State Hwy. Dept., De

MR. HEWITT

MR. ORMSBEE

MR. WAGNER

Denver, Colorado
AUG 6 1943

Dr. L. I. Hewes, Chief, Western Region

B. W. Matteson, District Engineer A. V. WILLIAMSON

486-Colorado-29-Relocation & Design
Boulder-Idaho Springs

There are enclosed for the information and files of your office two copies of "Relocation Survey Report (1942-43) on Boulder-Idaho Springs Forest Highway Route No. 29, Roosevelt National Forest, Colorado" by Robert Coffey, Chief Engineering Aid.

The Forest Service and the State Highway Department are each being furnished a copy of the report.

Enclosures
cc: Forest Service, Denver
State Highway Dept., Denver

ENGINEERING DIVISION

FEDERAL WORKS AGENCY

PUBLIC ROADS ADMINISTRATION

District No. 3

* * * *

RELOCATION SURVEY REPORT (1942-43)

on

BOULDER-IDAHO SPRINGS

Route 29

COLORADO NATIONAL FOREST HIGHWAY PROJECT

(Classes 1 and 2 Forest Highway Route)

U. S. Highway Route 40 State Route 119

Roosevelt National Forest

Boulder County

Colorado

* * *

File: 486-Colorado-29-Relocation & Design
Boulder-Idaho Springs
Accounts No. 6393

* * *

By Robt. Coffey
Chief Engineering Aid
(Resident Engineer)

Approved: B. W. MATTESON
District Engineer

By A. T. Williamson
Senior Highway Engineer

Date 8/5, 1943.

CONTENTS

RELOCATION SURVEY REPORT (1942-43)
ON
BOULDER-IDAHO SPRINGS FOREST HIGHWAY ROUTE 29
COLORADO

General:

This report covers the relocation survey of the east portion or Boulder Canyon section of the Boulder-Idaho Springs Forest Highway Route 29, located in the Roosevelt National Forest, Boulder County, Colorado.

The Boulder-Idaho Springs Forest Highway is a Class One and Two Forest Highway located in the Arapaho and Roosevelt National Forests, Boulder, Gilpin, and Clear Creek Counties, State of Colorado. The Class One highway extends east from Idaho Springs, Colorado, to a junction of U. S. Highway 40 and State Highway Route 119, a distance of 9 miles. The Class Two route extends from this junction to Boulder, Colorado, a distance of 44 miles.

This route extends from Boulder west to Nederland, a distance of 18 miles, then south via Rollinsville and Blackhawk to the junction with U. S. Highway 40, a distance of 26 miles, and west 9 miles to Idaho Springs.

At Nederland, Route 29 connects with Forest Highway 27 (on State Highway 160) to Raymond. Reference is made to the sketch map in the appendix of this report for detail of the general location.

This report covers the Boulder Canyon section between Boulder and Nederland.

The survey begins at Station 991+34.7, elevation 8284 feet, on

Section A, and continues to equation 1007+38.2 Bk = 6+89' ahead, and to Station 93+44.5 Bk = 86+869 ahead, elevation 8199 feet, which is the beginning of Section I, Construction. Thenstarting at Station 133+13.8, the end of Section I Construction, the survey continues down the Canyon to Station 228+04.9, elevation 7964 feet.

The length of the project is 19,750.0 feet, or 3.741 miles. There are no deductions for bridges.

The nearest railroad is the Denver and Salt Lake located at Rollinsville, approximately 6 miles from the beginning of the project. A bituminous-surfaced highway extends from the railhead to the project.

The principal town served by this route is Boulder, with a population of 12,958, which is the main source of supplies for the Nederland area. Other towns on and served by this route are Nederland, Rollinsville, Blackhawk, Central City, and Idaho Springs, with populations of 384, 289, 706, and 2112, respectively.

The land adjacent is devoted mainly to mining and livestock industries. The former, during the present emergency, provides considerable vital war materials. There is also considerable recreational development of summer homes and tourist resorts on and adjacent to this route.

The main highways adjacent or contiguous to this route are U. S. Highway 40, a transcontinental highway extending east and west, and U. S. Highway 87, a main north and south route. Also numerous connecting and feeder roads, which serve a large area, connect with this route.

This route provides access for supplies to the mines, ranches,

and tourist camps. It is important for trucking ore from the mines to the mill at Boulder, and stock to the Denver markets.

It is essential to the proper operations of the National Forest in which it is located.

For detailed data on historical and other information of this route, reference is made to Location Survey Report by Mr. R. T. Turner, Associate Highway Engineer, approved March 6, 1939; and Final Construction Report by Mr. P. E. Warren, Assistant Highway Engineer, approved March 7, 1942.

Traffic:

The traffic over the Boulder-Idaho Springs Route is largely commercial and recreational. This route, with the numerous connecting roads, serves a large area of mining and stock-raising activities, which receive their supplies from Denver, Boulder, and Idaho Springs. It also serves recreational traffic from the eastern plains area into the mountains. It is to be expected the recreational travel will increase with the improvement of this section. It also provides a part of many circle trips from Denver, Boulder, Estes Park, and Idaho Springs.

The handling of traffic during construction may develop into a major problem. Due to the narrow width of the Canyon traversed, it will be impossible to detour traffic around the work; however, some of the through traffic may be detoured via State Route 72 (Coal Creek). In the opinion of the writer, the road will have to be closed to all traffic for short periods, and it may be necessary to suspend construction

on weekends and holidays.

The State Highway Planning Survey report an average daily travel of 450 to 3150 vehicles over this Forest Highway route. On the Boulder Canyon section, the average was 450 to 1200. The heaviest is on U. S. Highway 40 between the junction and Idaho Springs, with an average of 3150.

Present Road:

The first road built in Boulder Canyon was started about 1870. From 1907 to 1911 the Canyon road was completed by convict labor. Other than maintenance, no further improvements were made until 1934 when approximately 1½ miles were reconstructed as a National Recovery Secondary Project No. 355. Later, in 1936, Boulder County highway forces placed a bituminous surfacing on approximately 6 miles of this route above Boulder. During 1941, the Public Roads Administration constructed 0.928 mile of type 100, shoulder-to-shoulder width of 28 feet. The portion between Nederland and Idaho Springs has been completed to a bituminous surface standard, 20 to 22 feet in width by the Public Roads Administration and the Colorado State Highway Department.

The section between Boulder and Nederland is not subject to slides except minor ones caused by freezing and thawing and some ravelling due to weathering.

The rock encountered will consist of a hard gray granite and schist. The latter is on the upper or Nederland section of the project.

Alignment and Grades:

The present alignment of the Boulder Canyon section follows the

course of the Canyon with numerous sharp curves with sight distance of less than 100 feet. Grades in excess of 10 per cent were used; however, generally the grades are good except in the "Narrows" where the existing grade exceeds 10 per cent for approximately one mile. The roadway width varies from 14 to 16 feet except the lower six miles near Boulder, which was reconstructed to 20 to 24 feet, and Section I, near the Barker Dam, to a width of 28 feet.

The proposed alignment will provide for a maximum speed of 35 miles. On the resurvey, the minimum radius of 318.3 feet was used for blind curves. Generally, curves with a radius of 573 feet (10°) and 818.6 feet (7°) were used. Curves over 2 degrees were spiralled; the minimum length of spirals used was 200 feet.

The maximum grade was 5 per cent for the surveyed section as covered by this report. However, on one section near the beginning of the survey the use of some 6 per cent grade may be more satisfactory to keep the grade higher on account of snow conditions.

The survey was started back on Section A at Station 991+ and holds to the east part of the town of Nederland, and crosses the main street about one-half block from the east town limits. This is necessary to avoid sharp curvature and possible right-of-way difficulties on the original survey. On the section north and above the Public Service Company reservoir just east of Nederland, the line was moved to the north and farther back from the reservoir. The alignment and grades will not be as desirable as on the original survey but will leave considerably more water area in the reservoir. From the end of the construction on Section I, the Canyon is narrow and side slopes so

steep the alignment for a maximum speed in excess of 35 miles per hour could not be obtained without excessive construction costs.

Proposed Construction Features

The design will provide for a shoulder-to-shoulder width of 28 feet, with additional widening for curves over 3°. The cut slopes vary from ½:1 to 1:1 in rock, to 1½:1 to 6:1 in common or mixed classification, and embankment slopes from 1½:1 to 6:1. A recommended typical section is included in the appendix of this report.

Widening of cut sections and flattening slopes in the vicinity of Nederland is proposed for snow conditions. In this section the almost constant high winds cause snow to drift in the cut sections.

The gutters in cuts and treatment of slopes should conform with the typical section.

No unsatisfactory material will be encountered. Most of the excavation is in solid rock. In the section from Station 995+00 through equation to Station 25, some sod and topsoil will be available for cover material on slopes. On the remainder of the project imported borrow will be required if slopes are to be covered to promote the growth of vegetation.

Subgrade excavation in rock cuts will be required, and indications are that suitable material may be found in the excavation for needed backfill.

Select material surfacing is available at locations between Stations 991+ and 228. A pit left of Station 69 provided satisfactory material and was used on Section I.

Surfacing material is available approximately one mile west of Nederland on Middle Boulder Creek. This material has been tested and used on other Public Roads projects in this vicinity. The pit is on privately-owned property and royalties will have to be paid.

Grading:

The material encountered will consist mainly of rock, and it is estimated approximately 75% of the material will require blasting.

All of the work will require power shovel and truck equipment, with adequate drilling equipment.

No borrow will be required other than select material surfacing. The schist rock material on this section will provide a suitable hauling surface.

Stripping of sod and topsoil for cover material on slopes is to be included in the section between the beginning of the project and Station 25.

Most of the material will have to be end-hauled, and cross-haul of selected material surfacing will be necessary, which will involve considerable overhaul.

It is estimated the type of rock encountered will swell 30 to 40 per cent.

Drainage:

There will be no difficult drainage problems on the project. The heavier snowfall is usually in the late winter, and has a slow runoff, which is controlled by the badly broken terrain.

One double reinforced concrete box culvert will be required over Middle Boulder Creek at Station 10+ in the town of Nederland, and other drainage structures will consist of corrugated metal pipe culverts. The location and sizes of the drainage structures were determined in the field.

It is estimated a small amount of perforated pipe underdrain will be required between Stations 1001 and 1007-right.

Channel changes will be required for an irrigation ditch from Stations 994 to 998. Between Stations 137 and 146, a rather extensive channel change will be required to avoid two reinforced concrete culverts on Middle Boulder Creek. Other minor channel changes on Middle Boulder Creek will be necessary to avoid excessive construction costs due to the limited area of the Canyon.

The paving of drainage gutters will not be required as most of the excavation is in solid rock.

The use of cement rubble masonry walls and hand-placed rock embankment will be required where channel changes are made and at some locations on the section along the Public Service Company reservoir.

Guardrail and Reflector Guide Posts:

Widening of the roadway for reflector guide posts on curves and higher embankments is to be provided in the design.

Obstructions:

Fencing of the right-of-way will be required between Stations 994 and 1007+38.2 and Stations 6+89.1 to 30+00.

There are a number of buildings and structures to be moved on the proposed line adjacent to and within the town limits of Nederland; also power and telephone lines in the Canyon.

Road Materials:

Samples of all materials to be used in the roadway prism have been tested. These tests indicate most of the material to be solid rock.

There is an extensive deposit of gravel available on Middle Boulder Creek located approximately one mile west of Nederland. The tests indicate this to be satisfactory for concrete aggregates; also base course and oil mix surfacing. This material was used in the construction of the Barker Dam and the bituminous oil surface on Section A by the Public Roads Administration. The pit is owned by the Public Service Company and a royalty will be required.

Water is available in the Middle Boulder Creek for the concrete work, and extra compaction of embankments.

No materials are to be furnished by the U. S. Government.

Extra and Additional Work:

The Standard Specifications FP-41 and special provisions to provide widening of cut sections for borrow excavation and additional compaction should provide sufficient control for the work. However, some additional or extra work may be required in the vicinity of Nederland depending on right-of-way negotiations.

Survey Data:

The survey was started December 8, 1942 and suspended January 20, 1943,

due to weather conditions. The progress was materially delayed due to adverse weather conditions of sub-zero temperatures, frozen ground, and snow on the steep mountain slopes.

The number of men employed varied from six to eight men, with the writer as Chief of Party. The engineering personnel consisted of the following:

Caddell, Richard C.	Jr. Engineering Aid
Fincher, Robert E.	Chief Draftsman
McCoy, Jack R.	Jr. Laborer
Patterson, Albert H.	Sr. Engineering Laborer
Riffey, Albert A.	Assistant Engineering Aid
Walworth, Fred A.	Jr. Engineering Aid
Coffey, Robert	Chief Engineering Aid, Chief of Party

The engineering personnel made private arrangements for subsistence in Boulder, Colorado.

A field office was established at the Public Roads Administration Maintenance Camp, in Nederland, Colorado.

Transportation on the project was provided by two Government-owned trucks. Supplies for the operation of these trucks were secured on regular Government contracts.

The total length of the location survey completed was 3.741 miles. The total cost of the work completed, including field plans, was $3,594.89, or $960.94 per mile.

Following is a summary of distribution of time:

Travel to and from the project	1 day
Preliminary investigations	6 days
Non-working days	7 days
Actual time on survey	31 days
Total time charged to project	45 days

Actual time on survey	31 days
Average length of location survey per day	0.1209 mi.

The original location survey of the Boulder Canyon section was made during 1934-1935 by Mr. M. B. Kinnikin, C.E.I.S., in conjunction with other Public Roads Administration projects that were active in this vicinity.

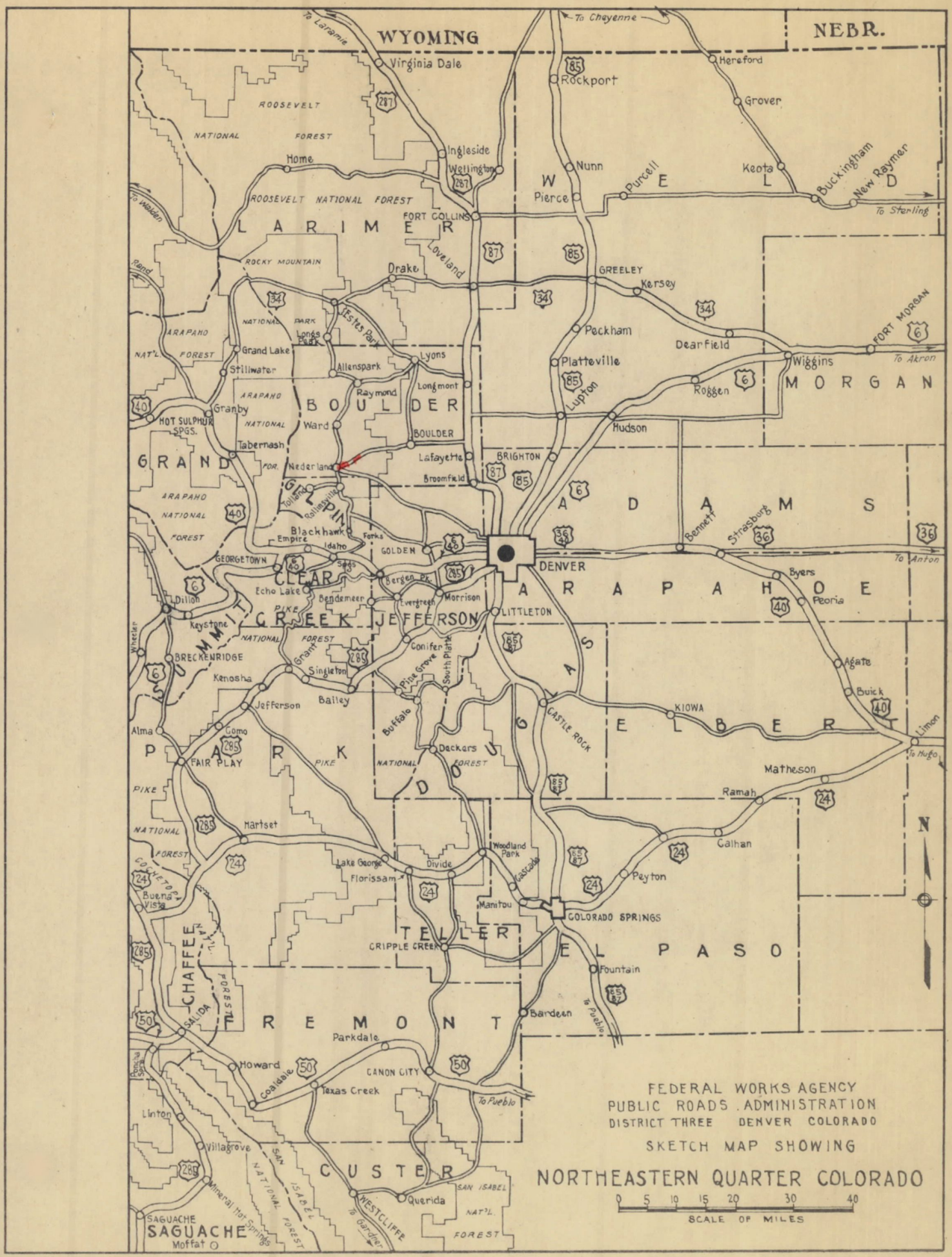
Further investigations of this section of the route located within the town of Nederland, Colorado, and along the Public Service reservoir, were made during 1941 by Mr. Paul E. Warren, Assistant Highway Engineer.

At the time the original survey was made, spirals on curves were not run in the field. This was later included in the office projection with equations of stationing at the end of each curve.

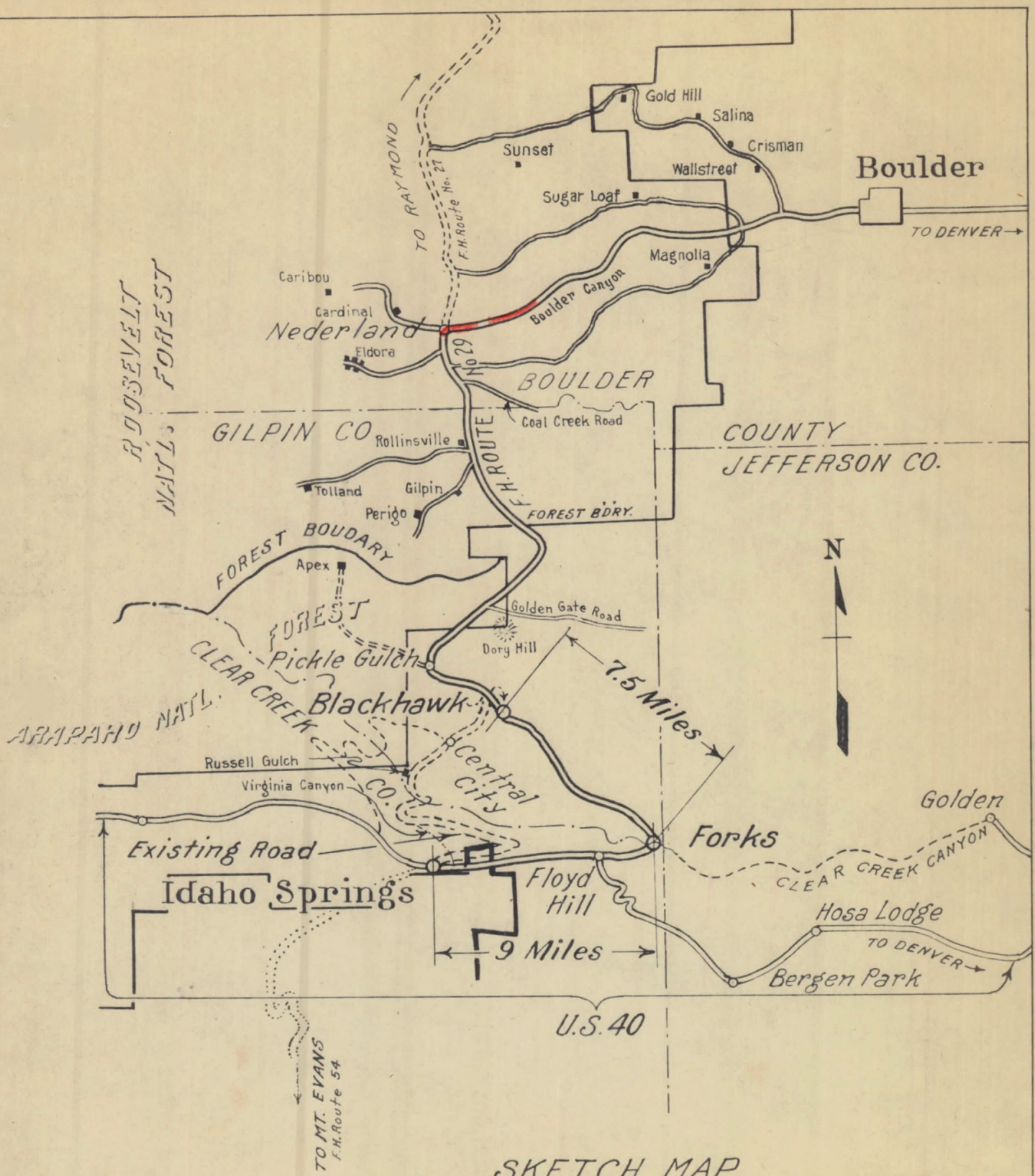
The relocation survey included the staking of spirals, and eliminated the equations shown on office projection plans.

There is approximately nine miles of the relocation remaining to complete the field work on the Boulder Canyon section.

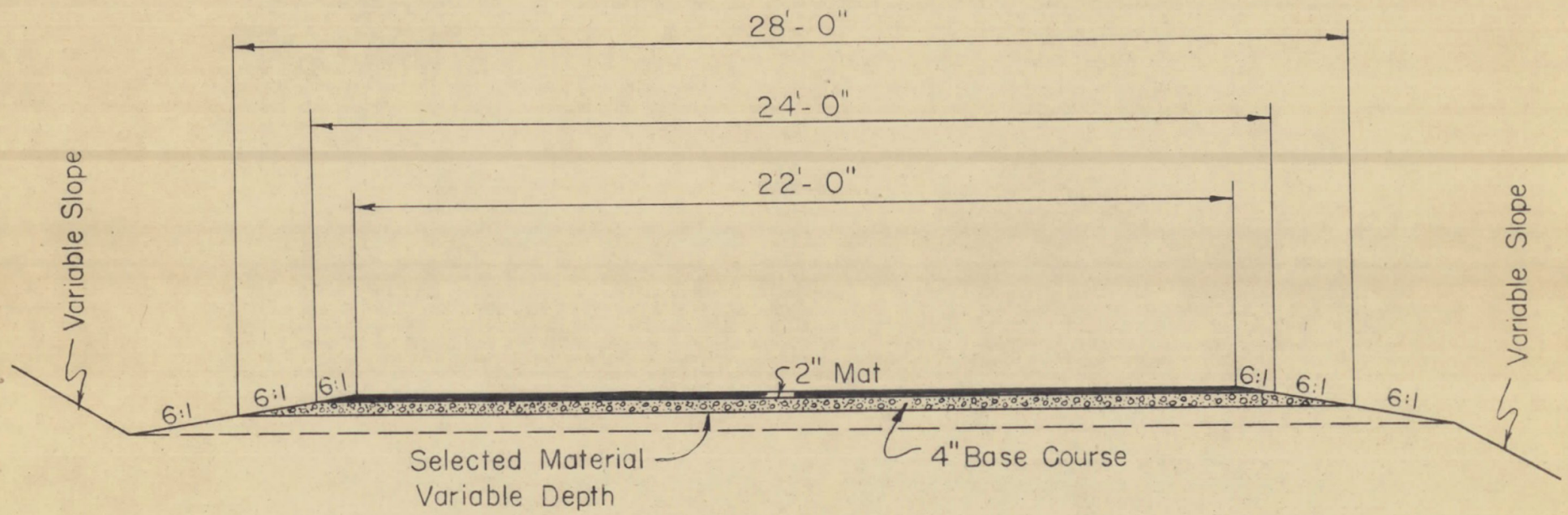
* * * *


WYOMING
NEBR.
To Laramie
To Cheyenne
Virginia Dale
Hereford
Rockport
Grover
ROOSEVELT NATIONAL FOREST
Ingleside
Home
Wellington
Nunn
Purcell
Keota
Buckingham
New Raymer
To Sterling
To Walden
Pierce
FORT COLLINS
LARIMER
Rand
ROCKY MOUNTAIN
Drake
Loveland
GREELEY
Kersey
ARAPAHO NAT'L FOREST
Estes Park
Longs Peak
Peckham
Dearfield
FORT MORGAN
To Akron
Grand Lake
Stillwater
Allenspark
Lyons
Longmont
Platteville
Wiggins
Raymond
Lupton
Roggen
MORGAN
BOULDER
Granby
HOT SULPHUR SPGS.
Ward
Hudson
BOULDER
Tabernash
Lafayette
BRIGHTON
GRAND
Nederland
Broomfield
GILPIN
Tolland
Gallinsville
ADAMS
Blackhawk
Empire
Idaho
Forks
Bennett
Strasburg
To Anton
GOLDEN
GEORGETOWN
Saxs
CLEAR CREEK
DENVER
Bergen Pk.
Byers
Echo Lake
Bendemeer
Evergreen
Morrison
ARAPAHOE
Dillon
Keystone
PIKE NATIONAL FOREST
JEFFERSON
LITTLETON
Peoria
Wheeler
SUMMIT
BRECKENRIDGE
Grant
Conifer
South Platte
Agate
Kenosha
Singleton
Pine Grove
Buick
Jefferson
Bailey
KIOWA
Alma
Como
Buffalo
CASTLE ROCK
ELBERT
Limon
To Hugo
PARK
FAIR PLAY
Deckers
DOUGLAS
Matheson
Ramah
Martset
Woodland Park
Calhan
Lake George
Divide
Florissam
Cascade
Peyton
Buena Vista
Manitou
COLORADO SPRINGS
TELLER
CRIPPLE CREEK
EL PASO
Fountain
CHAFFEE
SALIDA
Bardeen
To Pueblo
FREMONT
Parkdale
Howard
CANON CITY
Coaldale
Texas Creek
To Pueblo
Linton
Villagrove
CUSTER
SAN ISABEL NAT'L FOREST
Querida
WESTCLIFFE
To Gardner
SAGUACHE
Moffat
N
FEDERAL WORKS AGENCY
PUBLIC ROADS ADMINISTRATION
DISTRICT THREE DENVER COLORADO
SKETCH MAP SHOWING
NORTHEASTERN QUARTER COLORADO
0 5 10 15 20 30 40
SCALE OF MILES

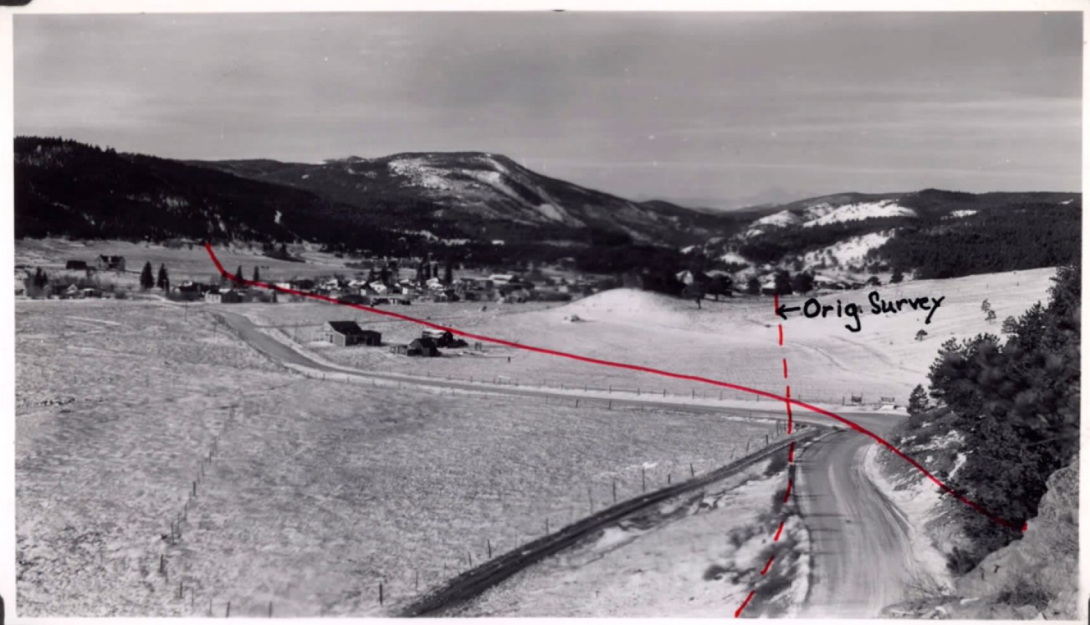
L.E.W. APR 1939



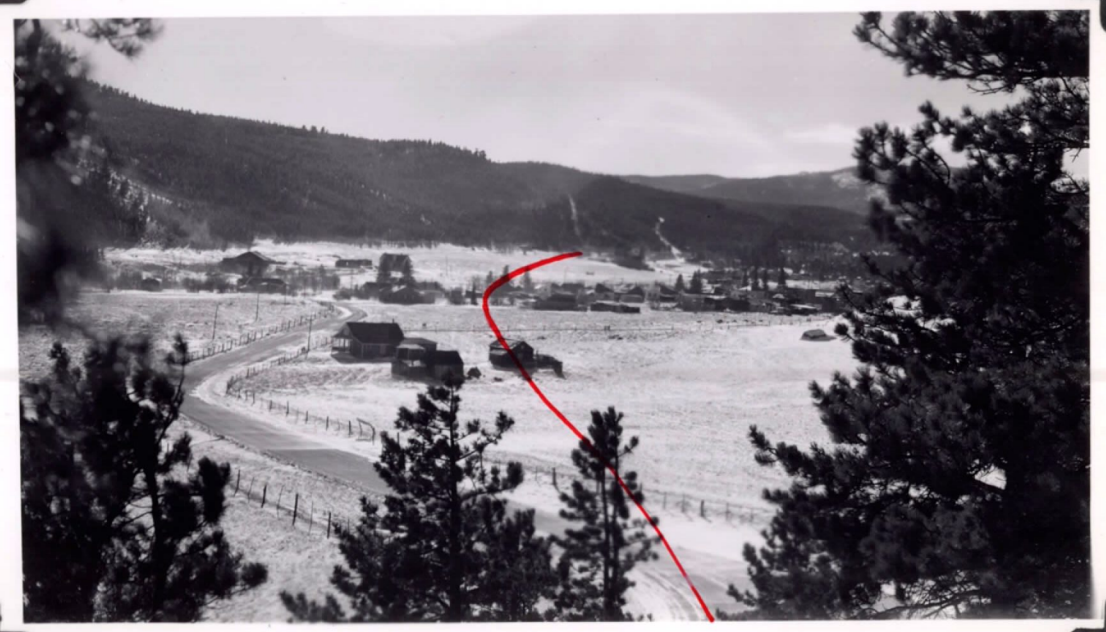
SKETCH MAP
SHOWING
LOCATION OF FOREST H'W'Y. ROUTE NO. 29
BOULDER - IDAHO SPRINGS
COLORADO



PROPOSED SECTION
FOR
BOULDER - IDAHO SPRINGS COLO. 29 RELOCATION
NATIONAL FOREST : ROOSEVELT
BOULDER COUNTY
STATE: COLORADO CLASS 2

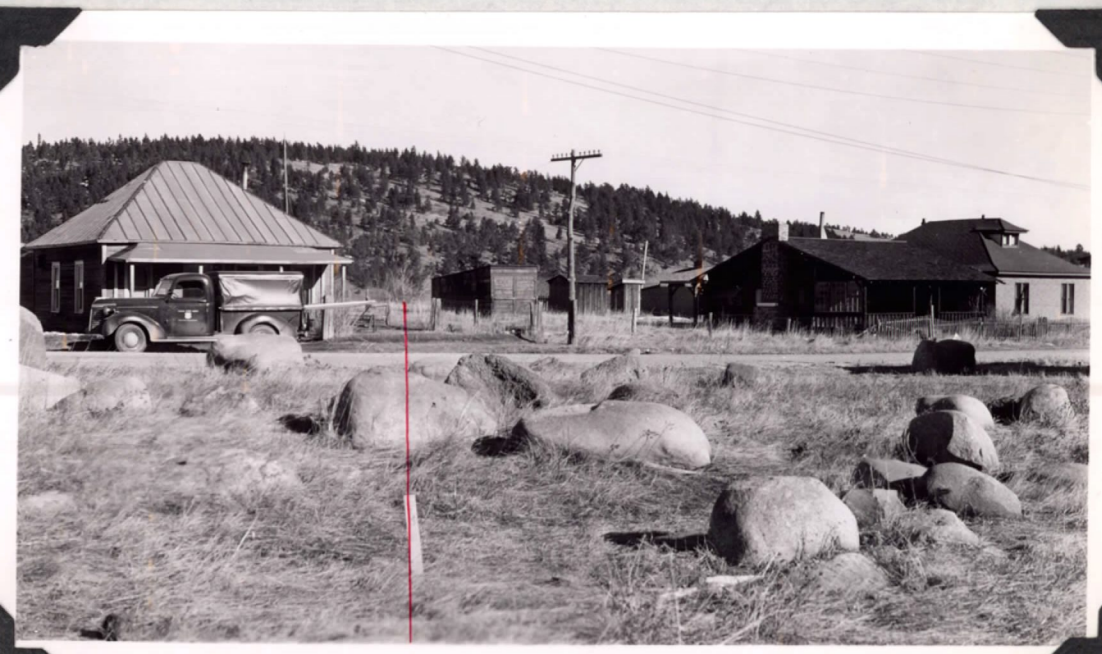


No. 69856. Looking southwest (back) to Nederland, Colorado, from opposite Station 30, showing location of surveys through town of Nederland. December 1942.



No. 69854. Looking southwest (back) from Station 25 showing existing and proposed approach to town of Nederland. December 1942.

No. 69858. Looking southwest (back) across Middle Boulder Creek from Station 11+00. December 1942.



No. 69860. Looking northeast (ahead) through town of Nederland, Colorado, from Station 11+00. This view shows houses bordering the centerline. January 6, 1943.

No. 69855. View looking east (ahead) from Station 30 on resurvey to avoid the Public Service Company reservoir. December 1942.

No. 69857. Looking west (back) toward Nederland, Colorado, from Station 40. December 1942.

No. 69861. Looking northwest (back) toward Nederland, Colorado, on "P" line relocation along reservoir from Station 88, beginning of Section I. January 6, 1943.

No. 69859. View looking east (downstream) on Middle Boulder Creek bridge site at Station 10+. January 6, 1943.

ESTIMATE

Route: Boulder-Idaho Springs
Project: Route No. 29
County: Boulder
State: Colorado

National Forest: Roosevelt
Prepared by: L. A. Hamilton
Title: Senior Highway Engineer
Date: August 2, 1943

This project has not been designed; therefore, detailed estimate cannot be furnished. The following is an approximate estimate given on the basis of estimated cost per mile:

Grading and Drainage: 3.741 mi. ($50,000 per mile). . . .	$187,050.
Surfacing and Bituminous Surfacing.	45,000.
Total	$232,050.

DRAINAGE STRUCTURES
BOULDER-IDAHO SPRINGS ROUTE 29

Station		Station	
994-998	Irrig. ditch	64+10	24" CMP
998-	24" CMP	69-	48" CMP
999-	24" CMP	74-	24" CMP
1003-	24" CMP	79-	48" CMP
1001 to 10+00 (Equa.)	subgrade	85	24" CMP
1000-1007	6" Perf. Pipe drain	136	24" CMP
1007+25	24" CMP	140	24" CMP
9+00	24" CMP	145+50	24" CMP
10+	Double conc. box culv.	151	24" CMP
11+65	24" CMP	155	24" CMP
13+50	24" CMP	160	24" CMP
14+40	48" CMP	163	24" CMP
17+50	24" CMP	166	24" CMP
21+50	24" CMP	174+50	24" CMP
24+25	36" CMP	178	24" CMP
28+25	24" CMP	182	24" CMP
29+60	24" CMP	188+50	24" CMP
33+00	24" CMP	195	24" CMP
35+00	24" CMP	200+25	24" CMP
39+25	24" CMP	205	24" CMP
42+40	24" CMP	210+50	24" CMP
47-	48" CMP	213-	30" CMP
52-	24" CMP	218	24" CMP
57-	24" CMP	223	24" CMP

* * * *

Form F. R. 58—Rev.

FEDERAL WORKS AGENCY
PUBLIC ROADS ADMINISTRATION

District No. 3
Report No. 12

Project name: Boulder-Idaho Springs Relocation
Project number: Colorado 29 Accts. No. 6393-3
State: Colorado
County: Boulder
Forest or park: Roosevelt National Forest
Length: 14.7 miles*
Roadway:
Type:

For period ending: June 15, 19 43
Contractor: S.P.A.E. by Public Roads Administration
Bids opened: , 19
Contract time began: , 19
Days allowed:
Days consumed to date:
Extensions granted: days.

(2) CONTRACTOR'S COSTS

CONSTRUCTION ITEMS	QUANTITIES			UNIT COSTS		TOTAL COSTS	
	This period	To date	Total probable	To date L. M. & S.	Probable L. M. & S.	To date	Probable
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
				$	$	$	$
			SEE REVERSE				
		*Station	0+00 to 57+00				
			136+00 to 530+00				

(3) TOTAL OF CONSTRUCTION ITEMS
CHARGES TO BE DISTRIBUTED
CHARGES TO BE PRORATED
PENALTY
TOTAL LIABILITIES

(4) Proratable factor
(5) Remarks

(6) Weather record for period:

Signature B. W. MATTESON
Title District Engineer

16—11043

(10) COSTS TO GOVERNMENT

CONSTRUCTION ITEMS	Per-cent comp.	UNIT BID PRICE	QUANTITIES			AMOUNTS		
			In proposal	To date	Probable	Bid	To date	Probable
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
ITEM		$	Miles Engineers Estimate	Miles to Date	Miles Probable	$ Engineers Estimate	$ To Date	$ Probable
Survey	64	511.23	5.0	6.399	10.0	1500.	3271.37	3500.00
Field Plans	47	68.27	5.0	4.739	10.0	250.	323.51	350.00
Office Plans			14.7		14.7	800.	318.94	650.00
Design			14.7	1.64	14.7	3170.	1991.08	2000.00
Material Invest.	68	9.63	14.7	10.00	14.7	780.	91.63	500.00
Bridge Invest.						1000.		500.00
Bridge Plans						500.		500.00
TOTALS,	75	× ×	× × ×	× × ×	× × ×	8000.	5996.53	8000.00

(11) DATE	FUNDS AVAILABLE	
	Authorized (Kind and amount)	Allotted (Kind and amount)
Set up	$8,000.00	FH
TOTAL,	$8,000.00	

	(12)	(8)
Construction		
Construction engr. (net)		
Survey and plans*	5996.53	8000.00
Other liabilities		
Total liabilities	5996.53	8000.00
AMOUNT AUTHORIZED	8000.00	8000.00
Balance of [redacted]	2003.47	0.00

* If from the same allotment.

16—11043 U. S. GOVERNMENT PRINTING OFFICE

REMARKS: Survey started April 1, 1941.
Field work resumed December 8, 1942.
Field work suspended January 20, 1943.