

Douglas County Transportation and Land Services

Drainage Report Guidelines

The Drainage Report is to be inclusive, clear, legible and reproducible, with a complete set of drainage computations. The computations are to be presented in a rational format with information included so as to allow a reviewer to be able to reproduce the same results. The computations should provide sufficient information for an unbiased third party to be able to review the report and determine that all applicable standards have been met. All assumptions and computer input and output data, and variables listed in the computer printouts, should be clearly identified. Computer printouts should clearly show which sub-basin(s) they are applicable to and the design storm event identified thereon if multiple-storm events are addressed in the design. Include copies of design charts, nomographs or other design aids used, with the calculations.

All relevant geotechnical information related to the project, and all site specific soil logs and subsurface testing information should be included in the Drainage Report or provided in a separate report prepared and stamped by the geotechnical engineer.

The Drainage Report should also include a basin map. A pre-developed and post-developed basin map should be provided. The following items shall be included on pre-developed and post-developed basin maps:

- Site boundary
- Basin limits, (on-site and off-site) which contribute or receive runoff from the project, field verified by the engineer.
- Drainage sub-basins. All sub-basins should be clearly labeled and correlated with the calculations.
- Topographic contours, extending beyond the project or drainage basin boundaries to the extent necessary to confirm basin limits; in the absence of topographic mapping being available, the Engineer may field verify the basin limits including contributing off-site areas, and should describe how the basin limits were determined.
- Drainage features, natural or man-made, such drainage channels, culverts, closed depressions, manholes, etc.
- Time of concentration routes, clearly labeled and correlated with the calculations.
- Footprint of proposed drainage features, such as ponds, infiltration facilities, pipe routes, ditches, etc.
- Indications of floodplain limits, as defined by FEMA or other studies.
- North arrow and scale bar.
- Wetlands
- Existing easements

The Drainage Report is to identify existing drainage facilities which are clearly inadequate or need repair, such as collapsed culverts or culverts with a substantial amount of debris. The condition and capacity of existing drainage facilities located onsite, which are proposed to be utilized by the development, should be evaluated and discussed in the drainage report.

Calculations for detention and infiltration ponds may include the following: inflow and outflow hydrographs, level-pool routing calculations, a listing of the maximum water surface elevation, pond volume and discharge rating tables (stage/storage & stage/discharge). Hydrograph and level-pool routing calculation sheets clearly marked with the design storm event, applicable sub-basin(s), and pond identification name, which corresponds with the basin map and plans. If infiltration is to be a significant element in the design (sizing) of the on site retention facility, frozen ground conditions must be considered and addressed in the design report.

The drainage submittal shall incorporate all calculations for the determination of the required size of the system. Typical calculations include:

- Hydrology computations
- Culvert and pipe capacities and outlet velocity
- Inlet capacities
- Detention/Retention storage capacities
- Ditch capacities and velocities
- Map with the project plotted thereon

A copy of applicable floodplain maps, or studies within the project area should be included in the Drainage Report.

For additional drainage design guidelines refer to the *Stormwater Management Manual for Eastern Washington* and Ecology's web site at www.ecy.wa.gov/programs/wq/stormwater.

Reports and plans shall be stamped by a professional engineer, licensed in the state of Washington. Incomplete reports may be returned without County review.

Additional requirements are provided in Douglas County Code and Road Standards available on the Douglas County website at www.douglascountywa.net.

Appendix 3B – Basin Maps

PROJECT: _____

LOCATION: _____

DESIGNER: _____ COMPANY: _____

DATE: _____

The following items should be included on pre-developed and post-developed basin maps:

- Site boundary
- Basin limits, both on-site and off-site areas which contribute or receive stormwater runoff onto or from the project, field verified by the engineer.
- Drainage sub-basins. All sub-basins should be clearly labeled and correlated with the calculations.
- Topographic contours, which should extend beyond the project or drainage basin boundaries to the extent necessary to confirm basin limits used in the calculations; or, in the absence of topographic mapping being available, the Engineer may field verify the basin limits, including contributing off-site areas, and should describe how the basin limits were determined.
- Significant drainage features, natural or man-made, such as creeks, seasonal drainage channels, culverts, closed depressions, manholes.
- Time of concentration routes, clearly labeled and correlated with the calculations.
- Footprint of proposed drainage features, such as ponds, vegetated or other infiltration facilities, pipe routes, ditches.
- Indications of floodplain limits, as defined by FEMA or other studies.
- North arrow and scale bar.
- Wetlands
- Existing easements

Construction Stormwater Pollution Prevention Plan Checklist

Project Name: _____

City Reference No. _____

Section II - Erosion and Sediment Control Plans

1. General

- ___ a. Vicinity Map
- ___ b. City/County of _____ Clearing and Grading Approval Block
- ___ c. Erosion and Sediment Control Notes

2. Site Plan

- ___ a. Legal description of subject property.
- ___ b. North Arrow
- ___ c. Indicate boundaries of existing vegetation, e.g. tree lines, pasture areas, etc.
- ___ d. Identify and label areas of potential erosion problems.
- ___ e. Identify any on-site or adjacent critical areas and associated buffers.
- ___ f. Identify FEMA base flood boundaries and Shoreline Management boundaries (if applicable)
- ___ g. Show existing and proposed contours.
- ___ h. Indicate drainage basins and direction of flow for individual drainage areas.
- ___ i. Label final grade contours and identify developed condition drainage basins.
- ___ j. Delineate areas that are to be cleared and graded.
- ___ k. Show all cut and fill slopes indicating top and bottom of slope catch lines.

3. Conveyance Systems

- ___ a. Designate locations for swales, interceptor trenches, or ditches.
- ___ b. Show all temporary and permanent drainage pipes, ditches, or cut-off trenches required for erosion and sediment control.
- ___ c. Provide minimum slope and cover for all temporary pipes or call out pipe inverts.
- ___ d. Show grades, dimensions, and direction of flow in all ditches, swales, culverts and pipes.
- ___ e. Provide details for bypassing off-site runoff around disturbed areas.
- ___ f. Indicate locations and outlets of any dewatering systems.

4. Location of Detention BMPs

- ___ a. Identify location of detention BMPs.

Construction Stormwater Pollution Prevention Plan Checklist

Project Name: _____

City/County Reference No. _____

5. Erosion and Sediment Control Facilities

- a. Show the locations of sediment trap(s), pond(s), pipes and structures.
- b. Dimension pond berm widths and inside and outside pond slopes.
- c. Indicate the trap/pond storage required and the depth, length, and width dimensions.
- d. Provide typical section views through pond and outlet structure.
- e. Provide typical details of gravel cone and standpipe, and/or other filtering devices.
- f. Detail stabilization techniques for outlet/inlet.
- g. Detail control/restrictor device location and details.
- h. Specify mulch and/or recommended cover of berms and slopes.
- i. Provide rock specifications and detail for rock check dam(s), if applicable.
- j. Specify spacing for rock check dams as required.
- k. Provide front and side sections of typical rock check dams.
- l. Indicate the locations and provide details and specifications for silt fabric.
- m. Locate the construction entrance and provide a detail.

6. Detailed Drawings

- a. Any structural practices used that are not referenced in the Ecology Manual should be explained and illustrated with detailed drawings.

7. Other Pollutant BMPs

- a. Indicate on the site plan the location of BMPs to be used for the control of pollutants other than sediment, e.g. concrete wash water.

8. Monitoring Locations

- a. Indicate on the site plan the water quality sampling locations to be used for monitoring water quality on the construction site. Sampling stations shall be located upstream and downstream of the project site.

Appendix 3C – Stormwater Construction Plans

PROJECT: _____

LOCATION: _____

DESIGNER: _____ COMPANY: _____

DATE: _____

The following items should be included on stormwater construction plans, as applicable:

- A plan profile of all key drainage systems including: streets, roads, and drainage facilities
- Elevation Datum
- North Arrow
- Right-of-Way details
- Outfall details
- Ditch details
- Invert elevations, slopes, and lengths of ditches
- Cross sections of all open ditches
- Elevations of all inlet grates
- Size, types, invert elevations, and lengths of all culverts and pipe systems
- Invert elevations of the existing or other proposed drainage system to which the drainage plan proposes to connect
- Stationing of all inlets, culverts and pipe systems angle points
- Invert elevations of pipes at all structures such as catch basins or manholes
- Construction details for inlets, drywells, detention facilities, etc. (notes referring to standard plans may suffice where applicable)
- Drainage easements shown, with key dimensions for depicting location, width, and length.
- The location of existing underground and above-ground utilities
- Lot grading elevations where appropriate
- Grading plan for drainage ponds. The grading plan should include existing contours, proposed contours, and catch points. A typical cross section of the pond should be provided in the plans, showing bottom of pond elevation, maximum water surface elevation for the design storm(s), inlet and outlet elevations, berm elevation and slopes, and keyway location and dimensions.

- Drainage ponds, pipe inlets and outlets, ditches, and drainage structures, which are serving public roads or are in single-family residential neighborhoods, should be horizontally defined with respect to property corners, street stationing, or a coordinate system.
- Drainage ditches should have their longitudinal grades defined with either a profile or elevation grades at intervals of 50 feet. Ditch centerlines and flow directions should be also be illustrated.
- Summary of short and long-term operation and maintenance requirements