Preparation of a Plan for the Enhanced Geothermal System Development of the
AmeriCulture Leasehold in the Animas Valley

Work Conducted Under DOE Solicitation
DE-PS07-ID13913

AmeriCulture, Inc. is a 5-year old organization that operates a commercial aquaculture facility in the Animas Valley of southwestern New Mexico. At present, AmeriCulture produces Tilapia fingerlings for a number of customers. They extract a small amount of geothermal water from a well on their leasehold located within the Lightning Dock Known Geothermal Resource Area (KGRA), and put it to use in thermal applications. The resource is tapped to a much larger extent by a neighboring industry, Burgett Geothermal Greenhouses, Inc. for both thermal and electrical applications. However, because the temperature of the produced fluid is only in the range of 230-240°F, the thermal to electric conversion efficiency is very low.

AmeriCulture would like to expand its operations in the Animas Valley, but the planned expansion will require larger quantities of thermal energy and also a source of low-cost electric power. If the quality of the local geothermal resource could be improved with respect to both production temperature and sustainable flow, geothermal energy could provide all of the thermal and electric power needed for the planned facilities. With that in mind, and with the cooperation of Burgett Geothermal Greenhouses, Inc., AmeriCulture assembled a team of experts in the spring of 2000, and applied to the USDOE for a grant under Solicitation DE-PS07-ID13913.

Working under the grant subsequently issued by the USDOE as part of Solicitation, DE-PS07-ID13913, AmeriCulture, Inc., and its team of geothermal experts, assembled a plan to apply enhanced geothermal systems (EGS) techniques to increase both the temperature and flow rate of the geothermal waters on its leasehold. The project brought together a team of specialists that, as a group, provided the full range of expertise required to successfully develop and implement the project.

Gary Seawright, the Founding President of AmeriCulture, provided executive leadership and brought experience in corporate organization, finance, and administration to the project. Damon Seawright, the Founding Vice President of AmeriCulture, served as the on-site AmeriCulture manager of the project. He made sure the project was integrated into the overall AmeriCulture operation in the Animas Valley and coordinated all legal, permitting, energy use, and related issues.

Dave Duchane, formerly a Program Manager for the Hot Dry Rock (HDR) Geothermal Energy Program at Los Alamos National Laboratory and now a Laboratory retiree, assumed general management, coordinating, and reporting responsibilities for the project. Don Brown, an active Los Alamos employee with more than 25 years of experience in all aspects of the Los Alamos HDR effort, brought expertise in drilling and hydraulic

stimulation, as well as a wealth of knowledge regarding the field operations that are critically important to any geothermal implementation program.

Jim Witcher, affiliated with the Southwest Technology Development Institute at New Mexico State University, provided first-class geological expertise to the project. Jim is widely recognized as the geologist most cognizant of the geothermal resources of the southwest, in general, and New Mexico, in particular. Finally, Ken Nichols, CEO of Barber Nichols, Inc., rounded out the project team. Ken, whose firm has designed and built a number of commercial geothermal power plants, brought his power plant engineering expertise to the project.

The above group of five core team members called upon additional expertise as necessary to prepare a credible and comprehensive plan for the implementation of EGS technologies on the AmeriCulture leasehold. A number of American oilfield service companies assisted in formulating the development strategy and providing costs estimates for the proposed reservoir development work, and meetings were held with officials of the New Mexico Oil Conservation Division to discuss permitting issues and related legal requirements. Mr. David Robbins of Integrity Strategic Solutions was retained to assist the project in all the legal and marketing aspects of electric power production. Mr. Robbins previously served as Director of Finance and Administration at Sioux Valley Electric Cooperative in South Dakota, and Sr. Financial Analyst for Plains Generation & Transmission Cooperative, Inc. Working with Mr. Robbins, AmeriCulture management met with utility personnel and local government officials in southwestern New Mexico to discuss the proposed plan.

The team met a number of times during development of the plan. After an organization meeting in August 2000, the entire team visited the AmeriCulture location in the Animas Valley in early October 2000. At this time, they reviewed the known resource characteristics, toured the AmeriCulture operation, and discussed how the EGS plan could be integrated into the proposed expansion of the AmeriCulture facility. Jim Witcher supervised a flow-test of the AmeriCulture well which was coordinated with this site visit. Jim subsequently applied the results of this flow test, together with the wealth of published information on the Lightning Dock KGRA, to assure that the EGS plan developed was well-suited to the energy potential of the local resource.

During a subsequent meeting in November 2000 at New Mexico State University in Las Cruces, NM, Jim reviewed the results of the flow test and related geological information. At the same meeting Don Brown presented preliminary EGS field-work plans for consideration, review, and revision by the team. In a December meeting, at the offices of Barber Nichols Engineering in Denver, CO, the revised field work plans were integrated with power plant specifications provided by Ken Nichols.

In the final meeting of the full team in mid-January 2001 at Santa Fe, NM, all aspects of the plan were once more reviewed, reassessed, and coordinated. Dave Robbins attended this meeting and, with sound preliminary cost figures now in hand, agreed to run several electric cost scenarios using a spreadsheet program provided to the project by the National Renewable Energy Laboratory (NREL). The results showed that power could be produced from an EGS system on the AmeriCulture lease at competitive costs, in

quantities suitable for the proposed AmeriCulture expansion, and at rates sustainable over the long term based on the known characteristics of the resource. The proposed EGS facility would also contribute significantly to economic development in the region by creating more than 100 jobs, primarily in work related to the industries that would utilize the additional geothermal energy.

With all the data in hand, the detailed plan was completed and compiled in late January. The plan together with a large amount of supporting documentation was submitted to the USDOE on the deadline date of February 1, 2001, and is now under consideration for funding in a subsequent phase of the DOE EGS Program.