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DEPARTMENT OF
WATER RESOURCES

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Attorneys for Idaho Ground Water Appropriators, Inc.

BEFORE DEPARTMENT OF WATER RESOURCES

STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION OF WATER TO WATER RIGHT NOS. 36-02551 & 36-07694 (RANGEN, INC.)	Docket No. CM-DC-2011-004 **AFFIDAVIT OF CANDICE McHUGH IN SUPPORT OF IGWA'S RESPONSE TO RANGEN'S MOTION FOR PARTIAL SUMMARY JUDGMENT RE: MATERIAL INJURY**

STATE OF IDAHO)
) ss.
COUNTY OF ADA)

Candice M. McHugh being fully sworn upon oath, deposes and states as follows:

1. I am one of the attorneys representing the Idaho Ground Water Appropriators, Inc. in the above-referenced matter and make the following Affidavit upon my personal knowledge of the facts and circumstances set forth herein.

2. Attached hereto as **Exhibit A** is a true and correct copy of the ***Draft Evaluation of the Feasibility of a Water Recirculation System for the Rangen Aquaculture Research Facility*** prepared by Charles Brockway on November 7, 1995.

3. Attached hereto as **Exhibit B** is a true and correct copy of the ***Application for***

Financial Assistance to Evaluate the Feasibility of a Horizontal Well in the Vicinity of the Curren Tunnel submitted to the Idaho Department of Commerce and Labor Division of Economic Development by Rangen, Inc. on June 1, 2004.

4. Attached hereto as **Exhibit C** is a true and correct copy of the ***Application for Financial Assistance to Evaluate the Feasibility of Ground Water Pumping at the Rangen Aquaculture Facility*** submitted to the Idaho Department of Commerce and Labor Division of Economic Development by Rangen, Inc. on June 1, 2004.

FURTHER, Affiant sayeth naught.

DATED this 8th day of February, 2013.

Candice McHugh
CANDICE M. McHUGH

SUBSCRIBED and sworn to before me this 8th day of February, 2013.

MARY TADDICKEN
NOTARY PUBLIC
STATE OF IDAHO

Mary Taddicken
Notary Public for Idaho
Residing at Boise, ID
My commission expires 9-12-13

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of February, 2013, I caused to be served a true and correct copy of the foregoing **Affidavit of Candice M. McHugh in Support of IGWA's Response to Rangen's Motion for Partial Summary Judgment Re: Material Injury**, upon the following by the method indicated:

Signature of person serving form

Original: Director, Gary Spackman Idaho Department of Water Resources PO Box 83720 Boise, ID 83720-0098 Attn: Deborah Gibson Deborah.Gibson@idwr.idaho.gov Kimi.White@idwr.idaho.gov	☐ U.S. Mail/Postage Prepaid ☐ Facsimile ☐ Overnight Mail ☒ Hand Delivery ☒ E-mail
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Southern Region Copy for Margin Note Annotation (Unmarked copy in A36-00134B)

DRAFT

EVALUATION OF THE FEASIBILITY OF A WATER RECIRCULATION SYSTEM FOR THE RANGEN AQUACULTURE RESEARCH FACILITY.

Brockway Engineering, P.L.L.C.

November 7, 1995

Introduction

The Rangen Aquaculture Research facility is located northeast of Hagerman, Idaho. Water for the facility is drawn from Curren tunnel, a spring issuing from the north face of the Snake River canyon. Three other water users also withdraw water from the tunnel under water rights which are senior to those of Rangen, Inc. Because the rights of Rangen, Inc. are junior to the others, the spring is an unreliable source; fish raceways frequently go unused for lack of water. One option to acquire additional water is to divert water allocated under the senior water rights, use it in the aquaculture facility, and return the flow by pumping back to the Curren tunnel, thereby having no impact on the water rights of the other users. The purpose of this study is to evaluate the feasibility of such a recirculation system.

System layout

A diagram of the Rangen facility is shown in Figure 1. Water is diverted at the tunnel via a concrete headbox and pipe, flows through the facility including three sets

ADM: Send copies to Tim Luke
? Is this proposal going to make better the senior rights water supply to the injuries of downstream users?

Exhibit A

there is "Billingsley Creek"?

of raceways, and returns to a ditch which eventually flows into Billingsley Creek. It is proposed to locate a pumping facility near the point where the ditch crosses the road at the downstream end of the last raceway. This facility would consist of a concrete pump bay, a vertical turbine pump, a flow regulation valve, and a flow measurement device.

The return-flow pipe would be buried in a trench along the road as shown in Figure 1. Two possible paths for the pipe are shown: 1) following the Curren tunnel access road, or 2) following the main road to the toe of the canyon face and going directly up to the tunnel. Both routes are approximately 2600 feet in length. The first route is less steep, but it would be difficult to dig a trench for the pipe since the ground contains much rock. The second route would not require a trench from the toe of the face to the headbox, but placement of a large pipe would be more difficult. In either case, the return-flow pipe would be anchored to the top of the concrete headbox.

Water rights

Rangen is maintaining objection based on early priority for fish uses.

In addition to water rights for Rangen, Inc., three other users withdraw water under several rights with priority dates ranging from 1884 to 1908. The irrigation and domestic Rangen rights also have early priority dates, but all of Rangen's fish propagation rights have dates much later than these. The water rights from Curren tunnel are listed and described in Table 1.

Table 1. Water users and water rights from the Curren tunnel

Water user	Description of rights	Total rate (cfs)
Crandelmier	5 rights for irrigation and stockwater	8.91
Musser	1 right for irrigation and stockwater	4.10
Candy	2 irrigation rights	0.72
Rangen, Inc.	2 rights for irrigation and domestic	0.14
Rangen, Inc.	2 rights for fish propagation	76.0

The total diversion from the tunnel for irrigation and stockwater uses is 13.94 cfs. Under the proposal examined in this study, this amount (approximately 14 cfs or 6283 gpm) would be diverted from Curren tunnel, used in the aquaculture facility, and pumped back to the headbox, thereby having no impact on downstream water users when the system is in equilibrium. During startup, downstream users could experience momentary fluctuations in flow as the sytem fills.

The Idaho Department of Water Resources (IDWR) has measured the discharge in Curren tunnel for the past two years. These discharges are shown in Figure 2. Minimum flow for the 1993-1995 period was 2.99 cfs in the spring of 1995. The maximum recorded flow was 20.27 cfs in the fall of 1993.

Preliminary selection of pump

The elevation of the Curren tunnel is approximately 3138 feet[1]. The elevation of the ditch at the proposed location of the pumping plant was estimated from a USGS 7.5-minute quadrangle and found to be approximately 3053 feet. The elevation head

[1]Covington, H. R. and J. N. Weaver, "Geologic map and profiles of the north wall of the Snake River canyon," USGS publication, 1989

is therefore equal to 86 feet. The pump must be designed to pump 14 cfs against the total dynamic head (TDH), which equals the elevation head plus the velocity head plus all head losses in the system.

System curves were developed and are shown in Figure 3 for a range of pipe sizes from 20 inches to 30 inches. The design flow will be 14 cfs, which is the maximum flow that will be returned to the headbox. However, the actual flow may vary, depending on the discharge of the Curren tunnel. A pump which delivers a range of flow from 10 cfs to 14 cfs (4488 gpm to 6283 gpm) against a sufficient TDH the while maintaining reasonable efficiency is the Ingersoll-Dresser 18NKH. The pump curves for this unit are shown in Figure 4.

what happens when spring flow is minimal? (ei 2.99 cfs)

This pump with a 250-horsepower motor and a 10-foot column will cost approximately $21,750 installed, as quoted by Layne Pump of Twin Falls, Idaho.

Selection of pipe size

The cost of pumping is directly related to the TDH which must be overcome. For a given flow, a larger pipe results in lower water velocity and less head loss due to friction, and therefore less pumping cost. However, larger pipe costs more. The optimal pipe size may be found by expressing the tradeoff between pipe cost and pumping cost in economic terms. For a range of pipe sizes, the pumping cost per year was found assuming an average electricity cost of $.035 per kilowatt-hour. This average price considers the monthly demand charge, which is based on the power rating of the pump, and the usage charge per kilowatt-hour. Prices for steel pipe and installation were quoted by Farmore Co. of Jerome, Idaho and are given in Table 2.

Table 2. Cost of steel pipe.

Pipe diameter	Cost per foot
20"	$16.50
24"	$20.50
26"	$23.50
36"	$47.00

It was assumed that the same pump is appropriate over the range of pipe sizes examined, so that the cost of the motor and pump does not vary with pipe size. A comparison of the system curves in Figure 3 with the pump curves in Figure 4 suggests that this is a reasonable assumption. It was also assumed that the cost of excavation and pipe installation does not vary with pipe size.

Because the yearly electricity cost is an amortized cost, the present value was calculated assuming a project life of 20 years with a minimum acceptable rate of return of 10%. This amount was then added to the cost of the pipe, which is already a present value, to yield a total present value (see Figure 5). The pipe size which minimizes the total present value 26 inches. A very large pipe is selected by this procedure because when pumping continuously, the present value calculation is very sensitive to pumping cost, which is a function of head loss and thus the size of the pipe. If a 24-inch pipe is chosen rather than a 26-inch, the initial cost of the pipe would decrease to $53,300 from $61,100 but the annual pumping cost would increase to $46,500 from $45,300. Given than this is a relatively small increase in pumping cost, and because a 24-inch pipe is easier to handle and may be more readily available, it may be a better choice.

Allowance for system down time

Water recirculated by the pumping plant would be used for fish propagation. Raceways require continuous replenishment with fresh water. Any occurrence which interrupts this flow of water would be devastating to the fish in the raceways and would result in a significant monetary loss. Interruption of the flow could be caused by a power outage, a malfunction of the pump or motor, or a break in the return-flow pipe. A pipe break is unlikely unless the pipe were defective or a weld was improperly performed. However, the first two scenarios are not only probable but a certainty if the pump is run continuously. As protection, a redundant system could be built (two pumps of equal size) and a 440-volt, 3-phase generator could be installed for use during power outages. Neither of these has been included in the cost estimate for this study.

Cost estimation

Initial cost estimates for the components of the system and installation are presented in Table 3. Excavation costs assume a 3-foot wide by 4-foot deep trench for the pipeline. The pipeline price was quoted by Farmore Co. in Jerome, Idaho for steel pipe with a wall thickness of 0.281". Installation of the pipeline involves placement of the pipe and welding of the sections, both of which could be performed by Farmore. Prices for the pump and motor and the electrical panel were quoted by Layne Pump of Twin Falls, Idaho and include installation. A flow meter would be required on the pipeline to measure the return flow to Curren tunnel. An in-pipe impeller-type meter may be obtained for approximately $900 including installation from Farm Irrigation systems of Twin Falls, Idaho. The flow should also be measured in the ditch at the end of the last raceway to ensure that water is not deprived of downstream users who have senior water rights. This cost is not included in the estimate.

The motor requires a 440-volt, 3-phase supply of electricity. According to Mr. Greg Evans of Idaho Power, the nearest 440-volt tap is approximately 1050 feet from the pumping plant location. The cost to tap this line and supply power to the pump house would be approximately $1875 plus $7.00 per foot, for a total of $9,267. Idaho Power gives a $30 per horsepower discount for large users, which would bring the cost down to $1767 for a 250 horsepower pump. However, Mr. Evans cautioned that this discount may not be available next year due to changes in the regulatory environment of utilities.

Including other costs for concrete, a pre-fabricated pump house, miscellaneous metal fabrication for an expansion fitting and other incidental work, plus a 10% margin for unexpected costs, the total initial cost for the system installation is estimated to be $116,300.

Annual pumping costs were estimated to be $0.035 per kilowatt-hour on average, which includes both demand and usage costs as discussed previously. Assuming 14 cfs (6283 gpm) were pumped continuously, the annual pumping cost would be $45,300 with a 26-inch pipe and $46,500 with a 24-inch pipe. One option to reduce pumping cost is to operate the recirculation system only during the irrigation season when the other water users were withdrawing significant flow. With a 180-day growing season from April 15 to October 15, the annual pumping cost would be $22,300 with a 26-inch pipe and $22,900 with a 24-inch pipe.

Conclusions

The analysis of the proposed recirulation system for Rangen, Inc. shows that it is a feasible solution with significant annual cost. Even though the arrangement may be feasible, a proposition such as this would require the approval of each of the involved water users with senior rights and of the Idaho Department of Water Resources (IDWR).

Table 3. Estimate of initial cost.

Item	Description	Cost	Vendor
Excavation	1200 cu yds @ $5/yd	$6,000	Loosli Excavating
Pipeline	2600 ft, 26" @ $23.50/ft	$61,100	Farmore
Pipeline installation	Placement & welding	$5,200	Farmore
Pump & motor	250 Hp, 6200 gpm pump, installed	$21,750	Layne Pump
Electrical panel	All options	$5,000	Layne Pump
Panel installation	Installation by qualified electrical contractor	$1,000	Shotwell
Power supply	440-volt, 3-phase tap, 1050-ft run, minus credit	$1,767	Idaho Power
Flow meter	Grainland impeller w/totalizer, installed	$900	Farm Irrigation Systems
Check valve	Needed to prevent backflow after system shutdown	$1000	Farmore
Butterfly valve	Needed to regulate the flow rate	$1000	Farmore
Pump bay & pad	5 cu yd concrete @ $200 / yd in place	$1,000	Triple-C or equivalent
Pump house	Pre-fab metal pump house 8'x8'	$1,500	Petersen Brothers
Metal fabrication	Pipe expansion, misc. brackets & fittings	$500	Langdon or equivalent
	SUBTOTAL	$107,717	
	10% Contingency	$10,572	
	TOTAL INITIAL COST	$118,289	

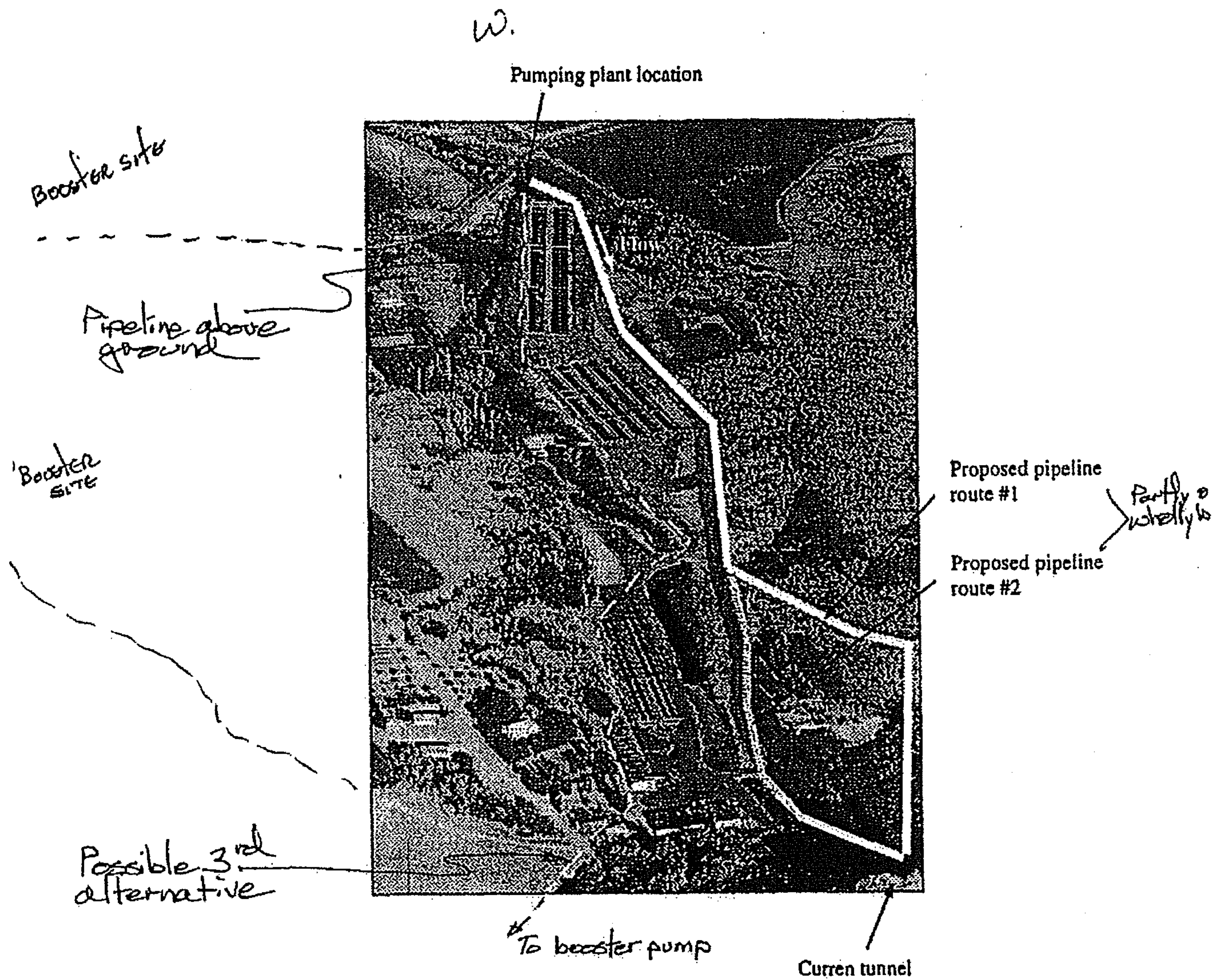


Figure 1. An aerial photo of the Rangen, Inc. facility with the proposed layout of the water recirculation system superimposed. The locations of the pumping plant and pipeline are shown.

Potential injury to junior priority irrigators if top 14 cfs is pumped back to pipelines (i.e. flows that ordinarily not be available to Crandlemire, Candy, Musser).

Figure 2. Measured discharge of Curren tunnel

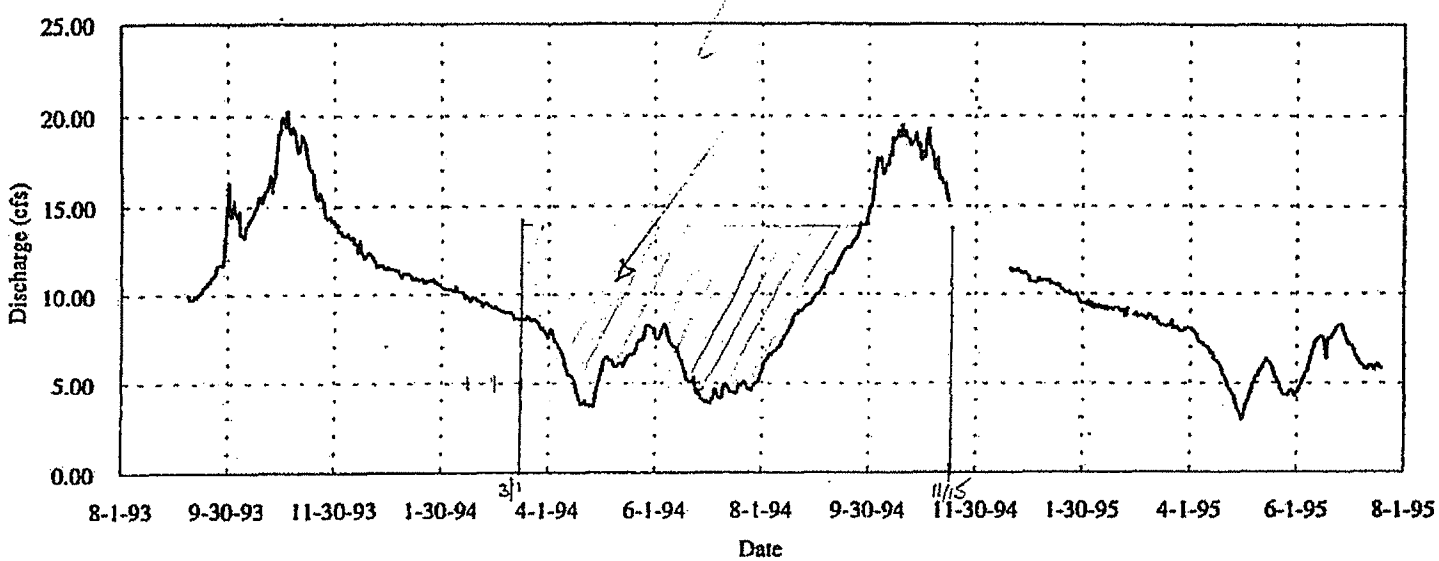
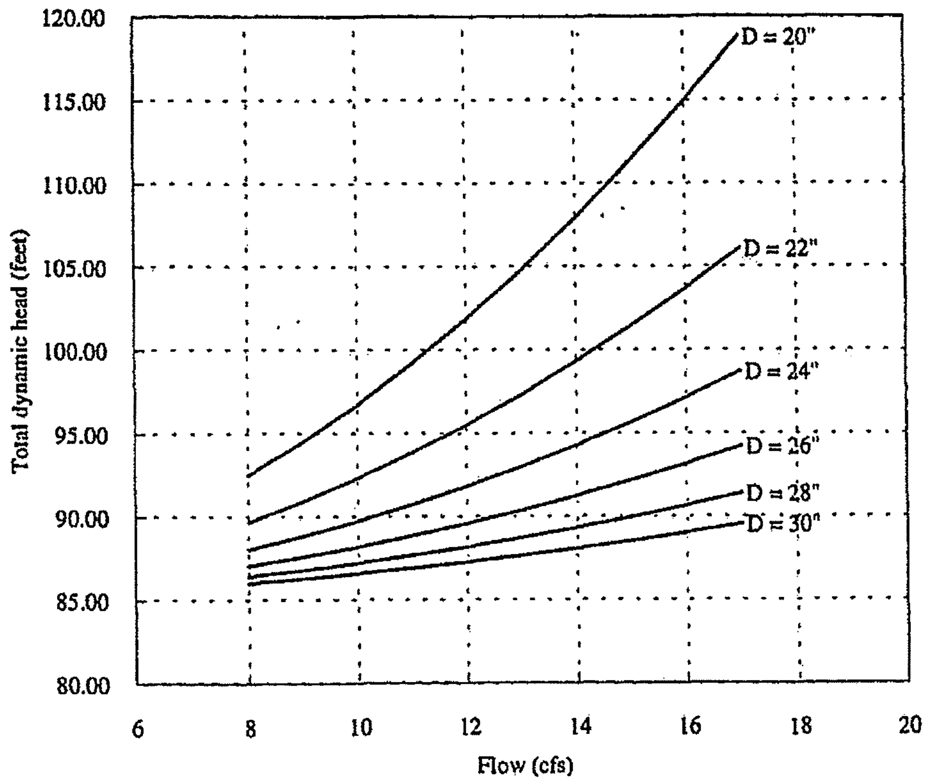


Figure 3. System curves for several pipe diameters



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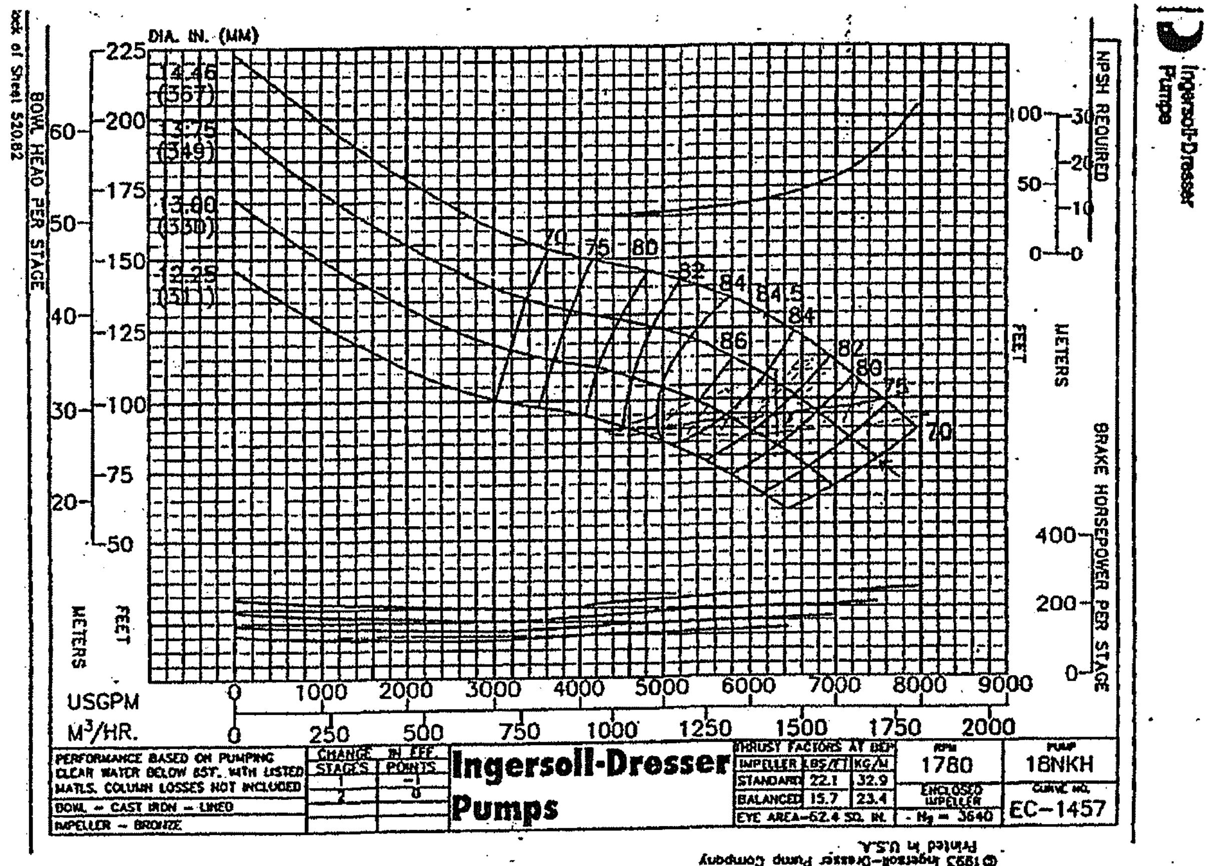
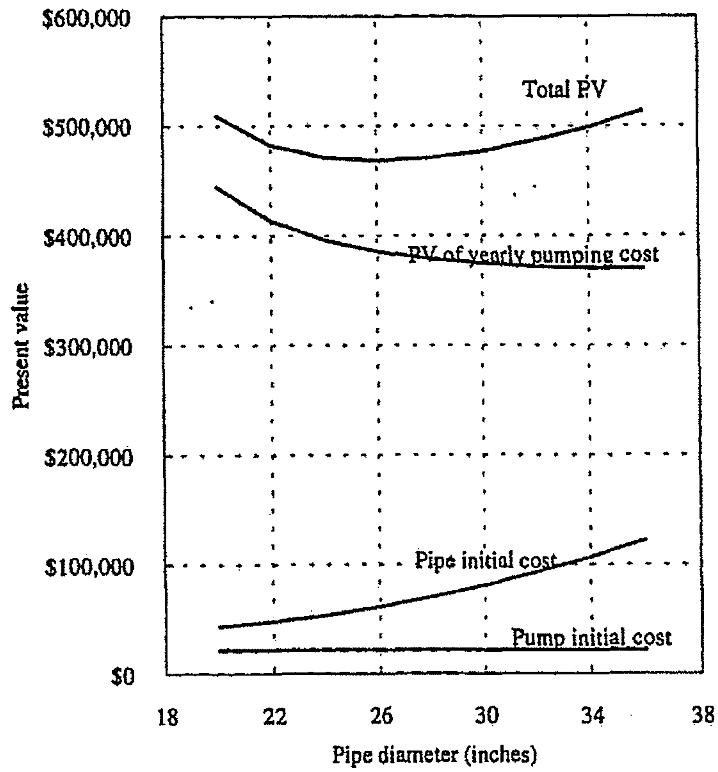


Figure 4. Pump curves for the Ingersoll-Dresser 18NKH

Figure 5. Pipe size selection by minimizing the present value of total cost



Eastern Snake Plain Aquifer Mitigation Program

APPLICATION FOR FINANCIAL ASSISTANCE TO EVALUATE THE FEASIBILITY OF A HORIZONTAL WELL IN THE VICINITY OF THE CURREN TUNNEL

Submitted to:

The Idaho Department of Commerce and Labor
Division of Economic Development
P.O. Box 83720
Boise, ID 83720-0093

Submitted by:

Rangen, Inc.
P.O. Box 706
Buhl, ID 83316

June 1, 2004

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ESPAM ASSISTANCE GRANT APPLICATION

Applicant: Rangen, Inc. Phone: 208-543-6421

Address: P.O. Box 706, Buhl, ID 83316

Application Prepared By: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Technical Service Provider: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Water Right Number(s): 36-15501, 36-02551, 36-07694

Amount of Water Supply Reduction: Approximately 80%

PROJECT FINANCING OVERVIEW:

ESPAM:	$ 132,928
Private:	$
Federal:	$
Other:	$
TOTAL:	$ 132,928

DESCRIBE PRIVATE/FEDERAL/OTHER MATCHING FUNDS:

BRIEF PROJECT DESCRIPTION: Feasibility evaluation of a horizontal well in vicinity of Curren Tunnel; primary task consists of installation of three test wells on canyon rim above Curren Tunnel

APPLICATION CERTIFICATION: The data in this application is true and correct. The undersigned has the authority to submit this application on behalf of the Applicant and will comply with all required certifications, laws, and regulations if the application is approved and selected for funding.

Name: (typed) J. Wayne Courtney Title: Executive Vice President

Signature: Date:

Name: (typed) May, Sudweeks & Browning Title: Attorneys for Rangen, Inc.

Signature: [signature] Date: 6-1-04

ESPAM ASSISTANCE GRANT APPLICATION

Applicant: Rangen, Inc. Phone: 208-543-6421

Address: P.O. Box 706, Buhl, ID 83316

Application Prepared By: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Technical Service Provider: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Water Right Number(s): 36-15501, 36-02551, 36-07694

Amount of Water Supply Reduction: Approximately 80%

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Name: (typed) J. Wayne Courtney Title: Executive Vice President

Signature: [signature] Date: 6/1/2004

Name: (typed) May, Sudweeks & Browning Title: Attorneys for Rangen, Inc.

Signature: ______ Date: ______

IGWA 000037

Attachment A - Budget

Grantee: Rangen, Inc. Project No.:

Project: Feasibility Evaluation of a horizontal Well in Vicinity of Curren Tunnel

LINE ITEMS	AMOUNTS				
	ESPAM Grant	Private	Federal	Other	Total
Construction and Project Improvement (includes equipment)	67,000				$67,000
Professional/Engineering Fees	43,773				$43,773
Contingency	22,155				$22,155
Total Costs	$132,928	$	$	$	$132,928

1) Project Description

a) Background

Rangen, Inc. ("Rangen") is one of the largest suppliers of high-yield, low waste feeds for the aquaculture industry. Rangen conducts on-going nutrition research to improve aquaculture feeds and husbandry practices. Rangen feeds are then tested in its aquaculture facility near Hagerman, Idaho to measure performance under practical conditions.

The Rangen aquaculture facility (Figure 1) is located in Gooding County approximately 3 miles from Hagerman, Idaho. The primary water source for the Rangen facility (Table 1) is spring discharge from the Curren Tunnel[1]. This is one of many springs in the Milner to King Hill reach of the Snake River (Figure 2) that collectively form a primary discharge area for the Eastern Snake River Plain (ESRP) aquifer.

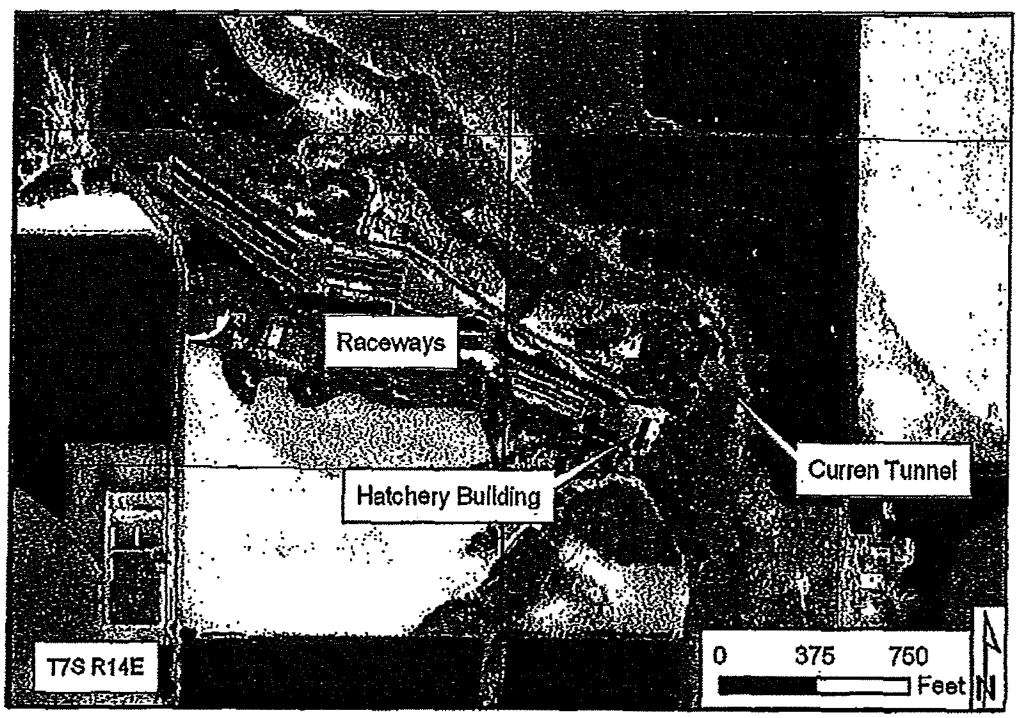

Figure 1: Rangen aquaculture facility.

[1] Also known as the Martin-Curren Tunnel.

Number	Priority Date	Decreed Date	Source	Maximum Diversion Rate	Maximum Diversion Volume
36-135A	Apr 1 1908	Aug 27 2001	Martin-Curren Tunnel	0.050	0.000
36-15501	Jul 1 1957	Dec 29 1997	Springs	1.460	0.000
36-2551	Jul 13 1962	Dec 29 1997	Martin-Curren Tunnel	48.540	0.000
36-10269	Aug 5 1976	Nov 22 1996	Ground Water	0.040	0.000
36-7694	Apr 12 1977	Dec 29 1997	Springs	26.000	0.000
36-8048	Dec 21 1981	Aug 27 2001	Ground Water	0.410	80.800
36-134B	Oct 9 1884	Aug 27 2001	Martin-Curren Tunnel	0.090	0.000

Table 1: Rangen water rights.

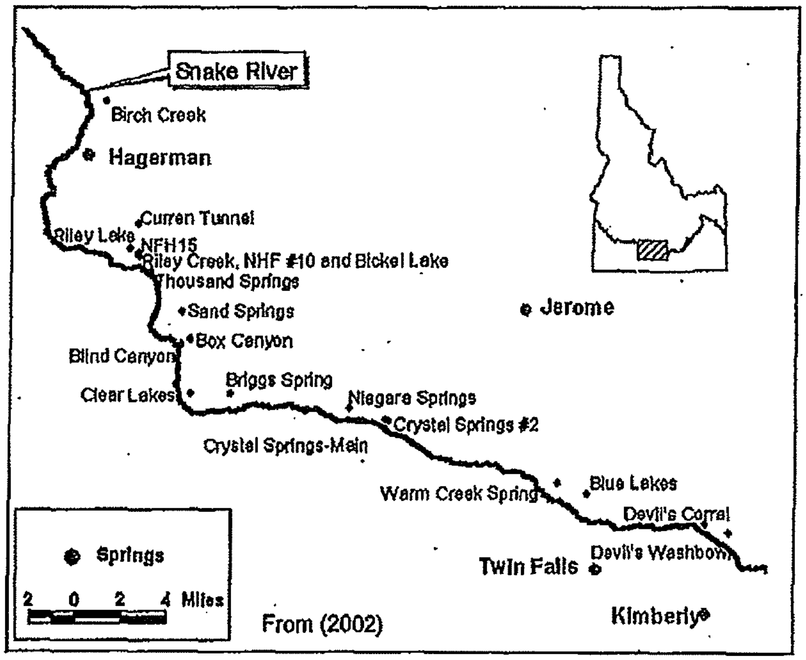

Figure 2: Major springs in the Milner to King Hill reach of the Snake River.

Numerous springs in the Milner – King Hill reach have experienced decreased flows in recent years (Bendixsen, 1995; Johnson et al., 2002). Average annual diversion rates (based on average monthly diversions) to the Rangen facility from the Curren Tunnel were over 50 cfs during the 1960s and early 1970s, but have decreased to less than 15 cfs in recent years (Figure 3).

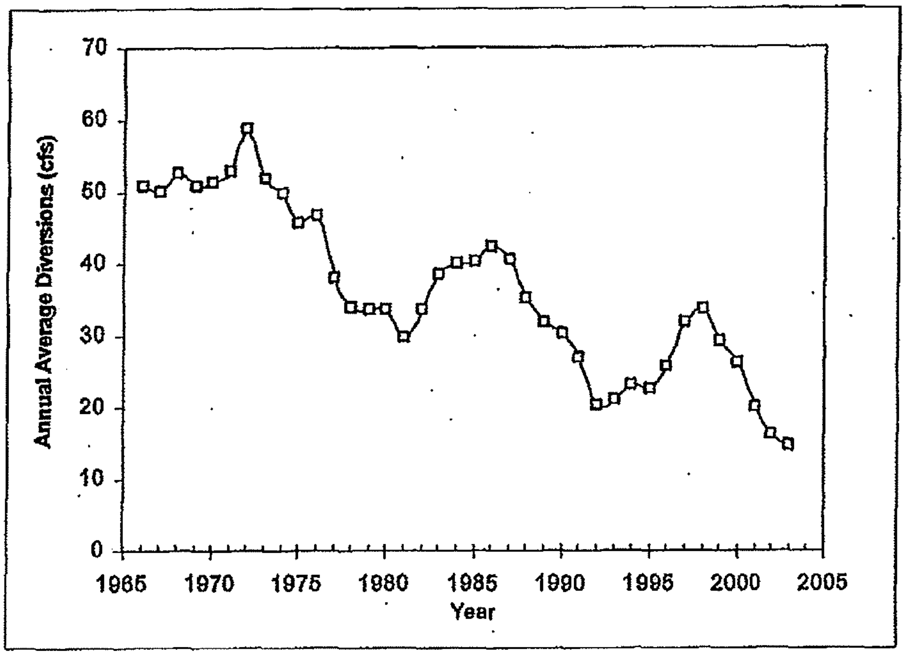

Figure 3: Average annual discharge rates from the Rangen, Inc., Aquaculture Facility.

The Curren Tunnel draws water from a pillow lava facies of the Malad Basalt (Johnson et al., 2002). Review of a geologic cross section (Figure 5) of the vicinity of the Curren Tunnel (Figure 4) compiled by Covington and Weaver (1989) suggests that discharge at the Current Tunnel may be controlled, in part, by clay zones associated with the Yahoo Clay or varying permeability characteristics of the Malad Basalt.

b) Project Description

One alternative for increasing spring flows to the Rangen facility would be to construct a horizontal well in the vicinity of, but at an elevation below, the Curren Tunnel. The purpose of the horizontal well would be to tap ground water in the vicinity of the Curren Tunnel, but doing so in the context of decreased local ground water levels. Such a horizontal well in the vicinity of the Curren Tunnel could be considered a "well deepening" of the current Curren Tunnel discharge point.

The major benefit of a horizontal well is this: if successful, a horizontal well could provide substantial increase in flow to the Rangen facility without requiring new water rights, mitigation for potential new withdrawals from vertical wells located at the Rangen facility, or ongoing operational costs and water quality concerns associated with various pump back strategies.

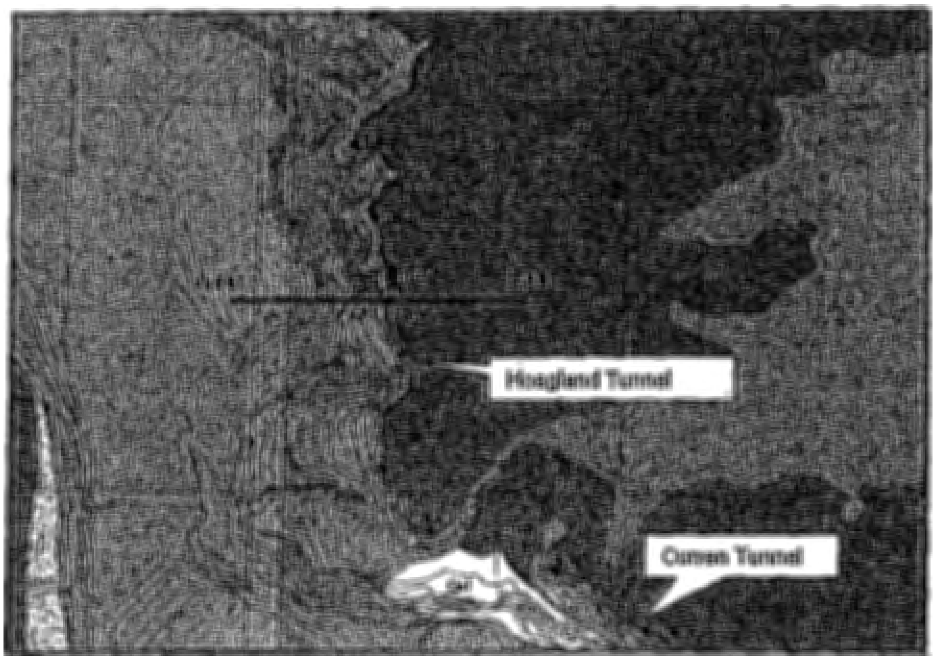

Figure 4: Approximate location of cross section shown in Figure 5 (adapted from Covington and Weaver, 1989).

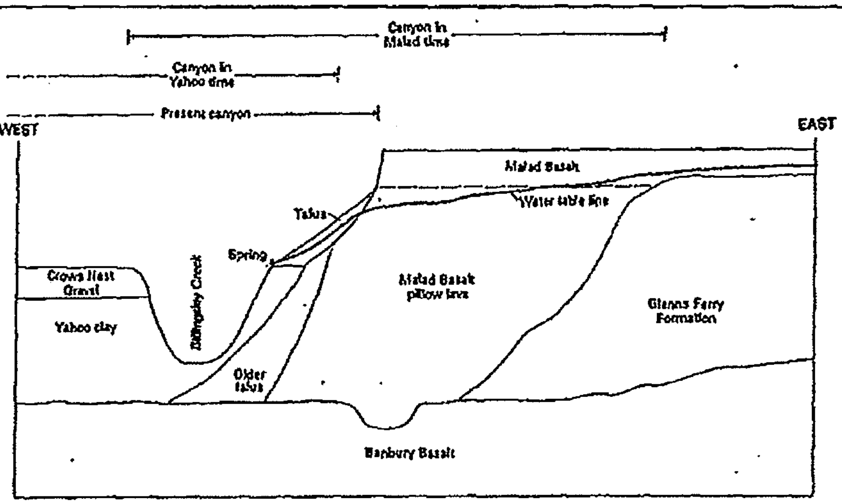

Figure 3. Schematic section of the canyon wall near profile-control location 179–1 east of Hagerman. Section shows the interpretative relation of the confining units of Yahoo Clay and Glenns Ferry sediments to the Malad Basalt canyon filling deposits.

Figure 5: Schematic cross section just north of Hoagland Tunnel/Weatherby Spring (from Covington and Weaver, 1989).

A major question associated with the construction of a horizontal well would be the availability of water at a point lower than the Curren Tunnel. Most of the natural springs in the vicinity of the Curren Tunnel discharge from a similar elevation, suggesting that a common geologic feature is controlling the discharge elevation. Such controls might include the presence of Yahoo Clay, Glenns Ferry sediments, other interflow sediments, or a less permeable portion of the Malad Basalt. Installing a horizontal well below the elevation of the Curren Tunnel risks missing the permeable zone that currently supplies water to the Curren Tunnel.

Drilling of a horizontal well can be expensive, costing approximately $500 per linear foot (Jack Seburn, North American Construction). A 300-foot long horizontal bore (24" diameter) with drilling and associated costs could cost more than $250,000. One approach to better define horizontal-well target zones would be to construct one or more vertical test wells. Test wells located above the canyon rim, but close to the Curren Tunnel, could be used to define subsurface lithology, water levels, vertical hydraulic gradients, and aquifer characteristics. Multiple vertical test wells would be less expensive than a horizontal test well, and would better enable evaluation of the feasibility of horizontal well to provide water to the Rangen facility.

2) Purpose and Objectives

The purpose of this proposed project is to increase natural flows to the Rangen aquaculture facility. The general objective is to evaluate the feasibility of a horizontal well located in the vicinity of the Curren Tunnel to supply natural flow to the Rangen facility. Specific objectives include the following:

a. Review local hydrogeologic conditions based on existing information.
b. Drill three vertical test wells on the canyon rim in the vicinity of the Curren Tunnel; evaluate subsurface lithology and hydrogeologic characteristics in the vicinity of the test wells based on of drill cuttings, drilling resistance, test pumping, water level measurements, etc.
c. Evaluate the feasibility of a horizontal well based on test-drilling results.
d. If a horizontal well appears feasible, develop a construction plan and cost estimate for a horizontal production well near the Rangen facility.

3) Project Tasks

a) Evaluate Hydrogeologic Conditions

The first task will consist of a detailed review of hydrologic and geologic information in the vicinity of the Curren Tunnel. The task will include refinement of several cross-sections (including field-verification of well locations) for insight into characteristics of the Malad Basalt in this area. The task will include obtaining and plotting the timing of surface water flow and ground water extraction patterns with respect to Curren Tunnel Hoagland Tunnel, local well hydrographs, and other available spring-flow data. These and other data will be used to identify test well locations.

b) <u>Well Construction and testing</u>

Well construction and testing will include the following subtasks:

- Selection of drilling location
- Preparation of well design documents
- Solicitation of drilling bids
- Drilling supervision
- Geophysical logging
- Hydraulic gradient testing
- Aquifer testing

Three test wells are envisioned on the canyon rim above the Rangen facility, within approximately 400 feet of the canyon rim (Figure 6). Three wells located on the canyon rim could provide a lithologic description in three general directions from the Curren Tunnel, and would provide basis for determining local potentiometric surface.

The drilling location probably will be limited to property owned by Rangen, Inc. These wells will be used to evaluate hydrogeologic conditions (e.g., aquifer materials, relative permeability, etc.) to the maximum depth that would be considered for a horizontal well. Two of the test wells will be between 150 and 175 feet deep. The third test well may extend to a depth of approximately 300 feet. The latter well will provide similar information as the first two wells, but will also provide subsurface information (geology, gradients, etc) for zones underlying the elevation of a possible horizontal well.

Eight-inch diameter test wells will be constructed using air-rotary drilling. Once below the water table, test pumping and water level checks will generally be conducted with every additional 20 feet of depth (coinciding with drill-stem lengths). Each test-pumping cycle may require removing the drill stem and lowering a test pump capable of pumping between 100 and 300 gallons per minute. Water levels will be monitored prior to and during pumping.

Camera surveys, geophysical logging, and/or borehole flow measurements will be conducted in each well prior to well completion. This information will be used to complete these wells as monitoring wells. The wells will be completed with seals, if necessary, to avoid substantial vertical flows within the boreholes. Completed as monitoring wells, the test wells will provide long-term, dedicated water level information for the vicinity of the Curren Tunnel.

A geologist will be on-site during drilling to monitor drill cuttings, fluid levels, and aquifer testing. Test well locations will be estimated using a global positioning system device; relative elevations will be surveyed following well completion.

A summary report will completed following test well construction and testing. The report will include a drilling description, detailed well logs, lithologic descriptions, camera survey and/or geophysical interpretations, and other data.

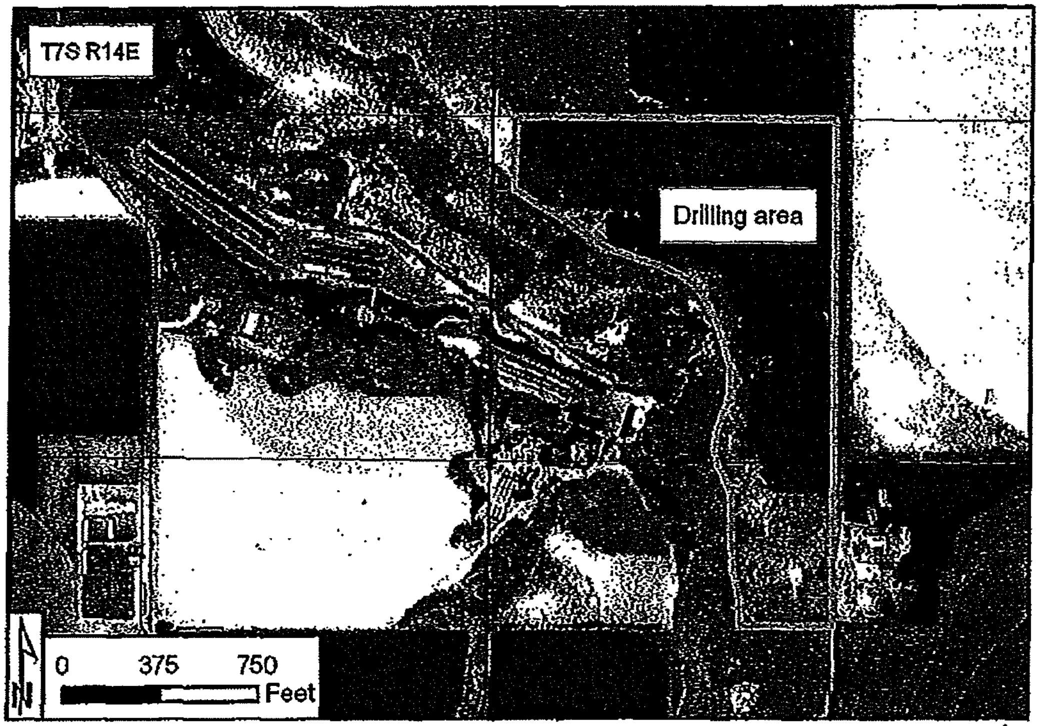

Figure 6: Rangen, Inc. property. Likely drilling area is shown in yellow.

c) Evaluate Feasibility of Horizontal Well

An evaluation of horizontal well feasibility will be prepared based on the test drilling results. This evaluation will have three components. The first component will consist of an evaluation of horizontal well feasibility based on test-well drilling, vertical and horizontal hydraulic gradient analysis, and aquifer testing results, and on discussions with horizontal drilling contractors.

The second component will be an evaluation of potential effects on other water users. As of 2003, most of the water required by Curren Tunnel water-right holders (Table 2) users is being delivered through a recently-installed pipeline that transports irrigation water from the Northside Canal Company and rental pool water. This water is delivered in lieu of water from the Curren Tunnel. However, the rights to withdraw water from the Curren Tunnel have been maintained. If water deliveries in the pipeline are not possible (e.g., if rental water is unavailable) these users are still entitled to draw water from the Curren Tunnel (Jeff Martin, North Snake Ground Water District, *personal communication*, 5/24/04). If a new, successful horizontal well is installed below the elevation of the Curren Tunnel, there may be insufficient head for gravity feed from the horizontal well to the places of use, requiring mechanical lift. Furthermore, a successful horizontal well may produce more water than is currently flowing from the Curren Tunnel. Some of the additional water (up to the full allotment based on priority dates) might be claimed by the other Curren Tunnel users. An agreement resolving these issues might be required before the construction of a horizontal borehole in the vicinity of the Curren Tunnel commences.

Water Right	Priority Date	Owner	Maximum diversion rate (cfs)			
			Irrigation	Stockwater	Domestic	acres
134A	10/9/1884	Walter and Margaret Candy	0.49	0.04	-	36
135B	4/1/1908	Walter and Margaret Candy	0.51	-	-	36
134D	10/9/1884	Howard and Rhonda Morris	1.58	0.06	-	143
135D	4/1/1908	Howard and Rhonda Morris	1.58	0.06	-	143
10141A	12/1/1908	Howard and Rhonda Morris	0.82	0.03	-	143
134E	10/9/1884	Howard and Rhonda Morris	0.82	0.04	-	75
135E	4/1/1908	Howard and Rhonda Morris	0.82	0.02	-	75
10141B	12/1/1908	Howard and Rhonda Morris	0.43	0.02	-	75
102	4/1/1892	J Alvin Musser	4.1	0.07	0.04	205
Total			11.15	0.34	0.04	931

Table 2: Water rights to flow from the Curren Tunnel, excluding those held by Rangen, Inc.

In addition, it is possible that lower horizontal well near the Curren Tunnel may lead to decreases in local ground water levels outside of the immediate Curren Tunnel area. An analysis of responses in surface water applications, ground water withdrawals, and spring flows in the Curren Tunnel and Hoagland Tunnel (to the extent that data are available) may give insight into this question (Task 3a). These factors will be considered in analyzing the feasibility of a horizontal well.

The third component – a construction plan for a horizontal test well – will be prepared if it is determined that a horizontal well would represent a feasible solution to supplying additional water to the Rangen facility. The plan would contain drilling specifications, estimated costs, and other information required to proceed with construction of a horizontal well.

4) Project Schedule

A tentative project schedule is shown in Table 3. The schedule assumes a start time of August 2004.

Task	Tentative Schedule						
	Aug 2004	Sep 2004	Oct 2004	Nov 2004	Dec 2004	Jan 2005	Feb 2005
a) Evaluate Hydrogeologic Conditions	X						
b) Obtain drilling bids, construct test wells, evaluate hydrogeologic characteristics		X	X	X	X		
c) Evaluate Feasibility of Horizontal Well; develop horizontal well construction plan				X	X	X	
Submit Final Report							X

Table 3: Tentative project schedule.

5) Cost Details

Preliminary costs for this project are shown in Table 4. These costs are greater than general well-drilling costs because of frequent water level measurements and test pumping during drilling, the presence of an on-site engineer/geologist during drilling and testing, and pre- and post-drilling analyses. These costs will be refined on the basis of final well specifications and contractor bids.

6) Potential Benefits and Risks

a) Potential Benefits

A successful horizontal well could result in a substantial increase in flow to the Rangen facility. Rangen's facility is nonconsumptive. Increased water flow through the Rangen facility will benefit not only those junior users in the Snake River Plain that could be subject to curtailment, but would also benefit water users downstream of the Rangen facility. The Department of Water Resources has indicated that a horizontal well in this location would be analogous to a "well deepening." Therefore, administratively, this horizontal well would be much simpler than a new vertical well. If constructed at an elevation greater than the Rangen aquaculture facility, the horizontal well would not require operating costs to lift water.

Task	SubTasks	Engineering	Construction and Indirect	Total
a) Evaluate Hydrogeologic Conditions				
	Review of driller reports	944		944
	Field verify well locations	1,216		1,216
	Draw several x-sections in vicinity of Curren Tunnel based on field-verified well locations	1,288		1,288
	Obtain any available ground water extraction estimates for vicinity of Curren Tunnel	200		200
	Obtain Northside canal flows and timing in vicinity of Curren Tunnel	200		200
	Plot canal timing and ground water extraction timing on Curren Tunnel, Hoagland Tunnel, and other hydrographs	1,488		1,488
	Summarize results in brief report	2364		2364
	Subtotal	7,700		7,700
b) Well Construction				
	Prepare well design specifications	1,920		1,920
	Obtain, review bids	1,920		1,920
	Drilling supervision	10,930		10,930
	Geophysical logging	1,180		1,180
	Lithologic descriptions	1,480		1,480
	Geophysical interpretation	960		960
	Summary report	4,248		4,248
	Travel Expenses		1875	1,875
	Subtotal	22,638	1875	24,513
Estimated Contractor Costs				
	Drilling subcontractor (assume 2 wells at 200 ft each and 1 well at 300 ft each for a total of 700 ft. Assume $85/ft to account for frequent water level measurements and tripping out for test pumping every 20 feet).		59,500	59,500
	Geophysics and/or camera subcontractor; assume $2,500 per well		7,500	7,500
	Subtotal		67,000	67,000
c) Evaluate Feasibility of Horizontal Well				
	Analysis	2,904		2,904
	Horizontal drilling plan	4,368		4,368
	Presentation with client, discussion with Interim Committee	1,600		1,600
	Summary Report	2,688		2,688
	Subtotal	11,560		11,560
Subtotal				$110,773
Contingency (20%)				22,155
Total				$132,928

Table 4: Budget details

The primary immediate benefit of this project would be knowledge. Vertical test wells will provide necessary information to design a horizontal well, and minimize the potential risks of a horizontal well. A horizontal well in the vicinity of the Curren Tunnel may lower local hydraulic heads, which may lead to decreased flows in the Curren Tunnel and possibly other springs in the vicinity of the Curren Tunnel. Some analysis of hydrologic characteristics in the vicinity of the Curren Tunnel, other springs (e.g., Hoagland Tunnel), and fluxes above the canyon rim (e.g., spring canal filling, summer ground water withdrawals, etc.) may give insight into this question (Task 3a).

Provisions would need to be considered to shield other Curren Tunnel users with rights more senior to that of Rangen from the effects of reduced flow. Options for doing so would be identified as part of Task 3c. The vertical test wells and associated evaluations will be completed by February 2004.

b) <u>Potential Risks</u>

There are several potential risks associated with this project. The first is that test drilling may not reveal a promising zone into which to drill a horizontal well. The second risk is that a promising zone is identified, but the horizontal well, if constructed, is unable to produce a sufficient amount of water. It is also possible that the concerns listed above cannot be adequately addressed and therefore a horizontal well would not be feasible.

7) Summary Discussion

This proposed project consists of constructing a series of vertical test wells to determine feasibility of a horizontal well in the vicinity of the Curren Tunnel. A successful horizontal well to replace decreased flows to the Rangen aquaculture facility may provide a long-term solution to diminished flows that are constraining the Rangen aquaculture operation. Increasing flows to the Rangen facility would provide a major benefit to other water users that may be affected by decreased flows to the Rangen facility.

The success of a horizontal well design based on the proposed test wells is not guaranteed. Test drilling may not indicate productive targets for a horizontal well. Potential targets based on test drilling may or may not result in a successful horizontal well. A successful horizontal well may have adverse impacts on flows to the Curren Tunnel and surrounding water levels.

8) References

Bendixsen, S., 1995. Summary of Ground Water Conditions at the Curren Tunnel near Hagerman, Idaho, Idaho Department of Water Resources (Draft Report).

Covington, H.R. and Weaver, J.N., 1989. Geologic Map and Profiles of the North Wall of the Snake River Canyon, Bliss, Hagerman, and Tuttle Quadrangles, Idaho. U.S. Geological Survey, Miscellaneous Investigations Series, Regional Aquifer System Analysis Program.

Johnson, G.S. et al., 2002. Spring discharge along the Milner to King Hill Reach of the Snake River, Idaho Water Resources Research Institute.

Eastern Snake Plain Aquifer Mitigation Program

APPLICATION FOR FINANCIAL ASSISTANCE TO EVALUATE THE FEASIBILITY OF GROUND WATER PUMPING AT THE RANGEN AQUACULTURE FACILITY

Submitted to:

The Idaho Department of Commerce and Labor
Division of Economic Development
P.O. Box 83720
Boise, ID 83720-0093

Submitted by:

Rangen, Inc.
P.O. Box 706
Buhl, ID 83316

June 1, 2004

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ESPAM ASSISTANCE GRANT APPLICATION

Applicant: Rangen, Inc. Phone: 208-543-8421

Address: P.O. Box 706, Buhl, ID 83316

Application Prepared By: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Technical Service Provider: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Water Right Number(s): 36-15501, 36-02551, 36-07694

Amount of Water Supply Reduction: Approximately 80%

PROJECT FINANCING OVERVIEW:

ESPAM:	$ 51,097
Private:	$
Federal:	$
Other:	$
TOTAL:	$ 51,097

DESCRIBE PRIVATE/FEDERAL/OTHER MATCHING FUNDS:

BRIEF PROJECT DESCRIPTION:
Evaluate feasibility of ground water pumping for water supply augmentation at the Rangen, Inc. aquaculture facility

APPLICATION CERTIFICATION: The data in this application is true and correct. The undersigned has the authority to submit this application on behalf of the Applicant and will comply with all required certifications, laws, and regulations if the application is approved and selected for funding.

Name: (typed) J. Wayne Courtney Title: Executive Vice President

Signature: [signature] Date: 6/1/2004

Name: (typed) May, Sudweeks & Browning Title: Attorneys for Rangen, Inc.

Signature: Date:

IGWA 000053

ESPAM ASSISTANCE GRANT APPLICATION

Applicant: Rangen, Inc. Phone: 208-543-6421

Address: P.O. Box 706, Buhl, ID 83316

Application Prepared By: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Technical Service Provider: SPF Water Engineering, LLC Phone: (208) 383-4140

Address: 600 East River Park Lane, Suite 105, Boise, ID 83706

Water Right Number(s): 36-15501, 36-02551, 36-07694

Amount of Water Supply Reduction: Approximately 80%

PROJECT FINANCING OVERVIEW:

ESPAM:	$ 51,097
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Name: (typed) J. Wayne Courtney Title: Executive Vice President

Signature: Date:

Name: (typed) May, Sudweeks & Browning Title: Attorneys for Rangen, Inc.

Signature: [signature] Date: 6-1-04

ATTACHMENT A - BUDGET

Grantee: Rangen, Inc. Project No.:

Project: Evaluation of ground water pumping for water supply augmentation at the Rangen aquaculture facility

LINE ITEMS	AMOUNTS				
	ESPAM Grant	Private	Federal	Other	Total
Construction and Project Improvement	$27,500				$27,500
Professional/Engineering Fees	$15,081				$15,081
Contingency	$8,516				$8,516
Total Costs	$51,097	$	$	$	$ 51,097

1) Project Description

a) Background

Rangen, Inc. ("Rangen") is one of the largest suppliers of high-yield, low waste feeds for the aquaculture industry. Rangen conducts on-going nutrition research to improve aquaculture feeds and husbandry practices. Rangen feeds are then tested in its aquaculture facility near Hagerman, Idaho to measure performance under practical conditions.

The Rangen aquaculture facility (Figure 1) is located in Gooding County approximately 3 miles from Hagerman, Idaho. The primary water source for the Rangen facility (Table 1) is spring discharge from the Curren Tunnel[1]. This is one of many springs in the Milner to King Hill reach of the Snake River (Figure 2) that collectively form a primary discharge area for the Eastern Snake River Plain (ESRP) aquifer.

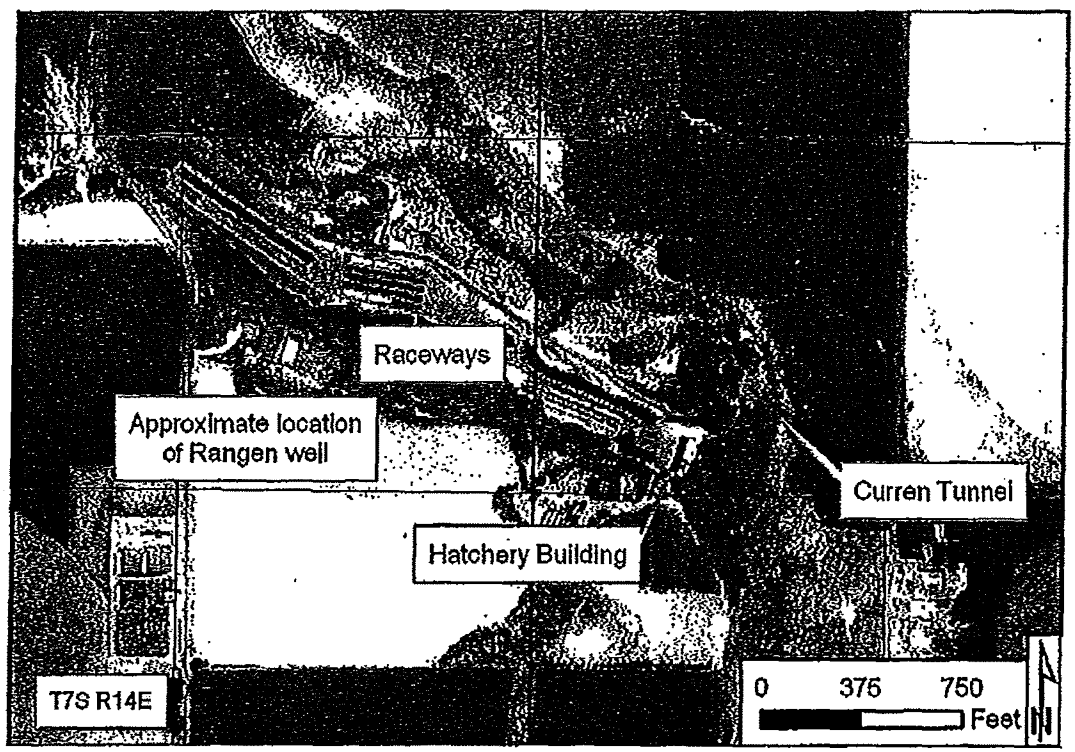

Figure 1: Rangen aquaculture facility.

[1] Also known as the Martin-Curren Tunnel.

Number	Priority Date	Decreed Date	Source	Maximum Diversion Rate	Maximum Diversion Volume
36-135A	Apr 1 1908	Aug 27 2001	Martin-Curren Tunnel	0.050	0.000
36-15501	Jul 1 1957	Dec 29 1997	Springs	1.460	0.000
36-2551	Jul 13 1962	Dec 29 1997	Martin-Curren Tunnel	48.540	0.000
36-10269	Aug 5 1976	Nov 22 1996	Ground Water	0.040	0.000
36-7694	Apr 12 1977	Dec 29 1997	Springs	26.000	0.000
36-8048	Dec 21 1981	Aug 27 2001	Ground Water	0.410	80.800
36-134B	Oct 9 1884	Aug 27 2001	Martin-Curren Tunnel	0.090	0.000

Table 1: Rangen water rights.

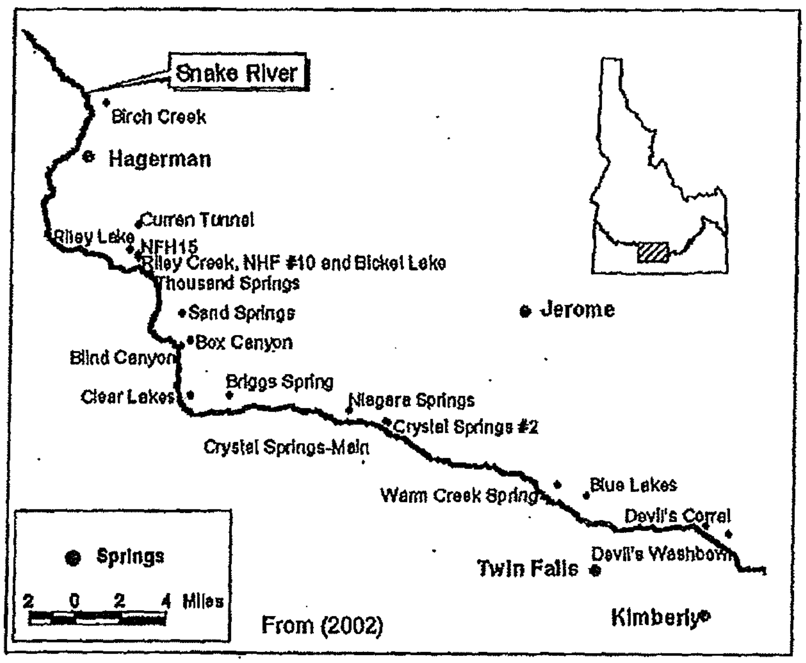

Figure 2: Major springs in the Milner to King Hill reach of the Snake River.

Numerous springs in the Milner – King Hill reach have experienced decreased flows in recent years (Bendixsen, 1995; Johnson et al., 2002). Average annual diversion rates (based on average monthly diversions) to the Rangen facility from the Curren Tunnel were over 50 cfs during the 1960s and early 1970s, but have decreased to less than 15 cfs in recent years (Figure 3).

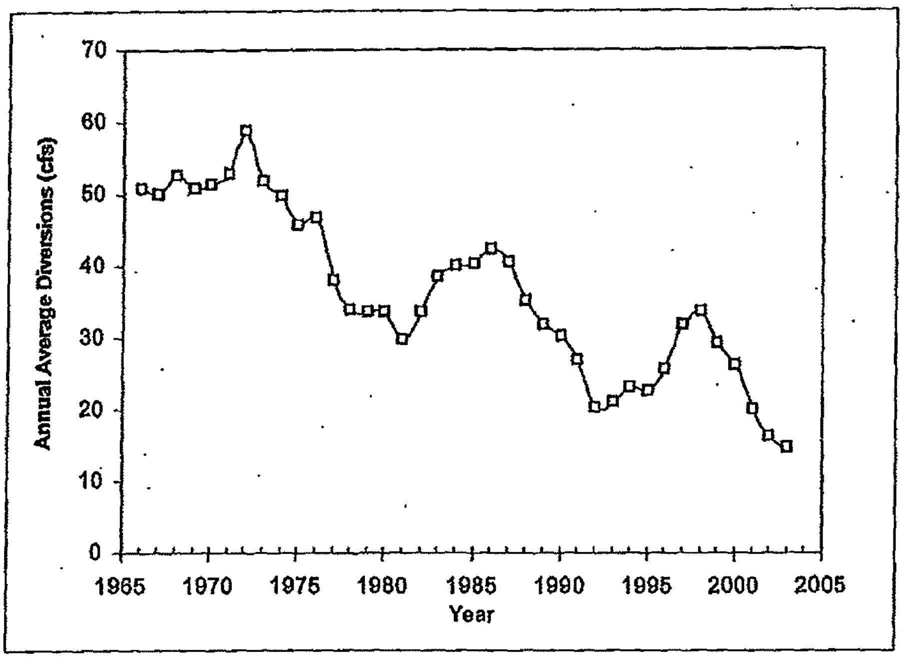

Figure 3: Average annual discharge rates from the Rangen, Inc., Aquaculture Facility.

The Curren Tunnel draws water from a pillow lava facies of the Malad Basalt (Johnson et al., 2002). Review of a geologic cross section (Figure 5) of the vicinity of the Curren Tunnel (Figure 4) compiled by Covington and Weaver (1989) suggests that discharge at the Current Tunnel may be controlled, in part, by clay zones associated with the Yahoo Clay or varying permeability characteristics of the Malad Basalt.

b) Project Description

One alternative for increasing spring flows to the Rangen facility would be to construct one or more vertical production wells at the Rangen facility to withdraw ground water for hatchery uses. Such a strategy would be successful if a well was highly productive with a relatively small amount of lift.

One domestic well is present southwest of the Rangen facility (Figure 1)[2]. The lithologic description (Figure 6) indicates penetration of this well through approximately 80 feet of clay – presumably Yahoo Clay (Figure 5). It appears that the primary water-bearing zone (which is likely the Banbury Basalt – see Figure 5) was encountered at a depth of approximately 265 feet.

[2] A second domestic well appears to exist adjacent to the Rangen facility, but a driller's report for this well was not available in IDWR's online database. The lithologic description in this well (and any other nearby well) may influence the scope and nature of this project.

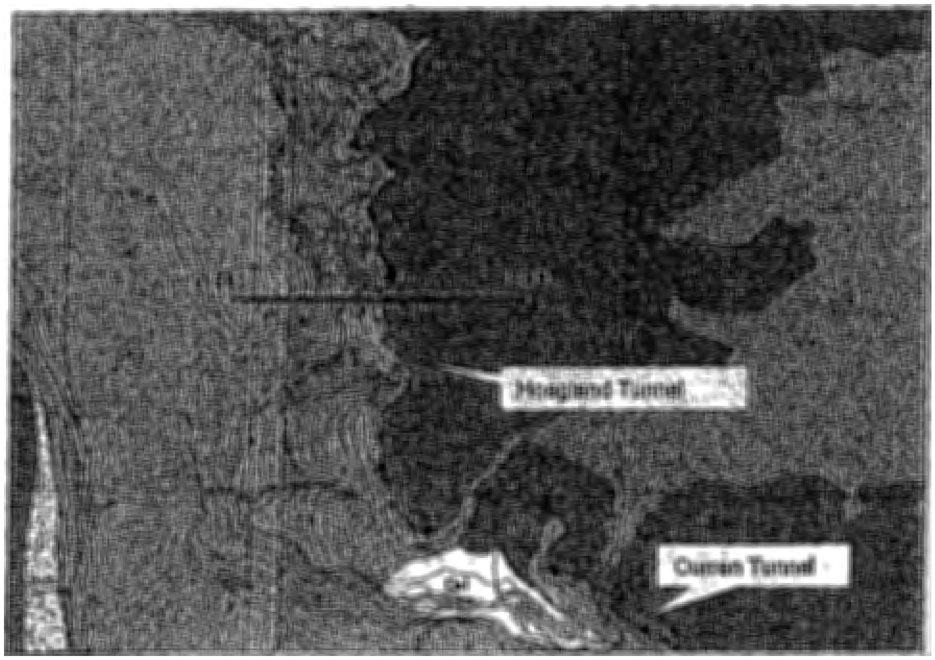

Figure 4: Approximate location of cross section shown in Figure 5 (adapted from Covington and Weaver, 1989).

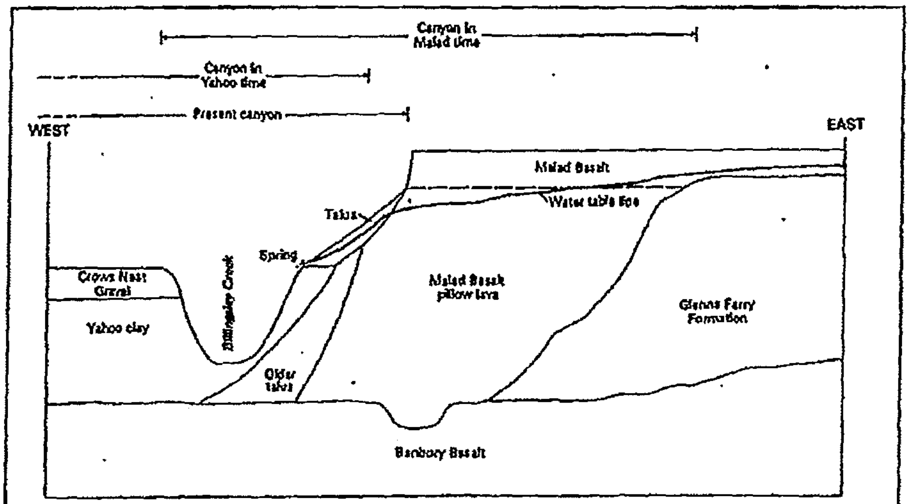

Figure 3. Schematic section of the canyon wall near profile-control location 179-1 east of Hagerman. Section shows the interpretative relation of the confining units of Yahoo Clay and Glenns Ferry sediments to the Malad Basalt canyon filling deposits.

Figure 5: Schematic cross section just north of Hoagland Tunnel/Weatherby Spring (from Covington and Weaver, 1989).

The static water level was noted at 112 feet below ground surface in the Rangen domestic well, which approximates the discharge elevations of lower springs near the National Fish Hatchery. This depth to water, if encountered in a new Rangen facility well, may represent an infeasible lift for large amounts of water.

However, the control on water levels in this area are not well understood. Water levels at the Curren Tunnel (apparently drawing from the Malad Basalt) are much greater than those in the Rangen domestic well (presumably drawing from the Banbury Basalt). The degree of hydraulic connection between upper zones in the Malad Basalt supplying water to the Curren Tunnel and this lower Banbury Basalt aquifer is unclear. The upper aquifer may be somewhat perched in this area, or controlled by other factors limiting vertical water movement. Water levels in the proposed well area may reflect the water level at the Rangen domestic well or possibly water levels associated with the upgradient Malad Basalt.

The driller's report for the Rangen domestic well indicates one zone between 93 and 102 feet in which the driller lost return air or water. There is a chance that productive zones and ground water levels may be closer to ground surface at a location closer to the canyon rim than those indicated in the Rangen well driller's report. This project consists of the construction of a test well at the Rangen facility near the canyon rim to test this hypothesis.

2) Purpose and Objectives

The purpose of this proposed project is to provide increased flow to the Rangen aquaculture facility. The general objective is to evaluate the feasibility of a vertical production well located within the Rangen facility. Specific objectives include the following:

a. Drill a vertical test well below the canyon rim within the Rangen aquaculture facility, evaluate subsurface lithology and hydrogeologic characteristics in the test well based on drill cuttings, drilling resistance, test pumping, water level measurements, etc.
b. Evaluate the feasibility of a larger-diameter production well based on test-drilling results.

3) Project Tasks

a) <u>Well Construction and testing</u>

This task will begin with a comprehensive search for drillers' reports for wells in the immediate vicinity of the Rangen facility. Review of any additional available logs may influence the tasks outlined below.

USE TYPEWRITER OR BALL POINT PEN

State of Idaho
Department of Water Resources

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name: Rangen, Inc.
Address: Hagerman, Idaho
Owner's Permit No.:

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☒ Domestic ☐ Irrigation ☐ Test ☐ Other (specify type)
☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

4. METHOD DRILLED

☒ Cable & ☒ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole ____ inches Total depth 278 feet
Casing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
.250 inches	6 5/8 inches	+1 feet	88 feet
.188 inches	6 9/16 inches	+1 feet	213 feet

Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation ____ inches by ____ inches
Number ____ perforations From ____ feet To ____ feet

Well screen installed? ☐ Yes ☒ No
Manufacturer's name ____
Type ____ Model No. ____
Diameter ____ Slot size ____ Set from ____ feet to ____ feet

Gravel packed? ☐ Yes ☒ No Size of gravel ____
Placed from ____ feet to ____ feet

Surface seal depth 18 Material used in seal ☐ Cement grout ☒ Puddling clay ☐ Well cuttings
Sealing procedure used ☐ Slurry pit ☐ Temporary surface casing ☒ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.

Subdivision Name ____
Lot No. ____ Block No. ____
County: Goodling
SW NW, SE ¼ Sec. 31 T. 7S N/S R. 14E E/W

7. WATER LEVEL

Static water level 111 feet below land surface
Flowing? ☐ Yes ☒ No G.P.M. flow ____
Temperature ____ °F. Quality ____
Artesian closed-in pressure ____ p.s.i.
Controlled by ☐ Valve ☐ Cap ☐ Plug

8. WELL TEST DATA

☒ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped
Approx 33	None	3

9. LITHOLOGIC LOG 40128

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
6	0	48	Sand		X
	48	82	Clay w/grayish white basalt		
8/6	82	93	Hard Gray Basalt		
6	93	102	Broken Gray Basalt lost return		
	102	139	Hard w/large breaks		
	139	160	Soft Clay Brown (Broken Gray basalt)		
	160	171	Soft Gray Clay		
	171	181	Broken Gray Basalt w/gray clay		
	181	192	Soft Gray Clay		
6/5	192	216	Soft Gray Clay w/sand	X	
5	216	220	Soft gray Clay/Broken Gray Basalt		
	220	236	Hard Black Basalt		
5/6	236	241	Gray Soft Lava		
6	241	248	Hard Gray Lava		
	248	254	Soft Brown Lava		
	254	265	Hard Gray Basalt		
	265	266	Sand		
	266	270	Dark Gray Med Hard Lava	X	
	270	278	Gray Broken Lava	X	

10. Work started 6/12/76 finished 8/5/76

11. DRILLERS CERTIFICATION

Firm Name: SMITH DRILLING & PUMP CO., INC. Firm No. 11
Address: 325 East Avenue A, Jerome Date 8/12/76
Signed by (Firm Official) [signature]
and
(Operator) [signature]

USE ADDITIONAL SHEETS IF NECESSARY FORWARD THE WHITE COPY TO THE DEPARTMENT

Figure 6: Driller's report for Rangen domestic well.

Well construction will include the following subtasks:

- Selection of drilling location
- Preparation of well design documents
- Solicitation of drilling bids
- Drilling supervision
- Geophysical logging
- Hydraulic gradient testing
- Aquifer testing

The criteria for selecting a drilling location will include proximity to the canyon rim, proximity to the Rangen raceways and/or hatchery building, and the presence of a sufficient work area. The test well will be constructed in an 8-inch diameter borehole drilled using an air-rotary rig. The test well may extend to a depth of approximately 300 ft (similar to the depth of the Rangen domestic well). Occasional pumping and water level checks will be done after the borehole has encountered saturated conditions.

A camera survey, geophysical logging, and/or borehole flow measurements will be conducted in each well prior to well completion (if possible). This information will be used to complete these wells as monitoring wells. Completed as a monitoring well, the test well would provide long-term, dedicated water level information in the Rangen vicinity.

A geologist will be on-site during drilling to monitor drill cuttings, fluid levels, and aquifer testing. The test well location will be estimated using a global positioning system device; a top-of-casing elevation will be surveyed to a known point.

A second domestic well appears to exist adjacent to the Rangen facility, but a driller's report for this well was not available in IDWR's online database. The lithologic description in this well log may influence the scope of this project.

b) <u>Evaluate Feasibility of a Vertical Production Well</u>

The feasibility of a vertical production well will be evaluated on the basis of test-well results. Primary feasibility criteria are potential production rates and pumping lift. The assessment also will include a brief discussion of possible impacts to other water users by withdrawals in a production well at the Rangen facility.

An aquifer test will be conducted if warranted based on production potential and depth to water. Possible monitoring points include the Range domestic well and the Curren Tunnel.

c) <u>Summary Report</u>

A summary report will completed following test well construction and testing. The report will include a drilling description, detailed well logs, lithologic descriptions, camera survey and/or geophysical interpretations, and other data. The summary report will provide a discussion of the feasibility of augmenting the water supply for the Rangen facility by pumping water from vertical wells.

4) Project Schedule

A tentative project schedule is shown in Table 2. The schedule assumes a start time of August 2004.

Tentative Schedule					
Task	Aug 2004	Sep 2004	Oct 2004	Nov 2004	Dec 2004
a) Create well specifications, obtain drilling bids, construct test wells, evaluate hydrogeologic characteristics	x	x	x		
b) Evaluate Feasibility of Horizontal Well; develop horizontal well construction plan			x	x	
c) Submit Final Report					x

Table 2: Tentative project schedule.

5) Potential Benefits and Risks

a) Potential Benefits

A successful production well (defined by high production volume and a small pumping lift) could provide much-needed water to the Rangen facility. Such a well could be used to augment water from the Curren Tunnel.

b) Potential Risks or Constraints

There are several potential risks associated with this project. The first is that test drilling does not reveal a promising zone into which to drill a production well. The second risk is that a promising zone is identified, but the production well, if constructed, is unable to produce a sufficient amount of water at an acceptable pumping lift. A third risk is that a productive zone with an acceptable pumping lift is identified, but Rangen is unable to obtain a permit to produce water from the well. Similarly, if permitted, water from the new well may have a new priority date. Finally, substantial ground water withdrawals from this area may have an effect on local water levels or discharges from other springs.

6) Cost Details

Preliminary costs for this project are shown in Table 3. These costs are greater than general well-drilling costs because of the presence of an on-site engineer/geologist during drilling and testing, and pre- and post-drilling analyses.

Task	SubTasks	Engineering Costs	Construction and Indirect Costs	Total Costs
a) Well Construction				
	Prepare well design specifications	1,080		1,080
	Obtain, review bids	740		740
	Drilling supervision	4,230		4,230
	Lithologic descriptions	1,424		1,424
	Geophysical interpretation	960		960
	Travel Expenses		625	625
	Subtotal	**$8,834**	**$625**	**$9,059**
	Estimated Contractor Costs			
	Drilling subcontractor (assume 300' at $75 per foot).		22,500	22,500
	Test pumping upon completion		5,000	5,000
	Subtotal		**$27,500**	**$27,500**
b) Evaluate Feasibility of Production Well				
	Analysis	1,734		1,734
	Presentation with client, discussion with Interim Committee	1,600		1,600
	Summary Report	2,688		2,688
	Subtotal	**$6,022**		**$6,022**
Subtotal				**$42,581**
Contingency				**$8,516**
Total				**$51,097**

Table 3: Budget details

7) Summary Discussion

This proposed project consists of constructing a vertical test well to determine feasibility of a production well near the Rangen aquaculture site. A successful production well may replace a portion of diminished flows that are constraining the Rangen aquaculture operation. Increasing flows to the Rangen facility would provide a major benefit to other water users that may be affected by decreased flows to the Rangen facility. Any additional flows through the Rangen facility would benefit users downstream of the Rangen facility.

The success of a test well or subsequent production well is not guaranteed. Test drilling may not indicate productive target for a production well. Potential targets based on test drilling may or may not result in a successful production well. A successful well may have adverse impacts on surrounding water levels or spring discharge.

8) References

Bendixsen, S., 1995. Summary of Ground Water Conditions at the Curren Tunnel near Hagerman, Idaho, Idaho Department of Water Resources (Draft Report).

Covington, H.R. and Weaver, J.N., 1989. Geologic Map and Profiles of the North Wall of the Snake River Canyon, Bliss, Hagerman, and Tuttle Quadrangles, Idaho. U.S. Geological Survey, Miscellaneous Investigations Series, Regional Aquifer System Analysis Program.

Johnson, G.S. et al., 2002. Spring discharge along the Milner to King Hill Reach of the Snake River, Idaho Water Resources Research Institute.