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7/14/2004 Page 1 of 15 10:41AM

COVER SHEET

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Sedro-Woolley, WA 98284
Phone: (360)855-2121

REDTAIL RIDGE OPERATION AND MAINTENANCE MANUAL FOR THE STORMWATER COLLECTION SYSTEM AND DETENTION SYSTEM

Grantor: KEN and LAURA HOWARD

Grantee: Lot Owners of Redtail Ridge

Legal Description:

A Portion of the Southeast Quarter of Section 11 and a Portion of the Northeast Quarter of Section 14, all in Township 34 North, Range 1 East, W.M.

ASSESSOR'S PROPERTY TAX PARCEL NUMBER: P19190; P19207; P121232

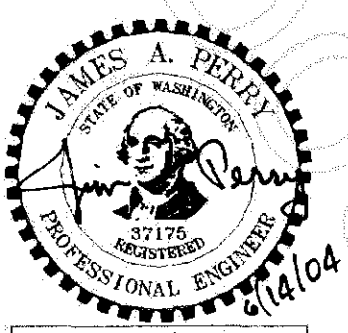
REDTAIL RIDGE

OPERATION
AND
MAINTENANCE MANUAL

FOR THE
STORMWATER COLLECTION SYSTEM
AND
DETENTION SYSTEM

June 14, 2004

PREPARED BY



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OPERATION AND MAINTENANCE MANUAL

for

REDTAIL RIDGE

STORMWATER COLLECTION SYSTEM
AND
DETENTION SYSTEM

TABLE OF CONTENTS

EXHIBITS:

A. STORMWATER SYSTEM LAYOUT
B. DETENTION POND LAYOUT
C. FLOW CONTROL STRUCTURE DETAIL
D. MAINTENANCE LOG FORM

I. PURPOSE OF MANUAL

The purpose of this manual is to outline the procedures for the proper operation and maintenance of the stormwater facilities for REDTAIL RIDGE as required to be maintained by the REDTAIL RIDGE Road, Stormwater Collection System and Detention System Maintenance Declaration/Agreement.

Lot owners in REDTAIL RIDGE have the responsibility for all reasonable and necessary maintenance and repairs of the stormwater facilities within the short plat for REDTAIL RIDGE. The Skagit County Public Works Department will maintain the road ditch and culverts within the right-of-way for Sharpe Road.

This manual is the mechanism for the maintenance, repair and replacement of stormwater, water detention and drainage facilities.

For the benefit of the owners of the lots in the REDTAIL RIDGE Plat, conditions should not be allowed to deteriorate, nor maintenance not performed on-site, which would force the Skagit County Public Works Department to assume responsibility of the facility. The stormwater collection system and detention system should add to the beauty and ease of living in REDTAIL RIDGE as much as possible.

II. PURPOSE OF FACILITY

In the development of the residential lots for REDTAIL RIDGE, the natural drainage of the area was changed by the construction of the road and houses. Instead of the rain falling on trees and grass and percolating into the soil, some of the rain will fall on gravel roads and roofs and quickly run off and collect at low points.

Now with more water reaching the low point faster, this stormwater facility provides control of the quality, amount and rate at which stormwater is discharged to the ditch in Sharpe Road.

III. LAYOUT OF FACILITY

The stormwater system for REDTAIL RIDGE basically is comprised of two parts. First, the collection system and secondly, the detention system.

Exhibit "A" is the plat layout of the private road and lots for REDTAIL RIDGE. Also shown are the drainage easements of which the lot owners have legal right of access for maintenance purposes.

IV. FUNCTION OF UNITS

A. ROAD DITCHES

Culverts are placed, as shown on Exhibit "A", to convey land and road stormwater runoff along the roadside ditches. Ditches over 5% grade are rock-lined in order to prevent erosion and transport of sediment. The ditches convey most of this runoff to the biofiltration swale which directs the flow into the detention pond.

There is a short section of the road where the runoff from the road is allowed to run off down the slope of the natural terrain (see Exhibit "A").

A short section of ditch, on the north side of the road just east of Sharpe Road, is allowed to flow directly into the County ditch along Sharpe Road. Including the volume of this flow in sizing the detention pond mitigates these two situations.

B. BIOFILTRATION SWALE

Prior to flowing into the detention pond, the collected stormwater flows along a biofiltration swale. This swale provides for water quality control of the stormwater. This control is provided by slowing down the velocity of the water and having it flow along this grass-lined swale. The flat slope and the grass provide for sediment to settle out along the length of the swale. The grass also removes (absorbs) some oil from the stormwater by having the globules of oil attach to the blades of grass.

This swale is designed as part of the stormwater control and detention system. Big weeds should not be allowed to grow in the swale. The grass should be maintained at 6 to 10 inches high.

C. DETENTION POND

The detention pond is designed and sized to store the increase in runoff as a result of the construction of the road and the construction of three new houses. This increase in runoff from "pre-developed" to "developed" conditions was calculated to be 17,120 cubic feet or 128,000 gallons. The only purpose of the detention pond is to store this volume of increased stormwater runoff while it is slowly discharged into the roadside ditch.

D. FLOW CONTROL STRUCTURE (FCS)

The purpose of the flow control structure (FCS) is to release the stored water in the detention pond to the roadside ditch at a slow rate. This rate is regulated by the Skagit County Drainage Ordinance. The flow rate is basically similar to the "pre-developed" runoff rate from the site.

The flow is controlled by two orifices or holes in the discharge riser pipe inside the FCS manhole. These two holes provide for the first two flow-rate criteria. Stormwater in excess of these two criteria flows over the top of the riser pipe and into the discharge pipe.

The first and lowest hole (orifice) in the riser pipe is designed to discharge 50% of the "pre-developed" 2-year flow rate. A 7/8" hole below the level of the discharge pipe provides for the flow. The rate of flow through this hole is when the pond holds 9,163 cubic feet of water. For this volume the water depth is 2.60 feet (2 feet, 7 inches) in the pond and the discharge rate in 0.036 c.f.s. (16 gpm). This is the volume of the difference between the "pre-developed" and "developed" 2-year storm runoff. Note that a "2-year storm" is a rainoff that is likely to occur every 2 years and is a certain amount based on many years of rainfall records.

The second hole is designed to discharge the same as the "pre-developed" 10-year stormwater runoff rate from the site. A 2¼" diameter hole in the side of the riser pipe allows 0.261 c.f.s. (117 gpm) of stormwater to be discharged when the water level is the detention pond is 3.5 feet (3 feet 6 inches.)

The overflow pipe (the top of the riser pipe) is designed to handle the increase in the 100-year flow. This flow is 0.717 c.f.s. (320 gpm) when the level in the pond is 4.15 feet (4 feet 2 inches.)

Stormwater flowing into the pond which is greater than this 320 gpm will continue to fill up the pond and flow over the spillway into the ditch.

It must be understood that the pond and discharge structure are designed to handle only the increase in the stormwater runoff as a result of this development (road and 3 houses). However, all the stormwater runoff is still being directed to the detention pond. Stormwater volume and flow rates in excess of the pond volume and FCS discharge rates will flow over the spillway. This is normal and how the detention system was designed.

E. DITCH AND CULVERT

The ditch downstream from the FCS discharge pipe and the detention pond spillway direct the flow to the 12-inch culvert under the entrance road. The culvert discharges the stormwater into the ditch on the north side of the entrance road which directs the flow into the ditch in the County's Sharpe Road. The County has responsibility for the stormwater beyond this point.

V. NORMAL OPERATING PROCEDURES

The stormwater collection and detention system is designed to function on its own. A rainstorm comes, the water is collected and flows through the ditches and culverts in the detention pond. The only and main operating procedure is to once a month make sure nothing has plugged the culverts and the orifices in the flow control structure (FCS). It is important that this operating procedure be recorded.

Inspect the orifices by removing the manhole lid on the FCS. You will need a ½ - allen wrench to remove the bolt-down lid. Visually inspect the orifices to make sure they are not clogged. By looking down the inside of the riser pipe you should be able to see the bottom orifice.

The County may wish to see a record of operating and maintenance procedures actually performed. Keep a log of the date and what was observed and/or done. A copy of a master form for keeping this log is included as Exhibit "F". The person responsible for operating and maintaining the stormwater system for REDTAIL RIDGE is to keep a copy of this manual in a ring binder with extra copies of the maintenance log form. This way the manual and the log will keep everything recorded and organized.

A "normal" operating procedure is to do the above mention inspection after a very heavy rain. This way you will make sure everything worked property and the system is ready for the next rainstorm. Be sure to log all of your inspection items on the log form.

VI. MAINTENANCE OF FACILITY

There basically is no routine maintenance of your stormwater system. When tall weeds or trees start to grow in the biofiltration swale and on the bottom and sides of the detention pond they should be removed. When this is necessary, record it on the maintenance log form.

The ditches and culverts should be inspected to remove any accumulated debris. This should be part of the monthly operating procedure.

VII. RECORD KEEPING

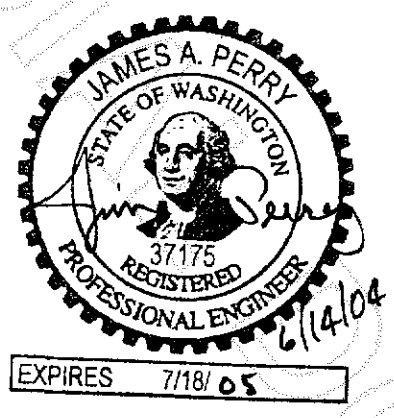
As explained in the previous sections, it is important to keep a log of all inspections and maintenance performed on your stormwater collection and detention system. This log is to be available for inspection by the Skagit County Public Works Department. By keeping this log up to date and kept in a binder, you will be ready for any unexpected inspection.

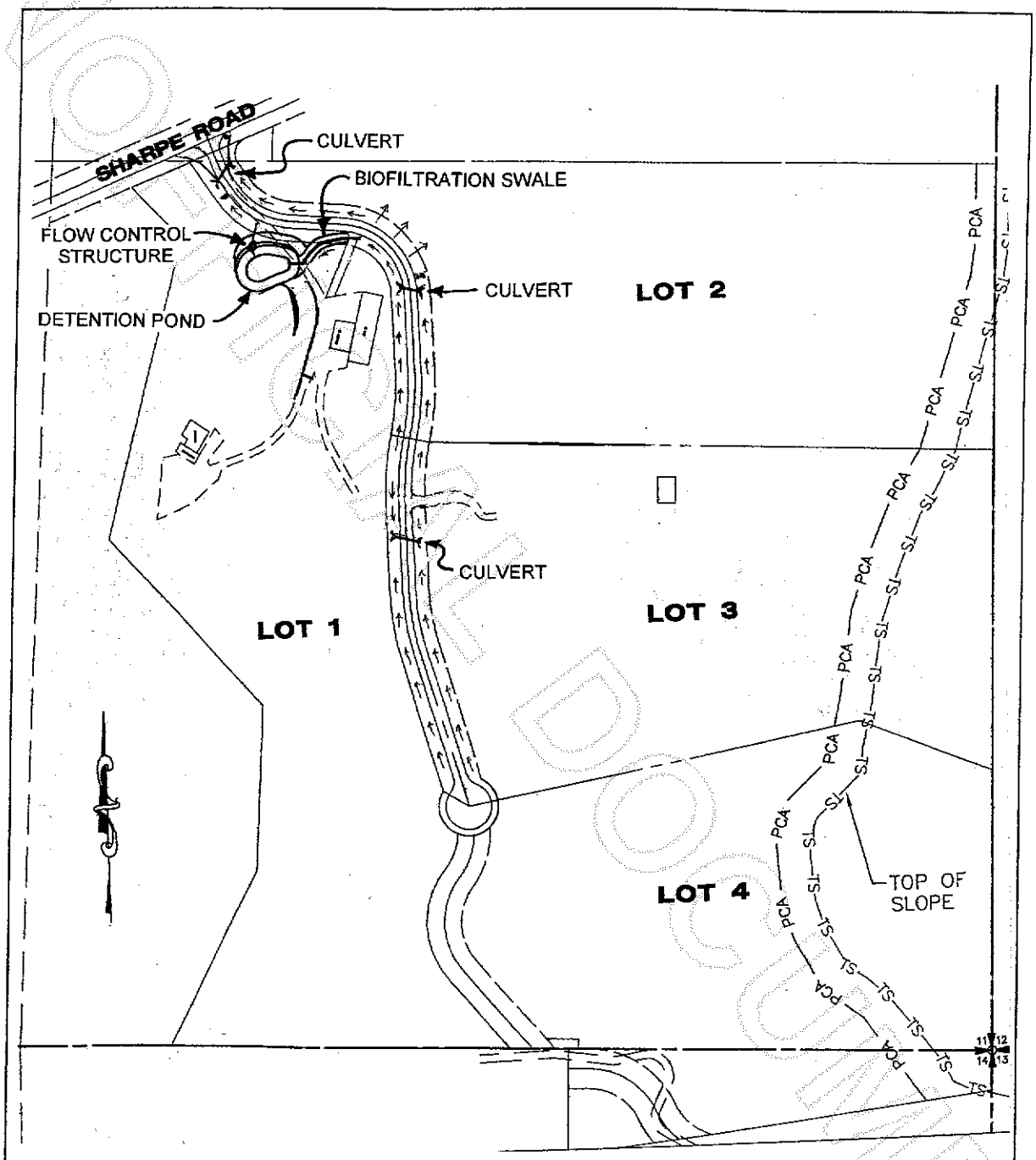
These maintenance procedures are required by Skagit County pursuant to the terms and conditions set forth on the face of the short plat for REDTAIL RIDGE

VIII. EMERGENCIES

If there is a situation, such as a major oil spill into your collection system, or if there is any other type of major damage to the stormwater collection or detention system, be sure to call the Skagit County Public Works Department at 360-336-9400 and report it to them. Inform the County what happened, what you are doing about it, and solicit any help you may need.

If any major repairs are necessary make sure they are done consistent with the initial plans and construction of your facilities. A copy of the construction plans is to be readily available to the maintenance person at all times.





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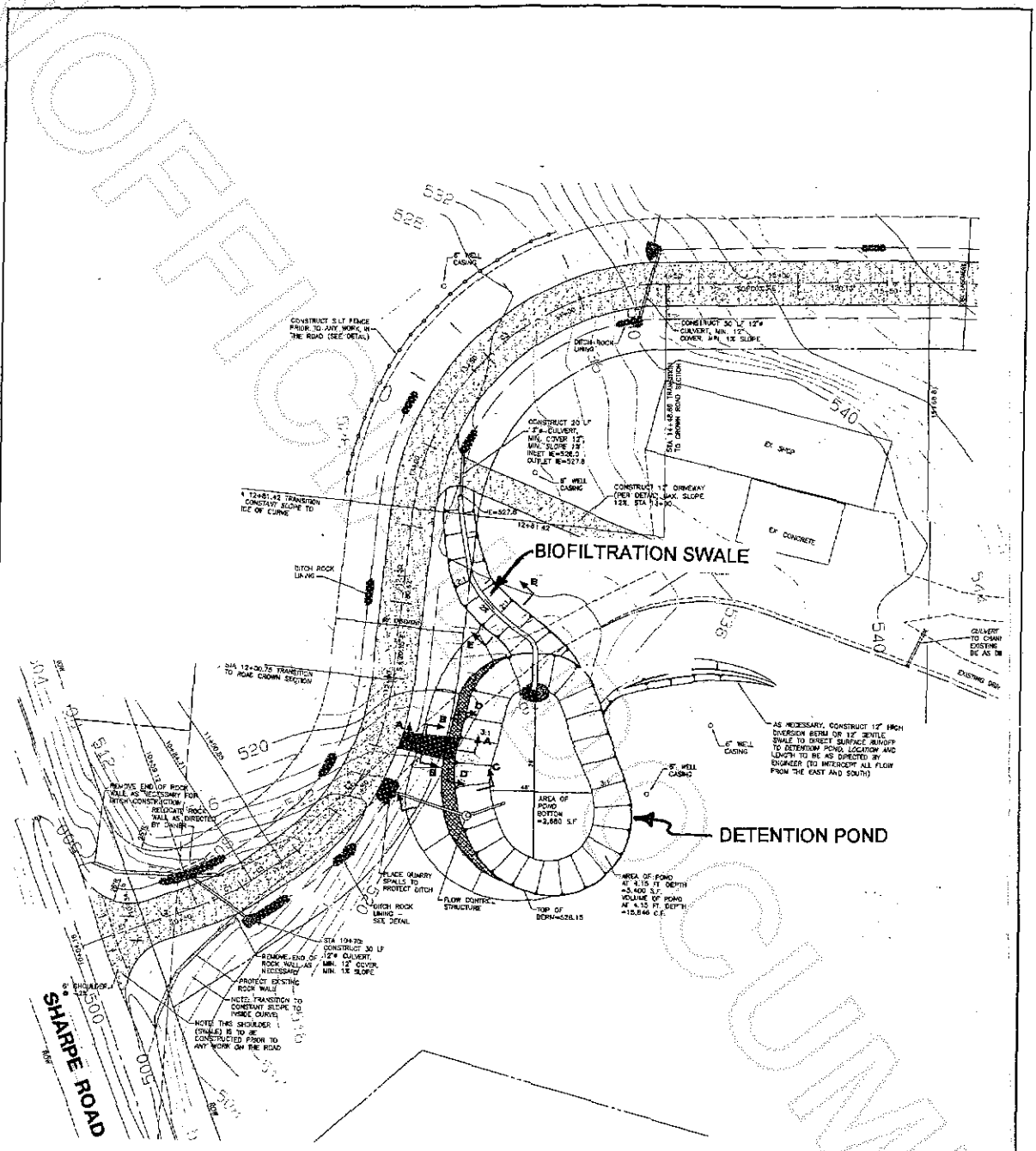
REDTAIL RIDGE
STORMWATER SYSTEM O &M MANUAL

STORMWATER SYSTEM LAYOUT

EXHIBIT "A"

200407140080
Skagit County Auditor
7/14/2004 Page 9 of 15 10:41AM



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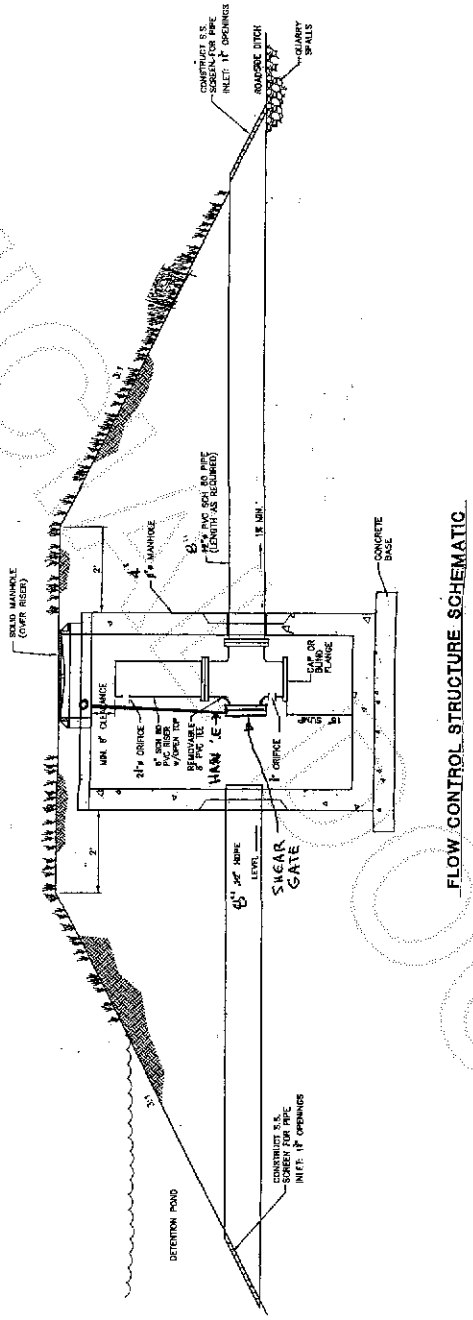
REDTAIL RIDGE
STORMWATER SYSTEM O &M MANUAL

DETENTION POND LAYOUT

EXHIBIT "B"



FLOW CONTROL STRUCTURE SCHEMATIC

NO SCALE

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REDTAIL RIDGE
STORMWATER SYSTEM O &M MANUAL

FLOW CONTROL STRUCTURE DETAIL

EXHIBIT "C"

REDTAIL RIDGE O & M MANUAL

MAINTENANCE LOG FORM

MASTER COPY

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REDTAIL RIDGE
STORMWATER SYSTEM

Maintenance Log

DATE	NAME	DESCRIPTION OF INSPECTION/WORK

Page _____

REDTAIL RIDGE O & M MANUAL
MAINTENANCE LOG FORM

ACTIVE MAINTENANCE LOG

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REDTAIL RIDGE
STORMWATER SYSTEM

Maintenance Log

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