



State of Idaho
DEPARTMENT OF WATER RESOURCES

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WATER RESOURCES
WESTERN REGION

October 31, 1995

PHILIP E. BATT
GOVERNOR

KARL J. DREHER
DIRECTOR

Jim Spencer
Boise Cascade Co.
PO Box 217
Emmett, ID 83617

Re: Boise Cascade Payette River Diversion at Emmett, Measuring
Device Considerations

Dear Mr. Spencer:

Thanks again for meeting with me and Mark Limbaugh on October 11 regarding measuring device options for the Boise Cascade mill diversion. You had asked that I provide Boise Cascade with some recommendations for measurement of the mill diversion which would be acceptable to the Idaho Department of Water Resources (IDWR).

I am happy to provide you with a recommendation which I believe will work best for your diversion system and also be economical. Please realize however that this recommendation does not come with any specific or detailed engineering design. Boise Cascade may decide to install a different type of measuring device. An alternative device is acceptable if it is both accurate and accessible to the watermaster. In implementation of water measurement programs in other parts of the state, IDWR requires that installed measuring devices have an accuracy of +/-10 percent. This range of accuracy should also be applicable to any device installed by Boise Cascade for its Payette River diversion.

As we discussed, a measuring device should be installed at a location above, or upstream from any point where water is normally diverted for plant operations. I believe your first re-diversion point on the ditch is the pump just upstream from the trash screen and cogeneration plant pipe intake. The set of fire pumps near the first spill structure need not be considered a normal point of re-diversion since these pumps would only be used in the event of a fire emergency. IDWR would accept a measuring device that is installed between the first spill structure and the pump that is just upstream of the cogeneration plant pipe intake. A measuring device at this location will measure only that water which goes to the plant and the Smith Ditch. Water returned to the river via the first spill structure will not be measured and therefore will not be charged against Boise Cascade. Keep in mind that based on our few spot measurements, the amount of water going to the plant and below the first spill structure is usually less than the amount of water diverted at the horse dam and may also be less than that amount of water which Boise Cascade believes it diverts for beneficial purposes. Boise Cascade may be concerned that a measuring device below the first spill structure may not measure the full amount of water which it is entitled to divert under its

water right. That concern could be resolved by periodically current metering the water immediately below the horse dam.

For the proposed measuring device location, the ditch does not appear to be suitable for installation and use of a standard open channel measuring device such as a weir or flume unless significant changes were made to the ditch and methods of diversion. The ditch appears to be very flat, with very low velocities and a rather large area given the total discharge that is normally encountered. These conditions appear to result from ditch flow being checked at several different locations, including the downstream headgate at the cogeneration plant.

Given the above conditions, I recommend installing a measuring device which will tolerate submerged flow. Specifically, I suggest that an open channel flow propeller meter be installed at the downstream end of a pipe which can be placed in the ditch channel. As an alternative, you might consider a submerged orifice. However, based on our meeting, I believe the flow meter may be more compatible with your interests. I sent you some information last year about submerged orifices (see my letter of 4/28/94, Smith Ditch).

The flow meter can be attached to brackets in a concrete bulkhead at the tail end of the pipe. The brackets supplied with these meters allow the meters to become portable, thereby eliminating the need for permanent installation and excessive maintenance concerns associated with trash and dirty water. The meter could be stored in a nearby shed accessible to both you and the watermaster, thus allowing the watermaster to make periodic measurements rather quickly and easily. Enclosed for your review is some literature on open channel flow meters, including meter manufacturer's specifications and prices.

Additional recommendations/comments which I have concerning the installation of an open channel flow meter are:

- Any installed culvert or pipe must be fully submerged and have full flow conditions. A current meter measurement of the ditch taken in May of 1995 just upstream of the diversion pump and cogeneration plant pipe shows that maximum depth was 3.6 feet. The measured discharge was 12 cfs.

- The selected pipe to be installed in the ditch can be either steel, PVC, or concrete. I would recommend that the pipe diameter be no more than three feet, which is the same diameter of the cogeneration plant intake pipe. A 24 or 30 inch diameter pipe would be more appropriate since velocities would be higher, thus avoiding possible meter inaccuracies due to lower velocities. The attached literature claims that inaccurate meter registration may occur for velocities in the 0.5 to 1.5 ft./sec range. A three foot diameter pipe carrying 12 cfs would have a velocity of about 1.7 ft/sec, whereas velocities in a 24 and 30 inch diameter pipe carrying 12 cfs would be about 3.9 and 2.5 ft/sec respectively. Moreover, using a smaller diameter pipe will provide for a larger ratio between propeller diameter and pipe diameter, which should enhance meter accuracy. Also, the smaller diameter pipe should provide for a greater head of water at the entrance and help guarantee full submergence of the pipe.

- The pipe length should be 30 or more pipe diameters when straightening vanes are not used, and at least seven pipe diameters if vanes are used. Due to concerns about floating debris and trash, I suggest using a longer pipe without vanes.

- The pipe should be set along the bottom of the ditch and centered between banks. I suggest that the intake be set in a concrete bulkhead. The bulkhead should be high enough to compensate for any additional freeboard which might result from the installation of the pipe.

- A concrete approach floor may be installed to minimize sediment and debris accumulation at the intake. A trash rack should be installed at the head of the approach floor, or just above the intake to reduce debris entering the pipe.

- The tail end of the pipe should also be installed in a concrete bulkhead in order to secure the pipe and allow mounting of the flow meter brackets (flow meter shaft is 6 ft. long). A concrete exit floor may be extended a few feet from the end of the pipe and bulkhead, again to minimize sediment accumulation and provide for better exit conditions.

- Consideration may be given to installing an open channel concrete rectangular box in the tail water area. Water in the box could discharge into another closed conduit which then goes on downstream to the diversion pump and cogeneration pipe. This design would be similar to the box located at the cogeneration plant. I have seen several open channel propeller meters installed in such boxes and found that they work well.

- You may need to take some caution or care in all designs, pipe size section and installation, particularly as they relate to approach and tail water conditions, as well as existing ditch operations.

I hope this recommendation and attached information helps Boise Cascade with its installation decision. Engineering staff at the regional and local Bureau of Reclamation (BOR) offices in Boise may be able to provide you with some design assistance. They may also have some alternative measuring device suggestions. Contacts at the BOR Northwest Regional office include Jeff Peterson (378-5093) and Brian Hamilton (578-5281). The Snake River Area office engineer is Brian Sauer (334-1750). I have already discussed your situation with Brian Sauer and Jeff Peterson. They both indicated a willingness to help. I am willing to help arrange a site visit with BOR staff if you wish to seek their input.

Again, thank you for the on-site visit opportunity as well as your efforts to work with IDWR and the water district. Please contact me at 327-7864 if you have further questions concerning this matter.

Sincerely,


Tim Luke

cc: Mark Limbaugh, Watermaster
Dave Tuthill, IDWR