Surficial Geologic Map of the Sweetwater Quadrangle, Nez Perce County, Idaho

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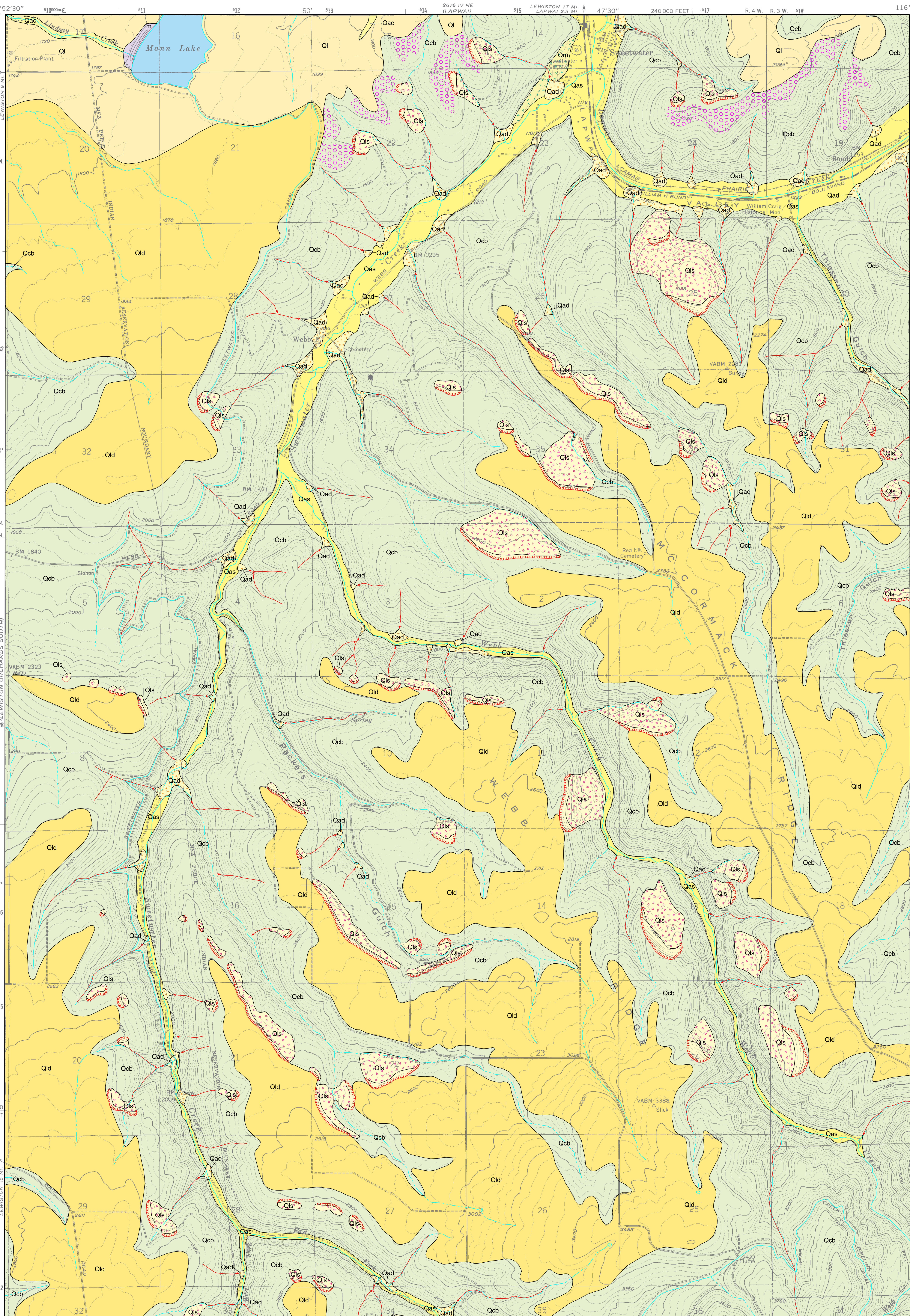
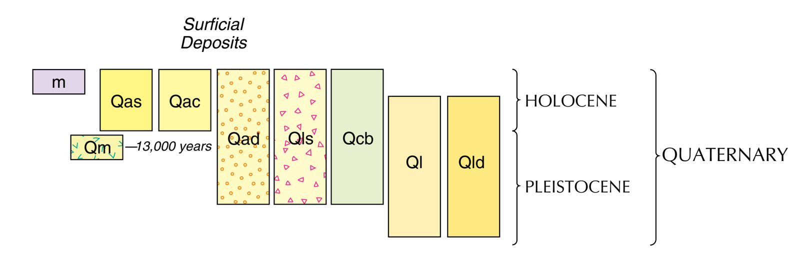
2003



CORRELATION OF MAP UNITS



INTRODUCTION

The surficial geologic map of the Sweetwater quadrangle identifies earth materials on the surface and in the shallow subsurface. It is intended for those interested in the area's natural resources, urban and rural growth, and private and public land development. The information relates to assessing diverse conditions and activities, such as slope stability, construction design, sewage drainage, solid waste disposal, and ground-water use and recharge.

The geology was intensively investigated during a one-year period. Natural and artificial exposures of the geology were examined and selectively sampled. In addition to field investigations, aerial photographs were studied to aid in identifying boundaries between map units through photogeologic mapping of landforms. In most areas map-unit boundaries (contacts) are approximate and were drawn by outlining well-defined landforms. It is rare that contacts between two units can be seen in the field without excavation operations which are beyond the purpose and scope of this map. The contacts are inferred where landforms are poorly defined and where lithologic characteristics grade from one map unit into another. The precision of a contact with respect to actual topography also depends on the accuracy and scale of the topographic base. Details depicted at this scale, therefore, provide an overview of the area's geology. Further intensive analyses at specific locations should be arranged through independent geotechnical specialists.

Sweetwater Creek canyon is the prominent feature in the quadrangle. Sweetwater Creek and its tributaries drain the plateau escarpment southeast of the quadrangle, which is the southern boundary of the Lewiston basin. The basin is a crustal depression between the Northern Rocky Mountains, the Blue Mountains, and the Palouse portion of the Columbia Plateau. In the Sweetwater quadrangle, Miocene basalt flows of the Columbia River Basalt Group are gently tilted northward into the Lewiston basin, and the streams have cut deep canyons into the basalt. Sediments of the Latah Formation are interbedded with the basalt flows and landslides occur where major sedimentary interbeds are exposed along the valley sides. The cooler and dryer climate of the Pleistocene brought on the cyclical deposition of wind-blown silt that forms the loess mantle on gently sloping basalt flows.

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

m **Made ground (Holocene)**—Large-scale artificial fills composed of excavated, transported, and emplaced construction materials of highly varying composition, but typically derived from local sources.

Qas **Alluvium of side streams (Holocene)**—Channel and flood-plain deposits of Sweetwater and Lapwai Creeks. Primarily coarse channel gravel deposited during high-energy stream flows. Subrounded to rounded pebbles, cobbles, and boulders of basalt in a sand matrix. Moderately stratified and sorted. Includes intercalated colluvium and debris flow deposits from steep side slopes. Soils developed in side-stream alluvium include the Bridgewater, Joseph, Lapwai, and Tombeall soil series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qac **Alluvium and colluvium (Holocene)**—Stream, slope-wash, and gravity deposits. Predominantly beds of silt, clay, and sand derived from erosion of adjacent units. Stream deposits typically are thin and interfinger with laterally thickening deposits of slope wash and colluvium derived from local loess deposits and weathered basalt. Soils developed in these deposits include the Broadax and Slickpoo series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qad **Alluvial-fan and debris-flow deposits (Holocene and Pleistocene)**—Primarily crudely bedded, poorly sorted brown muddy gravel shed from canyon slopes of basalt colluvium. Gravel is composed of subangular and angular pebbles, cobbles, and boulders of basalt in a matrix of granules, sand, silt, and clay. May include beds of silt and sand derived from reworked loess, Mazama ash, and Lake Missoula Flood backwater deposits. Thickness varies, but typically ranges from 6-50 feet. Fans composed of alluvium and debris-flow deposits commonly occur in canyon bottoms below steep debris-flow chutes (see Symbols).

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular basalt cobbles and boulders mixed with silt and clay. Landslide deposits include debris slides as well as blocks of basalt, sedimentary interbeds that have been rotated and moved laterally. Debris slides mainly composed of unstratified, unsorted gravel rubble in a clayey matrix. In addition to the landslide deposit, the unit may include the landslide scarp and the headwall (steep area adjacent to and below the landslide scarp) from which material broke away (see Symbols). The headwall area may include talus formed after landslide movement. Location of landslide deposits in canyons is controlled by the presence of sedimentary interbeds and the hydrogeologic regime. The largest landslides occur where canyon-cutting has exposed landslide-prone sediments to steep topography. Slope failures have occurred where the fine-grained sedimentary interbeds are saturated by ground water moving toward the valleys. This relationship is so prevalent that the major sedimentary interbeds may be traced by locating landslide deposits along the valley sides. The landslides range in age from ancient, relatively stable features, to those that have been active within the past few years. The factors that cause landslides have been prevalent in the region for thousands of years. The frequency of landsliding may have been greater in the Pleistocene. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper parts of canyon slopes can transform into high-energy debris flows that endanger roads, buildings, and people below (see *Debris-flow chute* under Symbols). Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water.

Qcb **Colluvium from basalt (Holocene and Pleistocene)**—Primarily poorly sorted brown muddy gravel composed of angular and subangular pebbles, cobbles, and boulders of basalt in a matrix of silt and clay. Emplaced by gravity movements on steep-sided canyons and gullies cut into Columbia River basalt. Includes outcrops of basalt that are common on steep, dry, southerly aspects where colluvium is thinner and the more erosion-resistant basalt flows form laterally traceable ledges. More gently sloping areas are mantled with thin loess (typically 1-5 feet thick), especially near boundaries with loess (*Ql* and *Qld*). Distribution and thickness of colluvium is dependent on slope aspect, upper and lower slope position, basalt and sediment stratigraphy, and association with landslides. Colluvium is thin and associated with many basalt outcrops on dry, southerly facing slopes, and may exhibit patterned-ground features (see Symbols). Colluvium is thicker on north- and east-facing slopes, and is associated with landslides (*Qls*) and debris-flow chutes (see Symbols), especially where more moisture is retained and where sedimentary interbeds are present. Areas of thicker colluvium have fewer outcrops of basalt, and the surface may have a patterned ground of crescent-shaped lobes of colluvium, probably relicts of Pleistocene solifluction. Unit includes landslides too small to map separately, and talus below cliffs and ledges of basalt. Colluvium typically increases in thickness toward the base of slopes where it interfingers with alluvium in valley bottoms. May include all of valley-bottom sediment where streams have little discharge or are ephemeral. Soils developed in basalt colluvium include the Alpowa, Gwin, Linville, Lickskillet, Kettenback, Keuterville and Waha, series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Qm **Lake Missoula Floods backwater deposits (Pleistocene)**—Rhythmites deposited when backwaters from Lake Missoula Floods inundated the Lapwai Creek valley. Primarily alternating thin beds of gray sand and pale brown silt. Cross-bedded, dark-gray, basalt-rich granule gravel and coarse sand may be present at the base. Includes cut and fill structures and sandy clastic dikes. Similar depositional environment, sedimentology, and age as Lake Missoula Floods rhythmites of eastern Washington (Smith, 1993; Waitt, 1980, 1985). Found locally up to 1,200 feet in elevation, the approximate maximum flood level. Soils developed in Lake Missoula Flood deposits include the Uhlig series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

Ql **Loess (Holocene and Pleistocene)**—Calcareous wind-blown silt. Exposures show one to several layers of loess that represent periods of rapid deposition of air-borne dust. Thickest layers may have formed immediately after Lake Missoula Floods backwater events in the Clearwater River and Lapwai Creek valleys. Buried soils mark the tops of loess depositional units. Forms cap on youngest Lake Missoula Floods deposits and blankets the relatively flat dip-slope surface of basalt. Partly correlates with the Palouse Formation, but lacks the distinctive Palouse Hills of the eastern Columbia Plateau, and unlike the Palouse Formation, is predominantly composed of a single late Pleistocene deposit. Thickness 5-20 feet based on well logs, field observations, and map relationships. In some areas apparent thickness based on topography may be misleading, and relief is due to erosion of underlying basalt surface before loess deposition. Thickness may be greater than 20 feet on some north-facing slopes where it is thickened by primary wind drift and where vegetation prevents subsequent erosion. Loess is thinnest on steep, south-facing slopes where sheet wash erosion is common. Thin loess with Holocene soil development caps Lake Missoula Floods backwater sediments, and probably represents rapid deposition following the Lake Missoula Floods at the end of the Pleistocene. Loess less than 5 feet is not included in this unit, but thin loess is a common soil parent material throughout the map area (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999). As slopes steepen loess thins and grades into areas of basalt colluvium (*Qcb*). Loess thins toward the south and grades into thin loess on duripan (Qld). Soils developed in loess include the Broadax and Hatwai series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

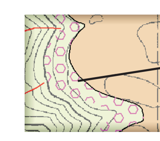
Qld **Loess on duripan formed in gently sloping basalt surface (Holocene and Pleistocene)**—Calcareous wind-blown silt that forms a thin blanket on the gentle dip-slope surfaces of basalt. Relatively soft silt buries a duripan (indurated lime- and silica-cemented angular basalt clasts), but the lime and silica cement diminishes as elevations and precipitation increase south and east toward the plateau escarpment. Relatively unweathered basalt is within a few feet below this contact. Loess is typically 1-6 feet thick, but is thicker on east- and north-facing sides of drainages where it is thickened by primary wind-drift deposition and where vegetation limits subsequent erosion. Soils developed in the unit include the Broadax, Hatwai, Nez Perce, Ulhorn, Vollmer, Naff, Thatuna, and Waha series (U.S. Department of Agriculture, Natural Resources Conservation Service, 1999).

SYMBOLS

Contact: Line showing the approximate boundary between one map unit and another. The apparent ground width of the line representing the contact is about 80 feet at this scale (1:24,000).

Landslide scarp and headwall: Ticks show top of scarp.

Debris-flow chute in canyons. High-energy, short duration floods and debris flows may occur in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. Debris flows can also be triggered by landslides. These events are historically infrequent, dependent on weather, with a recurrence cycle on the order of years to decades. The most prominent debris-flow chutes are shown on the map, but any steep-gradient valley sides and canyon bottoms have the potential for these catastrophic events. Thin and discontinuous alluvial-fan and debris-flow deposits (*Qad*) may be present, but are not mappable at this scale.



Patterned ground associated with the weathered, differentially eroded surface of basalt. Pattern consists of regularly spaced, subround fracture system in basalt with silty mounds between fractures. Silty mounds give way to fractured basalt downslope, but thicken upslope where they gradually obscure the fracture pattern and merge with loess deposits or weathered basalt. Probably formed by stripping of loess from the basalt surface through Pleistocene periglacial processes. Original patterned-ground features destroyed by field plowing in many locations.

REFERENCES

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Base map from USGS digital raster graphic 1958.

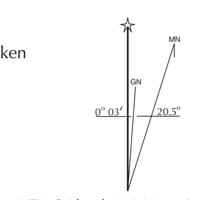
Topography by photogrammetric methods from aerial photographs taken 1955. Field checked 1958.

Polyconic projection. 1927 North American Datum.

10,000-foot grid ticks based on Idaho coordinate system, west zone.

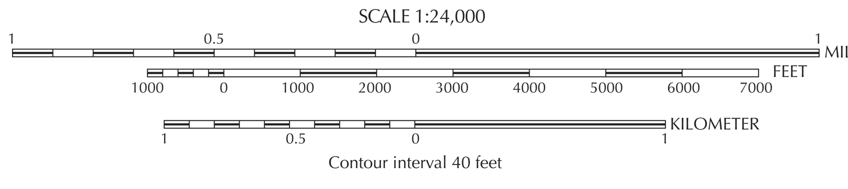
1000-meter Universal Transverse Mercator grid ticks, zone 11.

National geodetic vertical datum of 1929.



UTM Grid and 1958 Magnetic North Declination at Center of Map

SCALE 1:24,000



Contour interval 40 feet

QUADRANGLE LOCATION

Field work conducted 2000-2001.

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Reviewed by Terry Howard.

Digital cartography by B. Benjamin E. Studer and Jane S. Freed at the Idaho Geological Survey's Digital Mapping Lab.

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