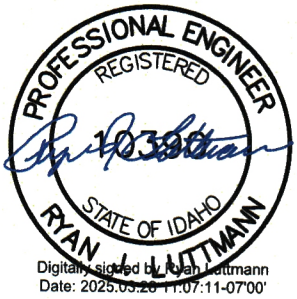
STORMWATER MANAGEMENT AND EROSION CONTROL PLAN

TAX 1 OF BLOCK 16, STARR'S ACREAGE



Prepared for:

INDEPENDENT HIGHWAY DISTRICT

Prepared by:

CENTURY WEST ENGINEERING

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March 2025

Project No. 51006.004.02

INTRODUCTION

The purpose of this report is to assess the proposed improvement to Tax 1 of Block 16, Starr's Acreage for the management of stormwater runoff and control erosion from the project site. The 3 +/- acre site is located in Ponderay, Idaho in Township 57N, Range 02W, Section 02 and is located on the west side of McNearney Road.

The report is based on and limited to the soil types identified by site inspection and the *Soil Survey of the Bonner County Area,* the preliminary site plan layout and general topography of the site.

EXISTING SITE CONDITIONS

The existing site is vacant land that is owned by the Independent Highway District. A portion of the site is currently fenced and some equipment and trucks are stored seasonally on the property. The area for the proposed improvements is relatively flat and is surfaced with some grasses, weeds, dirt and gravel materials. Historically, the site was approved to operate in the industrial zone as a Northwest Auto Body Storage Yard, and plans included fencing the 3-acre site, importing and compacting fill and finish grading the site with a gravel surface. The original stormwater management plan was approved to include a 3' wide grassy swale along the north, west and south sides of the property. The Independent Highway District intends to use the site as the primary shop location for maintaining the roadways within their maintenance jurisdiction and MOUs with the cities of Kootenai, Dover and Ponderay. The proposed on-site improvements include regrading and compaction of the site, construction of a new shop, outbuildings, material storage sheds and a deicer facility. The site will be accessed from two existing approaches on McNearney Road. The location of the approaches will be modified with the City of Ponderay's improvements to McNearney Road in 2025.

The site investigation did not reveal signs of slope instability or mass movement on site.

A vicinity drainage plan was not prepared with this report. The site visit in 2023 revealed that no off-site drainage would impact the site or the planned stormwater improvements proposed with this project. The Independent Highway District has coordinated with the design engineers for the McNearney Road Improvements so that the stormwater from the site can be routed to the new stormwater facilities along the roadway.

SOILS

The Department of Agriculture's *Soil Survey of the Bonner County Area* identifies the subject soils as "Odenson Silt Loam, 0 to 2 percent slopes". According to the

survey, "Odenson Silt Loam" is very deep, poorly drained soil. It formed in silty glacial lake-laid sediment derived from mixed sources and has a mantle of volcanic ash and loess. The average annual precipitation is about 32 inches and the average annual air temperature is about 45 degrees F, and the average frost-free period is about 100 days.

Permeability of this Odenson soil is slow. Effective rooting depth is limited by a seasonal high water table that is a depth of 6 to 24 inches from February to June. Available water capacity is high. Runoff is very slow, and the hazard of water erosion is none to slight.

Soil Permeability:

Depth (inches)	Permeability (in/hr)
0-9	0.6-2.0
9-35	0.2-0.6
35-60	0.06-0.2

A Custom Soil Resource Report from the USDA NRCS Web Soil Survey has been included at the end of this report. If undesirable ponding is observed with the native soils, the owner may choose to install a perforated underdrain beneath the grassed infiltration area.

STORMWATER MANAGEMENT

Run-off stormwater from all impervious surfaces will be collected and treated in grass infiltration swales. The swale volume will be designed to capture, at a minimum, the first ½" of run-off from the site. If plans for future expansion are desired, the stormwater plan should be reevaluated at that time and reviewed with future City of Ponderay stormwater ordinances.

CALCULATIONS

Included in this report are the calculations that demonstrate the ability of the stormwater system capability to retain and treat the first ½" of run-off from the impervious surfaces, the capacity of the retention basin and the design storm yield expected at the site.

The results of the calculations are as follows:

1. The minimum swale volume required to retain and treat the first ½ inch of run-off is 4595 cubic feet.

2. An additional 475 cubic feet storage volume is required for Pre- vs. Post Development run-off for a 25 year, 24-hour and other 25 year storm events.
3. The minimum design swale volume is 5070 cubic feet.
4. The minimum base swale area for design is 8691 square feet, based on a swale depth of 7 inches.

TEMPORARY EROSION CONTROL

The hazard of water erosion on the site is classified as none to slight for the Odenson silt loam. The existing site currently drains toward previously constructed swales around the property that connect to the roadside drainage ditch along McNearney Road. Site drainage has been coordinated with future McNearney Road improvements to discharge into the stormwater system along McNearney Road.

During contruction of site improvements, the contractor shall be required to provide a water truck (or equivalent) to apply water to the construction site in an appropriate manner to mitigate dust during grading and construction activities for compliance with the City's dust control regulations.

If mud is tracked from the site, temporary construction entrance stabilization should be placed, as needed, on the access utilized during construction.

PERMANENT EROSION CONTROL

All disturbed areas associated with the project that do not receive pavement or gravel surfacing shall be reseeded promptly. The revegetation of the site will serve as permanent erosion and sediment control for the site. Alternate seed mixture recommendations may be obtained from the U.S.D.A Natural Resource Conservation Service, the project Landscape Architect or a commercially marketed grass mixture. All revegetation work should be accomplished between the dates of April 15 and October 15 of a given year.

CONSTRUCTION SCHEDULE

The proposed schedule for site activities should occur in the following order:

Time Sequence	Construction Task
1	Rough-in swales to serve as sedimentation ponds during construction. Install temporary erosion control measures as needed.
2	Remove vegetation and topsoil for construction of hard surface area and stockpile within designated area.

3	Protect topsoil stockpile as necessary during construction by covering piles when not in use
4	Construct hard surface areas
5	Hydroseed and revegetate all remaining disturbed areas

OPERATION AND MAINTENANCE PLAN

Operation and maintenance shall be the responsibility of the landowner. The Temporary and Permanent Erosion and Stormwater control measures will be the responsibility of the Independent Highway District at PO Box 700 in Ponderay, Idaho. The phone number is (208) 263-8121.

Operation and maintenance shall include and not be limited to the following items:

1. Install temporary erosion control measures as needed.
2. The newly seeded areas shall be inspected weekly until it is certain that adequate root depth has formed and shall be inspected every three months and after every large storm event for erosion. If erosion has occurred, the eroded soils and vegetation shall be replaced.
3. The grassy swales shall be inspected every three months and after every large storm event. Any sediments and other debris deposited in the swales shall be removed and disposed off-site. In the summer months, the swales shall be watered and mowed as needed.

SUMMARY

The proposed site is adequately suited for the proposed improvements. The site is capable of withstanding any disturbances created by the proposed project and Stormwater Management and Erosion Control plan without risk of additional site run-off and/or sedimentation of ground water and/or surface water. The Stormwater Management plan is adequate to retain the first ½" of rainfall from all impervious surfaces proposed for the site.

STORMWATER CALCULATIONS

PROJECT: Independent Highway District - Shop Master Plan

PREPARED BY: RYAN J. LUTTMANN, P.E.

DATE: February 17, 2025

I. 1/2" RUN-OFF CALCULATIONS (PROPOSED ADDITION)

A. IMPERVIOUS SURFACES (square feet) — 110,275 Ft^2

BUILDINGS	38,504
GRAVEL	59,471
PAVEMENT	12,300
TOTAL	110,275

B. VOLUME REQUIRED FOR 1ST 1/2" STORAGE (cubic feet) — 4,595 Ft^3

IMPERVIOUS AREA X (0.5in/12ft) =

II. PRE-DEVELOPMENT 25 YR STORM CALCULATIONS (24 HR STORM)

A. TIME INCREMENT FOR BOWSTRING CALC'S (min.) — 5 Minutes

B. CALCULATED TIME OF CONCENTRATION (min.) — 4.85 Minutes
TIME OF CONCENTRATION USED (5 minute minimum) — 5.00 Minutes

L = 100 n = 0.1
s = 0.02 C_t = 0.15
where: $T_c = C_t (Ln/s^{0.5})^{0.6}$

C. TOTAL AREA (acres) — 2.95 Acres

D. INTENSITY (inches/hour) — 0.11 in/hr

E. EXISTING COMPACTED IMPORT AREA — 110,275 Ft^2

F. DEVELOPED "C" FACTOR — 0.59

COMPACTED IMPORT C = 0.65
OTHER C = 0.2

G. PEAK FLOW (cubic feet per second) — 0.190 cfs

Q=C*I*A

III. POST DEVELOPMENT 25 YR STORM CALCULATIONS (24 HR STORM)

A. TIME INCREMENT FOR BOWSTRING CALC'S (min.) — 5 Minutes

B. CALCULATED TIME OF CONCENTRATION (min.) — 1.79 Minutes
TIME OF CONCENTRATION USED (5 minute minimum) — 5.00 Minutes

L = 100 n = 0.027
s = 0.007 C_t = 0.15
where: $T_c = C_t (Ln/s^{0.5})^{0.6}$

C. TOTAL AREA (acres) — 2.95 Acres

D. INTENSITY (inches/hour) — 0.11 in/hr

E. IMPERVIOUS AREA — 110,275 Ft^2

F. DEVELOPED "C" FACTOR — 0.801

IMPERVIOUS C = 0.9
OTHER C = 0.2

G. PEAK FLOW (cubic feet per second) — 0.260 cfs

Q=C*I*A

IV. PRE- VS. POST DEVELOPMENT RUN-OFF CALCULATIONS

A. PRE-DEVELOPMENT PEAK FLOW (cubic feet per second) — 0.190 cfs

B. POST DEVELOPMENT PEAK FLOW (cubic feet per second) — 0.260 cfs

C. DIFFERENCE OF PRE- VS. POST PEAK FLOW — 0.070 cfs

D. VOLUME OF STORMWATER FOR 24 HR STORM (cubic feet) — 6015 Ft^3

$V = Q_{post-pre} * 24hr * 3600 sec/hr$

E. SWALE INFILTRATION FLOW (cubic feet per second) — 0.01 cfs

0 # OF 1cfs DRYWELLS = 0.0 cfs
0 # OF 0.3cfs DRYWELLS = 0.0 cfs
SOIL PERMEABILITY (in/hr) = 0.06

F. VOLUME LOSS THROUGH SWALE INFILTRATION — 945 Ft^3

G. ADDITION STORAGE REQUIRED ABOVE 1/2" RUN-OFF VOL. — 475 Ft^3

V. ROUTING CALCULATIONS

A. PROPOSED MINIMUM SWALE VOLUME (cubic feet) 5,070 Ft^3

B. SWALE INFILTRATION FLOW (cubic feet per second) 0.01 cfs

0 # OF 1cfs DRYWELLS = 0.0 cfs
0 # OF 0.3cfs DRYWELLS = 0.0 cfs
SOIL PERMEABILITY (in/hr) = 0.06

C. "BOWSTRING" METHOD

#1 Time Inc. (min)	#2 Time Inc. (sec)	#3 Intensity (in/hr)	#4 Q Dev. (cfs)	#5 V in (cf)	#6 V out (cf)	#7 Storage V (cf)	#8 Overflow V (cf)	#9 PreDev V (cf)
5	300	2.88	6.80	2733.87	3.62	2730.25	-2339.52	2001.14
10	600	2.06	4.86	3414.79	7.24	3407.55	-1662.22	2499.56
15	900	1.69	3.99	3998.66	10.86	3987.80	-1081.98	2926.94
20	1200	1.54	3.64	4734.69	14.49	4720.21	-349.57	3465.70
25	1500	1.34	3.16	5069.06	18.11	5050.95	-18.82	3710.45
30	1800	1.20	2.83	5389.54	21.73	5367.81	298.04	3945.03
35	2100	1.09	2.57	5667.66	25.35	5642.31	572.54	4148.61
40	2400	1.00	2.36	5908.09	28.97	5879.12	809.35	4324.60
45	2700	0.93	2.20	6153.34	32.59	6120.75	1050.98	4504.12
50	3000	0.87	2.05	6372.66	36.21	6336.45	1266.68	4664.66
55	3300	0.82	1.94	6587.31	39.83	6547.48	1477.71	4821.78
60	3600	0.78	1.84	6818.53	43.46	6775.08	1705.31	4991.03
65	3900	0.74	1.75	6993.09	47.08	6946.01	1876.24	5118.80
70	4200	0.70	1.65	7110.96	50.70	7060.27	1990.49	5205.08
75	4500	0.67	1.58	7280.84	54.32	7226.52	2156.75	5329.43
80	4800	0.65	1.53	7523.96	57.94	7466.02	2396.25	5507.39
85	5100	0.63	1.49	7738.75	61.56	7677.19	2607.42	5664.61
90	5400	0.61	1.44	7925.20	65.18	7860.02	2790.25	5801.09
95	5700	0.59	1.39	8083.32	68.80	8014.52	2944.74	5916.82
100	6000	0.57	1.35	8213.10	72.43	8140.67	3070.90	6011.82
1440	86400	0.11	0.26	22468.75	1042.92	21425.82	16356.05	16446.66

VI. RESULTS

A. VOLUME REQUIRED FOR 1ST 1/2" STORAGE (cubic feet) 4,595 Ft^3

B. ADDITION STORAGE PROVIDED ABOVE 1/2" RUN-OFF VOL. 475 Ft^3

C. PROPOSED MINIMUM SWALE VOLUME (cubic feet) 5,070 Ft^3

D. MINIMUM BASE SWALE AREA @ 7" DEPTH (square feet) 8691 Ft^2

VII. OUTLET PIPE SIZING

Peak Discharge Flow for 25-year storm = 0.258 cfs

Manning's Equation:

Q= (1.49/n)*A*(R^2/3)*(S^1/2)

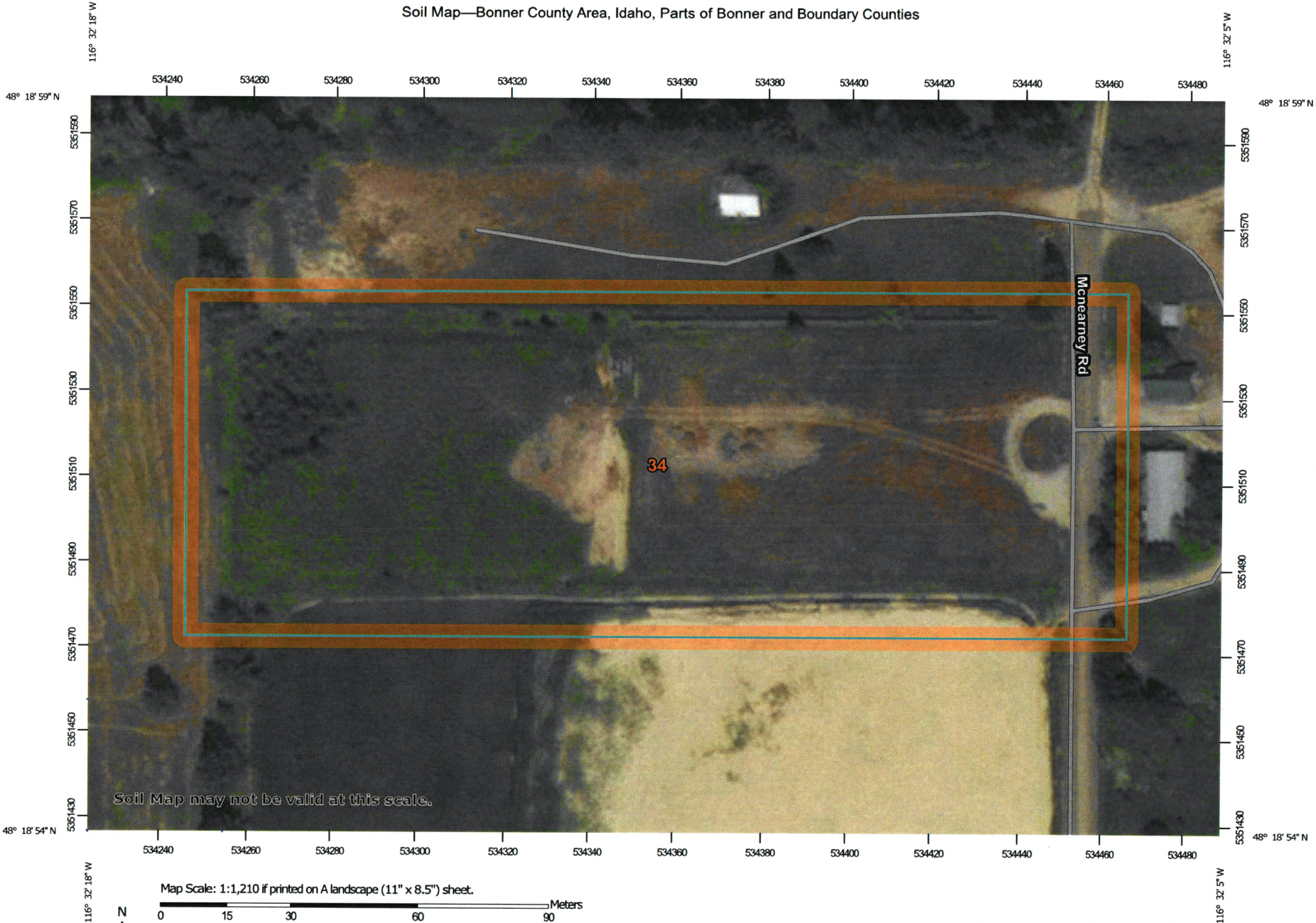
Q=	0.477	Flow (cfs)
n=	0.015	Roughness Coefficient
A=	0.1684	Cross Sectional Area (sq. ft.)
R=	0.1521	Hydraulic Radius (ft.)
S=	0.01	Slope (ft/ft)

Pipe Diameter =	6
Sectional Area =	0.196349375
80% Water Section =	0.1684
80% Wet Perimeter =	1.107
R =	0.1521
R^2/3	0.2850

gpm = 213.94

PIPE SIZE TO TRANSMIT POST-DEVELOPMENT PEAK FLOW: 6 inch

Soil Map—Bonner County Area, Idaho, Parts of Bonner and Boundary Counties



Map Scale: 1:1,210 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 16, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 15, 2010—Aug 23, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
34	Odenson silt loam, 0 to 2 percent slopes	4.4	100.0%
Totals for Area of Interest		**4.4**	**100.0%**

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
34----------	0-9	4-10	1.20-1.30	0.6-2.0	0.19-0.21	6.1-7.8	Low----------	0.43	5	5	3-6
Odenson	9-35	18-35	1.50-1.65	0.2-0.6	0.19-0.21	7.4-8.4	Moderate-----	0.49			
	35-60	4-42	1.40-1.70	0.06-0.2	0.15-0.21	7.9-8.4	Moderate-----	0.55			
35----------	0-13	3-5	0.65-0.95	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.43	4	---	1-3
Pend Oreille	13-17	2-8	0.85-1.20	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.43			
	17-41	2-5	1.30-1.50	2.0-6.0	0.07-0.09	5.6-7.3	Low----------	0.24			
	41-60	2-5	1.30-1.50	2.0-6.0	0.04-0.07	5.6-7.3	Low----------	0.15			
36*:											
Pend Oreille----	0-13	3-5	0.65-0.95	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.43	4	---	1-3
	13-17	2-8	0.85-1.20	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.43			
	17-41	2-5	1.30-1.50	2.0-6.0	0.07-0.09	5.6-7.3	Low----------	0.24			
	41-60	2-5	1.30-1.50	2.0-6.0	0.04-0.07	5.6-7.3	Low----------	0.15			
Hoodoo----------	0-15	0-5	0.65-0.85	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.49	4	---	2-5
	15-52	0-5	0.75-1.00	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.49			
	52-60	20-35	1.50-1.70	0.2-0.6	0.10-0.15	5.6-7.3	Moderate-----	0.07			
37*:											
Pend Oreille----	0-13	3-5	0.65-0.95	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.43	4	---	1-3
	13-17	2-8	0.85-1.20	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.43			
	17-41	2-5	1.30-1.50	2.0-6.0	0.07-0.09	5.6-7.3	Low----------	0.24			
	41-60	2-5	1.30-1.50	2.0-6.0	0.04-0.07	5.6-7.3	Low----------	0.15			
Rock outcrop.											
38, 39----------	0-12	3-8	1.20-1.35	2.0-6.0	0.07-0.09	5.6-7.3	Low----------	0.17	2	---	1-2
Priestlake	12-23	3-8	1.30-1.55	2.0-6.0	0.04-0.06	5.6-7.3	Low----------	0.10			
	23-60	3-8	1.55-1.70	>6.0	0.03-0.05	5.6-7.3	Low----------	0.05			
40----------	0-18	7-10	0.85-0.95	0.6-2.0	0.13-0.15	5.1-6.0	Low----------	0.28	2	---	2-4
Prouty	18-37	2-5	1.30-1.60	2.0-6.0	0.03-0.06	5.1-6.0	Low----------	0.24			
	37	---	---	---	---	---	----------	----			
41----------	0-10	---	0.20-0.40	0.6-2.0	0.22-0.30	5.1-7.3	High---------	----	5	2	20-65
Pywell	10-60	---	0.20-0.40	0.6-2.0	0.22-0.30	5.1-7.3	High---------	----			
42*:											
Pywell----------	0-10	---	0.20-0.40	0.6-2.0	0.22-0.30	5.1-7.3	High---------	----	5	2	20-65
	10-60	---	0.20-0.40	0.6-2.0	0.22-0.30	5.1-7.3	High---------	----			
Hoodoo----------	0-15	0-5	0.65-0.85	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.49	4	---	2-5
	15-52	0-5	0.75-1.00	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.49			
	52-60	20-35	1.50-1.70	0.2-0.6	0.10-0.15	5.6-7.3	Moderate-----	0.07			
43----------	0-17	---	0.65-0.85	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.55	5	5	3-6
Rathdrum	17-55	---	0.65-0.85	0.6-2.0	0.15-0.21	5.6-7.3	Low----------	0.55			
	55-60	---	0.65-0.95	0.6-2.0	0.11-0.21	5.6-7.3	Low----------	0.49			
44----------	0-17	---	0.65-0.85	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.55	5	5	3-6
Rathdrum	17-55	---	0.65-0.85	0.6-2.0	0.15-0.21	5.6-7.3	Low----------	0.55			
	55-60	---	0.65-0.95	0.6-2.0	0.11-0.21	5.6-7.3	Low----------	0.49			
45*:											
Rathdrum--------	0-17	---	0.65-0.85	0.6-2.0	0.19-0.21	5.6-7.3	Low----------	0.55	5	5	3-6
	17-55	---	0.65-0.85	0.6-2.0	0.15-0.21	5.6-7.3	Low----------	0.55			
	55-60	---	0.65-0.95	0.6-2.0	0.11-0.21	5.6-7.3	Low----------	0.49			
Bonner----------	0-5	2-8	0.70-0.95	0.6-2.0	0.17-0.21	5.6-7.3	Low----------	0.49	3	5	2-4
	5-21	2-8	0.85-1.20	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.28			
	21-29	2-8	1.35-1.55	0.6-2.0	0.08-0.12	5.6-7.3	Low----------	0.24			
	29-60	0-5	1.30-1.55	>6.0	0.03-0.05	5.6-7.3	Low----------	0.02			
46*:											
Rock outcrop.											

See footnote at end of table.

FIGURE 6-4 ZONE C, INTENSITY-DURATION-FREQUENCY CURVE
(IDAHO TRANSPORTATION DEPARTMENT)

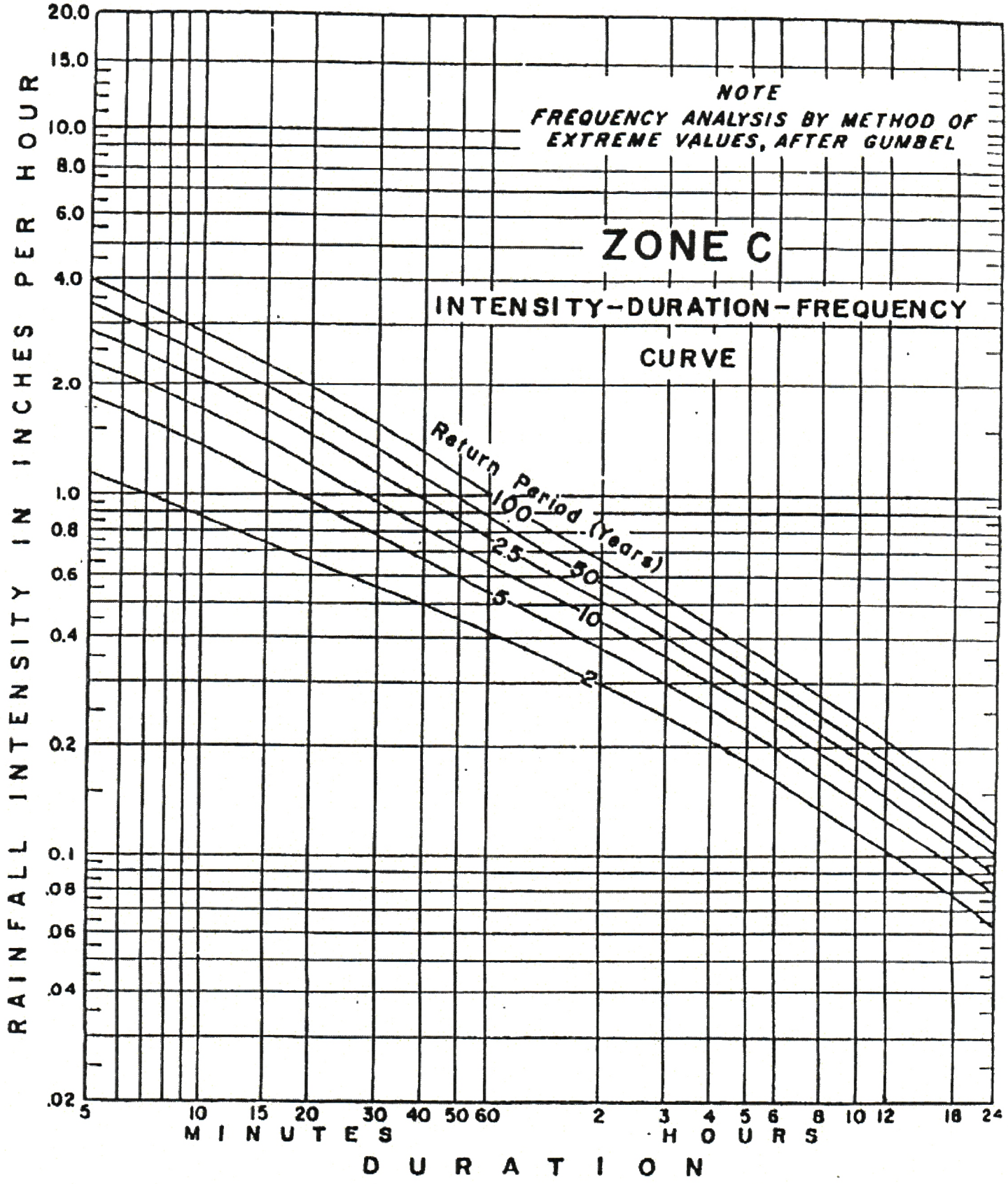


TABLE 6-2 RUNOFF COEFFICIENTS FOR THE RATIONAL METHOD FOR DETERMINING PEAK DISCHARGE

Type of Cover	Flat	Rolling 2%-10%	Hilly Over 10%
Pavement and Roofs	0.90	0.90	0.90
Earth Shoulders	0.50	0.50	0.50
Drives and Walks	0.75	0.80	0.85
Gravel Pavement	0.50	0.55	0.60
City Business Areas	0.80	0.85	0.85
Suburban Residential	0.25	0.35	0.40
Single Family Residential	0.30	0.40	0.50
Multi Units, Detached	0.40	0.50	0.60
Multi Units, Attached	0.60	0.65	0.70
Lawns, Very Sandy Soil	0.05	0.07	0.10
Lawns, Sandy Soil	0.10	0.15	0.20
Lawns, Heavy Soil	0.17	0.22	0.35
Grass Shoulders	0.25	0.25	0.25
Side Slopes, Earth	0.60	0.60	0.60
Side Slopes, Turf	0.30	0.30	0.30
Median Areas, Turf	0.25	0.30	0.30
Cultivated Land, Clay and Loam	0.50	0.55	0.60
Cultivated Land, Sand and Gravel	0.25	0.30	0.35
Industrial Areas, Light	0.50	0.70	0.80
Industrial Areas, Heavy	0.60	0.80	0.90
Parks and Cemetaries	0.10	0.15	0.25
Playgrounds	0.20	0.25	0.30
Woodland and Forests	0.10	0.15	0.20
Meadows and Pasture Land	0.25	0.30	0.35
Pasture with Frozen Ground	0.40	0.45	0.50
Unimproved Areas	0.10	0.20	0.30

TABLE 6-3 GROUND COVER COEFFICENTS

Type of Cover		K (ground cover coefficient)
Forest with heavy ground cover		150
Minimum tillage cultivation		280
Short pasture grass or lawn		420
Nearly bare ground		600
Grassed waterway or small roadside ditch		900
Paved area		1,200
Gutter flow	0.25 feet deep	1,500
	0.50 feet deep	2,400
	0.75 feet deep	3,100

		Concrete (n = 0.012)	CMP (n = 0.024)
Storm Sewers (Concrete)	12 inch diameter	3,000	1,500
	18 inch diameter	3,900	1,950
	24 inch diameter	4,700	2,350

		Narrow W/D = 1	Medium W/D = 2	Wide W/D = 9
Open Channel Flow (n = 0.040)	1 foot deep	1,100	1,500	2,000
	2 feet deep	1,800	2,300	3,100
	4 feet deep	2,800	3,700	5,000