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DIVISION OF WATER RESOURCES

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Mr. A. Ralph Owens
State Engineer
1845 Sherman Street
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Dear Mr. Owens:

Since this is my first report, in part it must also partially cover some of the things my predecessor (Mr. L. Rees Brooks) did while I was his understudy.

During the fall of 1966, a repair and reconstruction was begun on the Great Western Reservoir Dam owned by the Town of Broomfield, Colorado. Basically, the work called for rebuilding the toe (downstream) drain, breaching the embankment, placing a new outlet, and bringing the embankment up to its original height.

The toe drain trench was opened up to a depth of about 25 feet for the major portion of the length of the dam. A few days after the excavation was pretty well done, a slide occured. The slide was immediately South of the area being breached and was approximately 500 feet in length. A crack appeared in the crest which was about one foot in vertical displacement and one foot in the horizontal. Observation indicated that, even after the initial slip, movement was still taking place.

Mr. Brooks and the Town of Broomfield's Engineer concluded that the new drain pipe should be laid in place from on top of the ground as quickly as possible. By laying the pipe from ground level, no one would be buried alive in case of ditch side collapse. The gravel had been arranged for; and the contractor had obtained extra trucks and other equipment, so this part of the work was done as quickly as was possible. No further sliding took place after the trench was filled so far as could be determined.

The balance of the work went more or less as planned. Storage is limited for this season to about a gage height of 44 feet. Next year a new inspection will be made and possibly more storage may be in order.

During the late part of the winter in early 1967, construction was commenced on the Upper Highline Reservoir Dam near Loma, Colorado, in Water District 42. There is not room in a report such as this to go into the great detail; however, the construction was visited two or three times and appeared to be well done. Filling was started without notifying the local Water Commissionner or the Irrigation Division Engineer. All went well until 30 feet of depth was exceeded. At that point, leakage began to develop.

Mr. W. W. Saunders, the District Water Commissioner, heard a news report on June 4, 1967, just before going to bed that the dam had developed a small amount of leakage, but a local State employee was quoted as saying the dam was not dangerous. Mr. Saunders decided to inspect the site after breakfast in the morning.

The Commissioner found the dam failing by percolation carrying away soil from the toe of the embankment, and sliding of the material immediately downstream from the dam, in a natural embankment. He immediately called our office; and, following our instructions, started removing the storage through the outlet and bypassing inflow down other drainages.

The owner has spent many thousands of dollars trying to correct the situation; but, to date, while much improved it is still not as useful as it is hoped to eventually be. Leakage ten days ago was between eight and ten cubic feet per second and running clear water. Mud boils have developed, which, while quite unsightly, are probably not dangerous. Storage is in the neighborhood of 62 feet at this date.

In July of 1967, we had our most serious problem occur, when first encountered. The Standly Reservoir Dam developed two areas of distress. It appeared that the settlement was taking place in such manner that the movement was toward the upstream side of the embankment. There was no evidence of the usual circular cracks that occur when the movement is toward the downstream. I might say that there were, however, plenty of cracks to see. There was 88 feet of depth of storage with a total of about 37,000 acre feet of water. The height of the dam is 105 feet above the outlet. With the large number of people below this structure, we worked very carefully so as not to cause a panic. While many local people

saw the movement and cracks, none of them became concerned. Since the problem took place at the time that regular releases of water would take place, we drew the water down slowly until the irrigation season was over.

It appears that the settlement did indeed move toward the upstream toe of the dam. Most of the cracks observed in August and early September had pretty well disappeared by the early part of October. This is one we will also have to watch, not just because of the safety of the people involved, but, too, it is an interesting problem.

Together, Mr. Brooks and I were able to go into each Division; although, after his retirement, I found that I am not quite as mobile as before, due to the fact that two keep store better than one.

Following Mr. Brooks' lead, I am working on plans to formulate a system whereby we may work more efficiently and faster when emergencies occur. Further, it is not possible for one man to inspect all of the dams now in existance in Colorado, as the law originally envisaged the problem. I am open to suggestions from the Division Engineers and all others of our department on ways to best accomplish this. As soon as I have sufficient criteria for constructive criticism, I shall present it before you, and also to the Division Offices.

I have adopted the plan of trying to clear all outlet pipe sizes with the Division Engineers prior to recommending approval of plans, which seems to work out well. We need some suggestions on design of sound gage rods which will stand the severe icing conditions they must undergo. I have found one or two designs that are all right, but I believe that several heads are better than one. Our combined experience is better on a subject such as this one.

I appreciate very much the help I receive from the personnel of your office and from the Division Engineers and their Water Commissioners. I would say that each month a great many in the department give me a great deal of assistance both in the field and office.

Very truly yours,

Frederick W. Paddock

Frederick W. Paddock
Supervising Water Resource Engineer
Dam Construction

FWP:S