

DOE/ID/13040--T34

FEDERAL ASSISTANCE PROGRAM
QUARTERLY PROJECT PROGRESS REPORT

GEOTHERMAL DIRECT-HEAT UTILIZATION ASSISTANCE

GRANT NO. DE-FG07-90ID 13040

REPORTING PERIOD: JULY - SEPTEMBER 1996

PAUL LIENAU, PROJECT DIRECTOR

**GEO-HEAT CENTER
OREGON INSTITUTE OF TECHNOLOGY
KLAMATH FALLS, OR 97601**

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ABSTRACT

This report summarizes geothermal technical assistance, R&D and technology transfer activities of the Geo-Heat Center at Oregon Institute of Technology for the fourth quarter of FY-96. It describes 152 contacts with parties during this period related to technical assistance with geothermal direct heat projects. Areas dealt with include geothermal heat pumps, space heating, greenhouses, aquaculture, equipment, economics and resources. Research activities are summarized on greenhouse peaking. Outreach activities include the publication of a geothermal direct use Bulletin, dissemination of information, geothermal library, technical papers and seminars, and progress monitor reports on geothermal resources and utilization.

1.0 PROJECT SUMMARY: JULY 1 - SEPTEMBER 30, 1996

- 1.1 Technical Assistance. GHC staff provided assistance to 152 requests during the reporting period from 27 states, France, Germany, Italy, Ireland, Hungary, Mexico and China. A breakdown of requests relative to applications are: geothermal heat pumps (46), space heating (10), greenhouses (1), aquaculture (16), industrial (1), equipment (27), resources/wells (20), electric power (1), swimming pools (6), and other (24).
- 1.2 R & D Activities. Progress is reported on the task of greenhouse peaking.
- 1.3 Technology Transfer. GHC Quarterly Bulletin, Vol. 17, No. 3, was mailed to 1866 U.S. and 340 subscribers in other countries; Vol. 17, No. 4, is in preparation and should be published in October 1996. Nine technical papers were presented and 2 tours of geothermal facilities were provided to 2 group. A total of 225 publications were distributed on direct use and 14 volumes were added to the geothermal library. Geothermal Progress Monitor (GPM) reports include: (1) New San Luis Valley Aquaculture Training Program, (2) Fish and Alligator Ranching in Idaho, (3) Blowing Off Steam at Newberry Volcano, and (4) Australian Red Claw Lobster Raised at Belmont Hot Springs, Utah.
- 1.4 GHC staff that worked on the project included: P. Lienau (92%), K. Rafferty (100%), T. Boyd (95%), John Lund (30 hours), and D. Gibson (96%).

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2.0 TECHNICAL ASSISTANCE

The Geo-Heat Center provides technical assistance on geothermal direct heat applications to developers, consultants and the public. This assistance could include information on low-temperature (<150°C) resources, space and district heating, geothermal heat pumps, greenhouses, aquaculture, industrial processes and other technologies. The nature of assistance could include preliminary engineering feasibility studies, review of direct-use project plans, assistance in project material and equipment selection, analysis and solutions of project operating problems, and information on resources and utilization. The following are brief descriptions of technical assistance provided during the fourth quarter of the 1996 program:

<u>Name</u>	<u>Nature</u>
7/01/96 Brown, Brian Consulting Mechanical Engineer PO Box 563 Fort Klamath, OR 97626 541-783-3347	Re: Space Heating Discussed the contents of a paper being written for the GRC meeting on the evaluation of the Klamath geothermal district heating system. Informed him the due date for the final draft has been changed to July 19, 1996.
7/01/96 Tippetts, Jack PO Box 145 Auburn, WY 83111	Re: Aquaculture Has geothermal well in Wyoming, 510 ft deep, 147 F and 3000 gpm artesian. Wants to do fish farm and aquaculture. Planning and zoning giving him a hard time about H2S odor and vapor plume. Told him that those are legitimate issues but have not been show stoppers for any projects that I am aware of. Wrote letter that outlined phone conversation.
7/02/96 Anderson, David GRC PO Box 1350 Davis, CA 95617 916-758-2360	Re: General Discussed who would be an appropriate leader for a half-day field trip of commercial geothermal heat pumps at Portland. Suggested Mike Hatten, Consulting Engineer, Hatten, Johnson & Assoc., Eugene, OR, 541-343-8748.
7/02/96 Holtzgang, Larry Oregon Economic Development Klamath Falls, OR	Re: Industrial Larry stopped by to say that the well at Hines for SMC is down to 2000' and has about 105 F.
7/02/96 Michaels, Don Po Box 8652 Missoula, MT 59807 406-728-2576	Re: Space Heating He is a geochemist living in MT. Called about the White Sulpher Springs resource. They would like to do something about space heating. He asked about using heat pumps. Told him at 125 F they could use the water directly for space heating. Discussed terminal equip, no heat exchangers, piping.
7/02/96 Springer, Dave Davis Energy Group Davis, CA	Re: GSHP Working on pond loop for a job near Mt Shasta, needed weather data. Paul Bony at Plumas Sierra utility referred him to us. Told him we don't have any data that he didn't have.
7/06/96 Papapanagioton, Photiuiie Poitier, France	Re: General Discussed graduate programs in geothermal at the Geothermal Institute, University of Auckland, New Zealand and the University of Iceland.

7/08/96
Ebbage, Roger
Lane Community College
Eugene, OR

541-747-4501 x2451

Re: General
Roger called to ask if GHC personnel could teach a seminar on GSHP. Will be a moneymaker for his program at LCC. Asked him if he had any money said he could pay "contact" time and negotiate travel. Told him it was probably doable, sometime in Oct.

7/08/96
Fortuna, Ray
Office of Geothermal Technologies
RAYMOND.FORTUNA@hq.doe.gov

Re: GSHP
email to Ray Fortuna re his comments on our proposal. Discussed the residential GSHP package and the potential for duplication w/other publications from IGSHPA, Consortium etc. Said ours would be more technical than promotional. Told him I had discussed it w/ Harvey Sachs.

7/08/96
LaSala, Ray
Office of Geothermal Technologies
1000 Independence Ave SW
Washington, DC 20585
202-586-4198

Re: General
Discussed "Commercialization Ventures Program" that has available \$10 million for deployment of hardware on proven renewable technologies. The funds will be distributed through the State Energy Offices. Referred to John White, Oregon Department of Energy at 503-378-3194.

7/08/96
Taylor, Mike
McKean High Sch
301 McKennans Church Rd
Wilmington, DE 19808
mtaylor@del.net

Re: GSHP
email to M Taylor: responded to his email on GWHP for residence. Advised him that the 2 major issues are water quality and disposal. Requires a larger well pump, water flow requirements are 2 to 3 gpm per ton. Suggested he get Kavanaugh's residential book.

7/08/96
White, John
ODOE
Salem, OR 97310
503-378-3194

Re: General
Discussed "Commercialization Ventures Program" and the role of the Oregon Department of Energy. ODOE is willing to work with any private industry that is interested in applying for the program. John White did not know of any project in renewables that was ready to deploy hardware.

7/09/96
McIntyre, Stan
TRANE Oregon
Portland, OR
503-620-8031

Re: GSHP
Discussed which buildings in downtown Portland use groundwater heat pumps. This is for a GHP field trip at the GRC Annual Meeting. Said he would check with the building operators and get back to us.

7/09/96
Taylor, Mike
Wilmington, DE

Re: GSHP
email to mike taylor in DE about residential GSHP.

7/09/96
Thayer, Christie
AD Little
617-498-6134

Re: GSHP
Left message on our voice mail about Commercial GSHP. Didn't get the information we sent her some time ago. Called her back and got her voice mail, left message.

7/09/96
Trahan, Karl
1980 Benson
Klamath Falls, OR 97601

541-882-1217 or 541-949-8802

Re: Aquaculture
In office discussion about his aquaculture project. Discussed the layout and heating requirements. Did calculations using the Heatools spreadsheet. Also calculations on the loss from the greenhouse enclosures. Calculation summary in the logbook.

7/10/96
Amalgamated Sugar Co
Ontario, OR

Re: GSHP
Called to see about water source heat pumps - wanted to buy some.
Thought we were some kind of heat pump dealer.

7/10/96
Anderson, Dave
Geothermal Resources Council
Davis, CA

916-758-2360

Re: GSHP
Dave called about the heat pump tour for the GRC meeting in Portland in Oct. Needs people to guide tour of 3 downtown bldgs. Discussed potential buildings possible guides

7/10/96
Anderson, David
GRC
PO Box 1350
Davis, CA 95617
916-758-2360

Re: General
Discussed the field trip for Klamath Falls and Newberry. Reviewed the field trip description. Provided contacts in Portland for a geothermal heat pump field trip.

7/10/96
BuBmann, Werner
Gartenstr. 36
D 49744 Geeste
Germany
49 5907 545

Re: General
Publish a geothermal quarterly "Geothermische Energie" and is interested in exchanging information and publications. Provided back issue of the GHC Bulletin and an article on the GHC for publication.

7/10/96
Sadd, James
Occidental College
1600 Campus Road
Los Angeles, CA 90041
213-259-2518

Re: Resource
Requested information and data on geothermal wells in Imperial County for environmental research with GIS. Needed geographical information on Magma wells. Referred to California Division of Mines and Geology and explained the low temperature resources database.

7/11/96
Bailie, Bob
Advanced Thermal Transfer
713-292-1335

Re: Equipment
Called to talk about his product - some kind of heat exchanger that he thought might have geothermal application. Fluidized bed shell and tube configuration. Told him that plate and frame units work fine in direct use. His application would probably be in Binary where they use shell and tube. Gave him ORMAT and Barber/Nichols contacts.

7/11/96
Pearson, Sam
Out of the Wood
Houston, TX

Re: Aquaculture
Called to see if we could help him with the cooling of his aquaculture facility. Growing coy, 110 F inside today, the water is heating up too much. He wanted to put some tubes in the ground and pass the air through it to provide cooling. Told him he would need a whole bunch of tubing. Suggested cooling the water directly instead of the air - more direct with a cooling tower. Pad cooling doesn't work in his area.

7/12/96
Aronson, Michael
PO Box 1237
Delmar, CA 92014

619-436-3860

Re: GSHP
Discussed GSHP for a new residence. Discussed the GW option and it's possible cost advantages. Suggested that disposal and water quality are key. Sent heat pump package

7/12/96
Huttrer, Gerry
Geothermal Energy Mgmt
Frisco, CO

Re: General
Called Gerry to give him 2 projects that might meet the new DOE solicitation. Jack Tippetts in WY and Don Michaels in MT.

7/12/96
Trahan, Karl
904-278-0517

Re: Aquaculture
Karl called to say that they are considering locating at the old Maywood site. Temp only 106 F, how would this effect flow requirements? Told him I would make calculations and get back to him on Tue - Discussed the flow requirements at the Reach site for the tanks. 29 gpm per tank, much higher than the 5 gpm for the direct approach at Liskey's. Said I would get some quotes on the exchangers. Discussed whether or not air heating will be required. Covering the tanks at low temperature? Said that would be a last resort and would seriously degrade indoor air temp in the absence of auxiliary heat.

7/14/96
Aronson, Michael
Po Box 1237
Delmar ,CA 92014

Re: GSHP
He saw an article in "This Old House" on GSHP. He is building a new house in Sacramento, CA. Discussed types of GSHP systems - GW/GC costs, contractors, sizing, etc. Sent heat pump package.

619-436-3860

7/14/96
Phetteplace, Gary
US Army Cold Regions Res Lab
72 Lyme Rd
Hanover, NH 03755
603-646-4248

Re: GSHP
Note to Gary about the letter Kevin sent him yesterday on the ASHRAE GSHP PDS course outline. The last part of the outline was in error. Will be sending out a new one today.

7/14/96
Trahan, Karl
F1
904-278-0517

Re: Aquaculture
Discussed aquaculture ponds - inside ponds at 83 F, 50 F air, 16' x 100' requires 230,000 Btu/hr with 2 ponds per enclosure. 29 gpm per tank and 25 gpm per house for air heating. Discussed covering the ponds and heating the air w/ elec.

7/15/96
Gover, Barbara
Lakeview Chamber of Commerce
Lakeview, OR

541-947-6040

Re: Resource
Requested the name of a geologist familiar with Lake County, Oregon; specifically the Abert Rim fault scarp. The purpose is for someone to teach an Elderhostel class on geology along with ranching and spinning your own wool. Suggested a name from the OIT staff.

7/15/96
Holzgang, Larry
Oregon Econ. Dev. Regional Coord.
437 Main St.
Klamath Falls, OR 97601
541-883-7846

Re: Space Heating
Discussion with the Oregon Department of Economic Development about potential direct heat projects for the DOE Commercialization Ventures Program. A possible candidate is a manufacturing plant in Central Oregon that will be using geothermal for space heating.

7/16/96
Trahan, Karl
Florida
904-278-0517

Re: Aquaculture
Discussed the heat loads at the Reach site. Use about 100,000 BTU/Hr auxiliary heat as a safety measure. Went over the loss curve and tables of annual energy to maintain 50 F indoor air temp. \$40 to \$400 per year per greenhouse. Said they are going to 1 tank per house and 30 ft by 100 ft houses. He needs to know the size of the passages in the brazed plate exchangers - sounds like it will be a clogging problem.

7/17/96
Collentine, David
SHN Engineering
812 W. Wabash
Eureka, CA 95501

Re: Resource
Discussed utilization of waste silica for building materials. Sent copy of silica report.

7/17/96
Wright Water Engineers
pinson@wrightwater.com

Re: General
email to Wright engineers saying we can provide Tech Assistance at no charge. Response to her email to us.

7/18/96
Irkison, William
US Army CERREL
Champlain, IL

217-398-5508

Re: Equipment
Called about low temperature absorption performance. Confusing conversation - he doesn't seem to know what he wants. 180 F to 250 F. Discussed absorption cycle and temp limitations. Gave him manufacturers names - Trane, Carrier, Nutemp, Nordic aire.

7/18/96
Michaels, Don
D Michaels Assoc
PO Box 8652
Missoula, MT 59807
406-728-5276

Re: Aquaculture
Don was interested in getting copies of bulletins v16#1 and v13#2 on aquaculture. Told him about the heatools spreadsheet we have that makes the calculations simpler. He asked if we could convert to XLS. Said I would try.

7/18/96
Spencer, Dan
Flow Components
Vancouver, WA

360-256-0345

Re: Equipment
Dan called back with some quotes on the Trahan project. Brazed plate unit 60 plates - \$700. Minex data not in yet looks like 20 plates. It's a bolted frameless unit that would decrease the fouling problem. Available in 304/NBR.

7/18/96
Stein, Jeff
LBL
510-486-7680

Re: GSHP
Jeff is interested in getting copies of the following case studies in the heat pump report: CTo32, OKo27, ARo45, KYo17. Said I would see what is in there and get back to him. He is working on some heat pump project at LBL.

7/18/96
Unterreiman, Ryan
Wright Water Engineers
970-259-7411

Re: GSHP
Ryan called about well for GSHP, was sealed in '87. New well as replacement? Will call back.

7/19/96
Borders, Will
CREST
San Francisco, CA
waborders@earthlink.net

Re: General
email to Will Borders in response to his email asking us for data on installed capacity for geothermal direct use and power. Avoided pollution and types of applications. Told him I faxed the info to him. Call w/ questions.

7/19/96
Kolbeck, Olga
Old Faithful Geyser
Calistoga, CA
707-942-0919

Re: Equipment
Discussed sizing of plate heat exchanger for geothermal heating of a home. Recommended she contact a local plumber who has worked on other geothermal systems in the area. The well produces 200F geothermal fluids and in the past has caused severe corrosion on finned piping heating system in the home.

7/19/96
Spencer, Dan
Flow Components
Vancouver, WA

Re: Equipment
Dan Called with info on htx for the Trahan project. Minex unit to 97 F \$850 ea. plate and frame 35 gpm, 31 plates, 7psi, cost \$1577 ea. 18"

7/22/96
Wells, Jody
Klamath Falls, OR 97601

Re: Space Heating
Requested GHC staff talk to Jerry Foreman about home heating with geothermal energy. Has home at 458 Hillside in which he is planning to install gas. Neighbor has a well that he is willing to share.

7/22/96
Graft, Kay
Medford, OR
kutya@cdsnet.net

Re: Pool
email to Kay Graft requesting more info on the problem with her friend's geothermal system - she found us on the internet and emailed to ask if we could help her friend here in KF with her swimming pool.

7/23/96
Hatfield, Madeline
Klamath Falls, OR

Re: Equipment
Called to provide some info on her pool problem. Referred by her friend in Medford. Has an ozone generator to eliminate the use of chlorine, "brown stuff" comes out of the pipes. Explained to her that the geothermal is unlikely to be related to the problem, since it is on the other side of the htx. Needs to have her ozone generator checked.

7/23/96
Mohorich, Leroy M.
Bureau of Land Management MS CA-922
2135 Butano Dr.
Sacramento, CA 95825
(916) 979-2860

Re: Resources
Requested information for California. Sent him the California collocated map and database.

7/23/96
Young, Doug
3209 Franz Valley Rd.
Santa Rosa, CA 95404
707-523-4585

Re: General
Discussed steam gathering lines, which his company builds. Interested in involvement in the direct use industry. Requested Guidebook, Bulletins and publications request form.

7/24/96
Blake, Thurman
54015 Avenue Juarez
LaQuinta, CA 92253
619-564-0418

Re: Resource
Discussed a new lighting system for greenhouses. The system employs fusion lighting, a sulfur element with one-third cost and operating savings. This innovation may make it possible to develop greenhouses in Alaska. He was interested in geothermal resource possibilities near Haines, Alaska. Provided information on Tenakee Hot Springs - 43C at 84 L/m.

7/24/96
Spencer, Dan
Flow Components
Vancouver, WA

Re: Equipment
Discussed costs for strainers for the Trahan project. Steam strainers can be cleaned online. Have manual scrapper and blowdown. Could allow use of the brazed heat exchangers. \$700-1000 ea for 30 gpm size.

7/24/96
Tiffany, David
21316 58th Ave
Mount Lake Terrace, WA 98043

206-672-8674

Re: Aquaculture
Dave Tiffany in the office to discuss his aquaculture project. Already has it operating on small scale at his house, looking for resource to expand. Discussed locations, and equipment considerations for geothermal, showed him the calculations for Trahan project.

7/24/96
Trahan, Karl
FL
904-278-0517

Re: Equipment
Discussed heat exchanger costs for the REACH site. Will require more water and htx area than for the 150+ F site.
Will have to recalculate all the values based on the new resource temp

7/25/96
Massaro, Nick
Pitkin Iron Co
PO Box 1298
Glenwood Springs, CO 81602
970-945-0703

Re: Pool
email to Massaro in response to his email requesting help with a water park development in CO. He has 1200 gpm artesian at 120 F. His consultant in Atlanta needs help with the geo part of the project. Advised him we could help. Info on TA program.

7/25/96
Peake, Roger
California Energy Commission
Sacramento, CA

916-654-4609

Re: General
Called Roger to check on whether Kelly Birkenshaw is the right person to get our quarterly report. Also checked for any news on our contract with SAIC.

7/25/96
Phetteplace, Gary
US ARMY CRREL
Hanover, NH

603-646-4248

Re: GSHP
Discussed ASHRAE PDS issues, said he advised HQ that it wasn't possible to do GW and GC in 2 days. Told him I thought we could. Discussed papers submitted for the Phila Mtg.

7/26/96

Ebbage, Roger
Lane County Comm College
Eugene, OR

Re: GSHP

Roger called about a short course he is putting together on heat pumps for this fall. Can Kevin do a presentation? Told him I could if he could cover travel and related costs. Who is the audience? He wasn't sure. Advised him that it's important to separate utility, contractor and engineer groups.

7/26/96

Pate, Pete
Chiloquin, OR
541-783-2880

Re: GSHP

Called to ask about GSHP costs. Would like to put in system himself. He is an excavation contractor. Told him it's not advisable w/o training. Suggested he consider GW since he is already on a well. Discussed return wells and water quality. He will check with a driller he knows.

7/29/96

Ahmadi, Saman
Technology Transfer Center
3925 West Braker Lane, Suite 431
Austin, Tx 78759
512-305-0148

Re: Resources

Requested the Montana database of thermal wells and springs, which was sent as an attachment via e-mail. The Technology Transfer Center in Austin, Texas is looking at Montana for a potential site for an aquaculture project. E-mail: ecsaman@teexnet.tamu.edu

7/29/96

Anderson, Dave
Geothermal Resources Council
Davis, CA
916-758-2360

Re: GSHP

Dave called w/ Mike Thomas of water furnace to set up some sites for the heat pump tour in Portland this Sept. Discussed some of the heat pump buildings downtown. Suggested that they contact Stan McIntyre at Trane Oregon.

7/29/96

Brown, Brian
Mechanical Engineer, PE
Ft Klamath, OR
541-783-3347

Re: Equipment

Called about flow meters for the city system. Discussed flow elements for the Btu meters. Suggested insertion style, they have worked pretty well for several GDH systems.. Much cheaper than turbine types. Can interface to btu meter with optional card for output. Gave him 4 manufacturers; Data Industrial, EMC, Onicon, Panametrics, faxed list w/numbers.

7/29/96

Brunner, Josh
Atlanta, Ga
770-953-8583

Re: Equipment

Called about the Massaro project in Glenwood Springs. He is the water park consultant. Discussed heating load and heat exchanger info for the pool/slide. Worked up some htx size and cost numbers: 13.8E6 Btu/hr and 3540 sqft htx @ \$15 per sqft, based on 3 F approach 120 to 99, 96 to 115. Water chemistry is pretty bad, may require Ti plates.

7/29/96

e-mail
jimmcb@ dsp.net

Re: Equipment

e-mail in response to request for information on piping for geothermal plant. I requested more info on the application. Direct use or power, type of lining they are interested in, fluid conditions. Said we could check in our library with the above answers.

7/29/96

Lomoriello, Joe
PBassJo@aol.com

Re: GSHP

email to J Lomoriello re his GSHP problem - lake loop residential. CM equip, 2 units - compressors lock out. Asked him if the service man explained the nature of the lockout - high press, temp current, low press or temp.

7/29/96
Marshall, Reed
Office of Geothermal Technologies
1000 Independence Ave., S.W.
Washington, DC 20585
202-586-8076

Re: Resource
Requested that areas indicated as geopressured resources be removed from geothermal resource maps on the GHC webpage. This was done for the U.S. Geothermal Projects and Resource Areas map.

7/29/96
Neely, Ken
IDWR
1301 N. Orchard
Boise, ID 83706

Re: Resource
Discussed exploration strategy for a small scale geothermal project located along the Salmon River with hot springs located about 10 miles east and west. Suggested a geologist map the surface trace of the fault and locate a drilling target on the down-throw side with the distance depending on the direction and angle of dip. Also requested Bulletins and Ken will be a speaker at the direct use session of the GRC Annual Meeting.

7/29/96
Pate, Pete
Chiloquin, OR

Re: GSHP
Called and said that it looks like they are going to go with the GW system. He mentioned that ODOE has eliminated it's tax credit for GW systems.

7/29/96
Ryan, Michael P.
USGS Fluids & Rheology Lab, MS 955
12201 Sunrise Valley Drive
Reston, VA 22092
703-648-6770

Re: General
Research interests include work on hydrothermal convection in active volcanic centers. Field areas include Hawaii, Iceland, Japan and the Cascades. Requested copies of the GHC Bulletin and addition to the mailing list.

7/30/96
Drisbow, Jim
US Dept of Energy
1000 Independence Ave., SW EI-533
Washington, DC 20585
(202) 426-1185

Re: Direct Use
Regarding your drawing files sent 6/28, the files were embedded within your msg. Can you put them on an ftp server? I placed the drawings in the geoheat account, and gave him the URL's to download them.

7/30/96
Johnson, Rod
9263 S. Copley
Powell Butte, OR 97553
541-548-8700

Re: Resource
Discussed the Powell Butte, Oregon geothermal resource where two test holes were drilled to 1250 ft and produced 130F at 125 gpm. Projections are that at 1 km temperatures could be as high as 360F. Interested in developing geothermal binary power. Explained the limitations to produce power for pumping irrigation wells - do not run 8760 hrs/yr, cheap electric rates (\$0.064/kWh), etc. Suggested he could look at a number of direct heat applications - greenhouses and aquaculture.

7/30/96
Lomoriello, Joe
PBassJo@aol.com

Re: GSHP
e-mail on the GSHP lockout problem. Service man says the system locks out immediately on start up with all the safeties in the closed position. Advised him it must be a bad board in the unit. Sent a fax to B Brown from CM advising him of the problem.

7/31/96
Ravenscraft, Sheila
Concord, CA

Re: Resource
Home in subdivision in Concord CA has hot (138 F) floor. Don't know where the heat is coming from. She had already contacted Pat Muffler @ USGS. She has been in the house for 32 years and nothing like this has happened before. Adjacent to the Concord Naval Weapons Ctr. Suggested that she contact the Navy and check for leaking district heating lines.

8/01/96
Penn, George
Global Energy Resources
4634 Bonner La
Madison, WI
608-244-6436

Re: GSHP
Called to say that he would get his comments on the ASHRAE chapter to me right after he gets back from Russia. Also has sent comments on the groundwater chapter to me.

8/01/96
Risser, Dr
Oregon State University
Corvallis, OR

Re: General
Dr Wolf (president of OIT) dropped by with Dr Risser (president of OSU) - gave him a presentation on the Center and what we do in geothermal.

8/02/96
Hatcher, Kathryn
khatcher@negia.net

Re: GSHP
email requesting assistance with a GSHP residential system. Old hand dug well 40' deep 5' dia. New drilled well 245 ft, 6" 10 gpm. Wants to put a closed loop in the old well. email in response to Hatcher: suggested a GWHP using the old well to dispose of the water from the new well. Would be much cheaper to install than the closed loop system since wells already exist. Also advised that the old dug well would probably not support more than a ton of capacity if that. Suggested that she get Kavanaugh's residential book.

8/02/96
Massaro, Nick
Pitkin Iron Corporation
P.O. Box 1298
Glenwood Springs, CO 81602
970-945-6556

Re: Pool
Contemplating building a water park in Glenwood Springs and using geothermal water to heat pool waters and a building utilizing a heat exchanger system. The well flows about 1200 gpm at 120F. Requested technical assistance for this project. Water Park design firm is Water Technology Inc., Atlanta, GA (770) 953-8583.

8/05/96
Lewis, Jim
Lewis Aquaculture
764 N H st
Lakeview, OR 97630
541-947-3979

Re: Aquaculture
Jim called to check on the water chemistry we have on the Fremont well in Lakeview. They are going to raise lobsters instead of tilapia. Need info on boron in the water. They are having some trouble with opposition to the development from regulatory folks. Calculations for 11 x 700 ft raceway - 9 gpm.

8/05/96
Norman, Randy
Sandia National Laboratory
Albuquerque, NM
505-845-9675

Re: Equipment
Project Leader for drilling logging tools in high temperature boreholes. Wants an OIT senior Electronics Engineering Technology student to work with him on logging tools instrumentation. Referred to EET department chairman, John Yarbrough.

8/06/96
Maus, David
Harvest Fresh Seafood
Houston, TX
713-339-6000

Re: Aquaculture
Discussed his new aquaculture project near Houston - Harvest Fresh Seafood. He is building some thermal refuges for this winter. Almost lost the whole crop last year, but had insurance. No insurance this year. 17 ponds @ 5 acres, 8@7.5 acres, 10,000 gpm at 5 F above ambient. Explained how to calculate the heat flow available.

8/06/96
Phetteplace, Gary
US ARMY CRREL
Hanover, NH

Re: GSHP
email to Gary on the handbook subcommittee meeting for ASHRAE. Told him I didn't detect that much interest in the update of the chapter but agreed to go for a formal meeting to satisfy the ASHRAE HQ.

8/07/96
Johns, Ward
7882 N. Hwy 52
Sweet, ID 83670
208-584-3465

Re: Electric Power
Discussed resource with hot springs of 152F and projected subsurface temperatures of 300F near Sweet, Idaho. Four wells on property produce over 215F at 1800 gpm. Wants to develop binary power generation, has financial backing. Provided names of three binary power generation and equipment companies.

8/09/96
Stein, Jeff
LBL
JRStein@lbl.gov

Re: GSHP
email to Jeff regarding his article on GSHP, said I didn't have any major comments except that the systems in general have been oversold. They are a good choice under the right circumstances - new installation, no gas, high electric rates, etc.

8/09/96
Wright, Victoria
ERA Western Real Estate
Ennis, MT

406-682-4225

Re: Pool
The people of Ennis, Montana will be building an enclosed community swimming pool. The owner of a geothermal site (190F at 40 gpm) has donated 3.4 acres and a geothermal well to the project. Discussed how geothermal fluids could be used to heat the pool and disposal methods. The GHC will be providing technical assistance on the geothermal heating system.

8/12/96
Blood, Louisa
P.O. Box 1143
Delta Junction, AK 99737

Re: Resource
Answered three questions - how is geothermal energy used to generate heat and electricity, why is it an uncommon source of energy and what are its limitations and advantages and how does geothermal energy play a part in conserving the world's energy. Sent information to elaborate on the questions

8/12/96
Gallagher, Jack
gallagher@vvm.com

Re: Equipment
email to explain the publications that he requested. Cost spreadsheet is for engineers and is designed to consider the economics of large systems in comparison to fossil fuels. Pump report covers large deep well turbine pumps in direct use applications.

8/13/96
Culver, Gene
Klamath Falls, OR
541-884-1273

Re: Equipment
Gene called about Jim Holmes geo system. CPVC pipe failing. Steel lasted 4 yrs. Told him CPVC is probably the least expensive option in that size (2"). Suggested that they add a mixing set up on the return to keep the temperature down a little. Gene faxed a diagram of the Holmes geothermal heating system. I advised where to add the mixing components. Gave him temp/press limitations for CPVC. Advised not to install in hot weather and immediately backfill - puts the pipe in tension and joints pull apart.

8/13/96
Hamilton, Duncan
524 North Fifth St.
Belen, New Mexico 87002

(505) 861-0118

Re: Publications
Wanted to know about the Publications - Collocated Resources and the Geothermal Guidebook. He saw the collocated information on the internet, would like a copy of it. Sent him a copy of the Low-Temperature Assessment Final Report.

8/14/96
Carella, Roberto
Via Teulie 1
20136 Milano
Italy

Re: General
Requested reports on aquaculture and geothermal corrosion and six feasibility studies involving binary generators, ice making, district heating and a malting plant.

8/16/96
no name
gka3946@silver.sdsmt.edu

Re:
Responded to an email request for information on scaling in high temp systems. Said that scaling is not usually the problem in low temp systems - corrosion is. Also that scaling in higher temp wells for power is usually related to CO₂ and HCO₃ equilibrium issues. Suggested that they contact some one at UURI, 801-581-5126.

8/16/96
Phetteplace, Gary
US ARMY CRREL
Hanover, NH

Re: GSHP
email to Gary on the Ft Irwin Project. For 172 homes, the calculated load was 5831 ton hrs at the peak. At 14,000 Btu/ton hr that's 80E6 Btu/Day. If the tank was allowed to rise to 90F, it would require 1 tank volume per day to maintain equilibrium.
Based on the normal residential use of water this would permit a max. of about 5% of the homes to have this type of system.

8/19/96
Ecsaman, Saman
NASA MCTC
6300 Bridgepoint Parkway #1, Suite 310
Austin, TX 78730
512-342-4227

Re: Resources
Discussed Montana low-temperature database. Sent the database and referred to Montana Bureau of Mines and Geology for the full report.

8/19/96
Sievers, Ed
Consulting Engr
Houston, TX
713-482-8100

Re: GSHP
Discussed snow melt systems for direct use and gshp. Told him where to find design information (ASHRAE, Wirsbo). Discussed the high capital cost of heat from heat pumps. Large annual heat output requirements. Phillips gas stations systems - heat output from the refrigeration makes it work. Tubing PE not PB

8/21/96
Mink, Roy
IDWRRI
University of Idaho
Moscow, ID 83843
208-885-6429

Re: District Heating
Discussed a possible district heating system for the business district of Lava Hot Springs. Idaho Water Resources Research Institute is investigating the hot springs for temperature and flow capabilities. A concern for the development of wells is the impact on existing users for spas and motel heating. The GHC may be requested to do a preliminary feasibility for district heating if temperatures and flow are high enough.

8/26/96
Chitwood, Rick
Chitwood Energy Sevices
Mt. Shasta, CA
916-926-3539

Re: Equipment
Discussed Alturas, California school geothermal evaluation. Questions whether plate heat exchanger has titanium plates as specified for stainless steel. How can you tell? Titanium has a dull finish. How long will direct buried Sch 40 bare steel pipe last. Estimate 10 to 15 years. Design team is producing info and data for the School District to go to mediation October 1, 1996 with the contractor.

8/26/96
Easwaran, Eyob
1700 Rockville Pike, Suite 550
Rockville, MD 20852

Re: General
Discussed geothermal direct use developments in Utah. Sites included the Utah State Prison, greenhouses at Sandy and Newcastle. DOE is interested in a demonstration at the Winter Olympics. Sent photos and information on the developments.

8/26/96
Humfleet, Mark
1152 Solon
Cedar Springs, MI 49319
616-696-9522

Re: GSHP
Discussed heating a 17,000 sq. ft roller rink and 4 greenhouses (30'x100' ea.) with ground source heat pumps. Recommended he obtain bids or estimates from local contractors. Ag electric rates are \$0.075/kWh. Sent National average for installed cost of GSHP systems.

8/27/96
Chitwood, Rick
Chitwood Energy Svcs
Mt Shasta, CA
916-926-3539

Re: Space Heating
Discussed the Alturas schools mess. He is on the committee to try and straighten things out. Asked if I could provide some input. Said we could but it's limited to the DOE contract since we don't have a contract w/CEC. Advised that they hire an engineer that has done some of these systems and get it straightened out once and for all.

8/27/96
Smith, Mel
City of Klamath Falls
Klamath Falls, OR
541-883-5355

Re: Resource
Mel called about new well at 1500 Pacific Terrace. Owner thinks it is being affected by neighbors pumping. Can we look into it?

8/28/96
Johnson, Glenda
Ortowski Construction Company
Rt. 2, Box 360
Gainesville, TX 76240
800-356-8878

Re: GSHP
Discussed types of geothermal heat pump systems. Compared groundwater and ground loop systems in terms of design and cost and provided a list of manufacturers. Sent packet of heat pump information

8/28/96
Speilman, Mary
1500 Pacific Terrace
Klamath Falls, OR 97601
541-884-9634

Re: Resource
Called Mrs Speilman at 1500 Pacific Terrace about the well. She said that there isn't any problem.

8/30/96
Bohm, Burkhard
P.O. Box 1922
Portola, CA 96122
916-836-2208

Re: Pool
Discussed development of a swimming pool at Sierra Valley near Sierraville, 30 mi NE of Reno. A recently drilled geothermal well produces 125F at 100-300 gpm with <500 ppm TDS. Explained design of geothermal heating system for public pools using plate heat exchangers and the possibility of a downhole heat exchanger. Sent information on DHE's and swimming pools heat with geothermal fluids.

8/30/96
Brown, Brian
Consulting Mechanical Engineer
P.O. Box 563
Fort Klamath, OR 97626
541-783-3347

Re: Equipment
Discussed the lineshaft pump in the Klamath County Jail geothermal well. Wanted guidelines for specifying a new pump that will operate more efficiently at the required flow rate. Provided pump failure report, specification guidelines geothermal well pumps, static, pumped water levels and pump test data on the geothermal well.

8/30/96
Colahan, Kent
OIT Physical Plant
3201 Campus Drive
Klamath Falls, OR 97601
541-885-1600

Re: Well
Discussed OIT abandoned well No. 3. Provided depth, borehole diam., static water level, max. volume pumped, temperature, pumping level, casing schedule and cost. The pump, believed to be stuck in the well, is the reason for abandonment. Referred to Interstate Pump Company for more data.

8/30/96
Valiquette, Paul
pvalique@elmira.twcable.com

Re: GSHP
Responded to an email request for information on a home heating system. Told them we have a good residential GSHP package but we need a postal address to send it.

9/03/96
Bruenner, Joel
Atlanta, GA
770-953-8583

Re: Pool
Wants somebody with experience in "unusual" projects to look over the plans for the water park and comment. Gave him the names of a few engineers who fit the bill.

9/03/96
Friel, David
Irish Sea Fisheries Board
P.O. Box No. 12
Dun Laoghaire, Co. Dublin, Ireland
284 1544

Re: Aquaculture
Requested publications on geothermal aquaculture. Sent GHC aquaculture reports and info on two U.S. newsletters.

9/03/96
Nuttall, Gary
gmcgregor@gold.uni-miskolc.hu

Re: Resources
Requested information on geothermal resources in Hungary. Provided a listing of 5 papers in the Proceedings of the World Geothermal Congress, 1995 and an article in Geo-Heat Center Bulletin Vol. 17, No. 1 and contacts on how to obtain the papers.

9/03/96
Pantano, Sal
916-233-3232

Re: Aquaculture
Discussed using geothermal energy for growing algae. Developer wants to use Kelley Hot Springs as a growing facility. Referred to research done at the University of Nevada by Glen Bartmetler.

9/04/96
Brown, Brian
PE Mechanical Engineer
Ft. Klamath, OR

541-783-3347

Re: Equipment
Supplied guide specs for oil lube vertical turbine well pump. He is working on replacing the jail's well pump.

9/04/96
Petteplace, Gary
US ARMY CRREL
Hanover, NH

Re: GSHP
Trip to Ft Irwin, CA to evaluate the heat pump system on the base. Problems include gravel in the lines, operator errors (valve positions, pump operation) low water use leading to high system temps. Need greater system throughput to support the heat rejection load.

9/04/96
Smith, C. F.
cfsmith@tir.com

Re: GSHP
Responded to an email request for assistance with the design of a ground water system using a perforated drain line for disposal. Explained that it would take an exceptional soil to be able to accept the flow of water from a heat pump. Gave example of 3 ton system at 2 gpm/ton. Would have to handle 4000 to 5000 gal per day. Septic systems handle a few hundred gallons per day.

9/04/96
Orio, Carl
Water and Energy Systems Corp
100 Maple Ave
Atkinson, NH 03811
603-362-4666

Re: GSHP
Faxed comments regarding the EPA environmental guidelines for GSHP systems. Appears to be written by someone who is not familiar w/the technology. Thermal plume issue is not limited to GW systems - also occurs w/GCHP. Same quantity of heat is rejected to the ground regardless of the system type.

9/05/96
Birkle, Peter Dipl. Geol.
Instituto de Investigaciones Electricas
Appdo. Postal 1-475
Cuernavaca, Mor. 62001, Mexico
mguevara@iie.org.mx

Re: Equipment
Explained types of well pumps - lineshaft and submersible. The maximum depth setting for a lineshaft is 2,000 ft and a submersible could be set as deep as 12,000 ft. The depth specified was 3,600 ft which would require a submersible. Sent chapter on Well Pumps from the Guidebook. Provided listing of U.S. well pump vendors, and information on how to specify and price well pumps

9/05/96
Carr, James
J and J Construction
Springfield, OR

541-741-4169

Re: Equipment
Called for information about the power plant in Klamath Falls. He is a driller looking to relocate to OR from CA. Told him that the plant here is gas not geothermal. Told him about Newberry and Glass Mtn. Gave him McClain's number.

9/05/96
Macavoy, Dea
P.O. Box 113
Ukiah, OR 97880
541-427-3585

Re: Resource
Provided concentration of chemical constituents for Lehman Hot Springs in Umatilla County Oregon.

9/09/96
Pantano, Sal
Alturas, CA
916-233-3232

Re: Space Heating
Request for assistance with supplying a new subdivision with geothermal from an existing well. 160 F and about 150 gpm. How many homes would it serve for space and dhw. Suggested 2 to 3 gpm per home as a starting point. Discussed piping distribution costs, type of homes, conventional heat sources, etc.

9/09/96
Simpson, Stu
General Admin Dept
Olympia, WA
360-902-7199

Re: GSHP
Conversation regarding a school in Moses Lake WA. Doing a renovation on the HVAC. Would like to consider a GWHP system. Good aquifer and very low (<3 cents) electric rates. Can I talk to the engineer for the project about wells etc. Stu will have the engineer contact me.

9/10/96
Brown, Brian
PE Mechanical Engineer
Ft Klamath, OR
541-783-3347

Re: Equipment
Discussion about required lateral for the county jail well. How to calculate: L x delta T x alpha. Use the portion of the column above the water level as the "L". Pump he is looking at has max of 0.78" - will that be enough? Probably not at the Temp and setting depth. Have to go for extra lateral castings. Long lead time .

9/10/96
Pantano, Sal
Alturas CA
916-233-3232

Re: GSHP
Discussed the subdivision project and the water use numbers provided by the county. Explained the difference between peak loads and annual. Although the well could meet the annual, it would not meet the peak.

9/10/96
Weber, Dick
Springfield, OR (temporary)
541-741-4169

Re: Resource
Discussed the market for hot wells in the Klamath Falls area. He is a driller and would like to move up here. Wants to work on the Medicine Lake project. Would drill low temp wells while he waits for the power project to get started. Told him the number of wells going in is small and the local drillers can handle it.

9/11/96
Knust, Mark
Paddock Real Estate
Klamath Falls, OR

541-883-3333

Re: Aquaculture
Real estate agent working with a customer who wants to start an aquaculture operation here in KF. Checking on wells in the Klamath Hills area.

9/11/96
Tang, Nighua, Prof., General Secretary
Chinese Geothermal Committee
19 Xiwai S. Rd.
Beijing, China

Re: General
Fax request from Prof. Tang Nighua, General Secretary, wants to visit Klamath Falls space heating systems and spas and bottle water supplies in Calistoga. Sent letter in reply.

9/12/96
Beeland, Gene
P.O. Box 85
Buxton, NC 27920
919-995-6685

Re: General
Discussed the Geothermal Progress Monitor for 1997. Requested back issues of the GHC Bulletin and quarterly Progress Reports.

9/12/96
Crawford, David
NREL, Bldg. 17/1
1617 Cole Blvd.
Golden, CO 80401-3393
303-275-3693

Re: General
Discussed historical development and articles on geothermal direct use and the Geysers. Provided photos of the Boise Natatorium, Moore house and Klamath Hot Springs (circ 1890). Sent articles on historical development.

9/12/96
Crockett, John
Idaho Energy Div (Water Resources)
Boise, ID

Re: Space Heating
A group of homeowners in the Garden Valley area would like to use a 140 F artesian well to heat their homes. 32 lots, 60 gpm, 16 owners. There are 9 homes already constructed. Can we give them some help. Explained the TA program. He will have the home owners group contact us directly.

9/12/96
Murphy, John
Terra Thermal Power
P.O. Box 171
Moodus, CT 06469
203-873-8334

Re: Equipment
Discussed using geothermal energy for absorption chillers. Explained the OIT chiller and efficiencies. Provided Guidebook, Bulletins and publication request form.

9/13/96
Gruber, Frank
4930 hwy 12 west
Helena, MT 59601
406-443-0518

Re: Equipment
Discussed his pipeline and the possible materials to replace the steel line that failed. Suggested PEX, CPVC and FG. Could use closed cell PE insulation to get away from cost of pre-insulation. Explained the installation considerations for the materials. Fittings for PEX, tools for FG heat cure, expansion of CPVC etc. Installing 1.25 ", 300 ft line, 150 F and 60 psi.

9/13/96
Kolbeck, Olga
Old Faithful Geyser
Calistoga, CA
707-942-6463/Darlene

Re: Equipment
Discussed the installation of a plate heat exchanger to solve the problem of corrosion by geothermal fluid on radiators in a home. Provided a list of 6 manufacturers and several dealers in the San Francisco area. Recommended a compact brazed plate heat exchanger made of 316 ss plates.

9/13/96
Riley, John
Cumberland, MD
riley1@miworld.net

Re: Greenhouses
Growing mushrooms in "greenhouse structures" wants to use GSHP to heat them. R20 envelope, 8 air ch/day. .075 \$/kWh. 4 - 1000 sq ft houses to start with. I will make calculations and reply via email -riley1@miworld.net

9/13/96
Tyson, Mabry
Tkysen@ai.sri.com

Re: Resource
Provided info. on hot/warm springs in West Virginia via e-mail to an inquiry from Mabry Tyson.

9/13/96
Weltch, Richard
111 Baker Dr
Redwood Falls, MN 56283

Re: GSHP
Discussed residential GSHP systems. He was trying to find manufacturers names. Explained that our heat pump package contains about a dozen names, but the one he ends up with will be dictated by the local contractors. Sent heat pump package.

9/15/96
Barnes, Ken
61319 Kings Arms
Lacombe, La 70445
5043-257-0432

Re: Aquaculture
Concerning aquaculture locations in Oregon and Colorado. Discussed various sites - Kelley Hot Springs and Liskey's and pros and cons of raising various species of fish and shrimp. Sent packet on aquaculture and infor on Colorado resources who is considering a site near Grand Junction, Colorado.

9/17/96
Lewis, Jim
Lakeview, Oregon

Re: Aquaculture
Discussed an aquaculture development in Lakeview, Oregon that will raise red claw lobsters. The development involves intensive aquaculture in a greenhouse type building. They are also investigating using lake Abert, which has a huge supply of brine shrimp as a food source, to raise lobster in a separate development. Requested water chemistry of Lake Abert, referred to the Oregon Water Resources Department.

9/17/96
Martin, Thomas
Menlo Oaks Plumbing
P.O Box 2166
Menlo Park, CA 94026
415-363-2223

Re: Equipment
Discussed type of heat exchanger to use for a home in Calistoga which had problems with corrosion on radiators. Recommended a brazed plate or frameless plate heat exchanger made with 316 ss plates. Provided a list of manufacturer dealers in the San Francisco Bay area. Also, sent information on heat exchangers and report on testing of brazed plate heat exchangers by the GHC.

9/18/96
Garrett, Jim
1943 Merrimac Drive
Fayetteville, NC 28304

Re: Geothermal Maps
Received e-mail reply concerning his mailing address for information requested. Requested information concernig geothermal for his fifth grade class.

9/18/96
Gruber, Frank
4930 Hwy 12 West
Helena, MT 59601
406-443-0518

Re: Equipment
Discussed piping geo-fluid from thermal spring to home a distance of 300 ft. Fluid temprature is 150F, size 1.25 in. OD, and pressure of 60 psi. In the past steel pipe corroded in <1 year, polyethylene failed and PB is no longer available. Calculated temperature loss for 1 in. of 14.4F (bare) and 1.3 (insul) and for 2 in. 17.7 (bare) and 1.8 (insul). Referred to two pipe manufacturers for cost of fiberglass or cross-linked PE pipe.

9/18/96
Lodhi, Dr.
Dept. of Physics
Texas Tech University
Lubbock, TX 79409
806-742-3778

Re: General
Discussed geothermal direct use and developments in Texas. Interested in doing research in geothermal energy.

9/23/96
Baumgarner, Bob
10482 Armstrong Street
Fairfax, VA 22030
703-273-1188

Re: GSHP
Discussed soil characteristics for a horizontal ground loop heat pump for a home. Referred to Charles Remund, South Dakota State Univ. for data. Provided cost comparisons from a national survey for bids on horiz. and vert. systems.

9/23/96
Brown, Brian
PE Mechanical Engineer
Ft Klamath, OR

541-783-3347

Re: Equipment
Discussed pump bearing materials. American Turbine in Fresno likes rubber. Have used it in "high solids/200 F water" in the past. Told him I like bronze. We know that it works from experience in the OIT wells. Rubber has been a problem in shaft applications in water lube pumps.

9/23/96
Doll, Jeff
doll5825@kutztown.edu

Re: GSHP
Response to email request for info on do-it-yourself GSHP. Advised against it due to requirement for fusion tools, flush cart, care in backfill, ductwork, desuperheater, antifreeze etc. Suggested he get Kavanaugh's residential book.

9/23/96
Hodge, Lyle
lyle.hodge@Juno.com
Houston, TX

Re: GSHP
email reply to request for help w/ a gchp system running high loop temp. Advised that high loop temp can result from many causes: full grouting, high operating hours, poor efficiency heat pumps, shrinkage of the backfill, air in the loop, close borehole spacing, small loop etc. His temp is 90 to 100 F. Asked for more info.

9/23/96
Riley, John
15 N. Chase St.
Cumberland, MD 21502
301-777-9018

Re: GSHP
Discussed using a geothermal heat pump for a facility to raise pharmaceutical mushrooms. Calculated comparison between GHP and oil-fired boiler. The GHP system would produce heat at a cost of about \$5.13/million Btu/hr and the oil system \$10.20/million Btu/hr. The savings for the GHP system would be \$167/yr resulting in a 13.4 year payback.

9/24/96
Balin, Hal
13600 Homedale
Klamath Falls, OR 97603
882-9797

Re: Resource
Discussed fault locations in an area south of Klamath Falls. Provided copies of maps with fault lines from the Oregon geologic map.

9/24/96
Byler, Tom
Oregon Water Resources Dept
Salem, OR

503-378-2496

Re: GSHP
Wanted numbers on the water consumption of a "Typical" water source heat pump. The State commissioners are questioning the 15,000 gal/day exemption for residential users. Made some calculations and faxed him the values. Poorly insulated large home could be up to 12,000 gpd, urged him to maintain the 15k number.

9/24/96
Hodge, Lyle
lyle.hodge@juno.com

Re: GSHP
Reply to his additional info on the gchp system. Holes are fully grouted and close together (10ft). Advised that the system is probably doing the best it can based on the design. His desuperheater is not currently connected. Advised that he connect it to reduce the load on the loop.

9/24/96
Lewis, Jim
Lakeview, OR

Re: Aquaculture
Jim in the office to discuss water chemistry for his aquaculture project. Wants to mix salt and fresh water to come up w/ the right salinity for the lobsters. Advised that it could be done but there could be a problem with precipitate. Should have the water tested. Gave him a couple of clean sample bottles and the names of two water labs.

9/24/96
Littrell, Mike
Riley Engineers
1501 N Harvard
Spokane, WA 99201
509-327-5631

Re: GSHP
He is the engineer on the Moses Lake School that Stu Simpson, Washington General Admin Dept., called about. Discussed GWHP in general and the water flow requirements, wells costs. sent him a copy of my draft chapter on ground water system design and advised where to get the rest of the text.

9/24/96
Riley, John
riley1@miworld.net

Re: GSHP
email response to a request for information on the use of GSHP for a mushroom growing operation in DE. Individual houses would require about 23000 Btu/hr (2 to 3 ton system). 2 ton system would be about \$6250. Oil system would be about \$4000. At 33E6 Btu/yr heating requirement, simple payback would be 13.4 yrs. Assumes 4.0 COP, 70% eff, .07 \$/kWh and \$1.00 per gal oil.

9/24/96
Wolf, Scott
Washington State Energy Ext Service
925 Plum St SE Bldg 4
Olympia, WA 98504
360-956-2136

Re: GSHP
He has moved from the WSEO office to WA State Energy Ext Service. Would like to have info available to engineers on Commercial GSHP design. emailed him the info.

9/25/96
Finn, Donald
Geothermal Energy Institute
121 Northfield Rd
Mellington, NJ 07946

Re: General
Called to request that we send copies of our Aug Bulletin to 4 individuals in the investment industry. Addresses in the logbook.

9/26/96
Littrell, Mike
Riley Engineers
Spokane, WA

Re: GSHP
Discussed his calculations that he faxed to me on the school system. Heating flow is high because of the 4.0 COP that he is using. Flow rate should be based on SYSTEM performance not just the heat pumps. Load is high due to no heat recovery (retrofit).

9/26/96
McDougal, Rick
Belknap Hot Springs
McKenzie Bridge, OR

Re: Space Heating
Called to see if Kevin could come up to review the design that they have put together for heating the lodge at Belknap Hot Springs. Need to talk about heat exchangers etc. will call to confirm Mon meeting.

541-822-3512

9/26/96
Wolf, Scott
Washington State Univ
wolfs@wsu.edu

Re: GSHP
email repy to request for info on commercial gshp. Provided sources for design information on GCHIP and GWHP. ASHRAE, Kavanaugh, IGSHPA and CANETA research. Also commented on strengths and weaknesses of each.

9/27/96
Andrews, Jim
Thermal Pipe Systems
Corbett, OR

Re: Equipment
Called about my article in the last bulletin. Thought that my pipe material costs for the preinsulated DI were way too high (he is a pipe vendor). Explained that the numbers were for 2 lines in the trench (supply and return). He said never mind.

3.0 R & D ACTIVITIES

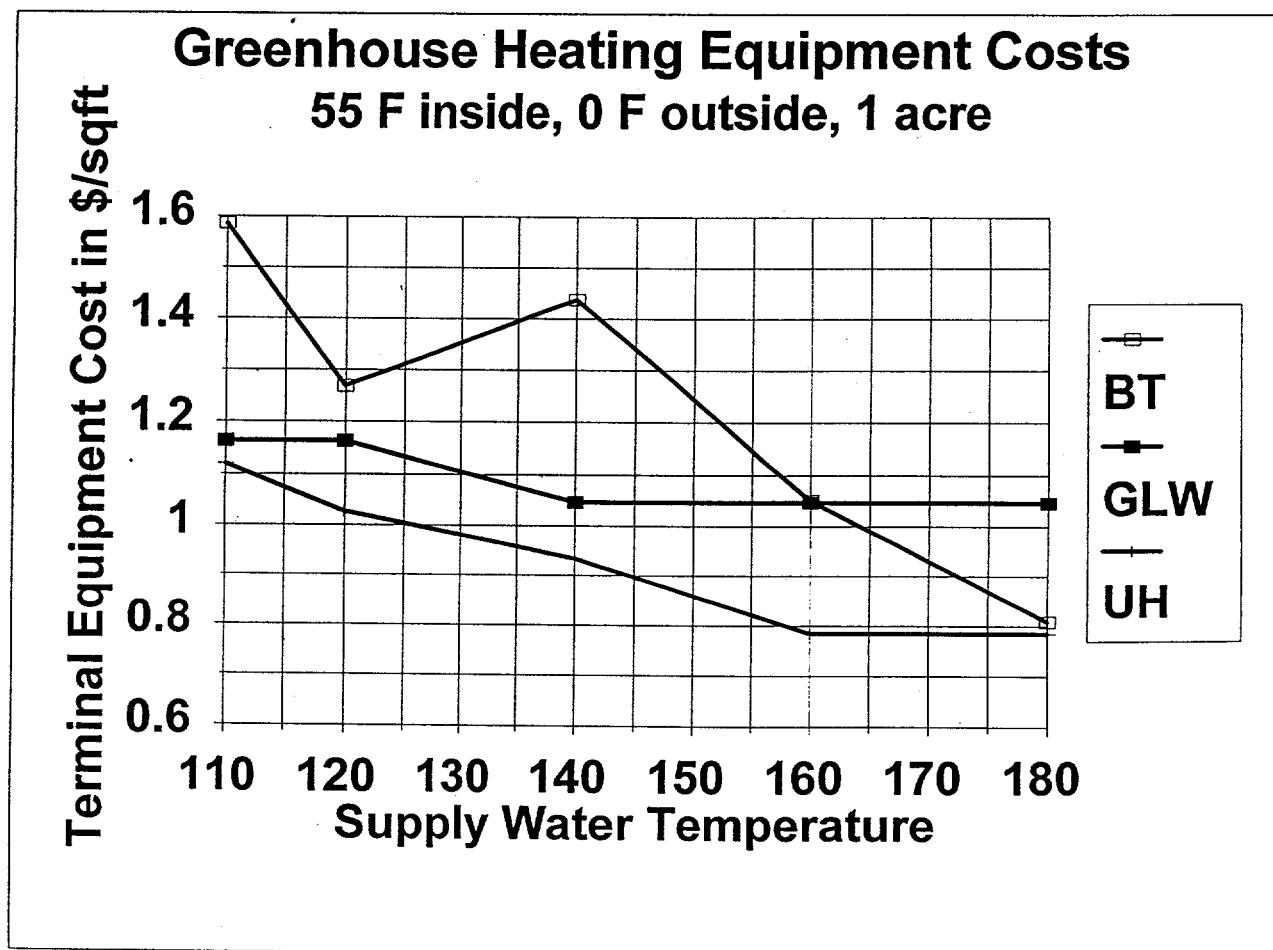
The direct use research and development program objectives are to aid industry in resource and technical development problems. To investigate and analyze methods or approaches to reducing the costs of designing, developing and operating low-temperature geothermal projects. The following is summary of activities for the fourth quarter of Fiscal Year 1996.

3.1 Greenhouse Peaking

Work on this task has focused on equipment performance for both fan-coil and bare-tube systems. These are currently the most popular systems among growers and the two upon which the final report will concentrate. Performance of these two systems at off-peak flows and temperatures has been established as necessary for use in conjunction with a peaking boiler.

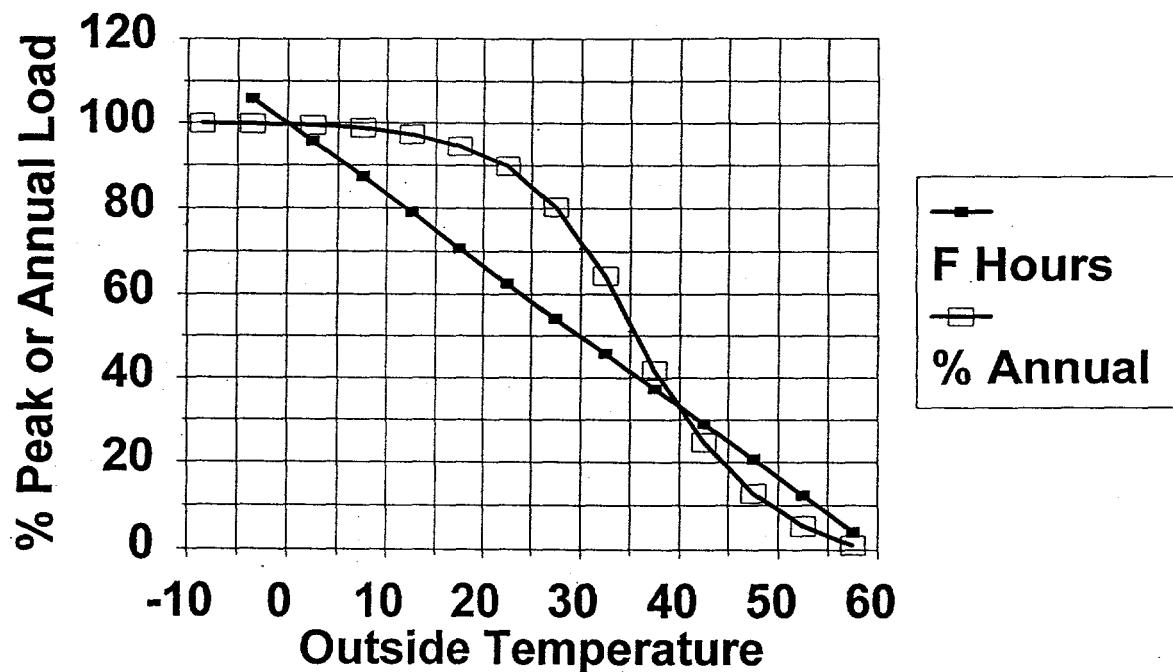
Drafts of the introduction, terminology glossary, conventional system and peaking justification sections have been written along with the necessary figures (one figure from the conventional system section and one from the peaking justification sections appear with this summary) and calculations.

Remaining work includes economic calculations, peaking systems equipment and conclusions along with final report preparation. These tasks will be completed in the first quarter of FY 1997.



Peak and Annual Load Relationship

Klamath Falls Data, 60 F inside



4.0 TECHNOLOGY TRANSFER

The Geo-Heat Center staff prepares and publishes information and educational materials on direct heat applications of geothermal energy that include: a quarterly Bulletin, technical papers, computer programs and progress monitor activities. In addition, a geothermal technical library, and tours of geothermal facilities in the Klamath Falls area are made available to the public.

4.1 Geo-Heat Center Quarterly Bulletin. Bulletin Vol. 17, No. 3 was distributed in August to 1866 domestic, and 340 foreign subscribers. Bulletin Vol. 17, No. 4 is in preparation and will be published in October. Articles include:

1. "Geothermal Energy Use in Iceland" by A. Ragnarsson,
2. "Direct Utilization of Geothermal Water for Space Heating in Akureyri, N-Iceland" by O. Flovenz,
3. "Nesjavellir Geothermal Cogeneration Power Plant" by A. Gunnarsson,
4. "High Technology in Geothermal Fish Farming at Silfurstjarnan Ltd., NE-Iceland" by L. S. Georgsson,
5. "Use of CO₂ in Icelandic Greenhouses" by ?,
6. "Recovery of CO₂ from Geothermal Fluids for Use in New Zealand Greenhouse" by M. Dunstall,
7. "Turning Community Wastes into Sustainable Geothermal Energy: The S.E. Geysers Effluent Pipeline Project" by M. Dellinger and E. Allen., and
8. Geothermal Pipeline - A Progress and Development Update from the Geothermal Progress Monitor.

4.2 Injection Well Permitting.

1. Maps. A digitized - Geothermal Projects and Resource Areas map was developed for the DOE exhibit at the World Renewable Energy Congress in Denver, Colorado. The map includes geothermal power plants, direct use sites and national labs involved with research which are identified as icons. It was also produced as a 11" x 17" poster distributed at the GRC Annual Meeting and will be added to the GHC homepage as an interactive map displaying data on the project sites.
2. Tour. The National Geographic Society sponsored a field trip for 20 high school science teachers. Showed them a slide show on geothermal applications, toured the campus geothermal heating system and observation well for injection well monitoring (8-3-96).
3. UNU Visiting Lecturer 1996

The United Nations University invites visiting lecturer to Iceland to give a series of lectures in his specialty. Dr. John Lund, Research Associate with the Geo-Heat Center gave the following lectures during August 1996:

26 August	Direct Utilization Overview
27 August	Downhole Heat Exchangers
28 August	Greenhouses and Aquaculture
29 August	Ground-Source Heat Pumps
30 August	Industrial Applications

4. Field Trip. Field Trip No. 1 - Klamath Falls Direct-Use and Newberry Volcano, GRC Annual Meeting, September 28 and 29, 1996. The Klamath Falls portion of the field trip included 12 stops at OIT, residential downhole heat exchanger, city district heating and Liskey Farms. A field trip guidebook is available from the GHC.

5. Technical Papers. The following papers were presented by GHC personnel at the GRC, 1996 Annual Meeting, September 29 - October 2, 1996 in Portland, Oregon.

Boyd, T. L., "Collocated Resources,"

Lienau, P. J., "OIT Geothermal System Improvements,"

Lund, J. W., "Research on the Use of Waste Silica from the Cerro Prieto Geothermal Field, Mexico" and

Rafferty, K., "Selected Cost Considerations for Geothermal District Heating in Existing Single-Family Residential Areas."

4.3 Geothermal Library. During the period of July 1 to September 30, 1996, 14 new volumes were added to the library. The library now has a total of 5267 volumes cataloged.

4.4 Information Dissemination. The GHC provided publications to individuals according to the following topics:

<u>Topic</u>	<u>No. Publications</u>
Geothermal Heat Pumps	137
Space Heating	4
District Heating	12
Greenhouses	6
Aquaculture	9
Industrial	2
Equipment	6
Resources/Wells	10
Other	<u>39</u>
Total	225

5.0 GEOTHERMAL PROGRESS MONITOR

5.1 COLORADO

New San Luis Valley Aquaculture Training Program

The commemorative "signing of the lease" between the State Board of Community Colleges and Occupational Education and Mrs. Ilene O. Kerr occurred on Thursday, August 1, at Kerr's Aquafarm location in Colorado's beautiful San Luis Valley.

In addition to the lease signing, the unveiling of a new sign dedicated Kerr's aquafarm as the James G. Kerr Educational Center for the Advancement of Aquaculture, Agriculture, Wildlife, and Water Conservation in honor of Ilene's late husband

The aquafarm will be used entirely for instructional and production purposes in the new Aquaculture Technician Program being offered for the first time this 1996 Fall Semester by the San Luis Valley Educational Center, Alamosa Campus, Trinidad State Junior College.

The new program will strive to address the growing demand for properly trained farm and hatchery technicians: both the private and public sectors.

Students currently enrolled in the new program may choose from a two-year Associate of Applied Science Degree or a 1-year Occupational Certificate upon successful completion of either program. The student will understand and be able to perform the duties and responsibilities as they relate to the propagation, feeding, care, transfer/harvest and sales of fish and other aquacultural products.

The Aquaculture Technician Program will be taught with a hands-on emphasis by utilizing a combination of classroom, lab/field and industry exposures.

Kerr's Aquafarm will provide the program with an excellent opportunity to introduce technology and to train students in the various types of culture practices and techniques currently employed in today's aquaculture industry.

The facilities at the farm include a geothermal well with a constant temperature of 97 degrees Fahrenheit for year-round fish production.

The artesian water resource, adjudicated for fish culture use, flows at a rate of 1,050 gallons per minute. The well supplies water to 30 acres of existing ponds, raceways, tanks and a greenhouse.

There is also a cold water well available on site. The nutrient enriched effluent from the fish farm is then reused to irrigate potatoes as well as award-winning Coor's Barley, which took first place at the Colorado State Fair last year.

In addition, the aquafarm and surrounding wetlands serve as a wildlife refuge for migratory geese, ducks, cranes and other waterfowl by providing habitat to sustain their seasonal activities and needs. This tremendous resource is now secured in a long-term lease to ensure all students will be involved in a rich educational experience.

For more information on the program, please contact: Aquaculture Technician Program, The San Luis Valley Educational Center at 1-800-411-8382. (Source: *Aquaculture News*, September 1996)

5.2 IDAHO

Fish and Alligator Ranching in Idaho

In the stifling, humid darkness, sweat pops out on your body. Through the murk all around you gleam the cold eyes of dozens of alligators. But this is not midnight in the Everglades. This is mid-afternoon in southern Idaho.

Though it might seem odd to be surrounded by alligators in rural Idaho, Leo Ray of Buhl finds it perfectly reasonable.

Leo is a commercial fish farmer. He studied under Dr. Howard Clemens, the dean of modern fish farming, at the University of Oklahoma. After completing his studies, he and his wife, Judith, opened their first fish farm in 1968, in California.

But when Leo visited the area around Buhl, on the Snake River, the hot artesian wells caught his interest. He thought that if all that pure, hot geothermal water could be mixed with cold surface water for an optimum temperature of 78 to 80 degrees, he could grow the finest fish around!

"Idaho is a desert," Leo quips, "and its most abundant resource is water. A fish is like a sponge, and absorbs the flavor of the water it's in."

If kept moving, water this pure would eliminate any off-flavors in fish.

In 1973, the Rays bought a hillside site on the bank of the Snake River, collected the water from eight artesian wells and began building a complicated series of concrete raceways and ditches cascading down the hillside. Although catfish had never been successfully raised in concrete raceways before, Leo did it.

Then he added tilapia, an Asian food fish, in raceways down the hill below the catfish. He branched out into trout at another site. Soon the family company--Fish Breeders of Idaho, Inc.--was turning out tons of fish a year, shipping them to Alaska, throughout the Pacific Northwest and even to Hawaii.

There was only one little problem.

When you raise hundreds of thousands of fish at a time, some will inevitably die, and others have to be culled out in the packing shed. What to do with these "mortalities" becomes a considerable headache. How do you dispose of all those dead fish?

The obvious answer--obvious to Leo, that is--was alligators. The big reptiles were already being farmed in Florida; but, he saw no reason he couldn't raise them in Idaho.

"What made it economical is that we had free food and free heat," he says. Last year he ordered a couple of hundred alligator hatchlings from Florida--at \$25 to \$28 a head--and built a sunken, circular pool, heated with flowing geothermal water, and with a domed roof made of spray-on insulation foam.

Florida "gator farmers" scoffed at his design. They recommended a rectangular structure, with square pens. So Leo built one of those and put more hatchlings in it. It turned out that the alligators actually did worse in a square pen. When spooked, they tend to pile up in the corners, like turkeys.

In Leo's round pit, the first batch of alligators--fed on a diet of cull fish--grew rapidly. At 18 months old, they weigh 50 pounds apiece and are six feet long--about the right size for commercial harvest for luxury leather products and meat for specialty restaurants.

But Leo is backing off on that. He *says* that it's because of the rising cost for alligator hatchlings; but, one suspects he might also be developing an affection for these scaly monsters.

Why keep buying expensive hatchlings, Leo explains reasonably, when he can just raise his first crop of 'gators to maturity, and start breeding his own? After all, alligators reach breeding age in only five to seven years, and the bigger they grow, the more waste fish they eat.

It's all economy of scale--or scaly economy.

So *now*, every day, Leo and his assistants visit the alligator pits with buckets of trout. The big alligators--thriving in the tropic heat of their circular den--continue to gorge and grow. And whenever someone enters the rectangular shed, the "small" gators--a mere two or three feet long--scramble out of the water expectantly, making a peculiar noise between a chirp and a croak, seizing thrown fish and wrestling each other for prize treats.

It's a scene straight out of the age of dinosaurs, and one Leo Ray watches with satisfaction.

After all, not every farmer can raise livestock like these. (Source: *Ruralite*, August 1996)

5.3 OREGON

Blowing Off Steam At Newberry Volcano

The decision by California Energy Co. to mothball its geothermal drilling operation at Newberry Crater is not only disappointing, it may be premature.

No one can blame the developers for being discouraged when two large-size production wells and two small-core test wells haven't yielded sufficient resources to support an economically viable plant.

But What California Energy learned about its leases by no means should foreclose further geothermal development in the Newberry Crater area.

The Newberry Volcano, in the Deschutes National Forest near Bend, has been toured by geologists for a quarter of a century as the Northwest's best hope for an economically-feasible geothermal plant.

In 1983, BPA contracted for a detailed assessment of geothermal power in the region and determined that 1,200 potentially hot sites existed. Ninety-nine sites were chosen as the most promising for further analysis. The Newberry site ranked No. 1.

The question that the Bonneville Power Administration, which pledged to buy 20 megawatts from the proposed 30-megawatt plant, should be asking is whether the developers looking for hot steam and rock fractures in precisely the right place.

The point of messing with geothermal energy at all is to establish its viability for the future. Most everyone in the energy business knows that geothermal energy today is not competitive with market prices for electricity.

In the current deregulated power market, in which natural gas seems to be getting cheaper by the day, the cost of geothermal is way off the charts.

So what to do?

BPA should encourage California Energy to reconsider its proposal to mothball the Newberry operation. Failing that, the agency should consider other proposals for the Newberry Crater area that are more promising.

The agency no doubt prefers a third option--getting out of the geothermal demonstration business altogether.

That may make a lot of sense to ratepayers for the rest of this century. But in the year 2010, when conventional thermal energy rates could be out of control, we could be very sorry we didn't give Newberry Crater more of a chance to blow off steam. (Source: *Oregonian*, September 6, 1996)

5.4 UTAH

Australian Red Claw Lobster Raised at Belmont Hot Springs, Utah

Near Fielding, Utah, north of Salt Lake City at the intersection of Interstates 84 and 15, Belmont Hot Springs is supplying heat to aquaculture ponds, a swimming pool, hot tubs and four homes. The 125°F hot spring, consisting of four big springs, produces 4000 gpm.

Red Claw Lobsters are raised in ten 60 ft x 20 ft and twenty 40 ft x 15 ft ponds and a channel 3/4 mile long, 50 ft wide and 10 ft deep maintained at 80°F. The lobsters are harvested at 1/4 in. to 9 in. in length and shipped live to various markets. In addition to the lobsters, the ponds also contain tropical fish.

A 200,000-gallon swimming pool and three 16 ft hot tubs are also supplied by the springs. Four homes utilize the geothermal water in a radiant-floor type heating system.

A unique application for one of the springs, which has a depth of 35 ft and a temperature of 92°F, is scuba diving during winter months from September through May. The spring is too hot to use during the summer months.

Owner and operator of the facility is Scott Holmgren, Belmont Hot Springs, Box 36, Fielding, UT 84311, Ph: 801-458-3200.