SUMMARY REPORT

# Generalized Geology & Hydrology Of Stevens County, Washington—1971

state of washington
**department of ecology**
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governor
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director
**olympia, washington**
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Summary report of the geology and water resources of Stevens County, State of Washington. Requested by the Stevens County Planning Commission by letter dated August 11, 1971. Report prepared by Robert H. Russell, Geologist, Office of Technical Services, Department of Ecology, Olympia, Washington, October, 1971.

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# GENERALIZED GEOLOGY AND HYDROLOGY

# OF

# STEVENS COUNTY, WASHINGTON

By: Robert H. Russell

## INTRODUCTION

### Purpose of Study

The Stevens County Planning Commission is presently developing an "in house" comprehensive land use plan for the County. An important part of the plan will be an inventory of existing and potential water supplies that may be available to satisfy the future water requirements of the various areas of Stevens County. This summary report was prepared in response to a request from the Stevens County Planning Commission to Director John A. Biggs, of the Department of Ecology, via letter dated August 11, 1971.

In this report, special emphasis was placed on water sources, both surface water and ground water, which possess potential for the development of moderate to large supplies of water of suitable quality for community domestic supplies, irrigation and industrial requirements of the various areas of Stevens County. Potential for individual domestic supplies is discussed briefly during the discussion of local areas.

### Previous Investigations

To date, the Department of Ecology has not conducted a comprehensive evaluation of the geology and ground water resources of Stevens County and there is no immediate plan to do so. The southeastern part of the County was included in a study of north-central Spokane County and published as the Department of Water Resources Water Supply Bulletin No. 27., 1969.

Water right files contain driller's logs and yield data for several hundred wells constructed in Stevens County and the State's geologic map defines the geologic outcrop pattern on an areal basis.

Flow characteristics of the Colville River are described in an open file report by the US Geological Survey and stream flows have been recorded on a long term basis on the more important streams as a part of the Department of Ecology's cooperative data gathering program with the US Geological Survey. Ground water quality data is available for five representative wells in Stevens County.

## GENERAL GEOGRAPHIC FEATURES

### Topography and Drainage

Stevens County with an area of 2,551 square miles ranks fifth in size among Washington counties. It is bounded on the north by the Canadian border, on the south and west by the Spokane and Columbia Rivers (Lake Roosevelt) respectively and on the east by Spokane and Pend Oreille Counties.

The County lies within the Okanogan Highlands physiographic province and is dominated by several north-south trending mountain ranges and valleys. Land elevations in Stevens County range from 1300 feet along the shore of Lake Roosevelt to 7,308 feet at the summit of Ambercrombie Mountain. Upland areas average about 3,000 to 4,000 feet above sea level.

The Colville River system drains most of Stevens County flowing northwesterly and emptying into the Columbia River near the Town of Kettle Falls. Several smaller streams drain runoff water directly to the Spokane and Columbia Rivers which are riparian to Stevens County at the south and west respectively.

### Climate

Stevens County like most northeastern counties of Washington State exhibit four distinct seasons dominated by warm, dry days and cool nights during the summer and cold, dry periods during the winter. Below 0° Fahrenheit temperatures are not uncommon during winter months.

Annual precipitation averages about 20 to 25 inches in the western half of the County and increases to 30 to 35 inches in the northeastern part of the County. Most of the precipitation occurs as rain or snow during fall, winter and spring months.

## SURFACE WATER RESOURCES

Three major water systems, the Columbia, Spokane, and Colville Rivers are available to many parts of Stevens County for development of projects which require moderate to large quantities of water of good quality. At this writing, water is available for appropriation from all three systems. Water for single domestic needs and small, local projects may be available from some of the small tributary streams and springs. Some streams have been closed to further consumptive diversions. See following list.

There follows a list, arranged alphabetically, of streams and lakes in Stevens County that have been closed to further consumptive diversion by the Departments of Fish and Game. It may be assumed that water is available for appropriation from all other surface water sources in Stevens County:

FIGURE 1

| Stream | Tributary To | Date of Closure |
|---|---|---|
| Cedar Creek | Little Pend Oreille River | |
| Chewelah Creek | Colville River | 3-7-61 |
| Clark Lake | Columbia River | 6-2-67 |
| Clungston Creek | Mill Creek | 3-22-63 |
| Cole Creek | Haller Creek | 9-26-52 |
| Colville Creek | Little Pend Oreille River | |
| Crown Creek | Columbia River | 11-8-68 |
| Deep Creek | Columbia River | 6-14-61 |
| Deer Creek | Columbia River (Low Flow 650) | 3-21-69 |
| Dragoon Creek | Little Spokane River | 4-15-51 |
| Flat Creek | Roosevelt Lake | 10-16-50 |
| Gillete Creek | Mill Creek | 3-21-63 |
| Haller Creek | Colville River | 7-2-64 |
| Harvey Creek(So. Fork) | Low Flow:0.50 cfs | 1-27-67 |
| Jump Off Joe Creek & Lake | Colville River | 2-28-52 |
| Little Pend Oreille River | Colville River | 11-10-64 |
| Mill Creek (Northwest of Colville) | Colville River | 2-22-62 |
| Narcisse Creek | Little Pend Oreille River | 4-12-21 |
| Stensgar Creek | Colville River(Low Flow 3.0 cfs) | 12-30-66 |
| Mill Creek(So. of | Colville River | 5-31-68 |
| Spratt Creek | Haller Creek | 9-2-64 |
| Stranger Creek | Columbia River | 1-4-57 |
| Stranger Creek | Colville River | 1-23-51 |

## GEOLOGY AND GROUND-WATER RESOURCES

### Geology and Groundwater

For this report, geologic formations have been grouped into three units, based principally on their water bearing potential, they are:(See Plate I)

1. Bedrock (Ptu)

   The bedrock designation covers all of the consolidated rocks of the project area and includes sedimentary rock, metasediments, igneous intrusives and basalt lavas. These rock materials form the cores of the hills and upland areas and outcrop at the surface in the mountainous areas. They also underlie the valley areas at various depths.

Rock formations of the bedrock group are generally dense and well cemented with few fractures or porous zones and lack favorable water storage and yield characteristics. Wells finished in the bedrock could not be relied upon for yields greater than minimum domestic supply requirements. The bore hole may serve as a reservoir in low yield areas, thereby increasing total yield potential.

### Glacial Drift(Qg)

Glacial drift materials found in Stevens County were deposited by ice melt streams during the advance and recession of at least one major continental glacier that rode over the area from Canada to the North. Drift materials include unconsolidated deposits of silt, sand, gravel, clay, and till. The finer sediments, silts and clays, were deposited in quiet water lakes created by ice damming. The sands and gravels were deposited by outwash streams as the ice melted. It is the outwash sands and gravels of Pleistocene age that provide the most important ground water reservoirs in Stevens County.

All of the stream valleys, most of the lowland areas, and lower reaches of the hills and mountains are mantled with glacial drift of varying thickness. Most of the small stream valleys and midlands have drift between 25 and 100 feet in thickness while deeper depressions along the Colville, Columbia and Spokane Rivers contain glacial drift and subsequent valley alluvium several hundred feet in thickness.

Based on limited well log data, bedrock may be 300-400 feet below land surface at Valley, between 175-300 feet at Chewelah and 200 feet or more at Colville (USGS 1969 Open File Report).

### Valley Alluvium(Qal)

Recent valley alluvium in Stevens County is limited almost entirely to the Colville River Valley where it lies directly on the glacial drift of Pleistocene time. The rock materials consist of clay, silt, sand, and gravel and quite closely resemble the glacial drift and have similar water bearing characteristics. When prospecting for ground water one would do well to treat the two as a unit.

## GROUND WATER YIELD

### General

The glacial drift and post glacial alluvium are stratified water lain deposits. The silts and clays (lake deposits) are fine grained and yield only limited amounts of ground water. The coarse sands and gravels are the important aquifers and yield moderate to large amounts of water to properly finished wells.

The unconsolidated deposits are not consistent over the entire County. In places, thick sections of clean sand and gravel yield large amounts of ground water and a short distance away they change to fine silts and clays or lens out entirely. This feature may require prospecting and/or test drilling to locate a preferred well site.

In most parts of Stevens County, ground water in the unconsolidated materials occurs under water table conditions. In a few places, where the aquifers are capped with till or clay, the water may occur under artesian conditions.

## Colville Area

The upland terraces upon which the City of Colville and Church and Garrison Flats lie are underlain by several hundred feet of stratified glacial clay, silt, sand, and gravel. Sand and gravel lens separated by silt and clay beds produce moderate to large amounts of ground water to properly finished wells. City of Colville water supply wells, located on Church Flat, east of the City, range in depth from about 50 feet to 236 feet, and yields range from 250 to 1900 gpm. The several aquifers tapped in each well react as composit aquifers with similar static water levels. Water in most wells on the upland terrace occurs under artesian conditions, many flow at land surface. Yields of most wells increase with depth as additional water bearing materials are exposed to the well bore.

Recharge to the Church Flat aquifers is a result of precipitation falling directly on the area and on the mountainous areas to the north and east. Surface water runoff from the upland areas recharge the aquifer systems along the contact between the glacial drift and underlying bedrock. A ground water high may occur near Pinkney City with sub-surface flow moving south to Church Flat and north to the Mill Creek drainage.

No attempt was made to quantify available ground water from the Church Flat aquifers but it must be considerable, based on an annual precipitation of 20 to 25 inches, and favorable aquifer characteristics.

## Colville River Flood Plain

Glacially derived clay, silt, sand, and graval, and post glacial valley alluvium underlie the Colville River valley to a depth of several hundred feet. Here also, the sand and gravel aquifers are poorly separated by the silt and clay lens.

The total thickness of the unconsolidated sediments which overlie the bedrock may be treated as a composit aquifer with essentially common water levels. Yields to wells with proper screens will increase with depth as additional sand and gravel lens are penetrated. A well drilled to a depth of 110 feet in Section 20, Township 35 N., Range 39 E., produced 300 gpm with a 15 foot drawdown. Most drilled wells along the Colville River Valley floor flow at land surface. Recharge is by precipitation falling on the area, Colville River effluent and subsurface inflow from adjacent upland areas. The total annual yield potential from the Colville River Valley aquifers is large, limited principally by the transmissability of the river bed sediments.

Intermontane Lowlands

Where relatively thin deposits of glacial drift lap upon the base of hills and mountains, or occurs in intermontane valleys and lowlands, shallow dug wells and infiltration trenches may produce small to moderate yields of water from gravel deposits usually found beneath the till or hardpan layer found at land surface over much of the area. Total annual yield potential from these aquifers would vary greatly from place to place, limited principally by the storage potential of local aquifers and precipitation available for recharge.

Dug wells and infiltration trenches range in depth from about 10 to 30 feet and produce between 25 and 100 gpm. An exceptional dug well located in Section 24, Township 35 N., Range 39 E (depth 16') produced 384 gpm during an 8 hour pump test.

Chewelah Area

Chewelah occupies a low terrace above the Colville River about 1 mile north of where Chewelah Creek enters the Colville River. The area generally is underlain by glacially derived silts, sands, gravel and clays up to 370 feet or more in thickness. The glacial sediments lie directly upon the underlying bedrock and are overlain by alluvium in the Colville River Valley.

There are two separate aquifer systems in the Colville River Valley in the Chewelah area. Both involve the sands and gravels of the glacial drift and/or the younger valley alluvium. However, it is possible that the shallow aquifer, less than 30 feet below land surface, is limited to the valley alluvium whereas the deeper wells from 80 to 360 feet deep tap aquifers within the glacial drift. This opinion is supported by the fact that most of the deep, drilled wells flow at land surface while most shallow wells occur under water-table conditions.

Moderate to large yields of ground water are available from drilled wells tapping the glacial drift materials which underlies the Colville River Valley and other stream valleys in the Chewelah area. Small to moderate yields are available from shallow dug wells and infiltration trenches tapping the alluvium and top of the glacial drift material.

Drilled wells range between 80 and 360 feet deep and produce from 100 to 3000 gpm. Several good aquifers occur in the glacial drift at various depths and yields increase with depth as additional aquifers are tapped. Dug wells range from a few feet to 30 feet in depth, and yield from 40 to 400 gpm. Most dug wells and trenches are capable of producing in excess of 150 gpm.

Recharge to both aquifer systems is from precipitation falling directly on the area, effluent from the Colville River and other streams and surface inflow from adjacent upland areas. A quantitative evaluation of the aquifers was not made, but the total yield potential, like the Colville River Valley generally, is quite large.

Valley Area

The Town of Valley area is similar geologically and hydrologically to the Colville River Valley generally. Ground water yields and recharge occur under conditions similar to the areas previously discussed. Wells drilled to a depth of 75 to 80 feet below land surface yield from 600 to 1200 gpm

from the glacial drift material. Some, but not all, drilled wells flow at land surface Shallow dug wells produce up to 130 gpm from the shallow, unconsolidated deposits.

Williams Valley

Moderate quantities of ground water are obtained from sand and gravel lens within the glaciolacustrine deposits which overlie the bedrock in Williams Valley in the southeastern part of Stevens County. Because the glacial lake deposits are relatively thin, generally less than 30 feet, and are principally fine grained silts and clays, they are not capable of the large yields to wells obtained from the glacial drift in the Colville River Valley. Small quantities of ground water are available from the underlying bedrock, principally the Yakima Basalt and Fractured Granite.

Dug wells in the Williams Valley range in depth from 10 to 30 feet and yield between 20 and 200 gpm and average about 100 gpm. A well in Section 14 G, Township 28 N., Range 41 E, was drilled to a depth of 68 feet and produced 720 gpm with a drawdown of 23 feet. The driller's log, however, indicates that most of the water was obtained fron an aquifer less than 16 feet below land surface.

Recharge to the aquifers is by precipitation falling directly on the area and runoff from the upland area to the west. Ground water discharge is to Dragoon Creek to the east.

Although a quantitative evaluation was not made, it should be noted that a 48 square mile area in Williams Valley in Stevens County is covered by glacial drift materials capable of receiving and storing an important part of the precipitation falling on the area. Assuming an average annual precipitation of 24 inches, this would provide 61,000$^{+}$ acre-feet of water per year. Assuming that 2/3 or 41,000 acre-feet was consumed by evapotranspiration and direct runoff, this would leave 21,000$^{+}$ acre-feet per year available for appropriation. This figure is just a working estimate and should be used accordingly, but it does give one a feel for the ground water potential.

Other Areas

Other parts of Stevens County, especially along the Spokane and Columbia Rivers, and other valleys which possess relatively thick deposits of glacial drift material, should produce moderate to large yields of water to properly finished wells. Yields will vary from place to place depending upon local geologic conditions. It would be desirable to obtain as much basic information about an area and wells that have been drilled there before developing a drilling plan in some of the more remote, unprospected areas.

## QUALITY OF WATER

Surface Water

On the basis of chemical and physical analyses of water samples collected at the Kettle Falls gaging station, about once a month from 1961 through 1963 and quarterly from 1964 through 1965, the quality of water in the Colville

River Basin is adequate for most uses. Dissolved solids content does not exceed limits established by the US Public Health Service for drinking water. Most of the time, however, color and turbidity were beyond the limits recommended and the water would require some treatment if it is to be used for drinking. Also silica and bicarbonate concentrations would require some reduction before the water would be suitable for many manufacturing processes.

Colville River Water is considered moderately hard to very hard, according to standards used by the US Geological Survey. Objectionable concentrations of iron and orthophosphate are present at times.

In addition to the Kettle Falls sampling, single samples were collected at eleven sites on Mill Creek and the Little Pend Oreille River, which indicate that the dissolved solids content and hardness values are comparable to those from the Colville River at Kettle Falls. (USGS Open File, 1961)

Ground Water

Water samples from five wells were collected and analyzed during the 1959-1961 period. Chemical analyses of the ground water show that in general, the quality of ground water in the basin is similar to the surface water.

## FLOOD CONTROL PROBLEMS, COLVILLE RIVER

Because of severe flooding along the Colville River in 1948, State Flood Control Maintenance Funds were used to assist Stevens County and the County Soil and Water Conservation District in emergency flood control work to restore channel capacity, remove jams and debris, and strengthen eroded river banks. A minor cooperative maintenance program was continued through 1954. The Department's record shows no further program between 1954 and 1971.

Flood damage within the Colville River flood plain remains a serious problem and is a major deterrent to Stevens County's achieving its economic and social potential. Floods inundate large areas of the flood plain of the Colville River annually, thereby retaining land capabilities at a much lower level than would be achieved under a proper flood protection program.

On October 10, 1969, Senators Magnuson and Jackson requested the Senate Public Works Committee to make a general investigation study of the flood problems on the Colville River. The Committee did authorize the study but as of October 1, 1971, Congress had not appropriated funds which would permit the Corps of Engineers to proceed with the study.

September, 1971 the Department of Ecology received a request from the Stevens County Commissioners asking for assistance in flood control work. They were advised that no funds would be available during the 1971-1973 biennial period.

Assistance was requested under Public Law 566 "Small Watershed Act" for Mill Creek, 1955 and Chewelah Creek and Little Pend Oreille River in 1957. Due to priority assignments and a general lack of interest by applicants of the three watersheds, no action has been taken by the Department or the Soil Conservation Service.

As of this date, no flood control zones have been established and no flood control districts have been organized for the Colville River Basin. The Colville River is one of a number of streams in the State of Washington scheduled for a 100-year flood plain report by the Corps of Engineers.

Note: Flood control data furnished by G. M. Hastings, Engineer, Central Operations Division, Department of Ecology.

## SUMMARY AND CONCLUSIONS

From the foregoing discussion and review of data it can be concluded that:

1. The three major surface water sources in Stevens County available for appropriation are the Columbia, Colville, and Spokane Rivers. Water may be available in limited amounts from some of the small streams, springs, and lakes. Figure 1, Page 3, contains a list of streams and lakes which have been closed to further consumptive diversion or have minimum flows established below which further appropriations will not be allowed.

2. Moderate to large yields of ground water can be developed from relatively thick (up to 300 feet) deposits of glacially derived sands and gravels along the Colville River Valley and several smaller stream valleys and adjacent to the Columbia and Spokane Rivers.

3. Small to moderate yields can be developed from post glacial valley alluvium and relatively thin (less than 30 feet) deposits of glaciofluvial sands and gravels with interbeds of silt and clay.

4. Small yields of ground water may be obtained locally from the bedrock, principally the basalt and granite.

5. To date, Stevens County does not have a water-level decline problem and the annual recharge potential far exceeds the present development. There may be local well interference problems where wells are too closely grouped.

6. For detailed information about specific areas, one should refer to Appendix A, "Drillers Logs of Representative Wells" and "Generalized Geologic Map of Stevens County" in back of report.

7. Flood damage does occur in varying degrees almost annually to bottom lands along the Colville River and in some of the smaller stream valleys. These continuing problems clearly point out the need for a flood damage evaluation and realistic flood control program.

## SELECTED REFERENCES

Cline, Denzel L., 1969, "Ground Water Resources and Related Geology North-Central Spokane and Southeastern Stevens Counties, of Washington". Washington State Department of Water Resources - W.S. Bulletin No. 27

Hunting, M. T. and others, Compilers, 1961, Geologic Map of Washington, Washington Division of Mines and Geology.

Scott, Walter R., 1969, "Characteristics of Streamflow in the Colville River Basin, Stevens County, Washington. U.S. Geological Survey Open File Report.

TABLE 1: Records of Representative Wells
Stevens County, Washington

| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T27N-R39E 13F | Floyd Snider | 285' | -- | 227' | 3-20-66 | 272'-282' Sand | 3hp. sub. | Dom., irr. |
| T27N-R40E 16J | Dept. Nat. Res. | 275' | 5gpm 10'dd | 40' | -- | 36'-45' Sand | -- | Dom. Park |
| T28N-R39E 24K | Dawn Mining Co. | 256' | | Flowing 10gpm | 7-11-56 | Sand | Flow 10gpm | Dom. Mine |
| T28N-R40E Sec. 28F | Harry Campbell | 70' | -- | 7' | 4-17-68 | Decomposed Granite | 1hp. | Dom. irr. |
| 30D | Ford Dev. Co. | 367' | 95gpm 114'dd | 59' | 9-12-56 | Gravel | -- | Comm. Dom. |
| T28N-R41E Sec. 3R | Wayne Leonard | 9' dug | -- | | 3-24-64 | Fine sand | -- | Irr. |
| 11P | E.O. Schmidt | 16'dr. | 50gpm 1'dd | 4' | 6-9-53 | Sand | | Irr. |
| 14B | Donald Leonard | 21'dug | 60gpm 15'dd | 5' | 5-1-45 | Sand | 3hp. | Irr. |
| 13C | Mike Burdette | Trench 100'x 10'deep | 30gpm | 8' | 10-1956 | Sand | -- | Irr. |
| 14G | S.K. McIlvanie | 68'dr. | 720gpm 23'dd | 6.5' | 10-6-61 | Decomposed Granite | 40hp. | Irr. |
| 24A | C.J. Davis | 28'dug | 35gpm 9'dd | 17' | 7-8-54 | Sand | -- | -- |
| T28N-R42E 6P | A.N. Davis | 150'x Trench 20' deep | 25gpm | -- | 8-15-53 | -- | -- | -- |
| T29N-R36E Sec. 24P | Lantzy Bros. | 16' | 9'dd | 3' | 8-10-64 | Sand & Gravel | 50hp. | Irr. |
| T29N-R37E 31C | Mickey McCrea | 300' | -- | 20' | 8-18-68 | Basalt? | -- | -- |
| T29N-R37E Cont. 19C | A. R. Schell | 102' | 30gpm 3'dd | 20' | 12-25-66 | Sand & Gravel | -- | Irr. |
| T29N-R41E 2E | Geo.W. Meyer | 16' | 128gpm 4'dd | 9' | 8-9-50 | 12'-15' Sand | -- | Irr. |
| 4K | R.M. Weusthoff | 16' | 120gpm 2'dd | 10' | 2-1963 | Decomposed Granite | 3hp. | Municipal |

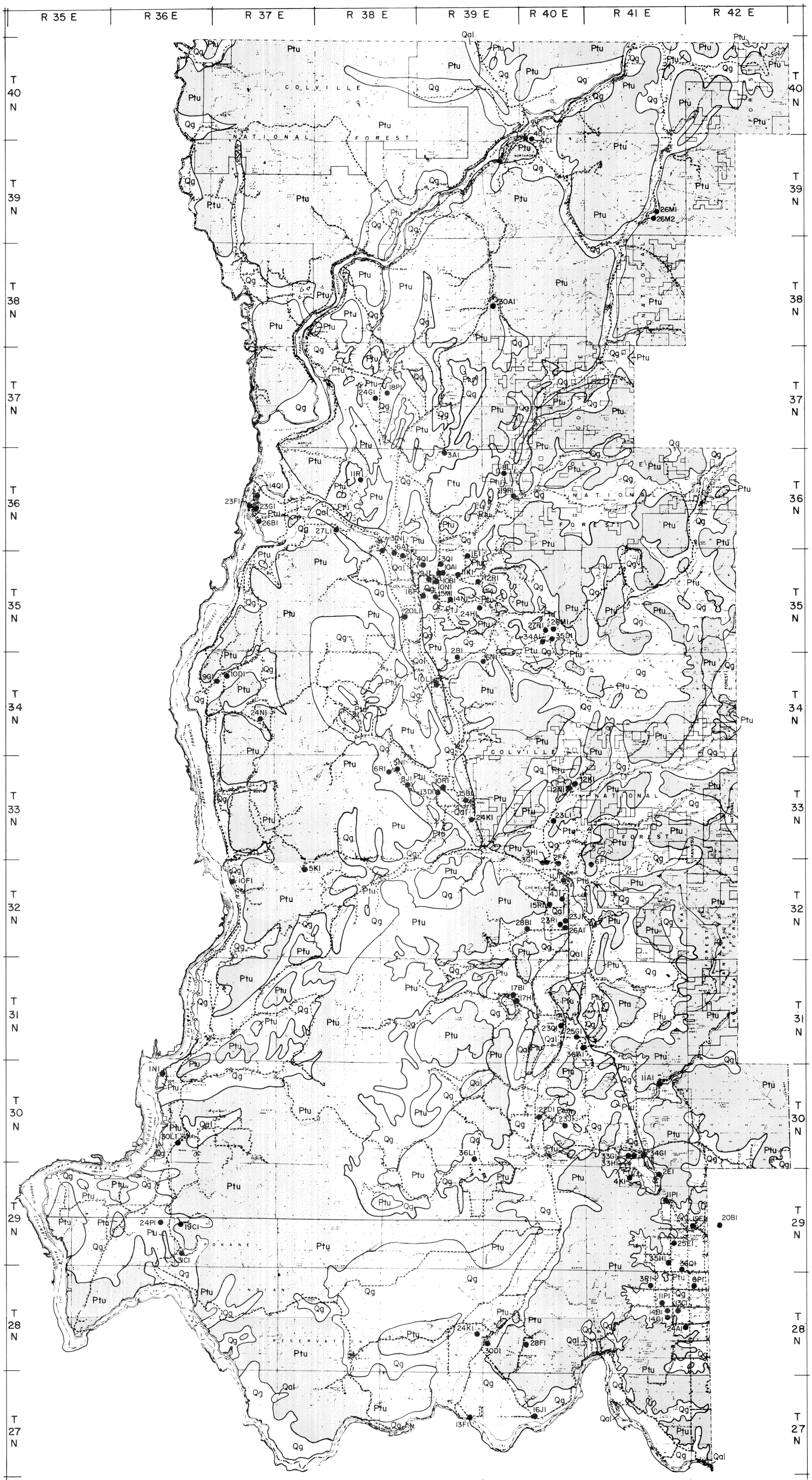
| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T29N-R41E Cont. | | | | | | | | |
| 11P | Harry Getman | 50'x 100' 20'deep | 100gpm | -- | 7-1952 | Sand | -- | Irr. |
| 25E | Ellen Newsome | 25' | 20gpm | -- | 11-14-67 | Sand | ¼hp. | Dom. |
| 35H | E.A. Casberg | 10' | 150gpm 1'dd | 9' | 7-10-48 | Sand | | Irr. |
| 36Q | R.L. Kewash | 35'x 100' 16'deep | 200gpm | -- | 6-29-52 | Sand | | Irr. |
| T29N-R42E 19E | Washington Brick & Lime Kettle-Stevens | 43' Trench | 25gpm 20'dd | 13' | 11-15-53 | Decomposed Granite | | Ind. |
| 20B | Soil Conserva. | 7' | 240gpm | -- | 9-7-55 | Sand & Gravel | -- | Irr. |
| T30N-R36E 1N | National Park Service | 146' | Good Yield | 32' | 6-2-67 | Gravel | Deep Well Sub. | Dom. for Nat. Park |
| T30N-R37E 30L | James Steele | 300' | 150gpm | 30' | 8-1-68 | Granite, Decomposed & Broken | 7½hp. | Dom. Irr. |
| T30N-R39E 36L | Phil Costich | 15' | 700gpm 30"dd | 76" | 10-4-52 | Sand & Gravel | 7hp. | Irr. |
| T30N-R40E 22D | L.E. Gower | 16' | -- | 12' | 1954 | Sand, fine | -- | -- |
| 23J | R.W. Knight | 10' | -- | -- | 5-22-62 | Decomposed Granite | -- | -- |
| T30N-R41E 11A | T.B. Maxson | 20' | -- | 15' | 8-8-68 | Gravel | 3/4hp. | Dom. |
| 33G | Loon Lake Park Co. | 100' | 55gpm 50'dd | 33' | 10-30-58 | Sand & Gravel | -- | Park Supply |
| 33H | " | 66' | 108gpm 12'dd | 35' | 6-23-62 | Gravel | -- | Park Supply |
| 34G | Carl Carlson | 16' | 17gpm 5'dd | -- | 7-1957 | Sand & Decomposed Granite | - | Dom. Irr. |
| T31N-R40E 17H | E.D. VanDissel | 168' | 30gpm 50'dd | 25' | 8-3-61 | Gravel | 5hp. | Comm. Dom. |
| 17B | J.H. Putter | 26½ | 7gpm 6"dd | 22' | 1951 | Sand & Gravel | -- | Dom. Irr. |
| 23Q | Lone Mt. Silica Co. | 75' | 1200gpm 14'dd | Flows | 9-13-60 | Coarse Gravel | 40hp. | Mining |
| 25G | J.H. Miller | 18' | 130gpm | 12' | -- | Sand | 10hp. | Irr. |

| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T31N-R40E Cont. | | | | | | | | |
| 36A | Dept. of Natural Res. | 80' | 600gpm | 38' | 7-7-67 | Sand & Gravel | -- | Irr. |
| T32N-R37E 10F | National Park Service | 152' | 300gpm | 72' | 4-4-66 | Sand & Gravel | -- | Park Supply |
| T32N-R38E 5K | M.M. Records | Sump 25'x156' 8' | 200gpm 4"dd | -- | 6-29-53 | Sand | -- | Irr. |
| T32N-R40E 2F | C.S. Ohler | 12½' | 192gpm 6½'dd | 4' | 8-29-53 | Sand & Gravel | -- | Irr. |
| 3G&H | Town of Chewelah | 30' | 450gpm 0 dd | 9' | 6-9-61 | Gravel | 10hp. | Town Supply |
| 11J | John Nett | 15' | 40gpm 10'dd | 3' | 7-15-48 | Sand & Gravel | ½hp. | Dom. Irr. |
| 14J | Town of Chewelah | 175' | 600gpm 137'dd | Flows | 10-1954 | Coarse Gravel | -- | Town Supply |
| 15R | " | 362' | 3000gpm | Flows | 1-28-66 | Gravel, clean | 60hp. | " |
| 23J | Northwest Magnesite Co. | 80' | 60gpm 65'dd | Flows | 4-1949 | Gravel | 7½hp. | Mining Ind. |
| 23R | " | 197' | 150gpm 0 dd | Flows 180gpm | 7-31-53 | Gravel | -- | " |
| 26A | " | 188' | Flows 10gpm | Flows | 6-30-53 | Cement, Gravel, clay | -- | " |
| 28B | O.R. McLenaghan | 110' | 4gpm | 90' | 3-1-70 | Sand | 3/4hp. | Dom. Irr. |
| T32N-R41E 6F | C.L. Salsman | Sump 30'x30' 6' deep | 35gpm | 5' | 12-55 | Sand | -- | Irr. |
| T33N-R39E 5N | L.S. Salsbury | 8' | -- | 3' | 10-2-67 | Sand & Gravel with clay | 15hp. | Irr. |
| 6R | C.W. Jacison | 21'6" | 75gpm 6'dd | -- | 8-30-62 | Sand & Gravel | 2hp. | Irr. |
| 8J | R.P. Rausch | 35'x100' Trench 10' deep | 300gpm | 5' | 9-1956 | Gravel | -- | Irr. |
| 10R | J.H. Korner | 24'x200' 10'deep | 100gpm 6"dd | -- | 10-1-55 | Sand 8'-10' | -- | Irr. |
| 13D | Forney & Egland | 35'x150' 6'deep | | -- | 11-1956 | Sand 5'-8' | | Irr. |

| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T33N-R39E Cont. | | | | | | | | |
| 15B | E.C. Peterson | 40'x80' 8'deep | 150gpm | -- | -- | Sand | -- | Irr. |
| 24K | St. Highway Department | 315' | 22gpm 222'dd | 53' | 7-17-67 | Sand 200'-210' | 10hp. | Dom., Irr. Park area |
| T33N-R40E 12N | Hubert Nett | Inf. Trench 7' deep | 450gpm | 2' | 8-28-64 | Sand & Gravel | 25hp. | Irr. |
| 12K | Don G. Knauss | 6' deep | 450gpm 2½'dd | 2' | 7-15-53 | " | -- | Irr. |
| 23L | Frank T. Ross | 11' | 110gpm 0 dd | 3' | -- | Sand | -- | Irr. |
| T34N-R37E 9G | Louis Schenegge | 80' | 150gpm 11'dd | 47' | 8-31-45 | -- | 5hp. | Irr. |
| 10D | Donald Jamieson | 49' | 20gpm 0 dd | 29' | 5-15-44 | Gravel | 1½hp. | Irr. |
| 24N | D.W. Laughbon | 100' | 5gpm 50'dd | Flows | 3-21-52 | Gravel @ 50' | | Com. |
| T24N-R39E 2B | Jake Horst | 200' | -- | 15' | 7-1964 | Decomposed Granite | 1hp. | Stock Dom. |
| 10L | Arden Lbr. Co. | 38' | 50gpm 5'dd | 15' | 7-1955 | Gravel | 5hp. | Mill Supply |
| T34N-R40E 6N | H. C. Hall | 6' | 250gpm 3'dd | 1' | 4-25-54 | -- | 7½hp. | Irr. Dom. |
| T35N-R39E 1E | R. L. Baker | 18' | 5gpm 4'dd | 2' | 9-2-67 | Sand & Gravel 16-18' | | |
| 3Q | Earl Leach | 75' | 10gpm 0 dd | 5' | 11-5-53 | Gravel, Coarse 55'-75' | ½hp. | Dom. |
| 4Q | D.C. Garringer | 27' | 100gpm 20'dd | 12' | 6-1-51 | -- | | Dom. |
| 5F | Nelson Bros. | 80' | 50gpm 5'dd | Flows | 3-1-53 | Gravel with clay 55'-80' | 5hp. | Irr. Dom. |
| 6A | Leta M. | 190' | 20gpm 15'dd | 15' | 12-1958 | Gravel 175-190' | 1½hp. | Dom. |
| 9J | Dept. of Game | 90' | 570gpm 26'dd | 31' | 9-10-66 | Sand & Gravel | -- | Fish Culture |
| 10B | City of Colville | 212' | 1200gpm 25'dd | Flows 300gpm | 7-21-53 | Gravel 35'-160' | | Municipal Supply |

| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T35N-R39E Cont. | | | | | | | | |
| 10A | City of Colville | 236' | 1700gpm 38'dd | 3' | 9-9-57 | Gravel 185-227' | | " |
| 10N | " | 48' | 250gpm 10'dd | 8' | 6-10-48 | Sand & Gravel | | " |
| 11K | " | 100' | 350gpm 66'dd | 5' | 9-28-60 | Sand & Gravel 82'-92' | 15hp. | Municipal |
| 12R | " | 146' | 1900gpm 51'dd | 46' | 10-14-70 | Sand & Gravel 90'-140' | -- | " |
| 14N | Roy Ogden | 6' | 63gpm 6'dd | 0 | -- | Sandy clay | -- | Irr. Dom. |
| 15M | P.G. Hildebrand | 26' | 25gpm | 9' | 6-1963 | Gravel | 3/4hp. | Dom. |
| 16F | Hugh Heritage | 196' | 50gpm 10'dd | Flows | 9-19-51 | Sand 185'-194' | | Irr. Dom. |
| 20L | P.R. Trunnell | 110' | 300gpm 15'dd | Flows | 5'20'59 | 92'-108' Gravel | -- | -- |
| 24H | Alice Chase | Dug 16' | 384gpm | -- | 12-2-63 | Gravel | 10hp. | Irr. |
| T35N-R40E | | | | | | | | |
| 26M | E.H. Sackman | 25'x50' 10' deep | 75gpm 5'dd | Flows | 7-15-53 | Gravel | -- | Irr. |
| 27R | D.I.&A.I. Chst | 15'x1000' 5'deep | 110gpm | -- | 8-15-62 | Gravel | -- | Irr. |
| 34A | L.E. Gotham | 30'x30' 8'deep | 150gpm | -- | -- | Gravel | -- | " |
| 35D | E.N.Sackman | 25'x25' 10'deep | 200gpm 4'dd | 2' | 7-17-53 | Gravel | -- | Irr. |
| T36N-R37E | | | | | | | | |
| 14Q | Sid Hamilton | 16' | 50gpm | 10.5' | 7-3-64 | Gravel 10'-16' | 2hp. | Irr. |
| 23G | " " | 18' | 20gpm 2'dd | -- | 5-2-63 | Gravel 14'-18' | 1hp. | Irr. |
| 23F | M. Beardslee | 30' | -- | 19' | 3-1-68 | Sand & Gravel 8'-29' | -- | Dom. Irr. |
| 26B | S.G. Swain | 51' | 55gpm 8'dd | 37' | 3-28-64 | Sand & Gravel 37'-51' | 1hp. | Dom. Irr. |
| T36N-R38E | Everett | | 30gpm | | | Sand | | Dom. |
| 11R | Craig | 16' | 4'dd | 10' | 11-10-51 | 10'-16- | -- | Irr. |
| 27L | B.J. Blenz | 100'x100' 6½'deep | 125gpm | -- | 6-1-51 | Sand | -- | Irr. |
| T36N-R39E | | | | | | | | |
| 3A | Joe J. May | 4'x4' 6'deep | Flows 30gpm | 0 | 10-1958 | Sand | -- | Irr. |
| 31N | D.C. Garringer | 5'x5' 28'deep | 10gpm 5'dd | 20' | 9-1-58 | Sand | ½hp. | Dom. |

| Well | Owner | Well Depth | Yield & Draw down | SWL | Date | Water Bearing Material | Pump | Use |
|---|---|---|---|---|---|---|---|---|
| T36N-R40E 8L | Victor Lawson | 9' | 180gpm ½'dd | 0 | 6-22-68 | Sand | 7½hp. | Irr. |
| 19R | Ray Bailey | 4'x20' 8'deep | 144gpm 3'dd | -- | 3-10-54 | Gravel | -- | Irr. |
| T37N-R38E 24G | Mrs. J.L. Owens | 58' | 200gpm 3'dd | 27' | 7-19-61 | -- | 7½hp. | Dom. Irr. |
| T37N-R39E 18P | W.D. Reynolds | 80' | 50gpm | 55' | 5-15-37 | Sand & Gravel @ 55' | -- | Dom. Irr. |
| T38N-R40E 30A | American Smelting & Refining Co. | 21' | 75gpm | -- | -- | -- | -- | Ind. |
| T39N-R40E 4D | Town of Northport | 200' | 70gpm 71'dd | 78' | 2-18-70 | Sand 138'-158' | 10hp. | Municipal Supply |
| 4C | " | 230' | 275gpm 62'dd | 42' | 7-18-69 | Sand 187'-227' | -- | " |
| T39N-R41E 26M | Funks Resort | 43' | 90gpm 10'dd | 23' | 6-1-69 | Sand & Gravel | 1½hp. | Dom. for Resort |
| 26M | Americal Zinc Co. | 65' | 30gpm 6'dd | 44' | 5-15-65 | Gravel 45'-65' | 3hp. | Dom. |




*– EXPLANATION –*

| | |
|---|---|
| Qal | ALLUVIUM; silt, sand, and gravel along stream valleys. Sand and gravel yield small to moderate quanitities of water. |
| Qg | GLACIAL DRIFT UNDIFFERENTIATED; clay, silt, sand, and gravel. Clays and silts yield little water. Sands and gravels yield moderate to large quanitities of water. |
| Ptu | BEDROCK; Sedimentary, Igneous, and Metamorphic rocks undifferentiated. Yields small quanitities of water locally. |
| 36AI ● | Represenative well |

NOTE:
Geology modified from Division of Mines and Geology state geologic map (1961) and Department of Water Resources water-supply bulletin number 27 (1969).

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
JOHN A. BIGGS, DIRECTOR

# GENERALIZED GEOLOGY AND WELL LOCATION MAP OF STEVENS COUNTY, WASHINGTON

SCALE: in miles 0 1 2 3 4 5 | DATE: OCTOBER, 1971

BY: ROBERT H. RUSSELL, GEOLOGIST

DRAWN BY: JOHN C. MILHOLLIN, C.E.T., CARTOGRAPHER