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# IDAHO FISH & GAME DEPARTMENT

IDAHO FISH & GAME DEPT



**Fisheries Division**

SILVER CREEK

STREAM IMPROVEMENT

SILVER CREEK STREAM IMPROVEMENT

A PROGRESS REPORT ON PROJECT F-16-D  
FOR 1955-56

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## Introduction

Location of area. Silver Creek is located in the south-central portion of Idaho in Blaine County. The waters of Silver Creek rise as springs across the bottom of the southeast corner of Big Wood River Valley and drain south eastward to join Little Wood River. The source of Silver Creek undoubtedly is from losses in the flow of Big Wood River as it flows across the sinks near Bellevue and from waters diverted from Big Wood River to irrigate lands above and adjacent to the headwaters of Silver Creek. Stream improvement structures were installed in Grove and Loving creeks, major tributaries of Silver Creek, and Silver Creek proper (Figure 1).

Purpose of development. The important aquatic plants of Silver Creek are pondweeds, watercresses and Chara. The growth of pondweeds and cresses is annual and reaches a peak of abundance in August. The growth of Chara, on the other hand, appears to be cyclic over a period of years. As the Chara becomes more abundant, silt, green algae and other materials are deposited within its dense growth, the water levels of Silver Creek raise and deep pools are cut between and below the relatively impervious 'islands' of Chara as the restricted waters flow downstream.

The cycle in the development of Chara may be terminated in several ways or combination thereof, i.e.: the volume in flow of the creek decreases and the exposed plants or portions of plants are killed by drying or freezing; the roots and stems of the Chara become covered with silt and die, and/or the pressures of water build up as the water levels rise until the vegetation is washed out.

At times, the vegetation washes out in localized areas; but, more often, as the vegetation is torn loose from the bottom in local areas, it tends to roll into a tight mass. The tightly rolled mass of vegetation dams the waters further, water pressures increase and the vegetation is washed or rolled out of large sections of the stream.

When the vegetation in Silver Creek is abundant, fish food and cover production is excellent and fish populations are high; but, when vegetation is sparse, the lack of fish food and cover causes the fish populations to decline.

The creation of pools by installation of stream improvement structures tends to supplement the fish habitat during periods of vegetation abundance and provides primary cover areas during periods when the growth of vegetation is sparse.

## Improvement Structures

Three types of improvement structures have been installed in Silver Creek: digging log, sheet piling and concrete block.

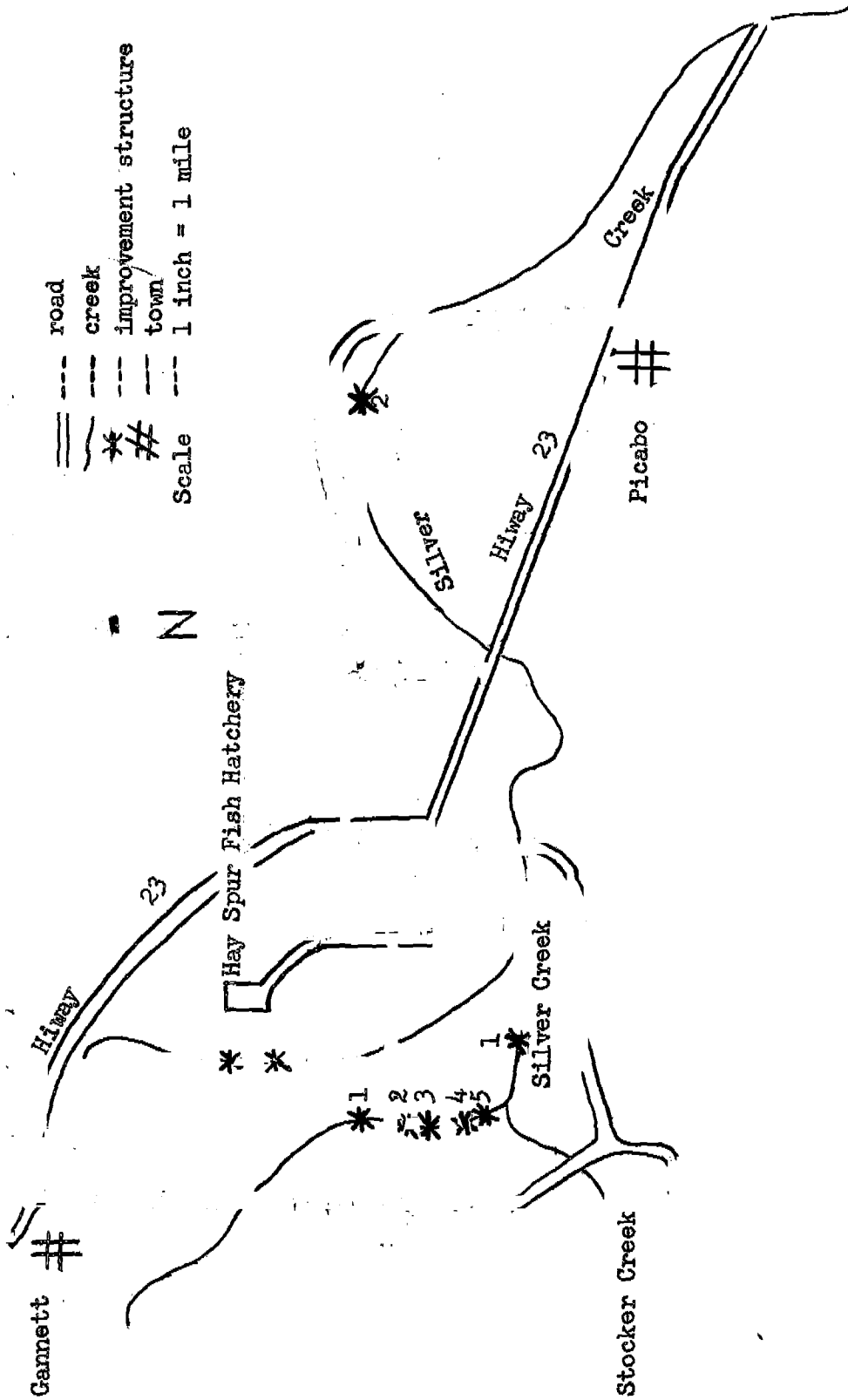


Figure 1. Silver Creek and main tributaries, Blaine County, Idaho with location of stream improvement structures installed during 1955 and 1956.

Digging-log structure. The digging log type of structure is comprised of a single log installed across the stream below the water level near the bottom with both ends firmly imbedded in the opposing banks.

Sheet-piling structure. The sheet piling type of structure is comprised of two-inch by eight-inch tongue and groove sheeting driven into the bottom of the stream and nailed to a waler log. The waler log has one end imbedded in the bank and the other end supported by a log post and wire crib filled with rocks.

Concrete-block structure. The concrete block type structure is comprised of base blocks with the following dimensions: 36 inches wide, 18 inches long and 6 inches high and common blocks with the following dimensions: 18 inches wide, 36 inches long and 6 inches high (Plate 6). Both the base and common blocks are tongue and grooved in such a manner that a sturdy structure is formed.

Since each concrete block weighs approximately 250 pounds, a power driven hoist, 4-wheel cart and adequate man power are needed to handle the blocks.

#### Installation of Structures and Results

Grove Creek installation #1. Since Grove Creek at this site is divided into two channels, a digging-log structure was installed in the smaller west channel and a concrete-block structure was installed in the larger east channel.

After the log was placed in the west channel, it appeared that little digging action would occur; therefore, several concrete blocks were placed on the upstream face of the log to further constrict the flow and increase the digging action. By November, 1956, as a result of a raise in water levels plus digging action, the pool below the digging log structure had increased in depth from 12 inches to 30 inches. (Figure 2).

Within a week after the concrete-block structure had been installed at Grove Creek #1, a large hole had washed under the center blocks of the structure (Plate 2). Corrective action was taken by removing the base and common blocks above the hole and adding common blocks on either side to restrict the flow to the open section in the center of the stream. By November, 1956, as a result of a raise in water levels plus digging action, the pool below the structure had enlarged and increased in depth from 30 to 42 inches (Figure 2).

Grove Creek installation #2. A concrete-block structure was installed at this site in October, 1956. Digging action began immediately, in fact, several loads of gravel and boulders were placed on the upstream side of the structure to prevent it from washing out before it could be completed. Within two weeks, the pool below the structure had enlarged and increased in depth from 25 inches to 74 inches. (Figure 3).

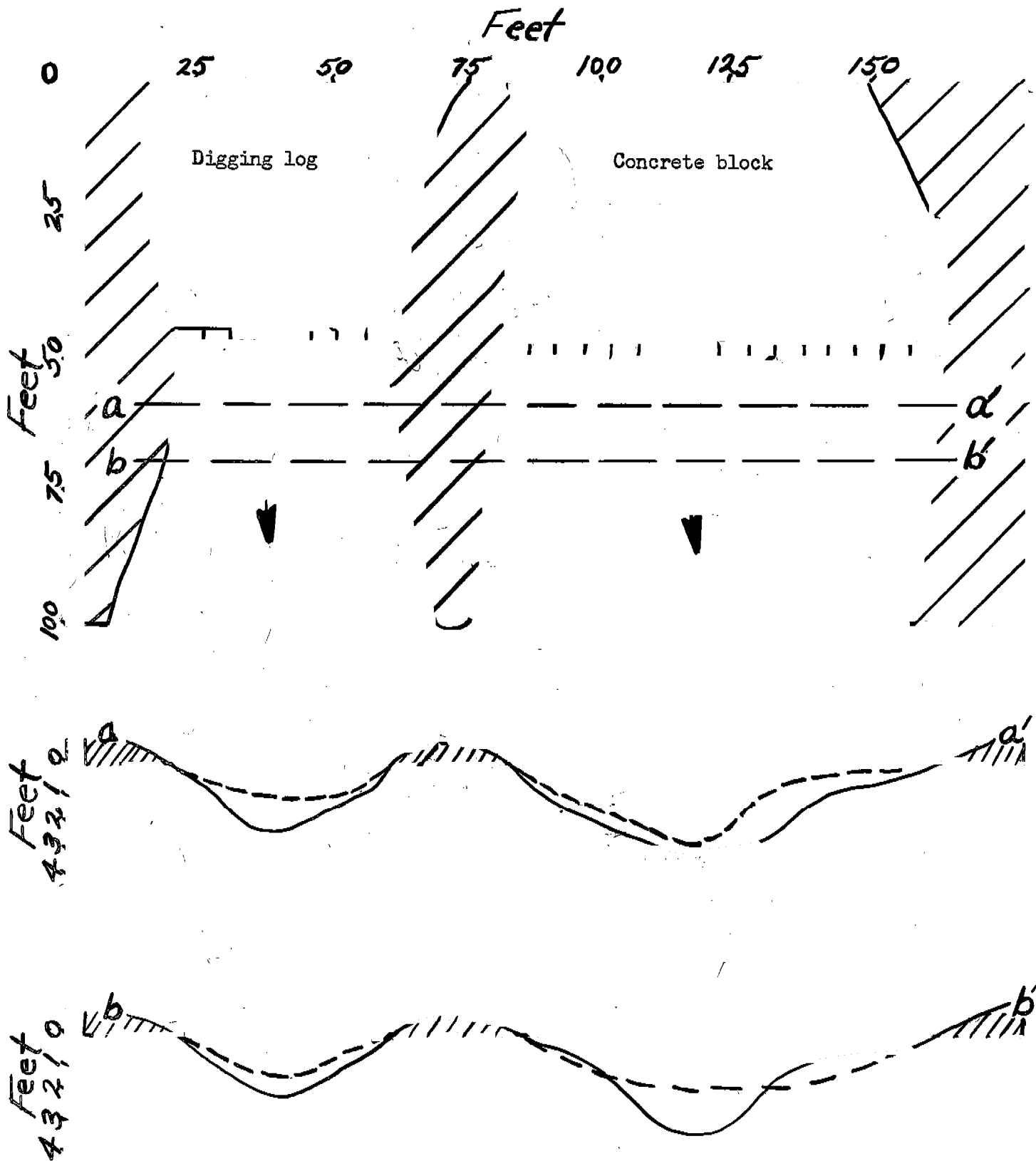


Figure 2. Grove Creek installation #1. Dotted lines show cross-section of stream bottom prior to installation of structures in October, 1955 and solid lines show cross-section of stream bottom in November, 1956.

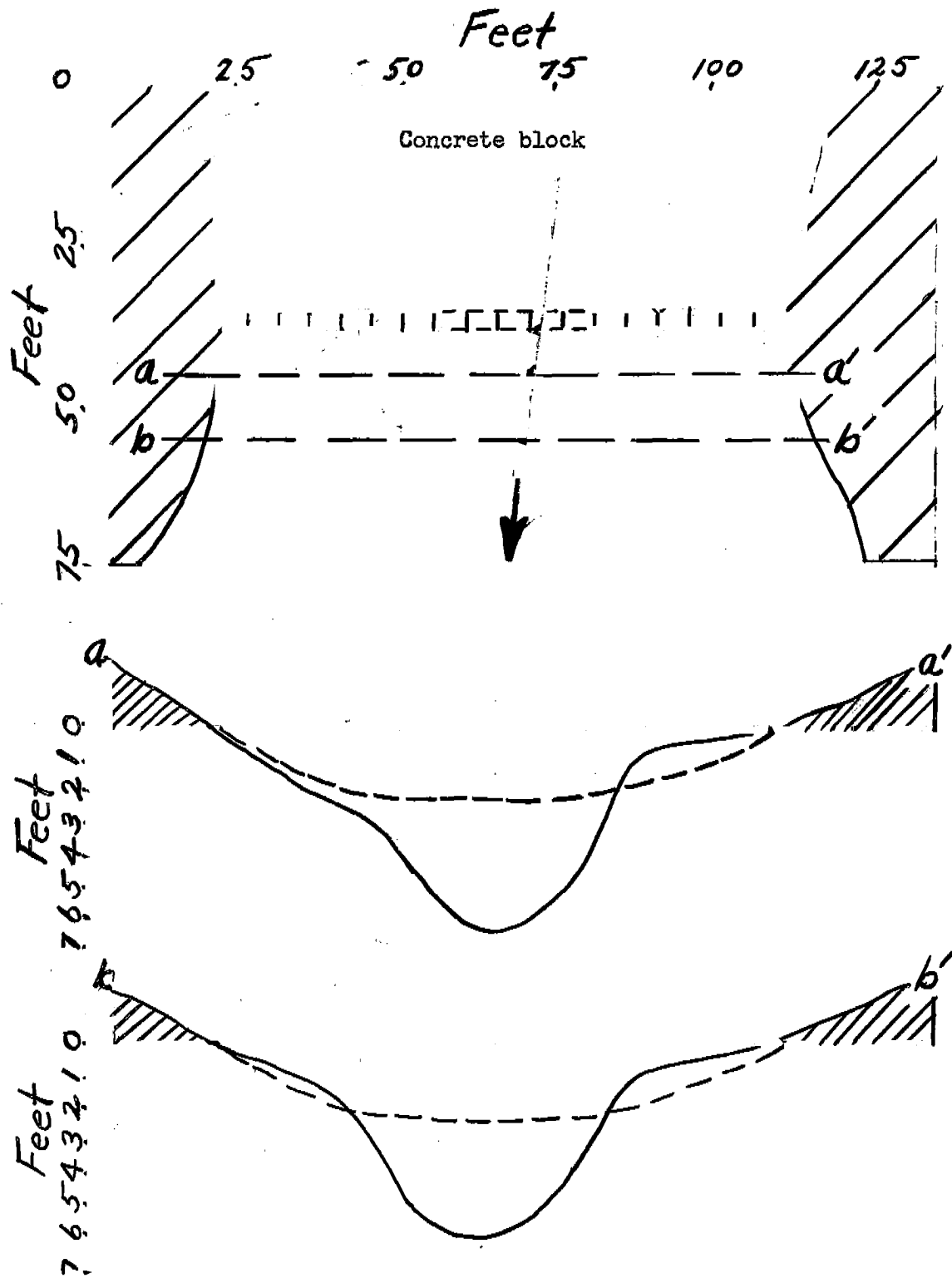


Figure 3. Grove Creek installation #2. Dotted lines show cross-section of stream bottom prior to installation of structure in October, 1956 and solid lines show cross-section of stream bottom in November, 1956.

Grove Creek installation #3. A digging log structure was installed at this site in October, 1955. By November, 1956, as a result of digging action, the pool below the structure had enlarged and increased in depth from 25 inches to 38 inches (Plate 4, and Figure 4).

Grove Creek installation #4. Since Grove Creek is divided into two channels at this site, a digging-log structure was installed in the smaller west channel and a concrete-block structure was installed in the larger east channel.

By November, 1956, the pool below the digging-log structure, as a result of a raise in water levels plus digging action, had enlarged and increased in depth from 20 to 39 inches (Figure 5).

After the concrete-block structure was installed at this site in October, 1955, several loads of gravel were placed along the upstream face of the base blocks to prevent washing beneath the structure. Within a week after this structure had been completed, the pool below had deepened to 50 inches and by November, 1956, as a result of a raise in water levels plus digging action, the pool was much enlarged and had increased in depth from the original 29 inches to 72 inches (Figure 5).

Grove Creek installation #5. The concrete-block structure installed at this site in October, 1955 is 150 feet in length: Grove Creek proper is 100 feet in width and the low bank on the east side is 50 feet in width. By May of 1956, a large hole had washed under the base blocks in the channel opening on the west side of the structure. The base blocks and common blocks above this hole were removed and additional common blocks were placed on the structure to restrict the flow to the two openings. By November, 1956, the pools below the west and east openings in the structure, as a result of a raise in water levels plus digging action, had enlarged and increased in depth from 12 to 30 inches and 17 to 36 inches, respectively (Figure 6).

Loving Creek installation #1. A concrete-block structure was installed at this site in October 1956. By November, 1956, the pool below the structure, as a result of digging action, had enlarged and increased in depth from 24 to 37 inches (Plate 38 and Figure 7).

Loving Creek installation #2. A concrete-block structure was installed at this site in October, 1956. By November 1956, the pool below the structure, as a result of digging action, had enlarged and increased in depth from 20 to 29 inches (Figure 8).

Silver Creek installation #1. The concrete-block structure installed in October, 1955 at this site is 120 feet in length. Initially, this structure was one base block and two common blocks in height except for the three openings which were one base block and one common block high (Plate 6). By May, 1955, a hole had washed under the base blocks at the opening on the south side. The common and base blocks at this opening were removed. The common blocks were removed at the other two openings and the height of the structure, except at the openings, was increased to one base block and three common blocks. By November, 1956, the pools below the south, middle and north openings in the structure, as a result of a raise in water levels plus digging action, had enlarged and increased in depth from 18 to 30 inches, 28 to 47 inches and 25 to 48 inches, respectively (Plate 7 and Figure 9).



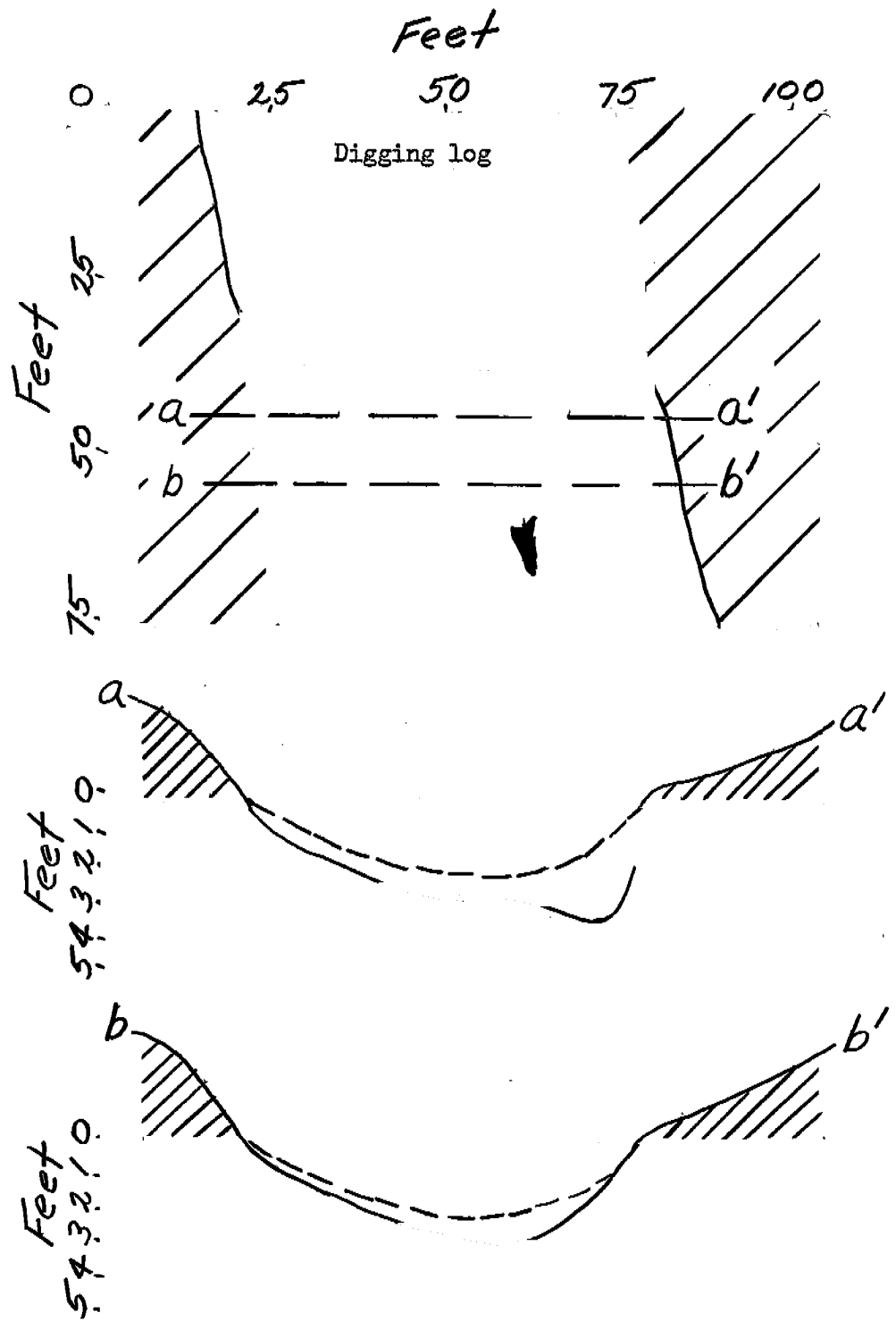


Figure 4. Grove Creek installation #3. Dotted lines show cross-section of stream prior to installation of structure in October, 1955 and solid lines show cross-section of stream bottom in November, 1956.

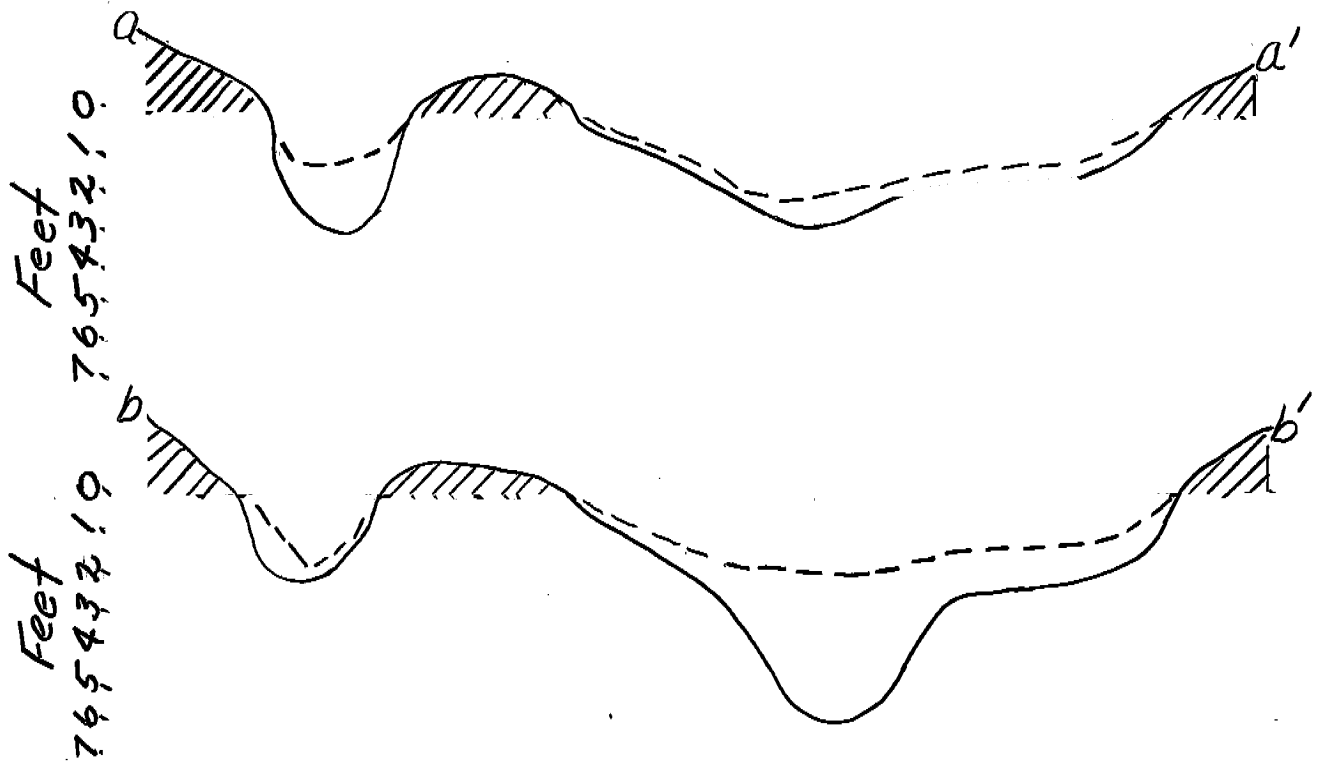
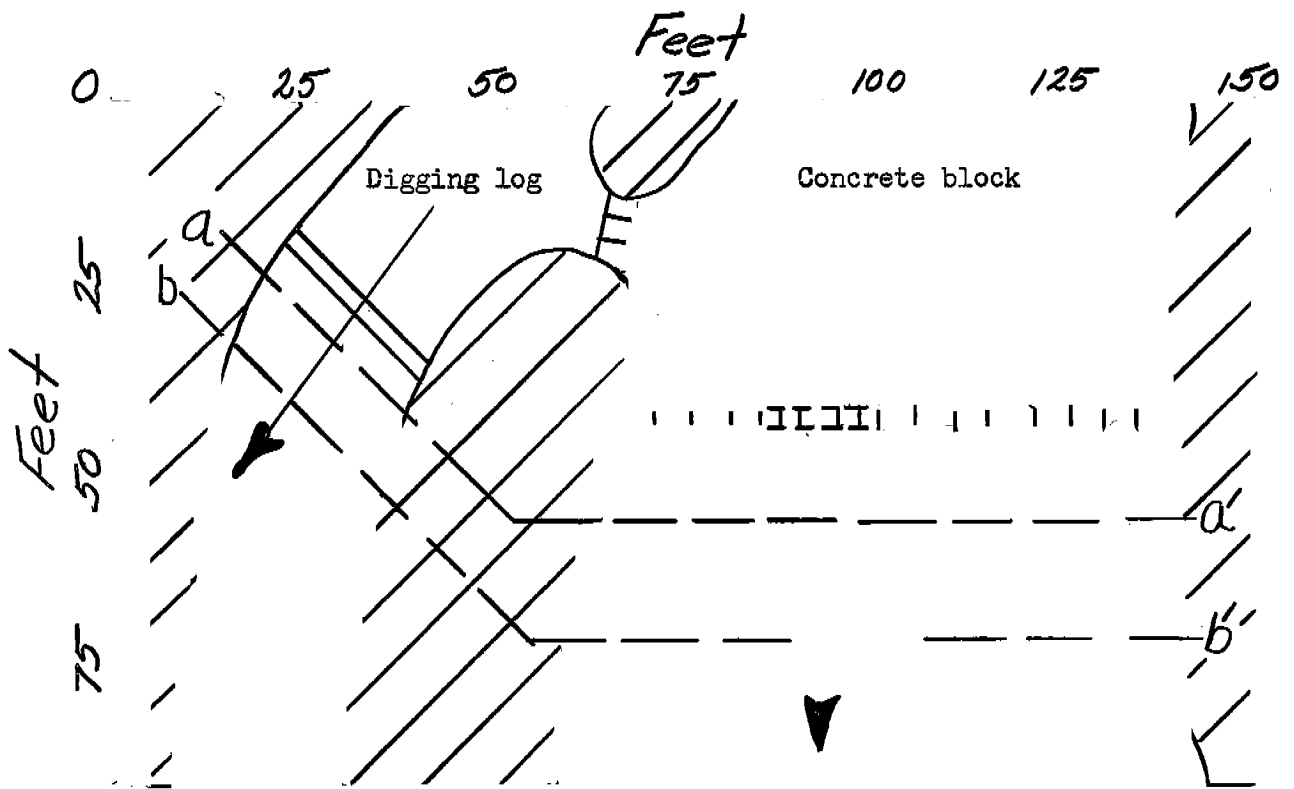


Figure 5. Grove Creek installation #4. Dotted lines show cross-section of stream bottom prior to installation of digging log and concrete block structures in October, 1955. Solid lines show cross-section of stream bottom in November, 1956.

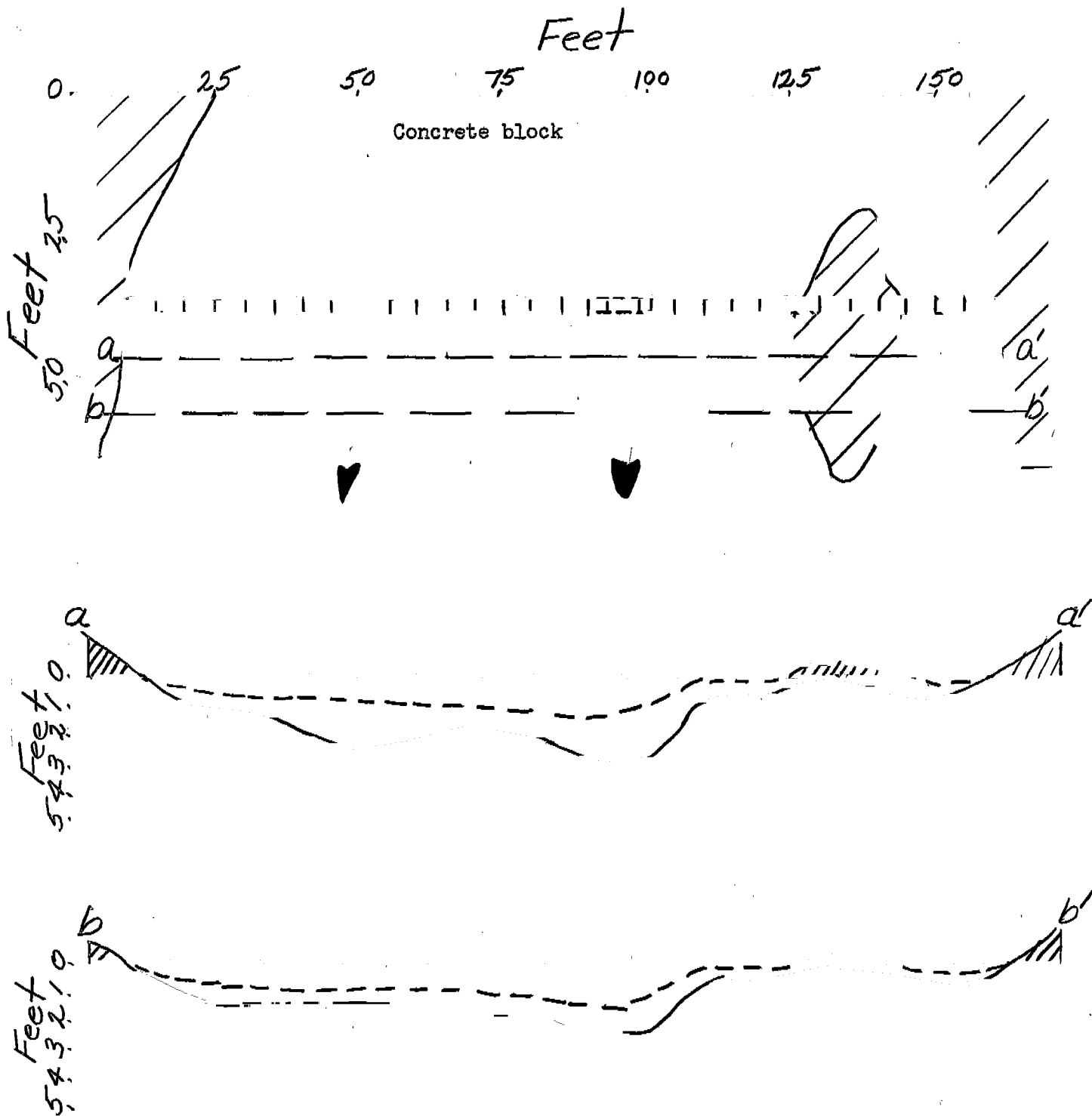


Figure 6. Grove Creek installation #5. Dotted lines show cross-section of stream bottom prior to installation of concrete-block structure in October, 1955. Solid lines show cross-section of stream bottom in November, 1956.

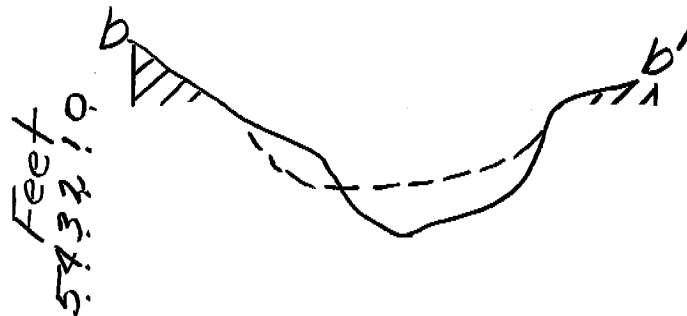
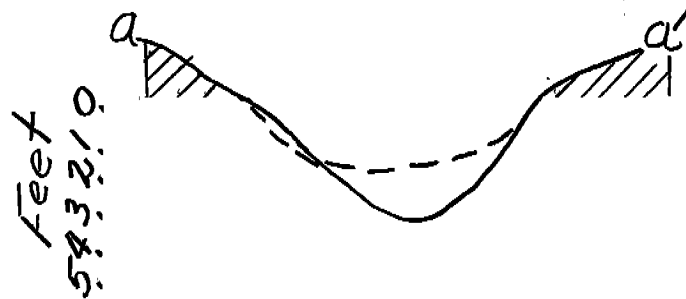
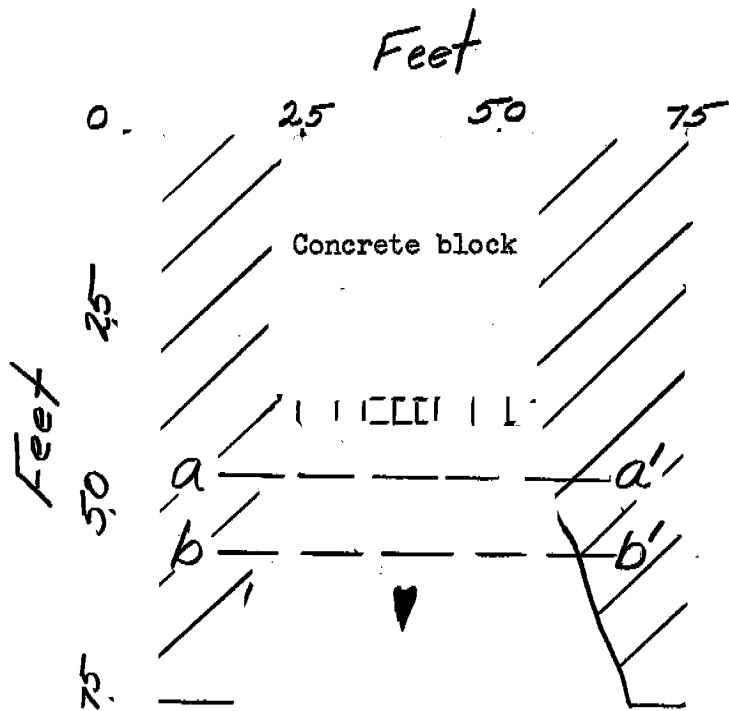


Figure 7. Loving Creek installation #1. Dotted lines show cross-section of stream bottom prior to installation of concrete-block structure in October, 1956. Solid lines show cross-section of stream bottom in November, 1956.

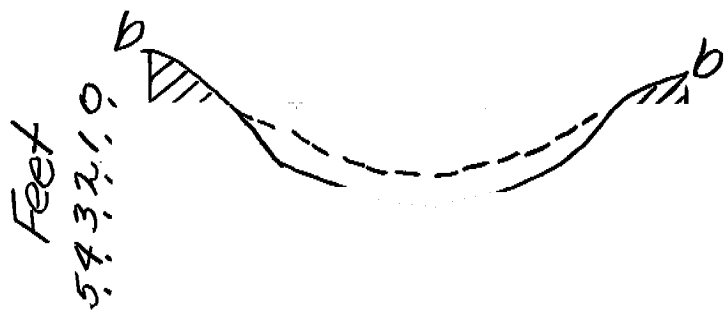
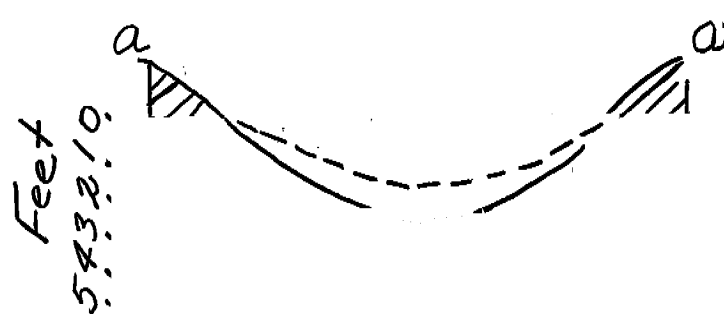
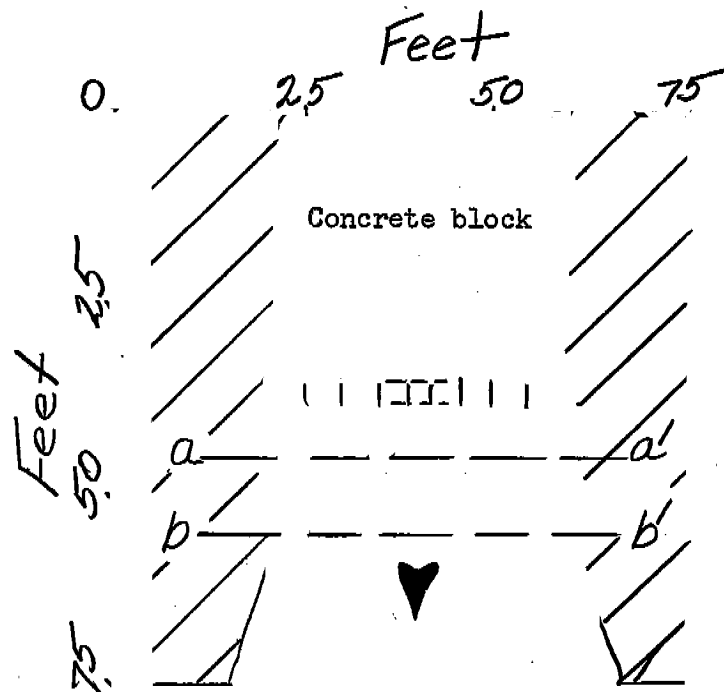


Figure 8. Loving Creek installation #2. Dotted lines show cross-section of stream bottom prior to installation of concrete-block structure in October, 1956. Solid lines show cross-section of stream bottom in November, 1956.

Silver Creek installation #2. A sheet-piling structure was installed at this site in November, 1955. During December, 1955, surface ice formed on Silver Creek in the vicinity of the site causing water levels to raise and flow over the structure. The wing deflector and the outer end of the sheet-piling structure extending from the south shore were forced upward by the ice pressure and an opening was washed under the structure at this point (Plates 45 and 46). No other damage to the structure was noted; but the aquatic vegetation washed from this section of the stream during the early part of the 1956 season. The sheet-piling structure extending from the south shore was repaired and strengthened in June, 1956 (Plate 8).

By September, 1956, the pool below this structure, as a result of digging action, had enlarged and increased in depth from 32 inches to 40 inches (Figure 10).

During October, 1956 five rows of common concrete blocks four blocks high, held in position by iron fence stakes, were installed in the opening between the sheet-piling deflectors. By November, 1956, the pool below the structure, as a result of increased digging action, had increased in depth from the original 32 inches to 78 inches (Figure 11).

#### Creel Census

Creel census boxes and cards and signs urging the return of catch information were installed at Grove Creek installations #1, #3 and #4 and at Silver Creek installations #1 and #2 (Plate 8).

Returns were collected from the boxes in early August, 1956. Cattle had rubbed off and destroyed the creel census boxes from stations at Grove Creek installation #4 and Silver Creek installation #1 sometime during the period from early August to September 30.

Creel census returns showed 46 fishermen had caught 155 trout in 80 hours of fishing within the areas 100 feet above to 100 feet below some of the improvement structures. These fishermen averaged 1.9 fish per hour and caught an average of 3.4 fish.

Creel census returns showed 51 fishermen had caught 263 trout in 222 hours from Silver Creek in other than improved areas. These fishermen averaged 1.2 fish per hour, but caught an average of 5.2 fish.

#### Preliminary Conclusions

1. Although digging-log structures are inexpensive and easily installed, this type of structure, to be effective, should be supplemented with concrete blocks or sheet piling to further restrict the water flow.

2. Concrete-block structures are most effective and require little maintenance if installed on relatively hard bottoms just upstream from pockets of silt or sand. Concrete-block structures should be one base-block high at the openings.

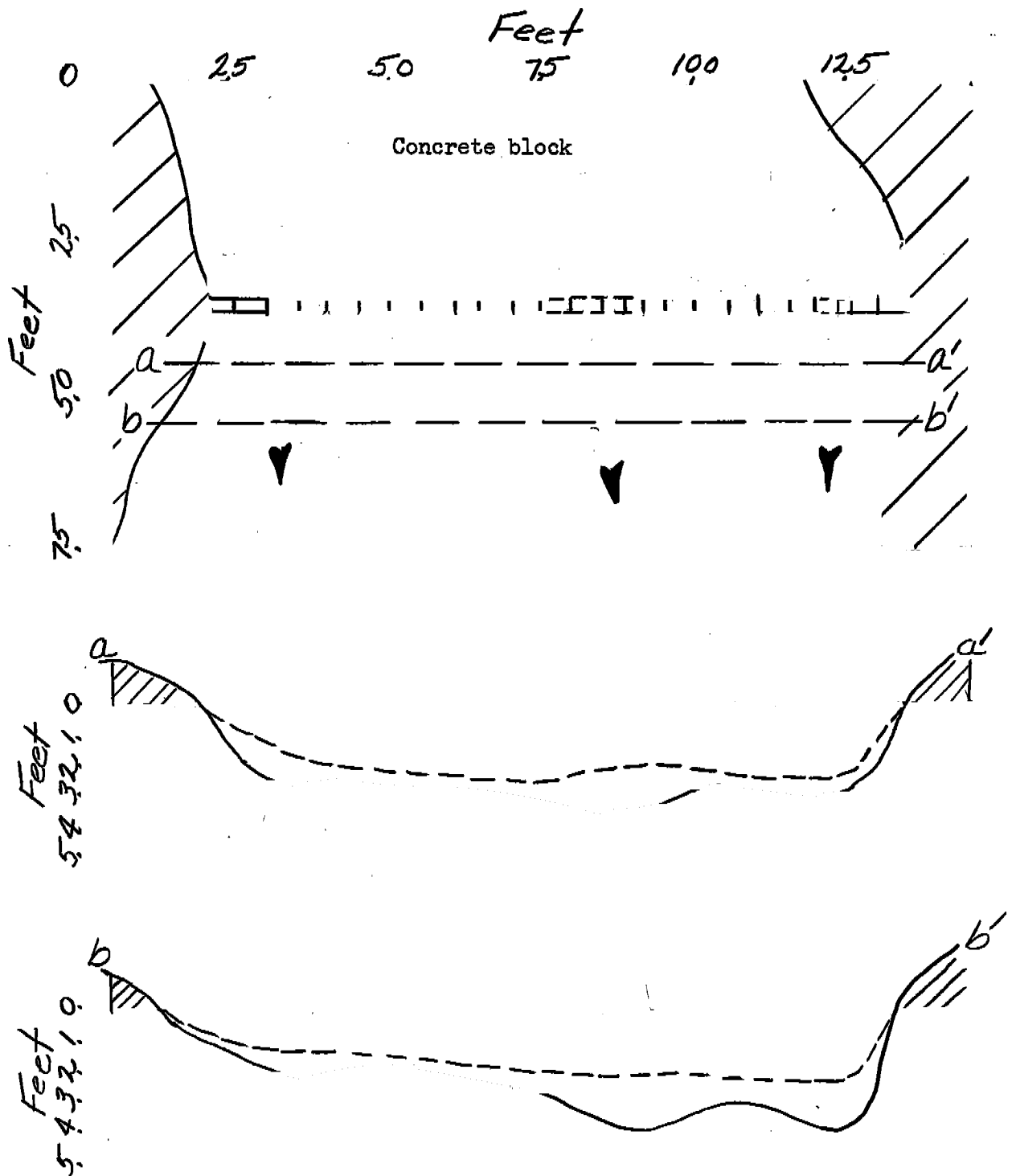


Figure 9. Silver Creek installation #1. Dotted lines show cross-section of stream bottom prior to installation of concrete-block structure in October, 1955. Solid lines show cross-section of stream bottom in November, 1956.

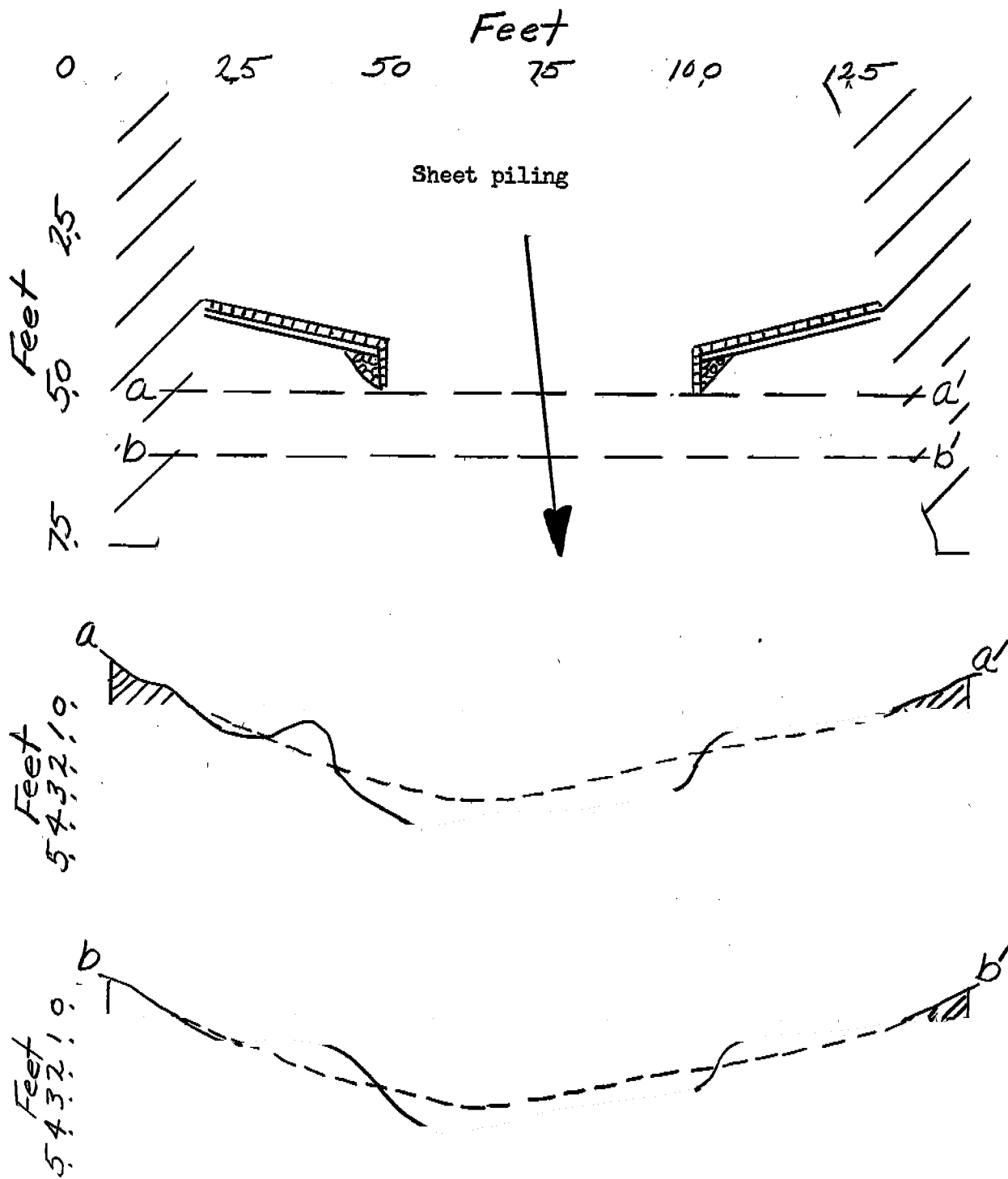


Figure 10. Silver Creek installation #2. Dotted lines show cross-section of stream bottom prior to installation of sheet piling structure in November, 1955. Solid lines show cross-section of stream bottom in September, 1956.



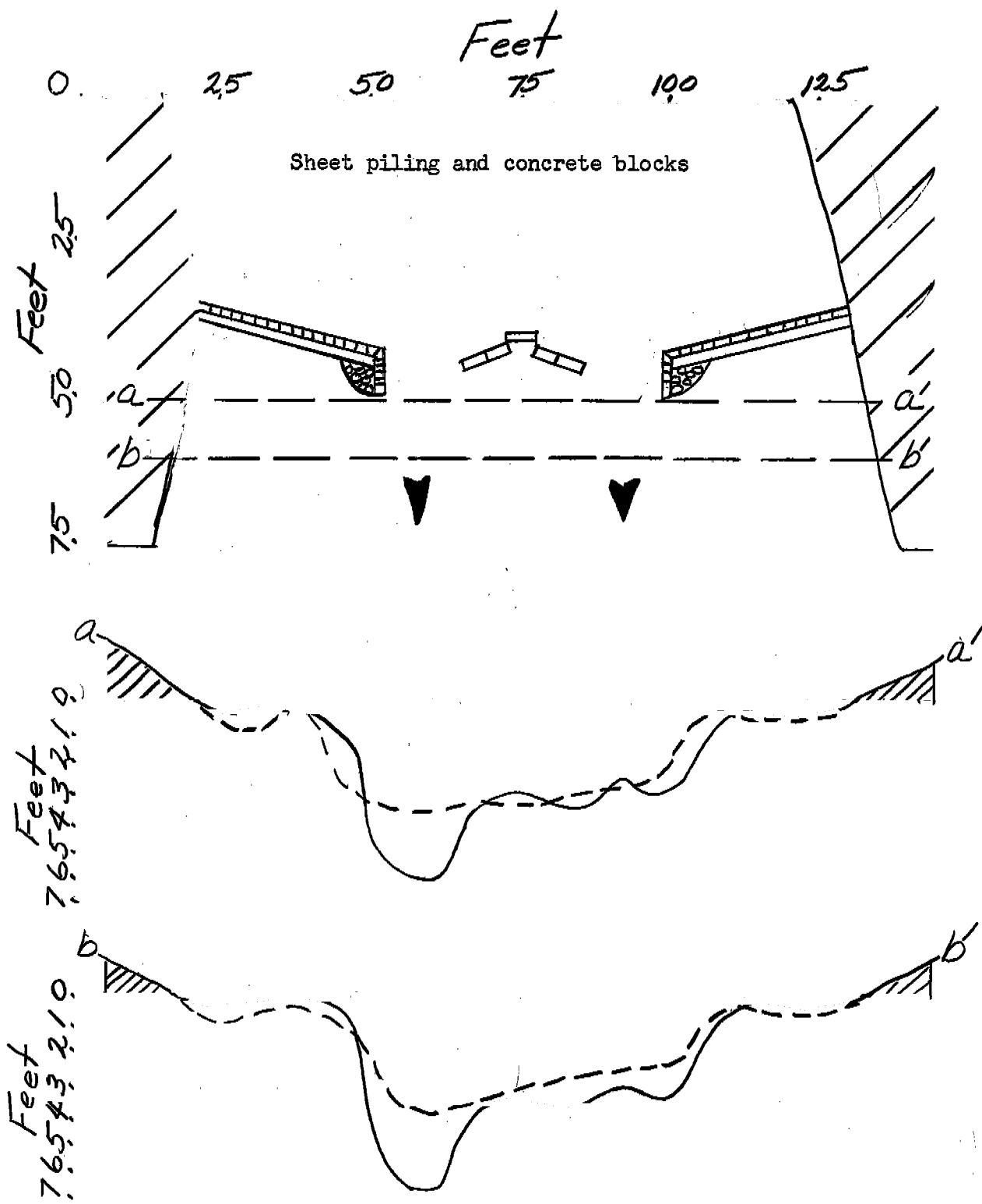


Figure 11. Silver Creek installation #2. Dotted lines show cross-section of stream bottom in September, 1956. Concrete-blocks were added in October, 1956. Solid lines show cross-section of stream bottom in November, 1956.

3. Sheet-piling structures are most effective if installed on soft bottoms. The opening between the sheet-piling deflectors should be quite narrow.

4. The velocity of the stream flow induced by the structure plus the composition of the stream bottom immediately below the structure are the most important factors which determine the extent of the improvement in pool structure. This is true at least for the period of one year after structure installation.

The stream bottoms below structures installed in 1956: Grove Creek #2, Loving Creek #1 and #2 and Silver Creek #2 were probed with a length of steel rod. The structures were installed immediately above areas with a bottom composition of sand or silt capped with a relatively hard but thin conglomerate of gravel and clay.

5. Creel census information indicates fish are more readily caught by fishermen from the improved areas of Silver Creek.

#### Recommendations

It is recommended that photographs of the existing structures, measurements of the pools formed below the structures and creel census information be collected from improved and unimproved areas of Silver Creek during the 1957 and 1958 seasons, and, based on the findings of the above information, proceed with further improvement if desirable.

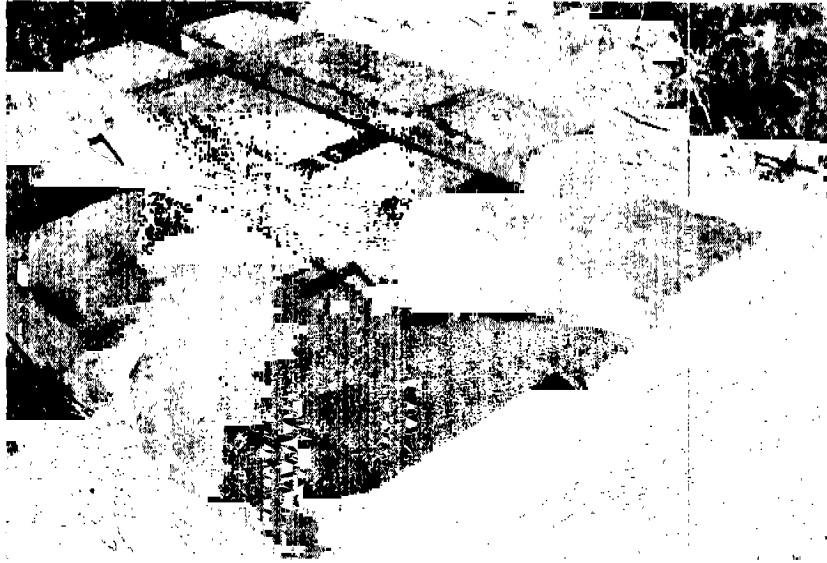


Plate 1. Common block (upper) has tongue on bottom which fits into groove on upper side of base blocks.

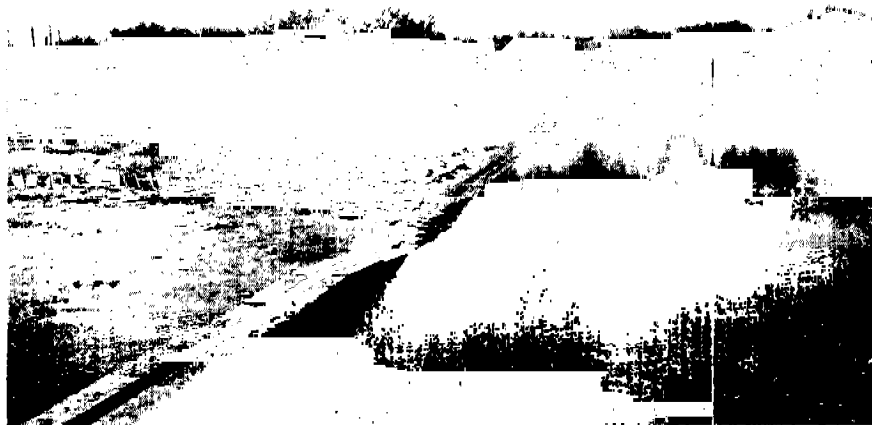


Plate 2. Concrete blocks structure at Grove Creek #1, October, 1955.



Plate 3. Concrete block structure at Grove Creek #2,  
November, 1956.

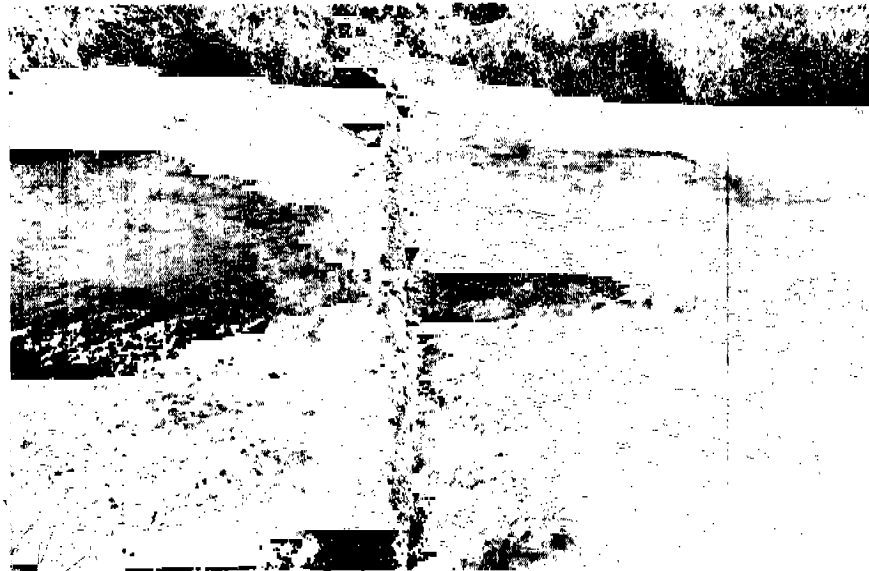


Plate 4. Digging log structure at Grove Creek #3,  
November, 1955.



Plate 5. Opening in concrete block structure at Loving Creek #1, November, 1956.



Plate 6. Concrete block structure at Silver Creek #1, November, 1955.

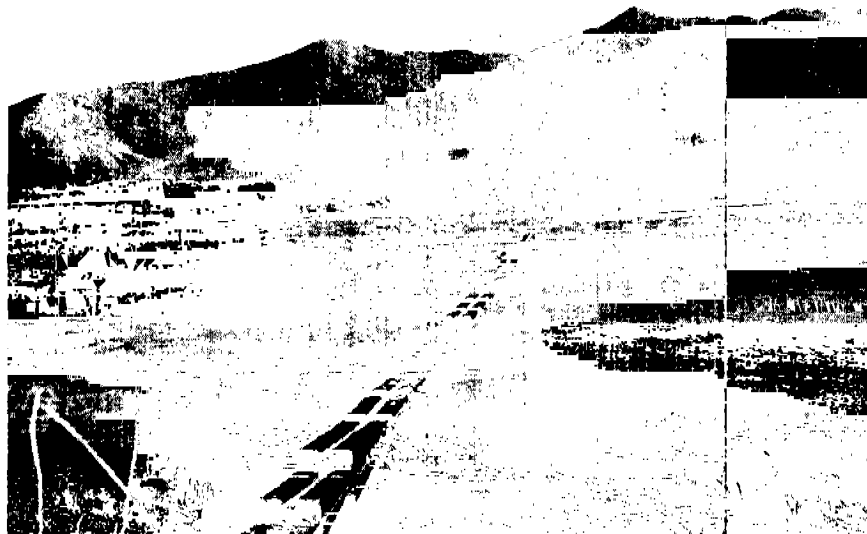


Plate 7. Concrete block structure at Silver Creek #1,  
November, 1956.



Plate 8. Sheet piling structure at Silver Creek #2,  
July, 1956.