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Geology of the 241-AX Tank Farm

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Environmental Engineering Section
Research Department
Research and Engineering Division

Prepared for the U.S. Energy Research
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Atlantic Richfield Hanford Company
Richland, Washington 99352

ARH-LD-128

GEOLOGY OF THE 241-AX TANK FARM

by

W. H. Price
K. R. Fecht

Environmental Engineering Section
Research Department
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ATLANTIC RICHFIELD HANFORD COMPANY
RICHLAND, WASHINGTON 99352

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GEOLOGY OF THE 241-AX TANK FARM

INTRODUCTION

A series of maps have been compiled to document the structure and stratigraphy of the sediments underlying the high-level radioactive waste storage tank farms located within the Energy Research and Development Administration Hanford Reservation. The primary purpose of these maps is to provide basic geologic information to be utilized to evaluate the impact of suspected and confirmed tank leaks. For convenience of usage map sets for each tank farm have been published in separate document packets (see Table I). The contents of this packet (see Table II) contain maps compiled only for the 241-AX Tank Farm.

TABLE I

TANK FARM GEOLOGY DOCUMENTS AVAILABLE
AS OF APRIL, 1976*

Title	Document Number
Geology of the 241-A Tank Farm	ARH-LD-127
Geology of the 241-AX Tank Farm	ARH-LD-128
Geology of the 241-B Tank Farm	ARH-LD-129
Geology of the 241-BX Tank Farm	ARH-LD-130
Geology of the 241-BY Tank Farm	ARH-LD-131
Geology of the 241-C Tank Farm	ARH-LD-132
Geology of the 241-S Tank Farm	ARH-LD-133
Geology of the 241-SX Tank Farm	ARH-LD-134
Geology of the 241-T Tank Farm	ARH-LD-135
Geology of the 241-TX Tank Farm	ARH-LD-136
Geology of the 241-TY Tank Farm	ARH-LD-137
Geology of the 241-U Tank Farm	ARH-LD-138
Generalized Geology of the 241-SY Tank Farm	ARH-LD-139

*Additional documents will be completed as new tank farms are built and well monitoring networks installed.

TABLE II

241-AX TANK FARM GEOLOGY MAPS

Title	Drawing Number
241-AX Tank Farm Geologic Map Legend and Plot Plan	H-2-38979
241-AX Tank Farm Geologic Characterization Cross Section A-A'	H-2-64953
241-AX Tank Farm Geologic Characterization Cross Section B-B'	H-2-64954
241-AX Tank Farm Geologic Characterization Cross Section C-C'	H-2-64955
241-AX Tank Farm Geologic Characterization Cross Section D-D'	H-2-64956
241-AX Tank Farm Geologic Characterization Cross Section E-E'	H-2-64957
241-AX Tank Farm Geologic Characterization Cross Section F-F'	H-2-64958
241-AX Tank Farm Geologic Characterization Base of Backfill	H-2-64952

PROCEDURES

During the drilling of 23 dry wells and 4 water wells in ard around the 241-AX Tank Farm, sediment samples were collected from one to 5-foot depth intervals. Information utilized to prepare this series of maps was obtained by the analysis of these samples, numbering approximately 600.

Each sediment sample was quantitatively analyzed according to grain size and $CaCO_3$ content. Size analysis was carried out utilizing a nest of 9 sieves selected for coincidence with the Wentworth (1922) grain size nomenclature (see H-2-38979). The $CaCO_3$ content of each sample was determined utilizing a semiquantitative CO_2 displacement method (Horwitz, 1970). Size and $CaCO_3$ data was input into the Rocksan Computer Program (Parr, 1974)

which categorized each sediment sample into 1 of 19 classes (classification scheme modified after Folk, 1968; see H-2-38979). After analysis, each sample was visually examined to aid in further characterization. Each sample was subsequently stored in the Hanford Well Library for future reference.

For convenience of usage, the geologic maps were prepared at the same scale (1" = 16') as drawing H-2-36935 (Wells in 241-AX Farm As-built). Steps outlining the preparation of the maps are listed in Figure 1.

GENERALIZED GEOLOGY

Included within this section is a brief discussion of the geology underlying the 241-AX Tank Farm. The stratigraphic descriptions included, along with the Glossary (see page), are designed only to provide sufficient information to permit a general understanding of the Tank Farm maps presented. For a more detailed discussion of the regional geologic setting of the 241-AX Tank Farm, the reader is referred to articles listed in the Selected References (see page).

The 241-AX Tank Farm is underlain by three major stratigraphic units (see Figure 2); (1) basalt of the Columbia River Group which forms the bedrock beneath the area; (2) semiconsolidated sediments of the Ringold Formation which directly overlie the bedrock; and (3) unconsolidated sand, silt, and gravel, collectively termed glaciofluvial sediments. A more detailed description of the character of these units underlying the Tank Farm follows.

COLUMBIA RIVER BASALT GROUP

About 20 million years ago a series of fissures opened around the periphery of the subsiding Pasco Basin and large volumes of basaltic lava poured out over the land surface. The highly fluid lava was extruded intermittently from these fissures until approximately 8 million years ago. At the cessation of Columbia River Basalt volcanism, the basin had been filled with more than 12,000 feet of basalt.

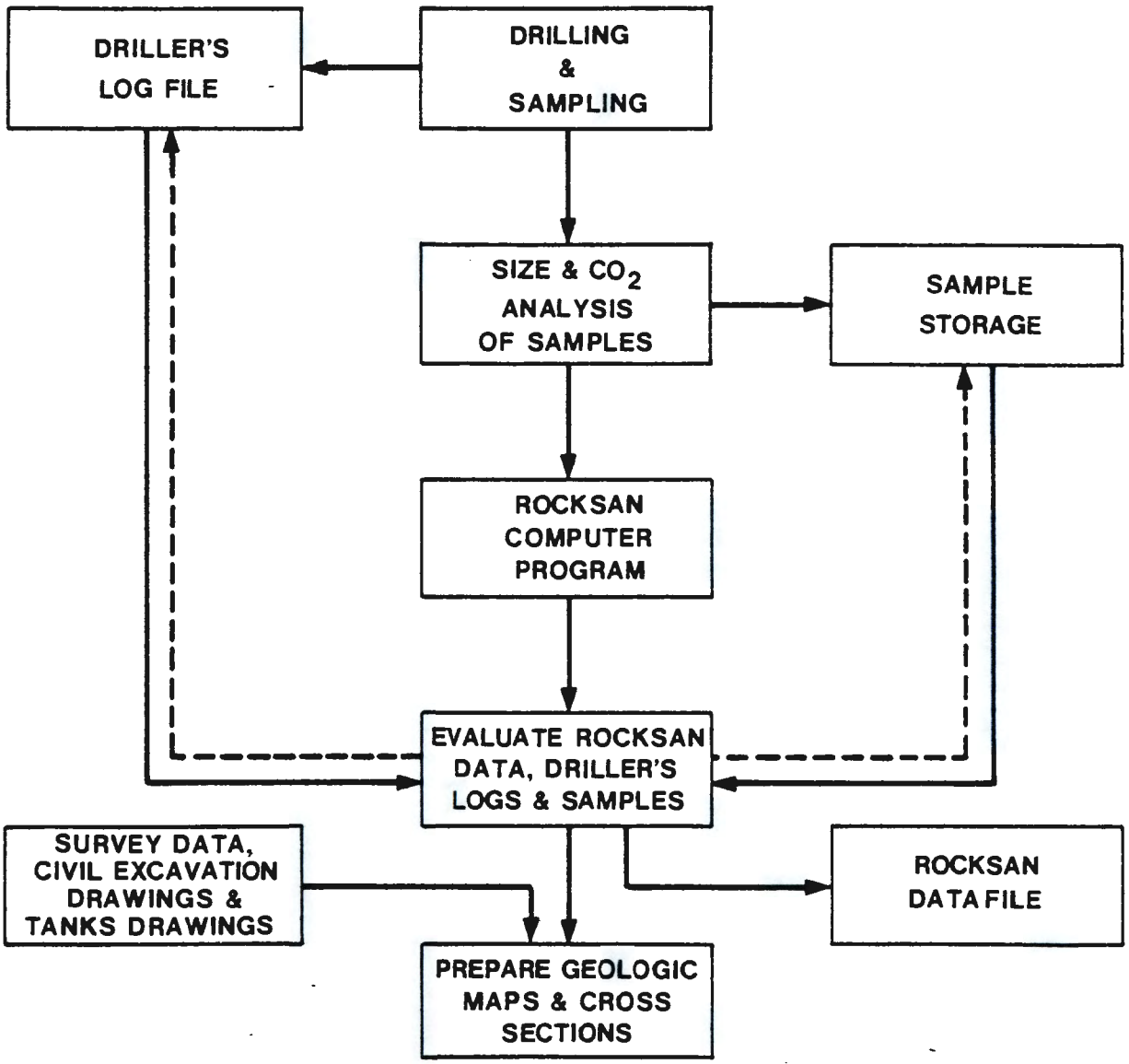

FIGURE 1

STEPS OUTLINING THE PREPARATION OF TANK FARM GEOLOGY MAPS

ERA	PERIOD	EPOCH	YEARS B. P.	STRATIGRAPHIC NAME AND/OR UNIT		LITHOLOGY DESCRIPTION
CENOZOIC	QUATERNARY	MODERN	30	BACKFILL		VERY POORLY SORTED GRAVEL, SAND & SILT
		PLEISTOCENE		GLACIOFLUVIAL SEDIMENTS		FAIRLY WELL SORTED FLUVIAL SAND & SILT WITH SOME GRAVEL
				EOLIAN SILT		FINE SAND & SILT DERIVED FROM THE UPPER RINGOLD
	TERTIARY	PLIOCENE	1,000,000	RINGOLD FORMATION	UPPER RINGOLD	WELL SORTED FLUVIAL OR LACUSTRINE SILT & SAND WITH SOME CALCAREOUS LAYERS
					MIDDLE RINGOLD	FLUVIAL GRAVEL & SAND VARIABLY CEMENTED WITH CALCIUM CARBONATE & SILICA
		MIOCENE	11,000,000	COLUMBIA RIVER BASALT GROUP	ELEPHANT MOUNTAIN MEMBER	DENSE BLACK EXTRUSIVE IGNEOUS ROCK, MICRO VESICULAR, BRICK BAT ENTABULATURE & NO COLUMNADE
					RATTLESNAKE RIDGE MEMBER	TUFFACEOUS SANDSTONE
					POMONA MEMBER	DENSE BLACK EXTRUSIVE IGNEOUS ROCK, SCATTERED OLIVINE PHENOCRYSTS, UPPER & SOMETIMES BASAL ENTABLATURE WELL DEVELOPED, FAN JOINTING IN COLUMNADE

WHP/KRF 1976

FIGURE 2

GENERALIZED STRATIGRAPHIC COLUMN FOR THE 200 AREA TANK FARMS

The surface of the Columbia River Basalt lies beneath 241-AX Tank Farm at an elevation of 300 feet (all elevations based on feet above mean sea level measured at approximate center of Tank Farm). On the 241-AX Tank Farm maps, this surface occurs approximately 60 feet below the bottom border of the prepared cross sections.

RINGOLD FORMATION

Following the cessation of Columbia River Basalt volcanism the ancestral Columbia River transported sediments from the surrounding highlands into the Pasco Basin where they accumulated to form the Ringold Formation. Beneath the Hanford Reservation, this formation is up to 1200 feet thick and can generally be divided into three units on the basis of lithology; the clays and silts of the lower Ringold unit; the pebbles and cobbles of the middle Ringold unit; and the silts and fine sands of the upper Ringold unit.

Within the region beneath 241-AX Tank Farm, the lower and upper Ringold unit are missing. The total thickness of the Ringold unit present is approximately 108 feet.

Middle Ringold

Beneath the 241-AX Tank Farm, the middle Ringold unit lies unconformably on the Columbia River Basalt and dips about 5° to the west. The unit consists predominantly of well-rounded pebbles and cobbles with the interstitial spaces filled with very coarse to coarse sand. Table III summarizes the grain size and $CaCO_3$ values of the middle Ringold sediments.

TABLE III

TYPICAL GRAIN SIZE AND CALCIUM CARBONATE VALUES
FOR MAJOR MIDDLE RINGOLD LITHOLOGY
BENEATH 241-AX TANK FARM

Lithology	%Pebbles & Cobbles	% Sand					%Silt & Clay	$\%CaCO_3$
		Very Coarse	Coarse	Medium	Fine	Very Fine		
Sandy Medium to Fine Pebble to Pebbly Very Coarse to Coarse Sand	30	25	20	11	5	3	6	0.8

GLACIOFLUVIAL DEPOSITS

During the close of the Ice Age, approximately 20,000 years ago, a continental ice sheet covered much of northern Washington. As the ice sheet retreated northward, the breakup of ice dams resulted in catastrophic floods in which large volumes of glacial meltwater were released. During one of these floods, over 500 cubic miles of water is estimated to have poured into the Pasco Basin at a rate of more than 9 cubic miles of water per hour. Sediments deposited within the basin by such flooding now comprise the glaciofluvial unit. The characteristic variability of sediment size and degree of sorting within this unit can be attributed to changes in water velocity and water level which occurred during the flooding process.

Glaciofluvial deposits are found beneath the 241-AX Tank Farm between elevations 408 and 626 feet. The 218-foot thick section of these deposits consists predominently of very coarse to medium sand and pebbles with some silt. Table IV summarizes the grain size and $CaCO_3$ values of the glaciofluvial sediments.

TABLE IV

TYPICAL GRAIN SIZE AND CALCIUM CARBONATE VALUES FOR MAJOR GLACIOFLUVIAL LITHOLOGIES BENEATH 241-AX TANK FARM

Lithology	%Pebbles & Cobbles	% Sand					%Silt & Clay	$\%CaCO_3$
		Very Coarse	Coarse	Medium	Fine	Very Fine		
Sandy Fine to Very Fine Pebble to Pebbly Very Coarse Sand	30	23	21	10	7	4	5	1.7
Slightly Silty Pebbly Very Coarse to Coarse Sand	14	21	23	15	10	7	10	1.8
Slightly Silty Very Coarse to Medium Sand to Very Coarse to Medium Sand	2	17	22	21	10	9	19	1.7
Slightly Pebbly Very Coarse to Medium Sand	7	25	37	20	6	2	3	1.2
Slightly Pebbly Silty Fine Sand	5	7	11	14	23	14	28	2.6

CLASTIC DIKES

Throughout the Pasco Basin, clastic dikes are found cross-cutting the Ringold Formation and glaciofluvial sediments. These dikes, which range from a few inches to several feet in width, are known to exist to depths of more than 100 feet below the ground surface. Generally, the dikes are composed of fine silts to coarse sands. The origin of the clastic dikes is still in refute and will not be discussed here (see Selected References). Identification of clastic dikes by drilling is difficult and although some dikes were detected in the 241-AX Tank Farm, they could not be mapped.

BACKFILL MATERIAL

In preparation for tank construction, glaciofluvial material was excavated at the 241-AX Tank Farm site. This material, consisting predominantly of pebbles, and coarse to medium sands with some silt, was subsequently used as backfill from the base of the completed tanks (626 feet) to the ground surface (681 feet). An inherent characteristic of the backfill is its poor sorting. Grain size and $CaCO_3$ values for the backfill are found in Table V.

TABLE V

TYPICAL GRAIN SIZE AND CALCIUM CARBONATE VALUES FOR THE 241-AX TANK FARM BACKFILL

Lithology	%Pebbles & Cobbles	% Sand					%Silt & Clay	$\%CaCO_3$
		Very Coarse	Coarse	Medium	Fine	Very Fine		
Slightly Pebbly Slightly Silty Coarse to Fine Sand	7	17	19	19	16	9	13	2.0

WATER TABLE

The water table beneath the 241-AX Tank Farm is located within the middle Ringold unit at an elevation of 403 feet, 223 feet below the base of the tanks. For further information concerning contours on the water table beneath 200 East Area the reader is referred to drawings H-2-38398 (200 East Area Water Table Map) and H-2-38399 (200 East Area Depth to Water Map).

GLOSSARY

Basalt. Fine-grained, dark-colored, extrusive igneous rock.

Calcareous. Containing calcium carbonate.

Caliche. Gravel, sand, or silt cemented by calcium carbonate.

Cement. Chemically precipitated material occurring in the interstices between particles of gravel, sand, or silt.

Clastic. A textural term applied to rocks composed of fragmental material derived from pre-existing rocks.

Clastic dike. A tabular body of clastic material transecting the bedding of a sedimentary formation, representing extraneous material that has invaded the containing formation along a crack.

Dip. The angle at which a stratum or any planar feature is inclined from the horizontal.

Eolian. A formation formed by, or deposited from, the wind or currents of air.

Fluvial. Produced by the action of a river or stream.

Formation. The ordinary unit of geologic mapping consisting of a large and persistent stratum of some one kind of rock.

Glaciofluvial. Pertaining to streams flowing from glaciers or to the deposits made by such streams.

Grain. The particles or discrete crystals which comprise a rock or sediment.

Group. A local or provincial subdivision of a series, based on lithologic features and contains two or more formations.

Lacustrine. A formation deposited in a lake environment.

Lava. Fluid rock such as that which issues from a volcano or a fissure in the earth's surface and the same material solidified by cooling.

Lithology. The description of rocks or sediments on the basis of such characteristics as color, minerologic composition and grain size.

Sediment. Descriptive term for gravel, sand, and silt transported from their sources and deposited by air, water, or ice.

Sieve. A utensil having many small perforated openings, used to separate fine particles from coarser ones.

Siliceous. Containing silica.

Silt. Fine grained material between sand and clay in size.

Sorting. The grain size range of the sediments.

Stratigraphy. The part of descriptive geology of an area that pertains to the discrimination, character, thickness, sequence, age and correlation of the sediments and rocks of the area.

Subaerial. Formed, existing, or taking place on the land surface.

Unconformity. A surface of erosion or nondeposition that separates younger strata from older strata.

Water table. The upper surface of a zone of saturation except where that surface is formed by an impermeable body.

Winnowing. Separation of fine particles from coarser ones by wind action.

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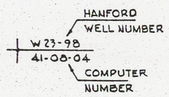
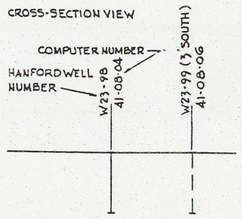
1- WELL DESIGNATION
WELL NUMBERS PREFIXED BY 299-

PLOT PLAN VIEW



CROSS-SECTION VIEW



SOLID LINE ON CROSS-SECTION.

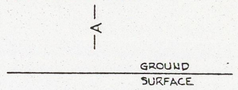
DASHED LINE WHEN PROJECTED TO CROSS-SECTION: DISTANCE AND DIRECTION FROM CROSS-SECTION ARE GIVEN.

2- COORDINATES
BASED ON HANFORD COORDINATE SYSTEM.

3- PLANE OF CROSS-SECTION

PLOT PLAN VIEW

CROSS-SECTION VIEW



4- TANK DESIGNATION
TANKS PREFIXED BY 241-

5- CONTACT BETWEEN LITHOLOGIES

SOLID LINE WHERE ACCURATELY KNOWN

DASHED LINE IF APPROXIMATELY KNOWN

QUERIED DASHED LINE WHERE INFERRED

BASE OF BACKFILL

6- LENSES OR STRINGERS

DISCONTINUOUS SEDIMENTS LESS THAN TWO FEET THICK

DISCONTINUOUS SEDIMENTS GREATER THAN TWO FEET THICK

7- WATER TABLE

CROSS-SECTION VIEW

DATUM - MEAN SEA LEVEL

WATER TABLE (12/75)
DATE WATER LEVEL MEASUREMENTS TAKEN

8- HORIZONTAL AND VERTICAL SCALES

VERTICAL EXAGGERATION - 1X
VERTICAL SCALE - FEET ABOVE MEAN SEA LEVEL

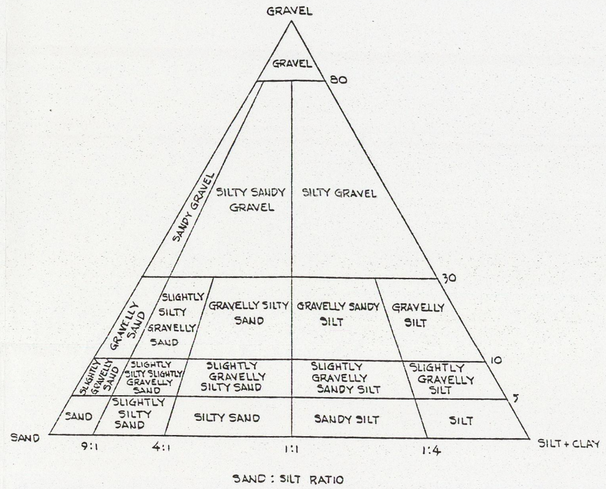
20 10 0 10 20 30 40 50

1:920

9- SEDIMENT DESCRIPTION

SEDIMENTS BENEATH THE TANK FARMS ARE CLASSIFIED ON THE BASIS OF ONE OF NINETEEN SEDIMENT TYPES (SEDIMENT CLASSIFICATION). FURTHER DETAIL IS GIVEN USING MODIFIERS FROM THE GRAIN SIZE NOMENCLATURE. SEDIMENTS WITH CHEMICALLY PRECIPITATED MATERIALS OCCURRING IN THE INTERSTICES BETWEEN GRAINS ARE PREFIXED BY THE TERM CEMENTED. SEDIMENTS WITH GREATER THAN 10% CALCIUM CARBONATE ARE PREFIXED BY THE MODIFIER CALCAREOUS. SEDIMENTS CONTAINING SILICA IN THE INTERSTICES BETWEEN GRAINS ARE MODIFIED BY THE TERM SILICEOUS.

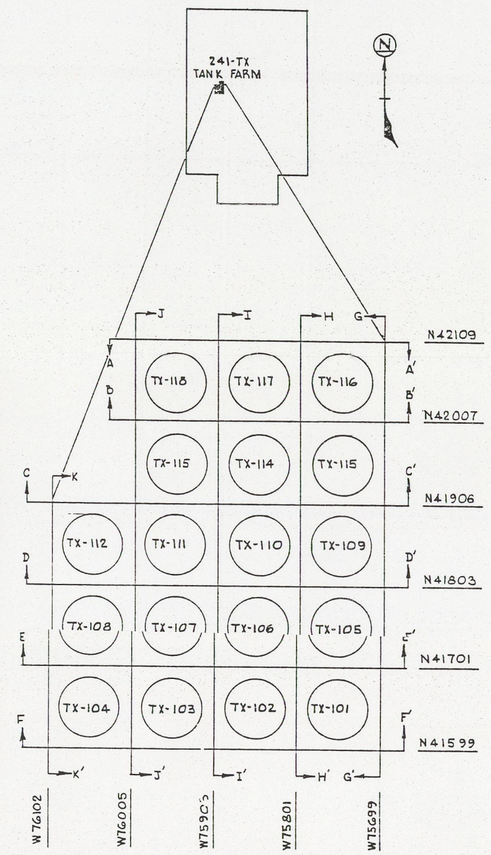
SEDIMENT CLASSIFICATION (MODIFIED AFTER R.L. FOLK, 1968)



GRAIN SIZE NOMENCLATURE (MODIFIED AFTER C.K. WENTWORTH, 1922)

	PARTICLE DESIGNATION		PARTICLE DIAMETER (MM)
GRAVEL	BOULDER		>256
	COBBLE	LARGE	256 - 128
		SMALL	128 - 64
	PEBBLE	VERY COARSE	64 - 32
		COARSE	32 - 16
		MEDIUM	16 - 8
		FINE	8 - 4
		VERY FINE	4 - 2
	SAND	VERY COARSE	2 - 1
		COARSE	1 - 0.5
		MEDIUM	0.5 - 0.25
		FINE	0.25 - 0.125
		VERY FINE	0.125 - 0.0625
	SILT + CLAY		<0.0625

200 WEST AREA



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241-TX TANK FARM
GEOLOGIC MAP
LEGEND AND PLOT PLAN

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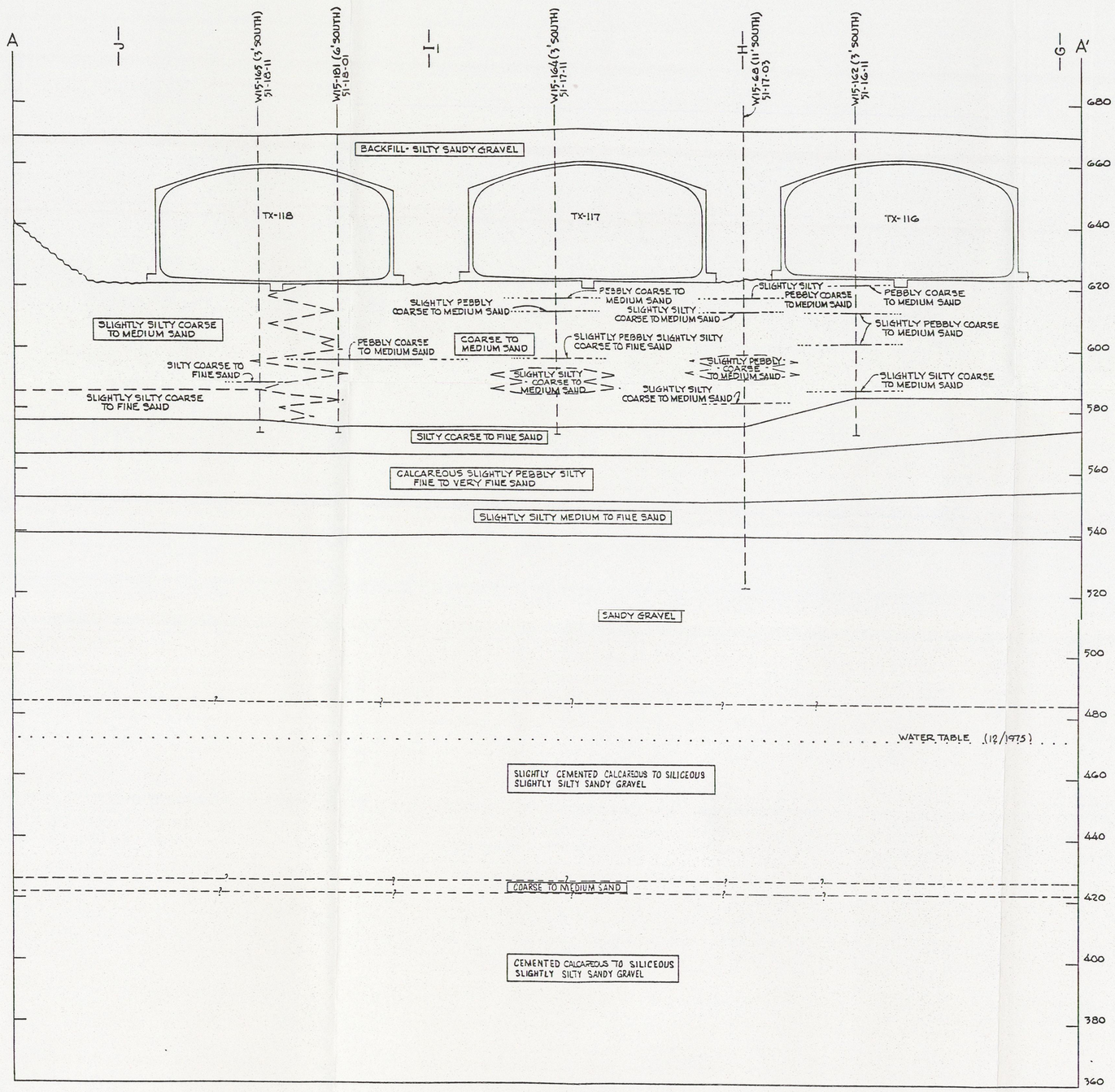
DWG NO. H-2-38988 — SHEET NO. — NO. OF SHTS. —



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CHECKED	3/12/76	
DRAWN CRICKSON	4/12/75	
SCALE 1" = 16'-0"		PROJ NO W O NO CE-2012 — PROJ TITLE GEOLOGIC CHARACTERIZATION
CLASSIFIED BY NOT REQUIRED	DATE	SLDG. NO. 241-TX — INDEX NO. 0402, 0501
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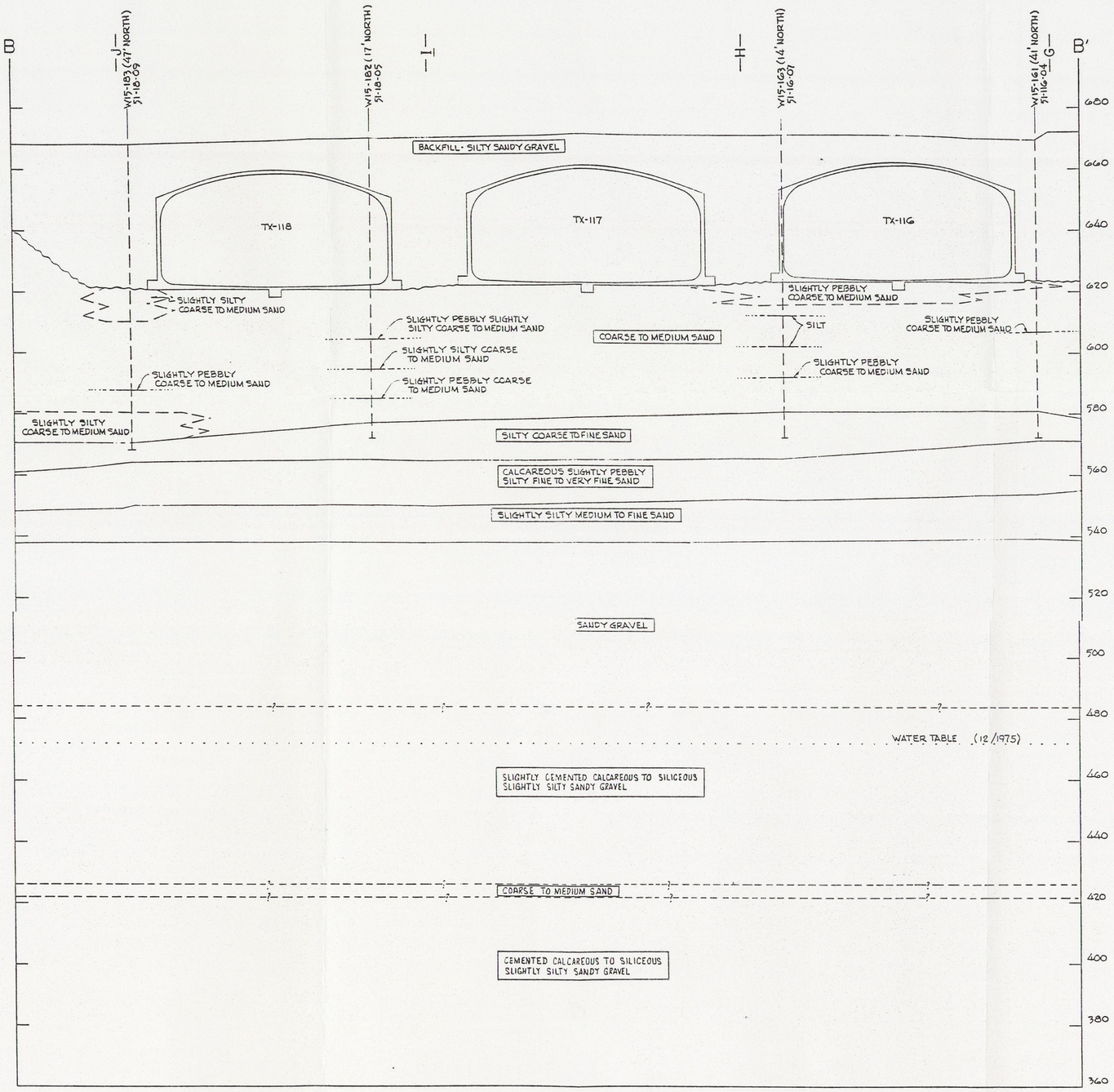
COMMENT PRT ISSUE NO. — DATE — CHECK PRT ISSUE NO. — DATE — LAST REV. 0

DRAWING STATUS



CROSS SECTION B-B'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT.		APPD				
REVISIONS							
COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV. 0			
DRAWING STATUS							

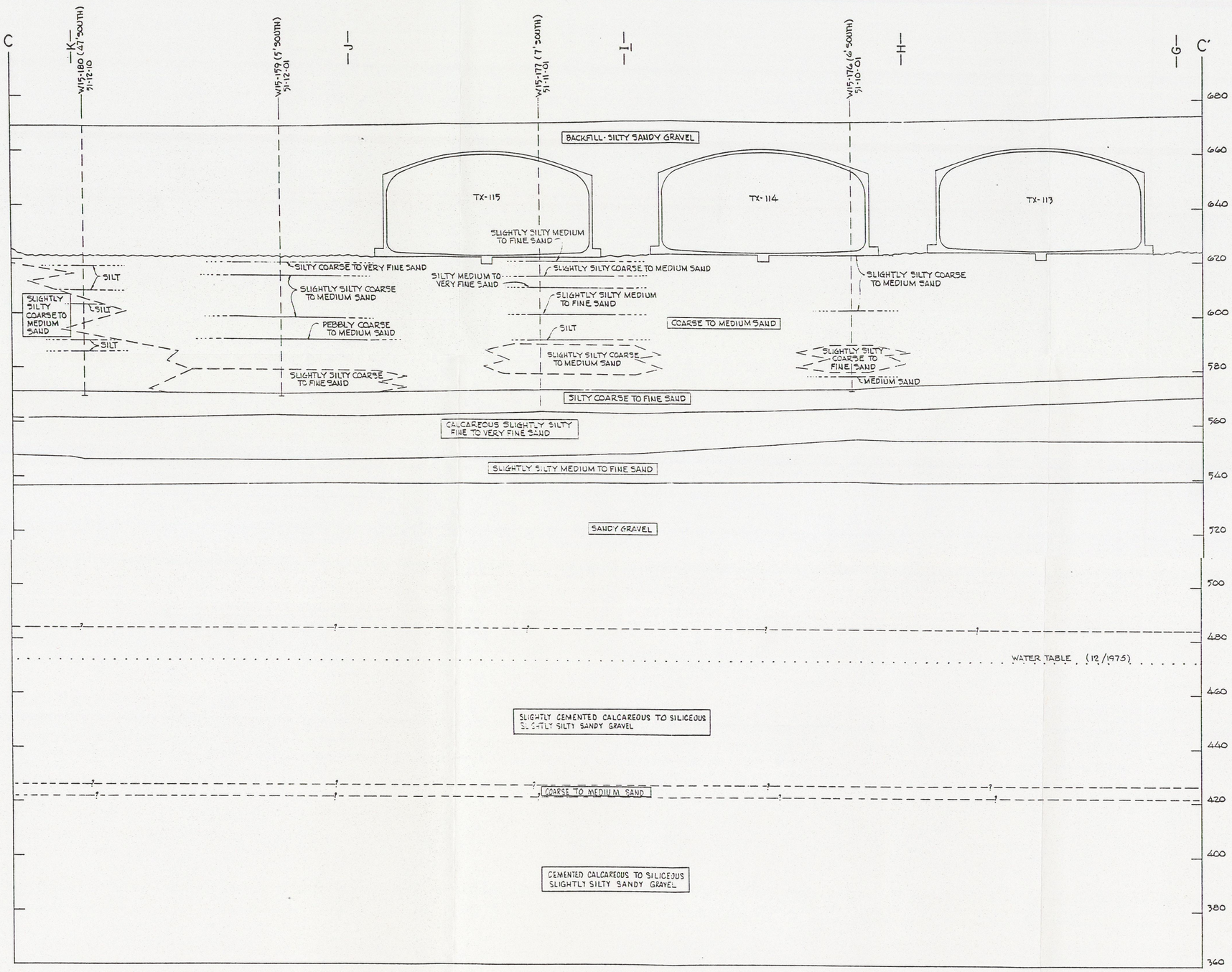
		DATE
APPD. FOR CONFORMANCE WITH DESIGN CRITERIA	BY R. Kirkwood FOR HCDO	3/2/76
APPD		
APPD	R. L. Dancy / R. W. Lee	3/5/76
DWN	D. LITEN	3/2/76
QA APPD	Fred Larson	3/2/76
CHECKED		3/2/76
DRAWN	ERICKSON	7/1/75
SCALE	1" = 16'-0"	
CLASSIFIED BY	NOT REQUIRED	DATE
CLASSIFICATION	NONE	

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
a division of AUTOMATION INDUSTRIES, INC.

241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION B-B'

PROJ NO	CE-2012	PROJ TITLE	GEOLOGIC CHARACTERIZATION
M.O. NO			
BLDG. NO.	241-TX	INDEX NO.	0402, 0501
DWG NO.	H-2-38970	SHEET NO.	—
		NO. OF SHTS.	—



CROSS SECTION C-C'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO 2" x 2"	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				
REVISIONS							
COMMENT PRT ISSUE NO.		DATE	CHECK PRT ISSUE NO.		DATE	LAST REV. 0	
DRAWING STATUS							

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA — DATE 3/24/76
BY R. P. Chalk
FOR ARCO
APPD
APPD R. L. Dunn — 3/24/76
ENGR D. LIEN — 3/24/76
QA APPD — 3/24/76
CHECKED — 3/24/76
DRAWN ERICKSON — 7/13/75
SCALE 1" = 16'-0"
CLASSIFIED BY NOT REQUIRED — DATE
CLASSIFICATION NONE

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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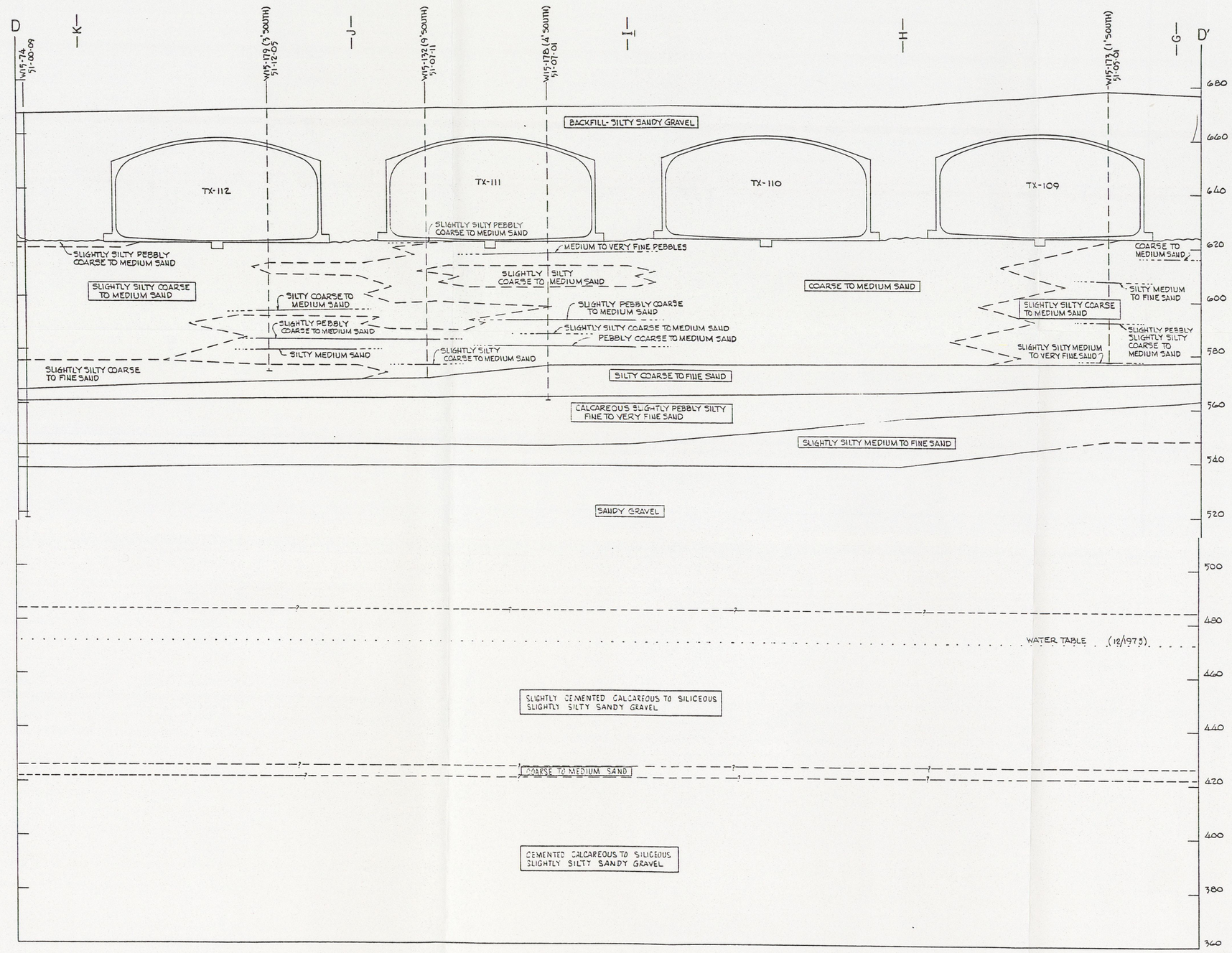
241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION C-C'

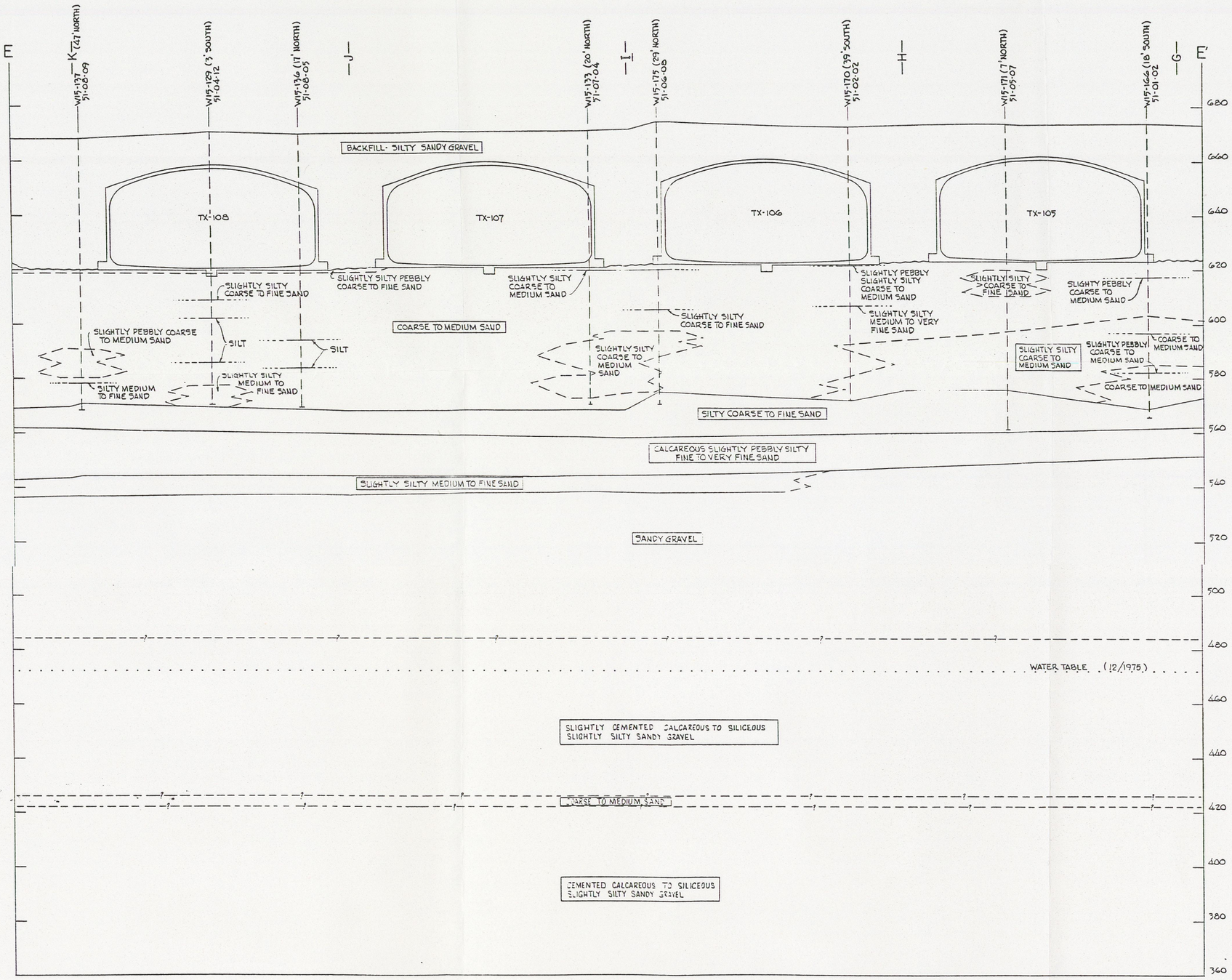
PROJ NO W.O. NO CE-2012 — PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX — INDEX NO. 0402, 0501
DWG NO. H-2-38971 — SHEET NO. — NO. OF SHTS. — —



CROSS SECTION D-D'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.	MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.	
				APPD FOR CONFORM WITH DESIGN CRIT		APPD			REVISIONS		
REFERENCE DRAWINGS				COMMENT PRT ISSUE NO.		DATE	CHECK PRT ISSUE NO.			DATE	LAST NO. 0
NEXT USED ON				DRAWING STATUS							

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY GTJ FOR ICHCO	DATE 3/20/78	EMERGY RESEARCH & DEVELOPMENT ADMINISTRATION RICHLAND OPERATIONS OFFICE
APPD		VITRO ENGINEERING • architects • engineers a division of AUTOMATION INDUSTRIES, INC.
ENGR D. LIEN	3/10/78 3/12/78	241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION D-D'
QA APPD	3/13/78	
CHECKED	3/16/78	
DRAWN ERICKSON	6/16/78	PROJ NO CE-2012 / PROJ TITLE GEOLOGIC CHARACTERIZATION
SCALE 1" = 10'-0"		BLDG. NO. 241-TX / INDEX NO. 0402, 0501
CLASSIFIED BY NOT REQUIRED	DATE	
CLASSIFICATION NONE		DWG NO. H-2-38972 / SHEET NO. — REV. — OF SHEETS —



CROSS SECTION E-E'

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA	DATE
BY R.P. Scott	3/12/76
FOR ARHCO	
APPD	
APPD.	3/12/76
ENGR D. LIEN	3/12/76
QA APPD	3/12/76
CHECKED	
DRAWN ERICKSON	6/20/75
SCALE 1" = 16'-0"	
CLASSIFIED BY NOT REQUIRED	DATE
CLASSIFICATION NONE	

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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241-TX TANK FARM
GEOLOGIC CHARACTERIZATION
CROSS SECTION E-E'

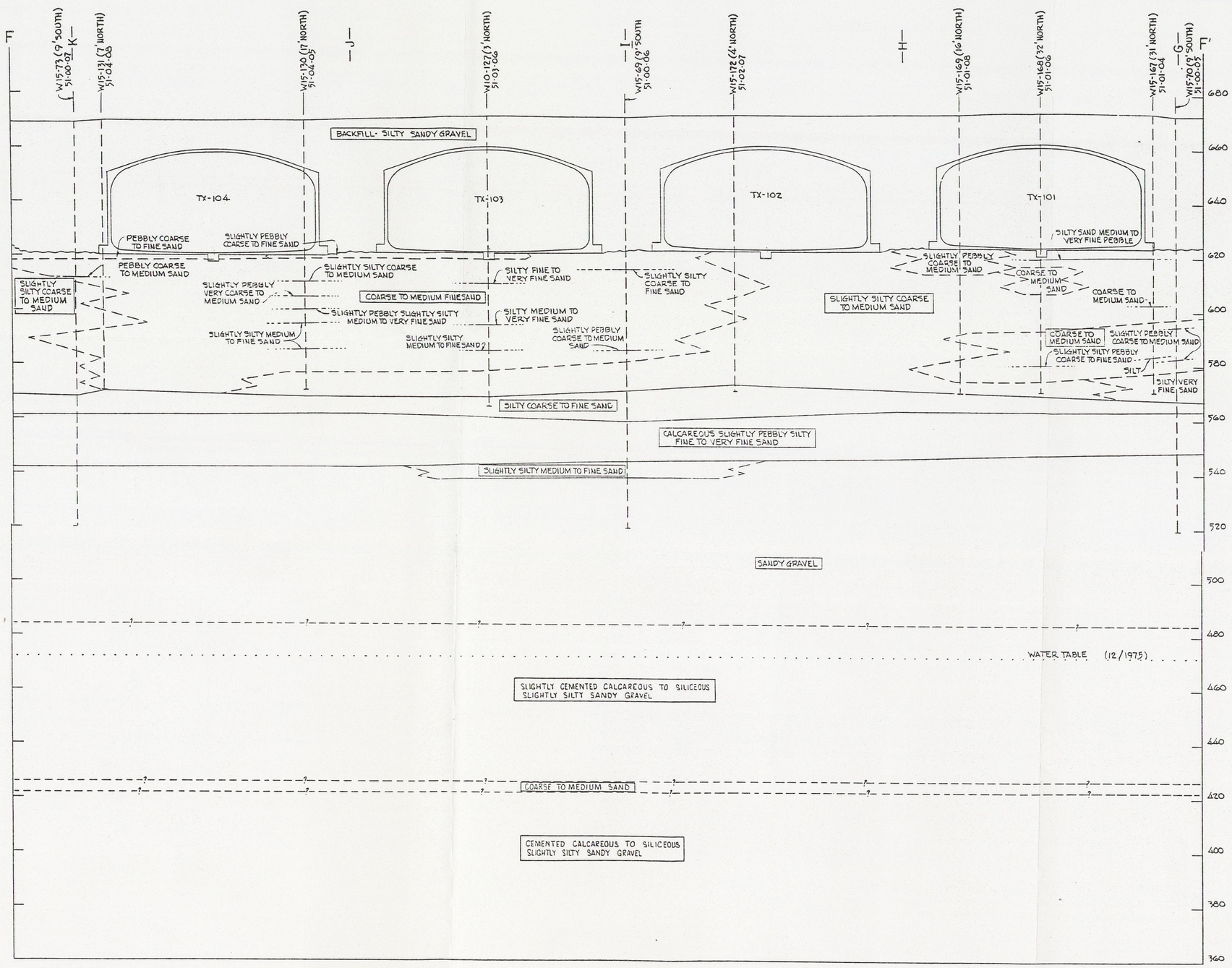
PROJ NO W O NO CE-2012 | PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX | INDEX NO. 0402, 0501
DWG NO. H-2-38973 | SHEET NO. | NO. OF SHTS — | —

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				

REVISIONS

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV.
DRAWING STATUS				0



CROSS SECTION F-F'

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY [signature] FOR SHEPCO	DATE 3/12/76	ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION RICHLAND OPERATIONS OFFICE
APPD		VITRO ENGINEERING • architects • engineers a division of AUTOMATION INDUSTRIES, INC.
APPD [signature]	2/3/76	241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION F-F'
ENGR D. LIEN	3/12/76	
QA APPD [signature]	3/12/76	
CHECKED		
DRAWN ERICKSON	6/23/75	
SCALE 1" = 16'-0"		PROJ NO W O NO CE-2012 — PROJ TITLE GEOLOGIC CHARACTERIZATION
CLASSIFIED BY NOT REQUIRED	DATE	BLDG. NO. 241-TX — INDEX NO. 0402, 0501
CLASSIFICATION NONE		DWG NO. H-2-38974 — SHEET NO. — NO. OF SHTS —

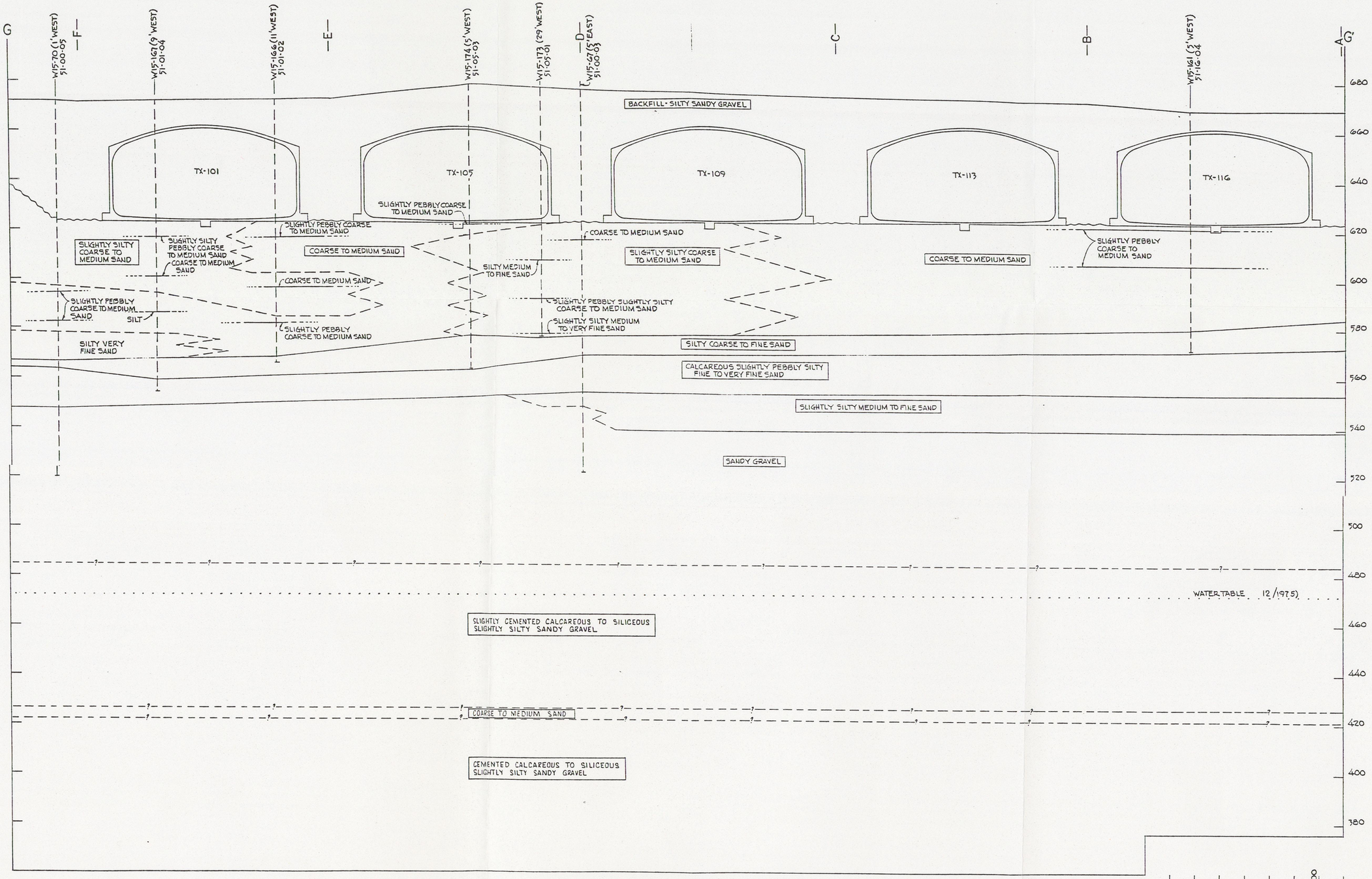
DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				

REVISIONS

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV.
DRAWING STATUS				0

12



CROSS SECTION G-G'

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA	BY R. Ritchie	DATE 3/2/76
FOR HRHCO	APPD	
APPD		3/2/76
ENGR D LIEN		3/2/76
QA APPD		3/12/76
CHECKED		
DRAWN ERICKSON		4/1/75
SCALE 1" = 16'-0"		
CLASSIFIED BY NOT REQUIRED		DATE
CLASSIFICATION NONE		

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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241-TX TANK FARM
GEOLOGIC CHARACTERIZATION
CROSS SECTION G-G'

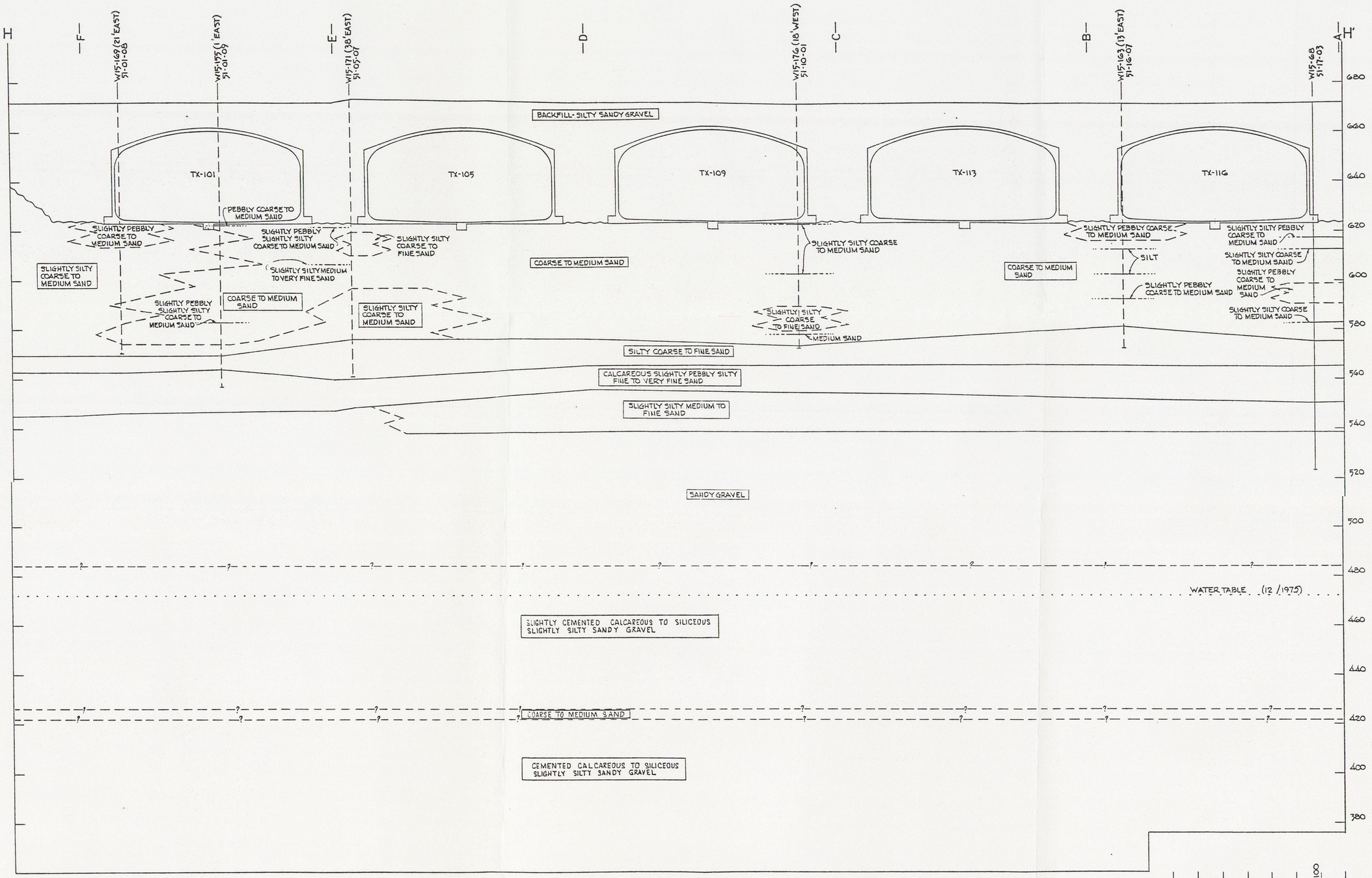
PROJ NO W O NO CE-2012	PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX	INDEX NO. 0402, 0501
DWG NO. H-2-38357	SHEET NO. / NO. OF SHTS — / —

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				

REVISIONS

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV.
DRAWING STATUS				0



CROSS SECTION H-H'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				
REVISIONS							
COMMENT PRT ISSUE NO.		DATE	CHECK PRT ISSUE NO.		DATE	LAST REV. 0	
DRAWING STATUS							

		DATE
APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY R. D. Wright FOR ARCHCO		3/2/76
APPD		
APPD R. E. Dickson / R. D. Wright		3/17/76
ENGR D. LIEN		3/12/76
QA APPD J. M. A. Garcia		3/14/76
CHECKED		
DRAWN ERICKSON		4/14/75
SCALE 1" = 16'-0"		
CLASSIFIED BY NOT REQUIRED		DATE
CLASSIFICATION NONE		

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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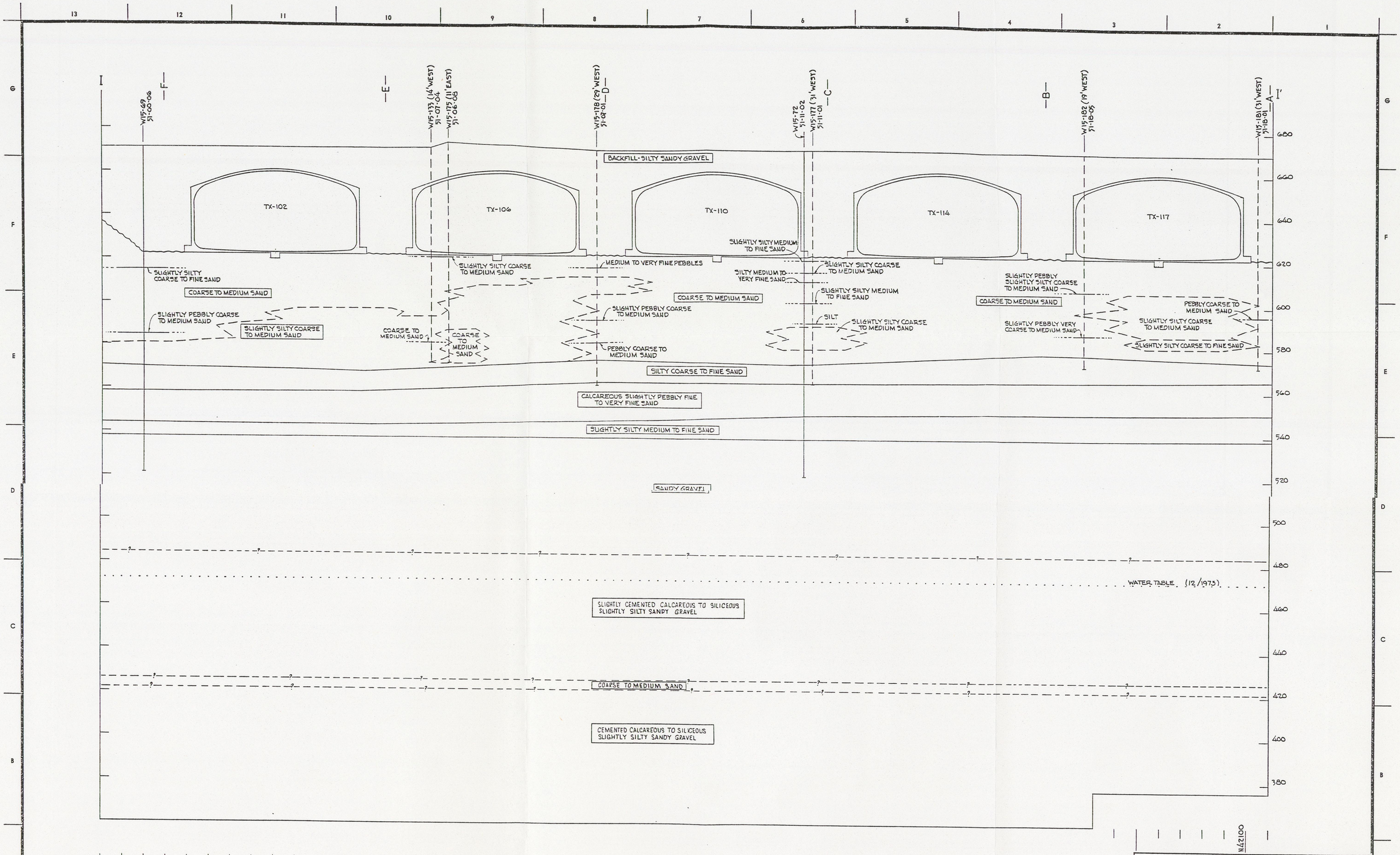
241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION H-H'

PROJ NO W O NO CE-2012	PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX	INDEX NO. 0402 . 0501
DWG NO. H-2-38358	SHEET NO. 1 OF 1 — —



CROSS SECTION I-I'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO FWD	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				

REVISIONS

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV.
				0

DRAWING STATUS

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY LR Scott FOR WHC APPD	DATE 3/22/76	
APPD	3/22/76	
ENGR D. LIEN	3/12/76	
QA APPD	3/12/76	
CHECKED	3/12/76	
DRAWN ERICKSON	6/5/75	
SCALE 1" = 16'-0"		
CLASSIFIED BY NOT REQUIRED	DATE	
CLASSIFICATION NONE		

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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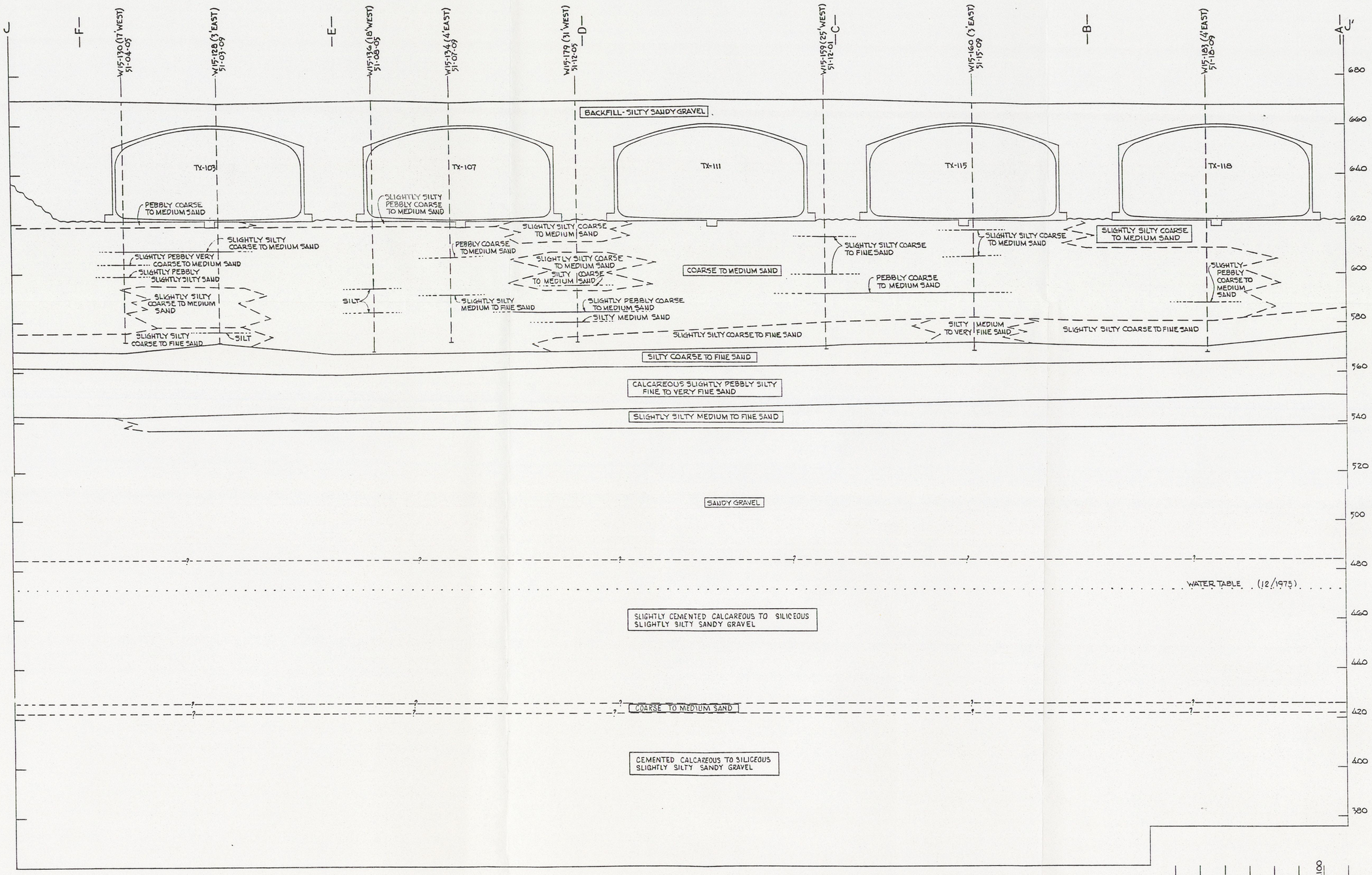
241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION I-I'

PROJ NO. W O HO CE-2012
PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX
INDEX NO. 0402, 0501
DWG NO. H-2-38975
SHEET NO. | NO. OF SHEETS — | —



CROSS SECTION J-J'

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

MICRO FM'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				
REVISIONS							
COMMENT PRT ISSUE NO.		DATE	CHECK PRT ISSUE NO.		DATE		LAST REV. 0
DRAWING STATUS							

		DATE
APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY	R.W. Schult	3/21/76
FOR	HCHD	
APPD		
APPD	R.W. Schult	3/21/76
ENGR	D. LIEN	3/12/76
QA APPD		3/26/76
CHECKED		
DRAWN	ERICKSON	4/24/75
SCALE	1" = 10'-0"	
CLASSIFIED BY	NOT REQUIRED	DATE
CLASSIFICATION	NONE	

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
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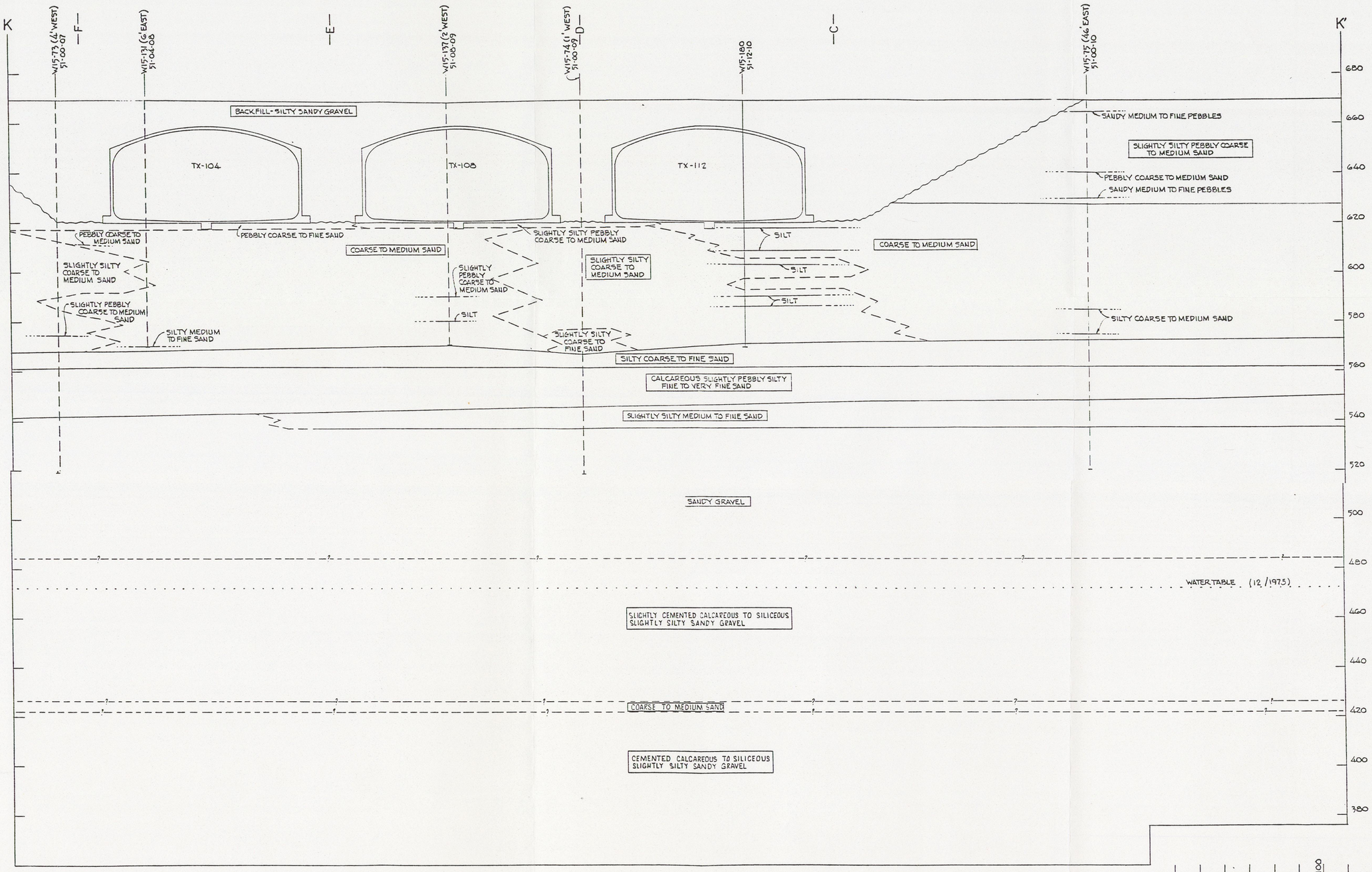
241-TX TANK FARM GEOLOGIC CHARACTERIZATION CROSS SECTION J-J'

PROJ. NO. W.O. NO. CE-2012
PWG. TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX
INDEX NO. 0402, 0501
DWG. NO. H-2-38976
SHEET NO. — NO. OF SHTS —



CROSS SECTION K-K'

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY	DATE 3/12/76
APPD FOR	
APPD	
ENGR D. LIEN	3/12/76
QA APPD	3/12/76
CHECKED	3/24/76
DRAWN ERICKSON	6/27/75
SCALE 1" = 16'-0"	
CLASSIFIED BY NOT REQUIRED	DATE
CLASSIFICATION NONE	

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
RICHLAND OPERATIONS OFFICE

VITRO ENGINEERING • architects • engineers
a division of AUTOMATION INDUSTRIES, INC.

241-TX TANK FARM
GEOLOGIC CHARACTERIZATION
CROSS SECTION K-K'

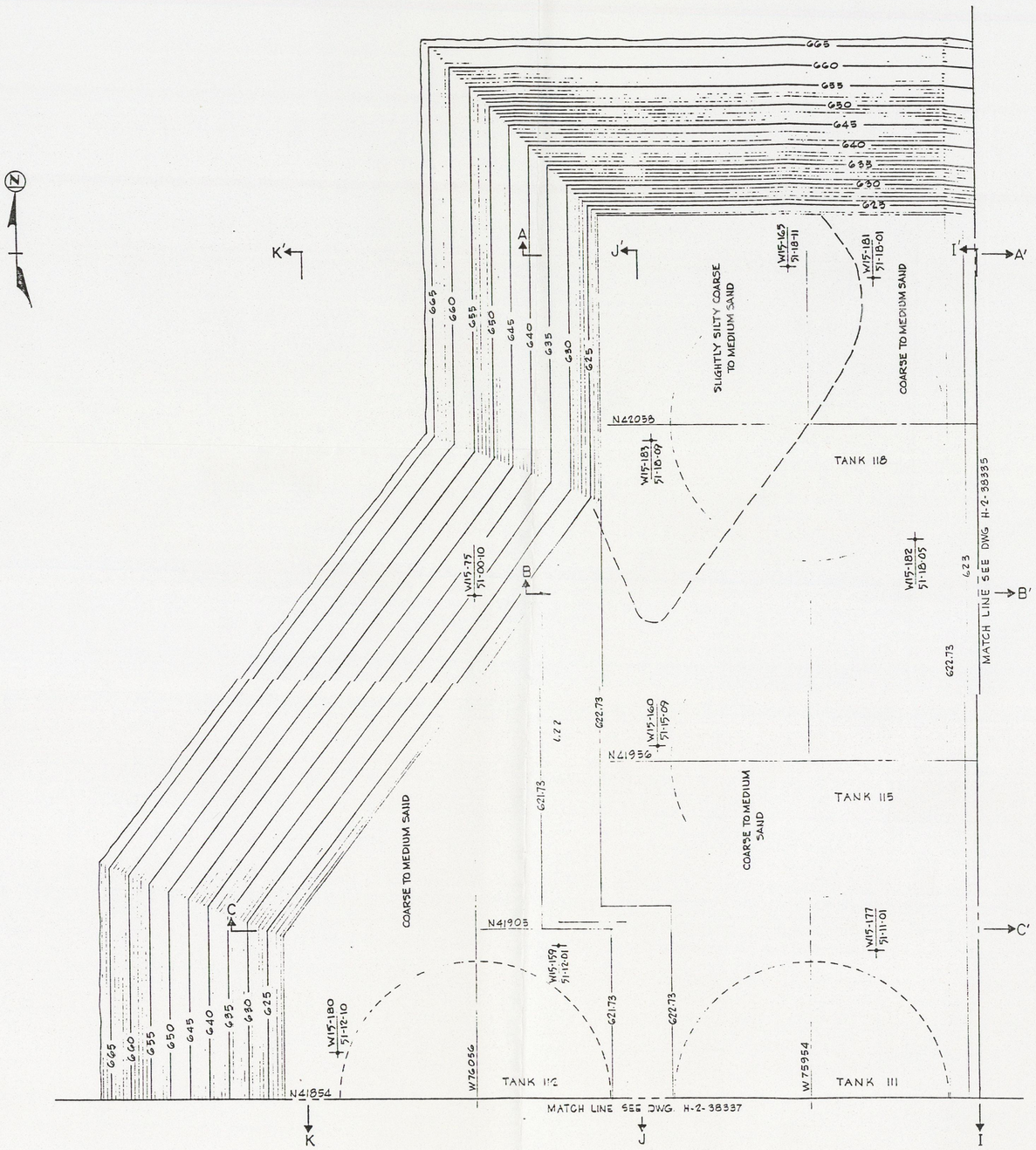
PROJ NO W O NO CE-2012 | PROJ TITLE GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX | INDEX NO. 0402, 0501
DWG NO. H-2-38977 | SHEET NO. | SHEET OF SHEETS — | —

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

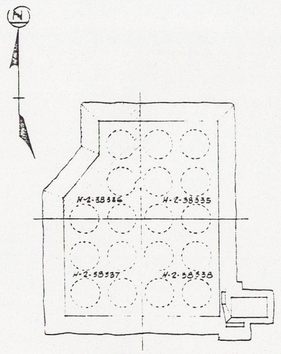
MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD				

REVISIONS

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE	LAST REV. 0
DRAWING STATUS				



241-TX TANK FARM



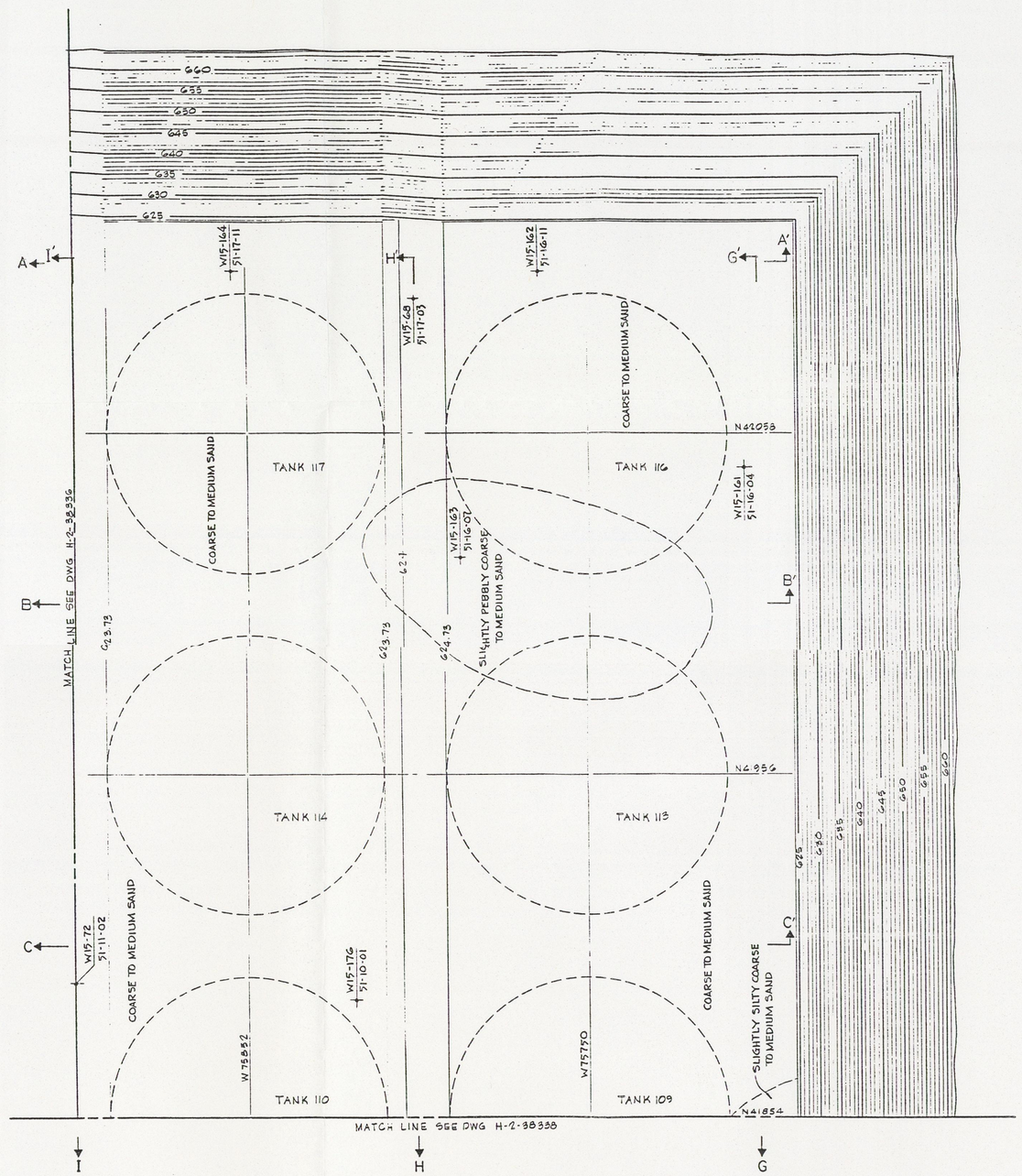
KEY PLAN
NTS

	W.H. Brown 8/30/74	AEWC	[illegible]	VITRO		REVISED TITLE BLOCK	2
	D.H. Brown 2/11/72	RLWC	[illegible] 5/1/68	VITRO		ADD CHARACTERIZATION UPDATED TO CUT SECTIONS #	1
MICRO FWS	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD			REVISIONS	
	COMMENT PRT ISSUE NO.		DATE	CHECK PRT ISSUE NO.		DATE	LAST REV 2
						DRAWING STATUS	

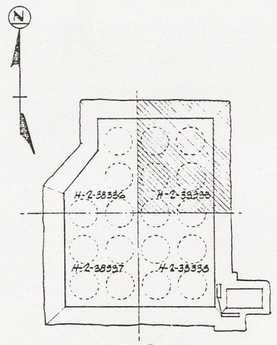
DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA	DATE	U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE
BY L.D.S. Cogan	10/24/72	AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION
APPD S.J. Lien	10/24/72	
STRUC. DESIGN R.W. Wilson	10/27/72	241-TX TANK FARM GEOLOGIC CHARACTERIZATION BASE OF BACKFILL - NW SECTION CONTOURED EXCAVATION
DWGS. APPD S.J. Lien Gunn	8/14/74	
DWGS APPD G.A. T.M.A. Lagan	4/16/70	
CHECKED S.J. Lien	7-1-70	
DRAWN S.Y. Ines	10-8-74	
SCALE 1" = 16'-0"		PROJ NO WO NO C5105 / PROJ TITLE BASE FOR BACKFILL
CLASSIFIED BY NOT REQUIRED	DATE	PLANT NO. 241-TX / INDEX NO. 0111
CLASSIFICATION NONE		DWG NO H-2-38336 / SHEET NO - / SHEETS -

CHARLES MUNDING CO. 777 F24-5000-473 EA. (4-74)



241-TX TANK FARM



KEY PLAN
NTS

	W.H. Dunn 2/26/74	R.E.Hall		VITRO		REVISED TITLE BLOCK	2
M	12/14/73 Dunn 3/18/74	ARHCO		VITRO		& ADD CHARACTERIZATION UPDATED TO CUT SECTIONS	1
MICRO F'M'D	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
	APPD FOR CONFORM WITH DESIGN CRIT		APPD			REVISIONS	

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
NEXT USED ON		

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE
DRAWING STATUS			LAST REV 2

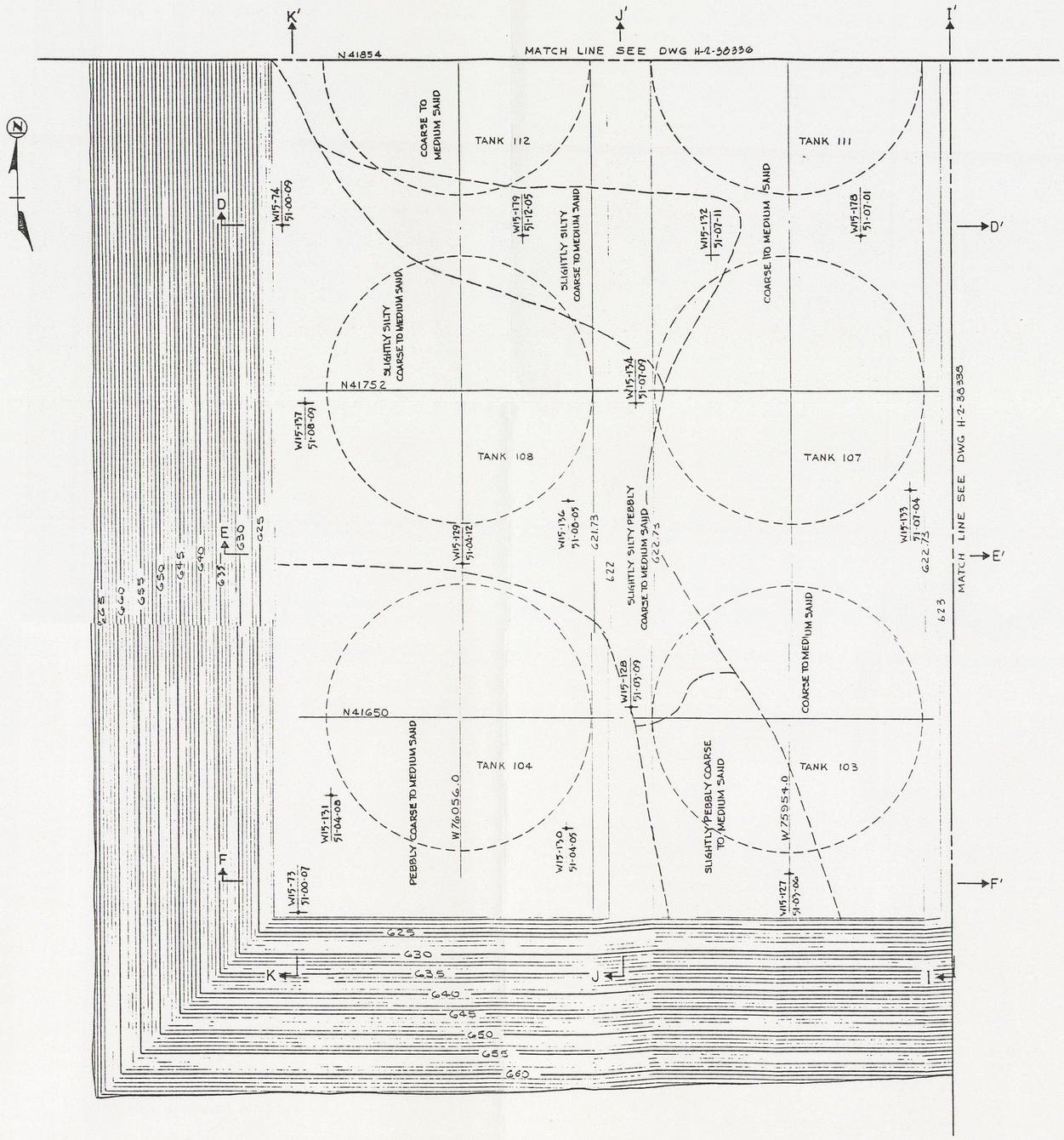
APPD. FOR CONFORMANCE WITH DESIGN CRITERIA — BY / FOR — DATE 10/24/74
APPD 10/24/74
APPD 10/24/74
DRWN 5.Y. Ines 10-8-74
SCALE 1" = 16'-0"
CLASSIFIED BY NOT REQUIRED — DATE
CLASSIFICATION NONE

U. S. ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
AUTOMATION INDUSTRIES, INC.
VITRO ENGINEERING DIVISION

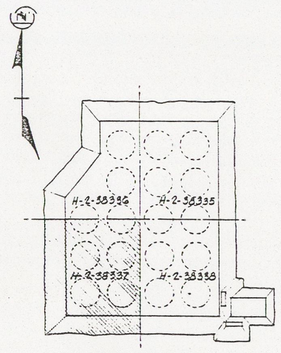
241-TX TANK FARM GEOLOGIC CHARACTERIZATION BASE OF BACKFILL - NE SECTION CONTOURED EXCAVATION

PROJ NO WO NO CE1031 — PROJ TITLE BASE FOR BACKFILL
BLDG. NO. 241-TX — INDEX NO. 0111
DWG NO. H-2-38335 — SHEET NO. - — SHEETS -

CHARLES BRUNING CO. ITT FRANKLIN-113 EA. (4-74)



241-TX TANK FARM



KEY PLAN
NTS

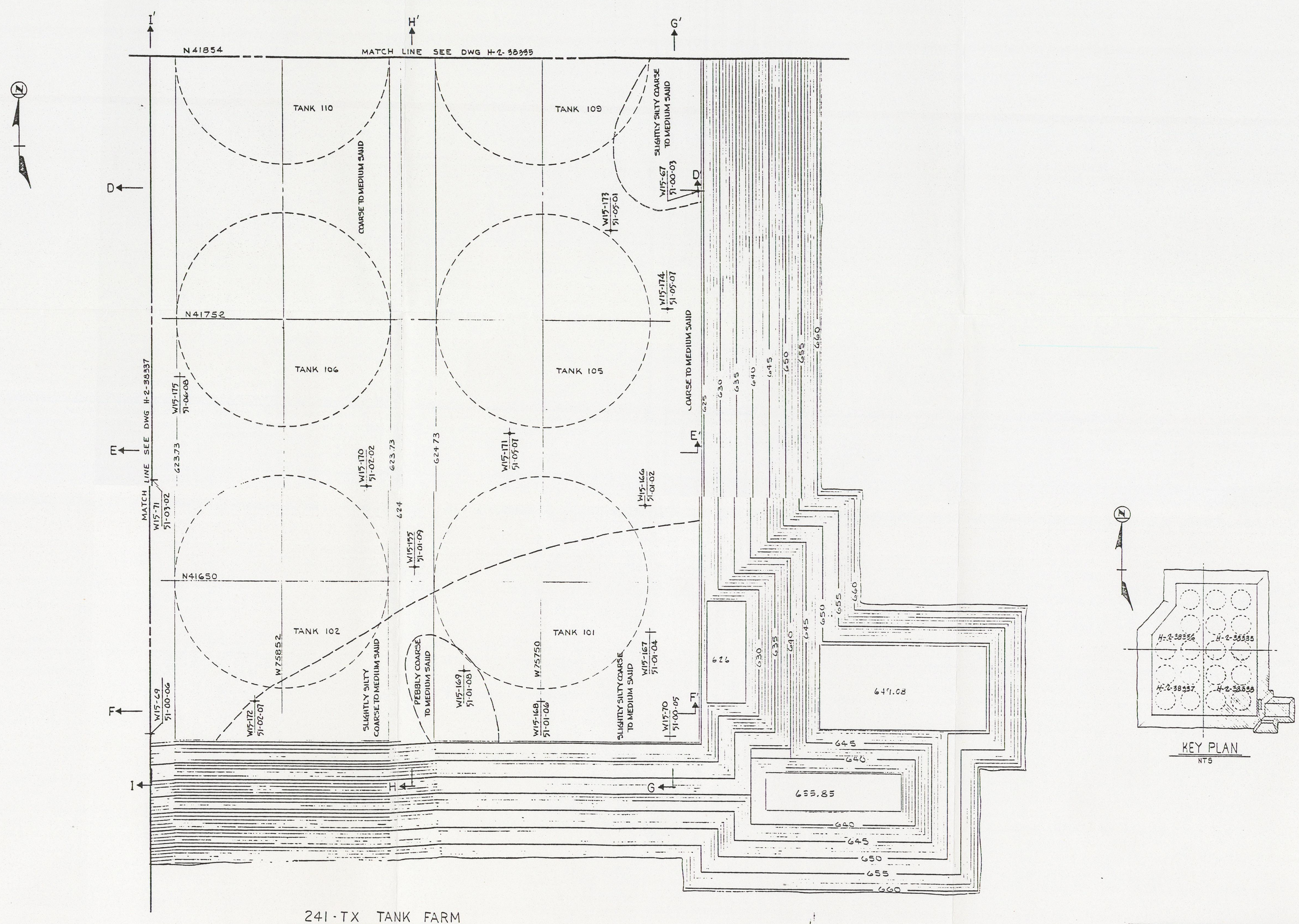
	Will Rosser 4/30/74	R.E.Hicks		VITRO		REVISED TITLE BLOCK	2
M	Will Rosser 3/15/74	R.E.Hicks				ADD CHARACTERIZATION UPDATED TO CUT SECTIONS &	1
	BY-DATE	FOR	BY-DATE	FOR	REV BY DATE	DESCRIPTION	REV NO.
MICRO FM'D	APPD FOR CONFORM WITH DESIGN CRIT		APPD			REVISIONS	

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.
		REFERENCE DRAWINGS
NEXT USED ON		

COMMENT PRT ISSUE NO.	DATE	CHECK PRT ISSUE NO.	DATE
DRAWING STATUS			

LAST REV 2

APPD. FOR CONFORMANCE WITH DESIGN CRITERIA	DATE	U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE
BY W. H. Rosser	10-24-74	AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION
FOR Svvec		
APPD B. H. Lien	10-24-74	
APPD V. T. Ochiai	10/1/74	241-TX TANK FARM GEOLOGIC CHARACTERIZATION BASE OF BACKFILL- SW SECTION CONTOURED EXCAVATION
DWN B. Lien	10/24/74	
DWN APPD G.R. Magassis	10/1/74	
CHECKED D. Lien	10/1/74	
DRAWN PAGEL & INES	9-20-74	
SCALE 1" = 16'-0"		PROJ NO CF 1931 / PROJ TITLE BASE FOR BACKFILL
CLASSIFIED BY NOT REQUIRED	DATE	FILING NO. 241-TX / INDEX NO. 0111
CLASSIFICATION NONE		DWG NO. H-2-38337 / SHEET NO - / SHEETS -



	WH [illegible] 4/24/76	ARHCO	[illegible]	VITRO	[illegible]	REVISED TITLE BLOCK	2
M	[illegible] 3/15/76	ARHCO	[illegible]	VITRO	[illegible]	ADD CHARACTERIZATION UPDATED TO CUT SECTIONS 8	1
MICRO FM'D	BY-DATE / APPD FOR CONFORM WITH DESIGN CRIT	FOR	BY-DATE / APPD	FOR	REV BY DATE	DESCRIPTION	REV NO.

REVISIONS

DWG. NO.	REV NO.	DRAWING TITLE OR INDEX NO.

REFERENCE DRAWINGS

NEXT USED ON

COMMENT PRT ISSUE NO. | DATE | CHECK PRT ISSUE NO. | DATE | LAST REV 2

DRAWING STATUS

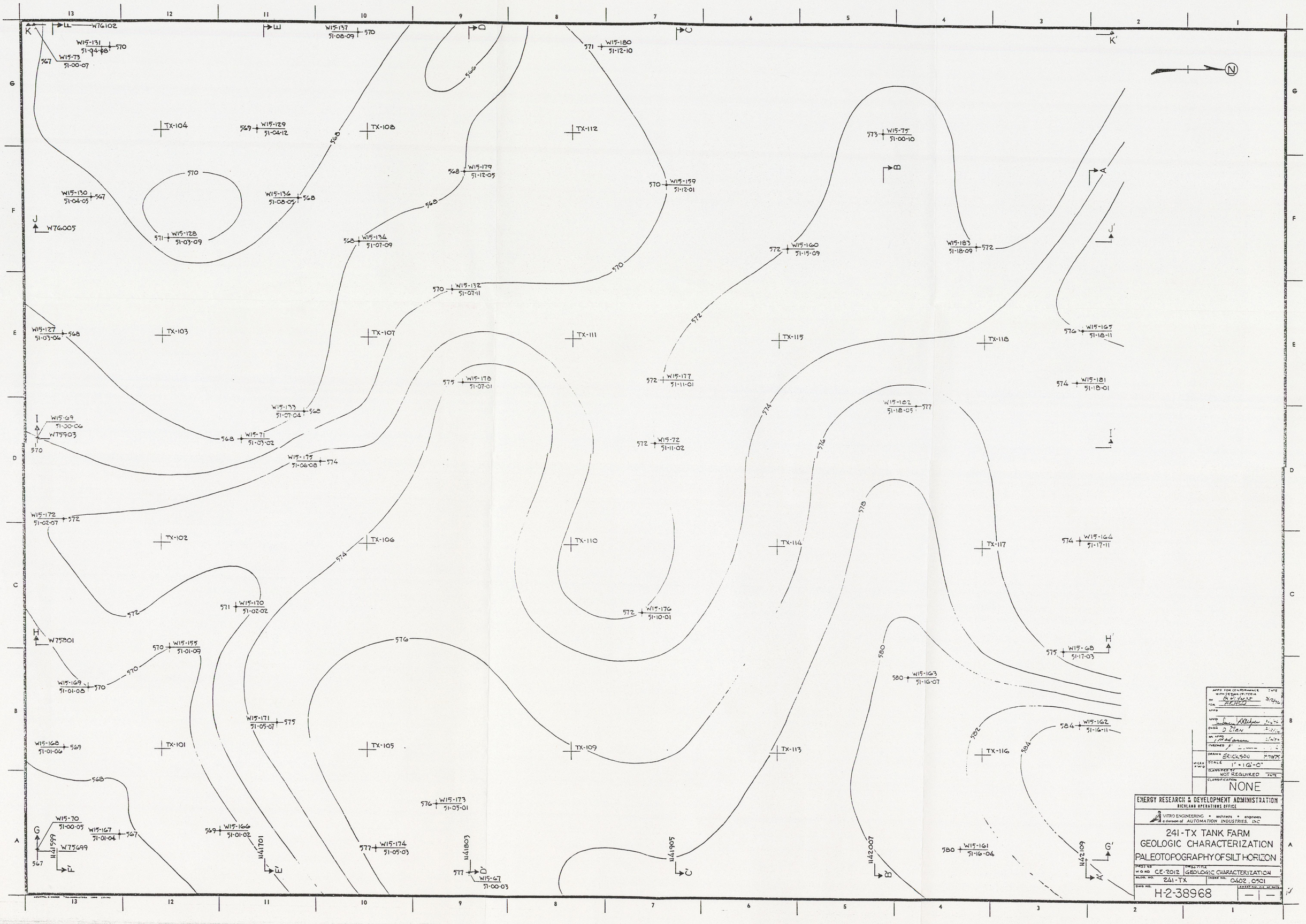
APPD. FOR CONFORMANCE WITH DESIGN CRITERIA BY [illegible] FOR ARHCO — 10/14/74
APPD D.D. [illegible] — 10/14/74
APPD [illegible] — 10/11/74
ENGR D. [illegible] — 10/16/74
QA APPD [illegible] — 10/16/74
CHECKED [illegible] — 10/16/74
DRAWN PAGEL & INES — 9-17-74
SCALE 1" = 16'-0"
CLASSIFIED BY NOT REQUIRED
CLASSIFICATION NONE

U. S. ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
AUTOMATION INDUSTRIES, INC.
VITRO ENGINEERING DIVISION

241-TX TANK FARM GEOLOGIC CHARACTERIZATION BASE OF BACKFILL-SE SECTION CONTOURED EXCAVATION

PROJ NO / WO NO CE 1031 | PROJ TITLE BASE FOR BACKFILL
BLDG. NO. 241-TX | INDEX NO. 0111
DWG NO. H-2-38338 | SHEET NO. - | SHEETS -

CHARLES BRUNING CO. ITT



APPD FOR CONFORMANCE WITH DESIGN CRITERIA — DATE
BY [signature] 3/2/76
FOR HRHCO
APPD
APPD [signature]
ENGR D. LEAN
QA APPD [signature]
CHECKED
DRAWN ERICKSON
SCALE 1" = 16'-0"
CLASSIFIED BY NOT REQUIRED — DATE
CLASSIFICATION NONE

ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
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241-TX TANK FARM
GEOLOGIC CHARACTERIZATION
PALEOTOPOGRAPHY OF SILT HORIZON

PROJ NO	PROJ TITLE
W.O. NO. CE-2012	GEOLOGIC CHARACTERIZATION
BLDG. NO. 241-TX	INDEX NO. 0402, 0501
DWG NO. H-2-38968	SHEET NO. OF SHEETS — —