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Water and Land Use Planning for Some State Lands Near Moab, Utah

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Final Report
to
The Division of State Lands
concerning

WATER AND LAND USE PLANNING FOR SOME
STATE LANDS NEAR MOAB, UTAH

by

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WATER AND LAND USE PLANNING FOR SOME
STATE LANDS NEAR MOAB, UTAH

Introduction

In an attempt to apply better management principles to the control of state lands, the Division of State Lands asked for the study of two questions concerning state administered lands near Moab, Utah. The first question deals with the Moab and Spanish Valleys while the second question applies to Castle Valley some 10 miles northeast of Moab. The Mill Creek Development Project is proposed to provide additional water for agriculture and M & I use in the Moab and Spanish Valleys. The question for consideration is, "How much water from the Mill Creek Development Project Reservoir should the Division of State Lands request or subscribe to from the Grand County Conservancy District?" The second question, dealing with Castle Valley, is, "What should be done with the well that the Division has drilled in Castle Valley?" The objective of this phase of the study is to suggest some alternatives and give recommendations related to these two questions.

Land Use

The climate and soil in the vicinity of Moab seems to be suited for the standard crops of pasture, alfalfa, and small grain; but it appears that produce can also be harvested from orchards, vineyards, intensive vegetable farms, and greenhouses. The current land use is generally limited to pasture, alfalfa, small grain, and small acreages of cash crop production. Since the climate and soil are favorable to the production of many crops, the general categories of these crops will be considered in determining the price that can be paid for water.

Water Value

Some consideration should be given to the ability of various crop production to pay for the required water usage. Select orchard and greenhouse production to represent the intense farming types and alfalfa to represent the conventional farming crops. Consider the ability of each of these crops to pay for water.

There are many approaches to determine the value of water to the farm. One of the most common methods is to estimate the increased net return to the farm using adequate water as opposed to the net return to the farm without any water. The method selected in this analysis is to determine the total income and expenses except for water, and then to assign the difference between the costs and returns as the amount available to pay for the water. This seemed to be a reasonable method since it considers what portion of return could be allocated to the payment of the necessary water.

Ability to Pay

The total returns to the farm are determined from the total production times the sale price per unit. The sales are made either on a wholesale or retail basis. Retail sales, however, require a local market while the wholesale products are assumed to be marketed away from the production area. A retail market usually requires additional labor and investment compared to the wholesale market. However, the returns on the wholesale market are much lower than those of the retail market.

Costs of production include capital investments for land and machinery, a return on the investment, labor of the farmer, hired labor, taxes, fertilizer, marketing costs, and operational expenses. These expenses are

totalled and divided by the number of acres to obtain the costs per acre. The difference between the costs and the returns is then allocated to water on an acre foot basis. The farm size will be considered as a one family business since most farms in the area are limited to one family. Corporate farms could be larger but would probably require about the same labor per acre as the one family farmer pays.

Alfalfa

The production of alfalfa requires several pieces of equipment such as a tractor, swather, baler, plow, drill, harrow, sprinkling system, and miscellaneous tools. The equipment also needs a building for protection. If we assume that the equipment was bought used where possible, we can estimate that the total cost would be about \$35,000. This of course is conservative. A 10% return will be allowed on investment, while 10% for 15 years will be required on the machinery. Calculations will be made for a ten year period, remembering that alfalfa will be grown for six years, grain for three years, and one year lost in starting the alfalfa crop. Though the average alfalfa production in Grand County is about 3.3 tons per acre (Utah Ag Statistics 1979), we will estimate that 4.5 tons per acre can be produced. Allow 80 bushels per acre for grain though the average production is about 45 bushels per acre in Grand County (Utah Ag Statistics 1979).

Income

Alfalfa sales @ \$58/ton @ 4.5 tons/acre for 6 yrs	\$ 1566
New alfalfa sales @ \$40/ton @ 2 tons/acre, 1 yr	80
Grain sales @ \$3/bu. and 80 bu./acre for 3 yrs	720
Total income per acre for ten years	\$ 2366

Costs

Investment return on \$1000/acre @ .8%/yr	\$ 800
Personal labor @ 11 hrs/day @ \$6.50/hr	630
Equipment annuity on \$35,000 @ 10% for 15 yrs	153
Marketing costs @ \$.20/bale	212
Fertilizer	78
Operation and maintenance	250
Taxes	60
	<u>\$ 2183</u>

Ability to Pay for Water

\$2366-\$2183=\$183; 183/28 acre feet for 10 yrs \$ 6.54/acre foot

If the farmer is willing to work for about \$4.00 per hour, he can afford to pay about \$15 per acre foot for the water. If the farmer will work for nothing for his labor he can pay \$29 per acre foot for water. Similarly, if he will accept nothing for his labor and nothing as a return on his investment, he can afford to pay about \$58 per acre foot for irrigation water.

Orchard

In calculating the ability to pay for water by orchard production, apples will be considered as the crop at a production rate of 500 bushels per acre. Assume that the harvest will be sold at wholesale prices and that it requires six years to start an orchard and ten years to get it to full production. Also assume that sufficient pickers will be available during the harvest season and that a family farmer should be able to care for about 45 acres of orchard. Summarizing income and expenses, we get:

Income

Sale at \$4/ bushel of 500 bu/acre from 45 acres \$90,000

Costs

Return on land investment of 45 ac @ \$1000/ac @ 10% per year	\$ 4,500
Personal labor @ \$6.50/hr, 11 hrs/day	18,876

Picking costs from 45 ac @ 500 bu/ac @ \$1.60/bu	36,000
Equipment annuity on \$30,000 @ 10% for 15 yrs	3,944
Taxes	350
Operation and maintenance costs	3,000
Annuity on costs of starting the orchard at \$3120/acre @ 10% for 45 yrs	<u>14,235</u>
	\$80,905

Ability to Pay for Water

$$\$90,000 - \$80,905 = \$9095; 9090/175 \text{ ac ft of water} = \$51.97/\text{acre foot}$$

If the farmer works for \$4.00/hr, he could pay \$93.46/acre foot for irrigation water. If he works for nothing, he could pay \$159.83 for the water. If the farmer is satisfied with no return on his investment and no pay for his labor, he can afford to pay \$185.55 per acre foot for irrigation water.

Greenhouse

A greenhouse operator can care for three 124'x30' greenhouses in vegetable production. An acre will hold ten of these greenhouses which means that three operators will be required per acre. If one operator is to manage a larger area, greenhouses that cover $\frac{1}{4}$ to $\frac{1}{2}$ acre can be purchased and probably for less money than an equivalent number of the smaller houses. However, for this analysis the ten smaller houses will be considered.

Income

30,000 lb tomatoes/house/yr @\$.45/lb	\$135,000
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Expenses

Labor for three operators @\$6.50/hr	\$ 41,184
Heating, cooling, and containers	30,000
Sprays, seeds, fertilizer, etc.	10,000
Return on investment \$20,000/house; \$1000/ acre 20 yrs @10%	23,609
Hired labor @ \$4.00/hr; 7 people @ $\frac{1}{2}$ time	<u>30,000</u>
	\$134,793

Available for Water

Four acre feet per year; \$207 available	\$51.75/ac ft
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Other crops could be grown which would increase the income from each greenhouse, but the local market is far too small for the production of 150 acres of potted plants and greens. The produce would be marketed at wholesale prices which would be about 40% higher than vegetables. One advantage of the greenhouse over the orchard is that the income is almost immediate. However, the greenhouse culture requires many more people to operate the same acreage. A 150 acre tract would require 450 operators plus 1050 part time employees.

Summary

In summary, a farmer can afford to pay about \$6.50 per acre foot for irrigation water for traditional crops while orchard or greenhouse production can pay about \$50 per acre foot. Vineyard or intensive vegetable farms would be able to pay about the same as the orchard or greenhouse operation.

Spanish Valley

The Division of State Lands administers a significant portion of land on the east, west, and south perimeters of the Spanish Valley. The land on the eastern side is largely located on the mesa and the steep valley sides. The land on the western side is located at the base of the valley walls and extends a short distance across Highway 160 in some areas. The land to the west of the highway is very broken up with hills, mounds, and jutting bluffs. The areas between these large obstructions contains large boulders and are quite steep. The topography and soil do not lend themselves to farming operations. The pieces east of the highway are mostly triangular in shape and some are acceptable for farming from a soils stand point. However, some of the pieces are very small and others have a wash or gully traversing through them causing these pieces to be even smaller.

There appears to be some land to the south and west of the old airport that is irrigable, however, water from the proposed Mill Creek reservoir would require pumping for application to these acres. Besides pumping requirements approximately one mile of pipeline would need to be installed after obtaining $\frac{1}{4}$ mile of right of way on private land. This land includes about 120 acres and is quite rocky though classified in the Mill Creek feasibility study as Class I soil. There is also a minor drainage through this area that would need some attention prior to farming. This area might be better adapted to orchard or vineyard production than to production of the conventional crops of alfalfa and small grain.

Castle Valley

Castle Valley lies northeast of Moab and is a long slender valley with considerable farming presently occurring. The well of interest lies toward the upper end of this valley near Round Mountain. The well is located near the corner of sections 22 and 16. The land for a mile down the valley from the well site contains large boulders and is unsuitable for farming in the conventional style. A pipeline begins at a small pond about a quarter of a mile from the well and carries irrigation water to a farm on the north side of the valley about one and one-half miles down the valley. A new center pivot irrigation system is currently being put into use on this farm.

There are a number of houses being built on the south side of the valley beginning about a mile from the well site. These structures are near the south wall of the valley. They are located above the valley floor in the cedar areas. Farming is being done on the valley floor below these houses and includes irrigation.

The well is located near the upper end of the valley about one mile beyond the current irrigated agriculture area. The well, a 10 inch casing, is drilled to a 306 foot depth. The static water level is at 240 feet, and it is estimated that the well will produce from 300 to 400 gpm. However, a dynamic pump test has not been made. A bailer test was made at 35 gal/min with one foot of drawdown after 5 hours.

Analysis

Spanish Valley

Topography and soil make the state lands east of Spanish Valley generally unsuited for agriculture except for some very small parcels. The state lands

at the upper end of the valley are unsatisfactory except for about 120 acres. West of Highway 160 the state lands are not suited for agriculture due to soils and topography. However, several very small parcels east of the highway might be farmed. One difficulty is that an intermittent stream traverses through this area creating an undesirable channel that would require special attention if the area were farmed. The irrigable land is in such small parcels that it appears difficult to develop them independently. Development of these parcels should then be considered in connection with a larger acreage that is already being farmed. From the map, it appears that about 160 acres would be available along the highway but after visiting the area it seems that less than half of that amount would lend itself to irrigated farming without extensive preparation.

Several alternatives are available to consider in determining the State Lands use in the Spanish Valley. The ones considered here are:

1. Develop all possible lands in sections 27 and 35 and subscribe for about 400 acre feet of water.
2. Develop the 120 acres at the south end of the valley and subscribe for about 470 acre feet of water.
3. Subscribe to a supplemental water right for the current 80 acre lease.
4. Subscribe to a full water right for the current 80 acre lease.
5. Lease or sell the land for building purposes.
6. Do nothing to change the present situation.

Alternative number six will be done only by default, that is only if none of the other alternatives is economical or desirable. This alternative will receive no further consideration.

Alternative number five should be given serious consideration. If the land were sold for building sites, beginning at the lower end and progressing up the valley, at \$4-5,000 per acre, the proceeds invested at 10% per year would net from \$4-500 per acre per year. If inflation continues, the

interest rate would increase and the proceeds should be reinvested periodically. The rate at which the land sold would be quite low or it would require many years to sell the available land.

Alternative number four should be done if the current pumping and capital costs of the well water are greater than \$15-18 per acre foot. Otherwise this alternative should not be considered.

Alternative number three should be considered only if the well is not able to deliver 240 acre feet per season, and the cost of well water is less than the cost of the surface water.

Alternative number two could be accomplished if the high cash crops were grown. However, these acres are outside of the considered development of the project and so would reduce the lands that could be irrigated under the proposed project plan. The State would probably have to absorb the \$3120 per acre cost of orchard development. This seems like something the State is not prepared to do because of expertise and purpose.

Of the six alternatives, number five would provide the greatest return per acre. However, it may take the longest time to develop, but more acres could be used for this purpose than could be used for agriculture. The state would not maintain control over the land unless a lease arrangement was made. The state of the economy would also dictate how rapidly this alternative could be accomplished.

Our recommendations are that number two not be considered at this time, since it would be additional land to the proposed project and would also have a large initial investment; because it is not economical unless one of the high cash crops is produced. The first priority is to obtain a full water right on the current 80 acre lease. If the well provides 3.5-4.0 acre

feet per acre at less cost than the surface water, the water requirement should be about satisfied and no action on this lease need be taken. If not, then alternatives 3 and 4 should be considered. The second priority would be number one. However, these parcels could only be developed in conjunction with a current farming operation. Alternative number five would give the most return per acre but would remove the land from State ownership. If the State has the expertise to accomplish this alternative and wishes to lose control of the land, then this alternative, number five, should take first priority. If it does not meet the mission of the Division of State Lands, it should not be considered. Remember that complete implementation of number five would probably require more time to accomplish than the other desirable alternatives.

In summary, alternative number five should be first priority if it meets the mission of the Division of State Lands; and if it doesn't meet that mission, it should not be considered. Alternatives 3 and 4 should be considered next, and alternative number one would be the third or second priority depending on the decision on alternative five.

Castle Valley

The analysis dealing with Castle Valley is concerned with the disposition of the well that was drilled for the Division of State Lands. Since a definitive pump test has not been made, the analysis will proceed without knowing the actual capacity of the well. The well has not been developed; in other words, in the present condition, the well will not produce a significant amount of water. Development of the well includes installation of a screen or slotted pipe, removal of the casing, and the proper pumping sequence applied.

There are at least six possible alternatives for the use of the water produced from the state well. They are:

1. Develop state lands in the vicinity of the well and use the water on these lands.
2. Develop state lands about two miles from the well and use the water from the well to irrigate these lands.
3. Develop the well, install a pipeline, and sell the water to currently developed agriculture in the valley.
4. Develop the well and sell the water to private homes or to the private school.
5. Abandon the present site and drill a new well.
6. Abandon the present site until sufficient change has occurred in the economy to make the project feasible.

Since a dynamic pumping test has not been made and the well has not been developed, well production must be estimated. The Johnson Screen Company has a rule of thumb for well production which is:

$$Q = \frac{TH}{2110}$$

in which

- T = transmissivity in gal/day/ft
 H = two thirds of the available drawdown head
 Q = the pumpable flow in gal/min

From the rule of thumb equation with a 15 ft. screen, and static head at 240 ft., the estimated maximum pumpable flow is 788 gal/min. This flow should be sufficient to irrigate 150 acres or one center pivot line. If the well is properly developed, the capacity should be sufficient to operate one half of an economic unit of alfalfa.

Before considering the costs of the alternatives, the cost of water at the well site will be estimated. If the finished well costs \$80/ft and the depth is 305 ft, the total well cost is \$24,400. The cost of a 60 HP motor

and pump is estimated to be \$7,000. Estimate the average annual cost of maintenance for the system to be about \$2,000. Figuring with a 20 year life and 10% interest, the annual payments are \$3,688. Pumping costs for 750 gal/min at 290 ft for 4.5 months are \$9,788. The sum of the equipment payment plus the maintenance, plus the pumping costs for one year are \$15,476, or \$34.39 per acre foot of pumped water. If diesel is used instead of electricity, the cost of delivered water at the well surface will be about \$45/ac ft. From the analysis of the price that a farmer can afford for water, it is apparent that the water cannot be used at the present time for conventional farming even at the well.

The cost of water delivered to the ground surface at the well demonstrates that the use of the water for conventional farming is uneconomical. This leaves two alternatives, 1) develop orchard, vineyard, or greenhouse production, or 2) abandon the present well site. The area near the well will be difficult to develop because of the large boulders both on the surface and to a depth of 96 feet. Development of state lands that do not have the large boulders but that do have some smaller rocks involves about two miles of pipeline which would add about \$15.50 per acre foot cost to the water. The cost of water would then be about \$60 per acre foot which is more than an economical orchard or greenhouse operation could pay for irrigation water.

The authors would recommend that the present well site be abandoned and that no lands be developed at the present time. The reasons are that the water will be too expensive for conventional farming, and the market, expertise, and part time labor are probably not available in the Moab area to support a large, labor intensive operation like orchard, vineyard, or greenhouse operations. However, if the decision of the Division of State

Lands is to become involved in a large development operation, then the orchard, vineyard, greenhouse possibilities should be more carefully investigated along with the availability of market and expertise in the area. Perhaps a combination of the three types of growing operations could be made satisfactory. If the development mode decision were made, both Spanish and Castle Valleys should receive further scrutiny. Remember though that such development would mean importation of the expertise and orchard or vineyard would require at least seven years to become productive. Such a decision would require additional staff and expertise for the Division and would require considerable capital expenditures.

The fourth alternative did not seem feasible since the private school is mostly involved in traditional farming, and there are insufficient homes in the area to use the amount of water available. The homes farther down in the valley probably have a smaller pump lift than does the state well. Alternative number five is not satisfactory since it does not improve the State lands but only sells water.

In summary, the economics of conventional crops or the development of higher cash crops do not have the ability to pay the price required for delivery of water from the State well. The only alternative to follow is to abandon the well until the economics changes sufficiently to make the use of this well economical.

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