of professional and business, financial services and the higher wage portions of the education/health sector.
- Lower wage retail, leisure and hospitality and food services also play an important role in providing for a competitive employment center – benefitting from an I-5 location and catering to nearby family wage employers and workers who increasingly want proximity to these services.
- The mix of business activity should accommodate both tightly niched small as well as large employers recognizing Clark County's shift to smaller firms over time. This mix can be accommodated with a combination of large sites for major corporate and branch facilities together with multi-tenant business parks for a greater diversity of small firms.
- In effect, I-5/179th and Discovery Corridor development offers the best prospect for success at the intersection between county-wide/CREDC business cluster opportunities and the corridor's distinctive advantages. This suggests building on the combination of life science and transportation-intensive firms – both large and small – coupled with the ability to draw from a broad, readily accessible labor market in multiple directions.

COMMITTED DEVELOPMENT

Considerable development is already either underway or pending for the I-5/179th Street corridor. Clark County tracks projects that are approved, built or under construction, development agreements (with trips reserved), approved projects in review for land use modifications, and pre-applications.

As of 2017, this listing included the developments as listed by the following chart.

Project	Туре	Quadrant	Status	Comments
Approved Built or Under Constru	ction			
179 th Commercial Center	СОМ	SW	No Activity	Initial phase of development complete
Hawken Building	COM	SW	No Activity	Pre-approved for warehouse/office
Fairground Station	COM	SW	Constructed	Site is partially developed
179 th Street Apartments	MFR	SE	Under Construction	
University Estates	SFR	SE	Constructed	
Pioneer Vista Apartments	MFR	SE	Constructed	
Velveteen Meadows Subdivision	SFR	SE	Under Construction	
Green Acres Subdivision	MFR	SE		
Trips Reserved by Development	Agreem	ent		
Three Creeks Development	COM/MU	NE/SE	Amendment Proposed	Amendment to include property added on north side of 179th Street
Projects Approved but In Review	for Lanc	l Use Mod	ification	
Whipple Creek Subdivision	SFR	SE	Approved	
Legacy Place Subdivision	SFR	SE	Approved	
Peach Springs Subdivision	SFR	SE	Approved	
Pre Application				
Evergreen Business Park	COM	SW	No Activity	
179th Street RV Park	COM	SW	In Review	
Elevate Church	INST	NW	No Activity	

I-5/179th Corridor Current Development Projects (2017)

Notes: Listing updated as of 2017. Quadrant refers to location to NW, SW, NE or SE of I-5/179th interchange. Source: Clark County Public Works.

As indicated by the listing, the most active developments underway are residential projects, both single- and multi-family. There is also commercial development planning activity but with less construction to date. Largely missing from the listing to date are industrial projects or other developments with clearly defined family wage potential.

The most significant employment-related project for the 179th corridor currently is the Three Creeks development both south and north of 179th Street just east of the I-5 interchange. The initial property acquired on the south side of 179th Street has been planned for a major retail center. Due to slowing demand from major retail anchor uses and increasing competition with

electronic commerce, development of this south-side site has been slowed pending major tenant commitments.

Approximately 90 acres on the north side of 179th has been purchased more recently – with focus on creating a mixed-use residential and employment center with supportive office-retail development. Due to continued if not increasing strength of the residential market, the northern property is now more likely to serve as the lead development for Three Creeks. Proposed by the developer Killian Pacific is an amendment of the current development agreement to address infrastructure needs with inclusion of the north property.

Three Creeks Development Agreement

Killian Pacific and Clark County entered into a Development Agreement with Clark County for the Three Creeks property in December 2012. Amending the agreement may be considered to include expanded site area and updating of infrastructure planning.

Key features of updated master planning may include:

- ✓ Approximately 107 acres of usable site area split about evenly north / south
- ✓ 1.8 2.1 million square feet of development at build-out
- ✓ 179th North planned for mixed use development single and multi-family residential together with commercial (likely including a mix of retail, lodging, medical or other office, and/or assisted living)
- ✓ 179th South development focus for convenience and lifestyle plus entertainment uses
- ✓ Phasing starting from north, then south depending on market opportunity
- ✓ Local arterial access to be re-aligned to reduce intersection conflicts near the interchange – by re-aligning NE 10th to connect with 179th further east (possibly with interim and final phases), and closure of NE Union Road with NE 15th Avenue to become the primary north-south access
- ✓ Proposed removal of Urban Holding (UH) designation from the northern portion of the site based on public-private infrastructure funding program
- Private funding to include right-of-way control, site studies/technical support, off-site mitigation and pre-paid transportation impact fee (TIF)
- ✓ Public portion of funding to include bonding, local revitalization finance (LRF) and grants (including potential CERB)
- CERB funding opportunity best for infrastructure to support family wage employment (as with medical, WSU research or tech-related flex/office)
INDUSTRIAL LANDS

Demand for industrial land represents one side of the equation for local and regional economic development. Supply represents the *flip side* – addressing the question of: *Can the needs of the business – for land, buildings, transportation and utility access – be supplied where and when needed*?

In conjunction with its Comprehensive Economic Development Plan, CREDC completed a *Clark County Employment Land Site Readiness* Analysis in November 2016. The purpose of the analysis was to determine the supply and readiness of industrial sites to meet shortand long-term market demand for employment growth county-wide. A related objective has been to compare the land supply to the needs of targeted industries for Clark County.

The study identified 56 potential employment sites of 20+ acres (including site assemblages) throughout the county. Of these sites:

- 17 sites (30%) are in the greater Discovery
 Corridor area extending from north of the I-5/205
 Junction to the county line at Woodland –
 including five sites in or immediately adjacent to the I-5/179th study area.
- Only 15 sites county-wide of the 56 are identified as Tier 1 properties that could be development ready within a 6-month time frame – including four sites in the Discovery Corridor but with no sites in the immediate I-5/179th study area indicated as development ready within 6 months.
- Another 29 sites are labeled as Tier 2 properties that could require 13-30 months to become development ready – including four of the five sites within the I-5/179th study area. One of these sites is situated directly on 179th Street on OR-22 zoned property; one is situated in proximity to the WSU campus at Salmon Creek; the others are located further north toward the 219th Street corridor.

Industrial Site Readiness Opportunities & Challenges

As part of its review, CREDC conducted more intensive analysis of five sites countywide, including **a potential 35-acre assemblage on the 179th Street corridor.**

This site exemplifies features and challenges faced by this as well as other study area potential employment sites:

- The property is indicated as ideal for corporate heqdquarters use – either single user or multi-tenant
- ✓ Multiple ownerships are involved, requiring parcel assembly for marketability
- ✓ Zoning is for Office-Residential (OR-22) but currently with an Urban Holding-10 (UH-10) Overlay over the entire site
- ✓ Sewer capacity has been improved with a new regional pump station
- ✓ There are wetlands requiring on-site mitigation
- Road improvements must be in place before development
- CREDC also identifies amenity build-out at 179th interchange as pivotal to site marketability
 - CREDC, Clark County Employment Site Readiness Analysis, November 2016

A FULL-SERVICE JOBS ECO-SYSTEM

As is the case nationally, CREDC's Comprehensive Economic Development Plan recognizes the need to go full service – for full amenity value. The first goal of the CREDC plan to expand the existing base with industry clusters is immediately followed by a second and a third goal, to:

- Support people with skilled workforce
- **Create place** distinctive to each community within Clark County

The post-recession experience makes clear that employers and workers no longer want to be in sterile 9-5 industrial campuses. Rather, successful employment centers increasingly are those that offer great amenity value – both in terms of diverse, readily accessible consumer services and also immediately proximate housing choices.

Retail and service amenity is now clearly recognized as important to attracting and keeping quality workforce. Employees want access to places to shop, eat, recreate and socialize – before, during and after work.

And proximity to diverse, affordable housing has now come to the fore as also being of pivotal importance. This is due in large part to the run-up in housing costs – a phenomenon that has spread beyond major urban centers to include fast-growing western U.S. communities as in Clark County.

Anecdotal accounts and empirical research provide clear evidence of how a weak inventory of housing choices undermines business location decisions and resulting job prospects. A few examples of the types of impacts experienced are highlighted by the sidebar to the right.

To address these market imperatives, the I-5/179th study area is proposed as a **multi-use employment center**. At build-out, the area will feature family wage employers, immediately proximate retail and service businesses, regionally significant entertainment venues, and a diverse mix of single and multi—family housing. True mixed use.

Economic Development & Housing Nexus

"...high housing costs make California a less attractive place to call home, making it more difficult for companies to hire and retain qualified employees, likely preventing the state's economy from meeting its full potential."

 Alejandro Lazo "California's Housing Costs Hurt Economy, Increase Poverty, Report Finds," Wall Street Journal, March 17, 2015.

"... a lack of affordable housing makes it more difficult to recruit and retain employees. In addition, to the extent that an affordable housing shortage forces workers to "drive 'til they qualify," a region may be faced with congested roads, which can reduce economic competitiveness."

- Keith Wardrip, et al, "The Role of Affordable Housing in Creating Jobs and Stimulating Local Economic Development," Center for Housing Policy, January 2011.

"Cities with less-affordable housing tend to experience slower employment growth, because land rents are so high that the supply of land must have reached some limit. These land supply limits are the ultimate restrictions on local employment growth."

- Ritashree Chakrabarti and Junfu Zhang, Unaffordable Housing and Local Employment Growth, Federal Reserve Bank of Boston, 2010.

V. MARKET STRATEGY

Building from the knowledge of the foregoing I-5/179th interchange area and market analyses, this market strategy starts with a 10-point concept. This is followed by identification of activity clusters, economic feasibility, partnership opportunities, marketing plan, economic outcomes and a summary action agenda.

THE CONCEPT

A series of 10 observations emerge from the combination of the quantitative and qualitative analyses – including stakeholder interviews – completed for this feasibility study:

- 1) There is substantial but as yet unrealized economic development potential for the I-5 corridor extending north to the Clark County line. Of 56 sites identified by CREDC as employment lands of 20+ acres, 17 sites are located in what has been described as the Discovery Corridor, extending from the I-5/205 junction north past La Center to the county line. Within the portion of the corridor extending from the I-5/205 confluence north to the 219th interchange (and centered at 179th), there is capacity for at least 5,550 added jobs dependent on infrastructure. Creating family wage jobs at sites proximate to this I-5 travel corridor also offers convenient opportunity to reduce the unneeded outflow of Clark County commuters to the Oregon side of the Columbia River.
- 2) The Discovery Corridor appears to a potentially powerful marketing concept but with no clear strategic plan for multi-year, multi-jurisdiction implementation. As this I-5/179th study makes clear there appear to be two distinct segments to the Discovery Corridor Concept a southern 134th to Battle Ground interchange segment with 179th at the center and a northern Battle Ground to La Center segment. Each is associated with a distinctive mix of target industry (or business cluster) opportunities.
- **3)** Targeted economic development opportunities need to be clearly defined. A broad strategy for each interchange area might be sketched out as follows (from south to north):
 - 134th/139th Higher education (WSU), medical, local service-commercial (but closer to build-out capacity than the other interchanges)
 - 179th entertainment/recreation complex, commercial/mixed use hub, I-5 visible business park/office campus and supporting residential (with mid-range home values)
 - **219**th a swing interchange with development more future-oriented pending UGA inclusion and possible extension of the interchange for west-side access.
 - **Ridgefield** ideal for large site industrial including warehouse-distribution with ready access to Puget Sound and Portland/Vancouver markets, coupled with prospective Clark College and Peace Health expansions
 - La Center anchored by casino driven entertainment with regional destination lodging and retail anticipated together with longer term east-side industrial potential

With the exception of the Clark County fairgrounds/amphitheater complex, the **179**th **interchange** does not yet have a clearly identified business development identity. The most market-ready uses currently are residential, commercial retail-service and possible mixeduse development. Corporate office development is a longer-term opportunity.

While there is light industrial and business park zoning, it is located away from the interchange, parcels are often fragmented and relatively small, and there appears to be minimal industrial development interest to date (with the possible exception of NE Delfel/10th Avenue most proximate to the fairgrounds).

Non-retail employment-focused development will rely not on any single economic driver, but rather will come from a multiplicity of sources – possibly including spinoff from nearby medical and higher education centers. The commonalities will be firms reliant on I-5 visibility and access, with a possible emphasis on incremental business park development oriented to smaller locally owned business uses – as with the Eastridge Business Park north of Orchards. Clark County has a lack of privately owned multi-tenant business parks compared to the rest of the metro region; I-5/179th could be a good location to fill this gap.

- 4) Environmental and infrastructure issues particularly transportation represent added costs to be addressed in a manner that will render pivotal economic development sites as locally and regionally competitive. Priority investments appear to be I-5/179th interchange reconstruction, 179th Street improvement, and north-south connector roads including NE 10th and 15th (in rough priority order). A major need is to establish full north-south connectivity parallel to and on both sides of I-5 extending from 134th to 199th/219th for improved internal circulation especially service to industrial and business park designated properties. This is complicated because the northern portions of these corridors are outside current UGA boundaries and cannot readily be improved to urban arterial standards.
- 5) If infrastructure and environmental constraints can be proactively addressed, the mix of business-industrial, commercial, entertainment, and residential choices fit well with resident and business preferences as a distinctive competitive advantage going forward. Put simply, there is no other location in Clark County that can concurrently "check the boxes" of I-5 access/visibility, vacant buildable land, and a mix of residential, commercial and industrial/flex choices so convenient to urban populations of southwest Washington.
- 6) Leveraging community, political and funding support requires sustained focus to generate family wage jobs for Clark County residents. Since before the Great Recession, much of the public discussion and economic development emphasis for this interchange has been on the Three Creeks development on the south side of 179th with a primarily retail orientation. While there can be exceptions, a challenge with retail and associated dining/entertainment uses is a relatively lower wage profile which does not as directly address county economic development priorities. Also noted is that retail is not an eligible use for CERB infrastructure funding, and residential is not favored either.

To package a competitive and successful CERB application, Clark County will need to demonstrate a primary focus on creating jobs that pay above the Clark County median wage. The best case will likely involve an infrastructure project demonstrated to directly create higher wage industrial, professional office, medical, educational, R&D or some combination of similar uses.

Based on current zoning, this will most likely occur on industrial or business park property located either north or south of the 179th corridor. In other words, as a job-creating adjunct to core I-5 interchange / 179th improvements. If a substantial family wage office use were to be developed on more proximate commercial property (as with Three Creeks north of 179th), this could also serve as rationale for CERB-related investment – as with a new road/bridge connector from about NE 15th Avenue at 179th) back to 10th Avenue.

- 7) Business cluster targeting also is important to make the case for state, local and private sector investment leveraging. CERB and other economic development funding sources will want to see a clear delineation of family wage job industry for which there the area is or will be competitive. Better yet, CERB would prefer to have an up-front *bird-in-hand* commitment from a lead investment or family wage employer ready to build, contingent only on the CERB investment. So in rough order of priority, the options would be to:
 - Secure a major user with family wage profile (which could mean waiting to apply for CERB until this anchor user is identified)
 - Obtain developer commitment to build the first phase of a multi-phase business park/office campus (with or without anchor tenants but targeting a family wage tenant profile)
 - Submit for CERB without any user/development commitment but with market analysis demonstrating strong demand (a tougher sell, especially at a location for which there has been limited family wage industrial or office user experience to date).
 - Whichever path is chosen, it is also worthwhile to make the case for strong linkages to nearby residential, retail-service and entertainment options as this is increasingly important to employer location decisions (especially to attract younger millennial workforce that is currently under-represented in the Clark County demographic mix).
- 8) Public-private partnership (P3) provides the best opportunity to create and sustain market-ready development offering compelling return on investment. One variation on the P3 model has been demonstrated with fairgrounds/amphitheater development notably the partnership with Quincunx (as manager of the Clark County Amphitheater). Another variation is anticipated to occur with the Three Creeks commercial and mixed use development now being planned for the opposite side of the interchange.

More partnerships with development agreements are likely needed. If CERB funds are to be brought to the table, a P3 arrangement is suggested for business park/office campus development – perhaps just beyond the commercially designated 179th corridor.

- 9) Economic development marketing and coordinated implementation depends on identification of a lead organization together with committed multi-jurisdiction and private supporting roles. At this time, there would appear to be two primary options for this lead role – Clark County or CREDC. Supporting roles (including leads on some project components) may be appropriate for public agencies including WSDOT, the Columbia Regional Wastewater District (CRWWD), Clark County Events Center at the Fairgrounds, and private participants (particularly via development agreements) – extending to other players including WSU Vancouver, the Port of Ridgefield and Cities of Vancouver, Battle Ground, Ridgefield, and La Center.
- 10) Successful I-5/179th interchange area development can best be realized under the umbrella of a 20+ year flexible, cooperative Discovery Corridor strategic plan. A recurrent theme expressed by stakeholders interviewed as part of this feasibility study has been for the development of a single cohesive, comprehensive, multi-jurisdictional Discovery Corridor strategic plan. The Port of Ridgefield is credited with creating the concept. Now there is need for clearly articulated geographic, programmatic and land use definition. While the plan could be created on a contractual basis, the jurisdictional lead role would appear to best fit Clark County in cooperation with the other entities noted above.

Family Wage Jobs For Clark County

The **2004-2024 Clark County Comprehensive Plan** defined a "family wage job" as a job which pays a combined amount at or above the average wage for Clark County plus an added 25% for benefits. The more recent **20-Year Comprehensive Growth Management Plan 2015-2035** places continued emphasis on family wage jobs for economic development

A framework plan policy is stated to: "Encourage businesses which pay a family wage to locate in Clark County." (Policy 9.1.3)

A 20-year planning policy for the unincorporated county is to: "Provide priority assistance to employers who pay a family wage. (Policy 9.2.4)

Included as an implementation strategy with the plan's transportation element is a priority to "allocate or reserve corridor capacity for land uses likely to produce family wage jobs."

A Washington state CERB program requirement is to fund projects resulting in an hourly wage that pays above the county-wide median. CERB also prioritizes projects with clear specification of employee benefits.

While not defined precisely the same, the terms "family wage job" and "above median wage" employment are used interchangeably in this feasibility report.

ACTIVITY CLUSTERS

The question now is: What are the best, most marketable employment uses for development of the I-5/179th full study area?

At first glance, I-5/179th might be considered as a *blank slate* from an economic development perspective. Compared to other freeway interchanges in Clark County, much of the area visible from the I-5 freeway appears as undeveloped or underutilized.

However, despite first impressions, there appear to be some definite opportunities – some clear direction going forward. The path of future development will be shaped by the freeway and interchange, the existing pattern of uses and zoning, and by development interests prepared to make major investments.

Taken together, existing conditions and expectations begin to narrow the range of realistically achievable opportunities. Going from north to south (as illustrated by the map on the next page), five key **activity clusters** are associated with a suggested economic development concept:

- Employment center as the largest repository of light industrial/business park land and best long-term opportunity for family wage employment creation – situated between 179th and 209th and as yet awaiting a lead investment (as a targeted use for CERB or other economic development related funding support).
- Commercial & mixed use most likely the most immediate economic catalyst development – anchored by Three Creeks right at the interchange – but with opportunity for major office campus at the eastern end and hospitality/entertainment at the western end of the 179th corridor.
- Entertainment & events anchored by the fairgrounds/amphitheater complex with long-term economic development potential tied to improved access and increased year-round utilization including supporting lodging and related hospitality investments.
- Business & commerce clustered along a newly improved NE 10th Avenue corridor with a southern T-axis supported by the 134th/139th Street corridors and associated I-5 Interchange improvement – attractive for local serving light industrial and service businesses, many at the mid-upper end of the employment wage range.
- **Surrounding residential** encompassing the economic clusters on all sides with a mix of single-family, multi-family and recreational use opportunities ideally oriented to support the emerging business and employment core clusters.

Not directly a part of the I-5/179th area but closely affiliated is the WSU university and medical cluster situated just beyond the southeast edge of the study area. Also noted is the longer-term opportunity for extension of the Discovery Corridor employment center north to the 219th/Battle Ground interchange pending future UGA decisions.



Activity Clusters for an I-5/179th Corridor Full Service Jobs Eco-System

ECONOMIC FEASIBILITY

The economic feasibility of future development planned for the I-5/179th study area can be assessed on two levels:

- Project-by-project which is beyond the scope of this study but will be assessed by each owner or proponent based on the merits of the types of investment being considered (as summarized by the side-bar to the right).
- Build-out of the UGA portion of the 5,300 acre study area the focus of this feasibility report.

Economic feasibility for build-out of the 1-5/179th study area as a **full-service jobs eco-system** appears to be eminently achievable – conditioned primarily on the ability to fund and re-build the 179th interchange and on associated local road network improvements. Of great importance to the viability of a family wage Employment Center is the development of a local north-south road network reaching from 179th north to the 219th/Battle Ground interchange. Mechanisms to encourage parcel assembly of smaller sites should also be considered.

The NE 10th Avenue improvements underway will greatly improve access to local business and commerce development opportunities south of the fairgrounds. Similarly, **NE 15th/10th Avenue** improvements on the east side of I-5 from 179th north will prove instrumental to realization of the interchange's best opportunity for a family wage industrial and business park employment center as well as for a commercial and mixed use center.

If successful, the **public-private partnership (P3)** approach to development agreements currently being refined for the commercial and mixed-use area on 179th can serve as a model for other similar joint investment opportunities – especially for the northern Employment Center and future potential fairgrounds/event center intensification.

And the feasibility of I-5/179th area development is best served if conducted as a **multi-jurisdictional**, **cooperative** effort involving all five Discovery Corridor interchanges.

Project-Based Feasibility

Factors pivotal for project feasibility likely vary by activity cluster as follows:

- Employment Center project feasibility may be determined on a user basis for an adequately sized build-to-suit site or as a multi-tenant real estate investment based on rental income returns to invested capital.
- Commercial & Mixed-Use feasibility is most likely assessed as a multi-tenant real estate development opportunity – with more development and financing sophistication required for mixed use than single use projects.
- Entertainment & Events feasibility will be driven by decisions of the Clark County Events Center, with supporting private hospitality investment driven by opportunity for year-round utilization.
- Business & Commerce feasibility is assessed similar to that of employment center uses, but focused more on local, smaller scale owner and multitenant development.
- Supporting Residential is driven by local owner and developer opportunity for quick absorption of each project or phase.

PARTNERSHIP OPPORTUNITIES

In conducting this economic feasibility study, interview contacts were made with key area stakeholders including developers and their legal representatives as well as with neighborhood and fairgrounds interests. A broader regional perspective was obtained via discussions with organizations including the Regional Transportation Council (RTC), Washington State Department of Transportation, and the Columbia River Economic Development Council (CREDC).

This network of contacts and supporting organizations will need to be further widened, especially to the extent that the jurisdictional interests of all five Discovery Corridor interchanges can be brought to the table. In addition to private sector and project-specific partnership opportunities, these additional institutional and public sector partners can be expected to include:

- City of Vancouver, WSU and major health care providers (134th/139th interchange)
- Cities of Battle Ground and Ridgefield (219th interchange)
- City and Port of Ridgefield (269th interchange)
- City of LaCenter and ilaini/Cowlitz tribal interests (319th interchange)

MARKETING I-5/179 & DISCOVERY CORRIDOR

As funder of this economic feasibility study, CERB asks for "identification of the group responsible for implementing the marketing strategy" on behalf of the affected project area. Also requested is information regarding the group's capacity to complete this responsibility.

As discussed with the study area development concept, the jurisdictional lead role for coordinating and marketing the I-5/179th full-service jobs center would appear to best fit Clark County in cooperation with other public jurisdictions and public/private development partners.

Determination of roles and responsibilities for coordinated marketing of the greater Discovery Corridor's set of five interchange areas is not as straightforward. What is most important – at least in the early going – is the identification of an entity that can best serve as interjurisdictional convener.

Due to its jurisdictional responsibilities that extend across all five interchanges, Clark County is suggested as an appropriate convener – especially for purposes of preparing a multi-jurisdictional strategic plan. Project implementation lead and support roles would then vary depending on the interchange area under consideration, project requirements, and specific jurisdictional responsibilities.

Conceptually, key participants and responsibilities can be outlined— on a preliminary basis – as outlined by the matrix chart on the following page.

I-5/179th and Discovery Corridor Marketing Roles / Responsibilities (Conceptual)

Function	Lead Role	Support Roles	
I-5/179 th Study Area			
Property Owner & Developer Coordination	Clark County	WSDOT, property owners and development interests	
Infrastructure Planning & Implementation	Clark County and WSDOT	Property owners, developers and public agency funders	
Business Development & Recruitment	CREDC	Property owners, developers and Clark County	
Full Discovery Corridor			
Strategic Plan	Clark County	All participating jurisdictions, business and civic representatives	
Infrastructure PlanningDepends on interchange a& Implementationjurisdictional responsibilit		All participating jurisdictions, business and civic representatives	
Business Development & Recruitment	CREDC	Property owners, developers, cities, Port, utility providers and Clark County	

Source: E. D. Hovee. This matrix chart is preliminary and subject to revision.

ECONOMIC OUTCOMES

As detailed in Section III of this report, economic outcomes anticipated with full **build-out** of the I-5/179th interchange study area are currently projected to include:

- **5,550 direct jobs** covering industrial, commercial, and entertainment sectors important to Clark County's economic vitality
- **5,650 housing units** as a mix of single attached/detached and multi-family workforce housing in support of the Discovery Corridor employment center.
- \$234 million in one-time construction plus \$34 million per year in subsequent on-going tax revenues to benefited state and local jurisdictions.
- Achieving an above median wage in excess of the approximately \$20 per hour current county-wide median.

Metrics for Monitoring

Datasets that should be available consistent with the study area boundaries of the I-5/179th interchange area include:

- Square footage of new building space for employment, residential and other uses
- Study area employment and wages
- Assessed valuation by use type
- Property tax and REET revenues
- Sales tax revenues (for properties within the LRF)

In the event that CERB funding is secured for a specific project area, Clark County should be prepared to establish protocols for compilation of similar information for the specific development(s) benefited. This may involve agreements with directly benefited property owners to provide outcome metrics – including payroll and employee benefits information in a manner as may be mutually determined.

Tracking Outcomes

Monitoring progress toward planned outcomes is important for compliance with CERB funding requirements. Outcome measures also are useful to track for Clark County and project partners. If performance (on a cumulative basis) is below expectations, policy and incentive options that might be useful for improving performance can be considered and implemented.

In the event of CERB capital funding, Clark County is prepared to establish protocols that include designation of a County department with the overall responsibility for data collection and management. This approach could include interagency agreements involving Clark County and the State of Washington for datasets that are within their respective purviews.

Data compilation is proposed to occur consistent with agency reporting cycles on an annual basis. The term of the data collection process is proposed to be for a period of not to exceed 10 years or as otherwise may be mutually agreed with the State of Washington / CERB program.

Anticipated data collection responsibilities are outlined as follows:

- **Clark County Auditor or Treasurer's Office** sales tax and REET revenues (tracked in a manner similar to what as currently maintained for the LRF)
- **Clark County Assessor/GIS** building square footage, valuation of new construction and property taxes by employment, residential and other use.
- State of Washington Employment Security Department (ESD) average and median wage for all work district employment (subject to confidentiality requirements)
- U. S. Census On-The-Map for employment and payroll estimates, if not available from other sources.

ESD data is proposed to be provided in the form of median hourly pay. This data is not currently available except on a county-level for all job sectors combined but not for specific NAICS industrial sectors. However, data regarding average annual wages is currently a part of the normal ESD county-level reporting format.

A consistently applied data collection process for a customized geography that is a sub-portion of the County depends on reaching protocols early on as to: the department of the County with overall coordinating or reporting responsibility, agreements with participating county and state agencies, and agreement as to the reporting period (annually or otherwise) together with a clear understanding of the duration of the monitoring activity.

ACTION AGENDA

Because there is no project specific application anticipated in the near term, the action agenda outlined below is more generalized – but also potentially more far-reaching. Three **action steps** are proposed for Clark County consideration:

Action Stop	Commonts	Timo Framo
1) Proceed with ready-to-build public-private partnership (P3) projects	Finalize development agreements; include lifting of the Urban Holding (UH) overlay to the extent supported by public-private committed infrastructure capacity and with reasonable return on investment for public and private participants	Starting this year (2018)
2) Recruit for the best available privately developed and CERB-supported capital funding proposal	Focus to be on securing a commitment from a clearly identified above median wage employer (either as sole site owner or as anchor tenant to a multi-use development) – with CERB or other similar economic development funding incentives	Next 2-3 years (2019-20)
3) Prepare a cooperative, multi-jurisdictional 20-year Discovery Corridor strategic plan	To encompass the five I-5 interchange areas extending from the I-5/I-205 junction to the north Clark County line with involvement of all directly affected state and local jurisdictions and with broad-based private sector and civic participation	In 3-5 years (2020-22)

I-5/179th and Discovery Corridor Marketing Roles/Responsibilities (Conceptual)

Source: E. D. Hovee. This matrix chart is preliminary and subject to revision.

These three action steps might be considered independently – with or without action on the full agenda. However, the long-term economic impact – for jobs, wages and tax base – is maximized if the full 3-step agenda is actively pursued:

- Proceeding with ready-to-build **public-private partnerships** builds momentum for further investment starting on 179th Street in closest proximity to the interchange.
- Active recruitment of a **family wage employer** is pivotal to extending development interest beyond the current market for mixed use residential and commercial by bringing additional infrastructure resources and possible land assembly assistance to the table in what can be a *win-win* for a significant employer and infrastructure providers.
- And implementing a cooperative **Discovery Corridor strategy** may be the best if not only way to better leverage current piece-meal initiatives, creating a jobs center that truly can make a dent in providing more jobs for Clark County residents in their home community.

APPENDIX A. PREPARER PROFILE

This economic feasibility study for the I-5/179th interchange study area has been prepared for Clark County by E. D. Hovee & Company, LLC. Since 1984, E. D. Hovee has provided economic and development consulting services for a wide range of public agency, non-profit and private clients – primarily in the Pacific Northwest states of Washington and Oregon.

As a specialized professional consulting practice, the firm's focus is on assessing market and financial feasibility, economic impacts and business development strategies for major public and private capital investment projects.

Based in Vancouver, EDH has extensive experience with projects locally and regionally – with clients including Clark County, most of the cities, all three port districts, and non-profit development organizations such as CREDC, Identity Clark County, and the Fort Vancouver National Trust. EDH has also worked with a wide range of private clients – including property owners and real estate development firms.

EDH has completed a range of economic feasibility studies addressing CERB requirements:

- CERB/LIFT tax benefits analysis for a regional retail center and business park in proximity to I-5 and NE 179thStreet on behalf of Killian-Pacific.
- Port Townsend's Howard Street Corridor economic feasibility for a \$7 million street and utility extension (with \$1.5 million funded by CERB) – providing the first fully-served, shovel-ready industrial land in Port Townsend as a work district marketed to both entrepreneurial and established firms as a place where "we speak craft."
- Skagit Manufacturing Feasibility study leading to the successful marketing and reuse of a former steel manufacturing firm in Sedro-Woolley for industrial incubator space.
- Health care industry assessment for the Lake Chelan valley area in north central Washington both with and without a new hospital facility.
- Feasibility study leading to Public Works Trust Funding of sewer improvements to serve industrial and commercial development on Tennant Way in Longview.
- Economic feasibility study leading to CERB funding for infrastructure to serve a 42-acre business park in Skamania County.

The firm is currently engaged in CERB-funded feasibility studies as lead consultant for the 55acre Bell Creek Economic Opportunity Area in Sequim on the Olympic Peninsula in Clallam County and as sub-consultant for the 4,000-acre Arlington-Marysville Manufacturing Industrial Center in Snohomish County.

APPENDIX B. PRIOR AREA ANALYSIS

In August 2015, an Economic Impact and Return on Investment Analysis for NE 179th Street Improvements report was prepared by Johnson Economics for area property interests involved with planned developments for the I-5/179th interchange area. As detailed by the chart to the right, the Johnson Economics analysis yielded higher estimates of potential economic impact than estimated with this 2018 economic feasibility report prepared by E. D. Hovee. Key differences include the following:

- The study area defined by Clark County for the 2017-18 E. D. Hovee analysis extended further south and west but did not encompass as much land to the east as considered by Johnson Economics.
- Johnson's area included about 650 more vacant acres than E. D. Hovee.
- More pivotally, the Johnson analysis resulted in an estimate of developable land area of 4,100 acres, 3.7 times the developable acreage figure of E. D. Hovee analysis as provided by the Clark County Vacant Buildable Lands Model (VBLM).

Comparison of Economic Impacts

De	escription	Johnson Economics	E. D. Hovee
DE	VELOPMENT PROGRAM		
La	nd Area (Acres)		
	Vacant Land Area	2,192.20	1,541.10
	Developable Land Area	4,100.10	1,114.19
	Commercial/Industrial	768.80	408.21
Po	tential Development		
	Added Housing Units	24,105	5,648
	Gross Building SF	50,782,145	15,676,000
	Development Cost	\$7,317,290,600	\$2,929,650,000
DI	RECT & ECONOMIC MULT	IPLIER BENEFITS	
Сс	onstruction (One-Time)		
	Direct Jobs	54,357	14,976
	All Jobs (w/Multiplier)	84,933	21,414
	Direct Payroll	\$3,009,590,003	\$1,010,884,000
	All Payroll (w/Multiplier)	\$4,237,357,279	\$1,293,933,000
	Direct Revenues	\$7,317,293,688	\$2,929,650,000
	All Revenues (w/Multiplier)	\$11,235,622,720	\$4,013,620,000
Op	perations (Annual)		
	Direct Jobs	23,728	5,550
	All Jobs (w/Multiplier)	30,502	7,670
	Direct Payroll	\$698,520,728	\$223,044,000
	All Payroll (w/Multiplier)	\$959,723,222	\$301,478,000
	Direct Revenues	\$1,368,961,248	\$862,430,000
	All Revenues (w/Multiplier)	\$2,164,635,778	\$1,171,306,000
DI	RECT TAX EFFECTS		
Co	onstruction Revenues		
	Sales Tax	\$629,286,992	\$194,366,000
	Real Estate Excise Tax	NA	\$44,491,000
	Total One-Time Revenues	\$629,286,992	\$238,857,000
Ar	Inual Kevenues	605 262 0 <i>4</i> 0	Ć4 E 004 000
-	Property lax	\$85,362,049	\$15,801,000
	Sales lax	\$41,667,000	\$12,610,000
	Total Appual Payapuas	NA	\$5,847,000
	Iotal Annual Revenues	\$127,029,049	şs4,258,000

Sources: Johnson Economics & E. D. Hovee, as described.

Two primary factors account for the difference in developable land estimates. *First,* the Johnson analysis does not appear to have excluded critical lands which the VBLM indicates as affecting close to half of all land area in the full study area – and the majority of otherwise vacant land that might be considered for added residential or employment purposes.

Second, the Johnson analysis includes a more encompassing estimate of redevelopable land than is associated with the VBLM which serves as a basis for Clark County's growth management planning. The Johnson analysis defined redevelopment lands based on valuation of current improvements "at 50% of average in study area or below." As a result, redevelopment sites account for close to one-half (47%) of the total developable land acreage assumed with the Johnson report.

In contrast, the Clark County VBLM defines under-improved properties as including residential sites of up to \$13,000 assessed valuation of building improvements on a residentially zoned parcel or up to \$67,500 for a commercially or industrially zoned property. This results in a more conservative estimate of redevelopment potential on already developed properties.

Differences in developable land estimates account for most of the differences in economic impacts estimated by the Johnson Economics report and this current economic feasibility study. Depending on the output metric considered, Johnson impact estimates range 2-4 times higher than impacts estimated by E. D. Hovee.

Other less significant differences noted between the two analyses include:

- Johnson used FAR estimates as a basis for estimating residential development; the E. D. Hovee analysis is based on average Clark County VBLM unit per acre estimates.
- For commercial and industrial space, Johnson applied FAR ratios of 0.24 and 0.31 respectively; E. D. Hovee applied VBLM employment density factors of 9 and 20 employees per acre factors together with typical employee square footage space requirements to arrive at somewhat lower imputed FAR ratios of 0.16-0.26 which may be more typical at lower density suburban locations.
- Economic multipliers were the same to somewhat higher than those utilized by E. D. Hovee with both firms drawing from the IMPLAN input-output model. E. D. Hovee estimates are limited to Clark County.
- Johnson includes estimates of income associated with households that would locate in new homes built in the area. The E. D. Hovee analysis is limited to economic effects associated with new employment within the I-5/179th study area.
- The E. D. Hovee analysis includes fiscal benefits to the state and Clark County associated with Real Estate Excise Tax (REET) with property sale and subsequent periodic re-sale which is not included with the Johnson Economics report.

APPENDIX C. SUPPLEMENTAL DATA

Supplemental data for this I-5/179th interchange area Economic Feasibility Study provided with this appendix covers:

- Comparative Population Trends
- Comparative Unemployment & Labor Force Trends
- Comparative Median & Average Wage Trends

Popu	lation	% Change from Prior Year		
Clark	Washington	Clark	Washington	
County	State	County	State	
345,238	5,894,143			
352,715	5,970,452	2.2%	1.3%	
364,855	6,059,698	3.4%	1.5%	
374,091	6,126,917	2.5%	1.1%	
385,370	6,208,532	3.0%	1.3%	
394,600	6,298,797	2.4%	1.5%	
404,737	6,420,219	2.6%	1.9%	
412,692	6,525,121	2.0%	1.6%	
419,091	6,608,234	1.6%	1.3%	
423,775	6,672,263	1.1%	1.0%	
425,363	6,724,540	0.4%	0.8%	
428,000	6,767,900	0.6%	0.6%	
431,250	6,817,770	0.8%	0.7%	
435,500	6,882,400	1.0%	0.9%	
442,800	6,968,170	1.7%	1.2%	
451,820	7,061,410	2.0%	1.3%	
461,010	7,183,700	2.0%	1.7%	
471,000	7,310,300	2.2%	1.8%	
age Growth	Rate (AAGR)·			
		1.8%	1 3%	
		1 4%	1.3%	
		1.8%	1.4%	
	Popu Clark County 345,238 352,715 364,855 374,091 385,370 394,600 404,737 412,692 419,091 423,775 425,363 428,000 431,250 442,800 451,820 461,010 471,000	Population Clark County Washington State 345,238 5,894,143 352,715 5,970,452 364,855 6,059,698 374,091 6,126,917 385,370 6,208,532 394,600 6,298,797 404,737 6,420,219 412,692 6,525,121 419,091 6,608,234 423,775 6,672,263 425,363 6,724,540 428,000 6,767,900 431,250 6,817,770 435,500 6,882,400 442,800 6,968,170 451,820 7,061,410 471,000 7,310,300 age Growth Ete (AAGR):	Population % Change from Clark County Washington State Clark County 345,238 5,894,143 352,715 5,970,452 2.2% 364,855 6,059,698 3.4% 374,091 6,126,917 2.5% 385,370 6,208,532 3.0% 394,600 6,298,797 2.4% 404,737 6,420,219 2.6% 412,692 6,525,121 2.0% 419,091 6,608,234 1.6% 423,775 6,672,263 1.1% 425,363 6,724,540 0.4% 428,000 6,767,900 0.6% 431,250 6,817,770 0.8% 435,500 6,882,400 1.0% 442,800 6,968,170 1.7% 451,820 7,061,410 2.0% 461,010 7,183,700 2.2% age Growth Texte (AAGR): 1.8% 471,000 7,310,300 2.2%	

Comparative Population Trends (2000-17)

Sources: U. S. Census, OFM.

	Labor	Force	Unemployment Rate		
Year	Clark	Washington	Clark	Washington	
	County	State	County	State	
2006	205,896	3,323,938	6.3%	5.0%	
2007	209,985	3,403,163	6.3%	4.7%	
2008	215,138	3,478,577	7.5%	5.4%	
2009	219,478	3,535,200	13.3%	9.2%	
2010	216,620	3,511,326	12.9%	10.0%	
2011	211,482	3,461,428	11.7%	9.3%	
2012	209,404	3,471,282	9.4%	8.1%	
2013	208,351	3,463,869	8.5%	7.0%	
2014	209,309	3,489,666	7.0%	6.1%	
2015	214,351	3,545,904	6.5%	5.7%	
2016	220,790	3,635,200	6.3%	5.3%	
2017	227,382	3,724,722	5.1%	4.8%	
Average	Annual Grov	GR - Labor F	orce):		
2006-17	0.9%	1.0%			
2012-17	1.7%	1.4%			

Comparative Unemployment & Labor Force Trends (2006-17)

Sources: U.S. Bureau of Labor Statistics. Data is as of April 2018.

	Median Ho	urly Wage	Average Ho	ourly Wage	Median Annual Wage*		
Year	Clark	Washington	Clark	Washington	Clark	Washington	
	County	State	County	State	County	State	
2000	\$14.07	\$14.99	\$18.71	\$22.45	\$38,979	\$41 <i>,</i> 528	
2001	\$14.63	\$15.75	\$19.58	\$22.44	\$39,916	\$42,972	
2002	\$15.05	\$16.12	\$20.11	\$22.75	\$40,518	\$43,399	
2003	\$15.25	\$16.34	\$20.47	\$23.44	\$40,260	\$43,138	
2004	\$15.57	\$16.66	\$20.93	\$23.60	\$40,282	\$43,102	
2005	\$15.99	\$17.15	\$21.66	\$24.16	\$39,915	\$42,811	
2006	\$16.37	\$17.76	\$22.30	\$25.18	\$39,799	\$43,178	
2007	\$16.96	\$18.38	\$23.12	\$26.22	\$40 <i>,</i> 380	\$43,761	
2008	\$17.30	\$18.98	\$23.88	\$27.26	\$40,123	\$44,020	
2009	\$17.80	\$19.48	\$24.73	\$28.02	\$41,152	\$45 <i>,</i> 036	
2010	\$18.01	\$19.92	\$24.85	\$28.74	\$40,961	\$45,305	
2011	\$18.32	\$20.25	\$25.36	\$29.60	\$40,511	\$44,779	
2012	\$18.66	\$20.56	\$26.17	\$30.42	\$40 <i>,</i> 652	\$44,791	
2013	\$19.01	\$21.00	\$26.37	\$31.04	\$40,871	\$45,150	
2014	\$19.27	\$21.48	\$27.16	\$32.28	\$40,816	\$45,497	
2015	\$19.99	\$22.03	\$28.01	\$32.98	\$42,193	\$46,499	
2016	\$20.39	\$22.72	\$28.93	\$34.61	\$42,737	\$47,621	
Average An	nual Growth Ra	ate:					
2000-16	2.3%	2.6%	2.8%	2.7%	0.6%	0.9%	
2006-16	2.2%	2.5%	2.6%	3.2%	0.7%	1.0%	
2012-16	2.2%	2.5%	2.5%	3.3%	1.3%	1.5%	

Comparative Wage Trends (2000-16)

\$19.99 denotes the median minimum wage threshold for CERB capital funding, per CERB web site: https://deptofcommerce.app.box.com/v/cerbcountymedianwage, as of February 2018.

> * Note: Annual wage figures are adjusted for inflation. Hourly wage figures are not inflation-adjusted.

Source: Scott Bailey, Regional Labor Economist, Washington State Employment Security Department. Includes all jobs covered by unemployment insurance, except for private households and federal government.

END NOTES

- ² The southeastern portion of the UH-10 Urban Holding area includes the Mill Creek Overlay District.
- ³ Critical/constrained lands are defined based on the Clark County *Buildable Lands Report,* Appendix C, June 2015. Constrained lands include:
 - 100-year floodplain or flood fringe
 - Wetlands inventory (NWI, high quality, permitted, modeled) with 100-foot buffer
 - Slopes greater than 15%
 - Land slide area that has active or historically unstable slopes
 - Designated shorelines
 - Hydric soils with 50-foot buffer
 - Habitat areas with 100-foot buffer
 - Species areas with 300-foot buffer
 - Riparian stream buffers by stream type
- ⁴ Clark County's VBLM defines vacant residential parcels has having building values of less than \$13,000. For commercial and industrial lands, vacant is defined as a parcel with building value less than \$67,500.
- ⁵ The proposed re-designation is associated with Annual Review Case CPZ2017-00012 Wollam. Transportation analysis indicates that trips at build-out could go from 61 DUs and 581 trips per day at current R1-10 densities to 335 DUs with 3,192 trips per day with the R-12 designation as proposed. However, it is unclear whether this would affect VBLM capacity estimates for 179th Street area holding zones – as the VBLM appears to assume an average of 8.0 units per acre across the area independent of zoning designation.
- ⁶ A Focused Public Investment Plan: Infrastructure Cost Report was prepared for the Clark County Department of Community Development consulting services support from David Evans and Associates, Inc., Parsons Brinkerhoff, and Henderson, Young and Company, by report dated April 28, 2003.
- ⁷ The major planned commercial development is Three Creeks, situated on both sides of NE 179th Street immediately east of the I-5 freeway interchange. Owned by Killian Pacific, Three Creeks has trips reserved by an existing development agreement with the stipulated property not part of a designated Urban Holding area.
- ⁸ As described by Washington State Department of Revenue, *First Come Basis Project Demonstrations*, per web site: <u>http://www.dor.wa.gov/Docs/Pubs/LocalRevitalization/FirstComeBasisDescriptions.doc</u>
- ⁹ If densities were to be adjusted to the mid-point between current minimum and maximum zoned densities by zone district for the UH overlay area, the number of added residential units accommodated at build-out might be increased somewhat from 4,815 to about 4,965 units – a relatively small 3% difference across all residential zones when aggregated together.
- ¹⁰ Scott Bailey, Regional Labor Economist, *Clark County Profile*, updated January 2016.
- ¹¹ Per CREDC web site <u>www.credc.org</u>, as of January 2018.

¹ Information for this economic feasibility study has been obtained from sources deemed to be reliable. Data for this assessment was compiled over the mid-2017 to early-2018 time period. The accuracy of information from third party sources is not guaranteed and is subject to change without notice. Observations and findings of this report are those of the author and should not be construed as the opinion of any other party prior to their express approval, whether in whole or part.





ECONOMIC IMPACT AND RETURN ON INVESTMENT ANALYSIS FOR NE 179TH STREET IMPROVEMENTS

August, 2015



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I. INTRODUCTION

JOHNSON ECONOMICS was retained to assess the potential return on a series of infrastructure investments along NE 179th Street between NE 15th Avenue and Delfel Road. The proposed project as funded by the state transportation package would convert NE 179th from a rural two lane facility to an urban arterial with traffic controls, and include a full reconstruction of the interchange to provide for greater capacity. The proposed improvements and the associated increase in capacity will enhance current function of the road network, as well as provide adequate capacity to meet the expected needs of north Clark County over a 30 to 40

year horizon.

DEFINED STUDY AREA

The following analysis evaluates the economic and fiscal implications of marginal anticipated development in the study area outlined in the map to the right. This area was chosen as the study area for this analysis, and ranges from 159th to the south, 219th to the north, NE 50th to the east and NW 11th to the west. The area has seen a significant level of investment over the last few decades, including Legacy's Salmon Creek hospital, Washington State University's Vancouver Campus, the Clark County Event Center, and Clark County Fairgrounds. As Clark County continues to expand, this area's location along the I-5 corridor places it within the path of growth, and the area is expected to attract considerable development activity assuming adequate infrastructure is in place.

The proposed improvements will allow the restrictions on lands designated urban holdings to be removed, significantly increasing the inventory of developable property. In addition, it will support full development of the property in the study area, as well as increasing the likelihood of redevelopment as greater development intensities are allowed.

II. MARGINAL DEVELOPMENT CAPACITY

Our analysis evaluated marginal development capacity in the impacted area through an evaluation of the current inventory of developable property by zoning classification. County GIS files were evaluated to identify vacant parcels by zoning classification within the designated study area. Our analysis identified almost 2,200 acres of vacant land in the area, including a mix of industrial, commercial and residential property.



VACANT LAND BY DESIGNATION, STUDY AREA

The analysis also considered the impact of likely redevelopment activity, as properties with relatively low value improvements are redeveloped to more intensive uses over time. In order to assess redevelopment potential on properties entitled for urban uses, we calculated a current estimated value per square foot of properties identified as being developed, and identified sites with values well below norms for similarly entitled properties. In addition, we calculated properties currently designated as urban holdings, and assumed development profiles consistent with fully entitled properties.



REDEVELOPABLE LAND BY DESIGNATION, STUDY AREA

STUDY AREA SUMMARY OF DEVELOPABLE PROPERTY

	Acr	Acreage by Category				
	Vacant	Redev 1/	Total			
COMMERCIAL						
Three Creeks	43.3	-	43.3			
Retail Development	59.2	85.0	144.2			
Office Development	39.5	56.7	96.1			
Infrastructure Allocation	17.4	25.0	42.4			
Subtotal Commercial Zoning	159.3	166.6	326.0			
INDUSTRIAL						
Business Park	59.3	193.3	252.6			
Warehouse Industrial	59.3	64.4	123.7			
Infrastructure Allocation	20.9	45.5	66.4			
Subtotal Industrial Zoning	139.6	303.2	442.8			
RESIDENTIAL						
Single Family	1,630.8	1,443.3	3,074.1			
Multi Family	93.7	163.6	257.3			
Subtotal Residential Zoning	1,724.5	1,606.9	3,331.4			
Totals All Uses	2,023.4	2,076.7	4,100.1			

1/ Redevelopment acreage estimated based on current improvements at 50% of average in study area or below

The overall assumed development capacity within the study area is summarized in the following table:

	% of	Land	Building	Coverage	Estimated Development Cost		opment Cost
	Use	(Acres)	Area (SF)	(FAR)	Cost/SF	Soft %	Taxable Value
COMMERCIAL							
Three Creeks	1%	43.3	531,600	0.28	\$176	20%	\$112,273,900
Retail Development	4%	144.2	1,569,963	0.25	\$141	20%	\$265,637,700
Office Development	2%	96.1	1,255,970	0.30	\$158	20%	\$238,131,900
Infrastructure Allocation	1%	42.4					
Subtotal Commercial Zoning	8%	326.0	3,357,533	0.24			\$616,043,500
INDUSTRIAL							
Business Park	6%	252.6	3,851,112	0.35	\$115	20%	\$531,453,500
Warehouse Industrial	3%	123.7	2,156,144	0.40	\$90	20%	\$232,863,600
Infrastructure Allocation	2%	66.4					
Subtotal Industrial Zoning	11%	442.8	6,007,257	0.31			\$764,317,100
RESIDENTIAL							
Single Family	75%	3,074.1	36,889,140	0.28	\$120	20%	\$5,312,036,200
Multi Family	6%	257.3	4,528,216	0.40	\$115	20%	\$624,893,800
Subtotal Residential Zoning	81%	3,331.4	41,417,356	0.29			\$5,936,930,000
Totals All Uses	100%	4,100.1	50,782,145	0.28			\$7,317,290,600
Annual Sales Estimate							\$2,049,145,000
Taxable Sales						24%	\$484,500,000

STUDY AREA SUMMARY OF DEVELOPMENT PROGRAM AND TAXABLE SALES ESTIMATE

Vacant and redevelopable acreage was allocated to a series of assumed development profiles based on comprehensive plan designation. This is inherently speculative, but the assumptions reflect current development patterns observed in Clark County.

III. IMPACT ANALYSIS OVERVIEW

Project Approach

Regional input-output models are processes developed by economists as a tool to estimate the potential impacts of a particular segment or change in economic production. These methods capture the complex interactions between firms, industries, and institutions in the economy. Among the most commonly used statistical software resources in conducting this analysis is IMPLAN (IMPact for PLANing). Originally developed by the U.S. Forrest Service to assist in land and resource management planning, IMPLAN is now a proprietary methodology maintained by MIG Inc., formally the Minnesota IMPLAN group. Foundational IMPLAN data include matrices of production and distribution across all counties in the U.S. This affords a clear advantage in that models are sensitive to local geographies, type of spending, as well as the ability to provide indirect/induced impacts and leakages within specific industry groups.

This report will evaluate a range of economic and fiscal impacts associated with the build-out over time of available capacity within the study area. The study area is broad, and the timing of future development is difficult to forecast with certainty. Our analysis addresses impacts at a broad aggregate level, and then looks at the likely economic and fiscal impacts over time based on assumed development timing.

The following is a definition of direct, indirect and induced impacts used in this report:

Direct Impacts: The actual change in activity affecting a local economy. For example, if a new institutional building is constructed, direct economic impacts comprise the value added output for that firm/user, as well as the jobs required by that business and the labor income paid.

Indirect Impacts: The response of all other local businesses within the geographic area to the direct impact. Continuing the previous example, indirect impacts of a new institutional user would comprise revenues for related vendors, i.e. real estate services, vendors, etc., and the jobs and labor income thereby generated.

Induced Impacts: The response of households within the geographic area affected by direct and indirect impacts. In the given example, induced impacts would be the increase in all categories of spending by households in the geography directly or indirectly employed by the businesses' activities.

Economic Impacts

Construction Impacts:

The economic impacts (jobs, labor income, and output) created by the temporary one-time activity of construction. Direct impacts are based on dollars spent through Clark County businesses.

Impacts from Ongoing Operations:

The economic impacts created by the on-going operations of the proposed developments. This includes the ongoing operations of business and/or tenants of commercial and industrial developments.

Fiscal Impacts

Property Tax Revenues

The permanent, direct on-going property tax revenue derived from the marginal development of properties in the study area.

Sales Tax Revenues

The sales tax revenues associated with the initial construction of developments, as well as ongoing impacts associated with sales by tenants. In addition, the analysis evaluates the impact of sales derived from incremental new residential development.

One-Time Construction Impacts

Construction impacts are the temporary impacts associated with the design and construction of the development projects within the study area over the study horizon. The delineated study area is quite large, and full development is expected to reflect almost \$7.3 billion in new investment over time (stated in \$2015).

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	54,357	\$3,009,590,003	\$3,854,088,975	\$7,317,293,688
Indirect Effect	14,503	\$626,473,872	\$991,264,460	\$1,791,556,902
Induced Effect	16,073	\$691,293,403	\$1,284,041,778	\$2,126,772,130
Total Effect	84,933	\$4,327,357,279	\$6,129,395,213	\$11,235,622,720

The following table summarizes the results of this analysis:¹

- The employment column reflects full time equivalent employment (FTE), which equates to one full time position for a full year. As an example, a drywall contractor employing someone for three months on a local project would equate to 0.25 FTE.
- Local construction spending is expected to translate into over 54,000 full-time equivalent jobs over the full build-out of the study area, generating \$3.0 billion in labor income and \$3.8 billion in value-added output.
- The overall impact, including Indirect and induced impacts from construction activity, would be expected to support almost 85,000 full time equivalent jobs, \$4.3 billion in labor income, and \$6.1 billion in value-added output.
- As would be expected, the industries with the largest economic impact are in the construction sector. Other
 major industries that are impacted include architectural and engineering, food services, retail stores and
 medical practices.

Value Added Output: The difference between an industry or establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus.

Labor Income: All forms of employment income, including employee compensation (wages and benefits) and proprietor income.



SOURCE: IMPlan and Johnson Economics

While addressed in this study as one-time impacts, it should be noted that these impacts are actually likely to be spread over a long term horizon, as the build-out of the area is expected to take decades. Assuming a twenty year build out, the 54,000 full time equivalent construction jobs would reflect development supporting an average of 2,700 jobs per year over that time period.

IV. IMPACTS OF ONGOING OPERATIONS

Impacts associated with the on-going operations of the development programs completed in the study area can be broken into labor and non-labor groupings. Development of the study area is expected to take decades, and construction spending is likely to feel like an ongoing as opposed to one-time impact. This section deals with the impacts associated with employment and operation of businesses in the Discovery Corridor over time.

Direct employment in new marginal developments within the corridor is estimated to exceed 23,700 jobs, with an average annual wage of just under \$50,000 (2015 Dollars). This yields direct annual wage income of just under \$1.2 billion per year. Over 82% of the marginal increase in employment in the area is expected to be in higher wage industrial and office space, with average pay rates 25% higher than the current median wage in Clark County.

Additional impacts are associated with residential development in the area, which is expected to accommodate roughly 24,000 new households. Assuming average annual household wages consistent with current averages in Clark County, residents in these developments would have over \$1.8 billion in annual income (2015 \$s). This level of local income would be expected to drive local sales tax revenues, as well as to provide support to medical and professional services.

	Building	Employees/	Average	Annual
	Area (SF)	Households	Wage/Income	Income
COMMERCIAL				
Three Creeks	531,600	952	\$37,436	\$35,638,994
Retail Development	1,569,963	3,172	\$37,436	\$118,746,733
Office Development	1,255,970	5,024	\$53,326	\$267,909,066
Subtotal Commercial Zoning	3,357,533	9,148		\$422,294,794
INDUSTRIAL				
Business Park	3,851,112	12,837	\$52,152	\$669,477,606
Warehouse Industrial	2,156,144	1,725	\$54 <i>,</i> 896	\$94,695,920
Subtotal Industrial Zoning	6,007,257	14,562		\$764,173,526
RESIDENTIAL	Units			
Single Family	18,445	18,445	\$84,142	\$1,551,971,312
Multi Family	5,660	5,377	\$54,693	\$294,096,099
Subtotal Residential Zoning	24,105	23,822	\$73,835	\$1,846,067,411

STUDY AREA ONGOING CHARACTERISTIC SUMMARY OF MARGINAL DEVELOPMENT AT FULL BUILDOUT

SOURCE: Johnson Economics

When the study area is fully built-out, direct employment is expected to approach 24,000 jobs in the area. Indirect and induced employment is expected to push the total employment to over 30,000 jobs, reflecting \$960 million in labor income, and over \$2.1 billion in value-added output.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	23,728	\$698,520,728	\$829,549,689	\$1,368,961,248
Indirect Effect	3,185	\$106,795,804	\$178,375,539	\$320,738,383
Induced Effect	3,589	\$154,406,690	\$286,712,391	\$474,936,147
Total Effect	30,502	\$959,723,222	\$1,294,637,618	\$2,164,635,778

The analysis assumed that much of the employment in the office and industrial space would be general business, which we consider to be a conservative assumption. If future tenants on the developed property include industries with higher multipliers, such as manufacturing, the indirect and induced effects would be expected to be much higher.

Outside of the direct employment in businesses and retail, the industries that will see the greatest level of indirect and induced impacts include employment services, food services and drinking places, and medical services.

SUMMARY OF	IMDACTS BV	MAIOR			RUSINESS	
JUIVIIVIART UF	INPACISON		NDUSIKI,	ONGOING	DUSINESS	OPERATIONS

Sector	Description	Total Employment	Total Labor Income	Total Value Added	Total Output
386	Business support services	18,379	601,289,761	631,246,936	1,121,014,002
330	Retail Stores - Miscellaneous	5,709	107,361,715	210,986,264	268,253,550
382	Employment services	733	16,377,185	19,854,302	26,204,415
413	Food services and drinking places	663	15,577,375	23,114,659	42,282,511
394	Physicians, dentists, and other health practitioners	287	21,884,908	22,595,444	37,125,556
388	Services to buildings and dwellings	278	6,149,558	7,653,959	15,568,694
372	Computer systems design services	179	6,823,987	3,034,988	8,871,845
360	Real estate establishments	172	5,812,467	21,537,666	29,690,077
329	Retail Stores - General merchandise	166	5,338,009	9,376,151	11,690,644
398	Nursing and residential care facilities	157	6,060,126	6,951,074	10,814,137



SOURCE: IMPlan and Johnson Economics

The increase in local income associated with the residential development was also modeled. While this didn't provide direct employment, it does drive a considerable level of induced impacts. The \$1.8 billion increase in local household income is expected to support 9,850 full time equivalent positions, with labor income excess of \$420 million. Major industries benefiting from this income include food services and drinking places, medical services, retail stores, and wholesale businesses.

			Total	Total Labor	Total Value				
Sector	Description		Employment	Income	Added	Total O	Output		
413	Food services and drink	ing places	1,179	\$6,814,283	\$41,122,828	8 \$75	,223,970		
394	Offices of physicians, de	entists, and other health practitio	o 767	\$14,375,511	\$60,362,736	5 \$99	,179,290		
398	Nursing and residential	care facilities	422	\$3,998,065	\$18,650,476	5 \$29	,015,487		
329	Retail Stores - General m	nerchandise	404	\$3,200,038	\$22,859,687	7 \$28	8,502,575		
397	Private hospitals		371	\$7,277,745	\$32,988,158	8 \$59	,589,125		
360	Real estate establishmen	nts	346	\$2,875,557	\$43,334,132	2 \$59	,736,913		
324	Retail Stores - Food and	beverage	309	\$2,505,079	\$14,206,296	5 \$19	,858,918		
319	Wholesale trade busine	sses	267	\$5,052,803	\$36,964,387	7 \$48	8,879,160		
330	Retail Stores - Miscellan	ieous	254	\$1,174,082	\$9,383,694	4 \$11	,930,678		
426	Private household operation	ations	220	\$304,992	\$1,240,405	5 \$1	,273,453		
	EMP	LOYMENT		VALUEAD	DED (\$000	S)			
Food s	services and drinking places		Food s	ervices and drinking places					
Of	fices of physicians, dentists,.		Off	ices of physicians, dentists,					
1	Nursing and residential care.		N	Jursing and residential care.					
	Retail Stores - General.		Retail Sto	ores - General merchandise					
	Private hospitals			Private hospitals					
	Real estate establishments			Real estate establishments					
Retail	Stores - Food and beverage		Retail	Stores - Food and beverage					
,	Wholesale trade businesses		1	Wholesale trade businesses					
R	etail Stores - Miscellaneous		R	etail Stores - Miscellaneous					
Pr	ivate household operations		Pri	ivate household operations					
		0 200 400 600 800 1,0001,2001	,400		\$0 \$20,000	\$40,000 \$60,00	00		

DUE TO RESIDENTIAL DEVELOPMENT

SOURCE: IMPlan and Johnson Economics

Summary of Ongoing Economic Impacts

The combined economic impacts of the ongoing operation of tenant businesses, and growth in local household income combines to support on a sustained basis a total of almost 33,000 full time equivalent jobs, with labor income of approximately \$1.1 billion per year.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	23,728	\$698,520,728	\$829,549,689	\$1,368,961,248
Indirect Effect	3,185	\$106,795,804	\$178,375,539	\$320,738,383
Induced Effect	13,438	\$575,252,029	\$1,046,263,014	\$1,758,484,912
Total Effect	32,924	\$1,063,202,454	\$1,481,399,137	\$2,480,240,177

As noted previously, the one-time impacts will actually serve similar to impacts designated as ongoing, as the development of the area is expected to be spread out over decades.

V. FISCAL IMPACTS

The fiscal impacts associated with the project are a function of anticipated costs and projected revenues. This section outlines the revenue forecasts associated with marginal development activity that the improvements will accommodate, and then reconciles these with the projected cost of improvements.

Tax Revenues

REAL ESTATE DEVELOPMENT TAX GENERATION BUILD OUT OF STUDY AREA

The development programs outlined will generate significant tax revenues for local governments. Sales taxes on construction are expected to exceed \$629 million in current dollars, while property taxes and sales taxes are expected to generate an ongoing revenue stream of over \$127 million per year at full build-out. The table to the right summarizes the tax generation estimates for marginal development in the study area at full build-out:

Summary of Direct State & Local Jurisdiction Tax Revenues

	Rate Applied	Revenue
ONE TIME TAX & FEE REVENUES		
Sales Tax on Construction		
State of Washington	6.50%	\$475.623.889
Clark County	1 20%	\$87 807 487
Clark County Criminal Justice	0.10%	\$7 317 291
Clark County Methamphetamine Tax	0.10%	\$7 317 201
C-Tran	0.70%	\$51 221 034
Subtotal Sales Tax on Construction	8 20%	\$629 286 992
Subtotal Sales Tax on Construction	0.20%	\$025,200,552
ON-GOING TAX REVENUES		
Property Tax		
State of Washington (Schools)	\$2.22440	\$16,276,581
Clark County	\$1.40090	\$10,250,792
Ridgefield Schools	\$3.51540	\$25,723,203
Port of Ridgefield	\$0.22810	\$1,669,074
Fire District 6	\$1.68710	\$12,345,001
Fort Vancouver Regional Library	\$0.46900	\$3,431,809
Clark County Roads	\$1.82440	\$13,349,665
Clark County Conservation Futures	\$0.05340	\$390,743
Clark County Mental Health	\$0.01250	\$91.466
Clark County Developmental Disabilities	\$0.01250	\$91,466
Clark County Soldiers/Sailors	\$0.01130	\$82.685
Metropolitan Parks	\$0.22680	\$1.659.562
Subtotal Property Tax	\$11.6658	\$85,362,049
		1,,
Sales Tax		
State of Washington	6.50%	\$31,492,500
Clark County	1.20%	\$5,814,000
Clark County Criminal Justice	0.10%	\$484,500
Clark County Methamphetamine Tax	0.10%	\$484,500
C-Tran	0.70%	\$3,391,500
Subtotal Sales Tax	8.20%	\$41,667,000
ESTIMATED ANNUAL REVENUE TOTALS		
State of Washington		\$47,769,081
Clark County		\$32,699,380
Ridgefield Schools		\$25,723,203
Port of Ridgefield		\$1,669,074
Fire District 6		\$12,345,001
Fort vancouver Regional Library		\$3,431,809
Total On-Going Tax Revenues		\$127.029.049
		÷==;;==;;=;;=;;

The study area is quite large, and we expect that full build-out of the area is likely to be completed over a long term horizon as the market supports incremental new development. In order to project estimated revenues over time from new development in the area, we made the following assumptions with respect to the timing of new development.

STUDY AREA

SUMMARY OF DEVELOPMENT PROGRAM AND TAXABLE SALES ESTIMATE

	Land Building Development			Estimate	Estimated Development Timing (Years)				
	(Acres)	Area (SF)	Cost (2015 \$)	1-5	6-10	11-15	16-20		
COMMERCIAL									
Three Creeks	43.3	531,600	\$112,273,900	100%					
Retail Development	144.2	1,569,963	\$265,637,700	10%	30%	20%	20%		
Office Development	96.1	1,255,970	\$238,131,900	10%	25%	25%	20%		
INDUSTRIAL									
Business Park	252.6	3,851,112	\$531,453,500	20%	20%	20%	20%		
Warehouse Industrial	123.7	2,156,144	\$232,863,600	20%	20%	20%	20%		
RESIDENTIAL									
Single Family	3,074.1	36,889,140	\$5,312,036,200	30%	30%	30%	10%		
Multi Family	257.3	4,528,216	\$624,893,800	10%	20%	30%	40%		
Totals All Uses	3,991.3	50,782,145	\$7,317,290,600	27%	28%	28%	13%		
Annual Sales Estimate			\$2,049,145,000						
Taxable Sales			\$484,500,000						

The preceding assumptions reflect build-out of the area to largely take place over the next twenty year. These assumptions were translated into estimated revenues over time by taxing jurisdiction. Tax revenues and development

costs were escalated at an average annual rate of 2.0%.

The resulting estimates reflect a steady pace of construction and associated sales taxes, as well as ongoing revenues from sales and property taxes. Over the twenty year period, overall revenues to Clark County are projected at \$472 million, while Ridgefield Schools are projected at 282 million.





SOURCE: Johnson Economics

These figures do not reflect system development charge revenues, which are assume to reflect an offset against marginal costs associated with new development.
VI. RETURN ON INVESTMENT

The anticipated revenue streams associated with the development of capacity made available by the infrastructure improvements provide for a strong return on investment. For both the State of Washington and Clark County, the proposed infrastructure investments will free up a significant level of new development capacity.

The projected revenues for the State of Washington were compared to the expected investments, assuming either a \$26 million or \$50 million series of improvements. At \$26 million, the revenue streams would be expected to yield a 33% internal rate of return over a twenty year horizon, with a net present value of over \$171 million if discounted at 3.5%.



If the cost of the project for the State is increased to \$50 million, the revenue streams return a 20% internal rate of return over the next twenty years, with a net present value of over \$148 million.



The return on these investments for Clark County are greater, with higher revenues and less investment. The discounted net present value of cash flows to the County approaches \$686 million over the next twenty years.







ECONOMIC IMPACT AND RETURN ON INVESTMENT ANALYSIS FOR NE 179TH STREET IMPROVEMENTS SUMMARY OF FINDINGS

August 2015

Future development potential in northern Clark County is limited by the capacity of the local infrastructure system to accommodate projected future growth. JOHNSON ECONOMICS was retained to assess the potential return on a series of infrastructure investments along NE 179th Street between NE 15th Avenue and Delfel Road that would address some

of the current system's limitations. The proposed project would convert NE 179th from a rural two lane facility to an urban arterial with traffic controls, and include a full reconstruction of the interchange to provide for greater capacity. The proposed improvements and the associated increase in capacity will enhance current function of the road network, as well as provide adequate capacity to meet the expected needs of north Clark County over a 30 to 40 year horizon.

Our analysis evaluated the economic and fiscal implications of marginal anticipated development in the study area outlined in the map to the right. This area ranges from 159th to the south, 219th to the north, NE 50th to the east and NW 11th to the west. The area has seen a significant level of investment over the last few decades, including Legacy's Salmon Creek hospital, Washington State University's Vancouver Campus, the Clark County Event Center, and Clark County Fairgrounds. As Clark County continues to expand, this area's location along the I-5 corridor places it within the path of growth, and the area is expected to attract considerable development activity assuming adequate infrastructure is in place.

DEFINED STUDY AREA



The proposed improvements will allow the restrictions on

lands designated urban holdings to be removed, significantly increasing the inventory of developable property. In addition, it will support full development of the property in the study area, as well as increasing the likelihood of redevelopment as greater development intensities are allowed.

DEVELOPMENT CAPACITY

Our analysis evaluated marginal development capacity in the impacted area through an evaluation of the current inventory of developable and redevelopable property.

Our analysis identified almost 2,200 acres of vacant land in the area, including a mix of industrial, commercial and residential property. The analysis also considered the impact of likely redevelopment activity, as properties with relatively low value improvements are redeveloped to more intensive uses over time. In addition, we calculated properties currently designated as urban holdings, and assumed development profiles consistent with fully entitled properties.

The overall assumed development capacity within the study area is summarized in the following table:

	% of	Land	Building	Coverage	Estimated Development Cost		
	Use	(Acres)	Area (SF)	(FAR)	Cost/SF	Soft %	Taxable Value
COMMERCIAL							
Three Creeks	1%	43.3	531,600	0.28	\$176	20%	\$112,273,900
Retail Development	4%	144.2	1,569,963	0.25	\$141	20%	\$265,637,700
Office Development	2%	96.1	1,255,970	0.30	\$158	20%	\$238,131,900
Infrastructure Allocation	1%	42.4					
Subtotal Commercial Zoning	8%	326.0	3,357,533	0.24			\$616,043,500
INDUSTRIAL							
Business Park	6%	252.6	3,851,112	0.35	\$115	20%	\$531,453,500
Warehouse Industrial	3%	123.7	2,156,144	0.40	\$90	20%	\$232,863,600
Infrastructure Allocation	2%	66.4	-	-			
Subtotal Industrial Zoning	11%	442.8	6,007,257	0.31			\$764,317,100
RESIDENTIAL							
Single Family	75%	3,074.1	36,889,140	0.28	\$120	20%	\$5,312,036,200
Multi Family	6%	257.3	4,528,216	0.40	\$115	20%	\$624,893,800
Subtotal Residential Zoning	81%	3,331.4	41,417,356	0.29			\$5,936,930,000
Totals All Uses	100%	4,100.1	50,782,145	0.28			\$7,317,290,600
Annual Sales Estimate							\$2,049,145,000
Taxable Sales						24%	\$484,500,000

STUDY AREA SUMMARY OF DEVELOPMENT PROGRAM AND TAXABLE SALES ESTIMATE

Vacant and redevelopable acreage was allocated to a series of assumed development profiles based on comprehensive plan designation. This is inherently speculative, but the assumptions are consistent with current development patterns observed in Clark County.

IMPACT ANALYSIS OVERVIEW

Our analysis evaluated a range of economic and fiscal impacts associated with the build-out over time of available capacity within the study area. The study area is broad, and the timing of future development is difficult to forecast with certainty. Our analysis addresses impacts at a broad aggregate level, and then looks at the likely economic and fiscal impacts over time based on assumed development timing.

Construction Related Impacts

The following table summarizes the results of this analysis for impacts related to construction:¹

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	54,357	\$3,009,590,003	\$3,854,088,975	\$7,317,293,688
Indirect Effect	14,503	\$626,473,872	\$991,264,460	\$1,791,556,902
Induced Effect	16,073	\$691,293,403	\$1,284,041,778	\$2,126,772,130
Total Effect	84,933	\$4,327,357,279	\$6,129,395,213	\$11,235,622,720

The employment column reflects full time equivalent employment (FTE), which equates to one full time position for a full year. As an example, a drywall contractor employing someone for three months on a local project would equate to 0.25 FTE.

Local construction spending is expected to translate into over 54,000 full-time equivalent jobs over the full build-out of the study area, generating \$3.0 billion in labor income and \$3.8 billion in value-added output. The overall impact, including Indirect and induced impacts from construction activity, would be expected to support almost 85,000 full time equivalent jobs, \$4.3 billion in labor income, and \$6.1 billion in value-added output. As would be expected, the industries with the largest economic impact are in the construction sector. Other major industries that are impacted include architectural and engineering, food services, retail stores and medical practices.

While construction-related impacts are addressed in the study as one-time impacts, it should be noted that these impacts are actually likely to be spread over a long-term horizon, as the build-out of the area is expected to take decades. Assuming a twenty-year build out, the 54,000 full time equivalent construction jobs would reflect development supporting an average of 2,700 jobs per year over that time period.

Impacts of Ongoing Operations

Direct employment in new marginal developments within the corridor is estimated to exceed 23,700 jobs, with an average annual wage of just under \$50,000 (2015 Dollars). This yields direct annual wage income of just under \$700 million per year. Over 82% of the marginal increase in employment in the area is expected to be in higher wage industrial and office space, with average pay rates 25% higher than the current median wage in Clark County.

Additional impacts are associated with residential development in the area, which is expected to accommodate roughly 24,000 new households. Assuming average annual household wages consistent with current averages in Clark County, residents in these developments would have over \$1.8 billion in annual income (2015 Dollars). This level of local income would be expected to drive local sales tax revenues, as well as to provide support to medical and professional services.

Value Added Output: The difference between an industry or establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. Labor Income: All forms of employment income, including employee compensation (wages and benefits) and proprietor income.

The combined economic impacts of the ongoing operation of tenant businesses, and growth in local household income combines to support on a sustained basis a total of almost 33,000 full time equivalent jobs, with labor income of approximately \$1.1 billion per year.

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	23,728	\$698,520,728	\$829,549,689	\$1,368,961,248
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Total Effect	32,924	\$1,063,202,454	\$1,481,399,137	\$2,480,240,177

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Tax Revenues

The development programs outlined will generate significant tax revenues for local governments. Sales taxes on construction are expected to exceed \$629 million in current dollars, while property taxes and sales taxes are expected to generate an ongoing revenue stream of over \$127 million per year at full build-out. The study area is quite large, and we expect that full build-out of the area is likely to be completed over a long-term horizon as the market supports incremental new development. Our analysis assumed that build-out of the area would largely take place over the next twenty year. These assumptions were translated into estimated revenues over time by taxing jurisdiction. Tax revenues and development costs were escalated at an average annual rate of 2.0%.

The resulting estimates reflect a steady pace of construction and associated sales taxes, as well as ongoing revenues from sales and property taxes. Over the twenty-year period, overall revenues to Clark County are projected at \$472 million, while Ridgefield Schools are projected at 282 million. Projected revenues to the State of Washington would exceed \$1.0 billion during this period.

These figures do not reflect system development charge revenues, which are assume to reflect an offset against marginal costs associated with new development.



RETURN ON INVESTMENT

The anticipated revenue streams associated with the development of capacity made available by the infrastructure improvements provide for a strong return on investment.

The projected revenues for the State of Washington were compared to the expected investments, assuming a \$50 million series of improvements. If the cost of the project for the State is \$50 million, the revenue streams return a 20% internal rate of return over the next twenty years, with a net present value of over \$148 million.





The discounted net present value of cash flows to the County approaches \$686 million over the next twenty years.



Southwest Region 11018 Northeast 51st Circle Vancouver, WA 98668-1709 360-905-2000 / Fax 360-905-2222 TTY: 1-800-833-6388 www.wsdot.wa.gov

November 7, 2018

Oliver Orjiako Clark County Community Development 1300 Franklin Street Vancouver, WA 98666

Re: Comprehensive Plan Amendment to remove Urban Holding CPZ2018-00021 Interstate 5, MP 9.52

Dear Mr. Orjiako:

The Washington State Department of Transportation (WSDOT) staff has reviewed the staff report to amend the Comprehensive Plan to remove Urban Holding Overlay on approximately 143 acres east of the I-5/NE 179th Street interchange. Approval will allow the applicant to develop the site with 606 single family homes and 99 townhomes. WSDOT would like to express our concerns and offer the following comments.

WSDOT supports the economic development and long-term growth of Clark County and the cities within it. The I-5/NE 179th Street interchange is an important link in the transportation network and is vital for the movement of people, goods, and services. It is imperative to preserve the safety and capacity of this interchange and the NE 179th Street corridor.

In 2016 the Washington State Legislature allocated \$50 million for improvements to the I-5/NE 179th Street interchange. These funds will not be available until the '23-'25 biennium and the interchange improvements are not anticipated to be operationally functional until 2028. The existing interchange lacks adequate capacity for any additional development that would use it as a connection to the road network until those improvements are completed. The development of the parcels in question will add a significant number of new vehicular trips to the existing interchange and further degrade the safety and capacity.

Clark County has identified a number of safety and capacity improvements for the NE 179th Street corridor that are necessary to serve urban development. These transportation improvements are forecasted to cost approximately \$12 million. The applicant has expressed a willingness to accelerate the payment of TIF funds of approximately \$2.9 million but this would leave remaining shortfall of \$9 million that would need to be identified. At this time there is no identified funding source to fill this shortfall.

Comprehensive Plan Amendment to remove Urban Holding Interstate 5, MP 9.52 Page 2 of 2

For safe and reliable travel, it's critical that both the NE 179th Street improvements and the I-5 interchange improvements are either in place or considered fully funded prior to the removal of the Urban Holding designation. Based on the information contained in the Clark County Staff Report and timing of WSDOT funding for the interchange, WSDOT supports the staff report recommendation of denial for this proposal.

Thank you for the opportunity to comment on this project. If you have any questions or need additional information, please contact Jeff Barsness, Southwest Region Development Services Engineer, at 360-905-2059.

Sincerely,

Michael A. Williams Planning Manager

MW: jb