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United States
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Region 10
1200 Sixth Avenue
Seattle WA 98101

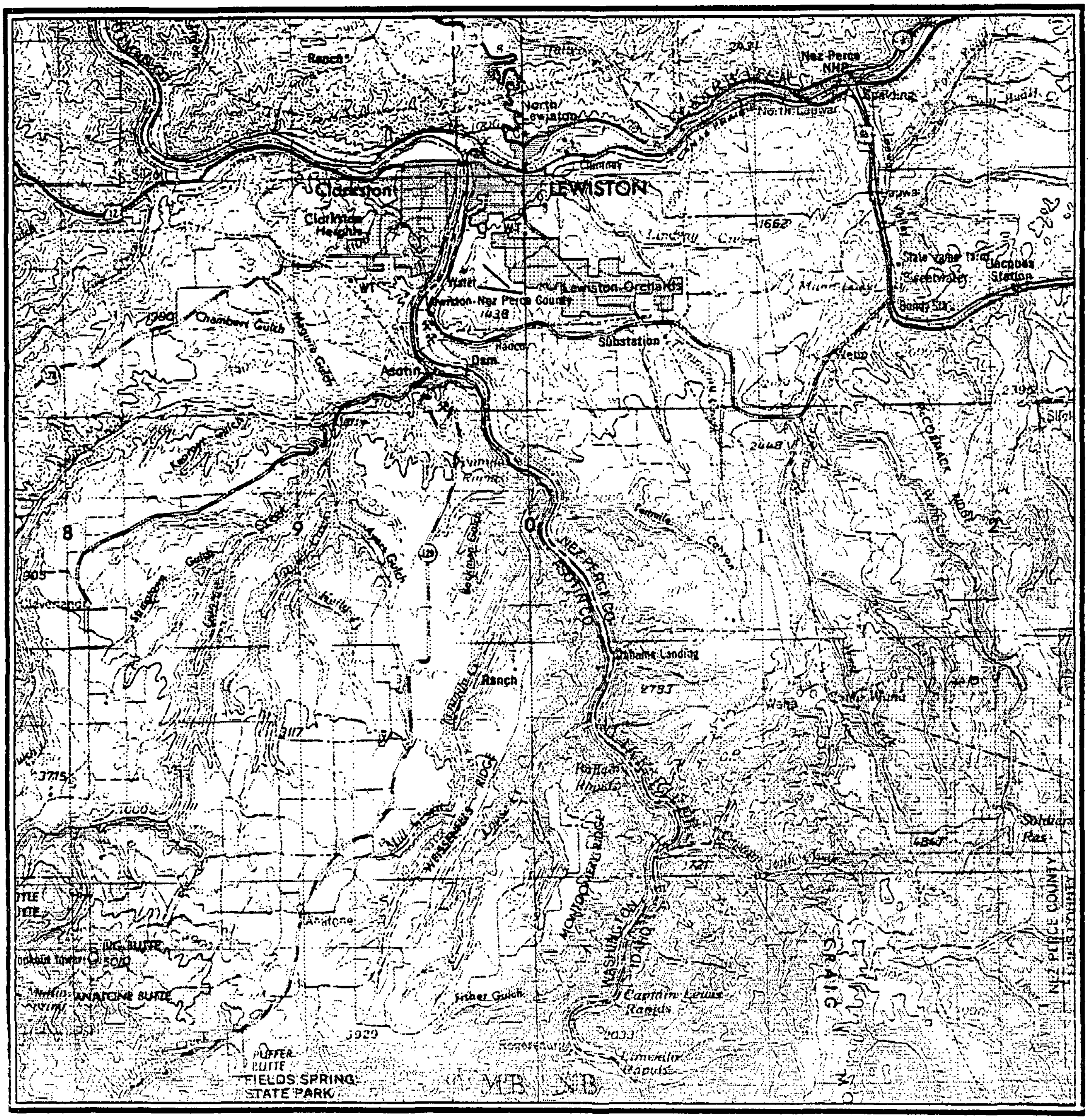
April 1988

Office of Ground Water

EPA

Resource Document

For Consideration of the Lewiston Basin Aquifer as a Sole Source Aquifer



RESOURCE DOCUMENT FOR CONSIDERATION OF THE LEWISTON BASIN AQUIFER AS A SOLE SOURCE AQUIFER

Office of Ground Water
U.S. Environmental Protection Agency
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TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

RESOURCE DOCUMENT FOR CONSIDERATION OF THE LEWISTON BASIN AQUIFER AS AS SOLE SOURCE AQUIFER

INTRODUCTION

Sole Source Aquifer Program

The Safe Drinking Water Act, Public Law 93--523, was signed into law on December 16, 1974.[1] This act provides the statutory basis for designation of sole source aquifers by the Environmental Protection Agency. Section 1424(e) of the Act states:

> "If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer."

EPA defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer.[2] EPA guidelines also stipulate that designated sole source aquifer areas have no available alternative source or combination of sources which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.[2]

Petition

On December 27, 1987, the Region 10 Office of the Environmental Protection Agency (EPA) received a petition from the Asotin County Public Utility District (PUD) requesting that EPA designate the "Russell Aquifer" as a sole source aquifer.[3] The PUD provided additional information through a revised petition which was received by EPA on February 1, 1988.[3]

The "Russell Aquifer" was defined as the upper 800 feet of the Grande Ronde Formation within the Lewiston Basin by a hydrogeological report published in 1980.[4] For the purposes of this report, EPA has combined the Grande Ronde Formation with other water-bearing rocks of the Lewiston Basin and will refer to the aquifer system as the Lewiston Basin Aquifer.

The Asotin County PUD petitioned EPA for designation of its water supply as a sole source aquifer (SSA) under Section 1424(e) of the Safe Drinking Water Act for a number of reasons. First, the PUD's action was designed to "heighten public awareness and further concerns for protecting the aquifer".[2] Second, the PUD stated that SSA designation would provide "the District and other groundwater users in the area a tool to protect the aquifer from potential sources of contamination".[3] Finally, the PUD mentioned EPA project review authority and the possibility of future financial assistance for aquifer protection efforts as reasons for submitting their petition.

Purpose

This document summarizes available information about the ground-water resources of the Lewiston Basin, Washington and Idaho, and will provide the technical basis for an EPA decision regarding sole source aquifer designation. Those interested in more detailed information may consult the references listed at the end of the report.

GENERAL DESCRIPTION OF THE LEWISTON BASIN

Geographical Overview

The Lewiston Basin covers approximately 400 square miles of southeastern Washington and western north-central Idaho.[4] The structural and topographic downwarp lies near the eastern margin of a more than 50,000 square mile area, underlain by layered basalt, known as the Columbia River Plateau (Fig. 1).[5,6] The asymmetrically shaped basin consists mostly of a basalt plateau surface, deeply dissected by permanent and seasonal drainages, which slopes gently northward.[7] Along the northern margin of the basin and near its structural center lies a pronounced triangular shaped lowland at the confluence of the Snake and Clearwater Rivers.[7] The cities of Lewiston, Idaho and Clarkston, Washington are built upon a series of gravel terraces on this lowland area where the two rivers meet.[8] Elevations within the basin range from about 800 feet along the Snake River to over 5000 feet along the southern margin of the area. A description of the hydrogeologic boundaries of the basin occurs later in this report, as does a map (Attachment 2) delineating those boundaries.

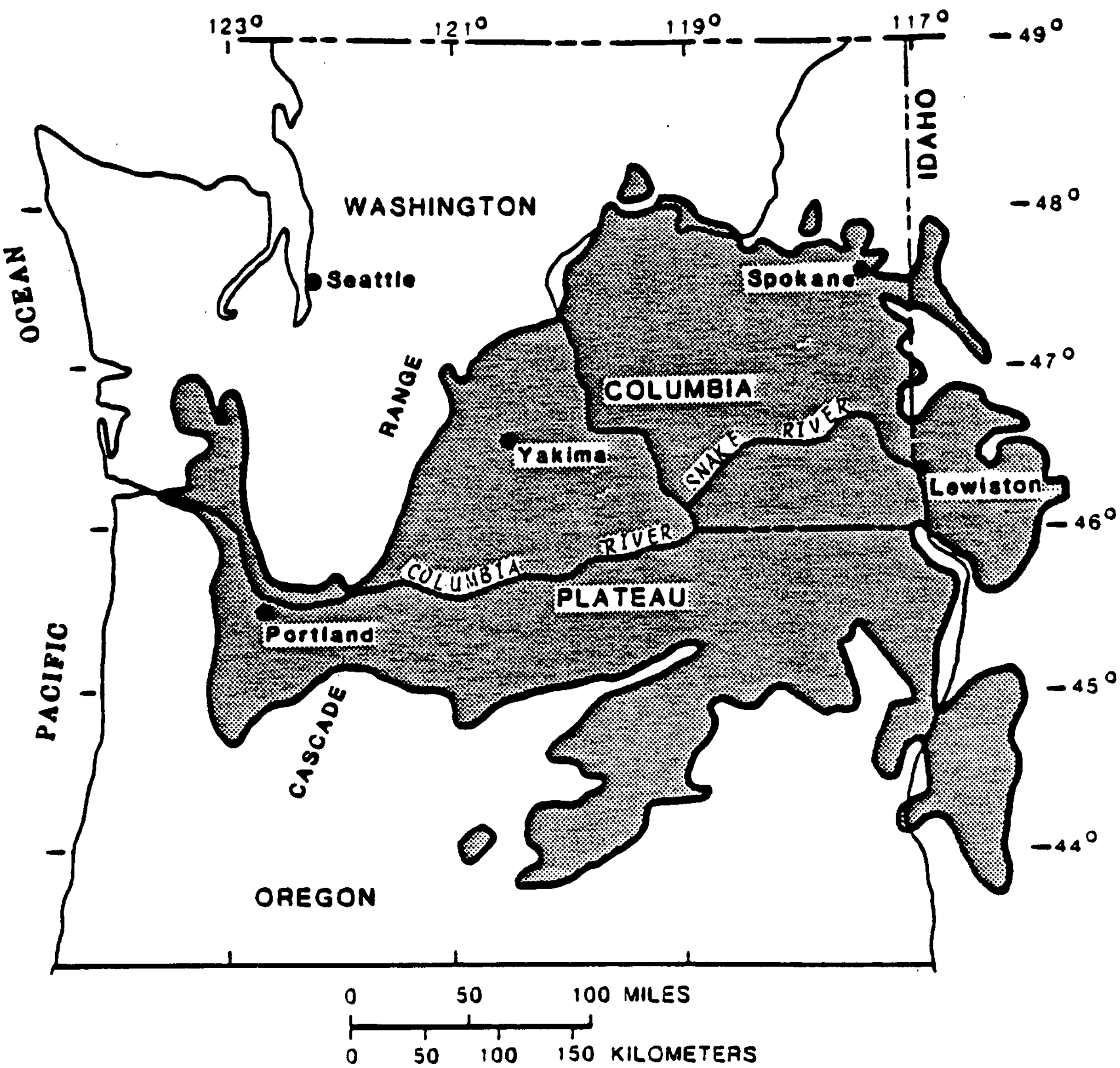


FIGURE 1

Areal Extent of the Columbia River Basalt
(Modified from Drost and Whiteman, 1986)

Climate

A semi-arid continental climate prevails across the lower elevations of the Lewiston Basin. Temperature records from the Lewiston-Nez Perce County Airport (elevation 1436 feet) show an average January temperature of 31 degrees (Fahrenheit), an average July temperature of 74 degrees, and an annual average of 52 degrees.[4] Precipitation averages about 13 inches each year in the Lewiston-Clarkston area whereas higher elevation areas average close to 25 inches of precipitation annually.[4] Summers in the Lewiston-Clarkston area tend to be quite hot and dry. Temperatures often exceed 100 degrees during July and August while the humidity averages 25 percent during those months.[4]

Population

The cities of Lewiston and Clarkston, located near the confluence of the Clearwater and Snake Rivers, account for most of the Lewiston Basin's population. A breakdown of the area's population by political subdivision appears below.

POPULATION WITHIN THE LEWISTON BASIN

Political Subdivision	Estimated Population*
Nez Perce County, Idaho:	
Lewiston	28,050
Lapwai	1,045
Unincorporated	1,005
Total	30,100
Asotin County, Washington:	
Asotin	1,020
Clarkston	6,730
Unincorporated	8,550
Total	16,300
Garfield County, Washington:	
Unincorporated	100
Lewiston Basin Total	46,500

* City and town populations are from the Idaho Blue Book, 1987-88 and the 1987 Washington State Yearbook. Rural population figures were provided by the petitioner.

Geology

The rocks of the Lewiston Basin fall into three general groupings: pre-Tertiary rocks, Miocene basalts of the Columbia River Group, and unconsolidated sediments. Pre-Tertiary rocks crop out extensively south, east, and north of the basin but are almost completely covered by basalt within the basin itself. Basalts of the Columbia River Group dominate the landscape of the Lewiston Basin and also contain most of its ground water. Pliocene to Holocene sediments, consisting mostly of gravels, cover the basalt in low-lying areas of the basin along the Snake and Clearwater Rivers and some tributary streams.

PRE-TERTIARY ROCKS

The only mapped exposure of pre-Tertiary rocks within the Lewiston Basin occurs along the Snake River in Township 33N, Range 47E, just northwest of the basin bounding Limekiln Fault. At this locality, a wide variety of Triassic through Cretaceous metamorphic rocks, all mapped as one unit, crop out over a roughly three square mile area which has over 3000 feet of relief.[7] This same map unit crops out extensively in Hells Canyon, to the south, and in parts of the Clearwater Plateau east of the basin.[7,9] North of the basin, Jurassic through Cretaceous intrusive granitic rocks outcrop extensively at Bald Butte.[7] Numerous investigators, beginning in 1897, have concluded that these pre-Tertiary "basement" rocks exhibit over 4000 feet of relief north, south, and east of the basin.[7,9,10,11] No wells within the Lewiston Basin have fully penetrated the basalt and reached the pre-Tertiary surface but ground-water studies east of the basin indicate that the pre-Tertiary rocks do not act as aquifers.[12]

COLUMBIA RIVER BASALT

Miocene basalts of the Columbia River Group cover much of the Pacific Northwest, including the Lewiston Basin, as shown by Figure 1. These rocks, referred to as flood basalts, originated as lava which flowed freely to the surface from long, narrow, northwest-trending vents or fissures.[13] The low-viscosity molten rock spread easily, cooling to form thin but areally extensive basalt beds.

Dozens of these individual flow units, whose thickness ranges from a few inches to about 300 feet, are stacked upon one another to form the Columbia River Basalt Group.[11] The total thickness of the basalt flows exceeds 4,000 feet and may reach 9,000 to 15,000 feet in the central part of the area shown in Figure 1.[5,14] Within the Lewiston Basin, the Columbia River Basalt Group is over 3,000 feet thick, and has been stratigraphically subdivided into four formations as shown in Figure 2.

Group	Subgroup	Formation	Thickness (feet)
Columbia River Basalt Group	Yakima Basalt Subgroup	Saddle Mountains Basalt	0-400[5]
		Sweetwater Interbed	
		Wanapum Basalt	0-400[5]
		Saprolite Horizon	
		Grande Ronde Basalt	2000-2800[9]
		Imnaha Basalt	0-400[11]

FIGURE 2

Generalized Basalt Stratigraphy of the Lewiston Basin

The earliest of the Columbia River Basalt flows, labeled the Imnaha Formation, occurs only in northeastern Oregon and adjacent parts of Washington and Idaho.[11] Apparent age determinations by whole-rock potassium-argon (K-Ar) radiometric analyses suggest that the Imnaha lavas were extruded about 16.5 million years ago.[11] Younger basalts cover the Imnaha Formation over most of the basin; mapped exposures occur only along the southeastern and northwestern margins near basin boundary faults.[7] The thickness of the Imnaha varies greatly due to the local relief of the pre-basalt surface with areas of ponded lava reaching 400 feet.[7,11] The unit contains noticeably coarser grains than the overlying Grande Ronde Formation, and has weathered to form slopes where it outcrops.[7,11] No wells in the Lewiston Basin have been drilled to the Imnaha Formation, because adequate supplies of ground-water are available in the overlying Grande Ronde Formation.

The Grande Ronde Formation accounts for by far the greatest volume of basalt throughout the Columbia River Plateau, including the Lewiston Basin. Estimated thicknesses vary from 2800 feet in the southern Lewiston Basin to 2,000 feet in the northern basin.[9] Individual basalt flows vary in thickness from a few feet to over 150 feet, and sedimentary deposits between flows are uncommon.[4,7]

The hard, dark gray to black colored rock, composed mostly of microscopic crystals of iron, calcium, and magnesium rich alumnosilicate minerals, weathers along fractures to form prominent cliffs throughout the Columbia River Plateau. In the Lewiston Basin, The Grande Ronde Basalt crops out mostly where surface drainages have cut deep and narrow canyons into, but not completely through, the formation.[7]

The Grande Ronde Formation produces most of the ground-water consumed in the area because of its great thickness, extensive lateral continuity, and lack of fine-grained sedimentary interbeds. Water level maps emphasize the dominance of the Grande Ronde Formation within the Lewiston Basin by showing generalized contours for the Grande Ronde Formation only, and not other units.[14] Ground water in the much thinner overlying basalts occurs in a series of laterally discontinuous areas as a result of the many canyons which have downcut into the Grande Ronde Formation.

A stratigraphic horizon of weathered basalt and clay forms the top of the Grande Ronde Formation. This interbed, which has an apparent absolute age of about 14.5 million years, occurs continuously across the basin.[4,7,11] The weathered basalt (saprolite) and clay surface marks the top of the most prolific aquifer in the basin. Water can percolate through the saprolitic horizon, however, and so the Grande Ronde Formation of the Lewiston Basin cannot be considered hydrogeologically separate from the overlying water-bearing rocks.

Thick and areally extensive basalt flows of Wanapum age pinch-out west of the Lewiston Basin.[5,9] Within the basin itself, flows of the Wanapum Formation occur sporadically.[4,9] These patterns of occurrence suggest that the basalt surface in the Lewiston Basin area was beginning to deform during Wanapum time.[4,9] Fine grained sedimentary beds between flow units are common.[4] Partly for this reason, wells completed in the Wanapum yield much smaller quantities of water than those completed in the Grande Ronde Formation.

Basalts of the Saddle Mountains Formation overlie an extensive fluvial deposit, the Sweetwater Interbed, which thins away from the structural center of the basin.[9] The Saddle Mountains flows originated within the Lewiston Basin and occur as two distinct physical types: (1) stratiform basalts, thin areally extensive flows separated by sedimentary interbeds, and (2) channelform basalts, interpreted to represent lava-filled canyons of the ancestral Snake River.[9,11] The massive channelform basalts are not tapped for ground water. The stratiform basalts, like those of the Wanapum Formation, yield much smaller quantities of ground water than the Grande Ronde Formation.

BASALT DEFORMATION

Deformation of the entire Columbia River Basalt Group has produced the present structural configuration of the Lewiston Basin. Deformation began after deposition of the Grande Ronde Formation but became most intense after deposition of the entire Columbia River Basalt Group during the period of mountain building which produced the Blue Mountains and the Cascade Range.[4,8,9]. Assuming that the top of the Grande Ronde Formation was roughly level when formed, deformation has produced about 5000 feet of relief in the basin since extrusion of the Grande Ronde Basalt ceased.[7]

UNCONSOLIDATED SEDIMENTS

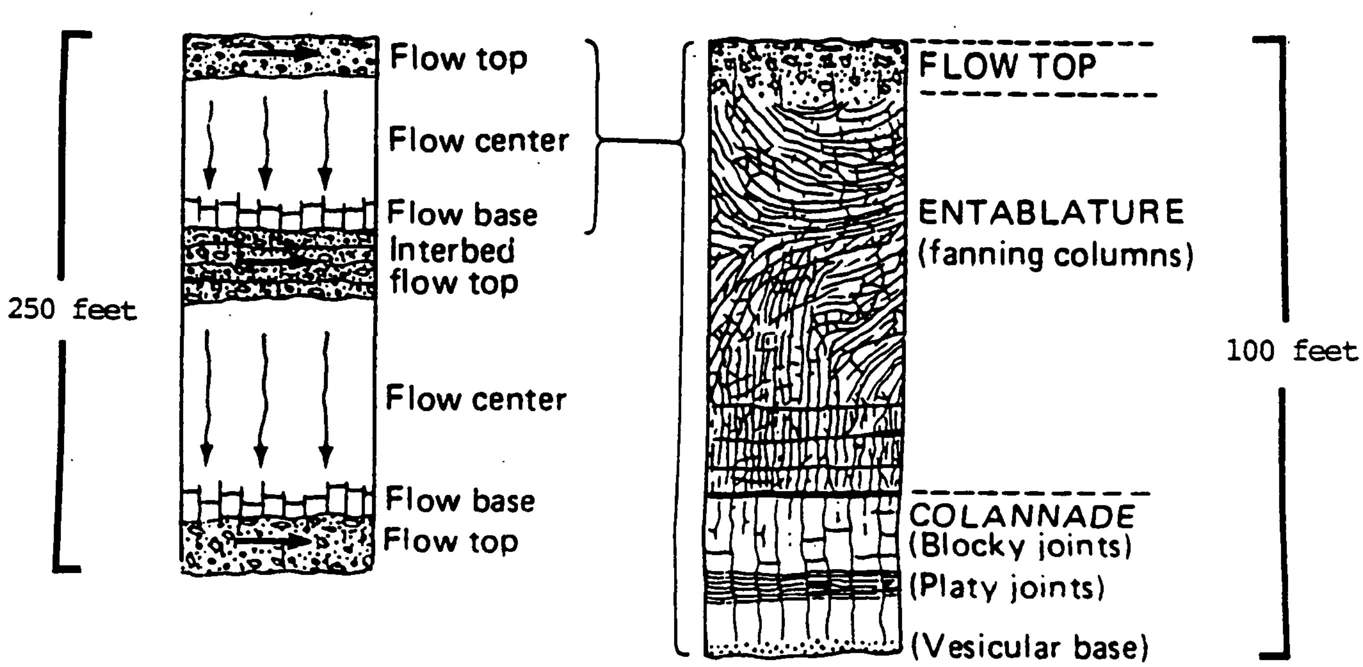
Unconsolidated sedimentary material, composed predominately of gravel with some sand and silt, covers much of the approximately 20 square mile triangular lowland at the confluence of the Snake and Clearwater River.[7,8] These sediments, which have been divided into seven stratigraphic units, are interpreted to represent recent alluvium and ancestral channels of the Clearwater, Salmon, and Snake Rivers.[8] Driller's logs from 23 wells in the Lewiston-Clarkston area record overburden depths of up to 190 feet although typical thicknesses range between 20 and 100 feet.[4] The unconsolidated sediments do transmit water to the underlying basalt and, where adequate recharge exists, form water table aquifers atop the basalt aquifer system.[4,15] However, few wells produce from the unconsolidated sediments and no published information characterizes the water table aquifers.[15]

Ground Water Movement

Basalts of the Columbia River Group, and especially those of the Grande Ronde Formation, store and transmit most of the ground water in the Lewiston Basin. The basalt itself is dense and impermeable to water. However, the basalt flows are fractured throughout as illustrated by Figure 3. Most ground water moves laterally along flow tops (composed of vesicular and broken basalt formed by rapid cooling at the top of the flow), but some water also moves between flow tops through the entablature and colonnade (Fig. 3). Very thin basalt flows may consist only of a flow top and an intensely fractured base which forms a good hydrologic connection with the underlying flow top.[6] The center portions of thick flows, although not impermeable, may restrict vertical ground-water movement enough to act as confining beds.[5,6,14]

FIGURE 3

Idealized Basalt Flow Sequence and Basalt Intraflow Structures



Water moves most easily along basalt flow tops as illustrated by the thicker arrows showing direction of water movement. The flow thickness of 100 feet represents a typical flow, but actual flow thicknesses within the Lewiston Basin range from a few feet to over 150 feet.

(from Whiteman, 1986)

Sedimentary deposits between basalt flows, called interbeds, vary greatly in their thickness and ability to transmit water. Ground water moves easily through coarse-grained interbeds but hardly at all through fine-grained units. Fine-grained interbeds, which act as confining units, occur commonly in the Wanapum and Saddle Mountains Formations but rarely between flows of the Grande Ronde Basalt.[4] About two-thirds of selected well logs (mostly sample descriptions by well drillers) from the Lewiston Basin document fine-grained interbeds somewhere in the stratigraphic section; reported thicknesses in individual beds range from 1 to 175 feet but are mostly less than 30 feet.[4]

On a grand scale, ground water moves from the higher elevation areas of the Lewiston Basin, mostly through the basalt flow tops, towards the lower elevation areas of the basin. Generalized water level contours for the Grande Ronde Basalt range from over 5000 feet near the crest of the Blue Mountains to less than 800 feet along the Snake River.[14] However, geologic features within the basin act to intercept, direct, or dramatically slow the ground water as it moves through the gently sloping basalt beds. Where canyons have cut deeply into the basalt, ground water discharges as springs in the canyon walls. Springs such as these provide the baseflow for the permanent streams of Asotin, George, and Pintler Creeks.[4] All permanent and a number of seasonal drainages within the basin completely intercept ground water moving laterally through the Wanapum and Saddle Mountains Formations.[7] In contrast, no canyons entirely intercept ground water moving laterally through the thick Grande Ronde Formation, although Asotin Creek does intercept ground water moving through the upper 400 feet of the 2,000 to 2,800 foot thick unit.[4,7,9] Dikes, which are long and narrow northwest trending volcanic vent relics, impede the flow of ground water since the solid basalt-filled fissures cut vertically through the stratigraphic section.[6,13] A pump test in 1979 identified a hydrogeologic barrier, interpreted as a dike, located between two water supply wells which produce from the Grande Ronde Formation southwest of Clarkston.[4]

The rate of ground-water movement within the basin has only been estimated for the Grande Ronde Formation beneath the Lewiston-Clarkston area. An average ground-water velocity of 0.84 feet per day was calculated by using a hydraulic conductivity value of 134 feet per day (derived from transmissivity as determined by a pump test), a gradient of 3.3 feet per mile (based upon water level data), and an estimated average porosity of 10 percent.[4] However, assuming the same values for porosity and hydraulic conductivity, but increasing the gradient to 2 degrees (184 feet per mile), which roughly represents the regional dip of the basalt along the southern flank of the basin, yields an average ground-water velocity of nearly 47 feet per day.

RECHARGE

Recharge to the Lewiston Basin aquifer system occurs principally from streamflow infiltration. Streamflow infiltration to the basalt aquifers occurs mostly where rivers and creeks flow over basalt flow tops, which happens where basalt beds dip more steeply than the surface drainage gradient.[4] These areas have been delineated for the upper 800 feet of the Grande Ronde Formation (Fig. 4). Although no streamflow data have been obtained to measure the amount of recharge, water level records of deep wells in the Lewiston-Clarkston area suggest excellent hydrologic communication between surface water sources and the Grande Ronde Formation. Deep wells in the Lewiston-Clarkston area show no long term declines and, in fact, water levels rose and stabilized at a higher level in response to the filling of the Lower Granite Reservoir.[4] Also, detailed measurements during aquifer tests show that water levels in some wells respond to changes in river stage.[4]

The Wanapum Basalts dip beneath the Clearwater and Snake Rivers in a manner which would favor recharge from the rivers. However, declining water levels over the past 20 years in wells near likely recharge areas suggest that streamflow less effectively recharges the Wanapum Basalts.[4]

Precipitation easily recharges the basalt and unconsolidated sediment lying at or near the surface. At lower elevations, however, scant precipitation and high evaporation rates probably allow recharge via precipitation on a sporadic basis only. Precipitation may significantly recharge the basalt aquifers at higher elevations, but the hydrogeologic impediments mentioned earlier (canyons and dikes) may prevent much of that ground water from reaching the water supply wells in the Lewiston-Clarkston area.[4] Also, if most recharge to the Grande Ronde Formation occurred in the higher elevation areas of the basin, static water levels would be considerably higher rather than at the approximate elevation of the river recharge areas.[4]

Excess irrigation water, which recharges water table aquifers in the unconsolidated sediments, also partly recharges aquifers of the Wanapum and Saddle Mountains Formations in parts of the Lewiston-Clarkston area.[4,15] Predominately lateral flow through the upper basalt and fine-grained interbeds combine to prevent most excess irrigation water from percolating to the Grande Ronde Basalt before reaching a discharge point.

DISCHARGE

Shallow ground water discharges mostly as springs along deeply incised surface drainages, whereas production wells tap much of the deeper ground water in the Lewiston-Clarkston area. Cohen and Ralston (1980) have identified areas where ground water from the Grande Ronde Formation discharged naturally to the Snake River before construction of Lower Granite Dam (Fig. 4). However, since the filling of the Lower Granite Reservoir (February of 1975), the static water levels in wells near the river have been below the elevation of the reservoir surface.[4] Thus, it seems that at least part of the natural discharge area now acts as a recharge area.[4]

Rates of production (artificial discharge) from wells within the Grande Ronde Formation are considerably higher than those from the overlying basalt and unconsolidated sediments. The Asotin County PUD wells produce at rates of 1345 to 4220 gallons per minute (gpm) from the top 800 feet of the Grande Ronde Basalt.[3] In contrast, wells completed in the Wanapum and Saddle Mountains Formations average 10 to 30 gpm.[4]

Areas of Ground Water and Surface Water Interconnection
for the Upper 800 Feet of the Grande Ronde Basalt

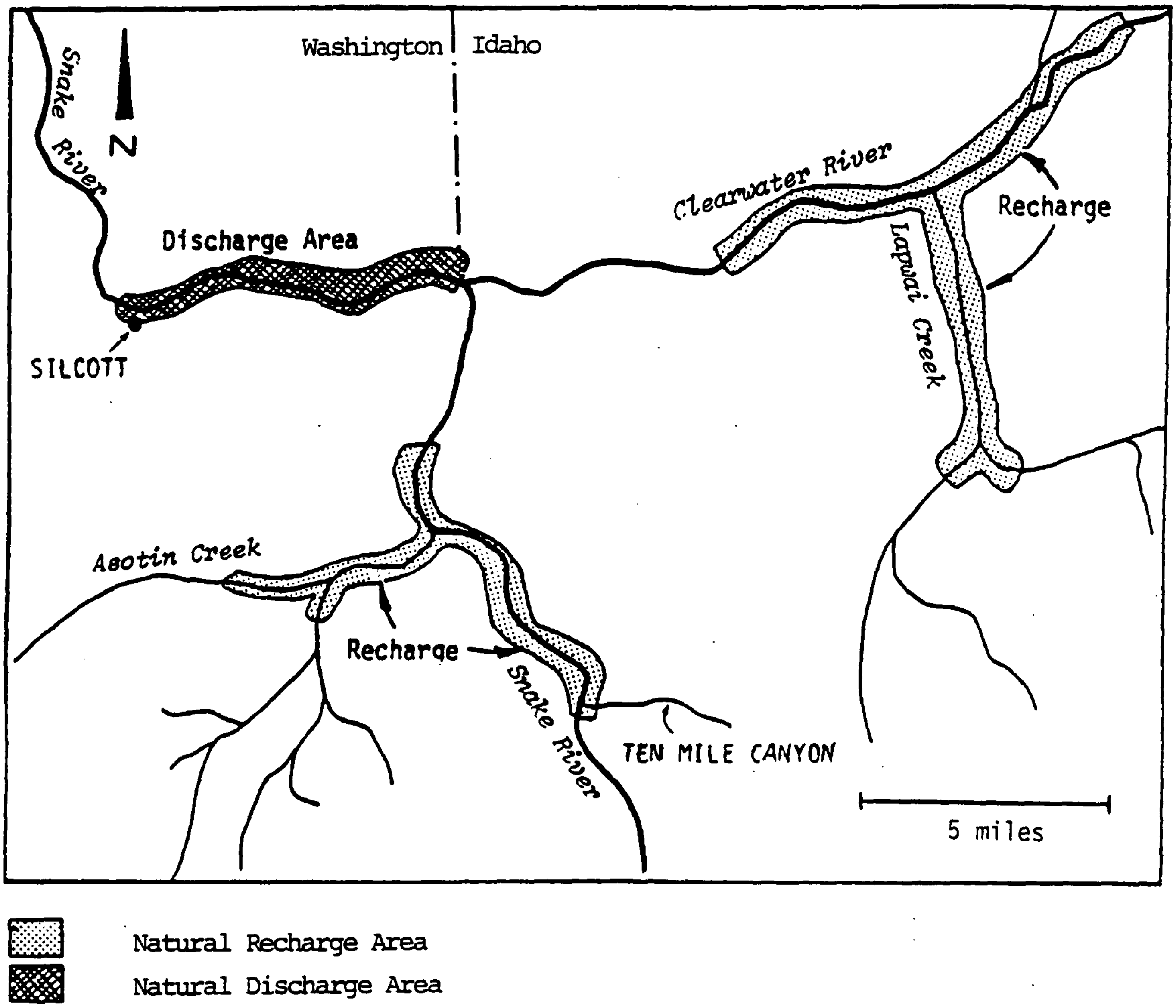


FIGURE 4

Available information suggests that the natural discharge area became a recharge area after filling of the Lower Granite Reservoir in 1975. All shaded areas are now interpreted to represent recharge areas for the upper 800 feet of the Grande Ronde Basalt.

(Modified from Cohen and Ralston, 1980)

Lewiston Basin Boundaries

Major faults and anticlinal folds form most of the hydrogeological boundaries of the proposed Lewiston Basin sole source aquifer area. Faults act as ground-water barriers by offsetting highly permeable flow tops.[6] Also, the pulverized rock in the fault zone weathers to form a clay-rich plane of low permeability.[4,6] Tight folds, caused by stress intense enough to severely deform the basalt, but not so strong as to offset the beds, crush and compact the flow tops so that they transmit water much more slowly. Major anticlinal folds, where the strata dip downward from the fold axis, also act as regional ground-water divides. The major faults and anticlinal folds which bound the Lewiston Basin are shown on Attachment 1. The basin boundaries, delineated on Attachment 2, follow these faults and anticlinal folds except in the southwestern part of the basin. The southwestern boundary has been drawn along a major topographic divide in the Blue Mountains which acts as a regional ground-water divide. No water budget studies for the basin, which would serve to check the hydrogeological significance of the boundaries, have been published.

Streamflow Source and Project Review Areas

Rivers and creeks flow across the structural barriers which act as boundaries for the ground-water basin. Federal financially assisted projects located in the drainage basins of surface streams which recharge ground water within the Lewiston Basin may constitute significant sources of contamination to the aquifer. While the entire streamflow source area includes all of the Snake River drainage upstream from Silcott, Washington, only a portion of the streamflow source area immediately adjacent to the ground-water basin has been delineated for project review purposes (see Attachment 2).

Water Quality

Public water supply wells in the Lewiston-Clarkston area produce excellent quality water from the Grande Ronde Formation. The water typically contains fewer than 350 parts per million (ppm) total dissolved solids (TDS), and requires no treatment before drinking.[3,4] The chemistry of water withdrawn from the Grand Ronde Formation appears typical for ground water from the Columbia River Basalt, and also strongly resembles chemical analyses of surface water from the Snake and Clearwater Rivers.[4,16] The only published report of contaminated ground water in the area occurred in shallow alluvial sediments of Lapwai Creek, probably from septic tank and drain field usage.[12]

Temperature readings of water from public water supply wells (all completed in the Grande Ronde Formation) range from 60 to 74 degrees (Fahrenheit). This corresponds with the typical geothermal gradient of 2 degrees per 100 feet for the Columbia River Basalts.[16] Temperature data for shallower wells has not been published but probably range closer to the mean annual surface temperature of 52 degrees.

Potential For Contamination

Aquifer units within the Lewiston Basin are vulnerable to contamination for one or more of the following reasons: (1) they occur at or near the surface, where precipitation, excess irrigation, and other artificial recharge can introduce contaminants to the subsurface; (2) they are extensively recharged by surface waters; (3) they are hydrologically connected to near-surface aquifers, either naturally or by wellbores.

The most valuable portion of the Lewiston Basin aquifer system from a drinking water standpoint, the upper 800 feet of the Grande Ronde Formation, is most vulnerable to contamination from surface water recharge. Therefore, any project or activity which would threaten the water quality of a possible surface water recharge area (Fig. 4) would also pose a threat to the principal source of drinking water within the Lewiston Basin. The Grande Ronde Basalt aquifer could also suffer if the overlying water-bearing strata became contaminated. In the event of such an occurrence, improperly cased wellbores would provide the most likely conduits. Natural seepage of contaminated ground water from overlying formations presents a real but less likely threat because of (1) the predominately lateral ground-water flow through overlying basalts and (2) areas of thick fine-grained sedimentary interbeds which inhibit percolation.

Aquifers in the unconsolidated sediments and upper basalt units are susceptible to contamination from surface activity since they lie close to the surface in the most populous portions of the Lewiston Basin. Possible sources of contamination include improper storage or handling of hazardous materials, septic tank effluent, storm runoff, pesticides, and chemical fertilizers. Although the shallow aquifer units serve far fewer people than the Grande Ronde Formation, they do serve as the sole source of drinking water for some households.[3] Also, they are hydrologically connected to the Grande Ronde Basalt (although poorly in many areas). But most importantly, they discharge to surface waters which, in turn, recharge the Grande Ronde Formation.

Water Supply Systems

The Lewiston-Clarkston area accounts for most of the drinking water consumed in the Lewiston Basin. The city of Lewiston uses water withdrawn from the Clearwater River for most of its needs but depends upon wells which produce from the Grande Ronde Formation for about 17 percent of its consumption.[2] All other public water purveyors in the Lewiston Basin depend entirely upon wells which produce from the Grande Ronde Formation.[3] Private users, such as food processors, who depend upon large volumes of high quality water derive their supplies exclusively from wells completed in the Grande Ronde Basalt.[3] Individual households which need only small quantities of ground-water utilize the basalts and sediments which overly the Grande Ronde Formation.[3,4] A summary of drinking water consumed within the Lewiston Basin, prepared as part of the sole source aquifer petition submitted by the Asotin County PUD, appears as Table 1. This table shows that ground water supplies about 68 percent of the water consumed within the basin, which is well above the 50 percent required for sole source designation.[2]

Alternative Sources

Surface water supplies capable of serving the Lewiston Basin are physically and legally available, but using the available surface water would be economically infeasible. The main water purveyors for the area, the city of Lewiston and the Asotin County PUD, have water rights which would allow them to legally withdraw enough surface water to supply the whole area. In fact, the Asotin County PUD alone has legal access to approximately 43 million gallons per day from the Snake River - enough to supply the peak water usage for the entire basin.[3] However, public and private water purveyors have not fully utilized surface water sources because the Grande Ronde Basalt provides higher quality water at a far lower cost. Surface water from the Snake and Clearwater Rivers requires filtration and disinfection before municipal use. Also, surface water treatment, storage, transmission and distribution facilities cost considerably more to build and operate than systems using high quality ground water.

In order to be considered "economically feasible", an alternative water source must not cost the typical household more than 0.4 to 0.6 percent of the average annual household income for the area.[2] Cost estimates generated by the Asotin County PUD indicate that the cost of using surface water render that alternative source economically infeasible for all the public water purveyors in the basin (Table 2). The cost of replacing individual homeowner wells with a surface water supply would be considerably higher.

TABLE 1

Lewiston Basin Drinking Water Consumption

	PUBLIC UTILITY DISTRICT NO. 1 OF ASOTIN CO.	CITY OF LEWISTON	OTHER PUBLIC SUPPLIES[a]	INDUSTRIAL[b]	PRIVATE	TOTAL USAGE	% OF TOTAL USE
Grande Ronde Formation	16 MGD (100)	2.5 (17)	3.3 (100)	3.9 (100)	0.3 (60) (EST.)	26.0	68
Other Ground Water	0 0	0 0	0 0	0 0	0.1 (20) (EST.)	0.1	< 1
Surface Water	0 0	12 (83)	0 0	0 0	0.1 (20) (EST.)	12.1	32
TOTAL	16 (100)	14.5 (100)	3.3 (100)	3.9 (100)	0.5 (100) (EST.)	38.2	100

[a] OTHER PUBLIC SUPPLIES

LAPWAI CITY	0.3 MGD
LOID*	1.9
ASOTIN CITY	0.8
PORT OF WILMA	0.3
	3.3 MGD

[b] INDUSTRIAL USES (culinary and high quality process requirement)

POTLATCH INC.	0.4 MGD
TWIN CITY FOODS	2.8
OMARK IND.	0.7
	3.9 MGD

NOTES:

1. All of the usage figures given are peak day flows in million gallons per day, MGD. (average day usage is approximately 30% of the value shown)
2. Numbers shown in parentheses,(), indicate the percent of supply provided by the source.

* *Lewiston Orchards Irrigation District*

(From the Asotin County PUD Petition, 1988)

TABLE 2

Summary of the economic burden if public water purveyors within the Lewiston Basin were to depend entirely upon surface water sources of drinking water

Water Users	Current Source	Potential Alternate Source	Alternate Source Treatment Requirements	Estimated Additional Facility Cost	Added Facility Annual Financing Cost	Added Facility Added Operation Cost	Current Number of Customers	Current Average Annual Service Charge	Additional Cost Per Customer With Alternate Source	Total Projected User Cost With Alternate Source	Average Household Income 1986[a]	Current Percent Of Income For Water	Projected Percent of Income With Alternate Source
Public Utility District No. 1 of Asotin County	Petitioned Aquifer	Treat Petitioned or Surface Supply	16 MGD Treatment Plant	$9,000,000	$900,000	$250,000	5,389	$315	$213	$528	$29,676	1.1%	1.8%
City of Lewiston	Petitioned Aquifer	Treat Petitioned or Surface Supply	2.5 MGD Treatment Plant	$2,500,000	$250,000	$ 70,000							
							5,037	$182	$ 64	$246	$28,715	.6%	.9%
City of Lewiston	Treated Surface Water	--	--	--	--	--							
City of Lapwai	Petitioned Aquifer	Treat Petitioned or Surface Supply	.3 MGD Treatment Plant	$ 500,000	$ 50,000	$ 14,000	300	$ 60	$213	$273	$28,715	.2%	.9%
Lewiston Orchard Irrigation District (Culinary System)	Petitioned Aquifer	Treat Petitioned or Surface Supply	1.9 MGD Treatment Plant	$2,100,000	$210,000	$ 59,000	5,200	$144	$ 52	$196	$28,715	.5%	.7%
City of Asotin	Petitioned Aquifer	Treat Petitioned or Surface Supply	.8 MGD Treatment Plant	$1,000,000	$100,00	$ 28,000	366	$216	$350	$566	$29,676	.7%	1.9%

[a] Sales and Marketing Management Magazine Survey and Buying Power, December 1987 Edition.

EPA considers any alternative water supply which would cost the typical customer more than 0.5 percent of the average household income for the area to be economically infeasible.[16]

(From the Asotin County PUD petition, 1988)

CONCLUSIONS

An aquifer or aquifer system must supply 50 percent or more of the drinking water for an area in order to receive designation as a sole source aquifer.[2] Additionally, EPA presently requires that no alternative sources exist which could feasibly serve the population dependent upon the aquifer.[2]

Ground water supplies about 68 percent of the drinking water for the Lewiston Basin. Adequate supplies of surface water are physically and legally available, but are considered economically infeasible. Therefore, the Lewiston Basin Aquifer meets the criteria for designation as a sole source aquifer under Section 1424(e) of the Safe Drinking Water Act.

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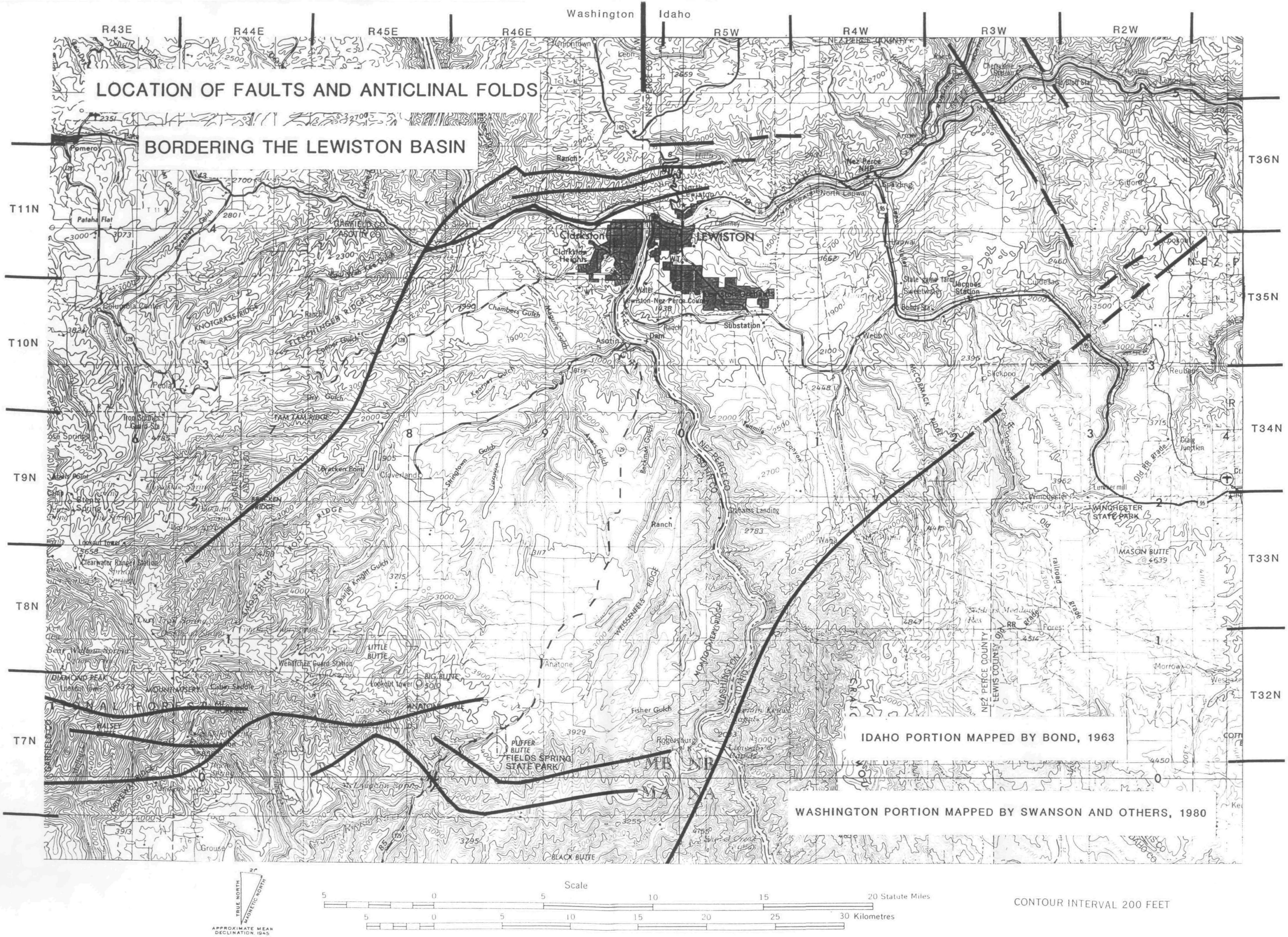
ATTACHMENT 1

MAJOR FAULTS AND ANTICLINAL FOLDS

SURROUNDING THE LEWISTON BASIN

MAP

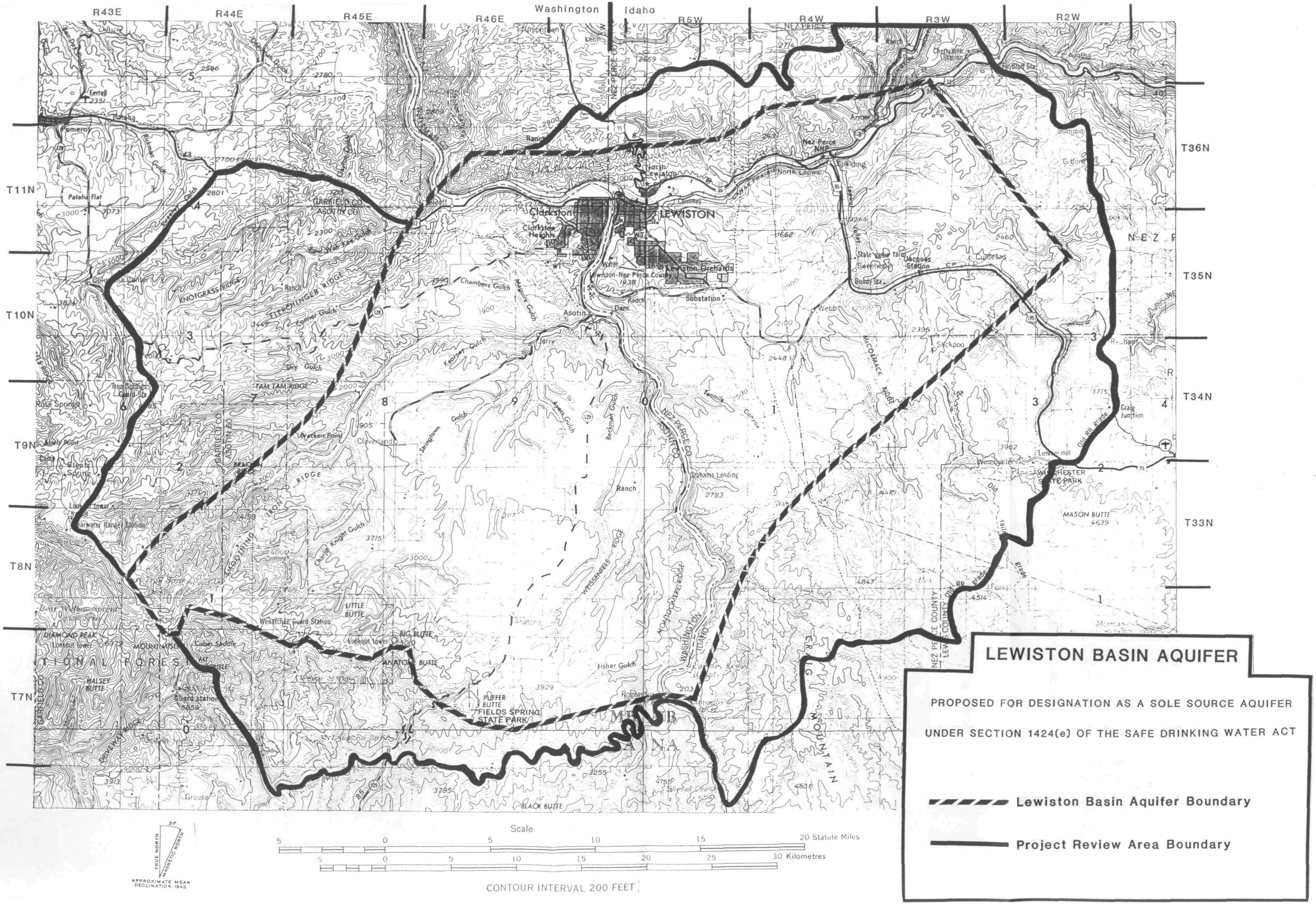

LOCATION OF FAULTS AND ANTICLINAL FOLDS
BORDERING THE LEWISTON BASIN
Washington
Idaho
R43E
R44E
R45E
R46E
R5W
R4W
R3W
R2W
T11N
T10N
T9N
T8N
T7N
T36N
T35N
T34N
T33N
T32N
NEZ PERCE COUNTY
Clarkston
LEWISTON
Clarkston Heights
Lewiston Orchards
Asotin
Pomeroy
Anatone
KNOTGRASS RIDGE
FLECHINGER RIDGE
TAM TAM RIDGE
WEISSENFELS RIDGE
MONTGOMERY RIDGE
Chambers Gulch
Kearney Gulch
Fisher Gulch
Rogersburg
FIELDS SPRING STATE PARK
PUFFER BUTTE
BIG BUTTE
LITTLE BUTTE
DIAMOND PEAK
Wenatchee Guard Station
Cloverland
Lapwai
Sweetwater
Slickpoo
Winchester
WINCHESTER STATE PARK
Craig Junction
Reubens
MASON BUTTE
Waha
Webb
Spalding
North Lapwai
NEZ PERCE COUNTY
LEWIS COUNTY
BLACK BUTTE
Grouse
IDAHO PORTION MAPPED BY BOND, 1963
WASHINGTON PORTION MAPPED BY SWANSON AND OTHERS, 1980
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION 1945
Scale
5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometres
CONTOUR INTERVAL 200 FEET

ATTACHMENT 2

PROPOSED LEWISTON BASIN

SOLE SOURCE AQUIFER AND PROJECT REVIEW AREAS

MAP



LEWISTON BASIN AQUIFER
PROPOSED FOR DESIGNATION AS A SOLE SOURCE AQUIFER
UNDER SECTION 1424(e) OF THE SAFE DRINKING WATER ACT
Lewiston Basin Aquifer Boundary
Project Review Area Boundary
Scale
20 Statute Miles
30 Kilometres
CONTOUR INTERVAL 200 FEET
APPROXIMATE MEAN DECLINATION 1945
TRUE NORTH
MAGNETIC NORTH
Washington
Idaho
R43E
R44E
R45E
R46E
R5W
R4W
R3W
R2W
T11N
T10N
T9N
T8N
T7N
T36N
T35N
T34N
T33N
Clarkston
Clarkston Heights
LEWISTON
Lewiston Orchards
North Lewiston
Asotin
Pomeroy
Anatone
Cloverland
Lapwai
Spalding
Sweetwater
Culdesac
Winchester
WINCHESTER STATE PARK
FIELDS SPRING STATE PARK
GARFIELD CO
ASOTIN CO
NEZ PERCE CO
LEWIS COUNTY
KNOTGRASS RIDGE
FLETCHINGER RIDGE
TAM TAM RIDGE
WEISSENFELS RIDGE
CRAIG MOUNTAIN
MASON BUTTE 4639
BLACK BUTTE