Office of the Supervising Engineer
5th Irrigation District
Albuquerque, New Mexico

October 2, 1930

Commissioner of Indian Affairs,

Washington, D. C.

Dear Sir:

Reference is made to your letter of August 26, 1930, Irrigation 43736-30, enclosing copy of letter from District Superintendent Hammond in which he suggests that further protection for the Leupp School might be provided by diverting Corn Creek into a new channel, and have the waters from that Wash enter the Little Colorado River below the Leupp School.

In compliance with instructions in your letter a detailed survey has been made of the entire area adjacent to the Leupp School in order to determine what changes, if any, could be made. In this connection, a survey was made of the conditions at Tolani Lakes which are some twenty miles north of the Leupp School and which receive the discharge from the Oraibi Wash. The matter of changing Corn Creek into a new channel was investigated and a detailed survey was made for the new location of a channel. This survey was tied into a survey made of the Leupp School which makes a complete map of the area in the immediate vicinity north of Leupp.

In addition to the suggestions made by Superintendent Hammond this office investigated the possibility of opening up a channel through a solid rock ledge which forms what is known as Grand Falls on the Little Colorado River seventeen miles below the Loupp School. While this matter has been given some attention previous to this time, no mention has been made of it in reports.

Tolani Lakes (sometimes called Red Lakes).

The map submitted by Mr. Hammond with his report is in error as to the location of Oraibi and Polacca Washes near the Tolani Lakes. Polacca Wash does not enter the Tolani Lakes but flows on much lower ground and six miles east of the Lakes. Oraibi Wash enters Tolani Lakes east of the location as shown and the changes are entered in red lines on the map accompanying Mr. Hammond's report, which is enclosed.

For many years the Navajo Indians have planted corn on the lower reaches of the Oraibi Wash, and from time to time have constructed an earth dam to divert the flood waters over the area for irrigation purposes. In the event the dam holds the overflow from Oraibi Wash flows into the Polacca Wash. In case the dam washes out, as is usually the case, then the waters enter the Tolani Lakes. The overflow from the Lakes flows in two directions; west to the Dennebito, and east to the Polacca Washes. From the confluence of the overflow of Tolani Lakes and Polacca Wash to the Little Colorado River the stream is known as Corn Creek.

It is evident that all the waters from Oraibi Wash can be diverted into the Dennebito Wash by excavating a channel 7000 feet long. This would relieve the situation at Leupp to some extent as a part of the water from Oraibi Wash enters the Polacca Wash and is discharging into the Little Colorado River through Corn Creek. The construction of the new channel would require the moving of 36,000 cubic yards of earth which due to the distance necessary to move the dragline to perform the work, was estimated to cost twenty cents per cubic yard. Reference is made to page 13 showing the general layout and profile of the proposed channel.

Change of Channel of Corn Creek.

Corn Creek Wash, which has proven such a menace to the Leupp School, receives its water from the overflow of Tolani Lakes, Polacca Wash, and from a few smaller washes which enter the stream below Tolani Lakes. However, most of the water flowing in Corn Creek which comes from the Polacca Wash and enters the Little Colorado River about two miles above the Leupp School and at right angles to that stream, carries about sixty per cent silt during flood stages. As the grade of Corn Creek is much steeper than the Little Colorado River, quantities of silt are deposited in the Little Color do River, forcing that stream to overflow its banks, flooding the area adjacent to the school.

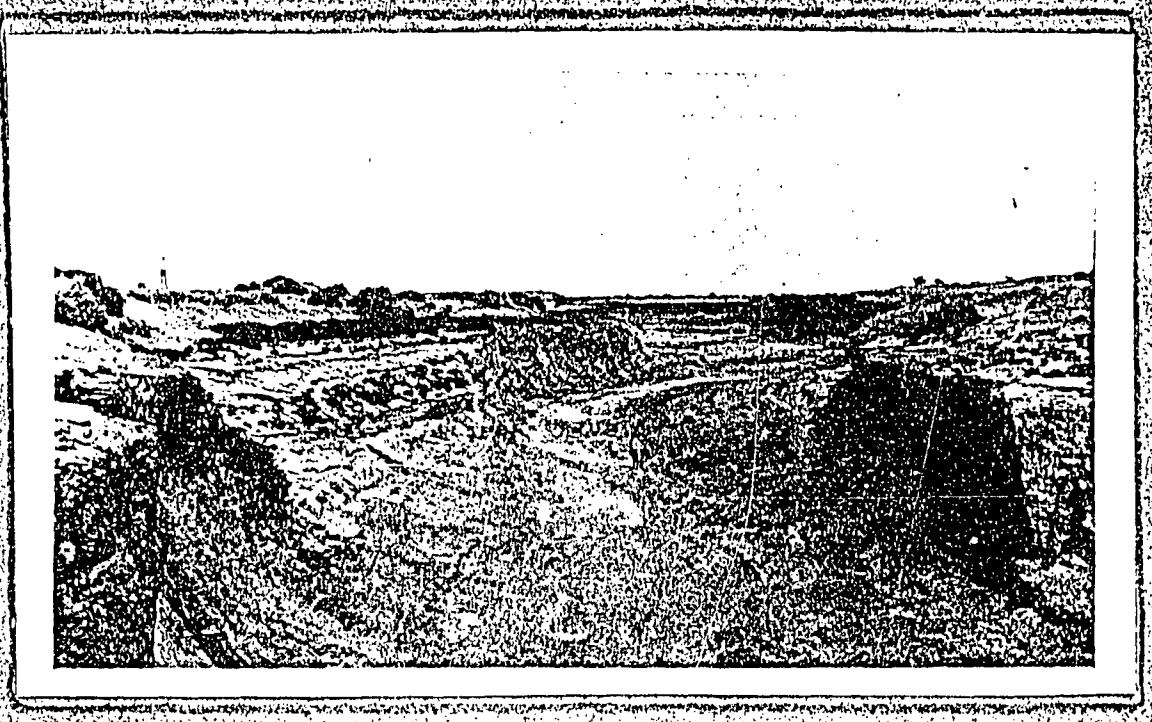
On August 13th, at which time Corn Creek was flowing at flood stages, it deposited about four feet of silt into the Little Colorado River bed from the mouth of Corn Creek to a point north of the Leupp School. This is perhaps the greatest amount of silt ever deposited in the Little Colorado River by Corn Creek during one flood. This deposit forced the Little Colorado River from its bed. The flood from the combined streams broke through the dikes originally constructed to protect the school, forcing practically all of the waters south of the Leupp School.

A survey has been made to change the channel of Corn Creek following close to the foot of Newberry Mesa where there is a small channel cut by flood waters from the hills and perhaps in years gone by this might have been the channel of Corn Creek. The Navajo Indians believe this is true. According to information received from various sources, and indication of ground conditions, Corn Creek was about three feet deep some fifteen years ago. The range has been gradually overgrazed allowing the rainwater to run off more rapidly. Today the range is practically denuded and the rainfall causes turbulent floods to flow in the stream, which has eroded to a depth of thirty-five feet. The grade line of the present stream bed is greater than the proposed change of channel due to the fact that the change requires a greater distance and the grade of the Little Colorado River is comparatively flat between the present mouth of Corn Creek and the point at which it will be discharged

by the new location.

In order to divert the waters from Corn Creek into the new channel it is necessary to take out on the grade of the present wash and carry it out on a grade of .002 which is less than the present grade but in view of the fact that the alignment of the channel is favorable over the meandering of the present stream, the velocity will be but slightly less. The proposed channel is 52,200 feet long and involves the excavation of 888,000 cubic yards of earth based on a bottom width of twenty feet with 1½ to 1 side slopes. In view of the fact that for the first 12,000 feet the cut will average twenty-four feet deep, and the material will have to be handled twice or hauled from the bottom of the cut, the cost of excavation will be high. It is estimated that the material excavated from the channel in this area will cost thirty cents per cubic yard. The balance of the excavation is estimated to cost fourteen cents.

In addition to the work of excavating the new channel it will be necessary to construct a dam across Corn Creek Wash, the location of the dam to be some 300 feet downstream from where the channel takes out of Corn Creek. As designed, the dam would have a twelve foot crown with a five foot freeboard, 2 to 1 slope on the downstream side, 3 to 1 slope on the upstream side which would be paved with rock in order to prevent erosion.



View of Corn Creek near point of proposed diversion.

As stated elsewhere in this report, the alignment of the proposed channel change would follow close to the foot of Newberry Mesa. A contour of the ground shows that between stations 300 and 500 there is a tendency for the water to flow south toward the Little Colorado River. To correct this condition a dike should be constructed parallel to the channel and about one-half mile south. This precaution is deemed necessary because the cut is from four to five feet deep with spoil bank to allow for additional depth. In the event a heavy or unusual flood should damage the spoil bank the water would spread out over a considerable area and the secondary dike would no doubt save the situation.

Change of Channel of Little Colorado River.

In addition to the above changes and the work accomplished during the present fiscal year, it would be essential to force the Little Colorado River into the old river bed by excavating a new channel and diverting the water through it by constructing two lines of jetties. By doing this the result would be that only back water would be against the dikes which would minimize the chances of their being destroyed. Reference is made to page 13 and profile on page 14.

In the construction of the channel changes it would be necessary to purchase a two-yard dragline with extended boom which would be capable of handling a one and one-half yard bucket.

The purchase price of this machine would be absorbed in the excavation cost. It is estimated that the purchase price of the machine would be $35,000.

In the above mentioned plan for the protection of the Leupp School there seems to be a serious objection to emptying the waters from Corn Creek into the Little Colorado River below the Leupp School. The sewage from the school plant empties into the Little Colorado River below the school. At the present time when the river is at flood stage the water backs up in the sewer line and prevents its discharge. While this condition prevails only a few days at a time, it is believed that a more serious situation might develop by waters from Corn Creek Wash depositing quantities of silt in the river, backing the water further up the sewerage line and cutting off its discharge for several days at a time. To alleviate this situation it might be necessary to resort to pumping the sewerage.

Grand Falls.

Grand Falls is located seventeen miles northwest of the Leupp School on the Little Colorado River. Investigation shows that the falls are approximately one hundred feet in height and that the rock forming the falls extends upstream approximately three-quarters of a mile. The cost of excavating a channel through this rock, 50 feet deep, 60 feet wide, and 3200 feet long, amounting to 355,000 cubic yards, at $2.00 per cubic yard, would be $710,000. In addition to the rock work at Grand Falls there are a number of places

along the Little Colorado River, between Leupp School and the falls, where rock outcrops in the channel for a short distance. However, the cost of excavating a channel at the falls would prohibit any further consideration of this feature.

The following is an estimate of cost for the protection of the Leupp School by changing the channels of Corn Creek and Oraibi Wash:

Changing Oraibi Wash through Tolani Lakes - 36,000 cu. yds. @ 20¢		$7,200.
Changing channel of Corn Creek - Station 0-00 to 120-00, 560,000 cu. yds. @ 30¢	168,000.	
Station 120-00 to 522-00, 328,000 cu. yds. @ 14¢	45,920.	213,920.
Dike to protect against overflow, station 300 to 500, 90,000 cu. yds. @ 14¢		12,600.
Dam - Corn Creek. 11,000 cu. yds. earth hauled to place @ 60¢		6,600.
Rock riprap upstream face, 900 sq. yds. @ $2.		1,800.
Changing channel of Little Colorado River - Excavation 14,000 cu. yds. @ 14¢		1,960.
600 units Kellner Jetties installed @ $20.		12,000.
Engineering and Superintendence		8,000.
		$264,080.

Present work done for the protection of Leupp School.

Work is now being done for the temporary protection of the Leupp School and Agency. This work consists of raising the present dikes approximately three feet above their present height, extending them on the north side of the school grounds and installing about 900 Kellner Jetty units to protect the dikes during flood times.

As stated in previous correspondence to the Office, this work is not considered of a permanent nature but is such that it may prevent overflow for a number of years. This period of protection may be anywhere from two to ten years, the length of time, of course, depending upon flood conditions.

Summary.

The Leupp School and Agency are now on approximately the lowest ground in that area and in order to continue operations they must be protected in some way from the overflow of the Little Colorado River, if they are to remain at the present location.

One of the chief menaces to the Leupp School is the fact that Corn Creek deposits silt in the bed of the Little Colorado River and causes it to overflow the land near the Leupp Agency and if it were not for the dike protection it would cover the school grounds also.

Corn Creek can be diverted from emptying into the Little Colorado River above the school to a point approximately

two miles below. This would relieve the situation above the school but eventually raise the bed of the Little Colorado River so that the backwater during floods would have to be taken care of, and also result in rebuilding the sewage disposal plant as even now during flood season, water backs up to such an extent that the system does not operate.

The total cost of doing this work is probably of an equal value to the school plant and after this work would be done there is the possibility that conditions would change such that the school would still be in a dangerous position. It is possible that due to overgrazing in the past the silt carried by these streams will be greater than at present and the situation be even more serious.

Recommendations.

From the standpoint of protecting the Leupe School and Agency against the floods of the Little Colorado River and Corn Creek, and at the same time considering sanitary conditions and possible danger even though the works as outlined in this report were constructed, it is believed that the economical and safe thing to do is to abandon the plant and salvage whatever building material and equipment possible, and re-locate at some other point.

A study of the ground and other conditions indicate that a small school, and possibly the agency, could be located near the banks of Canon Diablo about one mile west of the present location approximately as shown on the accompanying map.

The ground is well above any floods of the Little Colorado River and underlaid with rock so there would be no danger of erosion by the stream. The water supply for such a plant is believed to be available in the sandstone underlying this area as four stock water wells were recently drilled in this territory and good supplies obtained. Two or three wells about 200 feet deep would probably give an adequate supply.

In order to be properly protected it is believed that steps should be taken to make a change at an early date as the work now being done for the protection of the school can be considered only temporary.

Respectfully submitted,

H. C. Neuffer
Supervising Engineer