

ENGINEERING
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10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

GENERAL

State Texas County Caldwell ; 1/4 Sec. 1/4, T 1 R 1 ; Watershed Quadrangle
Subwatershed Plan Creek Fund class (FP-2, WP-1, etc.) Site number 21 Site group II Structure class A
Investigated by Henry H. Brown Equipment used Falling 1500 Date 7/23/61
(signature and title) (Type, size, make, model, etc.)

Dale L. Bidwell P.O.S.

SITE DATA

Drainage area size 2.45 sq. mi., 5945 acres. Type of structure compacted earth Purpose floodwater retarding
Direction of valley trend (downstream) south Maximum height of fill 35 feet. Length of fill 2500 feet.
Estimated volume of compacted fill required 204,500 yards

STORAGE ALLOCATION

	Volume (ac. ft.)	Surface Area (acres)	Depth at Dam (feet)
Sediment	<u>198</u>	<u>120</u>	<u>16.5</u>
Floodwater	<u>2514</u>	<u>332</u>	<u>33.0</u>

SURFACE GEOLOGY AND PHYSIOGRAPHY

Physiographic description Blackland Prairie Topography gently rolling Attitude of beds: Dip 51 SE Strike NE-SW
Steepness of abutments: Left 4.5 percent; Right 0 percent. Width of floodplain at centerline of dam 300 feet
General geology of site: Site 21 is located on an outcrop of the Wilcox group of Lower Tertiary
age.

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Centerline of Dam

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Small
<u>Felling 1900</u>	<u>11</u>	<u>5</u>	<u>1 Den</u>		<u>17</u>
<u>Acher</u>	<u>4</u>				
Total	<u>15</u>				

SUMMARY OF FINDINGS

(include only factual data)

The valley floor section to the left of the main stream channel exhibits fairly consistent conditions outlined as follows:

(1) A near surface (upper) horizon of sandy clay (CH) materials rests upon a slightly laminated sand and clay (CH) soil. Below this horizon lies a horizon containing interbedded laminae of sand and clay with the sand laminae increased percentage wise. This horizon also contains gypsum. Parent material consisting of laminated sand and shale lies below the lower horizon.

(2) Exceptions to the generalized conditions above were found in test holes 2 and 3 where horizons of SC materials were penetrated.

(3) To the right of the primary stream channel conditions in the lower horizons were similar to the segment previously described. The upper horizon, however, is composed of SC materials.

The foundation of the abutments is composed of interlaminated sand and clay materials.

An inter-connecting channel to be excavated between separated sediment pools was investigated at stations A 26+00 and A 28+00 of the borrow area.

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Centerline Principal Spillway

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Small
<u>Feiling 1300</u>	<u>3</u>	<u>1</u>			<u>6</u>
Total					

SUMMARY OF FINDINGS

(include only factual data)

Foundation conditions beneath the principal spillway are very similar to those
described for the valley floor segment of the centerline of the dam.

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Emergency Spillway

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Small
<u>Feeling 1500</u>	<u>1</u>	<u>1</u>		<u>2</u>	
<u>Anchor Auger</u>	<u>12</u>	<u>7</u>			
Total	<u>13</u>	<u>8</u>			

SUMMARY OF FINDINGS

(include only factual data)

Two soil horizons were found in the forebay section, crest, and upper part of the exit channel of the spillway.

The upper horizon consisted of a sandy CI material.

The lower horizon consisted of interlaminated clay and sand, and was classified as an SC-CI material.

Composite samples were taken of each of these two horizons.

Laminated CI materials similar to those found in zone A of the borrow were found in the lower part of the spillway exit channel.

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Stream Channels

(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Small
<u>Hand Auger</u>	<u>2</u>				
Total					

SUMMARY OF FINDINGS

(include only factual data)

Two stream channels are present and cross the centerline dam on this site.
Laminated sandy OH material was found to a depth of three feet at the centerline
of "C" section on the left stream channel.
Three feet of gravelly materials were found above laminated OH clay at the
centerline "C" section on the right stream channel.

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

FEATURE Borrow Area
(Centerline of Dam, Principal Spillway, Emergency Spillway, the Stream Channel, Investigations for Drainage of Structure, Borrow Area, Reservoir Basin, etc.)

DRILLING PROGRAM

Equipment Used	Number of Holes		Number of Samples Taken		
	Exploration	Sampling	Undisturbed (state type)	Disturbed Large	Small
Acker Auger	13	3		6	
Total					

SUMMARY OF FINDINGS

(include only factual data)

The borrow area was divided into four areal zones, mainly due to the presence of different types of materials in the surface horizon.

Three soil horizons are present in areal zone "A".

The surface horizon consists of sandy CH material.

The second horizon is a laminated sandy CH material containing slight amounts of gravel and slight to moderate amounts of gypsum.

The third horizon is a laminated, sandy, shaly clay.

Areal zone "B" is present along the left stream channel and two material horizons were present.

The top horizon was a laminated SC-CH material.

The second horizon was weathered shale.

A high water table was found in this zone as shown on the grid sheets.

Areal zone "C" contains three material horizons which are very similar to those found in areal zone "A". Reference should be made to the description of zone "A" materials.

Areal zone "D" also contains three soil horizons.

The top horizon is a GC or GC-CH material.

The second horizon is a laminated, sandy CH material with slight to moderate amounts of gypsum and slight amounts of gravel.

The third horizon is a shaly CH material similar to the third horizon material found in areal zone "A".

Materials found along the proposed sediment pool connecting trench line are similar to those found in zone "D" of the borrow and will be used as borrow material.

Representative samples were taken of the materials present in areal zones "A", "B" and "D".

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DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

State Texas County Calderill Watershed Guadalupe Subwatershed Pine Creek
Site number 21 Site group II Structure class A Investigated by Henry H. Swann Date 7-19-61
(signature and title)

INTERPRETATIONS AND CONCLUSIONS

Centerline of Dam: If the cutoff wall is founded as recommended on seepage submitted with this report most problems relating to near surface permeability and seepage reduction should be resolved.

Use of materials from the cutoff trench excavation in the abutment segments should be as recommended for spillway materials.

The use of materials from the valley floor segment of the cutoff wall trench should be as recommended for equivalent borrow materials.

Principal Spillway: Because of the great similarity of the foundation of the principal spillway to that of the valley floor segment of the centerline of the dam, to the left of the main stream channel, treatment of the principal spillway is the same as recommended for the above segment of the centerline of the dam. Materials used as backfill in the abutment foundation trench should be as identical as possible to those used in backfilling adjacent segments of the cutoff wall trench along the centerline of the dam.

Borrow Materials throughout the borrow are characterized by their laminated condition; however, the material **horizons** found in the borrow are fairly uniform and easy to correlate.

Due to the similarity of the materials present, Materials Testing Section information for some "B" samples may be referred to some "C" materials.

Sandy materials in some "B" along the stream channel may be difficult to excavate due to the high water table present. The water table in this area should fluctuate considerably according to the occurrence of wet and dry periods.

Loading of borrow materials by making long passes with the scrapers should give compaction curves which will more nearly correspond to Materials Testing Section compaction data on the soils.

Cl materials found in the borrow may be used anywhere in the dam, unless gypsum content is found to be high.

If materials are found to contain high gypsum content they should be avoided or used in the center section of the dam above the sediment reserve elevation.

SC-CH, GC and GC-CH materials should be used in the shell of the dam or in the downstream section.

Secondary Spillway: The second horizon SC-Cl material present in the forebay and crest section of the spillway is highly laminated and contains pockets of less plastic sandy materials.

A more accurate correlation between the laboratory compaction data and the field curve during construction may be obtained by making relative long passes with the scrapers during spillway loading operations.

Materials found in the lower soil channel section may be referred to materials found in some "A" of the borrow.

Cl materials may be used anywhere in the dam.

SC-CH materials should be used in the shell or downstream section of the dam.

A vegetative cover should be placed on the spillway soon after construction to reduce the effects of erosion.

Channel/Stream channel investigation was limited due to excessive stream flow. Gravelly and highly organic materials should be removed from the stream channel.

REPORT TO ACCOMPANY
DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

Watershed _____

Hole: Sample : Field :			Depth :		Type of Test					
No.:	Type	Class.:	From :	To :	M.A. :	Shear :	Cons.:	Perm. :	Salt :	Disp.
1		SC-CH	0.0	1.0						
2	Dist	CH	0.0	6.0						
2		SC-CL	6.0	16.0						
2		CH	16.0	20.0						
2		SC	20.0	24.0						
2		CH	24.0	28.0						
3		SC	8.0	12.0						
8		GC-CH	0.0	8.0						
8		CH	8.0	12.0						
8		CH	16.0	22.0						
8		CH	22.0	26.0						
8		CH	26.0	30.0						
302		CH	1.0	5.0						
302		CL	6.0	12.0						
302		CH-CL	12.0	17.0						
302		CH	18.0	20.0						
302		CH	20.0	24.5						
302		CH	24.5	29.0						

Comments:

Trial Form

REPORT TO ACCOMPANY
DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

COMPOSITE SAMPLES FOR MOISTURE DENSITY DETERMINATION

Watershed Plum Creek

Site No. 21

SUGGESTED EMBANKMENT SECTION(S)

Emergency Spillway
Crest El.

Elev. 499.9

Slope:

Slope:

SUGGESTED USE OF MATERIALS

Comp. No.	Material Source	Hole Nos.	Field Class.	Depth From	Depth To	Emb. Sec.	Quan. Avail. (Est.) Cu. Yds.
		153-155					
1	Source	253-155	CH	1.0	3.0	1	53,000
2		153-155	CH	3.0	10.0	1	50,000
3		153-155	CH	10.0	13.0	1	44,000
4		153-155, 206	CH	1.0	3.0	1	20,000
5		153, 203, 206	SC-CH	3.0	Grade	1	65,000
6		203-206	SC-CH	1.0	3.0	1	15,000
7		203-206	SC-CH	3.0	2.0	1	8,000
8		203-206	CH	3.0	12.0	1	19,000

Comments: Shove materials to be placed in subcut on a selective basis at the discretion of the U. S. Government representative (the plastic materials to be placed toward center of subcut and the less plastic materials to be placed in outer portion of subcut, if at all possible).

Trial Form

REPORT TO ACCOMPANY
DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

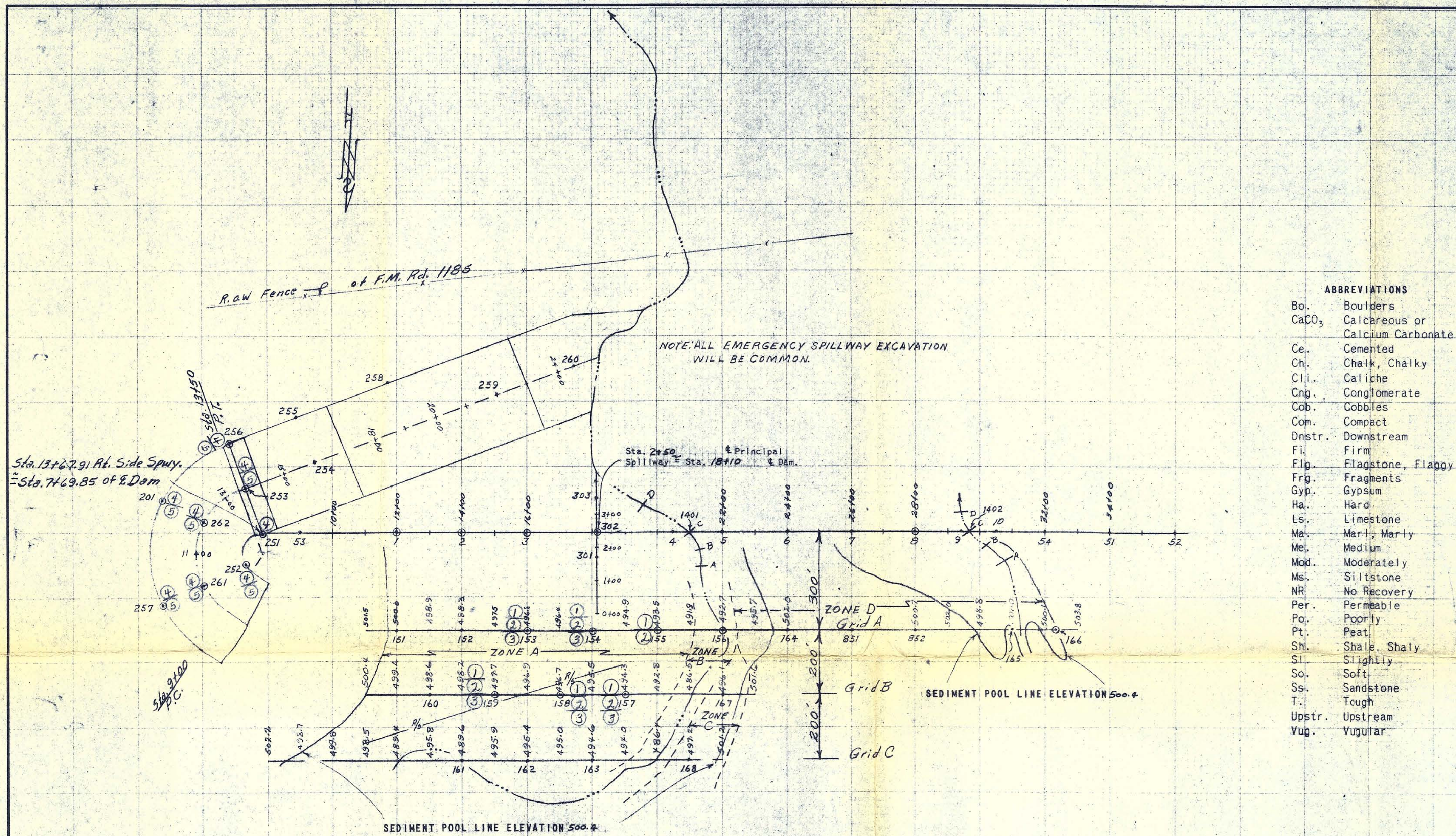
GROUNDWATER ELEVATIONS AND SUGGESTED TRENCH DEPTHS FOR
CUTOFF AND PRINCIPAL SPILLWAY FOUNDATION

Watershed

Site No. 21

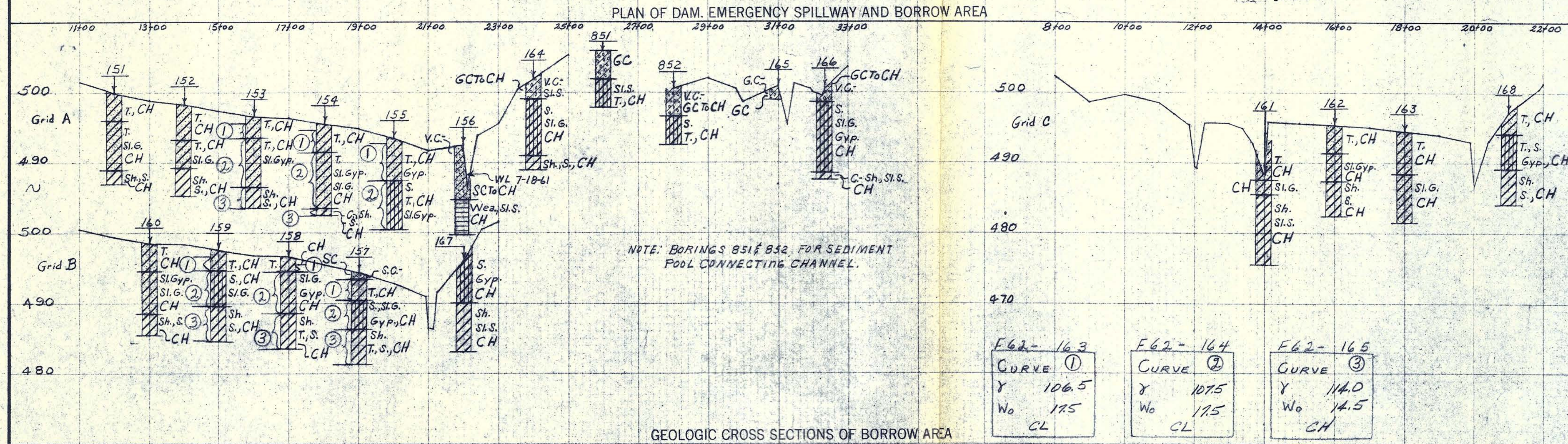
Centerline Embankment					Centerline Principal Spillway				
Test	Ground:	Trench	Material		Test	Ground:	Trench	Material	
Hole	Water:	Bottom	at		Hole	Water:	Bottom	at	
No.	Elev.:	Depth:	Elev.:	Grade	No.	Elev.:	Depth:	Elev.:	Grade
53		4.0	587.8	CH	301?				
1		4.0	999.4	CH	301		10.0	434.	CH
2		9.7	488.8	SC-CL	302				
5		12.0	483.9	CH-CL	302		11.0	433.0	CL
302		11.0	483.0	CL	303				
4		8.0	482.2	CL	303		9.7	433.0	CH-CL
1401		2.0	481.7	CH					
5		4.5	494.5	CH					
6		5.0	499.3	CH					
7			491.2	CH-CL					
8		8.0	490.6	CH	Alternate Location				
9		9.0	490.7	CH					
1402		4.0	490.8	CH					
10		2.0	495.5	CH					
14		5.0	503.3	CH					
51		4.0	512.0	CH					
52		0							

Comments: _____



The Soil Classifications shown on this sheet are those made by the operations geologist. They do not in all cases agree with the classifications made by the Soil Mechanics Laboratory. Refer to the Laboratory Report for further information.

NOTE: The individual letters of the Unified Soil Classification System symbols may be used separately as abbreviations for modifiers. For example, in G.W. (well graded gravel), G may be used for "gravel" and W for "well graded".



LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel	sand	silt	clay	cobbles, boulders
gravel, sandy	sand, gravelly	silt, gravelly	clay, gravelly	peat
gravel, silty	sand, silty	silt, sandy	clay, sandy	gypsumiferous *
gravel, clayey	sand, clayey	silt, clayey	clay, silty	calcareous *
gravel, sand, silt	sand, silt, clay	organic silt	organic clay	

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

CONSOLIDATED MATERIAL

Sedimentary Rocks

shale	sandstone	limestone	chalk	coal
calcareous shale	calcareous sandstone	cherty limestone	marl	gypsum
sandy shale	sandy sandstone	sandy limestone	chert	conglomerate
siltstone	breccia	dolomite		

Metamorphic Rocks

quartzite	slate	igneous rocks	
gneiss	schist	intrusive	extrusive
marble	soapstone	pyroclastic	
	talc	undifferentiated	
	serpentine		

Other Symbols

● hole logged only	⚡ dip and strike
⊙ hole sampled	○ pit or trench

ABBREVIATIONS

Bo. Boulders	CaCO ₃ Calcareous or Calcium Carbonate
Ce. Cemented	Ch. Chalk, Chalky
Cl. Caliche	Cli. Conglomerate
Cob. Cobbles	Com. Compact
Dnstr. Downstream	Fi. Firm
Flg. Flagstone, Flaggy	Frg. Fragments
Gyp. Gypsum	Ha. Hard
Ls. Limestone	Ma. Marl, Marly
Me. Medium	Mod. Moderately
Ms. Siltstone	NR No Recovery
Per. Permeable	Po. Poorly
Pt. Peat	Sh. Shale, Shaly
Sl. Slightly	So. Soft
Ss. Sandstone	T. Tough
Upstr. Upstream	Vug. Vugular

ABBREVIATIONS

aq aquifer	fri friable
cav. cavities	lam laminated
Q centerline	mas massive
con concretions	TD total depth
US undisturbed samples	v. very
DS disturbed samples	w/ with
dip dipping	wea weathered
frac fractured	WL (date) groundwater level on a specified date

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM-1	Silty coarse sand
SM-2	Silty fine sand
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, v. fine sands; sandy or clayey silts
CL-1	Clays of low plasticity; silty, sandy or gravelly clays
CL-2	Clays of medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS

PLAN OF DAM, EMERGENCY SPILLWAY & BORROW AREA

CROSS-SECTIONS OF BORROW AREA

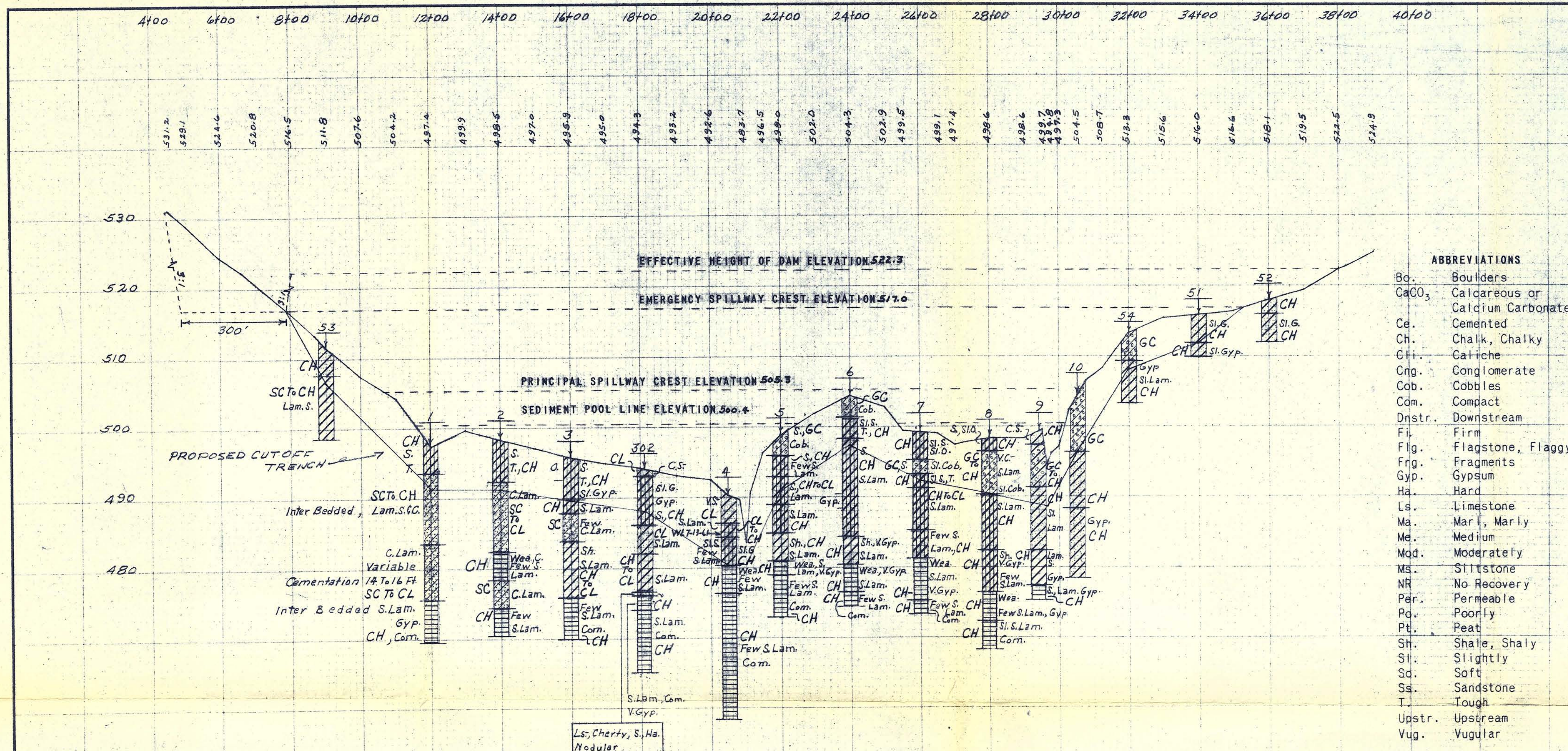
PLUM CREEK, SITE 21

CALDWELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Investigated by	Date	Approved by
Title		Title
Checked by		Title
Plotted By JWS 8-18-61		Drawing No.
Checked By E.A.K. 8-18-61		Sheet No. 1 of 3



LEGEND

SYMBOLS

UNCONSOLIDATED MATERIAL

gravel	sand	silt	clay	cobbles, boulders
gravel, sandy	sand, gravelly	silt, gravelly	clay, gravelly	peat
gravel, silty	sand, silty	silt, sandy	clay, sandy	gypiferous *
gravel, clayey	sand, clayey	silt, clayey	clay, silty	calcareous *
gravel, sand, silt	sand, silt, clay	organic silt	organic clay	

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

CONSOLIDATED MATERIAL

Sedimentary Rocks

shale	sandstone	limestone	chalk	coal
calcareous shale	calcareous sandstone	cherty limestone	marl	gypsum
sandy shale	shaly sandstone	sandy limestone	chert	conglomerate
siltstone	breccia	dolomite		

Metamorphic Rocks

quartzite	slate	intrusive	extrusive
gneiss	schist	pyroclastic	
marble	soapstone	talc	serpentine

Igneous Rocks

Undifferentiated

ABBREVIATIONS

Bo.	Boulders
CaCO ₃	Calcareous or Calcium Carbonate
Ce.	Cemented
Ch.	Chalk, Chalky
Cl.	Caliche
Cng.	Conglomerate
Cob.	Cobbles
Com.	Compact
Dnstr.	Downstream
Fi.	Firm
Flg.	Flagstone, Flaggy
Frg.	Fragments
Gyp.	Gypsum
Ha.	Hard
Ls.	Limestone
Ma.	Marl, Marly
Me.	Medium
Mod.	Moderately
Ms.	Stillstone
NR	No Recovery
Per.	Permeable
Po.	Poorly
Pt.	Peat
Sh.	Shale, Shaly
Sl.	Slightly
So.	Soft
Ss.	Sandstone
T.	Tough
Upstr.	Upstream
Vug.	Vugular

Other Symbols

- hole logged only
- hole sampled
- ↖ dip and strike
- ↗ pit or trench

ABBREVIATIONS

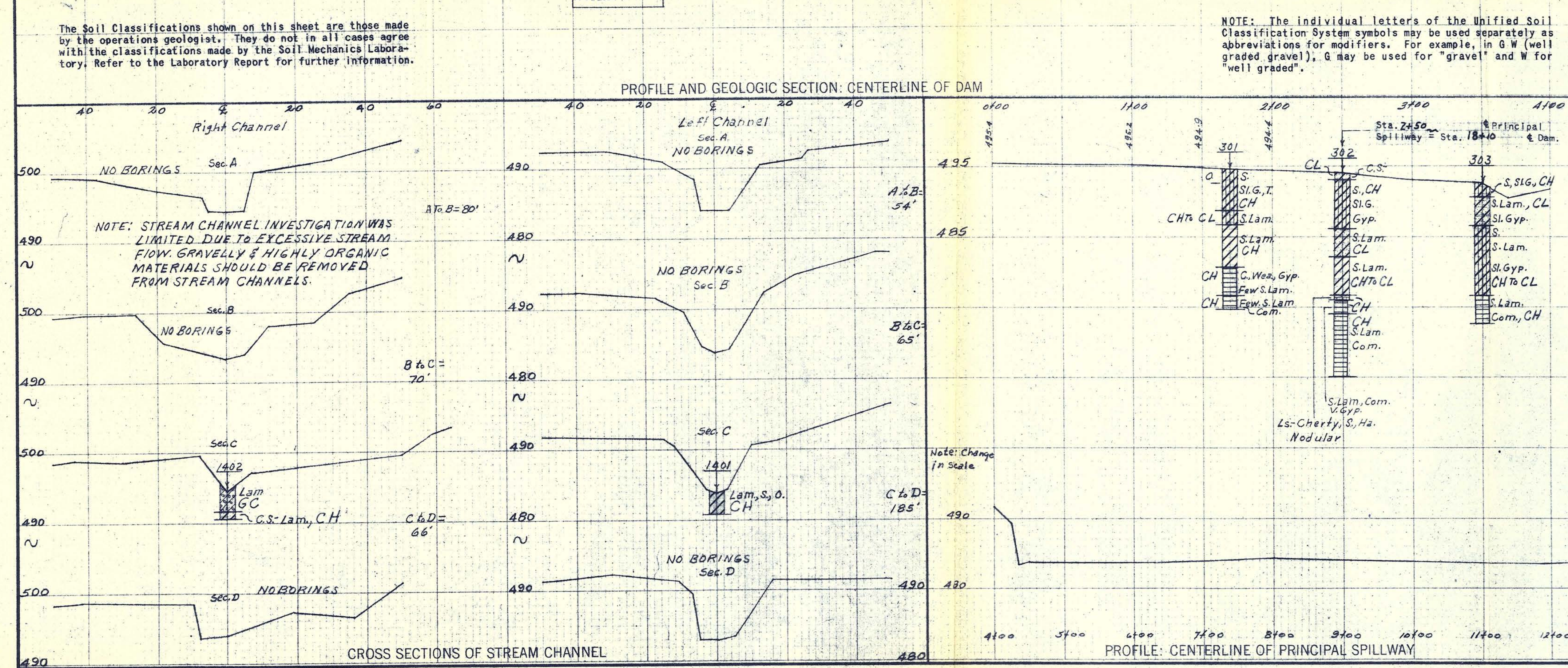
aq	aquifer	fri	friable
cav.	cavities	lam	laminated
Q	centerline	mas	massive
con	concretions	TD	total depth
US	undisturbed samples	v.	very
DS	disturbed samples	w/	with
dip	dipping	wea	weathered
frac	fractured	WL	(date) groundwater level on a specified date

TEST HOLE NUMBERING SYSTEM

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OH	Organic clays or silts of medium to high plasticity



PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS

PROFILE OF DAM, CROSS-SECTIONS OF STREAM CHANNELS
PROFILE OF PRINCIPAL SPILLWAY

PLUM CREEK, SITE 21

CALDWELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Investigated by	Date	Approved by	
Title		Title	
Checked by		Title	
Plotted By JWS, 8-18-61		Sheet No. 2	Drawing No.
Checked By EAK, 8-18-61		of 3	

ENGINEERING FILE COPY

ES 900 Sheet 2 of 3 SCS-358 (April 1958)

F62-146
 CURVE ④
 X 102.0
 W₀ 19.5
 CL

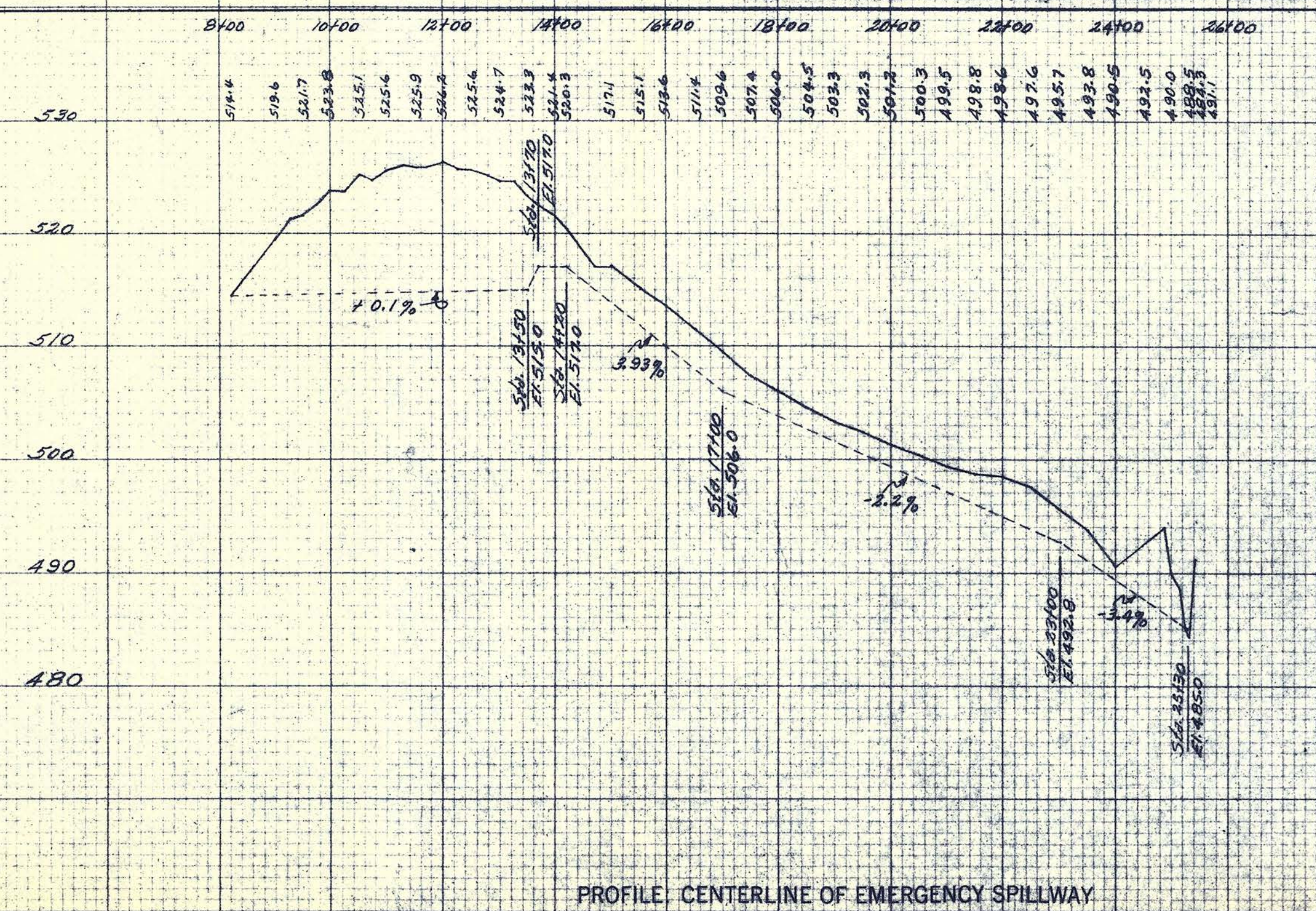
F62-167
 CURVE ⑤
 X 103.0
 W₀ 18.0
 CL

ABBREVIATIONS

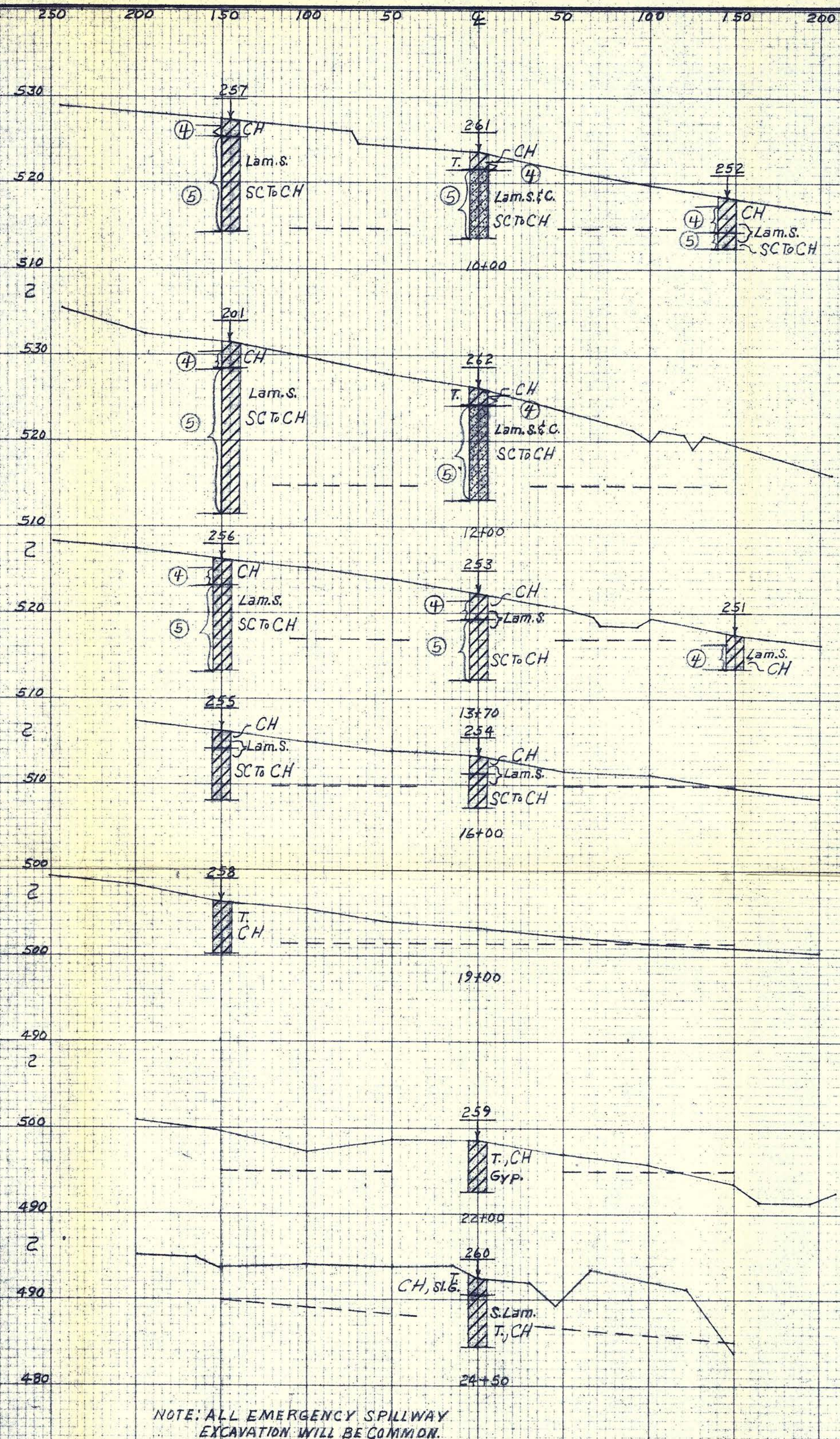
Bo.	Boulders
CaCO ₃	Calcareous or
Ce.	Cemented
Ch.	Chalk, Chalky
Cl.	Caliche
Cng.	Conglomerate
Cob.	Cobbles
Com.	Compact
Dnstr.	Downstream
Fil.	Firm
Fig.	Flagstone, Flaggy
Frg.	Fragments
Gyp.	Gypsum
Ha.	Hard
Ls.	Limestone
Ma.	Marl, Marly
Me.	Medium
Mod.	Moderately
Ms.	Siltstone
NR.	No Recovery
Per.	Permeable
Po.	Poorly
Pt.	Peat
Sh.	Shale, Shaly
Str.	Strightly
So.	Soft
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NOTE: The individual letters of the Unified Soil Classification System symbols may be used separately as abbreviations for modifiers. For example, in S.W. (well graded gravel), S may be used for "gravel" and W for "well graded".

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PROFILE, CENTERLINE OF EMERGENCY SPILLWAY



NOTE: ALL EMERGENCY SPILLWAY EXCAVATION WILL BE COMMON.

GEOLOGIC CROSS SECTIONS OF EMERGENCY SPILLWAY

LEGEND SYMBOLS

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gravel, clayey	sand, clayey	silt, clayey	clay, silty	calcareous *
gravel, sand, silt	sand, silt, clay	organic silt	organic clay	

* to be added to Standard Symbol when significant amounts of dispersed gypsum or calcified zones are present in the section.

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Other Symbols

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SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, v. fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Inorganic clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays of medium to high plasticity

PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS
PROFILE OF EMERGENCY SPILLWAY
CROSS-SECTIONS OF EMERGENCY SPILLWAY

PLUM CREEK, SITE 21
CALDWELL COUNTY, TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by	Date	Approved by
Title		Title
Checked by		Title
Plotted By JWS. 8-18-61		Sheet No. 3
Checked By EAK. 8-18-61		Drawing No. of 3