Clallam County
Small Project Drainage Requirements
And Technical Guidance Manual

Appendix

Draft

Appendix A: Sample Drainage Plan Submittal Form

Copies of this form are available at the Clallam County Department of Community Development or on the website: ----------

FEE:

Clallam County Public Works Department
223 E. 4th Street, Suite 6 Port Angeles, WA 98362
360-417-2379 Fax 417-2513

DRA_____

Drainage Plan Submittal

Information

Please print. Leave no blank lines.

Landowner	Tax Parcel #
Phone	Prepared By (Agent)
Address	Address
City, ST ZIP Code	City, ST ZIP Code
Nearest County Road	Phone
	Short Plat Name

Driveway:

____	Not on County Road (accesses private rd, easement, or State Hwy)	Block:	____	Lot:	____
____	Submitting permit now for driveway approach onto County road	Volume	____	Page:	____
____	Existing driveway approach onto County road	Acreage:	____	Soils:	____

Regarding pre-approval for additional/future structures: Locations and dimensions must be shown on this site plan for future drainage fees to be waived. Future/Additional structures which create impervious areas that are equal to or greater than 5,000 square feet may require engineered drainage plans.

Signature of Owner/ Owner's Agent _____ Date _____

Requirements: The following are required as part of a drainage plan submittal

- ☐ Drainage Plan (must be plotted to scale, with all significant dimensions given. Use attached sheet or attach a separate sheet, no larger than 11x17. See checklist for required information.
- ☐ Written Drainage Assessment
- ☐ Declaration of Covenant and Grant of Easement form

Submit the completed forms to the Clallam County Public Works Department. Incomplete information can delay processing of the drainage evaluation.

Drainage Plan

DRAINAGE PLAN CHECKLIST:

The following information must be included on all small project drainage plans:

Identification

- ☐ Name, address, and phone number of applicant
- ☐ Parcel number
- ☐ Dimension of all property lines
- ☐ Street names and existing or proposed property address
- ☐ Section, township, and range of proposal.
- ☐ North arrow
- ☐ Legend if needed
- ☐ Scale—use a scale that clearly illustrates drainage features and BMPs/measures
- ☐ Show at least 5-foot contours for all slopes steeper than 15% .

Building and Site Development Features

- ☐ Footprint of all structures (existing and proposed)
- ☐ Future structures and improvements planned.
    - If you wish to have drainage review fees waived for future structures/improvements on this parcel, you must show them (with dimensions) on the site plan.
- ☐ Parking, roads, and driveways (existing and proposed)
- ☐ Sport courts, patios, pools and any other paved or impervious surfaces (existing and proposed)
- ☐ Total impervious surface land cover (existing and proposed)
- ☐ Location of any retaining walls and rockeries (existing and proposed)
- ☐ Existing or proposed septic system, including all system components and both primary and reserve drainfields.
- ☐ Utility structures (poles, fire hydrants, etc.)
- ☐ Existing easements
- ☐ Existing wells or wells to be abandoned.
- ☐ Newly created vegetated areas.
- ☐ Remaining **vegetated open space** that will remain undisturbed.

Natural Features and Critical Areas

For a map detailing the critical areas on your site, go to http://www.clallam.net/Maps/ or visit the permit counter at the Department of Community Development. *Development within 200 feet of a critical area requires an engineered drainage plan.*

- ☐ Existing natural features of the property (woods, pasture, brush).
- ☐ Existing hydrology- Location of all existing and proposed ditches, swales, pipes, etc.
- ☐ Delineation of all streams, wetlands, lakes, closed depressions, or other water features (including any required buffer widths)
- ☐ Delineation of all flood hazard areas, erosion hazard areas, steep slope hazard areas, landslide hazard areas, and their buffers and building setback lines.

Stormwater Management Information

In addition to the general information listed above, the following additional information is required on drainage plans that include installation of stormwater BMPs:

- ☐ Identify the Stormwater Region your project is within.
  - Consult the map on page X to determine the stormwater region your project is within. This is critical for sizing various stormwater management techniques.
- ☐ Identify the soil type(s) on your project site in order to determine which stormwater management techniques in this manual will be applicable for your site.
  - For a County soils map showing this information, consult the *Soil Survey of Clallam County*, go to http://www.clallam.net/Maps/, or visit the Clallam Conservation District.
- ☐ Show delineation and dimensions of impervious surfaces and pervious surfaces, both existing and new.
- ☐ Show location and dimensions of runoff management BMP methods such as but not limited to infiltration trenches, drywells, rain gardens, permeable pavements, rain water storage tanks for managing stormwater from all impervious surfaces.
  - Use the drainage project planning chart on page x to select options for managing roof water runoff, driveway runoff, conveyance areas, and off-site ROW discharge areas.
  - Appendix C summarizes the BMPs appropriate for your soil type and slope.
  - Consult Section III of this manual for details on the design and applicability of each of the BMP options. Use the sizing charts located in Section III to determine the required dimensions for each BMP based on the stormwater region in which the project is located.
- ☐ Show delineation and dimensions of the flowpath of stormwater through the site - from the runoff management BMPs, to conveyance BMPs, to end-of-line discharge BMPs.
- ☐ Show setback lengths between stormwater management BMPs and any property line, structure, well, steep slope, stream, wetland, or septic system including drainfields.

Written Drainage Assessment

The written drainage assessment is a supporting document of the small project drainage plan that should include the following information:

- ☐ A description of the property:
  - **Property Description**: Describe the natural features of the parcel (i.e. woods, pasture, brush) and give the approximate area covered by those features.
  - **Existing Structures/ Improvements**: List any existing buildings, driveways (dirt, gravel, etc.), sidewalks, etc. and their area size in square feet or acres.
  - **New Structures/ Improvements:** List new buildings and their sizes along with any size changes in existing driveways, parking areas, landscaped areas, etc.
  - **Future Structures/ Improvements Planned**: If you wish to have drainage review fees waived for future structures/improvements on this parcel, you must list them (with dimensions) in this section. Show their locations on the plot plan.
  - **Remaining Undisturbed Land**: List and provide the size of the land (woods, pasture) not covered by buildings or improvements.
- ☐ Proposed Drainage Plan: A description of proposed stormwater management BMPs shown on the drainage plan and how they were selected.

Parcel Number:	
Description	**Area (sq. ft.)**
Property description: (wooded, pasture, etc.)	
Existing Structures/ Improvements:	
New Structures and Improvements:	
Future Structures and Improvements:	
Proposed Drainage Plan:	

I hereby certify the information provided above and on the attached plot plan is true and accurate to the best of my knowledge and represents the ultimate development of the parcel.

Signature of Owner/ Owner's Agent

Date

Appendix B: Maps of Stormwater Regions

The maps on the following pages illustrate the different stormwater regions of the County that determine the size requirements for stormwater BMPs. These regions are based on the amount of rainfall and the types of soils in the area.

- Overview of County Stormwater Regions
- Detail of Region I and II
- Detail of Region II and III

Appendix C: Suitable Soils and Slopes for BMPs

Some BMPs in this manual may not be appropriate for use in some areas of the county due to soil limitations or steep slopes.

The following tables outline applicable soils and slopes in the county for BMPs in the three stormwater regions. Soils are classified in different hydrologic groups depending on their drainage characteristics. The names and hydrologic groups of the soils present on your project site can be found in the *Soil Survey of Clallam County*, on the County website at http://www.clallam.net/Maps/ or by visiting the Clallam Conservation District.

Region I

BMP	Applicable Soils	Applicable Slopes
Runoff Management		
Infiltration Systems: Infiltration Trench Drywell	Only the following Hydrologic Group A or B soils: ▪ Carlsborg (7) ▪ Dick (16) ▪ Dungeness (17) ▪ Hoypus (23, 24,25) ▪ Pits (52) ▪ Sequim (63,64)	15% or less
Rainwater Dispersion	All Soils	10% or less
Small Lot Dispersion (with Splash Block)	Only the following Hydrologic Group A or B soils: ▪ Carlsborg (7) ▪ Dick (16) ▪ Dungeness (17) ▪ Hoypus (23, 24,25) ▪ Pits (52) ▪ Sequim (63,64)	10% or less
Rain garden	All Soils	10% or less
Rainwater Planters	All Soils	Level construction site
Runoff Filter Strips	All Soils	5% or less
Porous Pavement	Only the following Hydrologic Group A or B soils: ▪ Carlsborg (7) ▪ Dick (16) ▪ Dungeness (17) ▪ Hoypus (23, 24,25) ▪ Pits (52) ▪ Sequim (63,64)	5% or less
Rainbarrels/ Cisterns	All Soils	Level construction site
Conveyance		
Swales	All Soils	5% or less
Conveyance Furrows	All Soils	Greater than 15%
Conveyance Gardens	All Soils	10% or less
Gravel Trenches	All Soils	5% or less
Off-site Discharge		
Level Spreader	All Soils	All slopes
Continued Dispersion	All Soils	10% or less

Numbers after soils correspond to Soil ID numbers found on http://www.clallam.net/Maps/

Region II

BMP	Applicable Soils	Applicable Slopes
Runoff Management		
Infiltration Systems: Infiltration Trench Drywell	Only the following Hydrologic Group A or B soils: ▪ Carlsborg (7) ▪ Dick (16) ▪ Dungeness (17) ▪ Dystric Xerorthents (18,19) ▪ Hoypus (23,24,25) ▪ Louella (34,35,36) ▪ Neilton (44,45,46) ▪ Pits (52) ▪ Schnorbush (59,60,61,62) ▪ Sequim (63,64) ▪ Terbies (70,71,72) ▪ Typic Xerofluvents (73)	15% or less
Rainwater Dispersion	All Soils	10% or less
Small Lot Dispersion	Not Applicable in Region II	----------
Rain garden	All Soils	10% or less
Rainwater Planters	All Soils	Level construction site
Runoff Filter Strips	All Soils	5% or less
Porous Pavement	Only the following Hydrologic Group A or B soils: ▪ Carlsborg (7) ▪ Dick (16) ▪ Dungeness (17) ▪ Dystric Xerorthents (18,19) ▪ Hoypus (23,24,25) ▪ Louella (34,35,36) ▪ Neilton (44,45,46) ▪ Pits (52) ▪ Schnorbush (59,60,61,62) ▪ Sequim (63,64) ▪ Terbies (70,71,72) ▪ Typic Xerofluvents (73)	5% or less
Rainbarrels/ Cisterns	All Soils	Level construction site
Conveyance		
Swales	All Soils	5% or less
Conveyance Furrows	All Soils	Greater than 15%
Conveyance Gardens	All Soils	10% or less
Gravel Trenches	All Soils	5% or less
Off-site Discharge		
Level Spreader	All Soils	All slopes
Continued Dispersion	All Soils	10% or less

Region III

BMP	Applicable Soils	Applicable Slopes
Runoff Management		
Infiltration Systems: Infiltration Trench Drywell	Only the following Hydrologic Group A or B soils: ▪ Andeptic Udorthents (2) ▪ Calawah (5) ▪ Carlsborg (7) ▪ Dick (16) ▪ Dystric Xerorthents (18,19) ▪ Hoh (22) ▪ Hoypus (23,24,25) ▪ Hyas (26) ▪ Ilwaco (27,28) ▪ Klone (29,30,31) ▪ Louella (34,35,36) ▪ Lyre (39,40) ▪ Makah (41) ▪ Neilton (44,45,46) ▪ Palix (49,50,51) ▪ Pits (52) ▪ Queets (54,55) ▪ Quillayute (56) ▪ Schnorbush (59,60,61,62) ▪ Sequim (63,64) ▪ Snahopish (65) ▪ Solduc (66) ▪ Solleks (67,68) ▪ Terbies (70,71,72) ▪ Typic Xerofluvents (73) ▪ Wellman (74)	15% or less
Rainwater Dispersion	All Soils	10% or less
Small Lot Dispersion	Not Applicable in Region III	----------
Rain garden	All Soils	10% or less
Rainwater Planters	All Soils	Level construction site
Runoff Filter Strips	All Soils	5% or less
Porous Pavement	Only the following Hydrologic Group A or B soils: ▪ Andeptic Udorthents (2) ▪ Calawah (5) ▪ Carlsborg (7) ▪ Dick (16) ▪ Dystric Xerorthents (18,19) ▪ Hoh (22) ▪ Hoypus (23,24,25) ▪ Hyas (26) ▪ Ilwaco (27,28) ▪ Klone (29,30,31) ▪ Louella (34,35,36) ▪ Lyre (39,40) ▪ Makah (41) ▪ Neilton (44,45,46) ▪ Palix (49,50,51) ▪ Pits (52) ▪ Queets (54,55) ▪ Quillayute (56) ▪ Schnorbush (59,60,61,62) ▪ Sequim (63,64) ▪ Snahopish (65) ▪ Solduc (66) ▪ Solleks (67,68) ▪ Terbies (70,71,72) ▪ Typic Xerofluvents (73) ▪ Wellman (74)	5% or less
Rainbarrels/ Cisterns	All Soils	Level construction site
Conveyance		
Swales	All Soils	5% or less
Conveyance Furrows	All Soils	Greater than 15%
Conveyance Gardens	All Soils	10% or less
Gravel Trenches	All Soils	5% or less
Off-site Discharge		
Level Spreader	All Soils	All slopes
Continued Dispersion	All Soils	10% or less

Appendix D: Sample Drainage Plans

The following pages include sample drainage plans from development situations likely to be encountered in different areas of Clallam County. While each drainage plan should be site specific and address the unique conditions found on the site, these sample plans can be used as general examples for managing stormwater on residential sites.

- Large Lot with Full Dispersion
- Small Lot Dispersion
- Small Lot with Poorly Draining Soils
- Typical Rural Lot with Well-Drained Soils
- Typical Rural Lot with Poorly Draining Soils

Note: The following plans are intended as examples only. Each drainage plan should be designed to meet the specific conditions of the site.

Example A: Full Dispersion on Large Lot

A single family residential project with a roof area of 2,400 square-feet and a garage with a roof area of 970 square-feet on a 2.5 acre lot.

Step 1: Conduct Site inventory

A thorough inventory of the site is the initial step for developing and implementing an effective site design and drainage plan.

- The site is gently sloping with 5-7% slopes.
- There are no seeps, springs or visible drainage paths on-site.
- There are no environmental critical areas (e.g. wetlands, streams, geologic hazard areas) on the site.
- The forested portions of the site have native vegetated areas of trees and shrubs.
- The site utilizes an on-site septic system and well.

Step 2: Site Design

Using the information gathered in the Inventory, align the roads and structures on the site to maximize the preservation of vegetation and retain the existing flow of water on the site to the greatest possible extent.

- Building envelope and access point are identified.
- Clearing limits are marked on construction plans.

Step 3: Determine Soil Type and Stormwater Region

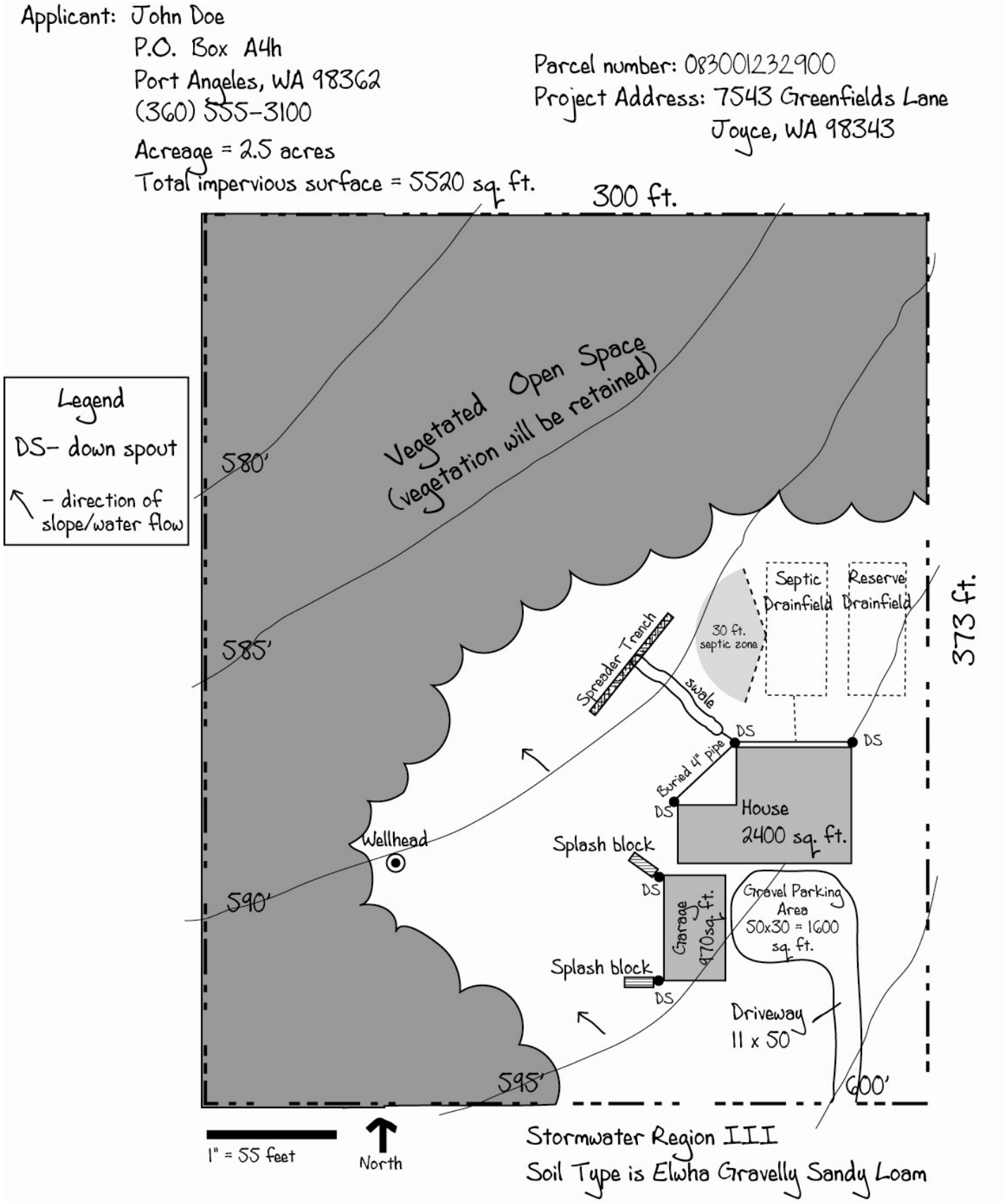
- The maps in Appendix A are consulted to determine the stormwater region of the project. The project is in Region III, in the Joyce area.
- The *Soil Survey of Clallam County* indicates the soil type of the project site is Elwha Gravelly Sandy Loam. According to the table in Appendix B, the soils are not suitable for infiltration techniques such as drywells or infiltration trenches.

Step 4: Drainage Plan Design

A drainage plan is developed using the project planning chart on page X and the details in the Small Project Drainage Plan Design Elements section (pages x-x) to select options for managing roof water runoff, driveway runoff, conveyance areas, and discharge areas. The sizing chart for each drainage element determines the required dimensions based on the stormwater region in which the project is located. The table in Appendix B is consulted to make sure the BMPs chosen are appropriate for the region and soil type. The following page shows the runoff, conveyance and discharge locations illustrated on the drainage plan for the site. The connection to the community drainage system is shown.

- ❑ Full dispersion of the roof runoff is possible because of the size of the lot, small building envelope and the existing vegetated open space is more than 50% of the lot cover.
- ❑ The house roof runoff is routed through downspouts, pipes and a swale to a spreader trench that is used to disperse the stormwater evenly.
- ❑ Splash blocks in combination with gutters and downspouts are used to disperse garage roof runoff.
- ❑ Runoff from the gravel driveway is dispersed into the surrounding lawn areas.

Example A: Full Dispersion on Large Lot



Example B: Small Lot Dispersion

A single family residential project with a roof area of 2,040 square-feet, a 1,180 square- foot driveway/parking area and a garage with a roof area of 936 square-feet on a 0.62 acre lot near Carlsborg.

Step 1: Conduct Site inventory

A thorough inventory of the site is the initial step for developing and implementing an effective site design and drainage plan.

- The site is level and there are no seeps, springs or visible drainage paths on site.
- There are no critical areas on the site.
- The site is a former hayfield and has no existing native vegetated areas but does have an intact ground cover layer of pasture grasses.
- The site utilizes an on-site septic system and well.

Step 2: Site Design

Using the information gathered in the Inventory, align the roads and structures on the site to maximize the preservation of vegetation and retain the existing flow of water on the site to the greatest possible extent.

- Building Envelope and Access Point are identified.
- Clearing limits are marked on construction plans.

Step 3: Determine Soil Type and Stormwater Region

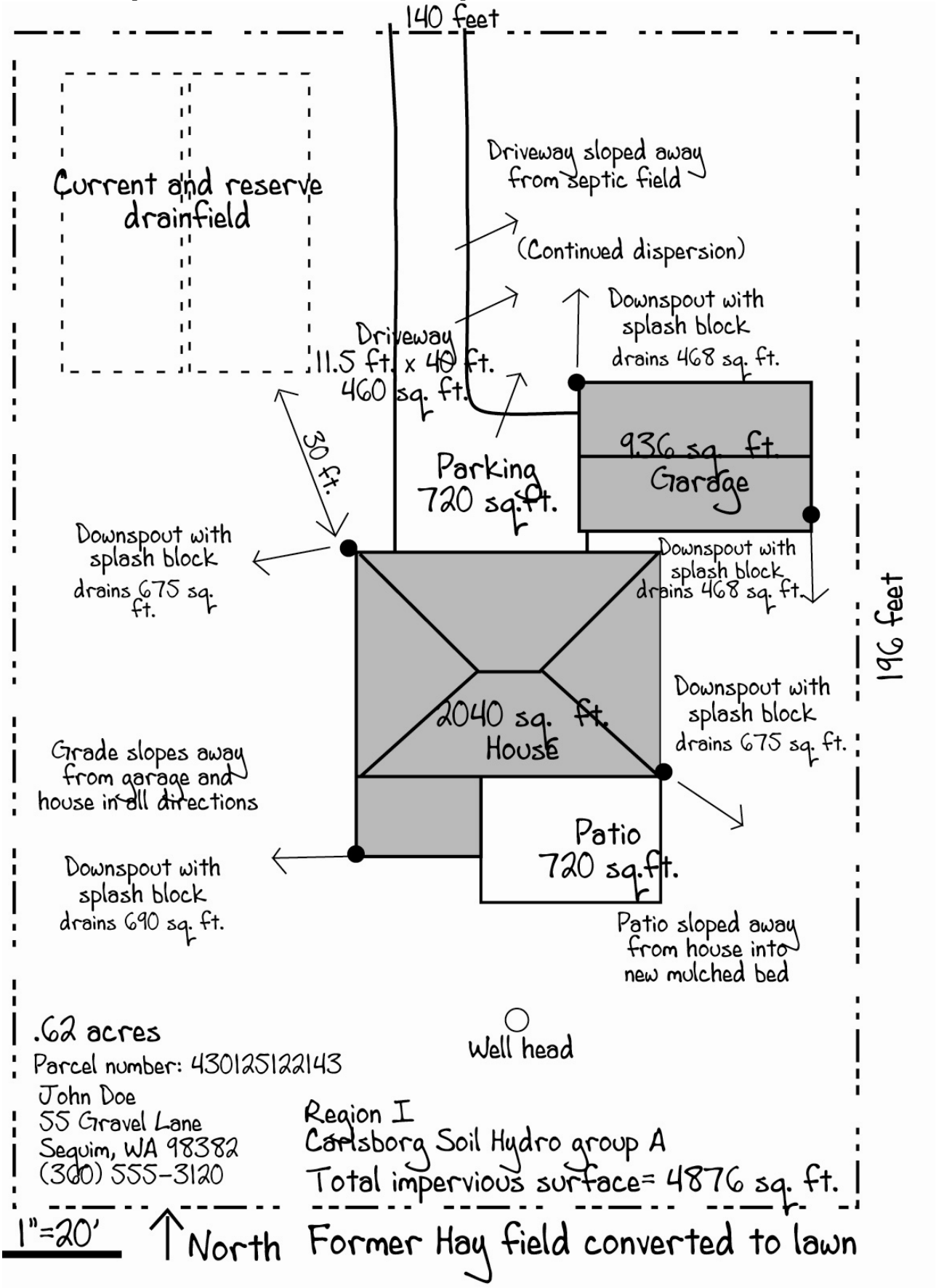
- The maps in Appendix A are consulted to determine the stormwater region of the project. The project is in Region I.
- According to the *Soil Survey of Clallam County*, the soil type of the project site is Carlsborg gravelly sandy loam (Hydrologic Group A). According to the table in Appendix B, this location is suitable for *Small Lot Dispersion*.

Step 4: Drainage Plan Design

A drainage plan is developed using the project planning chart on page X and the details in the Small Project Drainage Plan Design Elements section (pages x-x) to select options for managing roof water runoff, driveway runoff, conveyance areas, and discharge areas. The sizing chart for each drainage element determines the required dimensions based on the stormwater region in which the project is located. The table in Appendix B is consulted to make sure the BMPs are chosen are appropriate for the region and soil type. The following page shows the runoff, conveyance and discharge locations illustrated on the drainage plan for the site.

- ❑ Because this lot is eligible for *Small Lot Dispersion*, the roof runoff from the house can be managed with gutters, downspouts and splash blocks.
- ❑ No more than 700 square feet of roof area is drained to a single splash block. Size of drainage area is indicated for each dispersion site.
- ❑ A vegetated flowpath of at least 50 feet in length is available along the paths that runoff will follow upon discharge from the splash blocks to the nearest property line.
- ❑ Runoff from the driveway is dispersed into surrounding lawn area.

Example B: Small Lot Dispersion



Example C: Small Lot with Poorly Draining Soils

A single family residential project with a roof area of 1,854 square-feet, a 945 square-foot driveway, and a garage with a roof area of 528 square-feet on a 9,000 square-foot lot in the Sequim Urban Growth Area outside the City of Sequim.

Step 1: Conduct Site inventory

A thorough inventory of the site is the initial step for developing and implementing an effective site design and drainage plan.

- The site is level and there are no seeps, springs or visible drainage paths on site.
- There are no critical areas on the site.
- The site is former pasture land and has no existing native vegetated areas.
- The site has access to public sewer and water systems and a private community stormwater drainage system.

Step 2: Site Design

Using the information gathered in the Inventory, align the roads and structures on the site to maximize the preservation of vegetation and retain the existing flow of water on the site to the greatest possible extent.

- Building Envelope and Access Point are identified.
- Site was pre-cleared so defining clearing limits on plan is not an option.

Step 3: Determine Soil Type and Stormwater Region

- The maps in Appendix A are consulted to determine the stormwater region of the project. The project is in Region I, in the Urban Growth Area outside of the City of Sequim.
- According to the *Soil Survey of Clallam County*, the soil type of the project site is Clallam Gravelly Sandy Loam. According to the table in Appendix B, the soils are not suitable for infiltration techniques such as drywells and infiltration trenches.

Step 4: Drainage Plan Design

A drainage plan is developed using the project planning chart on page X and the details in the Small Project Drainage Plan Design Elements section (pages x-x) to select options for managing roof water runoff, driveway runoff, conveyance areas, and discharge areas. The sizing chart for each drainage element determines the required dimensions based on the stormwater region in which the project is located. The table in Appendix B is consulted to make sure the BMPs are chosen are appropriate for the region and soil type. The following page shows the runoff, conveyance and discharge locations illustrated on the drainage plan for the site.

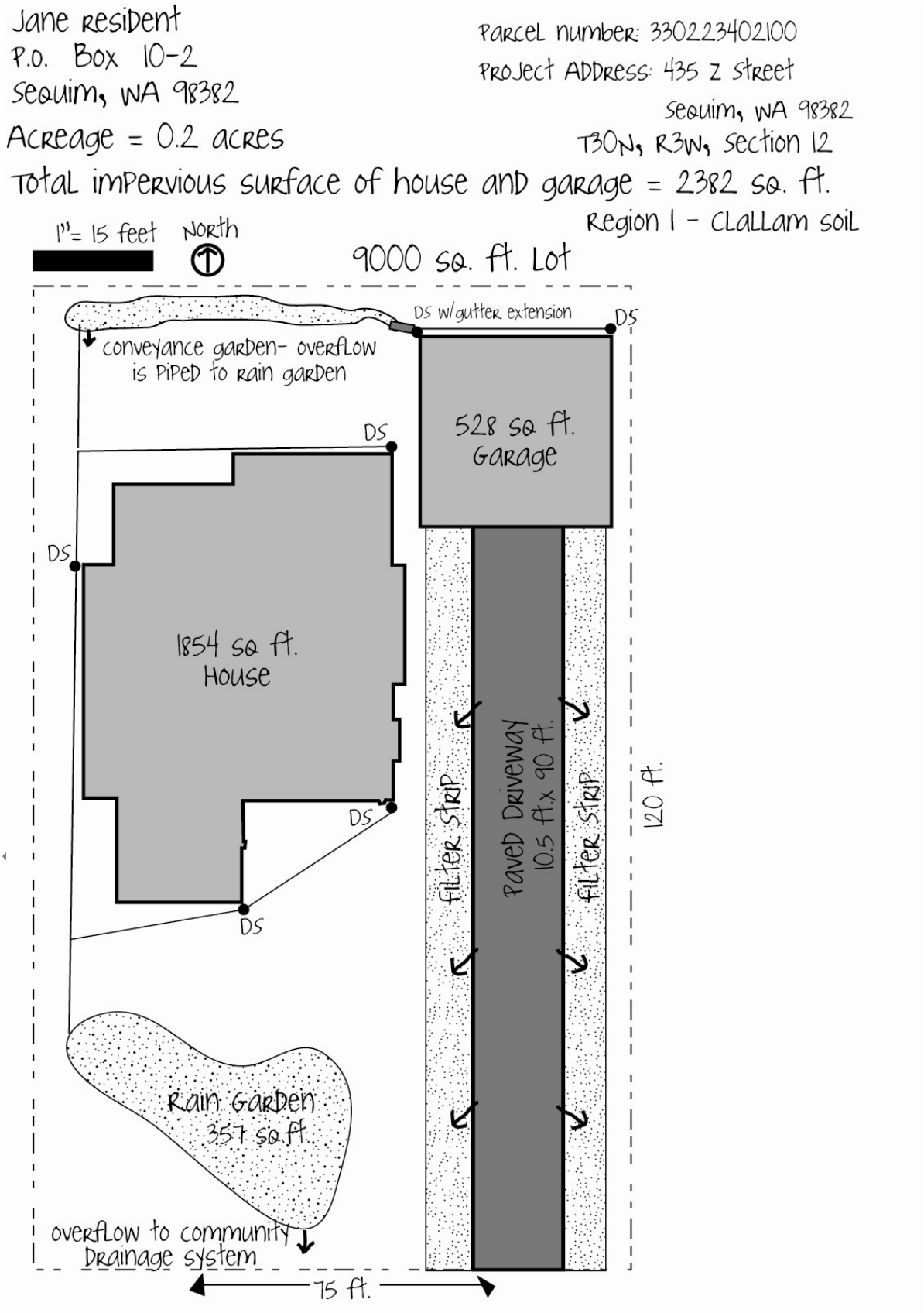
- ❑ The roof runoff from the house is managed with gutters and downspouts that are piped to a rain garden. The surface area of the rain garden is sized at 357 sq. ft. to handle the 2,382 square foot total of roof area (house and garage) according to the table on page x. The overflow of the rain garden is routed to the existing community drainage system.

- ❑ The roof runoff from the garage is routed through a conveyance garden to slow and infiltrate some water and to provide an amenity along the backside of the house. The overflow of the conveyance garden is piped to the rain garden at the front of the house.

- ❑ The 945 sq. ft. driveway is paved. Because the driveway is less than 2,000 square feet, filter strips are all that is needed to manage the driveway runoff. The filter strip areas are equal in size to the driveway.

- ❑ The connection to the community drainage system is shown.

Example C: Small Lot with Poorly Draining Soils



Example D: Typical Rural Lot with Well-Drained Soils

A single family residential project with a roof area of 3,281 square-feet and a garage with a roof area of 1,875 square-feet on a one-acre lot between Port Angeles and Sequim.

Step 1: Conduct Site inventory

A thorough inventory of the site is the initial step for developing and implementing an effective site design and drainage plan.

- The site slopes gently to the north with 5% slopes or less.
- There are no seeps, springs or visible drainage paths on-site.
- There are no critical areas on the site.
- The site has little native vegetation remaining.
- The site utilizes an on-site septic system and well.

Step 2: Site Design

Using the information gathered in the Inventory, align the roads and structures on the site to maximize the preservation of vegetation and retain the existing flow of water on the site to the greatest possible extent.

- Building Envelope and Access Point are identified.
- Clearing limits are marked on construction plans.

Step 3: Determine Soil Type and Stormwater Region

- The maps in Appendix A are consulted to determine the stormwater region of the project. The project is in Region II, east of Port Angeles.
- According to the *Soil Survey of Clallam County*, the soil type of the project site is Hoypus Gravelly Sandy Loam, Hydrologic Group A. According to the table in Appendix B, the soils are suitable for infiltration techniques such as drywells and infiltration trenches.

Step 4: Drainage Plan Design

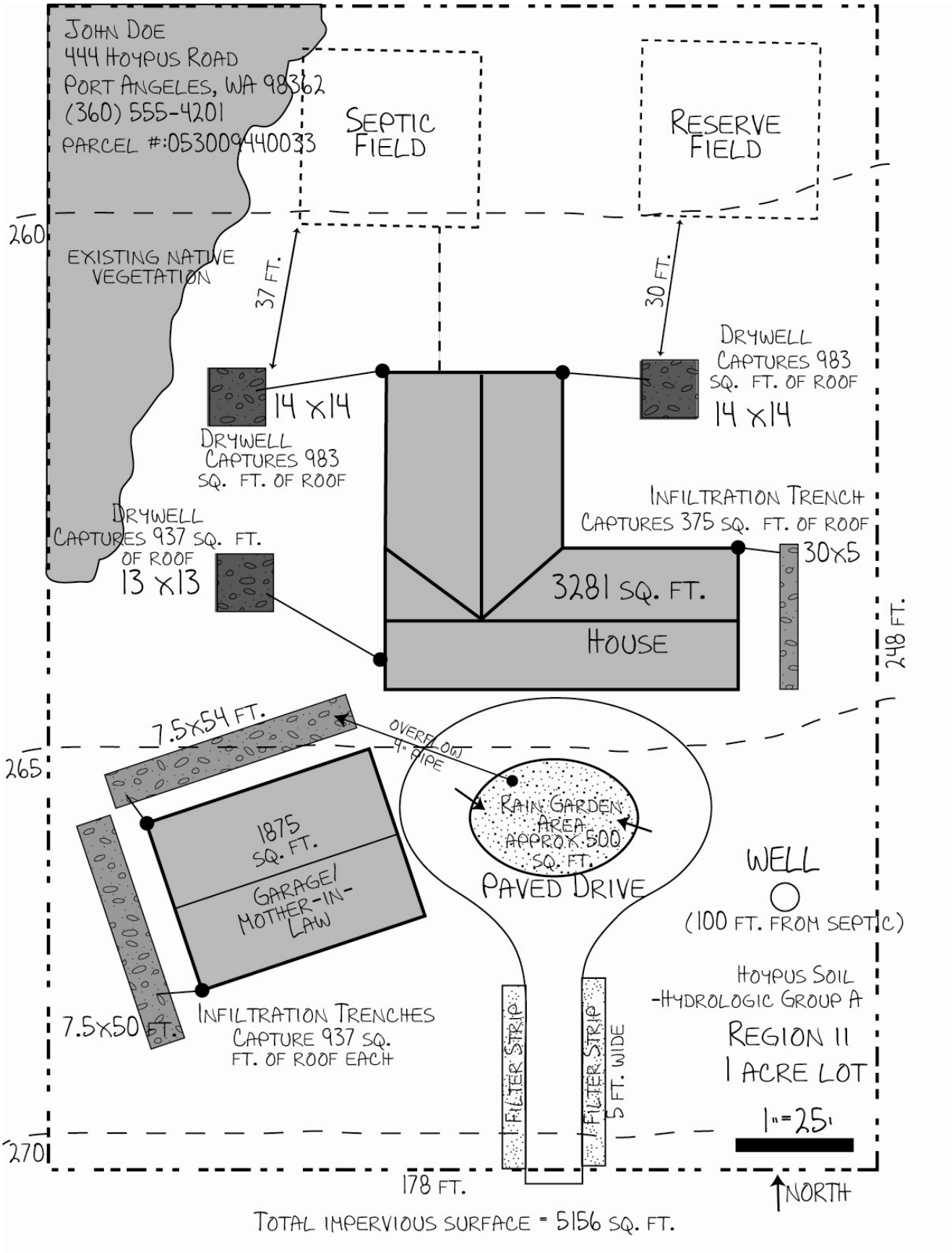
A drainage plan is developed using the project planning chart on page X and the details in the Small Project Drainage Plan Design Elements section (pages x-x) to select options for managing roof water runoff, driveway runoff, conveyance areas, and discharge areas. The sizing chart for each drainage element determines the required dimensions based on the stormwater region in which the project is located. The table in Appendix B is consulted to make sure the BMPs chosen are appropriate for the region and soil type. The following page shows the runoff, conveyance and discharge locations illustrated on the drainage plan for the site.

- ❑ Roof runoff is handled by 3 different drywells and an infiltration trench to avoid exceeding the 1,250 sq. ft. drainage area limit to a single drywell. The size of the drywells and trench and the area it drains is noted on the plan.

- ❑ Infiltration trenches are used to manage the garage roof runoff. The infiltration trenches are sized at 40% of the drainage area, according to directions on p. The size of the trenches and the area they drain are noted on the plan.

- ❑ Runoff from the gravel driveway is handled by filter strips and a rain garden. The circular drive is graded to drain to the rain garden.

Example D: Typical Rural Lot with Well-Drained Soils



Example E: Typical Rural Lot with Poorly Draining Soils

A single family residential project with a roof area of 2,496 square-feet with a outbuilding with a roof area of 576 square-feet on a two-acre lot in the foothills above Port Angeles.

Step 1: Conduct Site inventory

A thorough inventory of the site is the initial step for developing and implementing an effective site design and drainage plan.

- The site has slopes over 15% draining to the northwest.
- There is a seep/ wet area along the hillside of the property that seasonally drains to the north.
- There are no critical areas on the site.
- The site was logged and has little native vegetation remaining.
- The site utilizes an on-site septic system and well.

Step 2: Site Design

Using the information gathered in the Inventory, align the roads and structures on the site to maximize the preservation of vegetation and retain the existing flow of water on the site to the greatest possible extent.

- Building Envelope and Access Point are identified.
- Clearing limits are marked on construction plans.

Step 3: Determine Soil Type and Stormwater Region

- The maps in Appendix A are consulted to determine the stormwater region of the project. The project is in Region III, south of Port Angeles.
- The *Soil Survey of Clallam County* shows the soil type of the project site is Elwha Gravelly Sandy Loam, Hydrologic Group C. According to the table in Appendix B, the soils are not suitable for infiltration techniques such as drywells and infiltration trenches.

Step 4: Drainage Plan Design

A drainage plan is developed using the project planning chart on page X and the details in the Small Project Drainage Plan Design Elements section (pages x-x) to select options for managing roof water runoff, driveway runoff, conveyance areas, and discharge areas. The sizing chart for each drainage element determines the required dimensions based on the stormwater region in which the project is located. The table in Appendix B is consulted to make sure the BMPs are chosen are appropriate for the region and soil type. The following page shows the runoff, conveyance and discharge locations illustrated on the drainage plan for the site.

- ❑ Roof runoff of the house is handled by a rain garden sized at 25% of the house size (according to the sizing information on page dddddd. The size of the rain garden and the area that it drains is noted on the plan.

- ❑ Swales and pipes are used to convey the roof runoff to the rain garden. A gravel spreader trench is used as end-of- the line discharge.

- ❑ Roof runoff from the outbuilding is managed by a downspout with a splash block that drains to 3 conveyance furrows on the northern slope.

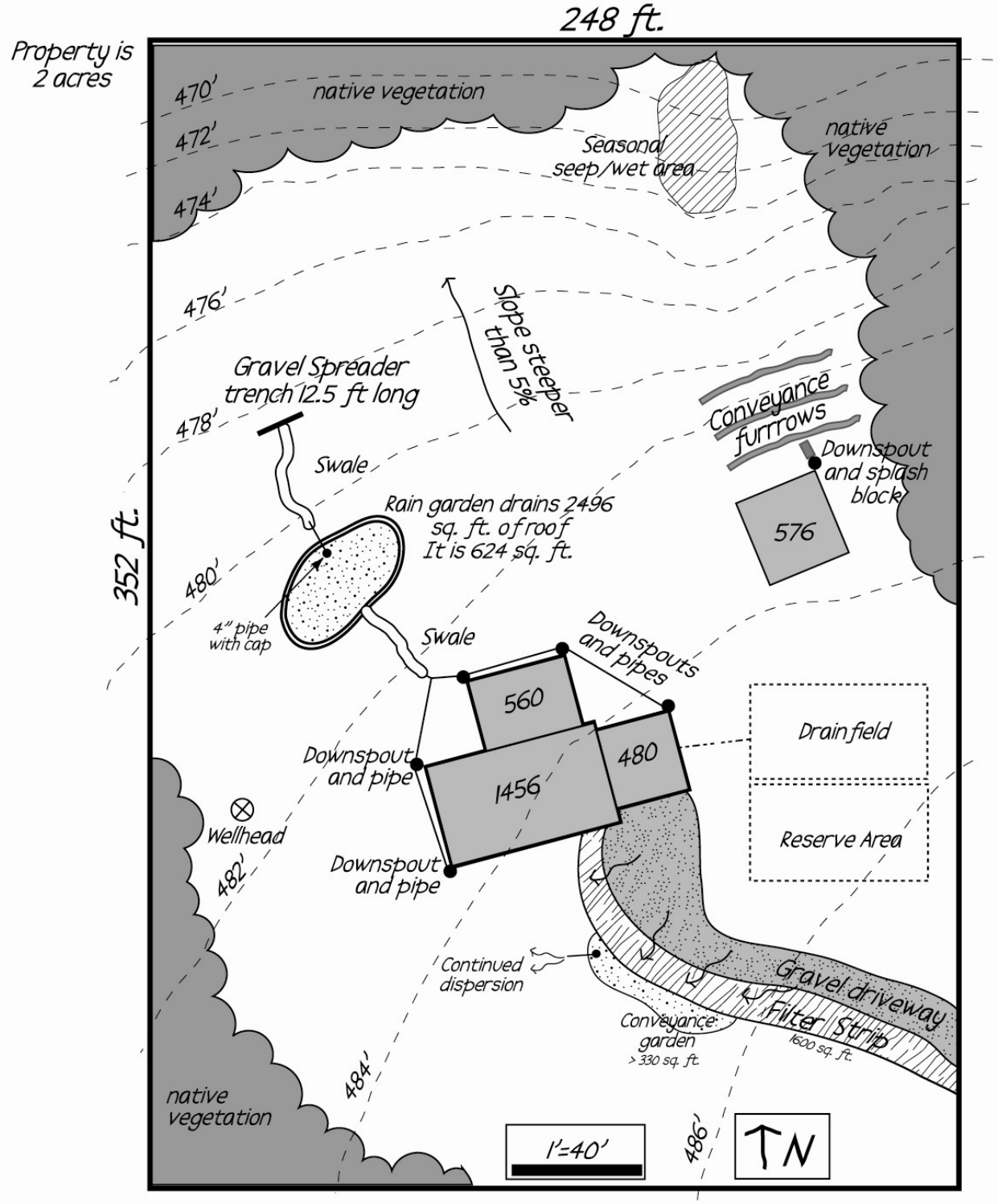
- ❑ The gravel driveway utilizes a Runoff from the gravel driveway is dispersed into the surrounding lawn area.

Example E: Typical Rural Lot with Poorly Draining Soils

Applicant: Jane Housebuilder
P.O. Box 42-10
Port Angeles, WA 98362
(360) 555-1410
Parcel number: 053029732220

Project Address: 56 Foothills Crt.
Port Angeles, WA 98362
Stormwater Region III
Elwha Soil- Group C

Total impervious surface = 3072 sq. ft buildings, 2944 sq. ft. gravel driveway



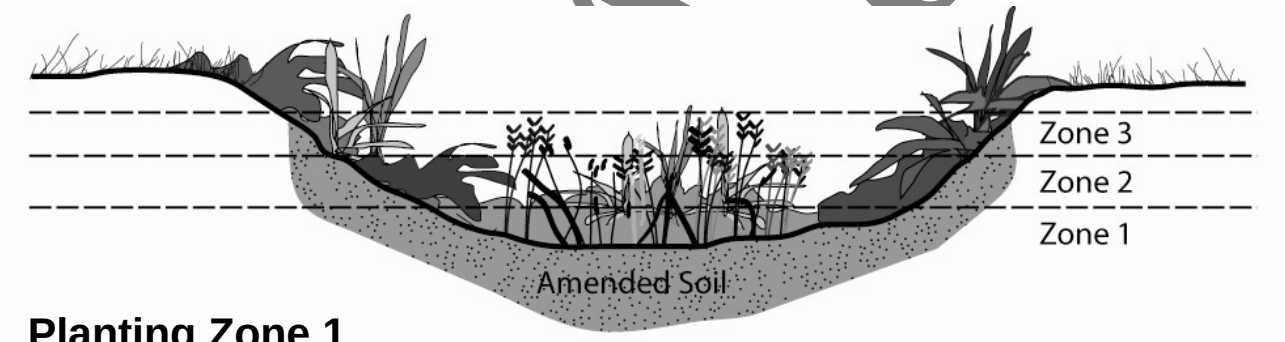
Appendix E: Recommended Plant List for Bioretention Areas

Adapted from *Low Impact Development: Technical Guidance Manual for Puget Sound*, Puget Sound Action Team and Washington State University Pierce County Extension, January 2005

The following native and non-native plants are recommended for use in Rain Gardens, Rainwater Planters, and Conveyance Gardens. Plants utilized in the bioretention areas should be adapted to withstand periods of dryness, but be able to tolerate saturated soil periodically. Conditions in the stormwater management areas will change from very dry during months with little or no rain, to wet or saturated soil following a storm event. The deeper areas of the Rain Garden and Conveyance Garden will be saturated more frequently than the sloping sides. The plants in the Rainwater Planter are at a more uniform depth, but soil moisture within the planter will vary seasonally.

The following list is arranged beginning with plants that thrive in wetter conditions to ones that prefer the slightly drier and higher sides of the Rain Garden or Conveyance Garden. Rainwater Planters should utilize plants from Zone 1 and Zone 2.

Zone 1: Areas of frequent inundation or standing water.
Zone 2: Periodically moist or saturated during larger storms.
Zone 3: Drier soils with infrequent inundation. Transition zone to existing landscape.



Planting Zone 1

Zone 1: Shrubs			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Cornus sericea	Red-osier dogwood	Sun/part shade	to 15 feet
Cornus sericea 'Kelsey'	Dwarf dogwood	Sun	to 1.5 feet
Cornis sericea 'Flaviramea'	Yellow dogwood	Sun/part shade	6-8 feet
Physicarpus capitatus	Pacific ninebark	Sun-part shade	6-13 feet
Spirea douglasii	Douglas spirea	Sun/part shade	4-7 feet
Rubus spectablis	Salmonberry	Shade	5-10 feet

Zone 1: Perennials			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Carex obnuta	Slough sedge	Sun/part shade	1-5 feet
Carex stipata	Sawbeak sedge	Part shade	10 inches-3 feet
Juncus effusus	Common rush	Sun/part shade	1-2 feet
Juncus ensipoluos	Daggerleaf rush	Sun	12-18 inches
Scirpus microcarpus	Small-fruited bulrush	Sun/shade	2-4 feet

Planting Zone 2

Zone 2: Shrubs			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Acer circinatum	Vine Maple	Part shade	to 25 feet
Hammamelis intermedia 'Diane'	Diane Witchhazel	Sun/part shade	10-20 feet/ 10 foot spread
Oemleria cerasiformis	Indian plun	Sun/part shade	5-15 feet
Symphoricarpos albus	Snowberry	Sun/shade	2-6 feet
Rosa nutkana	Nootka rose	Sun/part shade	6-10 feet

Zone 2: Perennials			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Aquilegia formosa	Western Columbine	Sun/part shade	1-3 feet
Asarum caudatum	Wild Ginger	Shade	to 10 inches
Aster subspicatus	Douglas aster	Sun	.5-2.5 feet
Iris douglasiana	Pacific Coast Iris	Sun/part shade	1-2 feet
Tellima grandiflora	Fringecup	Shade	1-3 feet
Hemerocallis fulva	Day Lily	Sun/part shade	1-4 feet
Heuchera micrantha	Purple Palace Heuchera	Sun/part shade	1-2 feet
Geranium sanguineum	Cranesbill	Sun/part shade	1.5 feet

Planting Zone 3

Zone 3: Shrubs			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Arbutus unedo 'Compacta'	Compact strawberry tree	Sun/part shade	to 10 feet
Holodiscus discolor	Oceanspray	Sun/part shade	to 15' feet
Mahonia aquifolium	Tall Oregon Grape	Sun/part shade	6-8 feet
Philadelphus lewis	Mock Orange	Sun/part shade	5-10 feet
Potentilla fruitcosa	Shrubby Cinqufoil	Sun	4 feet
Ribes sanguineum	Red-flowering current	Sun/part shade	8-12 feet
Rhododendron 'PJM'	PJM Rhododendron	Sun/part shade	4 feet
Vaccinium ovatum	Evergreen huckleberry	Part shade/shade	3-15 feet

Zone 3: Perennials and Grasses			
Scientific Name	**Common Name**	**Exposure**	**Mature Size/ Spread**
Achillea millefolium	Western Yarrow	Sun	4 inches-2.5 feet
Dicentra formosa	Pacific bleeding-heart	Sun/shade	6-20 inches
Festuca ovina 'Glauca'	Blue fescue	Sun/part shade	to 10 inches
Lupinus spp.	Lupine	Sun	3- 5 feet
Polystichum munitum	Sword Fern	Part shade/shade	2-4 feet
Rudbeckia hirta	Black-eyed Susan	Sun/part shade	3-4 feet
Smilacina racemosa	False Solomon's Seal	Par t shade	1-3 feet

Appendix F: Sample Declaration of Drainage Easement

An easement is a portion of the land set aside to assist in the management of stormwater runoff. Easements can vary greatly in size, shape, and location depending on the stormwater system on the property. Easements are permanent and are transferred with the title to the land. They generally require the property owner to give up certain rights in the area of the easement, such as building permanent structures or clearing and grading. In most cases in Clallam County, the private landowner is responsible for maintaining drainage easements under local regulations.

The following page is a sample of the Drainage Easement…

Appendix G:
Small Project Erosion and Sediment Control

The intent of erosion and sedimentation control measures is to prevent the erosion and transport of soils from a construction site. Eroded soil is a major pollutant to streams and wetlands and can have harmful impacts to private property by silting up drainage ways. Preventing construction site erosion can help prevent harm to salmon spawning beds, maintain good water quality, and safeguard public drainage infrastructure.

Erosion control is the most effective and inexpensive method to reduce the impacts associated with construction activities. These practices primarily involve the protection of site vegetation and soils, the trapping of eroded or tracked soils, and the reestablishment of vegetation after construction has been completed. The proper installation and maintenance of selected erosion control options to a large degree determines their effectiveness. Avoidance of land disturbance during the winter months, when erosion control is the most difficult is encouraged, and may be required as a part of the permitting of your project. It is important to remember that it is easier to prevent erosion than it is to trap it once it has been mobilized.

This section presents the specifications for erosion and sediment control BMPs applicable **for small projects. These measures may be used if less than one acre of soil will be disturbed by the project.** Additional measures may be required by Clallam County if these are insufficient for the project or fail to contain sediment on the project site. A complete description of erosion and sediment control measures can be found in the *Clallam County Erosion and Sediment Control Manual* **(doesn't exist yet!)** or the *Stormwater Management Manual for Western Washington, Volume II, Construction Stormwater Pollution Prevention, February 2005, Department of Ecology Publication No. 05-10-30.* Projects that disturb 1 acre or more of soil require an Erosion and Sediment Control plan developed by a civil engineer.

This section has been adapted from Kitsap County's *Residential Builder's Guide to Small Site Erosion Control and Stormwater Management*, 1999 and the *Washington Department of Ecology Stormwater Management Manual for Western Washington, Volume II Construction Stormwater Pollution Prevention, 2005.*

Limit site disturbance

The protection and management strategies discussed in this section are designed to protect vegetation and soil necessary for maintaining functioning hydrologic conditions on the site.

Equipment activity on construction sites can severely compact soil. Soil compaction is a leading cause of death or decline of mature trees in developed areas. Most tree roots are located within 3 feet of the ground surface and the majority of the ?ne roots necessary for water and nutrient absorption are within 18 inches. Roots can extend 2 to 3 times beyond the diameter of the crown. In addition to soil compaction, several other direct and indirect impacts can influence vegetation health during land development including:

- Direct loss of roots from trenching, foundation construction, and other grade changes
- Application of ?ll material
- Damage to trunks or branches from construction equipment and activities
- Exposure of forest interior areas to new stresses of forest edges as land is cleared
- Changes in surface and subsurface water ?ow patterns

Vegetation Protection

Leaving native vegetation intact is the single most effective method for reducing erosion on the construction site. Well marked clearing limits prevent disturbance to vegetation and soils in critical areas, buffers, and protected conservation and lot perimeter zones.

Vegetation Protection Guidelines:

- ❑ Map native soil and vegetation retention areas on all plans to protect soils and vegetation from construction damage.
- ❑ Clearing limits must be well marked with highly visible fencing or wire and tape and should be at least 3 feet high.
- ❑ Fencing for vegetation retention areas should be located at a minimum of 3 feet beyond the existing tree canopy along the outer edge of the tree stand.
- ❑ Individual trees that are to be preserved should be marked and the areas within the drip line protected from disturbance.
- ❑ Equipment operators should be informed of clearing limits prior to commencement of grading work. Walk property with equipment operators to clarify construction boundaries and limits of disturbance.
- ❑ Prohibit the stockpiling or disposal of excavated or construction materials in the vegetation retention areas to prevent contaminants from damaging vegetation and soils.
- ❑ Avoid excavation or changing the grade near trees that have been designated for protection.
- ❑ In areas of wildfire risk, utilize Firewise principles for developing a vegetation protection and planting plan. Consult the Firewise website (http://www.firewise.org/), the Washington State Department of Natural Resources, or your local fire department for details on Firewise recommendations.

Topsoil Conservation and Protection

Stockpiling topsoil for reuse during final site stabilization saves money by reducing the amount of soil to be imported and exported.

- ❑ Stockpile soil removed during grading.
- ❑ Cover stockpiled soil with mulch (preferred), plastic sheeting or temporary grass seeding (for stockpiles that may remain for several months) to prevent erosion.
- ❑ Surround stockpiles with silt fence.

Control Sediment and Flows On-site

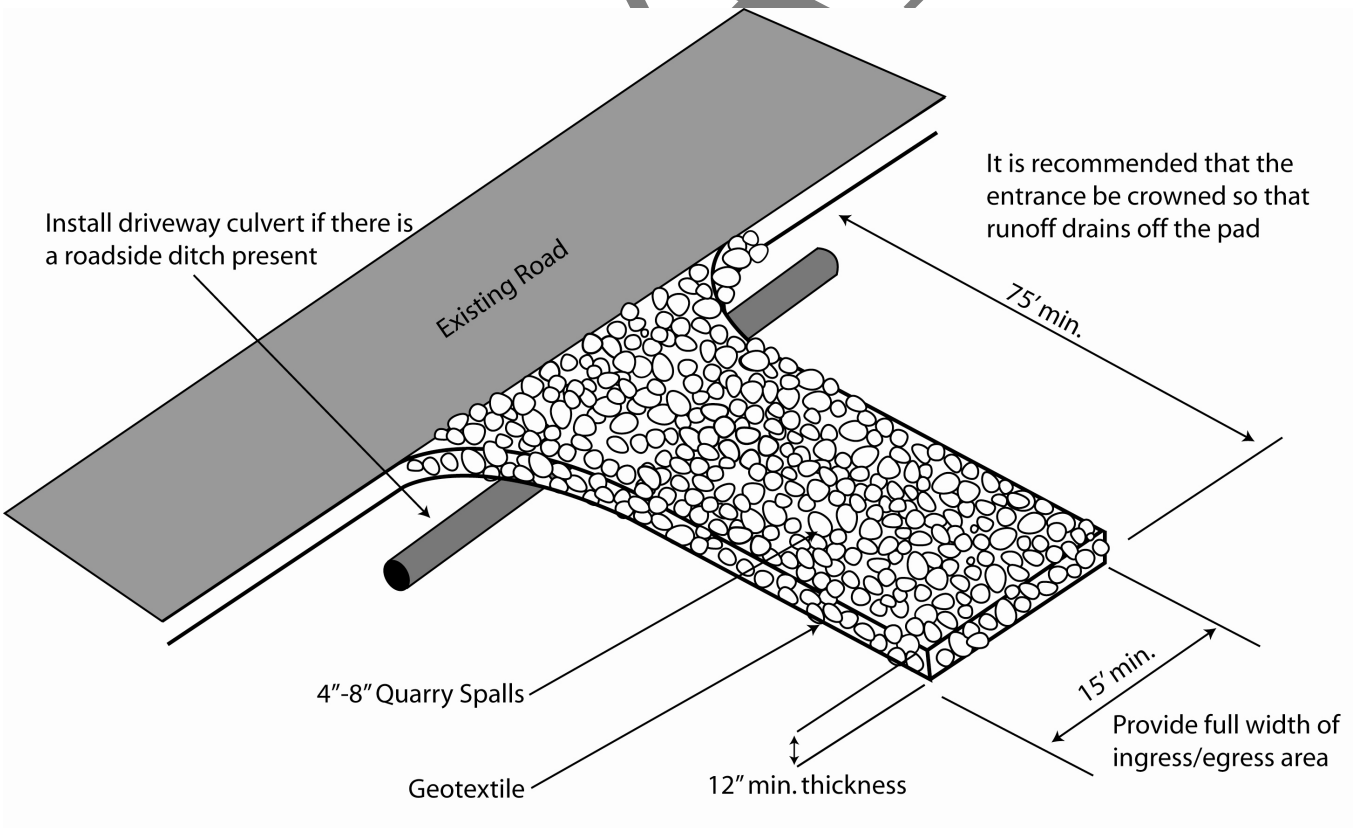
Most often some soil on a construction site will be mobilized. BMPs such as a stabilized entrance, silt fencing and sediment traps can capture and contain soil on site, reducing the amount of sediment and associated pollutants which can enter nearby waterways and wetlands.

Stabilize the Construction Entrance

Vehicles and heavy equipment can track mud offsite where it washes off the roads into ditches and waterways. A stabilized construction entrance is a stone pad located at the vehicular access point to the site that minimizes the amount of sediment and mud tracked offsite by construction site traffic.

- ❑ Stabilized entrance should use 4" to 8" angular quarry spalls
- ❑ Dimensions should be 75' minimum length, 15' foot minimum width, 1' depth
- ❑ If site soils are clayey, filter fabric should be placed under the stone pad to prevent soil from working into the rock material
- ❑ Install driveway culvert if roadside ditch is present
- ❑ Crown the entrance so runoff does not drain onto roadway
- ❑ Limit site access to one route
- ❑ Install fencing as necessary to restrict traffic to stabilized entrance
- ❑ Remove any mud or gravel that is tracked onto roadway by sweeping or shoveling it back onto site

Figure A-1. Stabilized Construction Entrance



Silt fences

Silt fencing, also known as filter fencing, is a temporary physical barrier to intercept sediment that has been mobilized on site. Silt fences are usually placed around the perimeter of a construction site, and can be used for both retaining sediment and demarking clearing limits on the site.

- ❑ The fabric at the bottom of a silt fence must be firmly anchored into the soil by burying it in a "J" configuration in a trench that is backfilled.
- ❑ A wire mesh fence can be placed behind a silt fence to prevent collapse where soil may pile up against the silt fence.
- ❑ Follow manufacturer's instructions on proper installation of filter fabric.
- ❑ Choose filter fabric with proper porosity and ability to trap sediments for the soil type on site.
- ❑ Do not install across streams or ditches.
- ❑ Do not attach to existing trees
- ❑ Construct trench to follow natural contour of land to ensure best protection.
- ❑ Inspect fencing on a regular basis throughout construction.

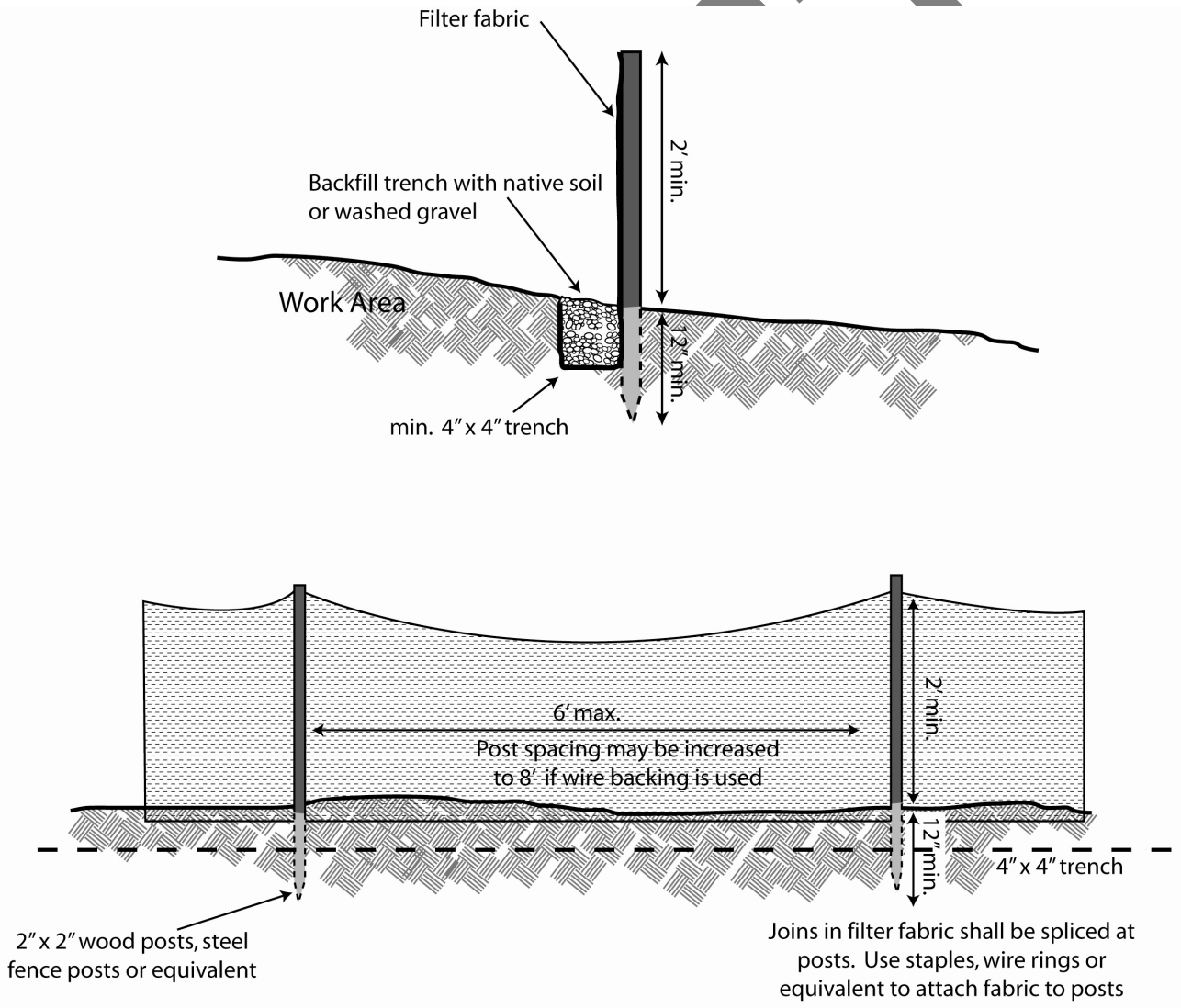


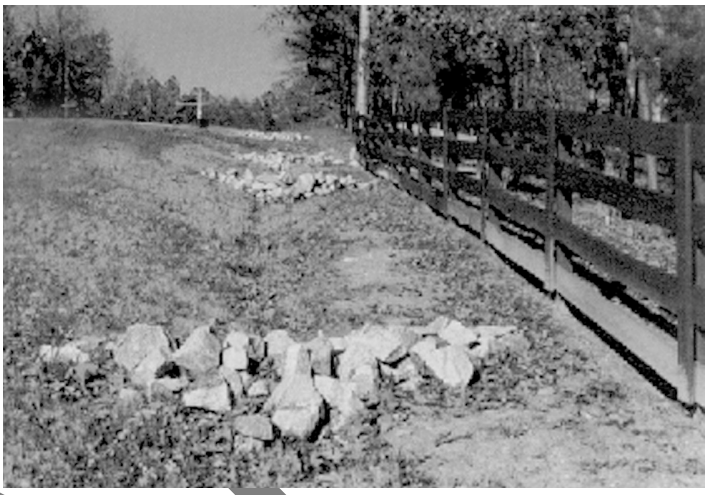
Figure A-2. Silt Fence diagram

Sediment barriers

Sediment barriers are used to impede the flow of water in small channels and ditches and allow sediment to settle out. Barriers are the last defense against sediment leaving a site and should be implemented as a secondary measure. Barriers may be constructed of sand or gravel bags, gravel or rock berms, manufactured silt dikes, straw bales, or brush waddles. In order to function, the barrier must be dense and allow water to back up behind it and flow across a low spot near the center of the barrier. A Check Dam is an example of an effective barrier.

Check Dams

A check dam is a small rock dam constructed across a path of water that slows concentrated flows and filters sediment.



Kitsap County

- ❑ Dam should be constructed of rock or pea-gravel filled sandbags
- ❑ Dam should be placed perpendicular to flow of water
- ❑ The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam
- ❑ Construct so that center of the dam is at least 12 inches lower than the outer edges
- ❑ Side slopes should be 2:1 or less
- ❑ Maximum height should be 2 feet at center of dam
- ❑ Whatever material is used, dam should form a triangle when viewed from side
- ❑ Line area under check dam with filter fabric
- ❑ Seed and mulch area beneath check dam immediately after removal

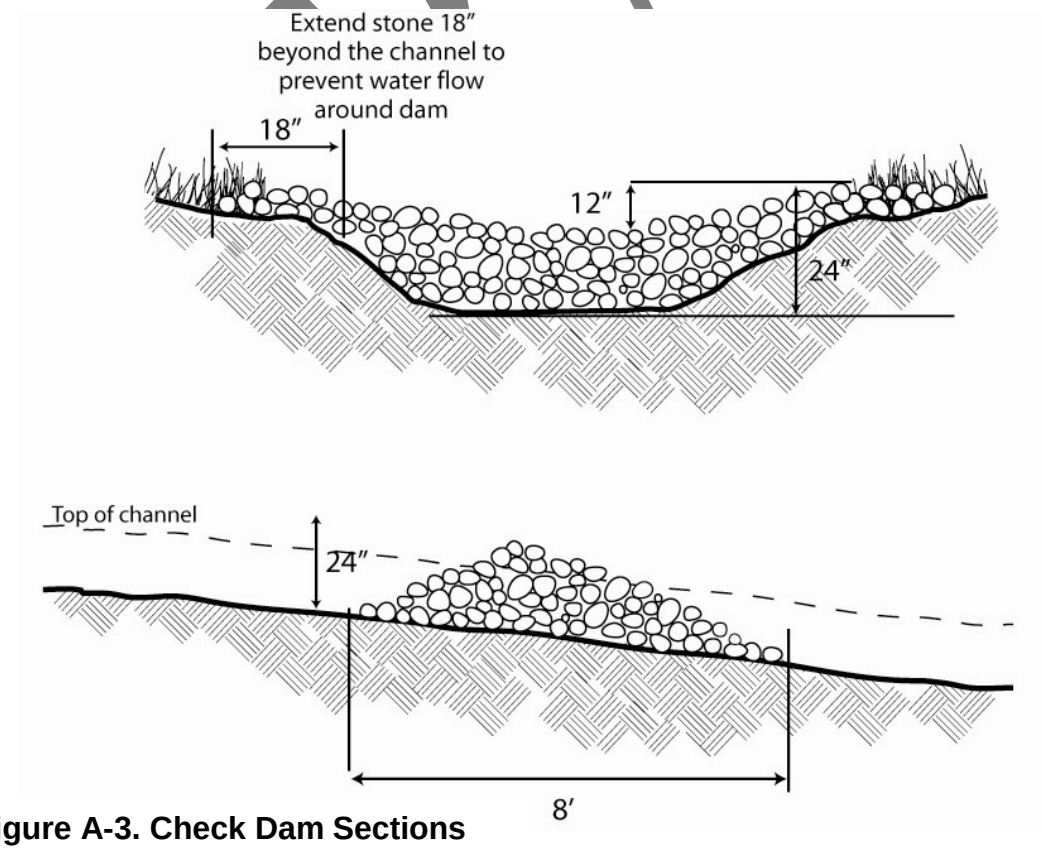


Figure A-3. Check Dam Sections

Stabilize Soils

Covering disturbed areas with mulch, woven materials, plastic sheeting or temporary seeding prevents soil erosion on disturbed areas and soil stockpiles. If the final stabilization of the site will not occur for more than 30 days, additional measures may be needed to protect the site soil.

Mulching

Mulching provides immediate temporary protection from erosion. Common mulch materials include straw, compost, and wood chips. Mulch is a temporary measure that should be followed up by seeding or other permanent landscape implementation. Mulch may be covered with a loose weave net to protect it from wind and water exposure.

Type of mulch	Thickness of Application
Straw	2"-3" thick; 5 bales per 1000 sq. ft.
Hydromulch	25-30 pounds per 1000 sq. ft.
Composted mulch and compost	2" minimum
Chipped on-site vegetation	2" minimum
Wood-based mulch	2" minimum

Temporary Seeding

Seeding is intended to reduce erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion. Seeding can be temporary or permanent. Seeding may be used throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

- ❑ Install all surface runoff control measures before seeding
- ❑ Mulch is required at all times because it protects seeds from heat, moisture loss, and transport due to runoff.
- ❑ All disturbed areas shall be reviewed in late August to early September and all seeding should be completed by the end of September. Otherwise, vegetation will not establish itself enough to provide adequate winter cover.
- ❑ The optimum seeding windows for western Washington are April 1 through May 31st and September 1 through October 1.

Temporary Erosion Control Seed Mix

Grass type	% by Weight
Chewings fescue *Festuca rubra var. commutata*	40
Perennial rye -*Lolium perenne*	50
Redtop or colonial bentgrass - *Agrostis alba* or *Agrostis tenuis*	5
White Dutch clover - *Trifolium repens*	5

Application rate of erosion control seed mix is 120 pounds per acre.