Engineering Division, Study Group
Report. Unit No. 10.

Navajo Service. Jan. 1937.

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UNIT 10

STUDY GROUP REPORT

ENGINEERING DIVISION

JANUARY 1937

APPROVED _____ SUBMITTED _____

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ENGINEERING REPORT
UNIT 10

JANUARY 1937

INTRODUCTION

LOCATION. Land Management Unit number 10 is geographically in the center of the Navajo District. With original boundaries it covers 799,256 surface acres. Changes as recommended and shown on the base map would increase this to 814,397.

The unit is approximately 44 miles long from north to south and 32 miles wide from east to west. It lies between meridians 109°15' and 110°00' and parallels 35°45' and 36°30'. The Demonstration Areas of Canyon de Chelly and Frazier are located in the vicinity of Chin Lee.

POPULATION AND CONCENTRATION. The population of the Unit is estimated at 2,196. The major concentration is in the Chin Lee Valley and the north half of Beautiful Valley. This is no doubt due to the agricultural land available there. While wind and water erosion has greatly affected the farm land in Beautiful Valley during recent years it was evidently at one time as good as any that could be found in the Unit. Lesser population concentrations are found at Nazlini, Canyon de Chelly, Tse-lani, Black Mountain and at Rough Rock in the winter. There are approximately 294 consumption groups and 40,769 sheep units of livestock.

TRADING POSTS, SCHOOLS AND HOSPITALS. Trading posts are found at Chin Lee, Nazlini, Tse-lani, Black Mountain, Frazier's in the Chin Lee Valley and Rough Rock. A day school at Rough Rock and a boarding school at Chin Lee constitute the educational facilities. One hospital is located at Chin Lee.

TELEPHONES. A telephone line enters the Unit from Ganado and follows the Ganado-Chin Lee road to Chin Lee and thence to Rough Rock. Another line, an extension, from the Ganado-Fluted Rock-Sawmill line, comes in to Nazlini.

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ROADS. All roads in the Unit are unimproved and of a secondary nature. The main arteries are from Ganado to Chin Lee then to Rough Rock, from Chin Lee down the Valley to Round Rock, Chin Lee to Black Mountain, Chin Lee to Sawmill, Chin Lee to Greasewood store in Unit 11, and Ganado to Tse-lani. Small portions of these roads have been worked and drainage provided for. Some culverts have been placed and bridges are found near Chin Lee but generally all roads are unimproved, with the exception of the Chin Lee to Sawmill and Greasewood roads which are usually closed in the winter. All roads in the Unit are passable yearlong.

ALTITUDE AND CLIMATE. Elevations in the Unit range from 8,300 at Fluted Rock to 5.320 at Many Farms. Chin Lee is at 5,510, Balakai Mesa 7,500, and Yale Point 7,900. The relative low altitude in the Chin Lee Valley predetermines a long growing season and a moderate climate.

RAINFALL. Some precipitation records for the Unit are as follows.

Chin Lee	8.75" (19 years)
	9.26" (1934-1936)
Frazier D. A.	4.99" (1935)
Black Mountain	15" to 18"
Fort Defiance Plateau	20" to 24"

These represent total annual precipitation. At Chin Lee the average annual rainfall for 19 years was 5.29" coming largely in August and September. Field observation indicated that yearly rainfall in the western part of the Unit is much less than at Chin Lee. Records at Frazier D. A., only twelve miles west, confirm this.

GEOLOGY AND SOILS. Geological formations and location are as follows.

De Chelly sandstone - Canyon de Chelly
Chin Lee sandstone and shale - Chin Lee Valley, and Beautiful Valley.
Wingate and Navajo sandstone and carmel formation - west central part of Unit and Carson Mesa.

Dakota sandstone, mancos shale, and Morrison formation - In escarpments of Balakai Mesa and Black Mountain.

The residual soils of the Unit are light textured and directly traceable to their parent material. They are usually less severely eroded than the alluvial valley fills and capable of supporting more vegetation, probably due to their high water absorption and water-holding capacity.

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The alluvial soils are mixtures of mancos, Chin Lee, and Mesa Verde shales. They have a high alkali content and low permeability. This group refers only to the large valley fills. Small overwashes from drainages out of sandstone formations are of a different character. They are generally light textured and highly permeable. The heavy alluvial soils have a light ground cover and being in the valleys where there is a concentration of run-off erosion is moderate to severe. The waterspreading and planting projects recommended are located in these valleys and should materially remedy conditions if carried out.

GENERAL PHYSIOGRAPHY. The east side of the Unit is characterized by Canyons de Chelly and del Muerto and Nazlini Canyon with deep gorges running westward down the slope of Fort Defiance Mesa. Soils are light and shallow with considerable rock exposed. Slopes are steep and predominate vegetative types are Juniper, Pinon, sage and grama. The southeastern portion of the Unit is in Yellow Pine country on top of the mesa.

The west boundaries of the Unit are the Balakai and Black Mountain escarpments. From these numerous drainages extend eastward traversing alluvial valleys where heavy soils from the shale formations have formed the valley fills. Lighter soils prevail on the slopes and hillsides.

The southeastern portion of the Unit is rolling galleta and grama country with many natural lakes. The Chin Lee Valley proper begins at Chin Lee and extends northward to Round Rock. It is bordered on the west by the escarpment of Carson Mesa. The floor of the Valley is relatively level and the soil is an alluvium from clay to sandy loam texture. Here is found a large part of the present and potential agricultural land of the Unit.

The top of Carson Mesa is galleta and grama rangeland with numerous sandstone exposures. Three large drainages break through the escarpment into the Chin Lee Valley.

Three extensive badland types are found in the Unit. Beautiful Valley, a severely eroded area in the Chin Lee shales, is the largest. It forms an extension of the Chin Lee Valley southward to Ganado Mesa. Smaller areas south of Frazier D. A. and southeast of Round Rock are typical of country where erosion has destroyed it beyond redemption. Parent materials are exposed and vegetation is found only in small fans formed at the feet of the slopes.

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FARM LAND. The Unit has 3,659 acres of farm land at present. Of this 3,571 acres are flood irrigated and 118 acres dry farm. Of the total approximately 2,500 acres are found in the Chin Lee Valley and 527 acres in Canyons de Chelley and del Muerto.

DRAINAGE. The major drainage of the Unit is the Chin Lee Wash. All other drainages are tributary to it. The largest percent of the runoff down this stream comes from the west slope of the Lukachukai Mountains via Wheatfields, Tsailee, and Whiskey Creek. The largest tributaries in the Unit are the Nazlini Creek, Beautiful Valley Wash, Tee-land Valley, Black Mountain Drainage (11.12) Sheep Dip Canyon and Black Mountain Wash. Canyons de Chelley, del Muerto and Monument Canyon are the Chin Lee drainage proper. Rough Rock drainage (12) heads in the Unit and enters the Chin Lee just south of Rock Point in Unit 9.

A drainage numbering system was set up on the Unit. The Chin Lee was given number 11 to correspond to the number given it in Unit 9. 12 went to that part of the Rough Rock drainage in the Unit, 13 and 14 to two other small drainages which terminate in dry lake beds. The rest of the drainage then became decimals of 11. These numbers will be found on the base map and on charts showing waterspreading and erosion control projects. This further aids in relating projects mentioned in this report to the map. Runoff results on the various streams will be found on the charts.

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ENGINEERING STUDIES

BASE MAP. The base map has become the responsibility of the engineer. While all branches aid in field mapping it is the engineers duty to compile this information for the drafting department. The overlay work map was worked up by Agronomy, Range and Engineering. Tracings of these maps are on file in the Gallup office. Waterspreading projects are numbered as W. S. 67, erosion control E. C. 2, and planting Pl. Waterspreading and planting areas are cross hatched while proposed erosion control areas are outlined in red on the prints or denoted by a red circle.

RUN-OFF. The maximum discharge in cu. ft. per sec. and the annual expectancy in acre feet were calculated for all streams where waterspreading or agricultural projects were proposed. For maximum discharge stream sections were taken as time permitted. On others the Burkli-Ziegler Formula was used for steep mountains drainages and the factors from the report prepared on Five Chapters were used for large areas with a variety of conditions.

For yearly discharge the rainfall records of the Unit were studied and an attempt made to establish a conservative annual rainfall expectancy for variouss sections on the Unit. Then as each drainage was worked a run-off coefficient was assumed with the condition of soil, slope, and vegetation in mind.

The results of these studies are found on the waterspreading chart. No figures are given for the Chin Lee Wash at the mouth of Canyon de Chelley. The sub-flow and tremendous size of the drainage area make it impossible to give a reasonable estimate. The drainage area is approximately 410,000 acres. One inch annually would be 34,000 acre feet. With stream loss and evaporation the total would probably be less than one inch. How much is a question.

RANGE WATER. Engineering conferred with Range Management on stock water improvements wherein construction work was needed.

In the case of Toh-de-ne-he lake it is recommended that the lake bed and stock tank to the east be connected by a canal. This will permit water diverted from Black Mountain Drainage into the lake to drain into the deeper charco of the stock tank. This would make a more permanent watering place and the lake bed would serve as a desilting basin. The diversion ditch from the dam on Black Mountain Drainage needs cleaning and widening. The maximum flood on Black Mountain Drainage at the diversion site was

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diversion site was measured at 3800 sec'.

In the range management report diversion dykes have been recommended at stock tanks R-167, R-151, R-46, and repair of dykes at R-148 and R-110.

The dyke proposed for R-48 will have erosion control value in that it will protect some severe heads downstream. It will be explained further under erosion.

R-61 needs some work and will be discussed under E. C. 1. quad. 52.

The lake adjacent to W. S. 45 quad. 52 receives its water from Tse-ah-kai Wash. If the spreading project is carried out the supply to the lake will be shut off. This won't matter since another stock tank nearby and the windmill at R-61 will take care of the needs.

CONDITION OF PRESENT AGRICULTURAL DEVELOPMENTS

Only two irrigation plants of any consequence are located in Unit 10. One at Nazlini and one at Chin Lee.

NAZLINI. The Nazlini plant was built to take water from Nazlini Creek, which is a permanent stream at this point, onto two potential land areas west of Nazlini Trading Post. The equipment includes a concrete heading and approximately one half mile of main canal. The heading is in good condition and workable with some maintenance. Small side drainages have broken through the canal in two places. With these repaired the canal will deliver water to the upper area. To irrigate the lower area a permanent storage dam, which has been surveyed and proposed, with canal and laterals or a temporary or permanent diversion dam with canal and laterals will be needed. Laterals and headgates are also needed on the upper area. All the land is new and no subjugation has been done.

CHIN LEE. Two concrete headings with canals and a siphon across Nazlini Wash make up the Chin Lee plant. They were intended to irrigate the land at Chin Lee on the south side of the Chin Lee Wash and east of Nazlini Wash, and the land along the Chin Lee Wash south of Fraziers store. Water to be taken from the Chin Lee Wash near the mouth of Canyon de Chelley. Silt in the intakes has made it difficult to get sufficient water to irrigate all the land under the canals. It is understood that additional work on these headings is planned.

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Irrigation of additional land along the Chin Lee Wash in the Chin Lee Valley is by temporary headings built by the Indians. Due to the slight grade of the Wash and the six foot wash bank it is hard for the Indians to build and maintain these headings here. They are destroyed by floods each year and can handle only the smaller streams. The heading at Many Farms has never provided irrigation for all the land. But with proper maintenance each year some irrigation is effected. A larger more permanent heading is planned by E. C. W. for Many Farms and the small area to the north.

BEAUTIFUL VALLEY. In past years some farmland in Beautiful Valley within the area shown as W. S. 48 was irrigated by a heading and canal from lower Nazlini Wash. The heading is completely washed out now and the ditch badly in need of repair.

The Nazlini is not a permanent stream at this point. The land proposed for development has mostly been abandoned due to lack of water and the effects of wind and water erosion.

RECOMMENDED AGRICULTURAL DEVELOPMENTS

CHIN LEE VALLEY. This area represents one of the largest and most favorable opportunities for agricultural development in the Navajo District. From Chin Lee northward along the east bank of the Chin Lee Wash there is 24,000 acres of land, a large percent of which is good farmland if water could be made available. At present 2,500 acres are being farmed and irrigated by inadequate headings which take water from the Chin Lee Wash. Only small surface flow can be diverted. Large floods and sub-flow can not be used.

A detailed soil survey is planned. This will indicate the acreage most desirable for development.

It is believed that the ultimate and most satisfactory plan for irrigating the land would be to take water from the Chin Lee Wash at the mouth of Canyon de Chelley, and deliver it to the land via a large canal extending the length of the valley. No run-off estimates have been made at the site of the proposed diversion. The drainage heads in the Lukachukai Mountains and Wheatfields, Tsailee, and Whiskey Creeks are a part of the system. Studies in Unit 11 accounted for approximately 20,000 acre feet entering the canyons. Stream loss would reduce this.

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But run-off from Crystal Wash and Monument Canyon raise the total expectancy.

At Chin Lee the channel passes thru rock walls and over a deep silt bed. This bed has been estimated to be 80 feet deep. Its depth will determine whether or not a concrete diversion would be feasible. A structure which would force up the sub-flow, which appears to be permanent, and a large part of the total run-off appears as such, would be best. A pumping station is a possibility but is doubtful whether a floating diversion dam or one of sheet piling would be successful for this project. Such structures would not make the sub-flow available and without it the amount of land that could be watered would be greatly reduced. It seems important to build on bedrock and thus utilize the sub-flow as well as what surface run-off can be diverted.

The first job is a thorough investigation of the possibilities of developing this valley. While all the land in the valley would not be needed by people of Unit 10 its full development would make land available to people in adjoining Units who need land or to farmers in Unit 10 whose present land is not the best and should be abandoned.

Another part of the project is construction of the storage dams as proposed in Unit 11 on Tsailee, Wheatfields and Whiskey Creeks. These will serve to equalize the run-off from the Lukachukai Mountains and insure a supply each year to irrigate the land developed in the Chin Lee Valley.

The potential land in this area is covered by W. S. 35 quad. 232

NAZLINI. Soils and topographic surveys of the Nazlini developments are available. Due to soil conditions on the potential land the construction of the proposed storage dam and canals would not be practical. The land can be irrigated with the present equipment and use of temporary diversions. This can be done by the Indians and a suggested program is to encourage them to subjugate the land and make use of the diversions and canal. It will be necessary to do two small repair jobs on the canal and clean the silt from the headgate.

There is an abundance of water to irrigate all the land available.

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BEAUTIFUL VALLEY, W. S. 48. The problem of getting water to this land is similar to that presented by the headings in the Chin Lee Valley. Last year storms completely washed the heading out. Lack of bedrock and the width of the stream bed made a diversion impractical. The land has been so depleted by wind and water erosion that construction of a permanent heading to provide water would not increase production appropriate to the expense. Abandonment of this land and making provision for the people in the Chin Lee Valley would seem a better plan.

The planting program proposed for the Beautiful Valley and Nazlini Washes will reduce wind erosion in this area.

WATERSPREADING. (See base map).

The topography on the west and central portions of Unit 10 present many opportunities for waterspreading. From the base of the Balakai and Black Mountain escarpments the drainages traverse broad alluvial valleys. Large and level spreading areas can be found adjacent to nearly every channel. On some the present vegetative cover is light and in such instances planting has also been recommended.

The previous waterspreading survey was considered while searching for sites. The base map and engineering report, disclose whether or not projects as listed in that survey were approved or not in the recent survey. One large deviation may be noted. Many of their projects show small areas of potential agricultural land. We recommended that agricultural development be confined to the Chin Lee Valley and that the waterspreading projects be developed for range improvement only. This decision was prompted by consideration of cost. An earth diversion dam to spread the entire flow would obviously cost less than a structure which would divide the flow; ie, some for farmland and the remainder for spreading, an abundance of farmland in the Chin Lee Valley which could be put under a large irrigation project at a lower cost per acre than land developed under the small waterspreading projects would make the latter unfeasible.

On the entire Unit a total of 10,530 acres of spreading is proposed at an estimated cost of $18,350. This does not include areas number 4 and 35 in quad 23 which are special cases. The engineering report carries detailed information regarding each project.

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The attached chart lists information regarding each project whether outlined in the old or the recent survey. The survey and drainage numbers appear on the base map. The survey numbers are taken from the old survey, or in the case of a new project a number continuing from the old survey was given. To explain the chart further. The letters A. B. C, under the Headings of waterspreading report and Study Group Recommendation indicate a relative feasibility of projects.

Under the soils heading the letters A, B, C, D, indicate a potential plant producing capacity based on soil, slope, erosion, drainage, and alkali content.

Under Present Cover the range plants and forage acre factor as taken from the type map are listed.

Following the chart a discussion of the projects that were not approved in the recent survey, or other projects that warrant special attention, is included.

DISCUSSION OF WATERSPREADING PROJECTS

No. 62 - Quad. 12. This drainage is already spreading naturally. Range management is projecting a charco in a dry lake bed downstream.

No. 64 - Quad. 12. This site is in E. C. 1 quad. 12. The stream is already spreading of its own accord. Some small farms on the spreading area attempt to utilize the water. But to fix them so that they might do this effectively would be far too expensive for the acreage included.

No. 67 - Quad. 12. This spreading area is too much too small for the drainage. There are two small drainage farming on the area now.

No. 28 - Quad 23. This drainage fans naturally.

No. 31 - Quad 23. This project was enlarged and changed to 1 10 Quad 9.

No. 33 - Quad.23. This site is too small for the drainage. It is about two miles upstream from site No. 34.

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No. 34 - Quad 23. This is a large site on Black Mountain Wash just east of Frazer D. A. A dam of 8400 yards would be needed to divert the total flow from the channel at a cost of approximately $10,000. The spreading area is part of the potential land in the Chin Lee Valley. Therefore, wild spreading of this wash would interfere with agricultural development in that section. A better plan would be to forego this project and concentrate on smaller projects proposed for the headwaters.

No. 35 - Quad 23. This site is the potential land in the Chin Lee Valley and has already been discussed under Agricultural Development.

No. 48 - Quad 51. This is the Beautiful Valley agricultural area and has already been reviewed.

No. 49 - Quad 51. This site is adjacent to Beautiful Valley Wash from which a partial diversion is recommended. It is estimated that the spreading area will not handle the large storms that come down this drainage. However, site 54 in quad 52 is recommended as a partial diversion from the same drainage. The drainage area to this site is 26,000 acres and it increases to 110,000 at W. S. 49 quad 23 due to the Nazlini Wash emptying in. But both sites will not handle the entire runoff. Also the cost of each project is prohibitive. They are reported and recommended only as a matter of record.

EROSION

GENERAL EROSION. With the exceptions of Beautiful Valley and the country in the vicinity of Tse-lani and Black Mountain store erosion on Unit 10 is moderate. The east side of the Unit lies on the west slope of Ft. Defiance Mesa in the yellow pine and woodland types. In the woodland the soils are shallow and most of the channels are rock bound.

On the mesa country west of Beautiful Valley to Balakai Mesa erosion is slight except in the alluvial valleys where there is a concentration of runoff. Waterspreading and planting projects cover these areas.

In the Chin Lee Valley and on Carson Mesa to the west severe erosion is confined to bank cutting of the major channels such as the Chin Lee Wash. A planting plan covers the former while waterspreading in the headwaters of Black Mountain Wash and other large drainages will reduce the bank cutting downstream.

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In Beautiful Valley and in a small area south of Frazer D. A. erosion is severe but advanced to a stage where treatment is impractical. These are badland types.

RECOMMENDED PROJECTS

E. C. 1, Quad. 12. In the area surrounding Black Mountain Store in the headwaters of Drainage 11.12 erosion is severe. A concentration of population and a dipping vat in this area have caused considerable overgrazing. The channels come from the steep rocky slopes of Balakai Mesa and Black Mountain.

In the range management plan this area is recommended for stock exclusion for five years. It is also recommended that the dipping vat be moved. A planting plan has been drawn to cover the main valleys along with what water-spreading and head protection that can be effected. This area includes 50,000 acres.

After the range plan is started detailed construction plans will need be made for the area. This area is shown on the base map as E. C. 1, quad 12.

E. C. 1, Quad. 23. A small area is recommended for erosion control as E. C. 1, quad. 23. Work would consist of head protection structures and small waterspreading projects combined with planting.

E. C. 1, Quad 26. Another area, E. C. 1, quad 26, is surrounding the potential agricultural area of Nazlini. Here head protection is badly needed and some gully control in the form of small spreader dams can be done.

Two small areas, E. C. 1, and 2 in quad 56 are recommended for gully control and planting.

E. C. 2, Quad 26. Other projects include some bank protection on the orchards at Nazlini. Nazlini Wash is undercutting them and some revetment is needed.

E. C. 1, Quad 52. The charco by the windmill at N-61 is being threatened by headcutting. Dikes and a drop structure is needed.

E. C. 1, Quad 51. Two bad heads in this area need work. Another part of the project is the work at Toh-De-Nee-He lake and R-12 as outlined under range water improvements.

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E.C. 2, Quad 51. Some severe heads that need treatment. They are completely destroying a small valley.

E.C. 2, Quad. 23. Some severe heads on Black Mountain Wash near Coyote Springs are advancing back into the main valley. The valley is large enough to be valuable as range 1 and the heads should be stopped as soon as possible.

E. C. 1, Quad. 12. Two special jobs are shown by red circles within the large area recommended for erosion control in the Black Mountain country. The one at R-48 proposes a large dyke to divert the upper part of drainage 11.12 into the stock tank. This will increase the stock water and protect some bad heads downstream. The other job is treatment on headcutting in the head waters of 11.12.12. They are severe and destroying the entire valley.

While it is hard to determine just how many acres are protected by various types of erosion control work plans for Unit 10 at present show 61,432 acres needing protection at a treatment cost of $37,800.

RECOMMENDATIONS FOR IMMEDIATE WORK

I. Inauguration of Erosion Control Plan on E.C. 1 Quad 12 (See Range Management Report).

II. Continue Investigations and Survey on Agricultural Development in Chin Lee Valley.

a. Test for bedrock on proposed diversion site at Chin Lee.

b. Make run-off estimates on Chin Lee drainage at diversion site.

III. Planting Plan on Chin Lee, Beautiful Valley, and Naslini Wash.

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KEY TO QUAD NUMBERS

109°00' x 36°00'		27
109°15' x 36°30'		46
109°15' x 36°15'		25
109°15' x 36°00'		26
109°30' x 36°30'		23
109°30' x 36°15'		51
109°30' x 36°00'		52
109°45' x 36°30'		9
109°45' x 36°15'		12
109°45' x 36°00'		56

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EROSION CONTROL WORK DISTRICT 10

Quad No.	Project No.	Card No.	Acreage	Type Work	Cost	Soil	Remarks
23	E 1	33	2800	Small earth gully plugs to spread small gullies	$ 2000	Clay	Also a planting possibility. P_2
26	E 1	34	4870	Waterspread Head Protection Small Div. Dykes	$ 5000	Clay loam Sandy loam	Area includes Nazlini pro. Ag.Area
56	E C 1	35	1080	W. S. Planting	$ 500	Clay C	Small waterspreading projects and planting
56	E C 2	36	180	Revetment and small W. S. jobs	$ 300	"	Control work largely for storm protection
12	E C 1	37	50297	Planting-Head Protection W.S.	$25000	Clay to Sandy loam	Black Mountain Area
26	E C 2	38	5	Revetment for bank protection	$ 500	Clay	Orchards at Nazlini need protection
52	E C 1	39		Head protection	$ 300		Charco being destroyed by heads
51	E C 1	40	500	Head protection and canal at R-12	$ 1000	Clay and loam	See discussion of Teh-Dee-Nee-He lake under Range Water
51	E C 2	41	100	Head Protection	$ 400	Sandy loam	
23	E C 2	42	1000	Head Protection	$ 800	Clay	Approx. 1000 A.will be destroyed if these heads aren't treated
12	E C 1	43	600	Head Protection	$ 2000	Clay	Two special jobs in E.C. 1 Quad 12

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Sheet 2

WATERSPREADING AND POTENTIAL LAND DATA — UNIT 10

Survey Number	Quad No.	Drainage Number	Card No.	Waterspreading report Agri.land	Hay Land	Range Imp.	Present Cover	Soil	Slope	Drainage Area	Max. Q. Sec'	Annual Q.Sec'	Study Group Recommendations Agric.land	Hay Land	Range Spreading	Estimated Cost of Project
6	9	11.4.5	1		B-50	B-125	Sac.9a Big.08	Clay alluvial C	1 %	544	500	100			B-175	$ 200
7	9	11.4.5	2		B-50	B-175	9a.Sac .04	Clay alluvial C	1 %	680	600	125			B-225	200
8	9	11.4.5	3		B-100	B-300	9a.Sac .04	"	1 %	2310	2200	450			B-400	800
9	9	11.4	4			C-400	9a.Big Cha.18	Sandy loam A	1 %	2560	2400	480			C-450	1500
10	9	11.6.4	5		B-130	B-300	Acu.Sac Was.03	Clay loam C	1 %	1180	1100	230			B-640	1000
62	12	11.12.5	No Card	B-15		B-85	Big.Mt. ga.29	Sandy loam A				Drainage spreading naturally.			Water needed for Charco development downstream	
63	12	11.12.6	6			C-1,5	ga.cha .14	Clay loam C	2%	717	600	130			B-175	$ 300
64	12	11.12.12	No Card	A-100		A-300	ga cha grs.08	"				Part of E.C. 1 Quad.12 stream spreads naturally. Intensive erosion control needed in head of drain.				
65	12	11.6	7			C-175	ga Sac Brs.21	Clay alluvial C	1%	1450	1000	270			B-175	300
66	12	11.6	8			C-100	"	"	1 %	560	400	110			B-100	300
67	12	11.12	No Card			C-500	Cha ga grs.14	Clay Loam C				Spreading Area already covered by side drainage. Too small for Black Mountain Drain.				
68	12	11.6	9				Sac Mt Brs.10	Sandy Loam Residual A	1 %	300	200	60			B-25	150
69	12	11.6	10				"	"	"	340	240	65			B-25	150
70	12	11.6	11				"	Sandy loam C - B	1 %	3910	2700	730			B-650	1200
27	23	11.5.5	12			B-635	9-W Sac .08Was	Clay loam C Alluvial	1 %	1170	1100	210			B-320	400
36	23	11.5.2	13				"	"	1 %	600	500	110			C-50	100
30	23	11.1	14	C-20		C-220	Hb. 9a Sw..04	"	1 %	3590 2890	3500 2800	670 540			C-330	300 300
29	23	11.5.1	15	C-40		C-160	Rt. 9W Was.01	"	1 %	15300	6000	2800			C-448	$1000
28	23	11.5.1 .2	No Card			C-150		Clay loam C				Washfans itself.				
31	23		"			C-140						Becomes #10 Quad 9				
33	23	11.6	"			C-800		Sandy loam			14600	See Discussion				
34	23	11.6	16	B-150		B-2250		Clay loam			14600	See Discussion			2400	10000

UNM 1863

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NN006298

Sheet 2 WATERSPREADING AND POTENT[illegible] LAND DATA UNIT 10

Survey Number	Quad No.	Drainage Number	Card No.	Waterspreading Report Agri.Land	Hay Land	Range Imp.	Present Cover	Soil	Slope	Drainage Area	Max.Q Sec'	Annual Q Sec'	Study Group Recommendations Agric.Land	Hay Land	Range Spreading	Estimated Cost of project
35	23	11	17	B-2000		B-10900		Sandy Loam B			23,000	See Discussion			21,510	
47	51	11.8	18	B- 25		B- 275	ga Sac Was .13	Clay C		4750	2,000	600			B- 300	$ 250
48	51	11.23	19	B- 75		B-1125	In cult Area	Clay C & B		app. 47000	9,000	See Discussion		B- 200 Partial div.		
49	51	11	20	B-100		B-1700	Sac Atr ga .09	Clay B		App 110000	11,000	"	"	Partial div.	B-1300	
50	51	11.17	21	A-50		A- 330	In Cult Area	Sandy Loam B		15000	7,500	"	"	Partial Diversion		
51	51	11.6.6	22		B- 150	B- 50	ga sac .11	Sandy Loam C & B-		2480	680	620			B-150	200
52	51	10.10	23			B- 100	Sac Brs Atr.07	Clay B		1240	340	310			B-100	100
53	51	11.11	No Card		B- 275		In Cult Area	Clay Loam B Hummocky						Fan naturally		
54	51	11.9	"		B- 125		"	"						Too many dunes. Uneven spreading		
55	51	11.7	"			B-300	Atr sha gr.10	"						Area very steep		
56	51	13	24				ga cha wds.18	Clay C		600	See discussion				B-300	200
57	51	11.12.2	25				ga kw .07	Sandy Loam A		4230	510	500			B-420	400
54	52	.11	26				Sac.Big Sha.16	Clay B	1%	26400 16400	8200		See discussion Partial diversion		C-500	5000
55	52	11.25	27				Sac.Cha 9rs.22	Sandy Loam C	1%	4900 3840	1500	480			B- 80	500
56	52	11.29	28				"	"	1%	300	500	160			B- 20	400
52	52	11.22	29				Sac-Big Sha.16	Light clay to sandy loam B	Level	1555	600	300			A-240	600
53	52	11.22	30				"	"	"	1830	915	35[illegible]			A-100	300
45	52	11.12 .3.6	31			B-1300	Cha ga .15	Heavy clay C	1%	6180	2500	800			B-1300	500
66	56	11.12 .3.4	No Card			B- 260		Clay C					Site below E.C. 2, stream fans naturally			
58	51	11.12 .3.2	32				ga Big Cha.23	Clay B	1%	19000	2000	2400			A-1500	2000

UNM 1894

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