EXHIBIT I: SOILS INFORMATION

The 1987 soils information still applies. We are also including the original maps from the 1987 amendment because they are referenced in the language in the 1987 soil information.


HOME OFFICE MINE
1 INCH = 300 FEET
KEY
LAKE
ACCESS ROAD
IRRIGATION DITCH
RIP RAP
PERMIT BOUNDARY
EXCAVATION LIMITS - TOP OF PIT
TRAIL
SETTLING POND
RAILROAD
RIVER
CONTOUR LINE - ELEVATION
PRE 1973 DISTURBANCE - NOT REAFFECTED
PHASE LINE
BRIDGE
TOPSOIL STOCKPILE
DIKE - ESTABLISHED
DIKE - OPTIONAL
SHALLOWS
BUILDING
OVERLAY REFERENCE
TAYLOR GILL DITCH
CACHE LA POUDRE RIVER
FORT COLLINS RECREATION TRAIL
COLORADO SOUTHERN RAILROAD
ARTHUR DITCH
RECEIVED
JUL 31 1987
MINED LAND RECLAMATION DIVISION
Permit Number M-77-439 Home Office Pit
Section Exhibit Exh. C-5 + C-6
AM 1
7/31/87
0 100 300 600
SCALE: 1 INCH = 300 FEET
STERLING COMPANIES
1800 North Taft Hill Road
Fort Collins, Colorado 80522
CMLRD FILE M-77-439 AMENDMENT
SCALE 1" = 300'
DATE 3-30-87
CHECKED BY M. REFER
DRAWN BY B. JANES
SIZE 30"x42"
EXHIBITS C-5 and 6
DRAWING NO. NA
0016090

EXHIBIT C - 5; SOILS MAP

The information for this exhibit and Exhibit I - Soils Information, was extracted from the U.S. Soil Conservation Service Larimer County Soil Survey (1975). Since topsoil will be stockpiled on the permeters of the areas of excavation, only "excess" topsoil stockpiles to be utilized as a soil reserve will be identified on this map. Topsoil salvage will be treated in detail under Exhibit I.

The distribution of insitu soils is overlain on the same map as presented for the mining plan under Exhibit C - 4. This allows for the relative position of the soils to be viewed in contrast to the mining related disturbance that will affect them. Each soil type is identified on the map by a number within a diamond. The character and nature of each soil type is detailed under Exhibit I. Included in the descriptions are the soil profile horizons for each soil series encountered. The nature and depth of soil to be salvaged, and total volume to area calculations, are also presented in Exhibit I. Since the majority of the affected lands will be inundated, forming ponds, adequate soil resources are available to meet an 8 inch mean soil depth for soil reapplied to affected lands remaining above water. Therefore, planimeter measurements have not been made on the different soil types presented. Once the total volume to area soil requirements have been stockpiled in the field, excess soil resources not set aside for reclamation as outlined above, will be stockpiled within the plant and deposit stockpile areas of the mine site, and the soil sold on demand. Accurate soil records and topsoil salvage monitoring will be utilized to assure adequate soil salvage. Soil identification and sampling will precede excavation in the field, so heavy equipment operators will be familiarized with soil color and locations ahead of time. The soil series and related soil unit (type), for each number represented on the soils map, are identified below:

7 ASCALON SERIES - Ascalon sandy loam, 0-3% slopes.
22 CARUSO SERIES - Caruso clay loam, 0-1% slopes.
42 Soils disturbed by mining prior to completion of the soil survey in 1974.
60 LARIM SERIES - Larim gravelly sandy loam, 5-40% slopes.
64 LOVELAND SERIES - Loveland clay loam, 0-1% slopes.
81 PAOLI SERIES - Paoli fine sandy loam, 0-1% slopes.
84 POUDRE SERIES - Poudre fine sandy loam, 0-1% slopes.
92 Riverwash soils - no soil profile development.
105 TABLE MOUNTAIN SERIES - Table Mountain loam, 0-1% slopes.

Quality of the A profile horizon among the different soil types to be salvaged is not significantly different. Therefore, it is not essential to segregate the different soils from each other during salvage and stockpiling. Only A horizon material will be salvaged for reclamation since it contains the best soil properties and is abundant enough to meet volume requirements. This discussion will be continued under Exhibit I. Soils 7 and 60 fall outside the areas of disturbance, and will not be impacted. Soils have been previously removed prior to the 1973 law (for all practical purposes) for areas identified under 42. Soils identified by 92 are lacking a distinct soil profile, and could contain large and varied quantities of riverwashed sand, gravel, and rock. Such soils are not suitable for salvage, and will be processed for aggregate, with the waste utilized as backfill or for creating pond irregularities, islands, or other purposes.

EXHIBIT I - SOILS INFORMATION

If revegetation of disturbed lands is to be optimumly successful, skillful management of soil resources must occur. Fundamental to that management is an adequate and reasonably accurate understanding of the soils involved. Soil series and soils unit descriptions were extracted from the U.S. Soil Conservation Service, Larimer County Soil Survey, 1975, and appropriate reproductions appear at the back of this exhibit.

Nine different soil types (units) occur on the property, as outlined under Exhibit C - 5, Soils Map Narrative. Ascalon Series (7), and Larim Series (60), soils will not be impacted and will receive no further mention, even though they occur within the permit boundary. Consideration of all other soils represented on Exhibit C - 5, Soils Map, is detailed below.

The soil series descriptions at the back of this exhibit give detailed soil profile descriptions and related information. This information (primarily soil texture and color variations) will be utilized to identify and validate the extent of affected soils as encountered in the field and in relation to their representation on Exhibit C - 5. Soil profile horizon identification will occur in pits excavated with a backhoe, approximately 2 feet wide, and deep enough to identify soil profile horizons to the top of the C horizon. The number and distribution of pits is indeterminate, however, initial pit locations will be based upon visual differences in soil and related factors (e.g., changes in vegetation cover or type, catena, and site location). Pit frequency would increase where determinations from the initial pits indicate discrepancies with soil extent portrayed on Exhibit C - 5, or unusual variations in soil profile horizon characteristics are revealed. Since soil unit (92), will not be salvaged, it is critical that this unit be adequately surveyed as to its actual extent and position on the ground. All pit locations will be identified on Exhibit C - 5, as they are determined, and the information included in the operator's annual report. Photographic records will be maintained for each pit's soil profile, and referenced to the pit records. Each pit will be referenced by a unique number, and records will contain information as to the depth of each horizon, and its corresponding soil texture class and color encountered. Soil color and texture will be sampled under moist conditions. Soil color will be determined with Munsell soil color charts. All soil determination and sampling will occur concurrent with, or prior to, excavation.

All A soil profile horizon material will be sampled from each pit, and/or from random surface samples from specified areas, and sent to the soils lab at Colorado State

University for analysis. At this stage, testing will occur solely to determine the presence of saline, sodic, or saline/sodic soils within the A horizon to be salvaged. Areas where irrigation has occurred are potential candidates for these soil conditions. Also, soil unit (64), is the greatest candidate for these problem soil conditions, as suggested by its moderate to high alkalinity to a pH of 8.4, and by its relatively high electroconductivity of 2 to 4 Mmhos/cm. Saline, sodic, and saline/sodic soil conditions can ruin, or seriously impair, revegetation if contaminated portions of the soil profile are mixed with the salvaged topsoil. The relatively small cost of testing for these conditions can result in significant long term gains in relation to the overall cost of reclamation.

Soil tests will occur again on resoiled areas prior to revegetation, to analyse the disturbed soil for its level of fertility, organic matter content in percent, and texture class (to evaluate the extent of mixing with other horizons that may occur during salvage). Fertilizer rates will based upon these tests.

Prior to stripping soils, heavy equipment operators will be versed as to the soil characteristics and color to look for in the field. Previously excavated soil pits will be utilized in the overall presentation. This will act to assure greater reliability of all soil salvage operations, and minimize salvage error, especially on critical areas where saline or sodic soil conditions are present.

Following stripping, soils will be stockpiled, as detailed under Exhibit D - The Mining Plan. The following seed mixture will be drilled into completed stockpiles which will not be disturbed for greater than one growing season. The intent is to provide stability to the stockpiles to prevent soil loss by erosion. Weeds will be controlled as detailed under Exhibit E - The Reclamation Plan. The mixture is based upon a 50/50 percent mixture, critical area planting, utilizing:

Crested wheatgrass	Agropyron cristatum (Fairway)	@ 5.0# pure live seed per acre.
Smooth brome	Bromus inermis (Lincoln)	@ 6.5 # " " " " "
Total #pls/acre =		11.5

Soil units ((64), (81), and (105), are the predominant soils affected by the operation, and subsequently salvaged and stockpiled. A careful reading of the soil series descriptions indicates that A soil profile horizon material can occur as shallow as 8 inches for soil unit (64), and 4 inches for soil unit (105). Conversely, A soil profile horizon material can extend as deep as 50 inches for soil unit (81). The maximum resoiling depth possible is difficult to quantify given the total potential variability

and distribution of soils over the affected area. Planimeter readings of area to maximum/minimum soil depth per unit per area of excavation, is detailed under Table IX. Planimeter readings of area requiring resoiling after establishment of ponds, is indicated for each area of excavation under Table X. Adequate soil reserves exist to commit to a resoiling depth of 6 to 12 inches, utilizing 8 inches as the standard for estimating required volumes to be stockpiled, and for warranty calculations. Soil salvage records of cubic yards of soil stockpiled, in relation to area requiring resoiling at that time, will be maintained as excavation progresses from the point of amendment approval. Present topsoil stockpile volumes, per area requiring resoiling, is given at the bottom of Table X.

Most of the soils encountered exhibit slow runoff potential, slight water erosion hazard, moderate wind erosion hazard, and are mildly to moderately alkaline. Soil units (22), (64), and (84), are of the Wet Meadow range site. Soil units (81) and (105), are of the Overflow range site (refer to Exhibit J - Vegetation Information).

Please note, that during resoiling operations, some anomalies may occur, where due to equipment limitations soil depth is less than 6 inches, or greater than 12 inches. If areas of soil depth less than 4 inches occur in frequency or extent greater than 1/10th of an acre per acre of disturbance (i.e., 10% error), then additional soil will be placed on those areas so identified.

sloping to strongly sloping soil is on terrace edges, fans, and benches. This soil has a profile similar to the one described as representative of the series, but the combined thickness of the surface layer and subsoil is about 18 to 19 inches.

Included with this soil in mapping are some areas of soils that are more sloping and some areas of soils that have a surface layer of sandy loam. Also included are small areas of Larimer, Stoneham, and Larim soils.

Runoff is medium, and the hazard of erosion is moderate to severe.

This soil is suited to wheat and barley under dryland management. If irrigated, it is also suited to alfalfa. It is well suited to pasture and native grasses. Capability units IVe–1, irrigated, and IVe–3, dryland; Loamy Plains range site; windbreak suitability group 1.

3—Altvan-Satanta loams, 0 to 3 percent slopes. This complex consists of nearly level soils on terraces and high benches. It is about 45 percent Altvan loam and about 30 percent Satanta loam. The soils are intermingled throughout the mapped areas, but Altvan loam commonly is more sloping and Satanta loam is more nearly level and is in some depressions. The Altvan soil has a profile similar to the one described as representative of the Altvan series, but the surface layer commonly is about 8 to 11 inches thick and is loam or sandy loam. The Satanta soil has a profile similar to the one described as representative of the Satanta series, but the surface layer is about 8 to 11 inches thick and is sandy loam in places. In places both soils are redder than is typical of their respective series.

Included with these soils in mapping is about 15 percent Nunn soils.

Runoff is slow to medium, and the hazards of wind and water erosion are slight to moderate.

If irrigated, these soils are suited to corn, sugar beets, dry beans, alfalfa, and small grain. Under dryland management they are suited mainly to wheat, but other small grain, such as barley and oats, is sometimes grown. The soils are also well suited to pasture and native grasses. Capability units IIIe–3, irrigated, and IIIe–6, dryland; Loamy Foothill range site; windbreak suitability group 1.

4—Altvan-Satanta loams, 3 to 9 percent slopes. This complex consists of gently sloping or strongly sloping soils on high terraces, benches, and fans. It is about 55 percent Altvan loam and 35 percent Satanta loam. Altvan loam is mainly more sloping, and Satanta loam is smoother. These soils have profiles similar to the ones described as representative of their respective series, but the surface layer is sandy loam and loam and the surface layer and subsoil are thinner. Many areas of both soils are redder than is typical of their respective series.

Included with these soils in mapping is about 10 percent Nunn and Larimer soils.

Runoff is medium to rapid, and the hazards of wind and water erosion are moderate.

If irrigated, these soils are well suited to alfalfa, small grain, and pasture. Under dryland management they are suited to wheat and barley. They are also suited to pasture and native grasses. Capability units IVe–1, irrigated, and IVe–3, dryland; Loamy Foothill range site; windbreak suitability group 1.

Aquepts, Loamy

5—Aquepts, loamy. These nearly level or gently sloping, poorly drained soils are in depressional areas on uplands, along drainageways, and on side slopes below large canals. The surface layer is fine sandy loam, loam, or clay loam. The underlying layer is mainly loam or clay loam extending to a depth of 40 to 60 inches or more. A water table is at or near the surface in spring and summer.

Included with these soils in mapping are a few small areas of Stoneham, Fort Collins, and Kim soils and Nunn clay loam, wet.

Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

These soils are suited to pasture and native grasses. A few areas are used for hay. If drained, the soils are suited to crops. The main irrigated crops are barley, corn, sugar beets, and wheat. Capability units IIIw–1, irrigated, and Vw–1, dryland; Wet Meadow range site; windbreak suitability group 5.

Aquepts, Ponded

6—Aquepts, ponded. These nearly level soils are near stream channels and drainageways. A water table is at or near the surface most of the year. The soils are extremely variable. The native vegetation is mainly cattails, sedges, and rushes.

These soils offer very little grazing but are suitable for wildlife habitat. Capability unit VIIIw–1, dryland; not assigned to a range site or windbreak suitability group.

Ascalon Series

The Ascalon series consists of deep, well drained soils that formed in mixed wind-deposited material. These soils are on uplands and foot slopes. Elevation ranges from 4,800 to 5,700 feet. Slopes are 0 to 5 percent. The native vegetation is mainly blue grama and other short grasses and forbs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is brown sandy loam about 6 inches thick. The subsoil is brown and pale brown sandy clay loam about 14 inches thick. The underlying material is pale brown or very pale brown sandy loam.

Permeability is moderate, and the available water capacity is medium to high. Reaction is neutral above a depth of about 16 inches and moderately alkaline below that depth.

These soils are used mainly for irrigated and dry-farmed crops. Some small areas are used for native grasses.

Representative profile of Ascalon sandy loam, 0 to 3 percent slopes, in a cultivated area, about 400 feet east and 650 feet south of the northwest corner of sec. 36, T. 5 N., R. 68 W.:

Ap—0 to 6 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky struc-

ture; hard, very friable; neutral; clear smooth boundary.

B2t—6 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium angular and subangular blocky; very hard, friable; numerous thin clay films on aggregates; neutral; clear smooth boundary.

B3ca—16 to 20 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable; thin patchy clay films; visible secondary calcium carbonate occurring as thin seams and streaks; strongly effervescent; moderately alkaline; clear smooth boundary.

C1ca—20 to 36 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; visible secondary calcium carbonate occurring as thin seams and streaks; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—36 to 60 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; slightly effervescent; moderately alkaline.

The A horizon ranges from fine sandy loam to sandy clay loam 5 to 12 inches thick. The B horizon ranges from 10 to 25 inches in thickness. It is neutral to moderately alkaline. The C horizon typically is sandy loam, but ranges from sandy loam to loam in places.

7—Ascalon sandy loam, 0 to 3 percent slopes. This nearly level soil is on uplands and high terraces. It has the profile described as representative of the series.

Included with this soil in mapping are a few areas of soils that have a surface layer of sandy clay loam. Also included are some small areas of soils in which sandstone is at a depth of 40 to 60 inches and small areas of Otero soils.

Runoff is slow. The hazard of wind erosion is moderate, and the hazard of water erosion is slight.

If irrigated, this soil is well suited to corn, beans, alfalfa, sugar beets, and barley. Under dryland management it is suited to wheat or barley. It is also well suited to pasture and native grasses. Capability units IIe–2, irrigated, and IIIe–8, dryland; Sandy Plains range site; windbreak suitability group 2.

8—Ascalon sandy loam, 3 to 5 percent slopes. This gently sloping soil is on uplands. This soil has a profile similar to the one described as representative of the series, but the surface layer and subsoil are thinner.

Included with this soil in mapping are some small areas of soils that are more sloping or less sloping. Also included are minor areas of Otero soils.

Runoff is medium, and the hazards of wind and water erosion are moderate.

If irrigated, this soil is suited to corn, alfalfa, beans, and small grain and, to a lesser extent, sugar beets. Under dryland management it is suited to wheat. It is also suited to pasture and native grasses. Capability units IIIe–4, irrigated, and IIIe–8, dryland; Sandy Plains range site; windbreak suitability group 2.

Bainville Series

The Bainville series consists of moderately deep, well drained soils that formed in material weathered from siltstone and shale. These soils are on uplands and are underlain by soft siltstone or silty shale at a depth of 20 to 40 inches. Elevation ranges from 5,600 to 6,400 feet. Slopes are 2 to 15 percent. The native vegetation is mainly blue grama, wheatgrasses, fringed sage, and other forbs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 47° to 50° F, and the frost-free season is 135 to 150 days.

In a representative profile the surface layer is brown silt loam about 5 inches thick. The underlying material is very pale brown silt loam to a depth of about 24 inches. Below this is soft siltstone.

Permeability is moderate, and the available water capacity is medium. Reaction is neutral above a depth of about 5 inches and mildly alkaline or moderately alkaline below that depth.

These soils are used for native grasses.

Representative profile of Bainville silt loam in an area of Bainville-Keith complex, 2 to 9 percent slopes, in native grass, about 50 feet west of benchmark near the southeast corner of sec. 13, T. 11 N., R. 68 W.:

A1—0 to 5 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

C1—5 to 12 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; calcareous; mildly alkaline; clear smooth boundary.

C2—12 to 24 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable; calcareous; moderately alkaline; clear smooth boundary.

C3r—24 to 60 inches; soft calcareous siltstone.

The A horizon is loam or silt loam 4 to 8 inches thick. The C horizon is silt loam or light silty clay loam 16 to 32 inches thick.

9—Bainville-Epping silt loams, 5 to 20 percent slopes. This complex consists of moderately sloping to strongly sloping soils on uplands. It is about 45 percent Bainville silt loam and about 35 percent Epping silt loam. Bainville silt loam is less sloping, and Epping silt loam is steeper.

Included with these soils in mapping is about 20 percent Keith and Larim soils and siltstone outcrop.

Runoff is rapid, and the hazard of erosion is severe.

These soils are suited to pasture and native grasses. Capability unit VIe–1, dryland; Bainville soil in Loamy Foothill range site and Epping soil in Shallow Siltstone range site; not assigned to a windbreak suitability group.

10—Bainville-Keith complex, 2 to 9 percent slopes. This complex consists of nearly level to moderately sloping soils on uplands and high benches. It is about 50 percent Bainville silt loam and about 35 percent

management it is suited to wheat or barley. It is also well suited to pasture and native grasses. Capability units IVe–1, irrigated, and IVe–3, dryland; Loamy Foothill range site; not assigned to a windbreak suitability group.

Caruso Series

The Caruso series consists of deep, somewhat poorly drained soils that formed in mixed alluvium. These soils are on low terraces and bottom lands. Elevation ranges from 4,800 to 5,500 feet. Slopes are 0 to 1 percent. The native vegetation is mainly inland saltgrass, alkali sacaton, sedges, and other water-tolerant grasses. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F. and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is grayish brown clay loam about 11 inches thick. The underlying material is stratified pale brown, light brown, and grayish brown clay loam, silty clay loam, fine sandy loam, and loamy fine sand. Below this is sand and gravel.

Permeability is moderately slow above a depth of about 25 inches and moderately rapid or rapid below that depth. The available water capacity is medium to high. Reaction is mildly alkaline or moderately alkaline above a depth of 25 inches and mildly alkaline below that depth.

These soils are mainly used for irrigated crops and pasture. A few areas are used for dryfarmed crops and pasture.

Representative profile of Caruso clay loam, 0 to 1 percent slopes, in dryland pasture, about 100 feet east of picnic area in the NE¼ sec. 34, T. 7 N., R. 68 W.:

A1—0 to 11 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable; strongly effervescent; mildly alkaline; clear smooth boundary.

C1—11 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; common medium distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very hard, friable; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—17 to 25 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/4) moist; common fine faint reddish brown (5YR 4/4) mottles; weak fine subangular blocky structure; very hard, friable; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—25 to 35 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common fine faint yellowish brown (10YR 5/4) mottles; massive; very hard, friable; faintly effervescent; mildly alkaline; clear smooth boundary.

C4—35 to 44 inches; grayish brown (10YR 5/2) loamy fine sand, dark brown (10YR 3/3) moist; common medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, very friable; mildly alkaline; gradual smooth boundary.

IIC5—44 to 60 inches; stratified sand and gravel.

The A horizon is heavy loam or clay loam 8 to 18 inches thick. The underlying C horizon is sandy loam, loam, clay loam, or silty clay loam. It has thin layers of loamy fine sand in places, but is mainly loam or light clay loam. It is stratified and generally mottled and is underlain by clean sand and gravel below a depth of about 40 inches. Reaction ranges from mildly alkaline to moderately alkaline.

22—Caruso clay loam, 0 to 1 percent slopes. This level soil is on low terraces and bottom lands.

Included with this soil in mapping are a few areas of soils that are more sloping. Also included are small areas of Loveland soils and a few minor areas of gravel bars.

Runoff is slow, and the hazard of erosion is slight.

If irrigated, this soil is suited to barley and sugar beets and, to a lesser extent, corn. It is also well suited to pasture and native grasses. Capability units IIIw–1, irrigated, and Vw–1, dryland; Wet Meadow range site; windbreak suitability group 5.

Clergern Series

The Clergern series consists of deep, well drained soils that formed in alluvium and valley-filling material from reddish sandstone and shale. These soils are in valleys and on side slopes. Elevation ranges from 7,500 to 8,500 feet. Slopes are 0 to 10 percent. The native vegetation is mainly needleandthread, slender wheatgrass, bluebunch wheatgrass, fringed sage, and rabbitbrush. Mean annual precipitation ranges from 12 to 14 inches, mean annual air temperature ranges from 42° to 46° F, and the frost-free season ranges from 75 to 100 days.

In a representative profile the surface layer is reddish brown fine sandy loam about 12 inches thick. The underlying material is reddish brown and light reddish brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is high. Reaction is neutral above a depth of about 12 inches and mildly alkaline below that depth.

These soils are used for native grasses.

Representative profile of Clergern fine sandy loam, 2 to 10 percent slopes, in native grass, about 800 feet south and 1,500 feet west of the northeast corner of sec. 27, T. 12 N., R. 75:

A11—0 to 6 inches; reddish brown (5YR 5/3) fine sandy loam, dark reddish brown (5YR 3/3) moist; weak to moderate fine granular structure; soft, very friable; slightly effervescent; neutral; clear smooth boundary.

A12—6 to 12 inches; reddish brown (5YR 5/3) fine sandy loam, dark reddish brown (5YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable; slightly effervescent; neutral; clear smooth boundary.

C1—12 to 30 inches; reddish brown (5YR 5/4)

3/4) moist; massive; hard, very friable; violently effervescent; streaks and small specks of calcium carbonate; moderately alkaline.

Thickness of the mollic epipedon is 20 to 40 inches. The A horizon is loam, fine sandy loam, or sandy loam 5 to 12 inches thick. The B horizon is loam, light clay loam, or sandy clay loam. The A and B horizons range from neutral to mildly alkaline. They are leached of lime but are slightly effervescent in many places because of additions of lime by irrigation water. A sand and gravel substratum is below a depth of 40 inches in some places.

40—Garrett loam, 0 to 1 percent slopes. This level soil is on terraces and fans (fig. 6).

Included with this soil in mapping are a few small areas of soils that have gravel on the surface and a few areas of soils in which gravel is at a depth of 40 to 60 inches. Also included are small areas of Harlan, Otero, Connerton, and Barnum soils.

Runoff is slow. The hazard of erosion is slight, but some areas near stream channels have been cut in places. Lower areas near the channels are flooded at times in spring or early summer.

If irrigated, this soil is suited to corn, sugar beets, beans, barley, alfalfa, and wheat. It is also well suited to pasture. Under dryland management it is suited to wheat and barley and it is well suited to pasture and native grasses. Capability units IIw–1, irrigated, and IIIe–6, dryland; Overflow range site; windbreak suitability group 5.

41—Garrett loam, 1 to 3 percent slopes. This nearly level soil is on terraces and fans. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of Harlan, Otero, Connerton, and Barnum soils. Also included are a few areas of soils in which gravel is on the surface and at a depth of 40 to 60 inches.

Runoff is medium, and the hazard of erosion is slight or moderate. Areas near the stream channel receive overflow at times and cutting occurs in places.

If irrigated, this soil is suited to corn, sugar beets, beans, barley, alfalfa, and wheat. Under dryland management it is suited to wheat and barley. It is also suited to pasture and native grasses (fig. 7). Capability units IIe–1, irrigated, and IIIe–6, dryland; Overflow range site; windbreak suitability group 1.

Gravel Pits

42—Gravel pits. This unit consists of areas where the soil and underlying gravel deposits have been removed. These areas have no value for farming and little value for grazing. Some areas are filled with water and provide habitat for fish and wildlife. Some areas are used for sanitary landfills. Also included are borrow pits and areas where material was removed in road construction, mainly along Interstate Highway 25. Capability unit VIIIs–1, dryland; not assigned to a range site or windbreak suitability group.

Haploborolls-Rock Outcrop Complex, Steep

43—Haploborolls-Rock outcrop complex, steep. This complex consists of steep and very steep, cool soils and Rock outcrop on mountainsides and fans (fig. 8). The soils are extremely variable; about 50 to 70 percent of the unit, however, is stony and cobbly, dark colored soils that range from shallow to deep. These soils mainly have a surface layer and subsurface layer of sandy loam or loam that contain 10 to 25 percent cobbles and 20 to 35 percent stones. Stones that are on the surface are mainly boulders of granite, gneiss, and schist. About 30 to 50 percent of the mapped area is Rock outcrop. It is mainly on the steeper parts of the area, but it is scattered throughout.

Runoff is rapid, and the hazard of water erosion is severe.

These soils are used for a limited amount of grazing and are also used for wildlife habitat and watershed. Capability unit VIIe–1, dryland; Haploborolls in Stony Loam range site and Rock outcrop not assigned to a range site; not assigned to a windbreak suitability group.

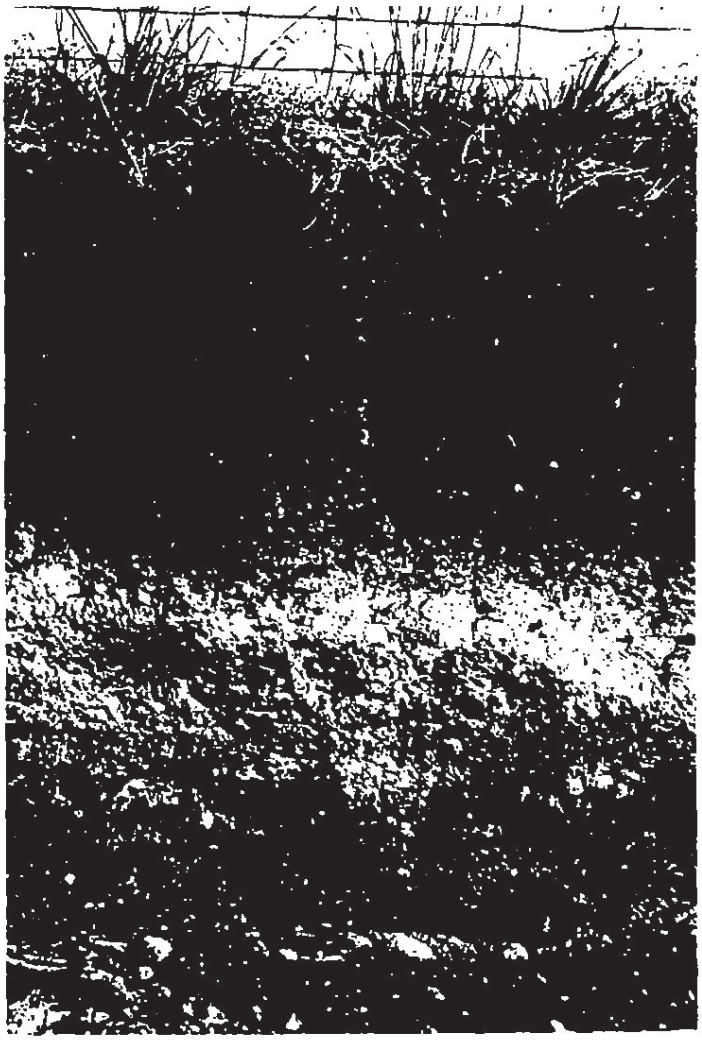

Figure 6.—**Profile of Garrett loam, 0 to 1 percent slopes.**

Haplustolls, Hilly

44—Haplustolls, hilly. These strongly sloping to

areas of soils that are similar to Kirtley and Purner soils but in which more sandstone fragments are in the profile. Also included are areas of Rock outcrop. These inclusions make up about 15 percent of the complex.

Runoff is rapid, and the hazard of erosion is severe.

These soils are suited to pasture or native grasses. Capability unit VIe–1, dryland; Kirtley soil in Loamy Foothill range site and Purner soil in Shallow Foothill range site; not assigned to a windbreak suitability group.

LaPorte Series

The LaPorte series consists of shallow, well drained soils that formed in material weathered from limestone. These soils are on uplands and are underlain by limestone at a depth of 10 to 20 inches. Elevation ranges from 5,200 to 5.800 feet. Slopes are 3 to 30 percent. The native vegetation is mainly blue grama, western wheatgrass, needleandthread, yucca, and pricklypear cactus. Mean annual precipitation ranges from 13 to 16 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is grayish brown loam about 9 inches thick. The underlying material is light brownish gray channery loam about 7 inches thick. Below this is limestone bedrock.

Permeability is moderate, and the available water capacity is low. Reaction is moderately alkaline.

These soils are used mainly for native grasses.

Representative profile of LaPorte loam in an area of LaPorte-Rock outcrop complex, 3 to 30 percent slopes, in native grass, about 1,712 feet north and 321 feet west of the southeast corner of sec. 1, T. 4 N., R. 70 W.:

A1—0 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine crumb structure; slightly hard, very friable; 5 percent limestone fragments; calcareous; moderately alkaline; clear smooth boundary.

Cca—9 to 16 inches; light brownish gray (10YR 6/2) channery loam; dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; some visible secondary calcium carbonate mostly as concretions; 30 percent limestone fragments; calcareous; moderately alkaline; gradual smooth boundary.

R—16 inches; weakly fractured limestone.

The A horizon is loam or fine sandy loam 5 to 16 inches thick. Content of rock fragments ranges from 5 to 35 percent.

59—LaPorte-Rock outcrop complex, 3 to 30 percent slopes. This complex consists of gently sloping to steep soils on uplands and ridges. It is about 45 percent LaPorte loam and about 35 percent Rock outcrop. LaPorte loam is commonly on the eastern side of ridges and is on the smoother parts of the western side, and Rock outcrop is commonly on ridgetops and on the western side, but is throughout the complex. Rock outcrop is mainly limestone or limy shale.

Included with this complex in mapping are about 20 percent areas of Kim, Minnequa, and Midway soils.

Runoff is rapid, and the hazard of erosion is severe.

This soil is suited to pasture and native grasses. It has been used to a large extent for strip mines because the underlying limestone is used in the manufacture of cement. Capability unit VIIe–1, dryland; LaPorte soil in Shallow Foothill range site, and Rock outcrop not assigned to a range site; not assigned to a windbreak suitability group.

Larim Series

The Larim series consists of deep, well drained soils that formed in mixed alluvium. These soils are on fans, benches, and terrace edges and are underlain by very gravelly sand at a depth of 11 to 20 inches. Elevation ranges from 4,800 to 6,300 feet. Slopes are 5 to 40 percent. The native vegetation is mainly blue grama, needlegrasses, side-oats grama, snakeweed, and some forbs and shrubs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 47° to 49° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is grayish brown gravelly sandy loam about 4 inches thick. The subsoil is brown gravelly sandy clay loam about 5 inches thick and pale brown very gravelly sandy loam about 6 inches thick. The underlying material is light yellowish brown very gravelly loamy sand.

Permeability is moderate above a depth of about 15 inches and very rapid below that depth. The available water capacity is low or medium. Reaction is neutral to mildly alkaline.

These soils are used for native grasses.

Representative profile of Larim gravelly sandy loam, 5 to 40 percent slopes, in native grass, 1,750 feet west and 2,500 feet north of the southeast corner of sec. 22, T. 12 N., R. 68 W.:

A1—0 to 4 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, very friable, nonsticky and nonplastic; 30 percent gravel; neutral; clear smooth boundary.

B2t—4 to 9 inches; brown (10YR 5/3) gravelly sandy clay loam, brown (10YR 4/3) moist; peds in upper part are coated with dark brown (10YR 3/3); weak medium subangular blocky structure; hard, friable; slightly sticky and slightly plastic; thin patchy clay films on peds; 35 percent gravel; neutral; clear wavy boundary.

B3ca—9 to 15 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few patchy clay films on peds; 45 percent gravel; calcareous; mildly alkaline; gradual smooth boundary.

IIC—15 to 60 inches; light yellowish brown

(10YR 6/4) very gravelly loamy sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; nonsticky and nonplastic; 60 percent gravel; calcareous; mildly alkaline.

The A horizon is gravelly or very gravelly sandy loam or loam 3 to 5 inches thick. The B2 horizon is gravelly or very gravelly clay loam or sandy clay loam. The combined thickness of the A and B horizons ranges from 12 to 18 inches. Content of rock fragments in the solum ranges from 25 to 50 percent but is more than 35 percent in the B horizon. Reaction ranges from neutral to moderately alkaline.

60—Larim gravelly sandy loam, 5 to 40 percent slopes. This strongly sloping to steep soil is on fans, benches, and terrace edges.

Included with this soil in mapping are small areas of soils that have a surface layer and subsoil of gravelly loam to gravelly loamy sand. Also included are small areas of soils in which shale or sandstone is at a depth of 10 to 20 inches.

Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is suited to pasture and native grasses. Some areas of this soil are used as sites for gravel pits. Capability unit VIe–4, dryland; Gravelly Foothill range site; windbreak suitability group 4.

Larimer Series

The Larimer series consists of deep, well drained soils that formed in material weathered from alluvium. These soils are on high terraces and fans and are underlain by sand and gravel at a depth of 20 to 40 inches. Elevation ranges from 4,800 to 5,800 feet. Slopes are 1 to 10 percent. The native vegetation is mainly blue grama, western wheatgrass, needleandthread, and cactus. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is light brownish gray fine sandy loam about 4 inches thick. The subsoil is brown and light brown loam about 18 inches thick. The underlying material is about 8 inches of light gray gravelly sandy loam that is underlain by sand and gravel.

Permeability is moderate above a depth of about 22 inches and rapid or very rapid below that depth. The available water capacity is medium. Reaction is neutral above a depth of about 4 inches, mildly alkaline between depths of 4 and 18 inches, and moderately alkaline below a depth of 18 inches.

These soils are used mainly for irrigated and dryfarmed crops and for pasture and native grasses.

Representative profile of Larimer fine sandy loam, 1 to 3 percent slopes, in native grass, about 0.2 mile west and 600 feet south of the northeast corner of sec. 16, T. 9 N., R. 68 W.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; strong very fine granular structure; soft, very friable; 5 percent gravel; neutral; clear smooth boundary.

B1—4 to 7 inches; brown (7.5YR 5/3) light loam, brown or dark brown (7.5YR 4/3) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; 5 percent gravel; mildly alkaline; clear smooth boundary.

B2t—7 to 18 inches; brown (7.5YR 5/3) heavy loam, brown or dark brown (7.5YR 4/3) moist; moderate fine and medium prismatic structure parting to moderate medium and fine subangular blocky; hard, very friable; thin nearly continuous clay films on peds; 5 percent gravel; mildly alkaline; clear, wavy boundary.

B3ca—18 to 22 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, very friable; few thin patchy clay films on the horizontal and vertical faces of aggregates; 5 percent gravel; some visible calcium carbonate as concretions and as coatings on the gravel fragments; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—22 to 30 inches; light gray (10YR 7/2) gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; 20 percent gravel; visible secondary calcium carbonate as concretions, in thin seams and streaks, as coatings on the gravel fragments, and in finely divided forms; moderately alkaline; diffuse wavy boundary.

IIC2ca—30 to 60 inches; relatively clean gravel, cobbles, and sand mainly of quartzite, gneiss, and granite; approximately 80 percent gravel and cobbles; small amount of calcium carbonate as coatings on the gravel and sand in the upper part; moderately alkaline.

The A horizon is loam, fine sandy loam, or sandy loam 3 to 11 inches thick. The B horizon is heavy loam or light clay loam. The A and B horizons range from neutral to moderately alkaline. Content of rock fragments ranges from 0 to 25 percent in the upper part of the profile and from 50 to 80 percent in the lower part.

61—Larimer fine sandy loam, 1 to 3 percent slopes. This nearly level soil is on terraces, fans, and benches. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small areas of Altvan, Fort Collins, and Stoneham soils. Also included are a few small areas of soils that are more sloping or less sloping and a few small areas of soils that have a surface layer of loam or sandy clay loam. The surface layer is about 11 inches thick because deep plowing has mixed the surface layer and subsoil in irrigated areas.

Runoff is slow. The hazard of water erosion is slight, and the hazard of wind erosion is moderate.

If irrigated, this soil is suited to barley, alfalfa, wheat, corn, and beans and, to a lesser extent, sugar

beets. Under dryland management it is well suited to pasture or native grasses and, to a lesser extent, wheat and barley. Capability units IIIe–5, irrigated, and IVe–5, dryland; Loamy Plains range site; windbreak suitability group 2.

62—Larimer-Stoneham complex, 3 to 10 percent slopes. This complex consists of gently sloping to strongly sloping soils on terraces, fans, and benches. It is about 35 percent Larimer fine sandy loam, about 25 percent Stoneham loam, and about 20 percent Cushman fine sandy loam. Larimer fine sandy loam is on side slopes and areas near terrace edges, Stoneham loam commonly has the more gentle slopes on terraces, and Cushman fine sandy loam is on side slopes.

Included with these soils in mapping are about 20 percent areas of Fort Collins, Larim, Altvan, and Satanta soils. Also included are some small areas of soils that are more sloping.

Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is well suited to pasture and native grasses under dryland management. If irrigated, it is suited to pasture and, to a lesser extent, barley, wheat, and alfalfa. Capability units IVe–1, irrigated, and VIe–2, dryland; Loamy Plains range site; windbreak suitability group 2.

Longmont Series

The Longmont series consists of deep, poorly drained soils that formed in alluvium mainly from clay shale. These soils are on flood plains, terraces, and valleys. Elevation ranges from 4,800 to 5,800 feet. Slopes are 0 to 3 percent. The native vegetation is mainly alkali sacaton, saltgrass, sedges, and other water-tolerant grasses. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is light brownish gray clay about 17 inches thick. The underlying material is mottled pale olive clay.

Permeability is slow, and the available water capacity is high. Reaction is strongly alkaline above a depth of 40 inches and moderately alkaline below that depth.

These soils are used for native grasses.

Representative profile of Longmont clay, 0 to 3 percent slopes, in native grass, about 1,350 feet east and 50 feet north of the southwest corner of sec. 17, T. 6 N., R. 68 W.:

A11—0 to 7 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, very firm; strongly effervescent; strongly alkaline; clear smooth boundary.

A12—7 to 17 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm; strongly effervescent; strongly alkaline; gradual wavy boundary.

C1cscag—17 to 40 inches; pale olive (5Y 6/3) clay, olive (5Y 4/3) moist; massive; very hard, very firm; common medium distinct mottles of yellowish brown (10 YR 5/6) moist; calcium sulfate accumulations in seams and streaks and calcium carbonate in spots; strongly effervescent; strongly alkaline; gradual wavy boundary.

C2cscag—40 to 60 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; very hard, very firm; common medium distinct mottles of olive (5Y 4/3 and 4/4) moist; calcium sulfate accumulations in seams and streaks and calcium carbonate in spots; strongly effervescent; moderately alkaline.

The A horizon is clay loam or clay 12 to 21 inches thick. The C horizon is heavy clay loam or clay. Reaction is strongly alkaline or very strongly alkaline in the surface layer but decreases with increasing depth. The water table is near the surface for part of every year.

63—Longmont clay, 0 to 3 percent slopes. This nearly level soil is on flood plains and upland valleys.

Included with this soil in mapping are some small areas of soils that are more sloping and a few small areas of soils that have a surface layer and subsurface layer of clay loam. Also included are a few small areas of soils in which gravel is at a depth of 40 to 60 inches.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to pasture or native grasses (fig. 9). Capability unit VIw–2, dryland; Salt Meadow range site; windbreak suitability group 4.

Loveland Series

The Loveland series consists of deep, somewhat poorly drained soils that formed in material weathered from alluvium. These soils are on terraces and flood plains and are underlain by sand and gravel at a depth of 20 to 40 inches. Elevation ranges from 4,800 to 5,500 feet. Slopes are 0 to 1 percent. The native vegetation is mainly blue grama, bluegrass, and sedges. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is mottled dark grayish brown or grayish brown clay loam about 15 inches thick. The underlying material is 17 inches of grayish brown clay loam over sand, gravel, and cobbles.

Permeability is moderately slow above a depth of about 32 inches and very rapid below that depth. The available water capacity is medium to high. Reaction is mildly alkaline above a depth of about 8 inches and moderately alkaline below that depth.

These soils are used mainly for irrigated and dryfarmed crops and for pasture.

Representative profile of Loveland clay loam, 0 to 1 percent slopes, in grass, 2,250 feet north and 600 feet west of the southeast corner of sec. 10, T. 6 N., R. 68 W.:

A11—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; weak to moderate fine gran-

Figure 9.—Area of Longmont clay, 0 to 3 percent slopes.

ular structure; hard, friable; common faint mottles; slightly effervescent; mildly alkaline; clear smooth boundary.

A12g—8 to 15 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, firm; common medium distinct light reddish brown (5YR 6/4) mottles; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1g—15 to 32 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm; common medium distinct light reddish brown (5YR 6/4) mottles; strongly effervescent; moderately alkaline; gradual smooth boundary.

IIC2g—32 to 60 inches; mixed sand, gravel, and cobbles; light reddish brown (5YR 6/4) mottles.

The A horizon is loam or clay loam 12 to 20 inches thick. It is mottled in the lower part. The C1 horizon is loam or light clay loam. The A and C horizons range from neutral to moderately alkaline. Content of rock fragments is 0 to 15 percent in the upper part of the profile and 35 to 60 percent in the lower part.

64—Loveland clay loam, 0 to 1 percent slopes. This level soil is on low terraces and flood plains.

Included with this soil in mapping are a few small areas of soils that are more sloping, small areas of soils in which gravel is at a depth of 40 to 60 inches, and a few small areas of soils that have a surface layer of loam. Also included are small areas of Poudre soils.

Runoff is slow, and the hazard of water erosion is slight.

If irrigated, this soil is suited to barley and pasture. If drained, it is suited to corn and, to a lesser extent, sugar beets. Under dryland management it is well suited to pasture and native grasses. Capability units IIIw–1, irrigated, and Vw–1, dryland; Wet Meadow range site; windbreak suitability group 5.

Midway Series

The Midway series consists of shallow, well drained soils that formed in material weathered from shale. These soils are on uplands and are underlain by soft shale at a depth of 10 to 20 inches. Elevation ranges from 4,800 to 5,800 feet. Slopes are 5 to 25 percent. The native vegetation is blue grama, buffalograss, western wheatgrass, cactus, and fringed sage. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is light olive brown clay loam about 4 inches thick. The sub-

79—Otero sandy loam, 5 to 9 percent slopes. This strongly sloping soil is on uplands and fans.

Included with this soil in mapping are small areas of soils that are more sloping or less sloping. Also included are a few small areas of Nelson, Kim, and Tassel soils.

Runoff is rapid, and the hazard of erosion is severe.

If irrigated, this soil is well suited to pasture and, to a lesser extent, wheat, barley, or alfalfa. Under dryland management it is suited to pasture or native grasses. Capability units IVe–2, irrigated, and VIe–2, dryland; Sandy Plains range site; windbreak suitability group 2.

80—Otero-Nelson sandy loam, 3 to 25 percent slopes. This complex consists of gently sloping to moderately steep soils on uplands. It is about 50 percent Otero sandy loam and 35 percent Nelson sandy loam. Otero sandy loam is less sloping at the top and near the base of the slope, and Nelson sandy loam is steeper. The Otero soil has the profile described as representative of the Otero series. The Nelson soil has a profile similar to the one described as representative of the Nelson series, but the surface layer is sandy loam.

Included with these soils in mapping are about 15 percent areas of Tassel soils and Rock outcrop.

Runoff is medium to rapid, and the hazard of erosion is severe.

These soils are suited to pasture or native grasses. Capability unit VIe–2, dryland; Sandy Plains range site; windbreak suitability group 3.

Paoli Series

The Paoli series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and bottom lands. Elevation ranges from 4,800 to 5,600 feet. Slopes are 0 to 1 percent. The native vegetation is blue grama, bluestems, needlegrass, and some forbs and shrubs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 42 inches thick. The underlying material is brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is high. Reaction is mildly alkaline above a depth of 22 inches and moderately alkaline below that depth.

These soils are used mainly for irrigated crops. Some areas are in native grass.

Representative profile of Paoli fine sandy loam, 0 to 1 percent slopes, in native grass, about 2,000 feet south and 100 feet east of the northeast corner of sec. 24, T. 5 N., R. 69 W.:

A11—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine granular and weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; calcareous; mildly alkaline; clear smooth boundary.

A12—8 to 30 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; calcareous; mildly alkaline; clear smooth boundary.

A13—30 to 42 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; calcareous; few streaks of visible secondary calcium carbonate and few calcium sulfate seams; moderately alkaline; clear smooth boundary.

Cca—42 to 60 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; calcareous; visible secondary calcium carbonate as seams and streaks; moderately alkaline.

The A horizon is sandy loam or fine sandy loam, but it is loam in some places. The C horizon is sandy loam to heavy loamy sand. Thickness of the mollic epipedon ranges from 20 to 50 inches. Reaction ranges from neutral to moderately alkaline.

81—Paoli fine sandy loam, 0 to 1 percent slopes. This level soil is on low terraces.

Included with this soil in mapping are a few small areas of soils that are more sloping. Also included are a few small areas of Caruso and Table Mountain soils and some gravel spots.

Runoff is slow. The hazard of water erosion is slight, and the hazard of wind erosion is moderate. This soil is flooded in places, especially near stream channels.

If irrigated, this soil is suited to corn, sugar beets, beans, barley, alfalfa, and wheat. Under dryland management it is suited to wheat and barley. It is also well suited to pasture and native grasses. Capability units IIs–2, irrigated, and IIIe–8, dryland; Overflow range site; windbreak suitability group 2.

Pendergrass Series

The Pendergrass series consists of shallow, well drained to somewhat excessively drained soils that formed in material weathered from reddish brown sandstone. These soils are on uplands and are underlain by hard sandstone at a depth of 10 to 20 inches. Elevation ranges from 7,800 to 8,800 feet. Slopes are 5 to 25 percent. The native vegetation is mainly wheatgrasses, junegrass, sage, and mountainmahogany. Mean annual precipitation ranges from 12 to 15 inches, mean annual air temperature ranges from 42° to 45° F, and the frost-free season ranges from 60 to 85 days.

In a representative profile the surface layer is reddish brown fine sandy loam about 5 inches thick. The underlying material is reddish brown channery fine sandy loam about 10 inches thick. Below this is hard sandstone.

Permeability is rapid, and the available water capacity is low. Reaction is neutral.

These soils are used mainly for native grasses.

Representative profile of Pendergrass fine sandy loam in an area of Pendergrass-Rock outcrop complex, 15 to 25 percent slopes, in native grass, 1,000 feet west of the northwest corner of sec. 27, T. 12 N., R. 75 W.:

A1—0 to 5 inches; reddish brown (2.5YR 4/4)

fine sandy loam, dark reddish brown (2.5YR 3/4) moist; weak fine granular structure; soft, very friable; 10 percent sandstone fragments; calcareous; neutral; clear smooth boundary.

C1—5 to 9 inches; reddish brown (2.5YR 5/4) channery fine sandy loam, reddish brown (2.5YR 4/4) moist; weak fine granular and weak medium subangular blocky structure; slightly hard, very friable; 30 percent sandstone fragments; calcareous; neutral; gradual smooth boundary.

C2—9 to 15 inches; reddish brown (2.5YR 5/4) channery fine sandy loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, very friable; 50 percent sandstone fragments and flagstones; calcareous; neutral; clear smooth boundary.

R—15 inches; sandstone.

The A horizon is fine sandy loam or light loam 3 to 6 inches thick. The C horizon is fine sandy loam, sandy loam, or light loam. Content of rock fragments, mostly channery or larger, averages 35 to 70 percent. Reaction ranges from neutral to moderately alkaline.

82—Pendergrass-Rock outcrop complex, 15 to 25 percent slopes. This complex consists of moderately steep soils on uplands. It is about 50 percent Pendergrass fine sandy loam and about 35 percent Rock outcrop. Pendergrass fine sandy loam is near the top of side slopes and the less sloping areas near the base of side slopes, and Rock outcrop is steeper.

Included with this complex in mapping are about 15 percent areas of Miracle and Clergern soils. Also included are some small areas of soils that are similar to the Pendergrass soil but in which bedrock is somewhat deeper and vegetation is mixed conifers.

Runoff is rapid, and the hazard of erosion is severe.

This complex is suited to native grasses. Capability unit VIIs–1, dryland; Pendergrass soil in Rocky Loam range site and Rock outcrop not assigned to a range site; not assigned to a windbreak suitability group.

Pinata Series

The Pinata series consists of deep, well drained soils that formed in material weathered from sandstone and shale. These soils are on mountainsides and ridges. Elevation ranges from 5,800 to 6,500 feet. Slopes are 15 to 45 percent. The native vegetation is mainly ponderosa pine and some juniper and oak brush. Mean annual precipitation ranges from 15 to 18 inches, mean annual air temperature ranges from 46° to 48° F, and the frost-free season ranges from 120 to 135 days.

In a representative profile a 1-inch-thick layer of organic material is on the surface. The surface layer is dark brown stony sandy loam about 2 inches thick. The subsurface layer is pinkish gray stony light sandy loam about 8 inches thick. The subsoil is reddish brown stony clay about 12 inches thick and yellowish red stony clay loam about 20 inches thick. Below this is hard sandstone.

Permeability is slow, and the available water capacity is medium. Reaction is neutral.

These soils are used for recreation, building sites, quarry sites, and limited grazing.

Representative profile of Pinata stony sandy loam in an area of Pinata-Rock outcrop complex, 15 to 45 percent slopes, in forest, about 1,500 feet west of the center of sec. 34, T. 5 N., R. 70 W.:

O1—1 inch to 0; partly decayed pine needles and leaves.

A1—0 to 2 inches; dark brown (7.5YR 4/2) stony sandy loam, very dark brown (7.5YR 2/2) moist; weak medium subangular blocky and weak fine granular structure; soft, very friable; about 35 percent stones and gravel; neutral; clear smooth boundary.

A2—2 to 10 inches; pinkish gray (7.5YR 6/2) stony light sandy loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure; soft, very friable; about 35 percent stones; neutral; clear smooth boundary.

B2t—10 to 22 inches; reddish brown (5YR 5/4) stony clay, reddish brown (5YR 4/4) moist; moderate medium and coarse subangular blocky structure; very hard, very firm; thin nearly continuous clay films on peds; about 40 percent stones; neutral; clear wavy boundary.

B3—22 to 42 inches; yellowish red (5YR 5/6) stony clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; very hard, firm; thin patchy clay films on peds; about 45 percent stones; neutral; gradual smooth boundary.

R—42 to 60 inches; hard sandstone.

The A1 horizon is sandy loam or heavy loamy sand 1 to 4 inches thick. The A2 horizon is light sandy loam or loamy sand 6 to 12 inches thick. The B2t horizon is heavy clay loam or clay. Depth to bedrock ranges from 40 to 60 inches or more. Content of rock fragments, mainly flagstone, ranges from 35 to 80 percent.

83—Pinata-Rock outcrop complex, 15 to 45 percent slopes. This complex consists of moderately steep to steep soils on mountainsides and ridges. It is about 50 percent Pinata stony sandy loam and about 35 percent Rock outcrop. Pinata stony sandy loam is smoother and less sloping, and Rock outcrop is commonly steeper and on west-facing slopes but occurs throughout.

Included with this complex in mapping are about 15 percent areas of Purner soils and soils that are similar to the Pinata soil but in which bedrock is at a depth of less than 40 inches.

Runoff is rapid, and the hazard of erosion is severe.

This complex is used for forest and for limited grazing for cattle. Many areas are used as building sites and as sites for quarrying building stone. Capability unit VIIs–1, dryland; Pinata soil in woodland suitability group 6x1; not assigned to a range site or windbreak suitability group.

Poudre Series

The Poudre series consists of deep, somewhat poorly

drained or poorly drained soils that formed in alluvium. These soils are on terraces, flood plains, and drainageways. Elevation ranges from 4,800 to 5,600 feet. Slopes are 0 to 1 percent. The native vegetation is sedges, bluegrass, timothy, and other water-tolerant grasses and forbs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is gray and grayish brown fine sandy loam about 30 inches thick. The subsoil is light brownish gray fine sandy loam about 30 inches thick.

Permeability is moderately rapid, and the available water capacity is high. Reaction is moderately alkaline.

These soils are used mainly for hay and grazing. A few areas are used for irrigated crops and pasture.

Representative profile of Poudre fine sandy loam, 0 to 1 percent slopes, in native grass, about 100 feet east of the west quarter corner of sec. 34, T. 8 N., R. 69 W.:

A11—0 to 10 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, very friable; nonsticky and nonplastic; crushed soil surface feels slippery and soaplike; many medium and large mica flakes; calcareous; moderately alkaline; clear wavy boundary.

A12—10 to 30 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common medium distinct dark yellowish brown (10YR 4/4 and 4/6) moist mottles; weak medium subangular blocky structure parting to coarse granular; crushed soil surface feels slippery and soaplike; many fine to large mica flakes; calcareous; moderately alkaline; gradual smooth boundary.

B2g—30 to 60 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; many large prominent light yellowish brown (10YR 6/4) moist mottles; massive; slightly hard, friable; nonsticky and nonplastic; crushed soil surface feels slippery and soaplike; many fine to large mica flakes; calcareous; moderately alkaline.

The A horizon ranges from fine sandy loam to sandy loam 20 to 40 inches thick. Thickness of the mollic epipedon is 24 to 50 inches. Content of rock fragments ranges from 0 to 15 percent. Reaction ranges from mildly alkaline to moderately alkaline. Gravel is at a depth of 40 to 60 inches in some profiles.

84—Poudre fine sandy loam, 0 to 1 percent slopes. This level soil is on low terraces and flood plains.

Included with this soil in mapping are a few small areas of soils that are more sloping. Also included are a few areas of soils in which gravel is at a depth of less than 40 inches, a few gravel bars, and a few small areas of Loveland, Caruso, and Paoli soils.

Runoff is slow, and the hazard of erosion is slight.

If irrigated, this soil is suited to pasture and hay. Barley, alfalfa, corn, and sugar beets can be grown if the water table is lowered. The soil is also well suited to pasture and native grasses. Capability unit IVw–1, irrigated; Wet Meadow range site; windbreak suitability group 5.

Purner Series

The Purner series consists of shallow, well drained soils that formed in material weathered from reddish brown sandstone. These soils are on uplands and are underlain by sandstone at a depth of 10 to 20 inches. Elevation ranges from 5,800 to 6,400 feet. Slopes are 1 to 30 percent. The native vegetation is mainly blue grama, wheatgrasses, mountainmahogany, and some other forbs and shrubs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 47° to 49° F, and the frost-free season ranges from 115 to 130 days.

In a representative profile the surface layer is reddish brown fine sandy loam about 7 inches thick. The underlying material is light reddish brown fine sandy loam about 7 inches thick. Below this is hard reddish brown sandstone.

Permeability is moderate, and the available water capacity is low. Reaction is mildly alkaline above a depth of about 7 inches and moderately alkaline below that depth.

These soils are used mainly for native grasses.

Representative profile of Purner fine sandy loam, 1 to 9 percent slopes, in native grass, about 1,000 feet north and 650 feet west of the southwest corner of sec. 22, T. 10 N., R. 70 W.:

A1—0 to 7 inches; reddish brown (5YR 4/3) fine sandy loam, dark reddish brown (5YR 3/3) moist; weak medium subangular and weak to moderate medium granular structure; slightly hard, very friable; calcareous; mildly alkaline; clear smooth boundary.

Cca—7 to 14 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; calcareous; visible secondary calcium carbonate as seams and streaks and finely divided forms; moderately alkaline; clear smooth boundary.

R—14 to 60 inches; hard reddish brown sandstone.

The A horizon is sandy loam or fine sandy loam 6 to 12 inches thick. Content of rock fragments, mainly gravel-size sandstone, ranges from 0 to 15 percent. The A horizon is leached of lime for a few inches in places. The zone of lime accumulation is immediately above or in the upper part of the bedrock in places.

85—Purner fine sandy loam, 1 to 9 percent slopes. This nearly level to strongly sloping soil is on uplands and ridges. This soil has the profile described as representative of the series.

Included with this soil in mapping are some small areas of soils that have a surface layer of loam. Also included are small areas of soils that have more stones in the surface layer, small areas of Rock outcrop, and a few small areas of Kirtley soils.

Runoff is rapid, and the hazard of erosion is severe.

This soil is suited to pasture and native grasses.

to a lesser extent, wheat, barley, beans, and corn. Under dryland management it is suited to pasture and native grasses and, to a lesser extent, wheat and barley. Capability units IIIe–1, irrigated, and IVe–3, dryland; Clayey Plains range site; windbreak suitability group 3.

90—Renohill clay loam, 3 to 9 percent slopes. This gently sloping to strongly sloping soil is on uplands. This soil has the profile described as representative of the series.

Included with this soil in mapping are some small areas of soils that are more sloping or less sloping and some small areas of soils that have a gravelly surface layer. Also included are small areas of Ulm, Heldt, Midway, and Thedalund soils.

Runoff is rapid, and the hazard of water erosion is severe.

If irrigated, this soil is suited to pasture and, to a lesser extent, wheat, barley, and alfalfa. Under dryland management it is suited to pasture and native grasses. Capability units IVe–1, irrigated, and VIe–1, dryland; Clayey Plains range site; windbreak suitability group 3.

91—Renohill-Midway clay loams, 3 to 15 percent slopes. This complex consists of gently sloping to moderately steep soils on uplands and ridges. It is about 55 percent Renohill clay loam and about 30 percent Midway clay loam. Renohill clay loam is smoother near the base of the slope, and Midway clay loam is steeper near ridgetops.

Included with these soils in mapping are about 15 percent areas of Ulm and Heldt soils, Shale outcrop, and gravel knobs.

Runoff is rapid, and the hazard of water erosion is severe.

These soils are suited to pasture or native grasses. Capability unit VIe–1, dryland; Renohill soil in Clayey Plains range site and Midway soil in Shaly Plains range site; both soils in windbreak suitability group 3.

Riverwash

92—Riverwash. This unit is highly variable, mixed, water-washed sand and gravel deposits, commonly next to stream channels. These areas are flooded each year, generally in spring or summer. In some places willow trees protect the soil against erosion along the streambanks. Forage production is little and there is little value for grazing. These areas provide some shelter and habitat for wildlife. Capability unit VIIIw–1, dryland; not assigned to a range site or windbreak suitability group.

Rock Outcrop

93—Rock outcrop. This mapping unit is bare or nearly bare rock. Included in mapping are areas of shallow and very shallow soils, mainly around the edges of the mapped areas.

Runoff is rapid. The hazard of water erosion is severe on the included soils and in adjacent areas that receive runoff.

This unit is used mainly for wildlife habitat and esthetic purposes. Capability unit VIIIs–1, dryland; not assigned to a range site or windbreak suitability group.

Satanta Series

The Satanta series consists of deep, well drained soils that formed in mixed alluvial and wind-deposited material. These soils are on uplands and high terraces. Elevation ranges from 4,800 to 5,600 feet. Slopes are 0 to 9 percent. The native vegetation is mainly blue grama, buffalograss, western wheatgrass, and cactus. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is brown clay loam and pale brown loam about 16 inches thick. The underlying material is very pale brown loam about 21 inches thick over very pale brown fine sandy loam.

Permeability is moderate, and the available water capacity is high. Reaction is mildly alkaline above a depth of 18 inches and moderately alkaline below that depth.

These soils are used mainly for irrigated and dryfarmed crops and for pasture.

Representative profile of Satanta loam, 1 to 3 percent slopes, in cropland, about 50 feet west and 50 feet north of the southeast corner of sec. 4, T. 5 N., R. 69 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; clear smooth boundary.

B1—7 to 12 inches; brown (10YR 5/3) heavy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; mildly alkaline; clear smooth boundary.

B2t—12 to 18 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, firm; thin patchy clay films on peds; mildly alkaline; clear smooth boundary.

B3ca—18 to 23 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, friable; fine thin patchy clay films; effervescent; visible secondary calcium carbonate as soft masses and spots; moderately alkaline; clear smooth boundary.

C1ca—23 to 44 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable; violently effervescent; visible secondary calcium carbonate as spots and seams; moderately alkaline; gradual smooth boundary.

spots and small areas of soils that are redder and have a surface layer of sandy loam. Also included are small areas of Fort Collins, Kim, and Larimer soils.

Runoff is rapid, and the hazard of erosion is severe.

If irrigated, this soil is well suited to pasture and, to a lesser extent, wheat, barley, and alfalfa. Under dryland management it is suited to pasture or native grasses. Capability units IVe–1, irrigated, and VIe–1, dryland; Loamy Plains range site; windbreak suitability group 1.

Sunshine Series

The Sunshine series consists of moderately deep, well drained soils that formed in material weathered from sandstone. These soils are on mountainsides and ridges and are underlain by sandstone at a depth of 20 to 40 inches. Elevation ranges from 8,500 to 9,500 feet. Slopes are 5 to 15 percent. The native vegetation is mainly Arizona fescue, bluebunch wheatgrass, mountain muhly, and big sage. Mean annual precipitation ranges from 15 to 17 inches, mean annual air temperature ranges from 40° to 44° F, and the average frost-free season ranges from 60 to 85 days.

In a representative profile the surface layer is grayish brown stony sandy loam about 10 inches thick. The subsurface layer is light gray stony sandy loam about 5 inches thick and brown very stony clay loam that is mixed with light gray fine sandy loam and is about 4 inches thick. The subsoil is brown very stony clay about 9 inches thick. The underlying material is weathered and fractured sandstone.

Permeability is slow, and the available water capacity is low. Reaction is neutral.

These soils are used for native grasses.

Representative profile of Sunshine stony sandy loam, 5 to 15 percent slopes, in native grass, about 30 feet west of road and 0.2 mile north of fence in SE¼ sec. 9, T. 11 N., R. 77 W.:

A1—0 to 10 inches; grayish brown (10YR 5/2) stony sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky and moderate fine granular structure; soft, very friable; 10 percent stones; neutral; clear smooth boundary.

A2—10 to 15 inches; light gray (10YR 7/2) stony sandy loam, grayish brown (10YR 5/2) moist; weak fine subangular structure parting to weak fine granular; slightly hard, very friable; 30 percent stones; neutral; gradual wavy boundary.

A&B—15 to 19 inches; brown (7.5YR 5/4) very stony clay loam, dark brown (7.5YR 4/4) moist; moderate fine angular blocky structure; hard, friable; this horizon consists of clayey material similar to that of the B2t horizon which is mixed with lighter colored fine sandy loam similar to the A2 horizon; thin patchy clay films on ped faces; 40 percent stones; neutral; diffuse wavy boundary.

B2t—19 to 28 inches; brown (7.5YR 5/4) very stony clay, dark brown (7.5YR 4/4) moist; strong medium subangular blocky structure; hard, firm; thin nearly continuous clay films on ped faces; 40 percent stones; neutral.

Cr—28 to 40 inches; fragmental sandstone.

The A1 horizon is sandy loam to loam 6 to 12 inches thick. The A2 horizon is sandy loam to light loam 3 to 6 inches thick. The B2t horizon is clay or heavy clay loam. Reaction ranges from slightly acid to neutral. Content of rock fragments, mainly flagstones and stones, ranges from 35 to 80 percent.

104—Sunshine stony sandy loam, 5 to 15 percent slopes. This strongly sloping to moderately steep soil is on ridges and mountainsides.

Included with this soil in mapping are a few small areas of soils that are more sloping or less sloping. Also included are a few small areas of Pendergrass and Naz soils.

Runoff is medium, and the hazard of water erosion is severe.

This soil is suited to pasture and native grasses. Capability unit VIe–6, dryland; Subalpine Loam range site; not assigned to a windbreak suitability group.

Table Mountain Series

The Table Mountain series consists of deep, well drained soils that formed in alluvium. These soils are on low terraces and flood plains. Elevation ranges from 4,800 to 5,600 feet. Slopes are 0 to 1 percent. The native vegetation is mainly blue grama, bluegrass, bromegrass, and some forbs and shrubs. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is grayish brown loam about 36 inches thick. The underlying material is brown fine sandy loam about 10 inches thick and yellowish brown fine sandy loam about 5 inches thick. Below this is sand and gravel.

Permeability is moderate, and the available water capacity is high. Reaction is neutral above a depth of 36 inches and moderately alkaline below that depth.

These soils are used mainly for irrigated and dryfarmed crops. A few areas are in native grasses.

Representative profile of Table Mountain loam, 0 to 1 percent slopes, in a cultivated area, about 850 feet east of the west quarter-corner of sec. 20, T. 5 N., R. 68 W.:

Ap—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

A1—4 to 36 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; hard, friable; neutral; clear smooth boundary.

C1ca—36 to 46 inches; brown (10YR 5/3) heavy fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very

friable; calcareous; few spots and seams of secondary calcium carbonate; moderately alkaline; gradual smooth boundary.

C2ca—46 to 51 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; very hard, friable; calcareous; few spots and seams of secondary calcium carbonate; few medium distinct mottles; moderately alkaline; gradual wavy boundary.

IIC3—51 to 60 inches; sand, gravel, and cobbles.

The A horizon is loam or light clay loam 20 to 40 inches thick. The C horizon is fine sandy loam, loam, or light clay loam. Reaction ranges from neutral to moderately alkaline. Content of rock fragments, mainly gravel or cobbles, ranges from 0 to 15 percent.

105—Table Mountain loam, 0 to 1 percent slopes. This level soil is on low terraces and bottom lands.

Included with this soil in mapping are some small areas of soils that have a surface layer of sandy loam and some small areas of soils in which slopes are more than 1 percent. Also included are a few small areas of Caruso and Paoli soils and small areas of soils in which sand and gravel layers are at a depth of about 40 inches.

Runoff is slow, and the hazard of erosion is slight. This soil is flooded or receives overflow in places.

If irrigated, this soil is well suited to corn, sugar beets, beans, alfalfa, wheat, and barley. It is also well suited to wheat or barley under dryland management. Capability units I, irrigated, and IIIc–1, dryland; Overflow range site; windbreak suitability group 1.

Tassel Series

The Tassel series consists of shallow, well drained soils that formed in material weathered from sandstone. These soils are on uplands and are underlain by soft sandstone at a depth of 10 to 20 inches. Elevation ranges from 4,800 to 5,800 feet. Slopes are 3 to 25 percent. The native vegetation is blue grama, little bluestem, green needlegrass, and yucca. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is light brownish gray sandy loam about 3 inches thick. The underlying material is pale brown sandy loam about 9 inches thick over soft sandstone.

Permeability is moderately rapid, and the available water capacity is low. Reaction is moderately alkaline.

These soils are used mainly for native grasses.

Representative profile of Tassel sandy loam, 3 to 25 percent slopes, in native grass, 1,000 feet south and 2,160 feet west of the northeast corner of sec. 11, T. 10 N., R. 68 W.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; soft, very friable; calcareous; moderately alkaline; clear smooth boundary.

C1—3 to 12 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable; calcareous; moderately alkaline; gradual wavy boundary.

C2r—12 to 60 inches; gray calcareous soft sandstone.

The A1 horizon is sandy loam or fine sandy loam 2 to 5 inches thick. The C horizon is sandy loam or fine sandy loam 8 to 14 inches thick. Depth to calcareous material ranges from 0 to 4 inches. Reaction ranges from mildly alkaline to moderately alkaline.

106—Tassel sandy loam, 3 to 25 percent slopes. This gently sloping to moderately steep soil is on uplands (fig. 11).

Included with this soil in mapping are some small areas of soils that have sandstone fragments on the surface and outcrops of sandstone. Also included are small areas of Nelson soils.

Runoff is medium to rapid, and the hazard of erosion is severe.

This soil is suited to pasture or native grasses. Capability unit VIe–3, dryland; Sandstone Breaks range site; windbreak suitability group 3.

Thedalund Series

The Thedalund series consists of moderately deep, well drained soils that formed in material weathered from sandstone and shale. These soils are on uplands and are underlain by soft sandstone and shale at a depth of 20 to 40 inches. Elevation ranges from 4,800 to 5,600 feet. Slopes are 0 to 9 percent. The native vegetation is blue grama, buffalograss, sage, and cactus. Mean annual precipitation ranges from 13 to 15 inches, mean annual air temperature ranges from 48° to 50° F, and the frost-free season ranges from 135 to 150 days.

In a representative profile the surface layer is grayish brown loam about 6 inches thick. The subsurface layer is light olive brown loam 8 inches thick. The underlying material is light yellowish brown loam about 23 inches thick over soft shale and sandstone.

Permeability is moderate, and the available water capacity is medium. Reaction is neutral above a depth of about 6 inches, mildly alkaline between depths of 6 and 14 inches, and moderately alkaline below a depth of 14 inches.

These soils are used mainly for native grasses and dryfarmed crops. A few areas are used for irrigated crops.

Representative profile of Thedalund loam, 3 to 9 percent slopes, in native grass, 1,150 feet east and 1,400 feet south of the northwest corner of sec. 33, T. 11 N., R. 68 W.:

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 4/2) moist; weak medium and fine granular structure; soft, friable; neutral; clear smooth boundary.

AC—6 to 14 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable; calcareous; mildly alkaline; clear smooth boundary.

C1—14 to 37 inches; light yellowish brown (2.5Y

TABLE IX

MAXIMUM/MINIMUM SOIL DEPTH PER UNIT, PER AREA OF EXCAVATION

Area	Soil Unit	Acres
A	# 92	9.1
E	# 64	23.8
	#105	35.7
F	# 64	36.6
G	# 22	3.3
	# 64	3.9
	# 81	29.7
	# 84	8.8
	# 92	10.4
	#105	34.0
J	# 60	1.3
	# 64	66.5
	# 81	4.7
	# 92	3.2
	Sum =	271.0

Unit	Maximum/ Min.(mean) Depth/Unit	Total Acres per Soil Unit	Maximum Cu.Yds. per Acre	Total Maximum Cu. Yds.	Minimum Cu. Yds. per Acre	Total Minimum Cu. Yds.
# 22	11 - 5.5"	3.3	1,478.89	4,880.34	739.44	2,440.15
# 60	4 - 2.0"	1.3	537.78	699.11	268.89	349.56
# 64	15 - 7.5"	130.8	2,016.67	263,780.44	1,008.33	131,889.56
# 81	42 - 21.0"	34.4	5,646.67	194,245.45	2,823.33	97,122.55
# 84	30 - 15.0	8.8	4,033.33	35,493.30	2,016.67	17,746.70
# 92	N/A Soil Unit # 92 will not be salvaged.					
#105	36 - 18.0	69.7	4,840.00	337,348.00	2,420.00	168,674.00
Sum total maximum available soil =				836,446.64		
Sum total minimum available soil =						418,222.52

TABLE X

AREA VOLUME REQUIREMENT OF SOIL FOR RECLAMATION

Area	Acres to be Reclaimed	Total Yds.^{3} Required 8" Depth
A	4.6	4,972.14
B	8.2	8,863.38
C	7.9	8,539.11
D	5.7	6,161.13
E I	18.3	19,780.47
II	5.8	6,269.22
III	9.9	10,700.91
F I	4.6	4,972.14
II	6.6	7,133.94
G I	3.0	3,242.70
II	4.2	4,539.78
III	7.6	8,214.84
H	5.2	5,620.68
I	11.7	12,646.53
J I	5.7	6,161.13
II	16.5	17,834.85
3	.3	324.27
4	.7	756.63
Sum =	126.5	136,733.85

ADDENDUM - EXHIBIT I - SOILS INFORMATION
Response to the CMLRD letter of adequacy of 15 October 1987

5. We agree with your favorable comments on our proposed soil management plan. It should be noted that through proper soil management we hope to decrease the risks of revegetation failure and thereby decrease the exposure to the potential costs of remobilizaiton and retreatment of areas treated under reclamation.