

# Bibliography and Index of Geothermal Resources and Development in Washington State, with Selected General Works

compiled by Rebecca A. Christie  
updated by Lee Walkling

WASHINGTON  
DIVISION OF GEOLOGY  
AND EARTH RESOURCES

Open File Report 2009-2  
March 2009



WASHINGTON STATE DEPARTMENT OF  
**Natural Resources**  
Peter Goldmark - Commissioner of Public Lands

Division of Geology and Earth Resources  
David K. Norman - State Geologist



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## **WASHINGTON DEPARTMENT OF NATURAL RESOURCES**

Peter Goldmark—*Commissioner of Public Lands*

### **DIVISION OF GEOLOGY AND EARTH RESOURCES**

David K. Norman—*State Geologist*

John P. Bromley—*Assistant State Geologist*

#### **Washington Department of Natural Resources Division of Geology and Earth Resources**

*Mailing Address:*                   *Street Address:*  
PO Box 47007                       Natural Resources Bldg, Rm 148  
Olympia, WA 98504-7007           1111 Washington St SE  
   Olympia, WA 98501

*Phone:* 360-902-1450

*Fax:* 360-902-1785

*E-mail:* [geology@dnr.wa.gov](mailto:geology@dnr.wa.gov)

*Website:* <http://www.dnr.wa.gov/AboutDNR/Divisions/GER/>

This and other DGER publications are available online at:

<http://www.dnr.wa.gov/ResearchScience/Topics/>

[GeologyPublicationsLibrary/Pages/pubs.aspx](http://www.dnr.wa.gov/GeologyPublicationsLibrary/Pages/pubs.aspx)

Online catalog and bibliography of the Washington Geology Library:

<http://www.dnr.wa.gov/ResearchScience/Topics/>

[GeologyPublicationsLibrary/Pages/washbib.aspx](http://www.dnr.wa.gov/GeologyPublicationsLibrary/Pages/washbib.aspx)

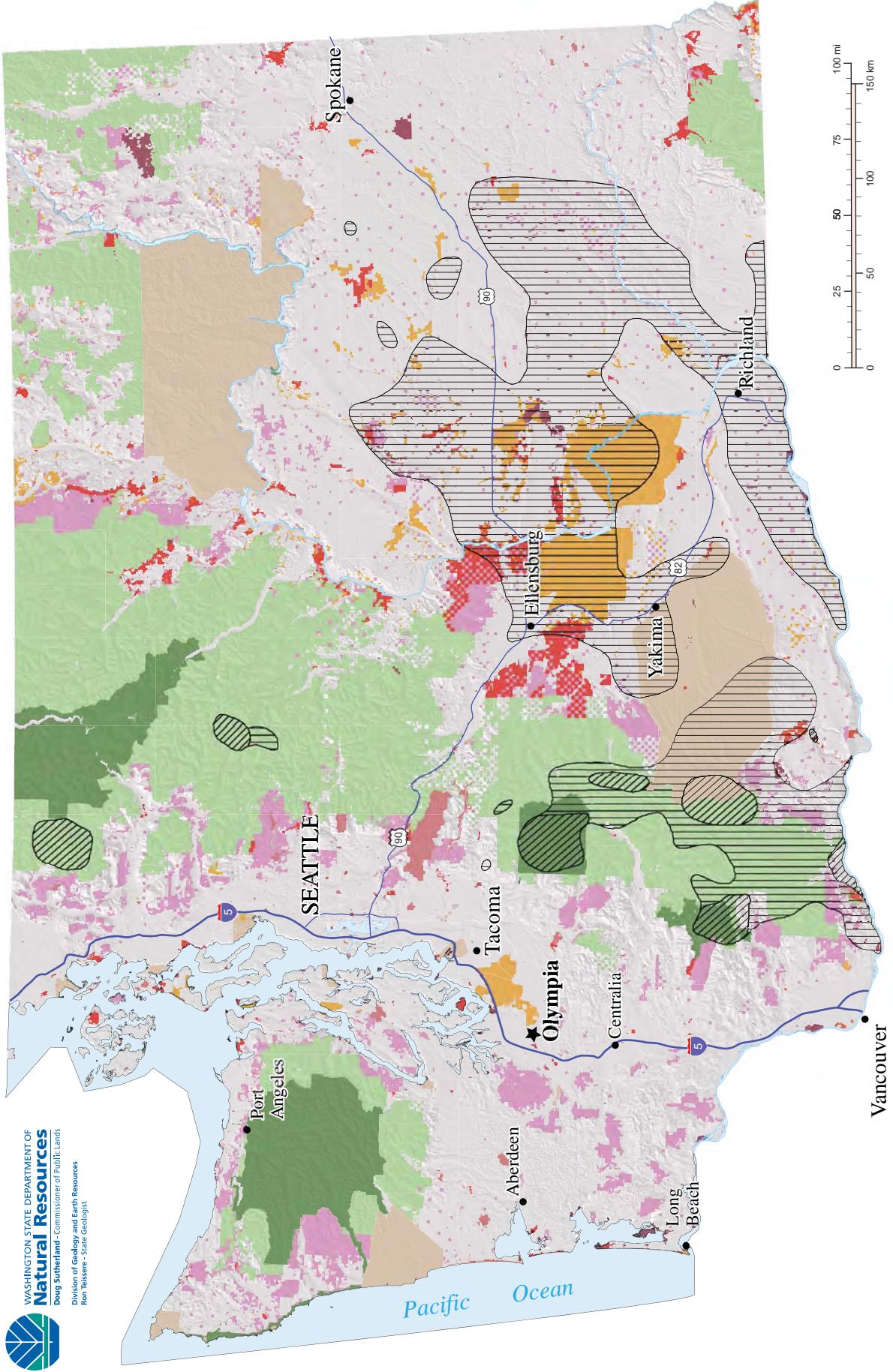
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# Washington Geothermal Resources

WASHINGTON STATE DEPARTMENT OF  
**Natural Resources**  
Doug Sutherland - Commissioner of Public Lands  
Ron Tissner - State Geologist



**Land Ownership**

- DNR-managed lands
- Tribal lands
- U.S. Forest Service
- National Park Service

**Geothermal Resources**

- High temperature (approx. 100 °C or higher)
- Low temperature (20 °C or higher)

Washington Division of Geology and Earth Resources,  
Washington State Department of Natural Resources  
Geothermal Data derived from Geologic Map-25,  
Geothermal resources of Washington,  
compiled by M. A. Korsc, K. L. Kaler, J. E. Schuster, R. G. Bloomquist,  
S. J. Simpson, and D. D. Blackwell, 1981, 1 sheet, scale 1:500,000,  
Lambert Conformal Conic Projection, North American Datum of 1983  
Cartography by Elizabeth E. Thompson

# Bibliography and Index of Geothermal Resources and Development in Washington State, with Selected General Works

compiled by Rebecca A. Christie  
updated by Lee Walkling

## INTRODUCTION TO THE 2009 UPDATE

This work is presented in two parts:

(1) INDEX BY SUBJECT—Items are indexed alphabetically by subject, county, and (or) physiographic province, with subject and (or) areal subdivisions as appropriate. See the Subject List (p. 3) for an alphabetical list of the subject headings used in this report.

Only the author(s), date, and title of the item are given in the Index—enough information to refer the user to the full citation in the Bibliography section.

(2) BIBLIOGRAPHY BY AUTHOR—Each citation is given in full according to our editorial standards. Works are listed alphabetically and chronologically by author, with an author's individual works preceding co-authored works. Joint-author cross-references are interfiled alphabetically.

Items with an asterisk (\*) are NOT held in the Washington Geology Library. Contact the other libraries listed below to obtain those documents.

Web addresses are given for documents available online. Check our [publications list](#) and [online bibliography](#) for new postings.

## Geologic Mapping

Through the [Washington State Geologic Information Portal](#), you can access interactive earth science mapping, data, and related information. Using our interactive maps, you can create, save, and print custom maps, find out more information about map features, and download map data for use in a geographic information system (GIS).

The [Index to Geologic and Geophysical Mapping of Washington](#) shows available published and open-filed reports, as well as theses, with mapping at any scale for a particular area.

Geologic mapping at 1:100,000-scale is available for the whole state, and some of the newer published maps have been included in this bibliography. All 1:100,000-scale mapping for Washington is available as [shapefiles online](#) or on CD by calling 360-902-1450.

Mapping at 1:24,000-scale is available for some [7.5-minute topographic quadrangles](#). We have included the newer maps in this bibliography. For more information on how to obtain geologic maps of an area, see our [geologic mapping webpage](#).

## Geothermal Database

The first edition of this publication mentioned a database being developed by J. Eric Schuster. That database was published as Open File Report 94-11 (Schuster and Bloomquist, 1994).

While this bibliography and index are as complete and accurate as possible, it is inevitable that some citations have been missed and some mistakes have been made. Any information about omissions or errors will be appreciated. Contact Geology Librarian Lee Walkling (contact information given below):

### Washington Division of Geology and Earth Resources

1111 Washington St SE, Natural Resources Bldg, Rm 148  
PO Box 47007; Olympia, WA 98504-7007  
Phone: 360-902-1450; Fax: 360-902-1785  
E-mail: [geology@dnr.wa.gov](mailto:geology@dnr.wa.gov)  
Website: <http://www.dnr.wa.gov/AboutDNR/Divisions/GER/>

### Washington Geology Library

Lee Walkling, Librarian  
1111 Washington St SE, Natural Resources Bldg, Rm 173  
PO Box 47007; Olympia, WA 98504-7007  
Phone: 360-902-1473; E-mail: [lee.walkling@dnr.wa.gov](mailto:lee.walkling@dnr.wa.gov)  
Website: <http://www.dnr.wa.gov/ResearchScience/Topics/GeologyPublicationsLibrary/Pages/library.aspx>

## ACKNOWLEDGMENTS

Although this update of DGER Open File Report 94-1 was produced and edited by Lee Walkling and Jari Roloff, the original author (Rebecca Christie) and the organizations listed below deserve most of the credit for this worthy project:

**Washington State University Extension Energy Program Library (formerly Washington State Energy Office)**  
905 Plum St SE, Bldg 3  
PO Box 4316  
Olympia, WA 98504-3165  
Phone: 360-956-2000; Website: <http://www.energy.wsu.edu/>

**Oregon Institute of Technology Geo-Heat Center**  
3201 Campus Drive  
Klamath Falls, OR 97601-8801  
Phone: 541-885-1750; E-mail: [geoheat@oit.edu](mailto:geoheat@oit.edu)  
Website: <http://geoheat.oit.edu>

**Geothermal Resources Council**  
PO Box 1350  
Davis, CA 95617-1350  
Phone: 530-758-2360  
Website: <http://www.geothermal.org/>  
Library website: <http://www.geothermal.org/databases.html>

## REFERENCE CITED

Schuster, J. E.; Bloomquist, R. G., 1994, Low-temperature geothermal resources of Washington: Washington Division of Geology and Earth Resources Open File Report 94-11, 53 p., 2 plates. [[http://www.dnr.wa.gov/Publications/ger\\_ofr94-11\\_low\\_temp\\_geothermal.zip](http://www.dnr.wa.gov/Publications/ger_ofr94-11_low_temp_geothermal.zip)]

# Bibliography and Index of Geothermal Resources and Development in Washington State with Selected General Works

compiled by Rebecca A. Christie

## INTRODUCTION [original 1994 edition]

This bibliography was compiled in support of, and to complement, a database of all known low and moderate-temperature geothermal springs and wells in the State of Washington. The database is being prepared by J. Eric Schuster and will be released as a separate open-file report by the Division of Geology and Earth Resources. The bibliography fulfills one requirement of a contractual agreement between the Oregon Institute of Technology Geo-Heat Center and the Washington Department of Natural Resources. Funding was provided by the U.S. Department of Energy. The intent of this work is to be a comprehensive compilation of references to publications about low- and moderate-temperature geothermal resources and potential development areas in the State of Washington through 1993. It is not limited to geological aspects of geothermal resource exploration. The bibliography contains references on geothermal engineering, exploration techniques, legal and institutional requirements, and case histories and feasibility studies for direct-use applications in Washington. Selected general works not specific to Washington are also included.

No attempt was made to include all reports about the geology of regions believed to have potential for development of geothermal resources. For comprehensive information on the geology of a given area, please consult the Division of Geology and Earth Resources library and (or) the indexes published by the Division.

This work is presented in two parts:

- (1) Bibliography—Each citation is listed alphabetically by author and is given in full, in accordance with our editorial standards. Joint author cross-references are also provided.
- (2) Index—Each citation is listed alphabetically by subject, county, and (or) physiographic province, with subject and (or) areal subdivisions as appropriate. In this section, only the author(s), date, and title of the citation are given—enough information to refer the user to the full citation in the bibliography. Items with the same author(s) and title that are issued more than once (for example, as both a thesis and an abstract) are marked with an asterisk (\*) and are not repeated.

Many of the materials listed are held in the reference library at the Division of Geology and Earth Resources in Olympia and are available to the public for inspection. Three other collections house most of the other publications: the Washington State Energy Office Library, the office collection of R. Gordon Bloomquist at the Washington State Energy Office, and the Washington State Library.

Information about additional relevant materials or errors will be appreciated.

## Acknowledgments [original 1994 edition]

Many individuals were generous with their time and resources. I especially thank J. Eric Schuster and Connie J. Manson at the Washington Division of Geology and Earth Resources, and R. Gordon Bloomquist and Char Gruessing at the Washington State Energy Office. I am grateful to individuals at the Washington State Library, the Washington State Energy Office Library, the Washington Department of Ecology Library, the Oregon Institute of Technology Geo-Heat Center, and the Geothermal Resources Council.

## Sources of Information [original 1994 edition]

Washington State Department of Natural Resources  
Division of Geology and Earth Resources  
1111 Washington St. SE, Rooms 148 & 173  
P.O. Box 47007  
Olympia, WA 98504-7007  
(206) 902-1450  
FAX (206) 902-1785

Washington State Energy Office (WSEO)  
925 Plum St., Town Square Bldg. 4  
P.O. Box 43169  
Olympia, WA 98504-3169  
WSEO Library (206) 956-2076;  
FAX (206) 956-2217  
R. Gordon Bloomquist (206) 956-2016  
FAX (206) 956-2217

Washington State Library  
16th & Water Streets  
P.O. Box 42460  
Olympia, WA 98504-2460  
(206) 753-5590 or 1-800-562-6090;  
FAX (206) 753-3546

Oregon Institute of Technology Geo-Heat Center  
3201 Campus Drive  
Klamath Falls, OR 97601-8801  
(503) 885-1750

Geothermal Resources Council  
P.O. Box 1350  
Davis, CA 95617-1350

# Subject List

This list gives you the subject headings related to geothermal resources that are used in this publication and the Washington Geology Library online catalog and bibliography. This list is included because the search terms you use may not be the ones used in this index.

Subject headings are in upper-case type. Where similar terms are in popular use, we have listed those terms with a ‘*see*’ note to lead users to the term used in this index. ‘*See also*’ directs readers to related or broader terms used in the index.

## ADAMS CO.

*see also* COLUMBIA BASIN

Aeromagnetic surveys, *see* GEOPHYSICS – MAGNETIC SURVEYS

## AGRIBUSINESS

*see also* GEOTHERMAL ENGINEERING [GENERAL WORKS]

Ahtanum Valley, *see* YAKIMA CO.

## AQUACULTURE

*see also* GEOTHERMAL ENGINEERING [GENERAL WORKS]

## ASOTIN CO.

*see also* COLUMBIA BASIN

BAKER HOT SPRING (WHATCOM CO.)

*see also* THERMAL AND MINERAL WATERS

## BENTON CO.

*see also*

COLUMBIA BASIN  
PASCO BASIN

## BIBLIOGRAPHIES

Black Diamond, Wash., *see* KING CO.

BONNEVILLE HOT SPRINGS (SKAMANIA CO.)

CAMAS, WASH., AND VICINITY

CARSON HOT SPRINGS (SKAMANIA CO.)

*see also* THERMAL AND MINERAL WATERS

CARSON, WASH. (SKAMANIA CO.)

## CASCADE RANGE

*Note:* Regional materials on the Cascade Range are listed here.

Specific materials within the Cascade Range are listed under the counties:

CHELAN CO.

KING CO.

KITTITAS CO.

LEWIS CO.

OKANOGAN CO.

PIERCE CO.

SKAGIT CO.

SKAMANIA CO.

SNOHOMISH CO.

WHATCOM CO.

YAKIMA CO.

Specific materials are also listed under the volcanoes and volcanic areas:

GLACIER PEAK AREA

INDIAN HEAVEN AREA

MOUNT ADAMS

MOUNT BAKER

MOUNT RAINIER

MOUNT ST. HELENS

WHITE PASS AREA

*see also*

CASCADE RANGE (NORTH)

CASCADE RANGE (SOUTH)

## CASCADE RANGE [GENERAL WORKS]

CASCADE RANGE – EXPLORATION AND EVALUATION

*see also* CASCADE RANGE (SOUTH) – EXPLORATION AND EVALUATION

## CASCADE RANGE – GEOPHYSICAL SURVEYS

*Note:* Includes electrical, electromagnetic, gravity, magnetic, and seismic surveys. Thermal surveys are listed under CASCADE RANGE – HEAT FLOW AND THERMAL SURVEYS.

*see also* CASCADE RANGE (SOUTH) – HEAT FLOW AND THERMAL SURVEYS

## CASCADE RANGE – HEAT FLOW AND THERMAL SURVEYS

*see also* CASCADE RANGE (SOUTH) – HEAT FLOW AND THERMAL SURVEYS

## CASCADE RANGE (NORTH)

*see also*

CASCADE RANGE

CASCADE RANGE (SOUTH)

## CASCADE RANGE (SOUTH)

*see also*

CASCADE RANGE

CASCADE RANGE (NORTH)

*Note:* Regional materials on the southern Cascade Range are listed here. Specific materials within the southern Cascade Range are listed under the counties:

KING CO.

KITTITAS CO.

LEWIS CO.

PIERCE CO.

SKAMANIA CO.

YAKIMA CO.

Specific materials are also listed under the volcanoes and volcanic areas:

INDIAN HEAVEN AREA

MOUNT ADAMS

MOUNT RAINIER

MOUNT ST. HELENS

WHITE PASS AREA

## CASCADE RANGE (SOUTH) [GENERAL WORKS]

## CASCADE RANGE (SOUTH) – EXPLORATION AND EVALUATION

## CASCADE RANGE (SOUTH) – HEAT FLOW AND GEOPHYSICAL SURVEYS

*Note:* Includes heat flow and electrical, electromagnetic, gravity, magnetic, seismic, and thermal surveys.

*see also*

CASCADE RANGE – GEOPHYSICAL SURVEYS

CASCADE RANGE – HEAT FLOW AND THERMAL SURVEYS

## CASCADIA BASIN (OCEAN)

Case histories/case studies, *see* HEATING – CASE HISTORIES

CHELAN CO.

*see also* CASCADE RANGE

CHENEY, WASH. (SPOKANE CO.)

CLALLAM CO.

*see also* OLYMPIC MOUNTAINS AND OLYMPIC PENINSULA

CLARK CO.

COLUMBIA BASIN

*Note:* Regional materials on the Columbia Basin are listed here. Specific materials within the Columbia Basin are listed under the counties:

ADAMS CO.

ASOTIN CO.

BENTON CO.

COLUMBIA CO.

DOUGLAS CO.

FRANKLIN CO.

GARFIELD CO.

GRANT CO.

KLICKITAT CO.

LINCOLN CO.

OKANOGAN CO.

SPOKANE CO.

WALLA WALLA CO.

WHITMAN CO.

YAKIMA CO.

COLUMBIA CO.

*see also* COLUMBIA BASIN

Computer programs, *see*

GEOTHERMAL ENGINEERING – COMPUTER PROGRAMS

GEOTHERMAL RESOURCES – COMPUTER PROGRAMS

COWLITZ CO.

Direct use, *see*

AGRIBUSINESS (includes greenhouses)

AQUACULTURE

GEOTHERMAL ENGINEERING [GENERAL WORKS]

HEATING

INDUSTRIAL AND PROCESS APPLICATIONS

District heating, *see* HEATING

DOUGLAS CO.

*see also* COLUMBIA BASIN

Drilling, *see*

EXPLORATION AND EVALUATION

EQUIPMENT AND MATERIALS – DRILLING

GEOPHYSICS – DRILLING – METHODOLOGY

GEOTHERMAL ENGINEERING [GENERAL WORKS]

ELECTRIC POWER [GENERAL WORKS]

ELECTRIC POWER – ECONOMIC ASPECTS

ELECTRIC POWER – ENVIRONMENTAL ASPECTS

ELECTRIC POWER – GEOTHERMAL POWER PLANTS

Electric power – Legal aspects, *see* LAW AND LEGISLATION

Electrical surveys, *see* GEOPHYSICS – ELECTRICAL SURVEYS

Electromagnetic surveys, *see* GEOPHYSICS –

ELECTROMAGNETIC SURVEYS

ELLENSBURG, WASH. (KITTIWAS CO.)

Energy – Geothermal, *see* ELECTRIC POWER

Energy resource planning, *see* RESOURCE PLANNING

ENVIRONMENTAL IMPACT STATEMENTS

EPHRATA, WASH. (GRANT CO.)

EQUIPMENT AND MATERIALS [GENERAL WORKS]

*see also* GEOTHERMAL ENGINEERING [GENERAL WORKS]

EQUIPMENT AND MATERIALS – DRILLING

EQUIPMENT AND MATERIALS – HEAT EXCHANGERS AND CONVECTORS

EQUIPMENT AND MATERIALS – HEAT PUMPS

EQUIPMENT AND MATERIALS – TRANSMISSION AND DISTRIBUTION PIPELINES

EXPLORATION AND EVALUATION [GENERAL WORKS]

*Note:* Includes works on geothermal resource exploration and assessment of development potential.

EXPLORATION AND EVALUATION – CASCADE RANGE

EXPLORATION AND EVALUATION – COLUMBIA BASIN

EXPLORATION AND EVALUATION – PUBLIC LANDS

EXPLORATION AND EVALUATION – SOUTHWEST WASHINGTON

EXPLORATION AND EVALUATION – STATEWIDE

Fifes Peak Formation, *see* YAKIMA CO.

FRANKLIN CO.

*see also*

COLUMBIA BASIN

PASCO BASIN

Fumaroles, *see* VOLCANISM – FUMAROLES

GAMMA HOT SPRINGS (SNOHOMISH CO.)

*see also* THERMAL AND MINERAL WATERS

GARFIELD CO.

*see also* COLUMBIA BASIN

GEOCHEMISTRY

*see also*

HYDROLOGY – CHEMICAL ANALYSIS

SOILS

Geologic hazards, *see* VOLCANISM – GEOLOGIC HAZARDS

GEOPHYSICS – AERIAL INFRARED SURVEYS

Geophysics – Aeromagnetic surveys, *see* GEOPHYSICS – MAGNETIC SURVEYS

GEOPHYSICS – DRILLING – METHODOLOGY

GEOPHYSICS – ELECTRICAL SURVEYS

GEOPHYSICS – ELECTROMAGNETIC SURVEYS

GEOPHYSICS – GRAVITY SURVEYS

GEOPHYSICS – HEAT FLOW AND THERMAL SURVEYS [STATEWIDE AND GENERAL WORKS]

GEOPHYSICS – HEAT FLOW AND THERMAL SURVEYS – CASCADE RANGE

GEOPHYSICS – HEAT FLOW AND THERMAL SURVEYS – COLUMBIA BASIN

GEOPHYSICS – MAGNETIC SURVEYS

Geophysics – Magnetotelluric surveys, *see* GEOPHYSICS – ELECTROMAGNETIC SURVEYS

GEOPHYSICS – SEISMIC SURVEYS

Geothermal energy – Laws and regulations, *see* LAW AND LEGISLATION – LEASES AND PERMITS

## GEOTHERMAL ENGINEERING [GENERAL WORKS]

*See also*

AGRIBUSINESS  
AQUACULTURE  
ELECTRIC POWER  
EQUIPMENT AND MATERIALS  
HEATING  
INDUSTRIAL AND PROCESS APPLICATIONS

## GEOTHERMAL ENGINEERING – COMPUTER PROGRAMS

## GEOTHERMAL ENGINEERING – ECONOMIC ASPECTS

## GEOTHERMAL ENGINEERING – ENVIRONMENTAL ASPECTS

## GEOTHERMAL ENGINEERING – HANDBOOKS, MANUALS, ETC.

Geothermal ice caves, *see* VOLCANISM – GEOTHERMAL ICE CAVES

Geothermal power plants, *see* ELECTRIC POWER – GEOTHERMAL POWER PLANTS

## GEOTHERMAL RESOURCES [GENERAL WORKS AND SUMMARIES]

*Note:* For more detailed works, *see* EXPLORATION AND EVALUATION.

## GEOTHERMAL RESOURCES – COMPUTER PROGRAMS

## GEOTHERMAL RESOURCES – ECONOMIC ASPECTS

## GEOTHERMAL RESOURCES – GUIDEBOOKS

## GEOTHERMAL RESOURCES – ORAL HISTORY, MYTHS, LEGENDS

## GEOTHERMAL RESOURCES – SUSTAINABILITY

## GIFFORD PINCHOT NATIONAL FOREST

## GLACIER PEAK AREA

Goat Rocks area, *see* WHITE PASS AREA

## GOLDDALE, WASH. (KLICKITAT CO.)

Goose Egg Mountain, *see* YAKIMA CO.

## GRANDVIEW, WASH. (YAKIMA CO.)

## GRANT CO.

*see also* COLUMBIA BASIN

Gravity surveys, *see* GEOPHYSICS – GRAVITY SURVEYS

Greenhouses, *see* AGRIBUSINESS

## GREEN RIVER SODA SPRINGS (COWLITZ CO.)

*see also* THERMAL AND MINERAL WATERS

Ground water, *see*

HYDROLOGY

THERMAL AND MINERAL WATERS

WATER WELLS

WELL LOGS

## HARRAH, WASH. (YAKIMA CO.)

Heat exchangers, *see* EQUIPMENT AND MATERIALS – HEAT EXCHANGERS AND CONVECTORS

Heat flow, *see* GEOPHYSICS – HEAT FLOW AND THERMAL SURVEYS

Heat pumps, *see* EQUIPMENT AND MATERIALS – HEAT PUMPS

## HEATING

*Note:* Includes works on district and space heating of buildings.

*see also*

EQUIPMENT AND MATERIALS  
GEOTHERMAL ENGINEERING

For other direct heating applications:

*see also*

AGRICULTURE  
AQUACULTURE  
INDUSTRIAL AND PROCESS APPLICATIONS

## HEATING – CASE HISTORIES

## HEATING – ECONOMIC ASPECTS

## HEATING – FEASIBILITY STUDIES

## HEATING – HANDBOOKS, MANUALS, ETC.

Heating – Legal aspects, *see* LAW AND LEGISLATION

## HEATING – RESIDENTIAL

*see also* POPULAR WORKS

Hot springs, *see*

GEOPHYSICS—HEAT FLOW AND THERMAL SURVEYS  
THERMAL AND MINERAL WATERS

## HYDROLOGY – CHEMICAL ANALYSIS [STATEWIDE AND GENERAL WORKS]

## HYDROLOGY – CHEMICAL ANALYSIS – CASCADE RANGE

## HYDROLOGY – CHEMICAL ANALYSIS – COLUMBIA BASIN

HYDROLOGY – CHEMICAL ANALYSIS – HANDBOOKS, MANUALS, ETC.

## HYDROLOGY – CHEMICAL ANALYSIS – PUGET LOWLAND

## HYDROLOGY – DIRECTORIES

## HYDROLOGY – GEOPHYSICS

*see also* WELL LOGS

Hydrology – Ground water, *see* THERMAL AND MINERAL WATERS

## HYDROTHERMAL VENTS AND PLUMES (OCEAN)

Ice caves, *see* VOLCANISM – GEOTHERMAL ICE CAVES

## INDIAN HEAVEN AREA

## INDUSTRIAL AND PROCESS APPLICATIONS

*see also* GEOTHERMAL ENGINEERING [GENERAL WORKS]

Institutional aspects, *see* LAW AND LEGISLATION

## KELSO, WASH. (COWLITZ CO.)

## KENNEDY HOT SPRINGS (SNOHOMISH CO.)

*see also* THERMAL AND MINERAL WATERS

## KING CO.

*see also* CASCADE RANGE

## KITTIKAS CO.

*see also* CASCADE RANGE

## KLICKITAT CO.

*see also* COLUMBIA BASIN

## LAW AND LEGISLATION

*Note:* Includes legal, institutional, and regulatory aspects.

## LAW AND LEGISLATION – HANDBOOKS, MANUALS, ETC.

## LAW AND LEGISLATION – LEASES AND PERMITS

Leases, *see* LAW AND LEGISLATION – LEASES AND PERMITS

## LESTER HOT SPRINGS (KING CO.)

*see also* THERMAL AND MINERAL WATERS

## LEWIS CO.

*see also* CASCADE RANGE

## LINCOLN CO.

*see also* COLUMBIA BASIN

## LONGVIEW, WASH. (COWLITZ CO.)

## LOOWIT HOT SPRINGS (SKAMANIA CO.)

*see also* THERMAL AND MINERAL WATERS

Magnetic surveys, *see* GEOPHYSICS – MAGNETIC SURVEYSMagnetotelluric surveys, *see* GEOPHYSICS – ELECTROMAGNETIC SURVEYS

## MAPS – GEOLOGIC

*Note:* Under MAPS – GEOLOGIC – [COUNTY] is a selected list of geologic maps. For a complete list of all geologic maps, *see* the indexes and web pages published by the Washington Division of Geology and Earth Resources.

Maps – Geologic – Adams Co., *see also* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – ASOTIN CO.

*see also* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

Maps – Geologic – Benton Co., *see* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – CASCADE RANGE

*see also*

MAPS – GEOLOGIC – NORTHWEST QUADRANT  
MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – CHELAN CO.

*see also*

MAPS – GEOLOGIC – NORTHEAST QUADRANT  
MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – CLALLAM CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – CLARK CO.

*see also* MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – COLUMBIA CO.

*see also* MAPS – GEOLOGIC –  
SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – COWLITZ CO.

*see also* MAPS – GEOLOGIC – SOUTHWEST QUADRANT

Maps – Geologic – Douglas Co., *see also* MAPS – GEOLOGIC – NORTHEAST QUADRANTMaps – Geologic – Ferry Co., *see* MAPS – GEOLOGIC – NORTHEAST QUADRANTMaps – Geologic – Franklin Co., *see* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – GARFIELD CO.

*see also* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

Maps – Geologic – Grant Co., *see*

MAPS – GEOLOGIC – NORTHEAST QUADRANT  
MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – GRAYS HARBOR CO.

*see also*

MAPS – GEOLOGIC – NORTHWEST QUADRANT  
MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – ISLAND CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – JEFFERSON CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – KING CO.

*see also*

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MAPS – GEOLOGIC – SOUTHWEST QUADRANT

Maps – Geologic – Kitsap Co., *see* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – KITTITAS CO.

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MAPS – GEOLOGIC – SOUTHEAST QUADRANT

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## MAPS – GEOLOGIC – KLICKITAT CO.

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## MAPS – GEOLOGIC – LEWIS CO.

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## MAPS – GEOLOGIC – LINCOLN CO.

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## MAPS – GEOLOGIC – MASON CO.

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## MAPS – GEOLOGIC – OKANOGAN CO.

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## MAPS – GEOLOGIC – OLYMPIC MOUNTAINS/OLYMPIC PENINSULA

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Maps – Geologic – Pacific Co., *see also* MAPS – GEOLOGIC – SOUTHWEST QUADRANTMaps – Geologic – Pend Oreille Co., *see also* MAPS – GEOLOGIC – NORTHEAST QUADRANT

## MAPS – GEOLOGIC – PIERCE CO.

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MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – SAN JUAN CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – SKAGIT CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – SKAMANIA CO.

*see also* MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – SNOHOMISH CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

## MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – SPOKANE CO.

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## MAPS – GEOLOGIC – STEVENS CO.

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## MAPS – GEOLOGIC – THURSTON CO.

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Maps – Geologic – Wahkiakum Co., *see also* MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOLOGIC – WALLA WALLA CO.

*see also* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – WHATCOM CO.

*see also* MAPS – GEOLOGIC – NORTHWEST QUADRANT

Maps – Geologic – Whitman Co., *see also* MAPS – GEOLOGIC – SOUTHEAST QUADRANT

## MAPS – GEOLOGIC – YAKIMA CO.

*see also*MAPS – GEOLOGIC – SOUTHEAST QUADRANT  
MAPS – GEOLOGIC – SOUTHWEST QUADRANT

## MAPS – GEOPHYSICAL

*Note:* This is a selected list of geophysical maps. For a complete list of all geophysical maps, *see* the indexes published by the Washington Division of Geology and Earth Resources.

## MAPS – GEOTHERMAL RESOURCES

## MAPS – HYDROLOGIC

## MOFFETTS HOT SPRINGS (SKAMANIA CO.)

*see also* THERMAL AND MINERAL WATERS

## MOSES LAKE, WASH., AND VICINITY

## MOUNT ADAMS (YAKIMA CO.)

## MOUNT BAKER (WHATCOM CO.)

## MOUNT BAKER/SNOQUALMIE NATIONAL FOREST

## MOUNT RAINIER (PIERCE CO.)

## MOUNT ST. HELENS (SKAMANIA CO.) [GENERAL WORKS]

*Note:* General works section does not include heat flow and thermal surveys or thermal and mineral waters. They are subdivided below.

## MOUNT ST. HELENS – HEAT FLOW AND THERMAL SURVEYS

## MOUNT ST. HELENS – THERMAL AND MINERAL WATERS

Moxee Valley, *see* YAKIMA CO.

## NORTH BONNEVILLE, WASH., (SKAMANIA CO.)

## OHANAPECOSH HOT SPRINGS (LEWIS CO.)

*see also* THERMAL AND MINERAL WATERS

## OKANOGAN CO.

*see also* CASCADE RANGE or COLUMBIA BASIN, as appropriate.

## OKANOGAN RANGE – HEAT FLOW AND THERMAL SURVEYS

## OLYMPIA, WASH. (THURSTON CO.)

OLYMPIC HOT SPRINGS (CLALLAM CO.)  
*see also* THERMAL AND MINERAL WATERSOLYMPIC MOUNTAINS AND OLYMPIC PENINSULA  
*see also* CLALLAM CO.

## OTHELLO, WASH. (ADAMS CO.)

## PASCO BASIN

*see also*

BENTON CO.

COLUMBIA BASIN

FRANKLIN CO.

WALLA WALLA CO.

Permits, *see* LAW AND LEGISLATION – LEASES AND PERMITS

## PIERCE CO.

*Note:* Materials about Mount Rainier are not listed here. They are listed under MOUNT RAINIER.

*see also* CASCADE RANGE

Pipelines, *see* EQUIPMENT AND MATERIALS – TRANSMISSION AND DISTRIBUTION PIPELINES

## POPULAR WORKS

Power plants, *see* ELECTRIC POWER – GEOTHERMAL POWER PLANTS

Refrigeration, *see* INDUSTRIAL AND PROCESS APPLICATIONS

Regulatory aspects, *see* LAW AND LEGISLATION

## REMOTE SENSING

## RESEARCH AND DEVELOPMENT

*see also* EXPLORATION AND EVALUATIONReservoir evaluation, *see* EXPLORATION AND EVALUATION

Residential geothermal power, *see* POPULAR WORKS OR HEATING – RESIDENTIAL

## RESOURCE PLANNING [GENERAL WORKS]

*Note:* Includes materials on energy planning and development to meet regional demands for heating and power consumption.

## RESOURCE PLANNING – ELECTRIC POWER

*see also* ELECTRIC POWER

## RESOURCE PLANNING – HEATING

*see also* HEATING

## RICHLAND, WASH. (BENTON CO.)

## SAINT MARTINS HOT SPRINGS (SKAMANIA CO.)

*see also* THERMAL AND MINERAL WATERS

## SEATTLE, WASH. (KING CO.)

Seismic surveys, *see* GEOPHYSICS – SEISMIC SURVEYS

## SHIPHERDS HOT SPRINGS (SKAMANIA CO.)

*see also* THERMAL AND MINERAL WATERS

## SKAGIT CO.

*see also* CASCADE RANGE

## SKAMANIA CO.

*Note:* Materials about Mount St. Helens are not listed here. They are listed under MOUNT ST. HELENS.

*see also* CASCADE RANGE

## SNOHOMISH CO.

*see also* CASCADE RANGE

## SOILS

## SOL DUC HOT SPRINGS (CLALLAM CO.)

*see also* THERMAL AND MINERAL WATERSSpace heating, *see* HEATING

## SPOKANE, WASH.

*see also* COLUMBIA BASIN

## STANDARDS

Steamboat Mountain area, *see* SKAMANIA CO.

## STEVENS CO.

## SULPHUR HOT SPRINGS (SNOHOMISH CO.)

*see also* THERMAL AND MINERAL WATERSSulphur Mountain area, *see* SNOHOMISH CO.

## SUMMIT CREEK SODA SPRING (LEWIS CO.)

*see also* THERMAL AND MINERAL WATERS

## SUNNYSIDE, WASH. (YAKIMA CO.)

## TACOMA, WASH. (PIERCE CO.)

## THERMAL AND MINERAL WATERS [STATEWIDE AND GENERAL WORKS]

*Note:* Works in this section include data on water with temperatures 20° C.

*see also*

BAKER HOT SPRING

CARSON HOT SPRINGS

GAMMA HOT SPRING

GREEN RIVER SODA SPRINGS

KENNEDY HOT SPRING

LESTER HOT SPRINGS

LOOWIT HOT SPRINGS

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OHANAPECOSH HOT SPRINGS  
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THERMAL AND MINERAL WATERS – SOUTHWESTERN WASHINGTON  
Thermal surveys, *see* GEOPHYSICS – HEAT FLOW AND THERMAL SURVEYS  
THURSTON CO.  
Tieton volcano, *see* YAKIMA CO.  
Tumac Mountain and Tumac plateau, *see* WHITE PASS AREA  
VANCOUVER, WASH. (CLARK CO.)  
VOLCANISM [GENERAL WORKS]  
*Note:* Works on specific volcanoes and volcanic areas are not included here.  
*see*  
GLACIER PEAK AREA  
INDIAN HEAVEN AREA  
MOUNT ADAMS  
MOUNT BAKER  
MOUNT RAINIER  
MOUNT ST. HELENS  
WHITE PASS AREA  
*see also*  
CASCADE RANGE  
VOLCANISM – FUMAROLES

VOLCANISM – GEOLOGIC HAZARDS  
VOLCANISM – GEOTHERMAL ICE CAVES  
WALLA WALLA CO.  
*see also*  
COLUMBIA BASIN  
PASCO BASIN  
WALLA WALLA, WASH. (WALLA WALLA CO.)  
WATER WELLS  
*see also*  
THERMAL AND MINERAL WATERS  
WELL LOGS  
Well drilling and construction, *see* EQUIPMENT AND MATERIALS – DRILLING  
WELL LOGS  
*see also*  
THERMAL AND MINERAL WATERS  
WATER WELLS  
WENATCHEE NATIONAL FOREST  
WEST RICHLAND, WASH. (BENTON CO.)  
WHATCOM CO.  
*Note:* Materials about Mount Baker are not listed here.  
They are listed under MOUNT BAKER.  
*see also* CASCADE RANGE  
WHITE PASS AREA  
WHITMAN CO.  
*see also* COLUMBIA BASIN  
WIND RIVER AREA (SKAMANIA CO.)  
YAKIMA CO.  
*see also* CASCADE RANGE or COLUMBIA BASIN, as appropriate.  
YAKAMA INDIAN RESERVATION  
Yakima Valley, *see*  
BENTON CO.  
COLUMBIA BASIN  
KITITAS CO.  
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YAKIMA, WASH. (YAKIMA CO.)

# Index by Subject

Subject heading are in upper-case type. Where similar terms are in popular use, we have listed those terms with a ‘*see*’ note to lead users to the term used in this index. ‘*See also*’ notes direct the readers to related or broader terms used in the index.

Full citations are found in the Bibliography section that follows.

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*see also GEOTHERMAL ENGINEERING [GENERAL WORK]*

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**Ahtanum Valley, *see* YAKIMA CO.**

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*see also GEOTHERMAL ENGINEERING [GENERAL WORKS]*

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*see also COLUMBIA BASIN*

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*see also THERMAL AND MINERAL WATERS*

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*see also COLUMBIA BASIN PASCO BASIN*

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**BONNEVILLE HOT SPRINGS (SKAMANIA CO.)**

*see also* North Bonneville, Wash.

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*see also* THERMAL AND MINERAL WATERS

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**CHELAN CO.**

**KING CO.**

**KITTITAS CO.**

**LEWIS CO.**

**OKANOGAN CO.**

**PIERCE CO.**

**SKAGIT CO.**

**SKAMANIA CO.**

**SNOHOMISH CO.**

**WHATCOM CO.**

**YAKIMA CO.**

Specific materials are also listed under the volcanoes and volcanic areas:

**GLACIER PEAK AREA**

**INDIAN HEAVEN AREA**

**MOUNT ADAMS**

**MOUNT BAKER**

**MOUNT RAINIER**

**MOUNT ST. HELENS**

**WHITE PASS AREA**

*see also*

**CASCADE RANGE (NORTH)**

**CASCADE RANGE (SOUTH)**

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*see also* CASCADE RANGE (SOUTH) – EXPLORATION AND EVALUATION

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- see also* **CASCADE RANGE (SOUTH) – HEAT FLOW AND GEOPHYSICAL SURVEYS**
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- CASCADE RANGE (SOUTH)**
- Note:* Regional materials on the northern Cascade Range are listed here. Specific materials within the northern Cascade Range are listed under the counties:
- CHELAN CO.**
- KING CO.**
- KITTITAS CO.**
- OKANOGAN CO.**
- SKAGIT CO.**
- SNOHOMISH CO.**
- WHATCOM CO.**
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- see also*
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- CASCADE RANGE (NORTH)**
- Note:* Regional materials on the southern Cascade Range are listed here. Specific materials within the southern Cascade Range are listed under the counties:
- KING CO.**
- KITTITAS CO.**
- LEWIS CO.**
- PIERCE CO.**
- SKAMANIA CO.**
- YAKIMA CO.**
- Specific materials are also listed under the volcanoes and volcanic areas:
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**BENTON CO.**

**COLUMBIA CO.**

**DOUGLAS CO.**

**FRANKLIN CO.**

**GARFIELD CO.**

**GRANT CO.**

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**DOUGLAS CO.**

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**MOUNT SAINT HELENS –  
THERMAL AND MINERAL  
WATERS**  
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# Appendix: Additional Sources of Geothermal Information

## Western States Geothermal Database

This CD contains information for the following states (no. of entries): Alaska (238), Arizona (1251), California (989), Colorado (168), Idaho (1555), Montana (292), Nebraska (87), Nevada (455), New Mexico (361), North Dakota (128), Oregon (2195), South Dakota (821), Texas (1101), Utah (964), Washington (814), and Wyoming (356).

The CD may contain up to five databases for each of the western states above. The five databases are:

- 1) *Wells and Springs*—contains all the known wells and springs for that state with a temperature typically greater than 20°C.
- 2) *Chemistry*—contains the most common fluid chemistry for the wells and springs listed in the Wells and Springs database. Chemistry information was not available for Texas and Nebraska.
- 3) *Other Information*—contains additional information found in the original databases that did not fit in the above two databases.
- 4) *Direct-Use Sites*—contains known locations of existing direct-use sites for each state. The states of Arkansas, Georgia, Hawaii, New York and Virginia were also included in the database since they all have direct-use.
- 5) *Collocated Sites*—contains information on population centers located within 8 km of a known resource with a temperature of 50°C or greater.

The databases are available in three different formats for use over a wide range of spreadsheets and database programs. The three formats are listed below:

- 1) QuattroPro 8 extension \*.wb3
- 2) Microsoft Excel 97 extension \*.xls
- 3) Comma delimited text extension \*.csv

*Price:* For all the western states, \$27.50; for just one state, \$12.00. To order the database CD online go to the Geo-Heat Center Store [<https://www.oit.edu/Storefront/geoheat/Store/Default.aspx>].

For further information, contact the Geo-Heat Center at 541-885-1750 or send an e-mail to [geoheat@oit.edu](mailto:geoheat@oit.edu). Please include a proper e-mail address within the text.

## Geo-Heat Center

3201 Campus Drive  
Klamath Falls, OR 97601  
Phone: 541-885-1750; Fax: 541-885-1754

## Geo-Heat Center Quarterly Bulletin online

The *Geo-Heat Center Quarterly Bulletin* (<http://geoheat.oit.edu/bullet.htm>) informs the geothermal technical community and the public on progress in research and development activities of direct heat utilization of low-temperature resources. This periodical provides valuable “how to” articles on various geothermal applications and equipment. It has been published since

1975 and currently has over 2,000 subscribers. Back issues of this periodical are available upon request.

## Geo-Heat Center web links

The Geo-Heat Center webpage, *Other Places of Interest*, provides valuable links to other geothermal organizations, equipment manufacturers, and laboratories (<http://geoheat.oit.edu/other.htm>).

## Geothermal Resources Council Bulletin

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## Metadata for Geothermal Locations in Washington State, version 1.0 (FGDC and ESRI metadata)

This dataset ([http://www.dnr.wa.gov/Publications/ger\\_data\\_geothermal\\_locations.htm](http://www.dnr.wa.gov/Publications/ger_data_geothermal_locations.htm)) presents information on the location, physical characteristics, and water chemistry of geothermal resources in Washington. It includes 941 thermal wells, 34 thermal springs, lakes, and fumaroles, and 238 chemical analyses. Most thermal springs occur in the Cascade Range, and many are associated with stratovolcanoes. In contrast, 97 percent of thermal wells are located in the Columbia Basin of southeastern Washington. Some 83.5 percent are located in Adams, Benton, Franklin, Grant, Walla Walla, and Yakima Counties. Yakima County, with 259 thermal wells, has the most.

## U.S. Geothermal Resource (3-10 km depth)

Interactive maps, titled *U.S. Geothermal Resource (3-10 km depth)* are available online at <http://www.google.org/egs>. You may need to download *Google Earth* at <http://earth.google.com> to view the maps. Map data include Enhanced Geothermal Systems (EGS) potential and state-by-state information.

*From: Geothermal Bulletin, v. 37, no. 5, p. 23.*

## Federal and State Lands Lease Map Data

As geothermal developers move toward using the hot fluids produced from oil and gas wells, a new map released by Petroleum GeoGraphics Corporation may be of interest. The map holds layers of oil- and gas-leasing data for federal and state lands in all of the western United States. The map layers include a full legal description, acreage, owner name, case type, interest-owner information, case disposition, action type and date, lease status, price per acre, serial number, commodity type, and lease-expiration date.

For more information, go to <http://www.Petroleumgeographics.com> or call 1-877-747-0650.

*From: Geothermal Bulletin, v. 37, no. 5, p. 12.*

## **Washington State University Extension Energy Program**

The WSU Energy Program provides technical assistance and policy analysis in support of the developing renewable energy industry in the state of Washington and nationwide.

The WSU Energy Program has world-class expertise in high-and low-temperature geothermal energy. Their experts have prepared a series of case studies on commercial geothermal heat pumps.

Current projects (2009) include the production of geothermal guidebooks for Western states, and a leading role in the development of state-level geothermal action plans. They are prepared to answer questions about cost, technologies, environmental impact and reliability.

*Homepage:* <http://www.energy.wsu.edu/>

*Geothermal page:* <http://www.energy.wsu.edu/projects/renewables/geothermal.cfm>

## **Washington State University Extension Energy Program Library**

The Washington State University Extension (WSU/CE) Energy Program Library provides objective and up-to-date information and research support related to energy-efficiency, energy conservation technologies, and renewable resources to:

- | WSU/CE Energy Program employees
- | WSU faculty, staff, and students
- | Energy professionals
- | Public and private utilities
- | Government agencies
- | Citizens of Washington State

*From:* <http://www.energy.wsu.edu/library/about.cfm>

