REPORT OF SOIL AND WATER ON
PROPOSED AGRICULTURAL AREA
MOHAVE DEMONSTRATION AREA.

General.

The soils of this area are almost entirely alluvial resulting from outwash materials from the adjacent sandstone uplands. The resulting soils are mainly fine sandy loams and loamy fine sands. The much folded Navajo sandstones lying to the north act as a water reservoir. The water which falls as rain slowly percolates through the sandstones strata finally appearing as seeps and springs along the escarpment wall. The percolating waters dissolve the soluble salts from the sandstones and shales, these salts appear in seep spots as salt incrustations. The open structure of the soils included within the agricultural area, however, makes possible the use of this water with very little danger if proper irrigation methods are used.

Soils.

The soils included within the agricultural area as outlined by Mr. Quate were formed by a gradual accumulation of outwash materials from the adjoining uplands. The soil profile is quite homogeneous. Only minor textural differences were encountered in the borings. Mr. Quate's plans call for a maximum cut of 18 inches in levelling and terracing. Recent alluvial soils formed under arid conditions have not been subjected to weathering, therefore, they do not have the sterile subsoil that one could encounter in older soils, or soils formed under humid conditions. Fifty borings were made within this area and no clay or sterile sands were encountered. Due to the open structure aeration progresses to great depths in arid soils. In view of these findings, levelling to the required depth will have no appreciable effect upon the fertility of the soil. The map which is enclosed with this report shows the location of borings and the textural log of each hole.

Water.

Water for irrigation will be developed largely from springs. Salt analysis of these spring waters are given in the following table:

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These analysis by J. F. Breazeale, Arizona Experiment Station.

Lab. No.	37	38	39	40	41	42	43	44	45	46	47	48
								L-4	L-10	S-1	T-1	
Field No.	M-7	M-8	M-9	M-12	V-1	V-2	V-15	L-9	L-15	S-6	T-2	K-17
Total Salts	196	177	188	323	258	330	311	487	568	250	180	189
Calcium	22	22	22	30	15	15	37	67	67	30	30	15
Magnesium	4	4	4	7	tr	tr	10	15	19	7	7	tr
Sodium	21	36	30	21	88	85	53	74	83	37	16	18
Carbonates	24	53	25	19	24	50	17	22	17	22	24	17
Bicarbonates	104	41	76	95	59	88	85	85	183	105	66	75
Chlorides	16	16	14	16	38	72	74	140	114	54	28	20
Sulphates	5	5	5	35	34	20	35	84	85	15	15	10

All these samples contain Carbonates or Black Alkali, the amounts, however, cannot be considered dangerous on the sandy soils found on this area. Water of this class while not the most desirable for irrigation may be safely used if precautions are taken to prevent the accumulation of salts. These precautions are: (1) selection of soils with open subsoils. (2) Flood irrigation using sufficient water to keep the salts moving downward. This means that soils with poor under drainage must be avoided.

The lower safety limit of this area is outlined on the accompanying sketch map. The diagrammatic soil section illustrates the occurance of silt lenses and clay substratum along the outwash fan(see map for section included.) When this area is put under irrigation there will be a tendency for the water table to rise, this will be especially true where the sandy soils are underlain by impervious clays. The ascending waters bring the dissolved salts to the surface where they are accumulated as the water evaporates.

The working plan as outlined by Mr. Jacobs calls for planting seeps to trees. Such plantings are foredeemed to failure. The salts carried in solution by the seepage waters will tend to concentrate in these areas - only plants of a hight salt tolerance will have any chance of survival. Qualitative tests have shown a predominate of sodium salts in these seepage waters.

Structures.

The reservoir site was investigated thoroughly with regard to soil texture and reaction. The dam site proper was sectioned to a depth of 21 feet. The accompanying textural log shows the findings. Alkali conditions very similar to those encountered at The Cove Demonstration Area were found here. Tunnelling and subterranean erosion is very much in evidence at the site selected. A 7 foot boring in the arroyo bed at the dam site shows that the underlying stratum consists of a porous sand. The water table was encountered at 19 feet below the surface proper. Loss through seepage will probably run quite high because of the sand underlying the arroyo bottom. Alkali tests were made upon the materials that are to be used for making the fill. The salt concentrations run quite high (see analysis of samples 4-5-6). The materials consist largely of fine sand, sand and gravel with very little

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binding material. The suggestion was made to Mr. Quate that some form of cut-off wall be included in his plans. In view of the fact that this will be a permanent storage reservoir, it will be well to plan a structure that will withstand these unfavorable conditions.

In discussing his plans, Mr. Quate said that he had included within his plans certain methods of controlling the small sand dune in the canyon above the dam site. He was of the opinion that much of the sand washed down by the stream came from this source. Our inspection leads us to believe that the principal source of sand is an old lake bed through which the stream cuts. Seepage and side erosion is responsible for much of the remaining sediments. In view of these findings construction of terraces and wind fences in this small dune area arehardly justified.

A study of the canyon flood indicates that run-off from the mesa is very low. There are no indications of recent severe cutting. With the exception of a few overfalls the bottom of the drainage way is well protected by vegetation. The folded sandstones and sand dunes of the mesa surface take care of most of the rain water, by absorption. There seems to be no need of structures above the canyon.

The extension or development of additional agricultural areas should be made only after a careful and detailed study of the proposed areas. Only soils well adapted should be selected as the land supply far exceeds the available water supply.

M. R. Isaacson.

Comments:

In the case of water represented by samples 38 and 42 the need for unusual care in using this water for irrigation needs to be strongly emphasized. The water should always be used in larger quantities, so as to maintain a constant leaching action through the soil. It would be a safe procedure to reduce the duty of this water by at least two times. That is, assuming a drop duty of one acre foot during the irrigation season, the duty could well be reduced to two acre feet. No attempt should be made toward any agricultural development below the safety limit shown by Mr. Isaacson. The water-table along the safety limit is already high and, with the proposed change in irrigation practices, there will be some tendency toward a rise in the underground water level. If this develops and if the local topography permits, it will be well to consider reducing the level of the water by means of some type of drain.

A. T. Strahorn.

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LOG OF TESTS HOLES FOR MOHAVE
DEMONSTRATION AREA DAM SITE

Sample Number	Depth in Inches	Texture	Alkali P.P.M.	Notes
1	0-12	Loamy fine sand	770	
	12-24	"	4600	Slight compaction at 13" to 15"
	24-36	"	4400	Compaction starts at 33"
	36-48	compacted find sandy loam	3650	
	48-60	"	2650	
	60-72	fine sandy clay	3550	
	72-84	"	3400	
2	0-12	fine sand	850	
	12-24	fine sandy loam	1500	
	24-36	loamy fine sand	1400	
	36-48	fine sandy clay	1380	compaction starts at 48"
	48-60	fine sand	1120	compaction ends 51"
	60-72	fine sand	1050	
	72-84	fine sand	1480	Visible accum.of salt contains some clay
3	0-12	fine sandy loam		Compact
	12-24	"		"
	24-36	"	no	"
	36-48	"	Alkali	"
	48-60	"	Samples	"
	60-72	"	Taken	Salty layer
	72-84	"		
	84-96	"		
	96-108	"		
	108-120	"	See	Gravels at 116"
	120-132	gravelly fine sandy loam	Samples	Cemented
	132-144	"	Land 2	"
	144-156	fine sandy loam		less compact
	156-168	"		"
	168-180	fine sand	2000	no compaction
	180-192	"	1500	"
	192-204	"	1180	"
	204-216	"	900	"
	216-228	"	720	wet
	228-240		800	no compaction
	240-252*		No sample	Excessive water
4	-0-2 *		3700	Fill materials dom- fine sand and gravel-
5	2-8'*		6200 1400	contains very little binding materials.
6	8-12'			

*Composite Samples.

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALTS P. P. M.	TEXTURE
7	7	0-12	1400	fine sandy loam
		12-24	1500	"
		24-36	1070	loamy fine sand
8	8	0-12	470	fine sandy loam
		12-24	600	"
		24-36	900	"
9	9	0-12	800	"
		12-24	1090	"
		24-36	700	loamy fine sand
10	10	0-12	200	fine sandy loam
		12-24	840	"
		24-36	900	loamy fine sand
11	11	0-12	800	fine sandy loam
		12-24	1000	"
		24-36	1060	"
12	12	0-12	1020	"
		12-24	1090	loam
		24-36	1200	fine sandy loam
13	13	0-12	1100	fine sandy loam
		12-24	1800	"
		24-36	1460	loamy fine sand
14	14	0-12	1000	fine sandy loam
		12-24	1300	"
		24-36	1350	sandy clay
15	15	0-12	200	loamy finesand
		12-24	800	"
		24-36	200	"
16	16	0-12	300	loamy sand
		12-24	800	fine sandy loam
		24-36	1100	loam
17	17	0-12	750	loamy fine sand
		12-24	1080	"
		24-36	1350	fine sandy loam
18	18	0-12	1100	loamy fine sand
		12-24	4000	fine sandy loam
		24-36	4400	"
19	19	0-12	820	fine sand
		12-24	820	fine sandy loam
		24-36	780	"
20	20	0-12	700	"
		12-24	350	loamy fine sand
		24-36	1020	fine sandy loam
21	21	0-12	1200	fine sandy loam
		12-24	1280	fine sandy loam
		24-36	1350	"
22	22	0-12	1700	"
		12-24	960	"
		24-36	1100	"

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALES P.P.M.	TEXTURE
23	23	0-12	600	loamy fine sand
		12-24	740	fine sandy loam
		24-36	840	sandy clay loam
24	24	0-12	840	loamy fine sand
		12-24	500	loamy fine sand
		24-36	-200	fine sand
25	25	0-12	710	fine sandy loam
		12-24	-200	loamy fine sand
		24-36	300	fine sandy loam
26	26	0-12	-30	loamy fine sand
		12-24	950	loamy fine sand
		24-36	860	fine sandy loam
27	27	0-12	-200	loamy fine sand
		12-24	-200	fine sand, loam
		24-36	-200	loamy fine sand
28	28	0-12	-200	loamy fine sand
		12-24	-200	fine sandy loam
		24-36	-200	"
F	29	0-12		fine sand
		12-24		loamy fine sand
		24-36		"
A	30	0-12		fine sand
		12-24		"
		24-36		loamy fine sand
B	31	0-12		fine sand
		12-24		fine sand
		24-36		loamy fine sand
C	32	0-12	1260	fine sandy loam
		12-24	550	loamy fine sand
		24-36	-200	"
D	33	0-12		fine sandy loam
		12-24		fine sandy loam, heavy texture.
		24-36		"
E	34	0-12	400	fine sandy loam
		12-24	3000	silt loam
		24-36		
2-L	35	0-12	-200	fine sandy loam
		12-24	520	"
		24-36	-200	loamy fine sand
		36-48	-200	"
3-L	36	0-12	-200	fine sand
		12-24	730	"
		24-36	500	"
4-L	37	0-12	-200	loamy fine sand
		12-24	-200	"
		24-36	-200	"
		36-48	-200	fine sand
29	38	0-12	-200	loamy fine sand
		12-24	200	"
		24-36	400	fine sandy loam

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALTS P.P.M.	TEXTURE
30	39	0-12	2750	loamy fine sand
		12-24	3600	fine sandy clay
		24-36	1600	fine sandy loam
		36-48	800	fine sand
		48-60	300	"
		60-72	1360	"
5-L	40	0-12	-200	"
		12-24	-200	"
		24-36	1250	"
		36-48	1350	loamy fine sand
31	41	0-12	640	loamy fine sand
		12-24	1920	fine sandy loam
		24-36	2450	fine sandy clay
32	42	0-12	-200	loam, fine sand
		12-24	-200	fine sandy loam
		24-36	-200	"
		36-48	450	loamy fine sand
		48-60	1200	loamy fine sand
		60-72	1300	fine sandy loam
		72-84	1300	fine sandy clay
33	43	0-12	5200	loamy fine sand, 6" clay
		12-24	6400	6" fine sandy loam
		24-36	3100	
34-	44	0-12	.01440	fine sandy loam
		12-24	.05600	clay
		24-36	650	clay
		36-48	1500	fine sandy clay
		48-60	1120	"

REPORT OF SOIL AND WATER
LITTLEFIELD SUB-AREA
MOHAVE DEMONSTRATION AREA.

Soil conditions at Littlefield are almost identical with those discussed in the Mohave report. Wind erosion has built up dunes which will necessitate deeper cuts and filling in terracing. The mode of formation of these dunes however, will probably obviate any danger from sterile subsoils. This, however, does not apply to the dunes consisting primarily of sand lying directly west of the agricultural area as outlined by Mr. Hunter(See map).

Water samples No.38 and 42 are a composite of the springs(see Mohave report) which will be used to irrigate this area. The total salts run somewhat higher than the irrigation waters used at Mohave, this, however, does not make them inferior since the soluble calcium runs quite high. This will tend to counteract the effects of the carbonates or Black Alkali. Examinations of arroyo cuts indicate sandy soils to a depth of at least 20 feet. Precautions must be taken in irrigating to prevent the accumulation of salts. The water must not be spread too thin. The planting of trees in seepage spots is not recommended.

M. R. Isaacson.

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LOG OF TEST HOLES FOR NORMAN
DEMONSTRATION AREA DAM SITE

SAMPLE NUMBER	DEPTH IN INCHES	TEXTURE	ALKALI P.P.M.	NOTES
1	0-12	loamy fine sand	770	
	12-24	loamy fine sand	4800	Slight compaction at 15" to 18".
	24-36	loamy fine sand	4400	Compaction starts at 35".
	36-48	compacted fine sandy loam	3850	
	48-60	compacted fine sandy loam	2850	
	60-72	fine sandy clay	3550	
	72-84	fine sandy loam	3400	
2	0-12	fine sand	850	
	12-24	fine sandy loam	1500	
	24-36	loamy fine sand	1400	
	36-48	fine sandy clay	1350	compaction starts 45"
	48-60	fine sand	1150	compaction ends 51"
	60-72	fine sand	1050	
	72-84	fine sand	1480	visible accum. of salt. contains some clay.
3	0-12	fine sandy loam	----	Compact.
	12-24	fine sandy loam		Compact.
	24-36	fine sandy loam	No	Compact.
	36-48	fine sandy loam	Alkali	Compact.
	48-60	fine sandy loam	Samples	Compact.
	60-72	fine sandy loam	Taken	Salty layer
	72-84	fine sandy loam		
	84-96	fine sandy loam		
	96-108	fine sandy loam		
	108-120	fine sandy loam	See	Gravels at 116"
	120-132	Gravelly fine sandy loam	Samples	Cemented
	132-144	Gravelly fine sandy loam	Land 2	Cemented
	144-156	fine sandy loam		Loose compact
	156-168	fine sandy loam		less compact
	168-180	fine sand	2000	No compaction
	180-192	fine sand	1500	No compaction
	192-204	fine sand	1150	No compaction
	204-216	fine sand	900	No compaction
	216-228	fine sand	750	Wet
	228-240	fine sand	800	No compaction
	240-252	fine sand	No sample	Excessive water
4	0-12"		3700	Fill materials
5	2"-8'*		6200	dam-fine sand and gravel-
6	8'-12'*		1400	contains very little binding materials.

*Composite Samples

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALTS P.P.M.	TEXTURE
7	7	0-12	1400	fine sandy loam
		12-24	1500	fine sandy loam
		24-36	1070	loamy fine sand
8	8	0-12	470	fine sandy loam
		12-24	600	fine sandy loam
		24-36	900	fine sandy loam
9	9	0-12	800	fine sandy loam
		12-24	1090	fine sandy loam
		24-36	700	loam fine sand
10	10	0-12	800	fine sandy loam
		12-24	840	fine sandy loam
		24-36	900	loamy fine sand
11	11	0-12	800	fine sandy loam
		12-24	1000	fine sandy loam
		24-36	1080	fine sandy loam
12	12	0-12	1090	fine sandy loam
		12-24	1090	loam
		24-36	820	fine sandy loam
13	13	0-12	1100	fine sandy loam
		12-24	1800	fine sandy loam
		24-36	1480	loamy fine sand
14	14	0-12	1900	fine sandy loam
		12-24	1500	fine sandy loam
		24-36	1850	sandy clay
15	15	0-12	800	loamy fine sand
		12-24	600	loamy fine sand
		24-36	800	loamy fine sand
16	16	0-12	800	loamy sand
		12-24	900	fine sandy loam
		24-36	1100	loamy
17	17	0-12	750	loamy fine sand
		12-24	1020	loamy fine sand
		24-36	1350	fine sandy loam
18	18	0-12	1100	loamy fine sand
		12-24	4000	fine sandy loam
		24-36	4400	fine sandy loam
19	19	0-12	820	fine sand
		12-24	820	fine sandy loam
		24-36	780	fine sandy loam
20	20	0-12	700	fine sandy loam
		12-24	350	loamy fine sand
		24-36	1020	fine sandy loam
21	21	0-12	1200	fine sandy loam
		12-24	1280	fine sandy loam
		24-36	1350	fine sandy loam
22	22	0-12	1700	fine sandy loam
		12-24	960	fine sandy loam
		24-36	1100	fine sandy loam
23	23	0-12	600	loamy fine sand
		12-24	740	fine sandy loam
		24-36	840	sandy clay loam

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALTS P.P.M.	TEXTURE
24	24	0-12	840	loamy fine sand
		12-24	500	loamy fine sand
		24-36	-200	fine sand
25	25	0-12	710	fine sandy loam
		12-24	-200	loamy fine sand
		24-36	300	fine sandy loam
26	26	0-12	-200	loamy fine sand
		12-24	630	loamy fine sand
		24-36	660	fine sandy loam
27	27	0-12	-200	loamy fine sand
		12-24	-200	fine sand, loam
		24-36	-200	loamy fine sand
28	28	0-12	-200	loamy fine sand
		12-24	-200	fine sandy loam
		24-36	-200	fine sandy loam
F	29	0-12		fine sand
		12-24		loamy fine sand
		24-36		loamy fine sand
A	30	0-12		fine sand
		12-24		fine sand
		24-36		loamy fine sand
B	31	0-12		fine sand
		12-24		fine sand
		24-36		loamy fine sand
C	32	0-12	1260	fine sandy loam
		12-24	550	loamy fine sand
		24-36	-200	loamy fine sand
D	33	0-12		fine sandy loam
		12-24		fine sandy loam, heavy text.
		24-36		fine sandy loam, heavy text.
E	34	0-12	400	fine sandy loam
		12-24	3000	silt loam
		24-36		
2-L	35	0-12	-200	fine sandy loam
		12-24	520	fine sandy loam
		24-36	-200	loamy fine sand
		36-48	-200	loamy fine sand
3-L	36	0-12	-200	fine sand
		12-24	720	fine sand
		24-36	500	fine sand
4-L	37	0-12	-200	loamy fine sand
		12-24	-200	loamy fine sand
		24-36	-200	loamy fine sand
		36-48	-200	fine sand
29	38	0-12	-200	loamy fine sand.
		12-24	200	loamy fine sand
		24-36	400	fine sandy loam
30	39	0-12	2750	loamy fine sand
		12-24	5600	fine sandy clay
		24 12-36	1600	fine sandy loam
		36-48	880	fine sand
		48-60	300	fine sand.
		60-72	1360	fine sand.

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FIELD NO.	MAP NO.	DEPTH IN INCHES	TOTAL SALTS P.P.M.	TEXTURE
5-L	40	0-12	-200	fine sand
		12-24	-200	fine sand
		24-36	1250	fine sand
		36-48	1350	loamy fine sand
31	41	0-12	840	loamy fine sand
		12-24	1920	fine sandy loam
		24-36	2450	fine sandy clay
32	42	0-12	-200	loamy fine sand
		12-24	-200	fine sandy loam
		24-36	-200	fine sandy loam
		36-48	450	loamy fine sand
		48-60	1200	loamy fine sand
		60-72	1300	fine sandy loam
		72-84	1300	fine sandy clay
33	43	0-12	5200	loamy fine sand 6" clay
		12-24	6400	6" fine sandy loam
		24-36	3100	
34	44	0-12	.01440	fine sandy loam
		12-24	.05600	clay
		24-36	650	clay
		36-48	1500	fine sandy clay
		48-60	1120	fine sandy clay

Navajo Project Alkali Soil Samples
Moenave - Collected by Isaacson, Lovald, Hubbell - Analysis by Miller.
February 4, 1955.

Lab.No.	Field No.	Depth.	T.Salt%	P.P.M.
1208	1	0-12	.097	970
1209	1	12-24	.460	4600
1210	1	24-36	.440	4400
1211	1	36-48	.355	3500
1212	1	48-60	.265	2650
1213	1	60-72	.353	3530
1214	1	72-84	.340	3400
1215	2	1-12	.085	850
1216	2	12-24	.150	1500
1217	2	24-36	.140	1400
1218	2	36-48	.138	1380
1219	2	48-60	.112	1120
1220	2	60-72	.105	1050
1221	2	72-84	.148	1480
1222	3	12'-15 ft.	.200	2000
1223	3	15'-16 ft.	.150	1500
1224	3	16'-17 ft.	.118	1180
1225	3	17'-18 ft.	.090	900
1226	3	18'-19 ft.	.072	720
1227	3	19'-20 ft.	0.020	200
1228	4	Surf.of fill	.370	3700

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Navajo Project Alkali Soil Samples

Meeteve - Collected by Isaacson, Lovald, Hubbell - Analysis by Miller.
February 4, 1955.

Lab.No.	Field No.	Depth	T. Salt %	P. P. M.
1229	5	Center of fill	.620	6200
1230	6	Bottom of fill	.140	1400
1231	7	0-12	.140	1400
1232	7	12-24	.130	1300
1233	7	24-36	.107	1070
1234	8	0-12	.047	470
1235	8	12-24	0.060	600
1236	8	24-36	.090	900
1237	9	0 -12	.080	800
1238	9	12-24	.109	1090
1239	9	24-36	.070	700
1240	10	0-12	.020	200
1241	10	12-24	.084	840
1242	10	24-36	.090	900
1243	11	0-12	.080	800
1244	11	12-24	.100	1000
1245	11	24-36	.106	1060
1246	12	0-12	.102	1020
1247	12	12-24	.109	1090
1248	12	24-36	.082	820
1249	13	0- 12	.110	1100
1250	13	12-24	.180	1800
1251	13	24-36	.146	1460
1252	14	0-12	.100	1000
1253	14	12-24	.150	1500
1254	14	24-36	.135	1350
1255	15	0-12	0.020	-200
1256	15	12-24	.060	600
1257	15	24-36	.020	200
1258	16	0-12	.080	800
1259	16	12-24	.080	800
1260	16	24-36	.110	1100
1261	17	0-12	.075	750
1262	17	12-24	.102	1020
1263	17	24-36	.135	1350
1264	18	0-12	.110	1100
1265	18	12-24	.400	4000
1266	18	24-36	.440	4400
1267	19	0-12	.082	820
1268	19	12-24	.082	820
1269	19	24-36	.078	780
1270	20	0-12	.070	700
1271	20	12-24	.035	350
1272	20	24-36	.102	1020
1273	21	0-12	.120	1200
1274	21	12-24	.128	1280

F. W. 276

Navajo Project Alkali Soil Samples
Moenave - Collected by Isaacson, Levald, and Hubbell-Analysis by Miller.
Feb.4,1955.

Lab.No.	Field No.	Depth.	T. Salt%	P.P.M.
1275	21	24-36	.135	1350
1276	22	0-12	.170	1700
1277	22	12-24	.094	940
1278	22	24-36	.110	1100
1279	23	0-12	.060	600
1280	23	12-24	.074	740
1281	23	24-36	.0 84	840
1282	24	0-12	.084	840
1283	24	12-24	.050	500
1284	24	24-36	-.020	-200
1285	25	0- 12	.071	710
1286	25	12-24	-.020	-200
1287	25	24-36	.030	300
1288	26	0-12	-.020	-200
1289	26	12-24	.035	350
1290	26	24-36	.066	660
1291	27	0-12	-.020	-200
1292	27	12-24	-.020	-200
1293	27	24-36	-.020	-200
1294	28	0-12	-.020	-200
1295	28	12-24	-.020	-200
1296	28	24-36	-.020	-200
1297	29	0-12	-.020	-200
1298	29	12-24	.020	200
1299	29	24-36	.040	400
1300	30	0-12	.275	2750
1301	30	12-24	.560	5600
1302	30	24-36	.160	1600
1303	30	36-48	.066	660
1304	30	48-60	.030	300
1305	30	60 plus	.136	1360
1306	31	0-12	.034	340
1307	31	12-24	.192	1920
1308	31	24-36	.245	2450
1309	32	0-12	-.020	-200
1310	32	12-24	-.020	-200
1311	32	24-36	-.020	-200
1312	32	36-48	.045	450
1313	32	48-60	.120	1200
1314	32	60-72	.130	1300
1315	32	72-84	.130	1300
1316	33	0-12	.520	5200
1317	33	12-24	.640	6400
1318	33	24-36	.510	5100
1319	34	0-12	.144	1440
1320	34	12-24	.560	5600
1321	34	24-36	.065	650
1322	34	36-48	.150	1500
1323	34	48-60	.112	1120

W. 277

Navajo Project Alkali Soil Samples
Moenave - Collected by Isaacson, Lovald, and Hubbell - Analysis by Miller.
Feb.4,1935.

Lab.No.	Field No.	Depth	T. Salt %	P.P.M.
1324	C	0-12	.126	1260
1325	C	12-24	.055	550
1326	C	24-36	-.020	-200
1327	E	0-12	.040	400
1328	E	12-24	.300	3000

Comments:

In the case of water represented by samples 44 and 45 the need for unusual care in using this water for irrigation needs to be strongly emphasized. The water should always be used in larger quantities, so as to maintain a constant leaching action through the soil. It would be a safe procedure to reduce the duty of this water by at least two times. That is, assuming a drop duty of one acre foot during the irrigation season, the duty could well be reduced to two acre feet. No attempt should be made toward any agricultural development below the safety limit shown by Mr. Isaacson. The water-table along the safety limit is already high and, with the proposed change in irrigation practice, there will be some tendency toward a rise in the underground water level. If this develops and if the local topography permits, it will be well to consider reducing the level of the water by means of some type of drain.

F.W. 278

NAVAJO PROJECT ALKALI SOIL SAMPLES

Samples Collect ed on Western Reservation Trip by Isaacson and Lovald

Lab. No.	Field No.	S. Type	Depth	T.Salt %	P.P.M.
		Tuba City School Farm			
826	TS 1		0-12	.375	3750
827	TS 2		12-24	.365	3650
828	TS 3		24-36	.340	3400
829	TS 4		0-12	.510	5100
830	TS 5		12-24	.410	4100
831	TS 6		24-36	.180	1800
		Hopi 4H Club			
832	4H1		0-12	.140	1400
833	4H2		12-24	.160	1600
834	4H3		24-36	.310	3100
		Hopi Village			
835	M-1		0-12	1.160	11600
836	M-2		12-24	1.200	12000
837	M-3		24-36	.970	9700
838	M-4		0-12	.680	6800
839	M-5		12-24	.850	8500
840	M-6		24-36	.952	9520
841	M-7		0-12	.770	7700
842	M-8		12-24	.360	3600
843	M-9		24-36	.195	1950
844	M-10		0-12	.675	6750
845	M-11		12-24	.700	7000
846	M-12		24-36	.520	5200
847	M-13		0-12	.705	7050
848	M-14		12-24	.314	3140
		Betakin			
849	A		0-12	.100	1000
850	B		12-24	.078	780
851	C 1		0-12	.028	280
852	C 2		12-24	.067	670
853	C 3		Surface	.137	1370
854	A-1	From around roots	Cottonwood	.180	1800
		Kayenta			
855	A-2		0-6	.120	1200
856	A-3	Kleethla Canyon	0-12	.156	1580
857	A-4	1/4 Mi. W. Red Lake	24-36	.232	2320

F. W. 279

NAVAJO PROJECT ALKALI SOIL SAMPLES

Samples Collect ed on Western Reservation Trip by Isaacson and Lovald

Lab. No.	Field No.	S. Type	Depth	T.Salt %	P.P.M.
		Tuba City School Farm			
826	TS 1		0-12	.375	3750
827	TS 2		12-24	.365	3650
828	TS 3		24-36	.340	3400
829	TS 4		0-12	.510	5100
830	TS 5		12-24	.410	4100
831	TS 6		24-36	.180	1800
		Hopi 4H Club			
832	4H1		0-12	.140	1400
833	4H2		12-24	.160	1600
834	4H3		24-36	.310	3100
		Hopi Village			
835	M-1		0-12	1.160	11600
836	M-2		12-24	1.200	12000
837	M-3		24-36	.970	9700
838	M-4		0-12	.680	6800
839	M-5		12-24	.650	6500
840	M-6		24-36	.952	9520
841	M-7		0-12	.770	7700
842	M-8		12-24	.560	5600
843	M-9		24-36	.195	1950
844	M-10		0-12	.675	6750
845	M-11		12-24	.700	7000
846	M-12		24-36	.520	5200
847	M-13		0-12	.705	7050
848	M-14		12-24	.514	5140
		Betakin			
849	A		0-12	.100	1000
850	B		12-24	.078	780
851	C 1		0-12	.028	280
852	C 2		12-24	.067	670
853	C 3		Surface	.137	1370
854	A-1	From around roots	Cottonwood	.180	1800
		Kayenta			
855	A-2		0-6	.120	1200
856	A-3	Kleethla Canyon	0-12	.158	1580
857	A-4	1/4 Mi. W. Red Lake	24-36	.232	2320

F.W. 280

NAVAJO PROJECT ALKALI SOIL SAMPLES

Samples Collected on Western Reservation Trip by Isaacson and Levald

Tuba City School Farm

Lab. No.	Field No.	S. Type	Depth	T.Salt %	P.P.M.
826	TS 1		0-12	.375	3750
827	TS 2		12-24	.365	3650
828	TS 3		24-36	.340	3400
829	TS 4		0-12	.510	5100
830	TS 5		12-24	.410	4100
831	TS 6		24-36	.180	1800
		Hopi 4H Club			
832	4H1		0-12	.140	1400
833	4H2		12-24	.160	1600
834	4H3		24-36	.310	3100
		Hopi Village			
835	M-1		0-12	1.160	11600
836	M-2		12-24	1.200	12000
837	M-3		24-36	.970	9700
838	M-4		0-12	.680	6800
839	M-5		12-24	.880	8800
840	M-6		24-36	.952	9520
841	M-7		0-12	.770	7700
842	M-8		12-24	.360	3600
843	M-9		24-36	.195	1920
844	M-10		0-12	.675	6750
845	M-11		12-24	.700	7000
846	M-12		24-36	.520	5200
847	M-13		0-12	.705	7050
848	M-14		12-24	.314	3140
		Betakin			
849	A		0-12	.100	1000
850	B		12-24	[illegible]	790
851	C 1		0-12	.028	280
852	C 2		12-24	.067	670
853	C 3		Surface	.137	1370
854	A-1	From around roots Cottonwood		.180	1800
		Kayenta			
855	A-2		0-6	.120	1200
856	A-3	Kleethla Canyon	0-12	.158	1580
857	A-4	1/4 Mi. W. Red Lake	24-36	.252	2520

F. W. 281

UNITED STATES
DEPARTMENT OF THE INTERIOR
SOIL EROSION SERVICE

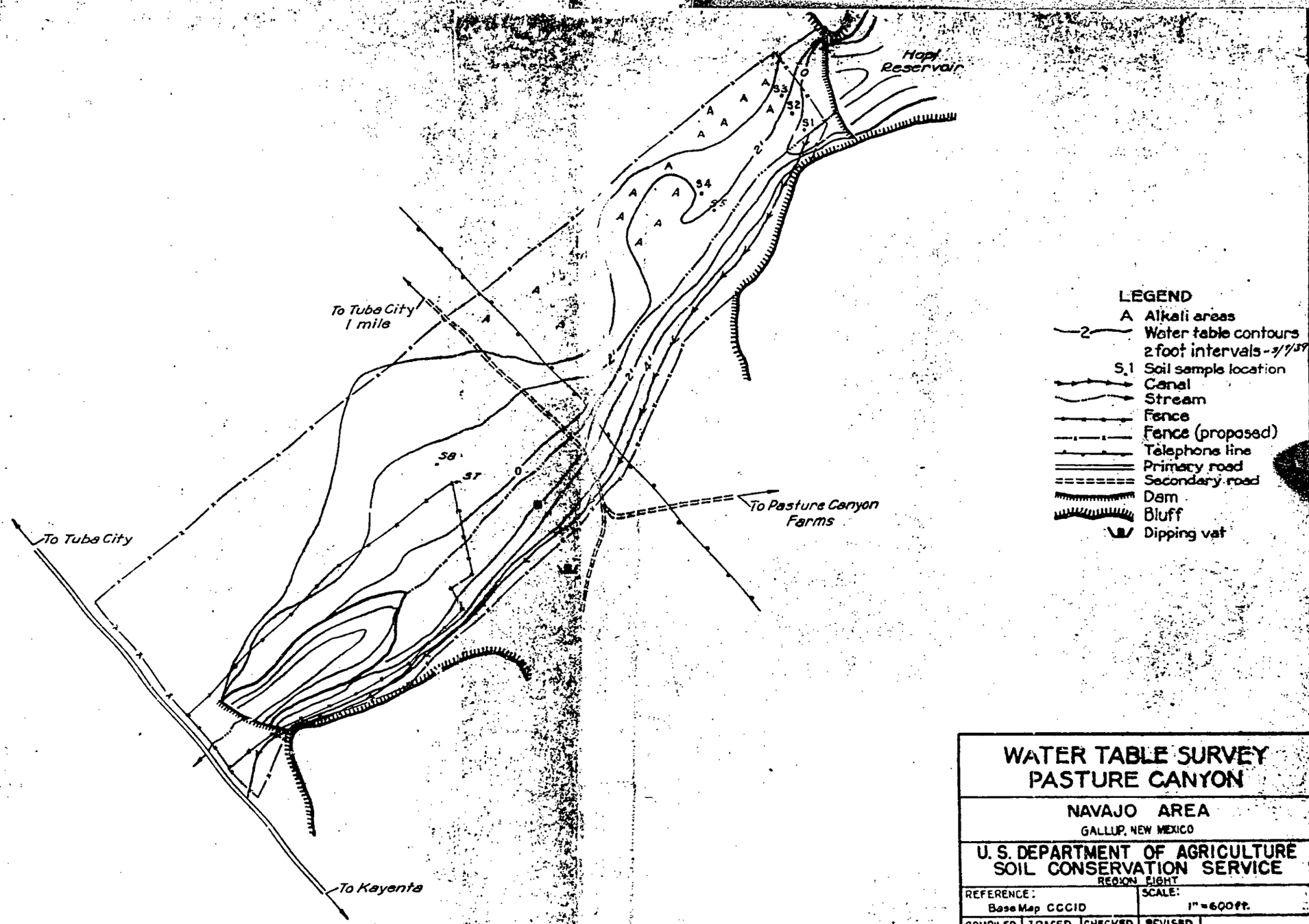
Collected by Isaacson and Lovald — Analysis by C. W. Miller

No.	Location	Depth	T.S. in P.P.M.
Ts-1	Tuba City School Farm	0-12	3750
Ts-2	" " " "	12-24	3650
Ts-3	" " " "	24-36	3400
Ts-4	" " " " S. of Pear Orchard	0-12	5100
Ts-5	" " " " " " " "	12-24	4100
Ts-6	" " " " " " " "	24-36	1800
4H-1	Hopi 4H Club 3rd Plot	0-12	1400
4H-2	" " " " "	12-24	1600
4H-3	" " " " "	24-36	3100
M-1	Hopi Village 60 ft. S. of pit	0-12	11600
M-2	" " " " " " "	12-24	12000
M-3	" " " " " " "	24-36	9700
M-4	" " 80 " " " Road S. of Pit	0-12	6800
M-5	" " " " " " " " " "	12-24	8500
M-6	" " " " " " " " " "	24-36	9500
M-7	" " Tule Patch	0-12	7700
M-8	" " " "	12-24	3600
M-9	" " " "	24-36	1950
M--10	" " 40 ft. E. of Tule Patch	0-12	6750
M-11	" " " " " " " "	12-24	7000
M-12	" " " " " " " "	24-36	5200
M-13	" " 50 ft. S.E. of L. Poplar	0-12	7050
M-14	" " " " " " " "	12-24	3140
A	Betakin Garden (strawberries)	0-12	1000
B	" " "	12-24	780
C-1	" Cornfield 50 ft. N. of Fence	0-12	280
C-2	" " " " " " "	12-24	670
C-3	" Alfalfa Field	surface	1370
A-1	" From roots of cottonwood	----	1800
A-2	Kayenta ¾ Mi. W. of dam	0-6	1200
A-3	Kleethla Canyon	0-12	1580
A-4	1/4 Mi. W. of Red Lake	24-36	2320

Copy mailed to Mr. Guy Hamilton 10/4/34

F.W. 282

CV-6417-201



WATER TABLE SURVEY PASTURE CANYON				
NAVAJO AREA GALLUP, NEW MEXICO				
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE REGION EIGHT				
REFERENCE: Base Map CCCID			SCALE: 1" = 600 ft.	
COMPILED H.F. Johnson	TRACED J. Williams	CHECKED	REVISED	N-2303

F. W. 283

NN000975