

Orr Affidavit

Exhibit 59

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DEPARTMENT OF
WATER RESOURCES

“Future Upstream Depletion Above Hells
Canyon,” by Lynn Crandall
(Apr. 6, 1953)

Fourth Orr Affidavit
Exhibit 7:

**“Future Upstream Depletion Above Hells
Canyon” by Lynn Crandall (Apr. 6, 1953)**

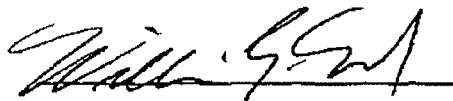
**(Exhibit 119 in Formal Hearings Before the Federal Power Commission,
Project No. 1971, P-2132, P-2133) (admitted Jan. 13, 1954)**

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

CERTIFICATION

I hereby certify that the attached 8 pages are
true and correct copies of a document on file with the
Commission.

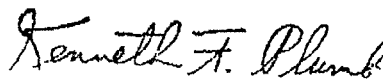
MAY 18, 1984
Date



Records Officer



I hereby certify that the Records
Officer, whose signature appears above,
is official custodian of the records of
the Federal Energy Regulatory Com-
mission which certification is made
and was such official custodian at
the time of executing the above
certification.



SECRETARY

The discussion of this subject will be divided into various sections as follows:

1. The Snake River Plain

This term as used herein applies to the area north of Snake River extending southwest from St. Anthony to Bliss, beneath which the great Snake River ground-water flow moves. Generally speaking, the soils in this area, where they exist, are of a satisfactory quality for agricultural use outside of local areas of sand dunes. There exists, however, a wide range of soil depths and depths to ground water. A large portion of the area is either bare lava rock or shallow soils. About 300 feet is assumed to be the maximum pumping lift likely to be sustained during the Hells Canyon payout period for profitable farming operations in this region. It is possible that greater lifts than this may prove feasible under certain conditions but the additional acreage involved is not likely to be of great magnitude. After examining the available information on this area, including my own observations from driving over it for many years, I believe that possibly 400,000 acres may be feasible of development by ground-water pumping. This figure and other similar ones in this report include the pumping developments already made since 1947. In this section the ground-water supply is believed to be adequate generally and the controlling elements are good land and feasible pumping lifts.

2. Minor tributary streams from the North, Camas Creek to Big Wood River

In this section ground-water pumping will be limited in some cases by available supplies contributed from the tributary streams. In some of the valleys pumping may be used as supplemental supply for lands that do not now receive a full supply in dry years. It is believed that the total use might be the equivalent of supplying about 45,000 acres of new lands. This would include any new storage developments on these streams.

3. Fort Hall Project

There are about 40,000 acres of new land on this project susceptible of irrigation, probably mostly by pumping from ground water. Some lawyers claim that the Indians' treaty rights would entitle them to so use the water even if it interfered with downstream Snake River rights. Some small developments are already under way by leasing the land for a term of years to whites who agree to provide a well on the land. About half of this area is south of the Portneuf River in the Michaud Flat-Bannock Creek region and about half in the vicinity of Fort Hall. The lands around Fort Hall have mostly somewhat sandy soils.

1/ District Engineer, U. S. Geological Survey, Idaho Falls, Idaho, and Snake River Watermaster, Idaho State Department of Reclamation.

4. Marginal increases to existing projects above American Falls

There is a narrow fringe of good land along the benches bordering the lands at present irrigated from Snake River along the east side of the valley between Ririe and Blackfoot. This may be irrigated partly by pumping from ground-water and partly by pumping from existing canals whose water supply will be augmented from Palisades reservoir. Some similar areas exist west of Snake River between Roberts and Shelley. During recent years there has been considerable clearing of brush lands and those subject to flooding in high-water years between Heise and Roberts. All these and others somewhat similar elsewhere are estimated to total 15,000 acres starting from 1947.

5. Tributary valleys south of Snake River, from Portneuf River to Salmon Falls River, inclusive.

In most of this section ground-water pumping developments will be limited by water supply or pumping lift. In some of the tributary valleys ground-water pumping might be used as supplemental supply; in others it would be used on new land. It is estimated that the total use for both purposes might be equivalent to irrigating 60,000 acres of new land.

6. Bruneau Project

The Bruneau Project of about 400,000 acres as heretofore proposed required the construction of a dam about 500 feet high on Snake River near Bliss, Idaho, and the creation of a reservoir which would flood Hagerman Valley, including about 10,000 acres of irrigated land and 4 power plants of the Idaho Power Company. Owing to the likelihood of large leakage thru the porous inter-canyon lava fill at the damsite it does not now appear feasible to construct the proposed dam. This fact, together with the large costs for property damage, appears to me to warrant discarding the proposed large Bruneau project for consideration within the foreseeable future. A possibility exists, however, of building a smaller dam on Snake River in the vicinity of the mouth of Salmon Falls Creek that would back the water upstream to the foot of Shoshone Falls and water could be diverted from above this dam to irrigate a portion of the Bruneau Project. Snake River at this point has at present a dependable flow of about 2800 second-feet that enters the river below Milner which would be sufficient to irrigate about 110,000 acres of the Bruneau Project. This flow may be appreciably lessened by future pumping developments on the Snake River Plains. This plan has not been studied in detail as to its feasibility and although it would doubtless be quite costly per acre of land irrigated I have included 80,000 acres in the list of projects that might conceivably be built during the 50-year payout period for the Hells Canyon project, assuming some decrease in present water supply due to upstream ground-water pumping.

7. Mountain Home Project

If the high dam near Bliss heretofore proposed for the Bruneau Project is discarded it will not be possible to supply the second unit of the Mountain Home project as contemplated in previous plans of the Bureau of Reclamation. Mr. W. G. Sloan has proposed a plan for irrigation of 123,000 acres of the Mountain Home project, by a combination of pumping from Snake River to Deer Flat Reservoir and ground-water pumping in Boise Valley. If this is done it would then be possible to irrigate an additional 192,000 acres from Payette-Boise River sources making a total of 315,000 acres on the Mountain Home project without use of the high diversion dam near Bliss. If this area is placed under irrigation on the Mountain Home project the ground-water levels beneath the project could very well rise to a level that would permit of ground-water pumping for the remaining 57,000 acres on the Mountain Home project heretofore proposed. Although these matters are somewhat speculative, the good quality of land and favorable location of this project appear to me to warrant the belief that some plan will eventually be devised for irrigating the full acreage of 372,000 acres.

Permits granted by the State of Idaho for ground-water pumping since interest in this subject started in 1947 are as follows:

<u>Year</u>	<u>New Land (acres)</u>	<u>Supplemental supply for lands now irrigated (acres)</u>
1947	12,400	7,600
1948	192,600	34,200
1949	39,000	73,000
1950	75,200	18,600
1951	104,400	104,600
1952	114,270	6,500
Total	537,870	244,500

Figures are for the entire State but nearly all are in the Snake River drainage area in southern Idaho. Some of these permits or water filings are no doubt speculative and will be canceled for failure to do the development work within the time allowed by the permits. In some areas also the permits cover more land than can be irrigated from the locally available water supply. However, additional filings are being made all the time at the rate of 100,000 acres annually and many wells are being drilled by individuals without permits. Under the provisions of the Idaho Constitution water rights can be so established without requiring authorization by the State and about 20% of irrigation wells drilled to date have been developed without applying to the State for a permit. Considering these various matters it appears from these water permit figures that the total acreage

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- 4 -

of feasible ground-water pumping projects in Idaho on Snake River above Hells Canyon could possibly be as much as 700,000 acres of new land since 1947.

New land areas (acres) that might be irrigated by 2010
(Figures include developments since 1947)

Michaud Flat to Nealey (outside of Fort Hall Reservation)	25,000
Minidoka North Side Extension from river flow	13,000
*Snake River plains ground-water pumping	400,000
*Minor tributaries Camas Creek to Big Wood River	45,000
*Fort Hall Reservation	40,000
*Marginal increases to existing projects	15,000
*Tributaries Portneuf to Salmon Falls River	60,000
Bruneau Project	80,000
Bruneau River	40,000
*Mountain Home project	372,000
Grandview pumping	18,000
*Weiser River basin	25,000
*Owyhee River basin	15,000
*Other tributaries below King Hill	20,000
*Miscellaneous ground-water pumping areas not listed above	132,000
Total	1,300,000

*All or partly ground-water pumping

The total consumptive use of water in this area will average about 2.3 acre-feet per acre actually irrigated. Assuming that 0.3 acre-foot per acre of this will be available from precipitation now used by native vegetation and that 10% of the area will be occupied by roads, buildings, small rocky areas, etc., we arrive at a consumptive water use of 1.8 acre-feet per acre from sources other than local precipitation applicable to the gross acreage.

Supplemental use on currently irrigated lands either by ground-water pumping, or from storage in reservoirs such as Palisades and Anderson, will also increase the consumptive use. This is a matter that cannot be calculated with any exactness because it would be small in good water years and larger in dry years. It might be estimated roughly at 270,000 acre-feet annually which would supply 1,000,000 acres with one-half of its consumptive use in three out of 10 years.

Evaporation losses on new reservoirs constructed since 1947 or proposed for new construction, in excess of water losses on the flooded areas prior to reservoir construction, will be of the magnitude of 130,000 acre-feet annually.

The sum of these three items, consumptive use on 1,300,000 acres of new lands, additional consumptive use from supplemental supply on lands now irrigated, and evaporation losses from new reservoirs will amount to about 2,740,000 acre-feet annually at the end of the 50 years Hells Canyon payout period.

If we assume that the Hells Canyon project will be completed by 1960, the end of the 50-year period would be 2010. The figures heretofore given refer to developments beginning in 1947 when the ground-water pumping projects started. Probably close to 150,000 acres of new lands have already been developed since 1947, mostly from ground-water pumping. Assuming a uniform rate of increase from now until 2010 the average additional consumptive use since 1947, during the Hells Canyon payout period, would be 1,650,000 acre-feet annually.

This additional consumptive use will not, however, decrease the stream flow at a uniform similar annual rate. The flood waters in years of ample runoff will be stored in new reservoirs such as Palisades and will be fed out onto the lands in dry years. Ground-water pumping will draw to some extent during dry years on water stored in the ground, with the ground-water supply being replenished in wet years. As a result the stream flow at Hells Canyon will generally be depleted more than the average in wet years and less than the average in dry years.

By reference to the attached Plate No. 1 it will be observed that the gain, excluding surface runoff from Big Wood River, in Snake River between Milner and King Hill has been steadily increasing during the past decade and from 1946-50 was running over 300,000 acre-feet annually greater than it was during the 1928-30 and 1938-41 periods in spite of steadily increasing irrigated acreage upstream. This would appear to be a permanent increase during the future as compared to past years except as it would be modified by new upstream ground-water pumping, and is doubtless due to increased canal diversions shown on the diagram. If the increased gain noted in 1951 and 1952 continues in future years the permanent gain would be greater than the 300,000 acre-feet above mentioned.

The Gooding project which began sizable diversions from Snake River in 1931 probably is responsible to a considerable extent for the increased gain as this project has contributed about 300,000 acre-feet of Snake River water annually to the ground water for a number of years past. The project had previously contributed a lesser amount when it received an inadequate water supply from Big Wood River. The recent gain is even greater if compared to the 1931-35 period but it is believed that the comparison will be more useful if made with years of similar precipitation on the plains and similar discharge from the streams whose runoff reaches the plains from the north. From Plate No. 1A it will be noted that a moderate decrease in the gain occurred from 1946 to 1950. This may represent the decreased contributions from river losses and canal diversions in the upper valley above American Falls in 1931 and 1934 indicating a time of travel of around 15 years before the ground water from those sources appears in the Hagurman Valley springs. In any event the gain appears to have resumed its upward trend in 1951 and 1952.

The years of critical water supply for power production at Hells Canyon occur in the period 1929-37 as shown on accompanying Plate No. 2. From the mid-date, 1933, until 1947, when the increased consumptive use figures

used herein start, there was an increase of about 200,000 acres in the irrigated area above Hells Canyon which would consume 360,000 acre-feet annually. This factor, as far as flow during low-water periods is concerned, is probably more than offset by new supplemental storage in such reservoirs as Anderson, Lucky Peak, and Palisades that will increase the river flow in low-water periods over that which occurred in the past.

Past experience on the river has been that irrigation of new land from surface flow of the streams above return-flow sections has increased downstream flow during low-water periods. Future expansion of the irrigated area by pumping from ground water or diversion of water from the stream in or below the return-flow sections will, however, directly reduce the downstream flow during low-water periods.

The drought during the early 1930's was the most severe and prolonged of any that have occurred during the 62 past years of stream-flow records on Snake River. The possibility exists that one of equal severity might not occur during the Hells Canyon payout period. If one should occur at the midpoint of the payout period, it is my opinion, considering all the matters herein discussed, that it might result in a runoff at Hells Canyon of about 1,300,000 acre-feet less annually than the historic flows that occurred 1929-37. If a dry period of this severity should occur at the end of the payout period rather than the midpoint, with more land in cultivation, the decrease below the historic flows of 1929-37 might be of the magnitude of 2,200,000 acre-feet annually.

Except in years of well above normal runoff it is quite likely that future years will see the flow of upper Snake River controlled so as to practically eliminate spills past Milner except for storage rights owned by the Idaho Power Company that usually require the discharge of about 155,000 acre-feet annually over Milner dam for downstream use by the Power Company.

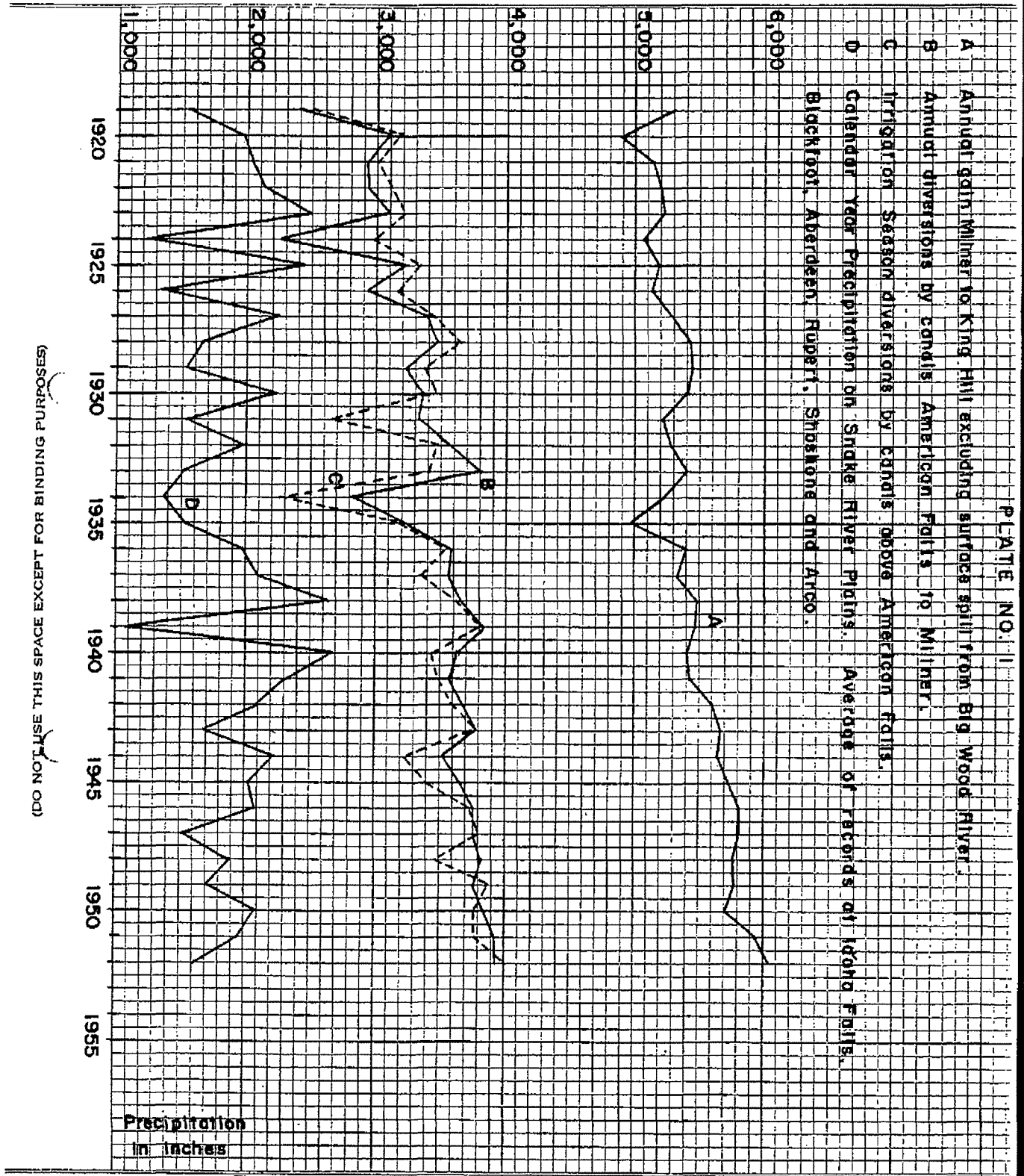
Additional storage of about 350,000 acre-feet may be developed on the river above Heise and surplus flood flows that would otherwise spill past Milner can be diverted by new canals onto the Snake River plains, allowed to spread over as large an area as possible, and be dissipated by percolation and recharge wells into the lavas, thereby replacing in part the water consumed by ground-water pumping. Such a project would be expensive and would probably require government financial aid. Similarly any surplus flood waters of Big Wood River could in wet years be diverted onto the lava beds north of Shoshone. The ground-water reservoir beneath these plains is of great capacity. Water contributed to it in the vicinity of Idaho Falls, for example, has to travel 150 miles underground before it reappears in Hagerman Valley, probably requiring a number of years to do so. Return flow from irrigation use below American Falls will of course reappear in lesser time, ranging from several months on portions of the North Side Canal Project to perhaps a year or more from the Minidoka project. If new upstream reservoirs are built and if the surplus flood waters are diverted to this ground-water reservoir it would result in a nearly equalized flow of Snake River at King Hill with an increased flow during low-water periods and less future depletion at Hells Canyon during low-water years than the figures herein suggested.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File { Washington
Number { District 10942

Thousands of acre-feet

GPO 16-12468-2



(DO NOT USE THIS SPACE EXCEPT FOR BINDING PURPOSES)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

File { Washington
Number { District { 1443

Annual runoff in thousands of acre-feet

GPO 16-13458-1

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