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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2409C	1	89

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34428.1.1		P.E.
		R/W & UTIL.

NOTE: SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. R-2409C 34428.1.1 F.A. PROJ. _____

COUNTY TRANSYLVANIA

PROJECT DESCRIPTION US 64 FROM LAKE TOXAWAY TO INDIAN CREEK

INVENTORY

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-L-	10+05 TO 76+00

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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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PERSONNEL

F&H CONSULTANTS

ROBBIE DeLOST

FRED WOODARD

INVESTIGATED BY JC KUHNE

CHECKED BY _____

SUBMITTED BY JC KUHNE

DATE 1/3/2013

NORTH CAROLINA LICENSED SEAL 1873 GEOLOGIST JODY KUHNE

DRAWN BY: JC KUHNE

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

CONTRACT: 34428.1.1

ID: R-2409C

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MX	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / OPT CMT / VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: NA

ELEVATION: FT.

NOTES:

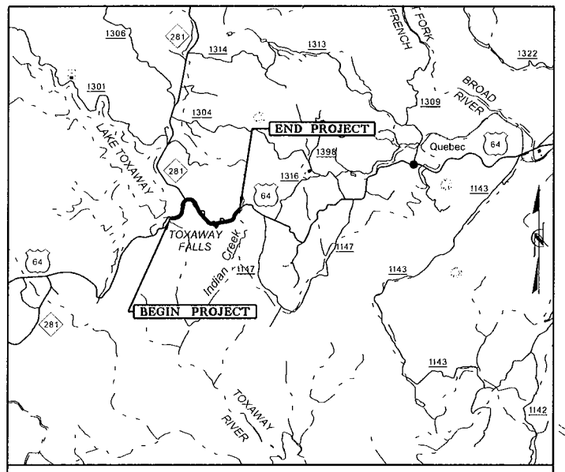
REVISED 09/23/09

09/08/99

TIP PROJECT: R-2409C

CONTRACT:

See Sheet 1-A For Index of Sheets



VICINITY MAP

25% REVIEW PLANS
JULY 3, 2012

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

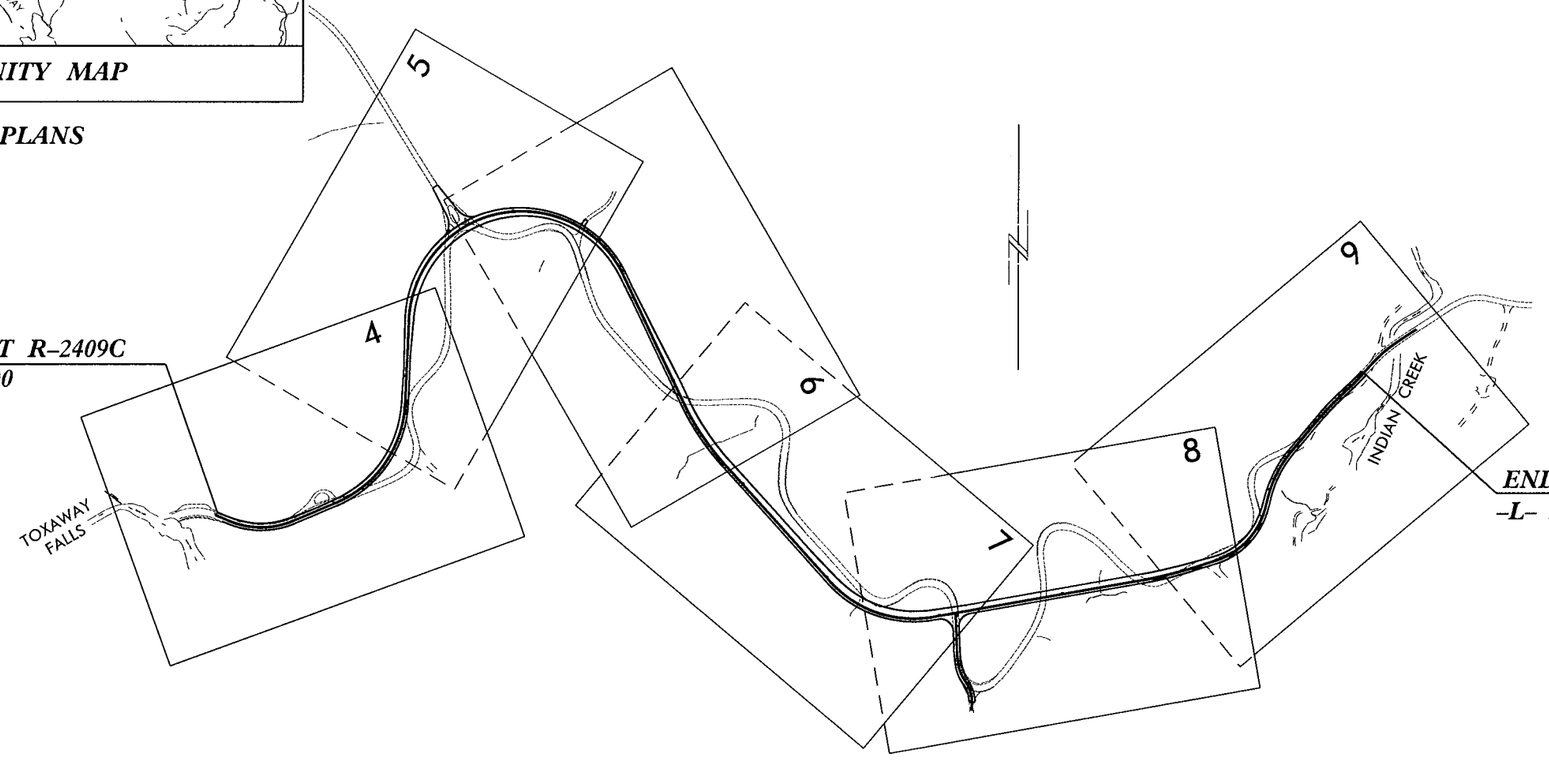
TRANSYLVANIA COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2409C	2A	39

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

LOCATION: US 64 from LAKE TOXAWAY TO INDIAN CREEK

TYPE OF WORK: GRADING, DRAINAGE, PAVING & RETAINING WALLS



BEGIN PROJECT R-2409C
-L- POT 10+05.00

END PROJECT R-2409C
-L- POC 76+00.00

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

50 25 0 50 100
PROFILE (VERTICAL)

DESIGN DATA

ADT 2008 = 3,700
ADT =
DHV = %
D = %
T = % *
V = 40 MPH
* TTST = DUAL
FUNC CLASS =
MINOR ARTERIAL
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2409C = 1.249 MI.

LENGTH STRUCTURES TIP PROJECT R-2409C = 0.000 MI.

TOTAL LENGTH OF TIP PROJECT R-2409C = 1.249 MI.

Prepared In the Office of:
Florence & Hutcheson
An ICA Company
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No. F-0255

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: , 2013

LETTING DATE: , 2014

BRIAN A. WILES, P.E.
PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE HIGHWAY DESIGN ENGINEER P.E.

21-DEC-2012 14:55
C:\Projects\CADDProjects\Roadways\R2409C_GEO_RDWY\CADD_ORIGINAL\r2409c_rdy_tsh.dgn
jkunne
GEA255445

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PURDUE
GOVERNOR

Eugene A. Conti, Jr.
SECRETARY

December 21, 2012

STATE PROJECT: 34428.1.1 (R-2409C)
COUNTY: Transylvania
DESCRIPTION: US 64 from Lake Toxaway to Indian Creek

SUBJECT: Geotechnical Report – Inventory

PROJECT DESCRIPTION

The project is located in southwestern Transylvania County near Lake Toxaway. This project section begins at the Lake Toxaway Dam, continues 1.25 miles east and consists of two-lane realignment and widening, substantial grade changes and climbing lanes. The terrain is mountainous, rugged and steep. The plans available at the time of investigation indicated several detour alignments in cross sections but these were not shown as an alignment on the plans. The following alignment was investigated:

–L- Station 10+00 to 76+00

The total length of lines investigated is 1.25 miles. The field investigation was conducted in October 2012. All borings were conducted with a CME-45 drill machine with an automatic hammer. Standard Penetration Tests were performed utilizing Hollow Stem Augers with carbide insert teeth in the head stem. Soil samples were submitted for triaxial testing to determine whether fill slopes can be constructed at the proposed 1.5:1.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

Crystalline Rock: Crystalline rock should be expected within 10' of grade in most of the project footprint.

Alluvial Soils: Potentially unsuitable alluvium is noted on the plansheets at Stations 69+00 to 70+00. It is expected to undercut the quantity shown in the Recommendations in order to construct the ultimate wall design.

SOIL PROPERTIES

All saprolite soils on the project are derived from the Toxaway Gneiss (Ytg) rocks encountered within the project corridor. Crystalline and severely weathered crystalline rock exists at or near the surface in most project areas. The dominant residual soil type encountered is micaceous silty sand (A-2-4) and sand (A-2).

Respectfully submitted,

Jody C. Kuhne. PG, PE
Project Geological Engineer

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
FAX: 919-250-4237

WEBSITE:
www.ncdot.gov/doh/preconstruct/highway/geotech

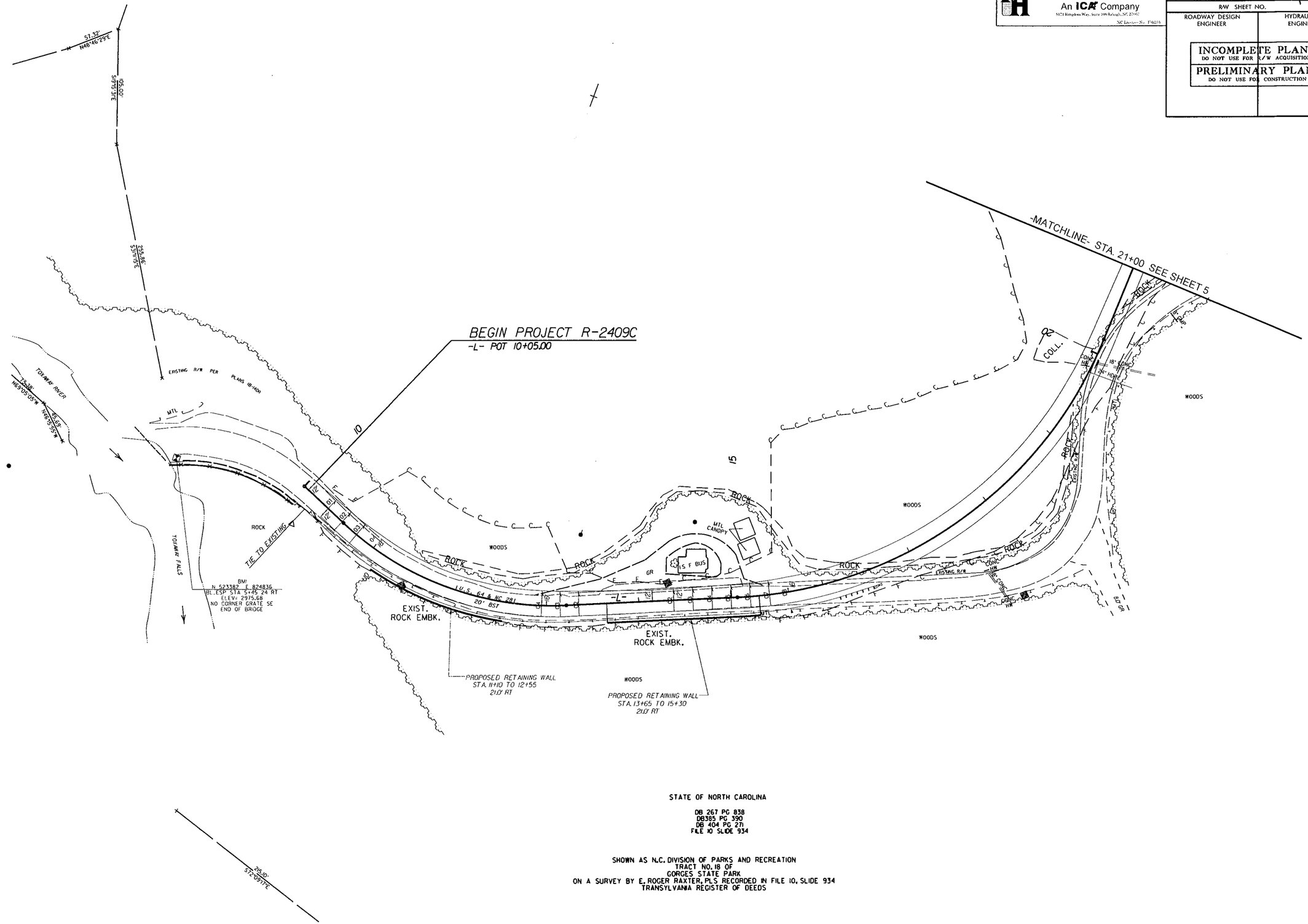
LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC

EARTHWORK BALANCE SHEET

Florence & Hutcheson
An ICA Company

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	4139
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



STATE OF NORTH CAROLINA

DB 267 PG 838
DB385 PG 390
DB 404 PG 271
FILE 10 SLIDE 934

SHOWN AS N.C. DIVISION OF PARKS AND RECREATION
TRACT NO. 18 OF
GORGES STATE PARK
ON A SURVEY BY E. ROGER RAXTER, PLS RECORDED IN FILE 10, SLIDE 934
TRANSYLVANIA REGISTER OF DEEDS

REVISIONS

8/17/99

10-DEC-2012 15:30
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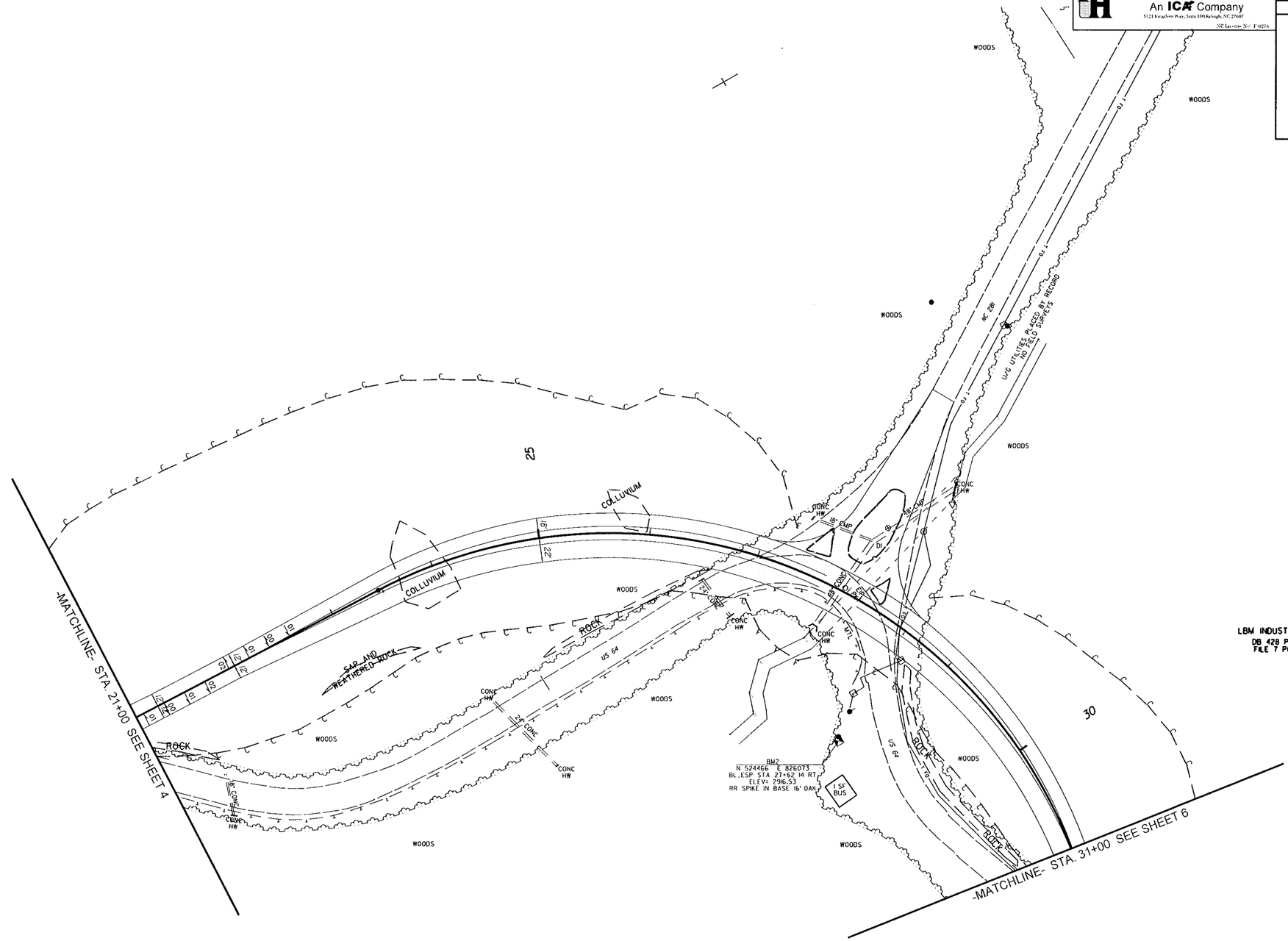
An ICA Company
5121 Kingsdown Way, Suite 100 Raleigh, NC 27607
NC License No. F-0256

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	5/39
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



LBM INDUSTRIES, INC.
DB 428 PG 262
FILE 7 PG 435

STATE OF NORTH CAROLINA

DB 267 PG 838
DB385 PG 390
DB 404 PG 271
FILE 10 SLIDE 934

SHOWN AS N.C. DIVISION OF PARKS AND RECREATION
TRACT NO. 18 OF
GORGES STATE PARK
ON A SURVEY BY E. ROGER RAXTER, PLS RECORDED IN FILE 10, SLIDE 934
TRANSYLVANIA REGISTER OF DEEDS

REVISIONS

8/17/99

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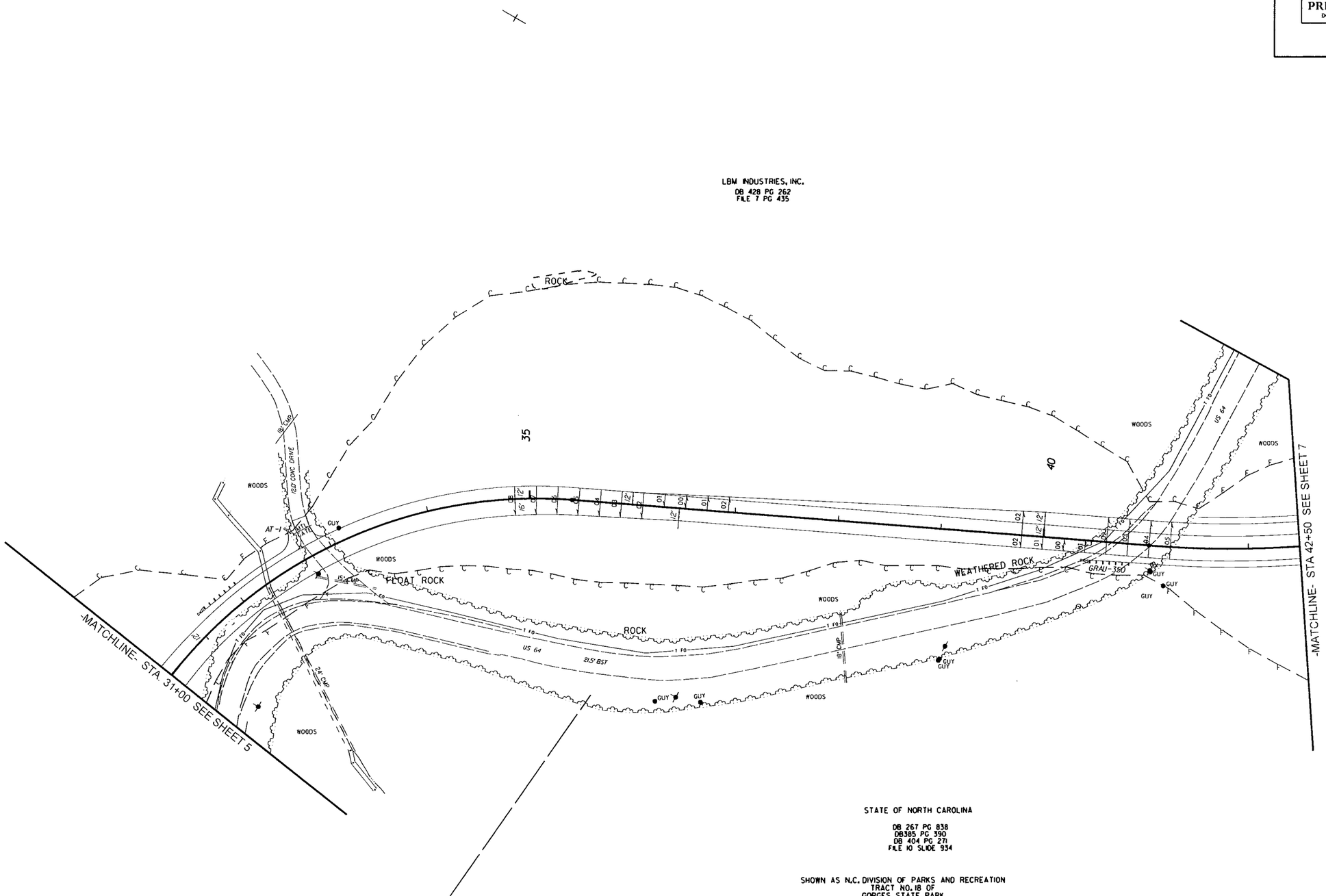
An ICA Company
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No. F-0258

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	6/89
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



REVISIONS

8/17/99

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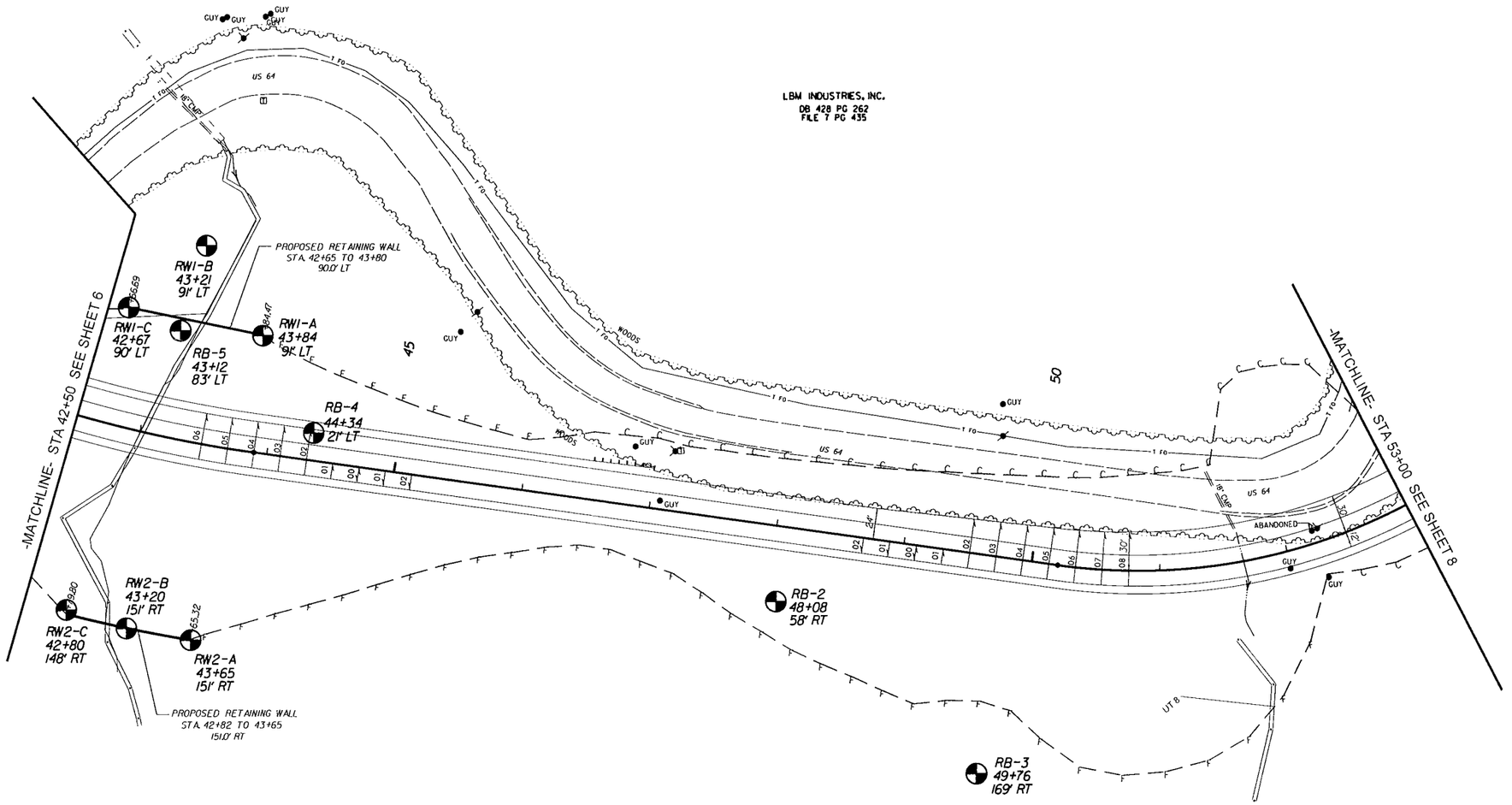
An ICA Company
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No. F-0238

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	7/89
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



STATE OF NORTH CAROLINA

DB 267 PG 838
DB385 PG 390
DB 404 PG 271
FILE 10 SLIDE 934

SHOWN AS N.C. DIVISION OF PARKS AND RECREATION
TRACT NO. 18 OF
GORGES STATE PARK
ON A SURVEY BY E. ROGER RAXTER, PLS RECORDED IN FILE 10, SLIDE 934
TRANSYLVANIA REGISTER OF DEEDS

REVISIONS

8/17/99

10-DEC-2012 15:36
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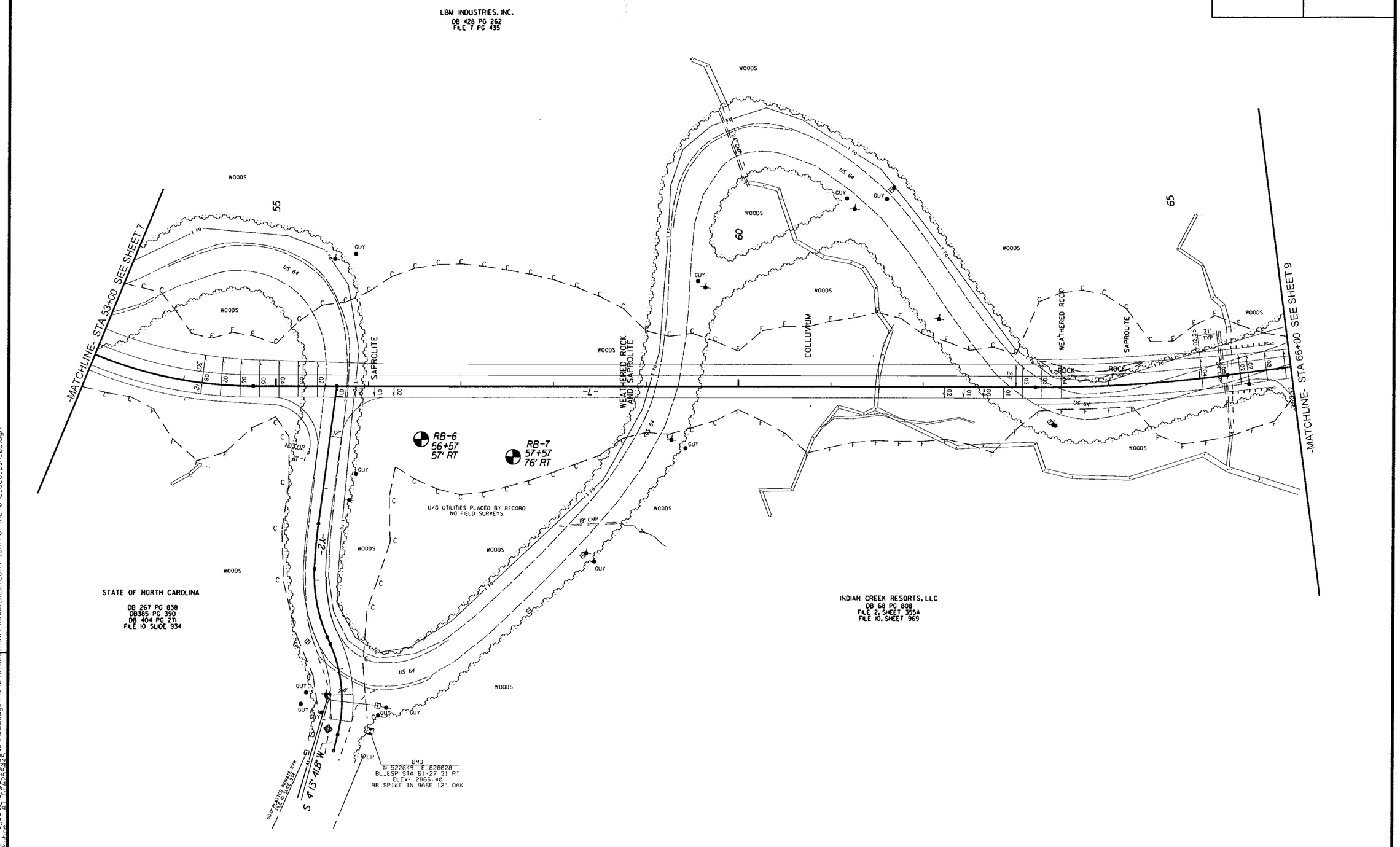
NC License No. F-0258

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	8/89
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



REVISIONS

8/17/99

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kuhne AT GEA25R445

Florence & Hutcheson
An ICA Company
5121 Kingsford Way, Suite 100 Raleigh, NC 27607
NC Licensure No. P-0205

PROJECT REFERENCE NO.	SHEET NO.
R-2409C	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS

8/17/99

31-DEC-2012 08:2
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END PROJECT R-2409C
POT Sta.75+75

LBM INDUSTRIES, INC.
DB 428 PG 262
FILE 7 PG 435

INDIAN CREEK RESORTS, LLC
DB 68 PG 808
FILE 2, SHEET 355A
FILE 10, SHEET 969

INDIAN CREEK RESORTS, LLC
DB 38 PG 840
FILE 2 SLID 355A

INDIAN CREEK RESORTS, LLC
DB 38 PG 840
FILE 2 SLID 355A

LOTS 1-8
SECTION ONE
CATATOGA FALLS COTTAGES
(EXCEPTION)
FILE 10, SLIDE 971

MATCHLINE STA 66+00 SEE SHEET 8

SEE SHEET 10

SMALL WHORLED POGONIA, INDIVIDUAL PLANTS

PROPOSED RETAINING WALL STA 67+75 TO 68+66 30.0' LT

PROPOSED RETAINING WALL STA 68+65 TO 69+80

UNDERCUT ALLUVIUM FOR WALL CONSTRUCTION (BOUNDARY APPROX.)

RW3-A 67+75 30' LT
RW3-B 68+19 20' LT
RW3-C 68+66 30' LT
RW4-A 68+81 139' RT
RW4-B 69+28 117' RT
RW4-C 69+80 143' RT

U/G UTILITIES PLACED BY RECORD NO FIELD SURVEYS

WEATH. ROCK

US 64

EXISTING R/W

24" CMP

2-4'x3'6" RCBC

INDIAN CREEK

WATER FALL

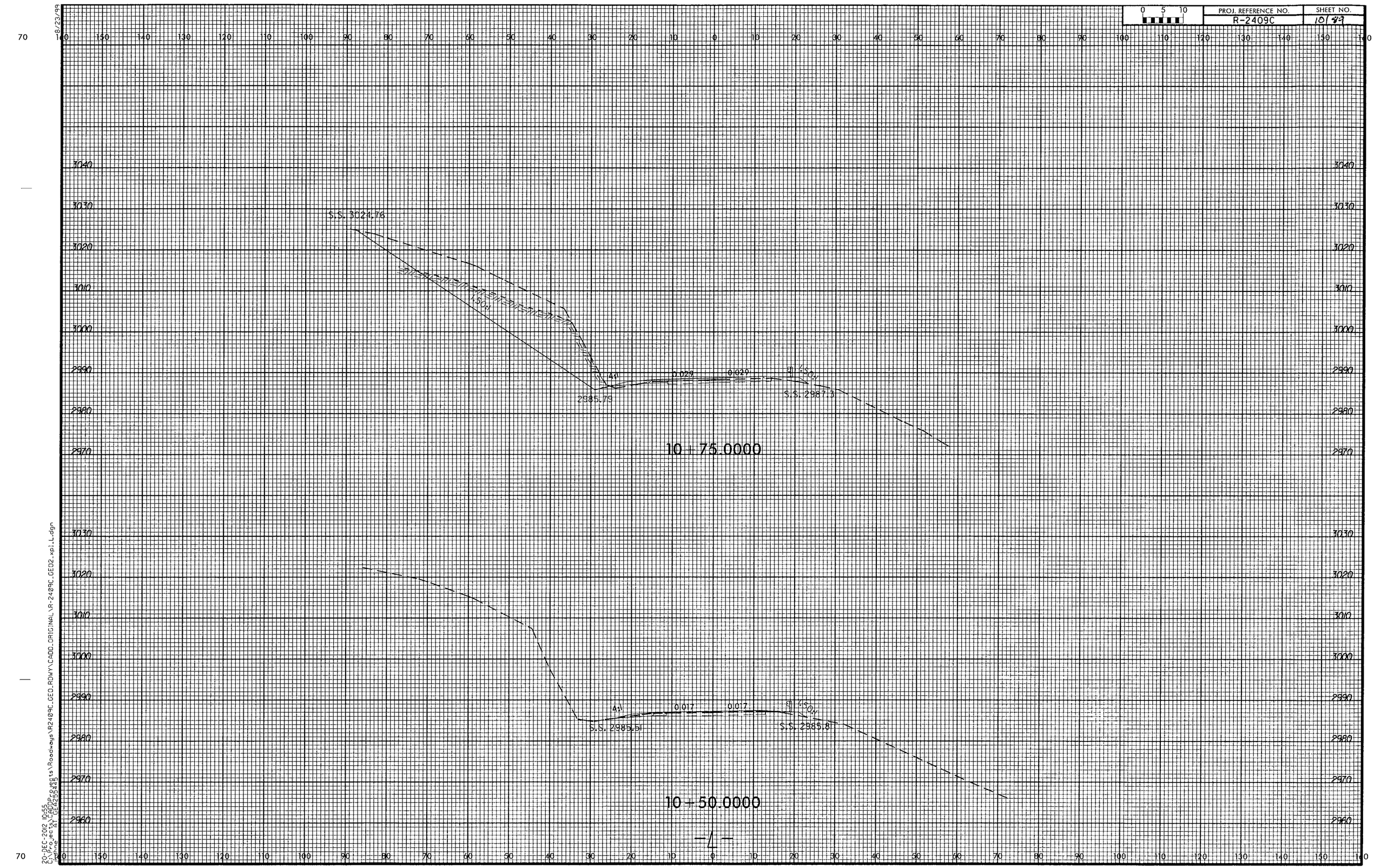
WOODS

GUY

RD GATE

BM4
N 524087 E 829749
BL.LESP STA 89+94.45 RT
ELEV= 2754.39
RR SPIKE IN BASE 20" OAK

FOR -L- PROFILE SEE SHEET 15



PROJ. REFERENCE NO.
R-2409C
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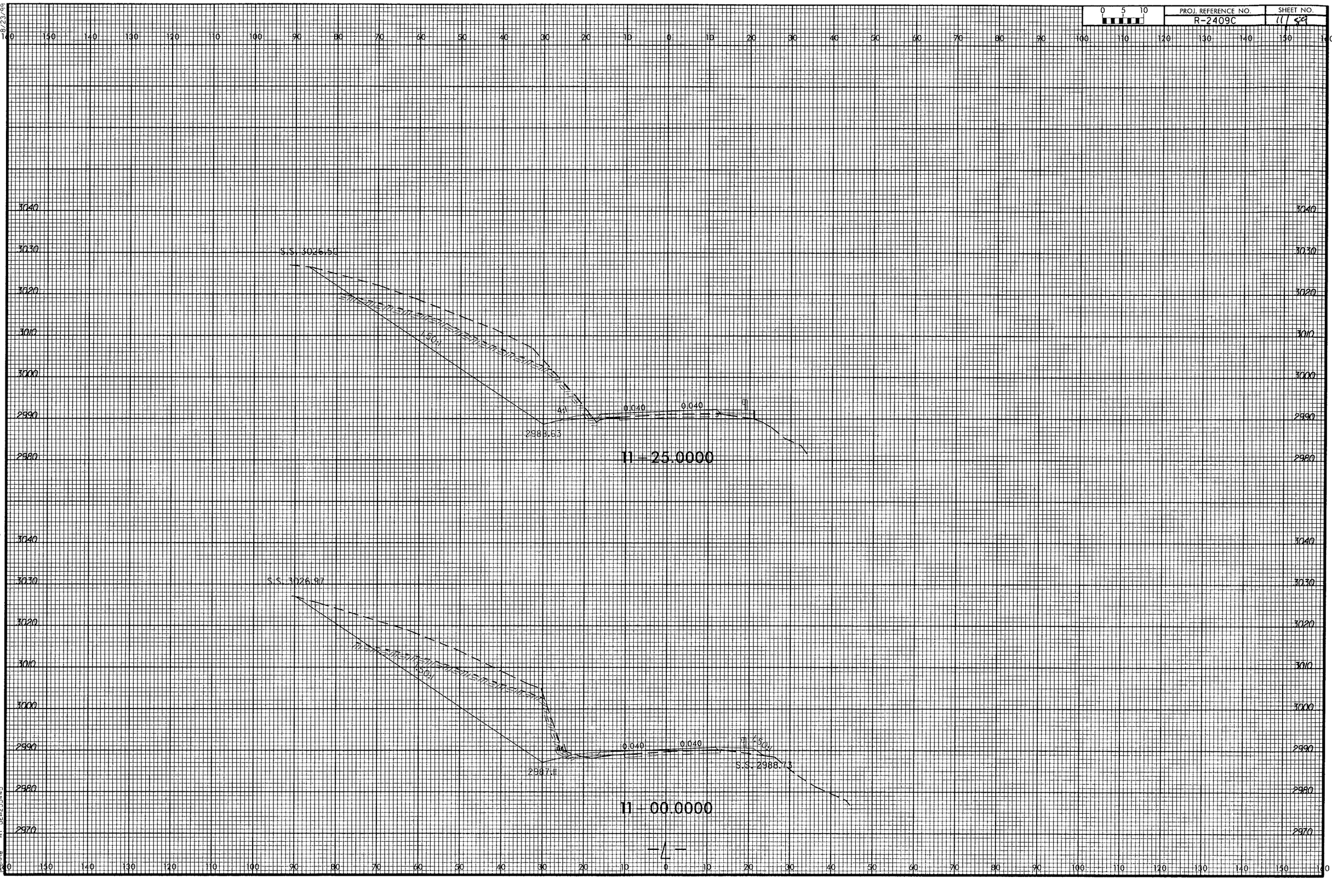
4:1
0.029
0.029
1.50:1
2985.79
S.S. 2987.3
10 + 75.0000
4:1
0.017
0.017
1.50:1
S.S. 2985.51
S.S. 2985.8
10 + 50.0000
-L-



PROJ. REFERENCE NO.
R-2409C
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11 - 25.0000
S.S. 3026.97
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4:1
0.040
0.040
1.50:1
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S.S. 2988.73
11 - 00.0000
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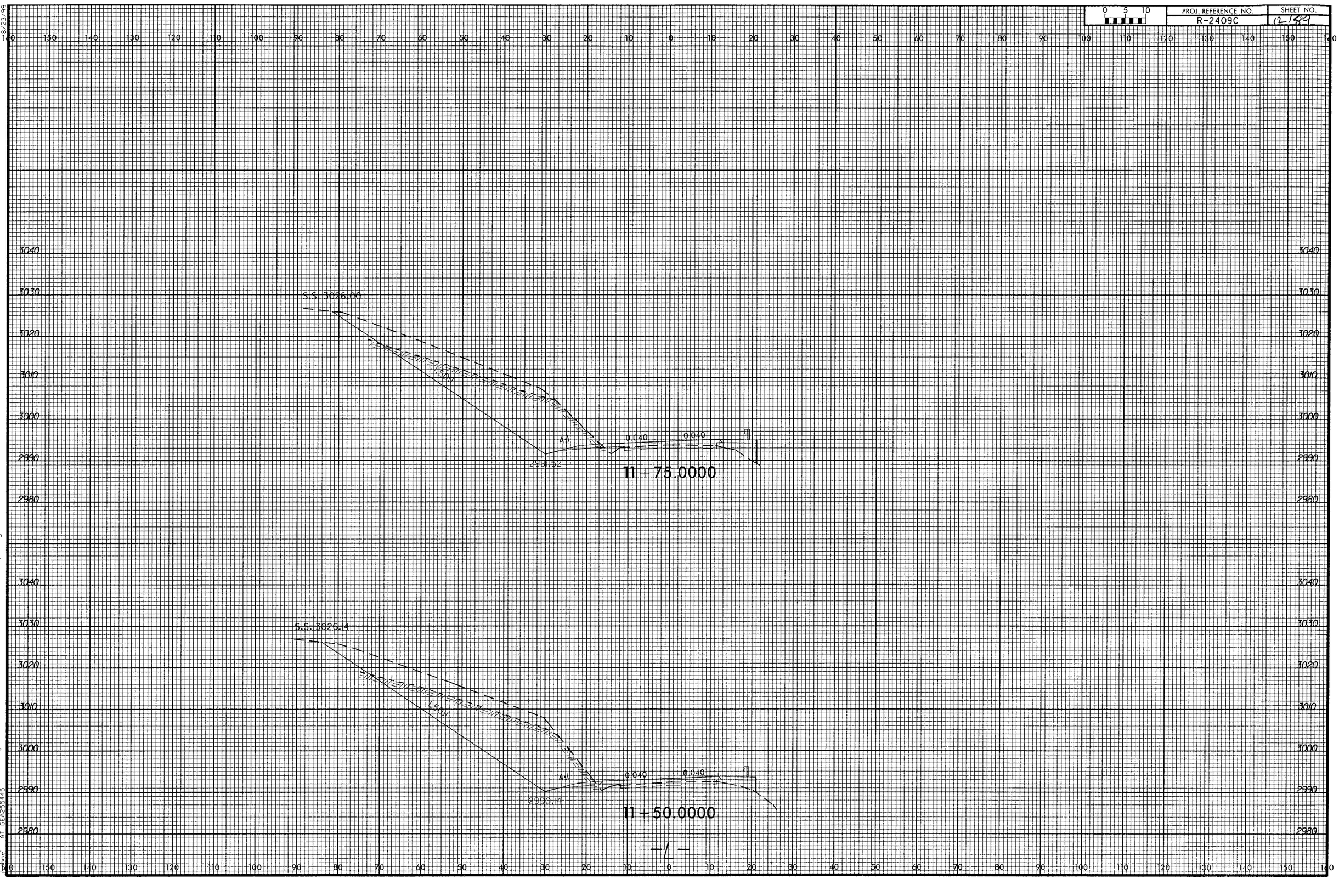

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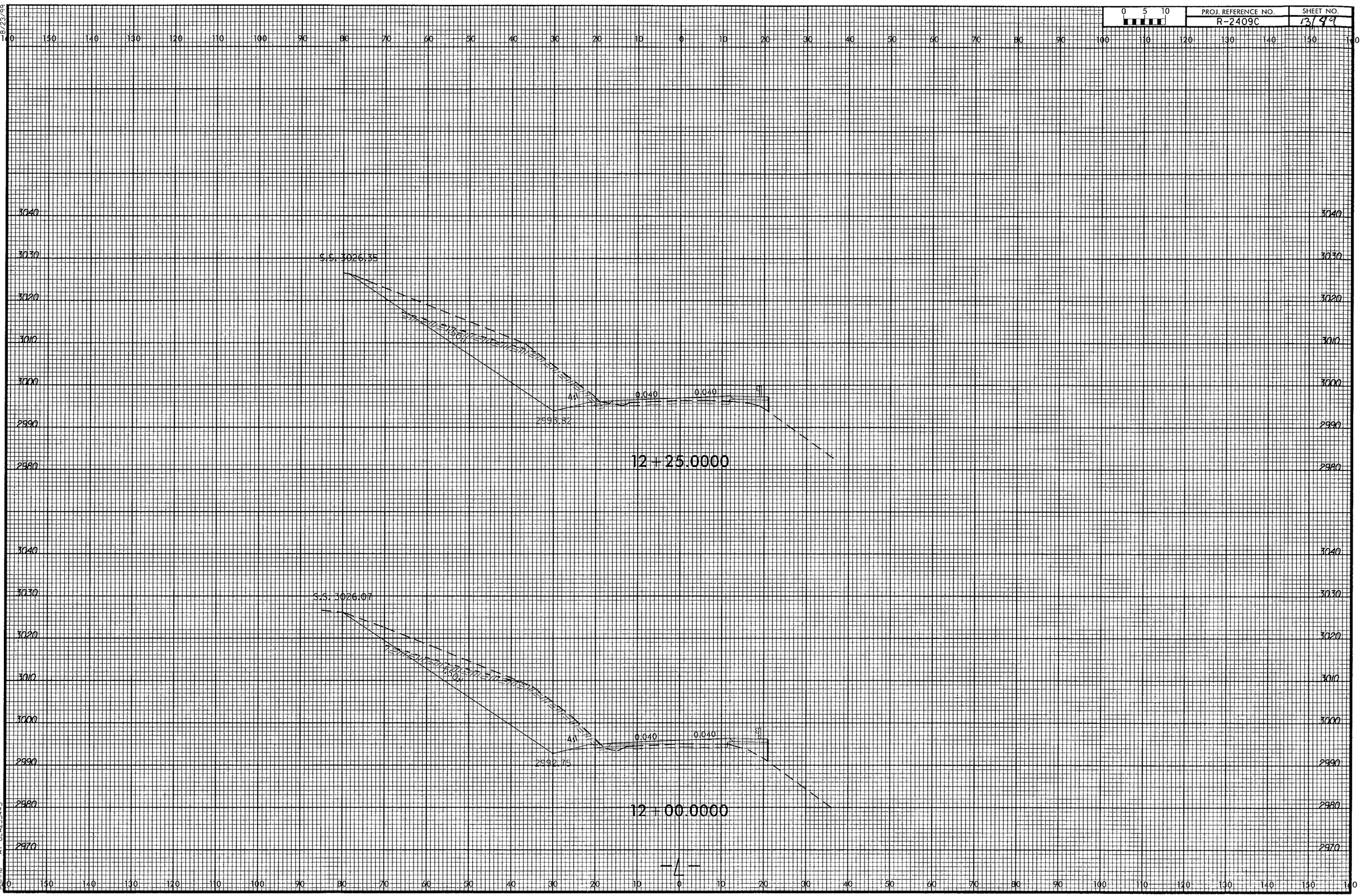
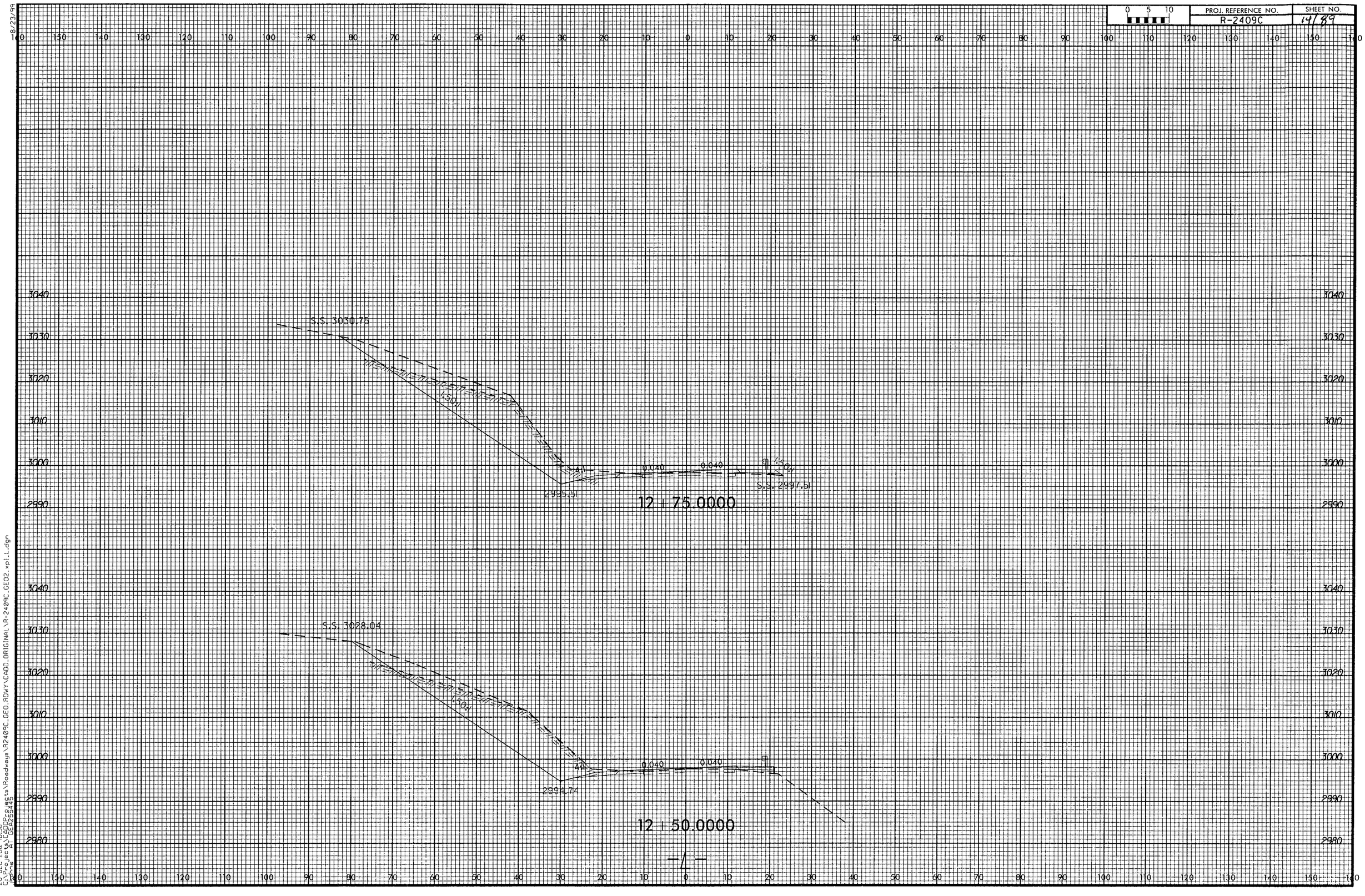
0.040
0.040
2991.52
11 + 75.0000
S.S. 3026.14
1.50:1
4:1
0.040
0.040
2990.14
11 + 50.0000
-L-

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-2409C	13





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0.040
1.50:1
S.S. 2997.51
2995.51
12 + 75.0000
S.S. 3028.04
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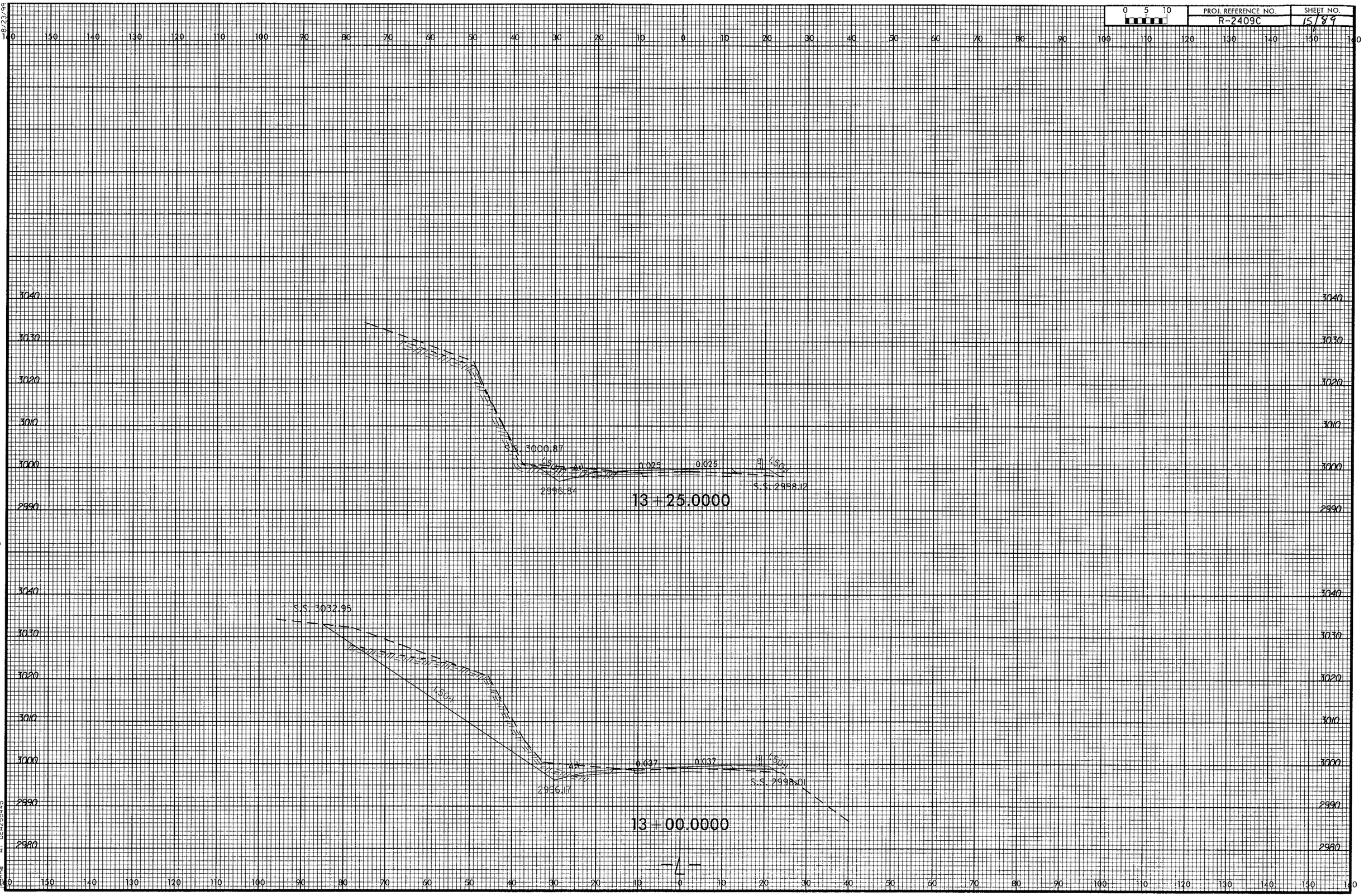
0.040
2994.74
12 + 50.0000
-L-



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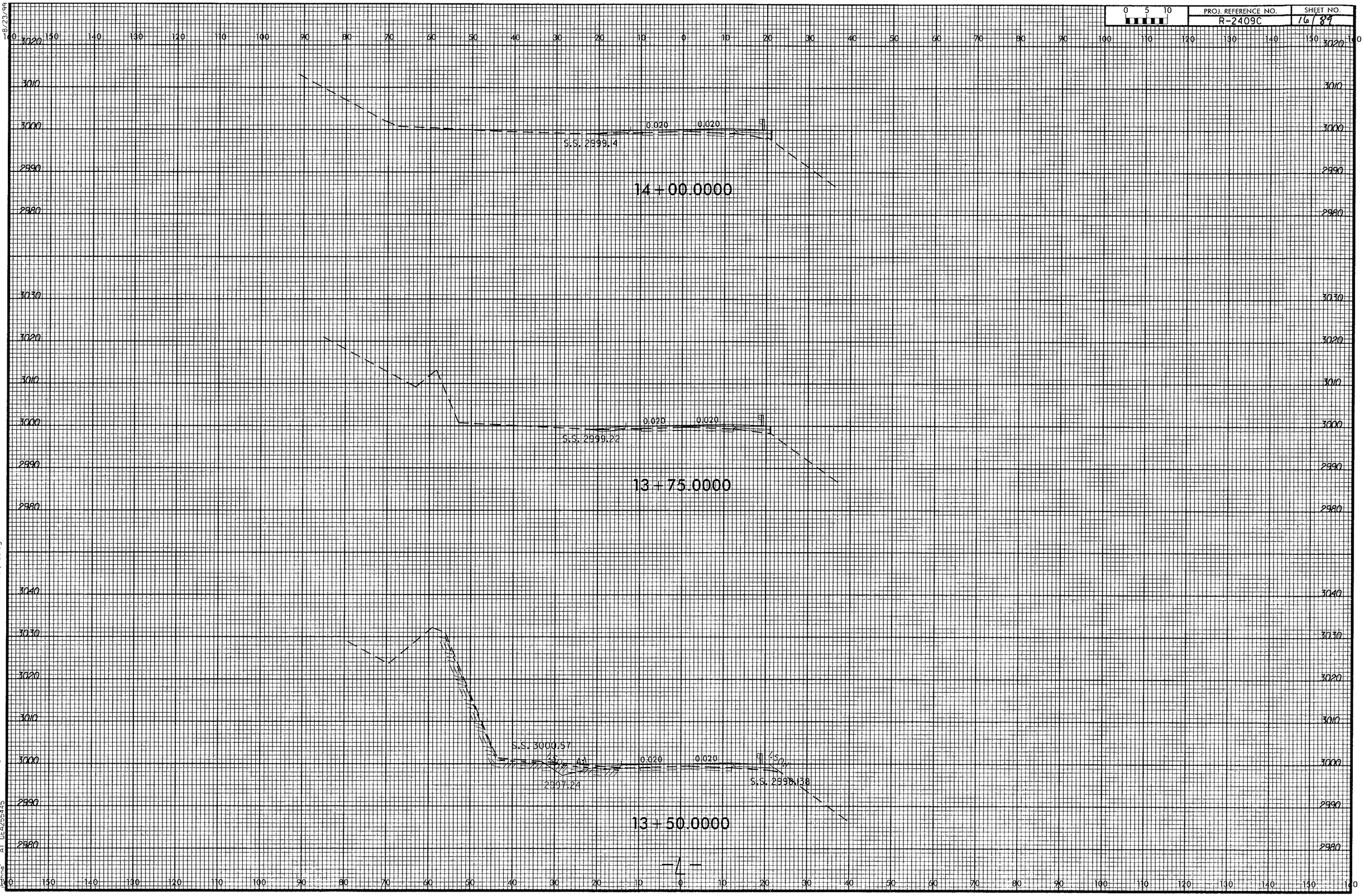

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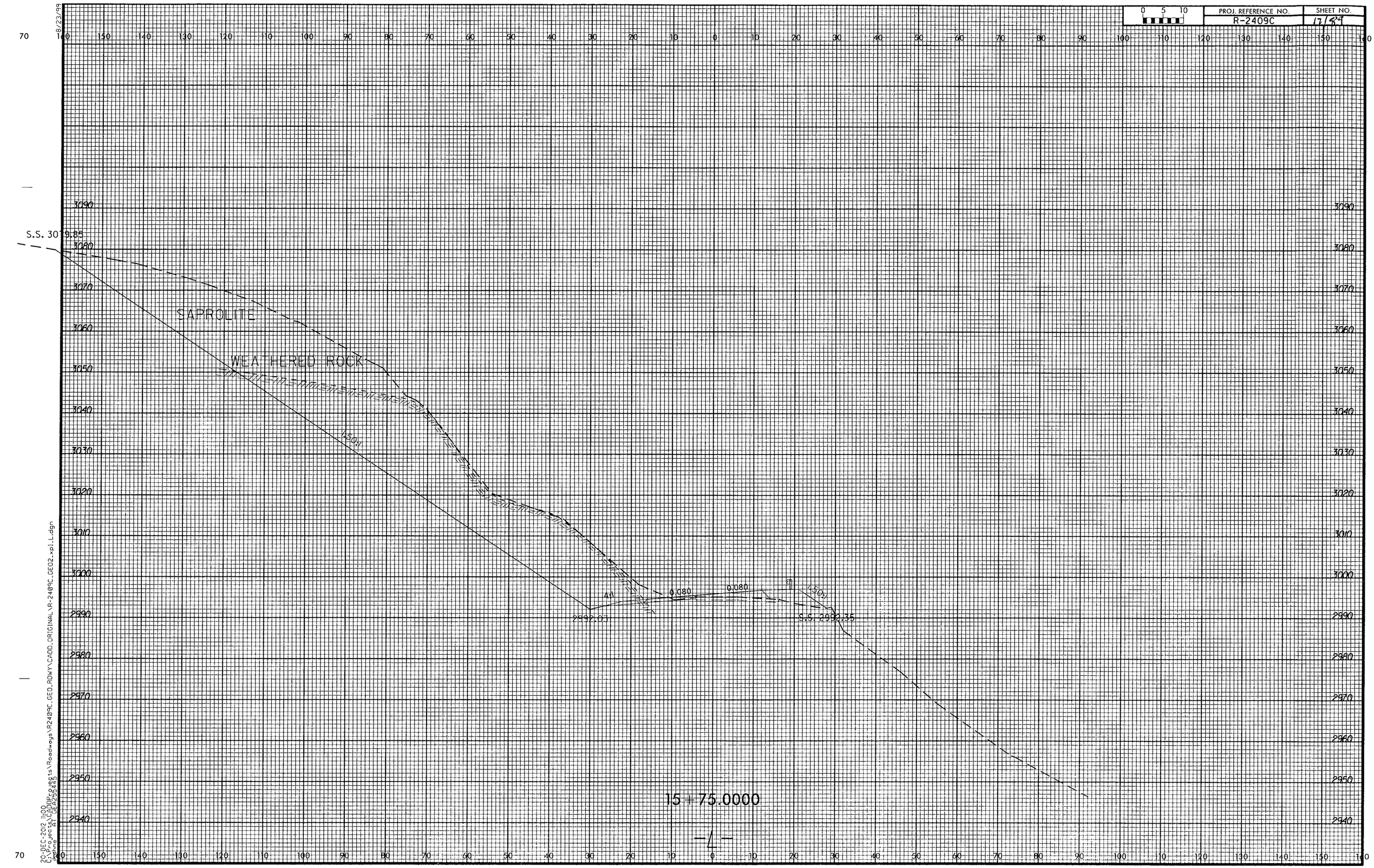

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R-2409C
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WEATHERED ROCK
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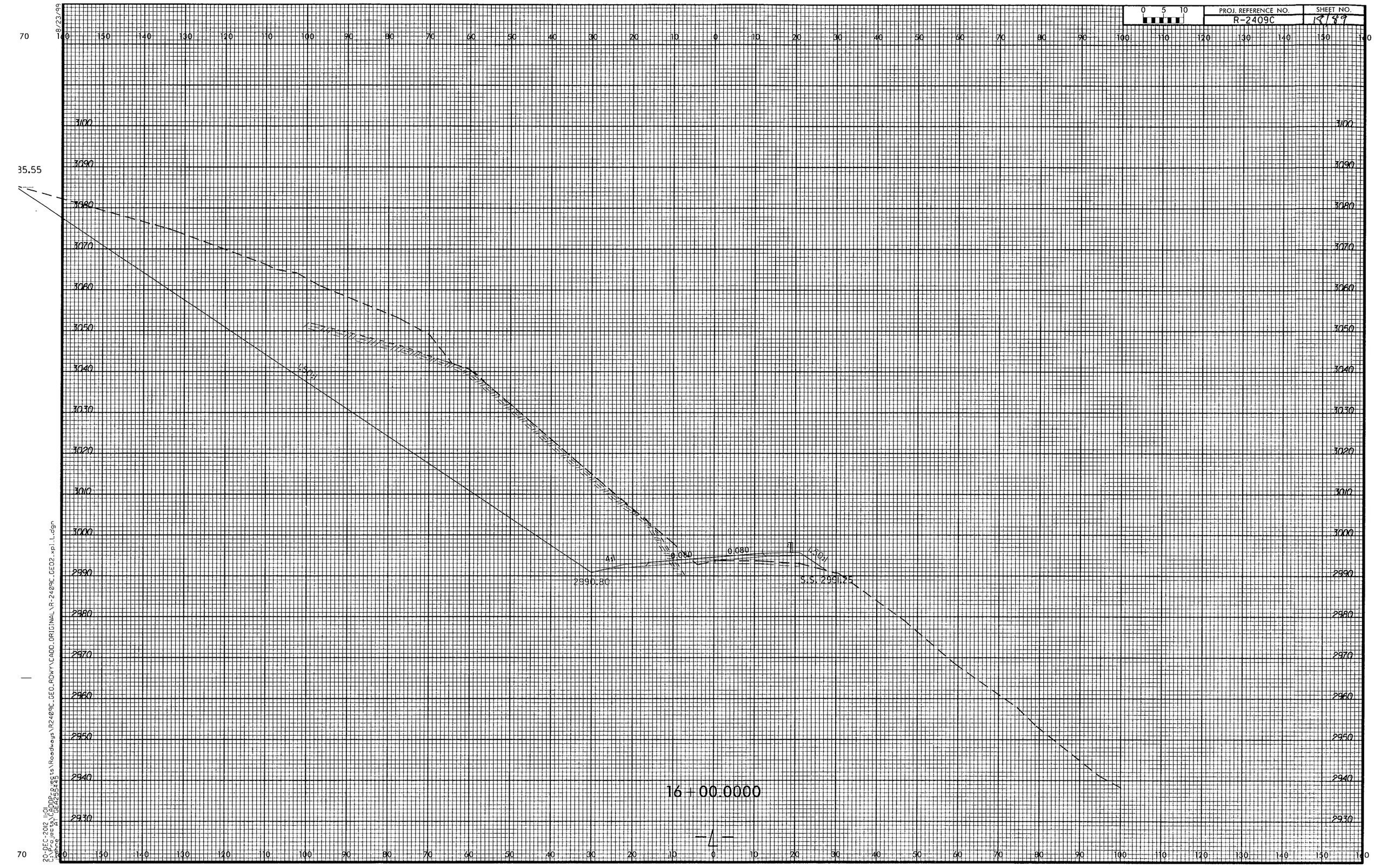
15+75.0000
-L-



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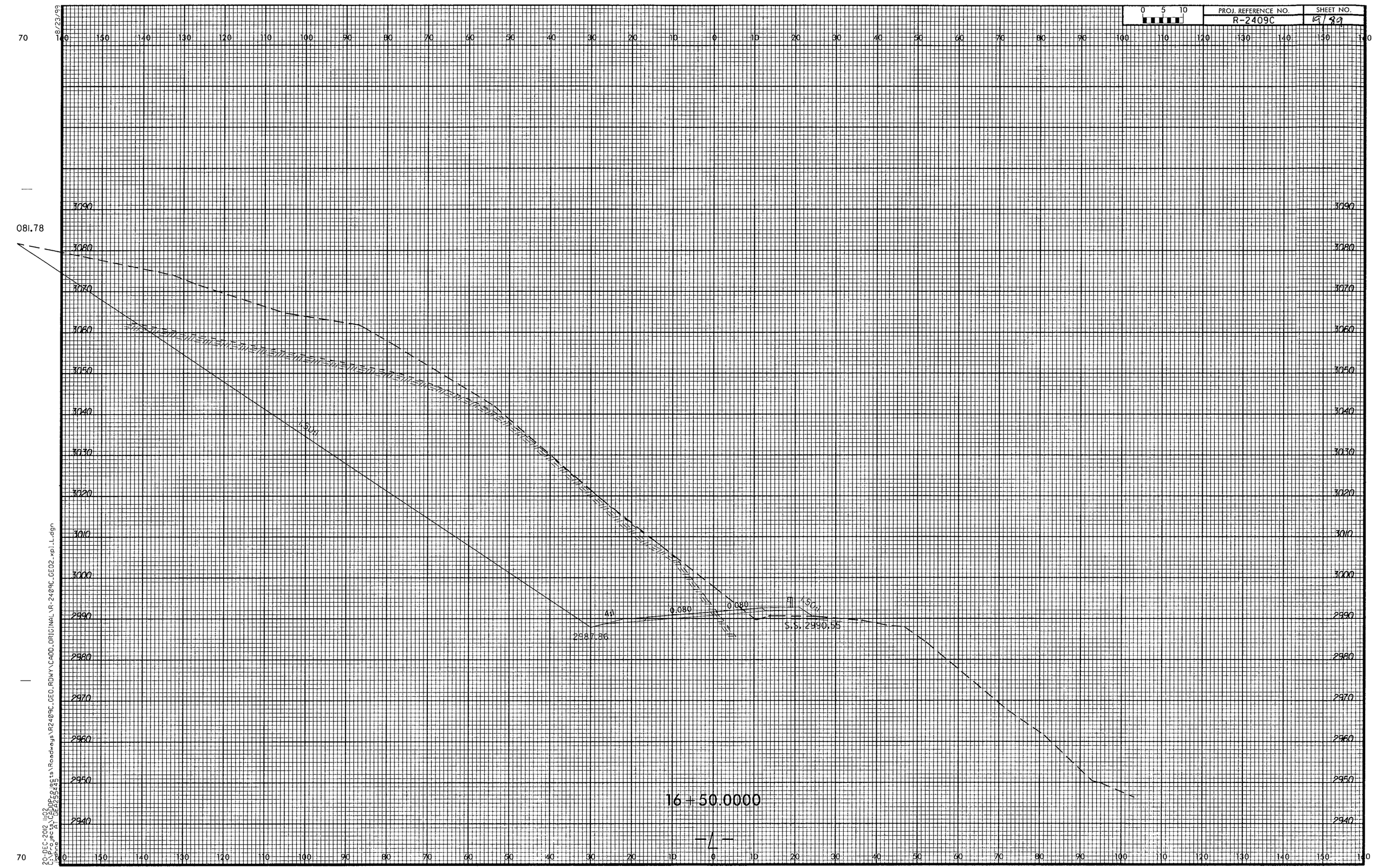
Phone AT GEA255445



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
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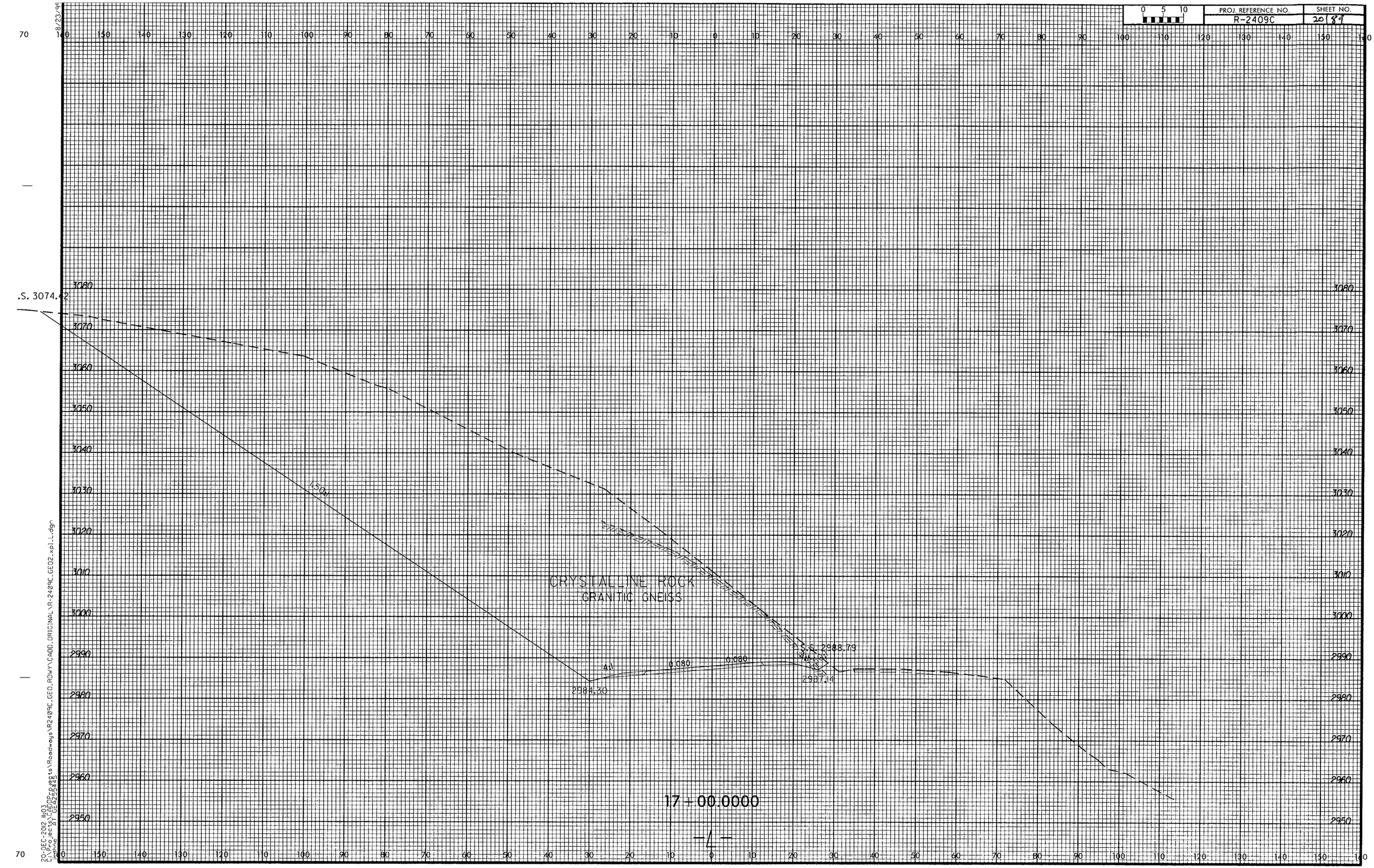
S.S. 2990.55
16+50.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
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1.50:1
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2988.79
4:1
0.080
0.080
2984.30
2987.14
17 + 00.0000
-L-
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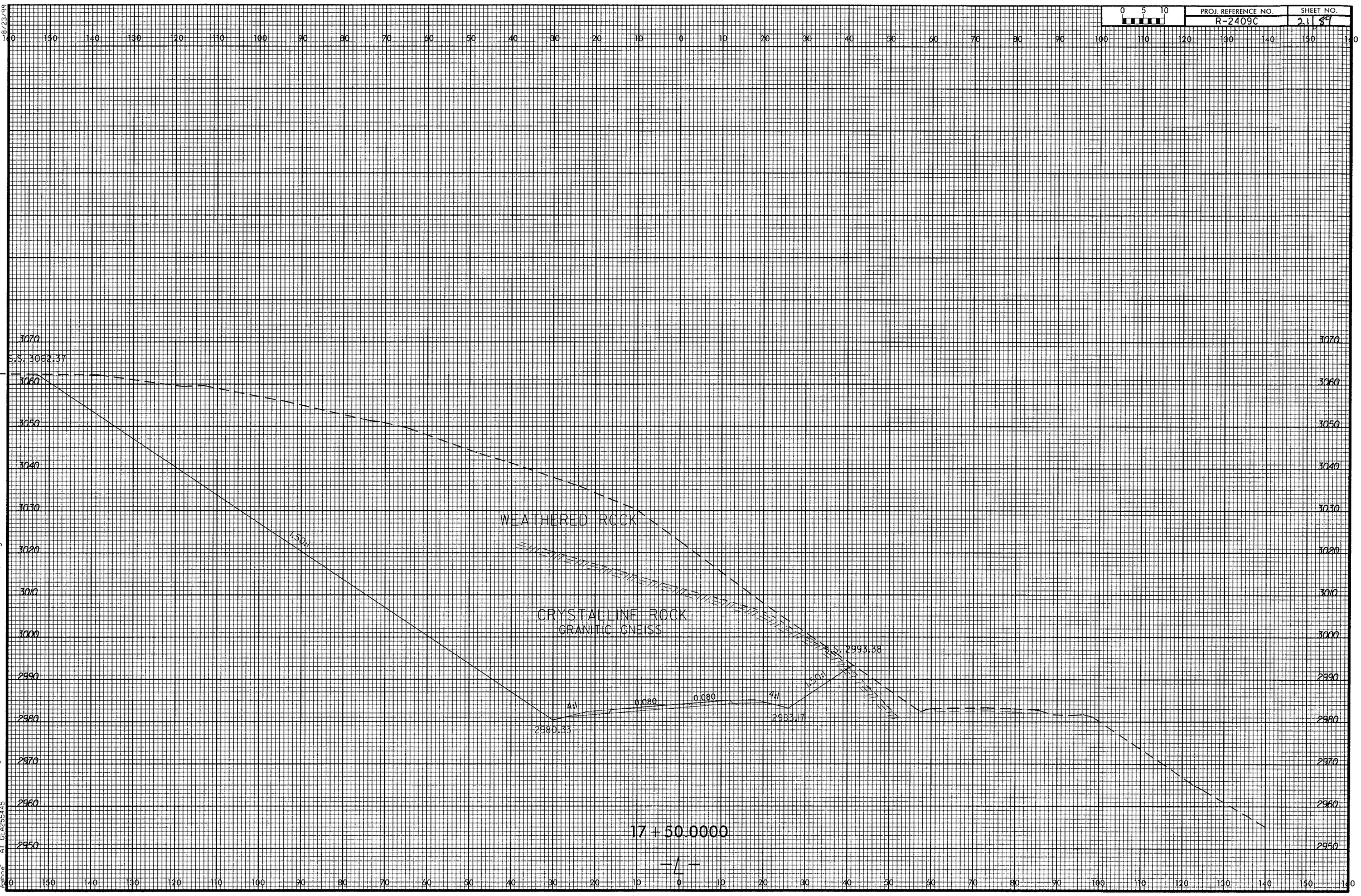
3070
3060
3050
3040
3030
3020
3010
3000
2990
2980
2970
2960
2950



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
21 of 89
0 5 10
S.S. 3062.37
WEATHERED ROCK
CRYSTALLINE ROCK
GRANITIC GNEISS
1.50:1
4:1
0.080
0.080
4:1
1.50:1
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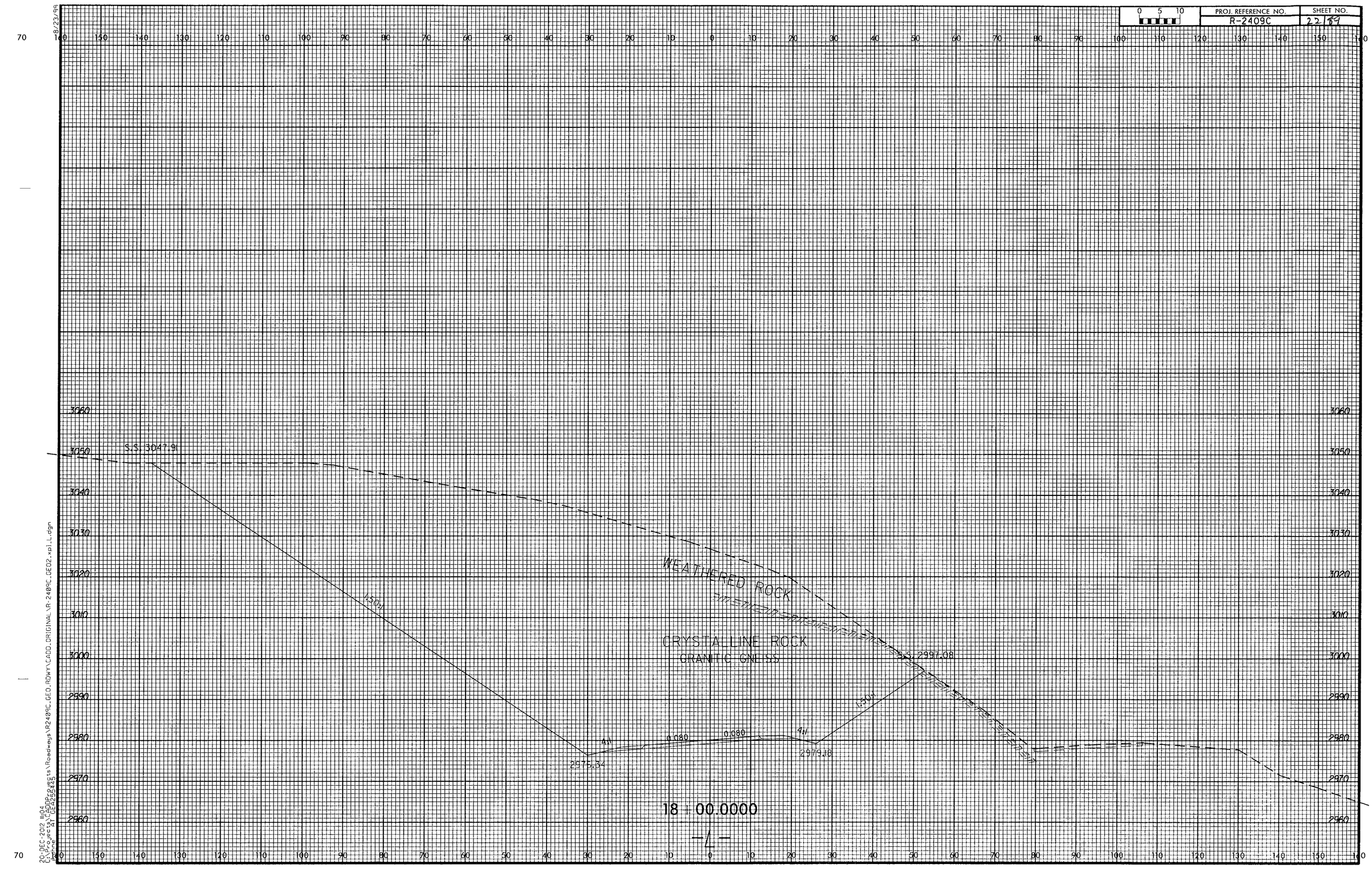
2980.33
2983.17
17 + 50.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
22/89
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CRYSTALLINE ROCK
GRANITIC GNEISS
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4:1
0.080
0.080
4:1
1.50:1
2975.34
2979.18
18 + 00.0000
-L-
3060
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3040
3030
3020
3010
3000
2990
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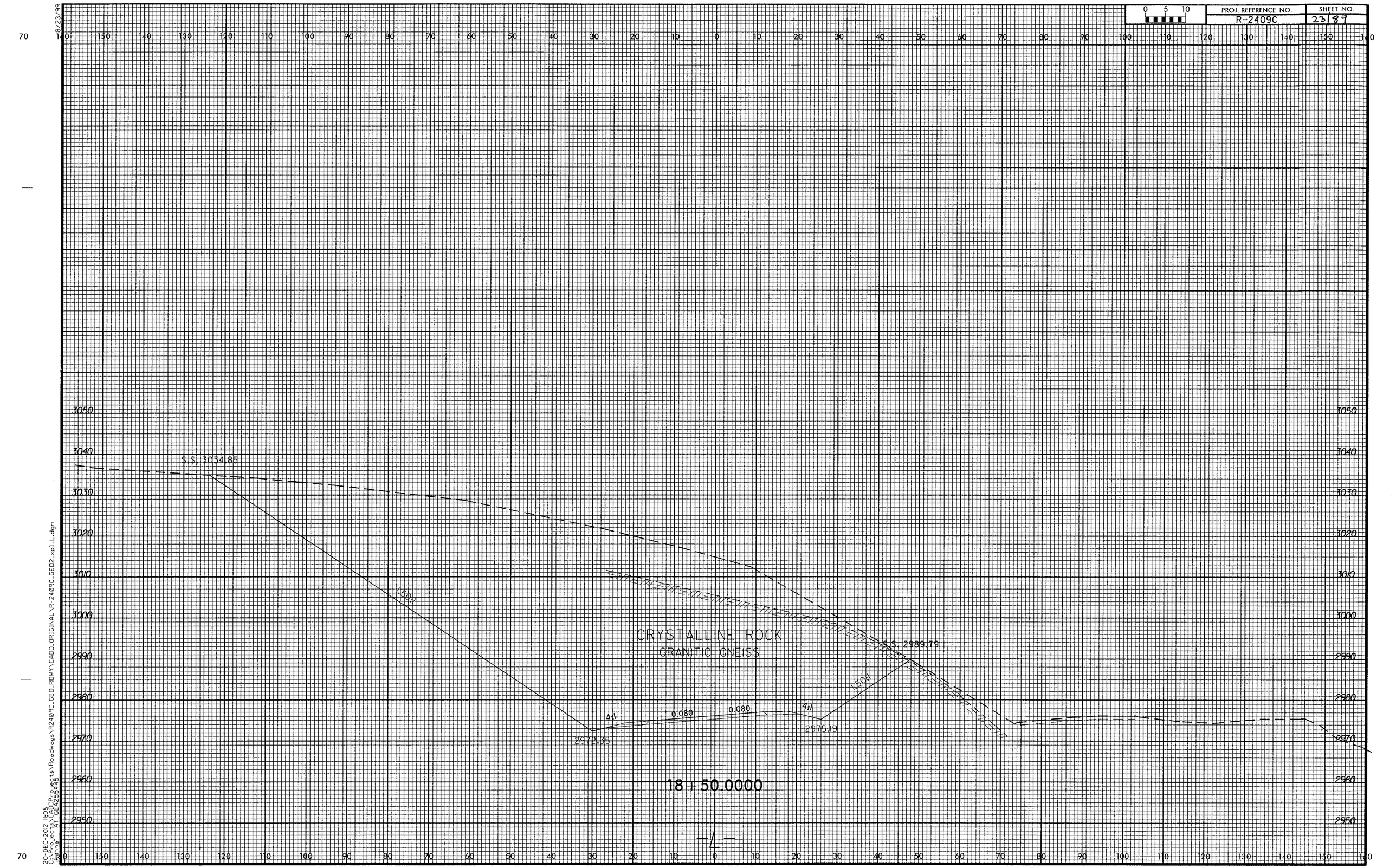
2970
2960



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
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4:1
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0.080
4:1
2972.35
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-L-
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3020
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3000
2990
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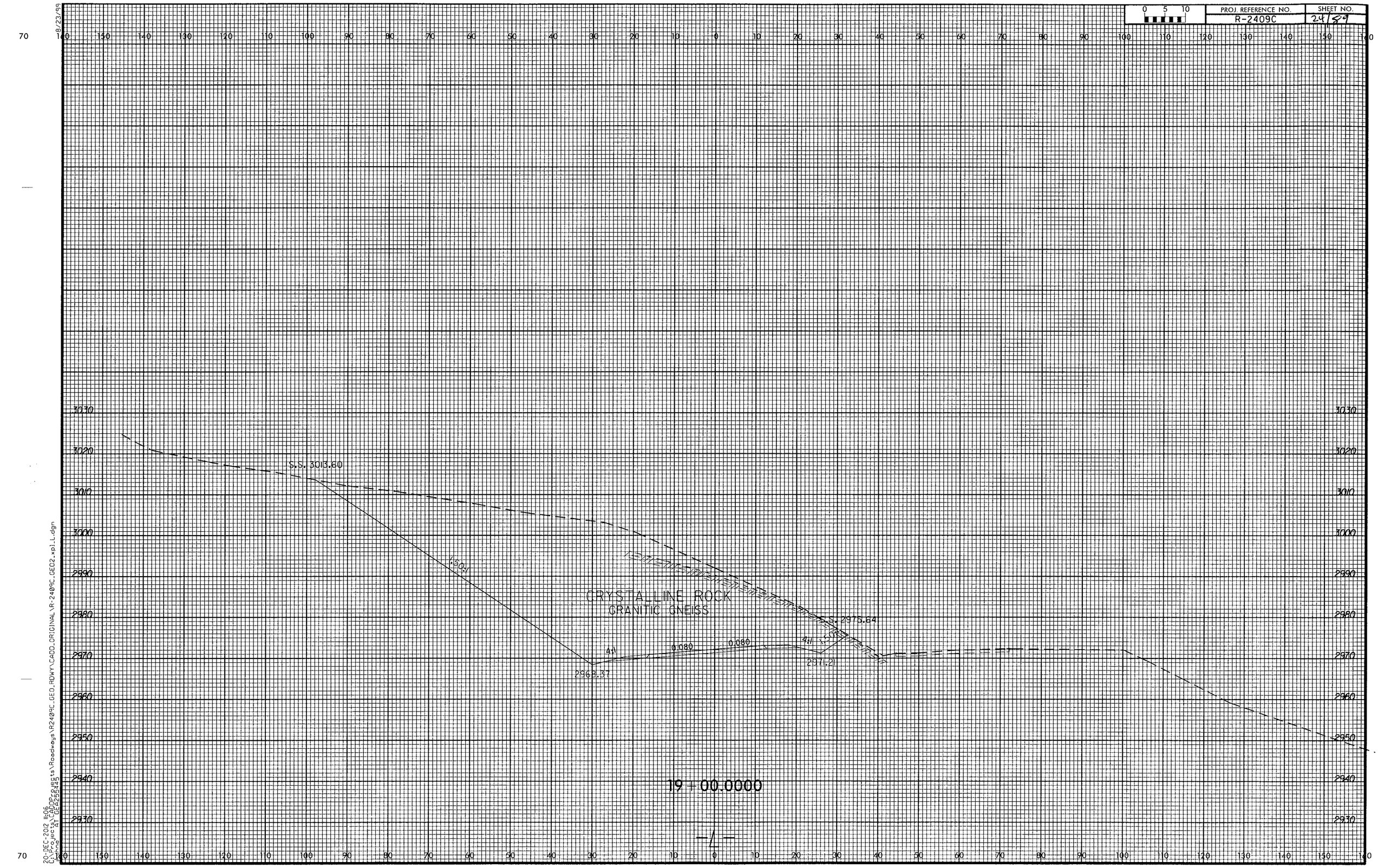
2970
2960
2950



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
24/89
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GRANITIC GNEISS
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0.080
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-L-
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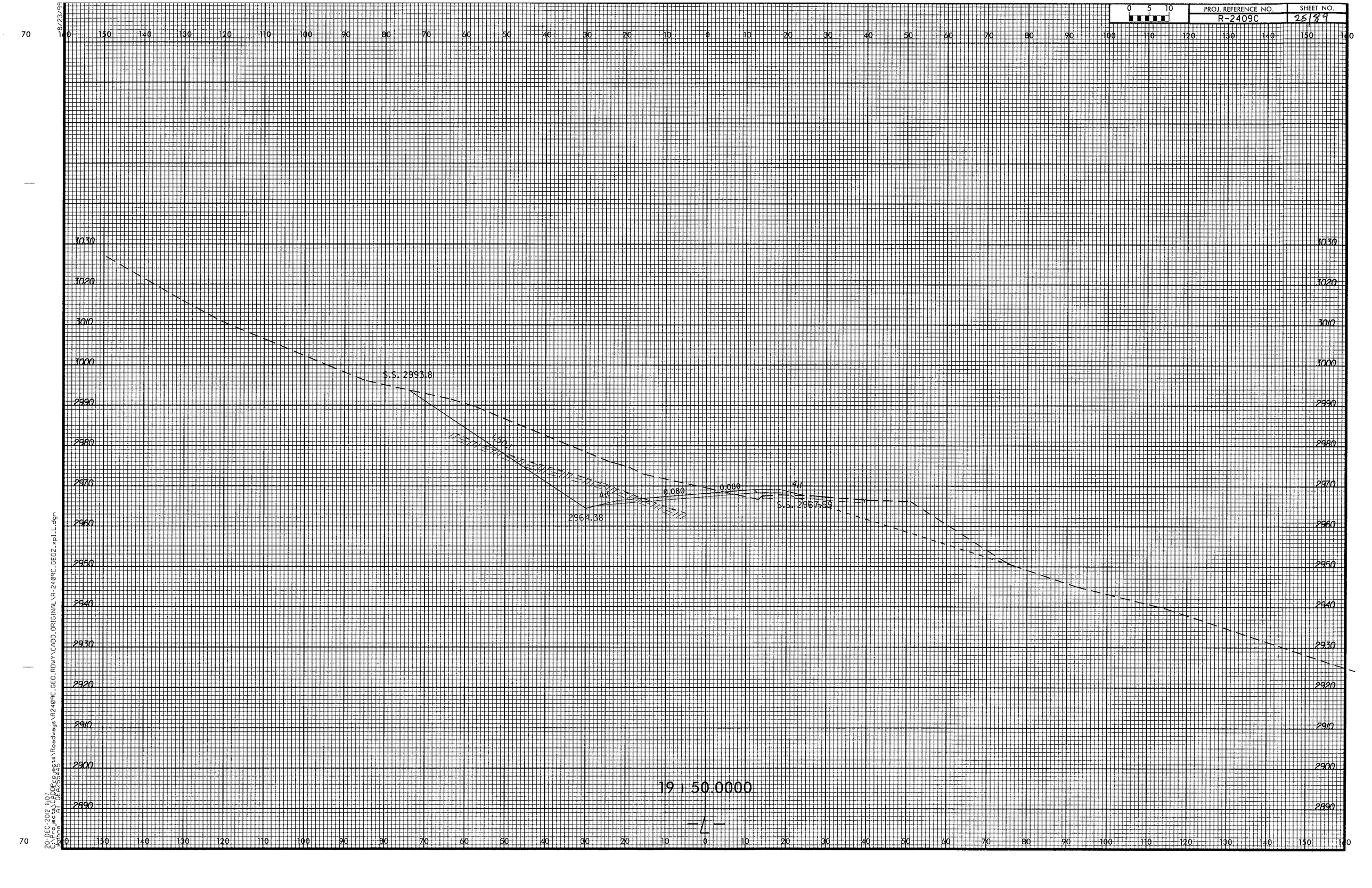

PROJ. REFERENCE NO.
R-2409C
SHEET NO.
25/89
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S.S. 2993.8
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4:1
0.080
0.080
4:1
S.S. 2967.59
2964.38
19 + 50.0000
-L-
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3000
2990
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2970
2960
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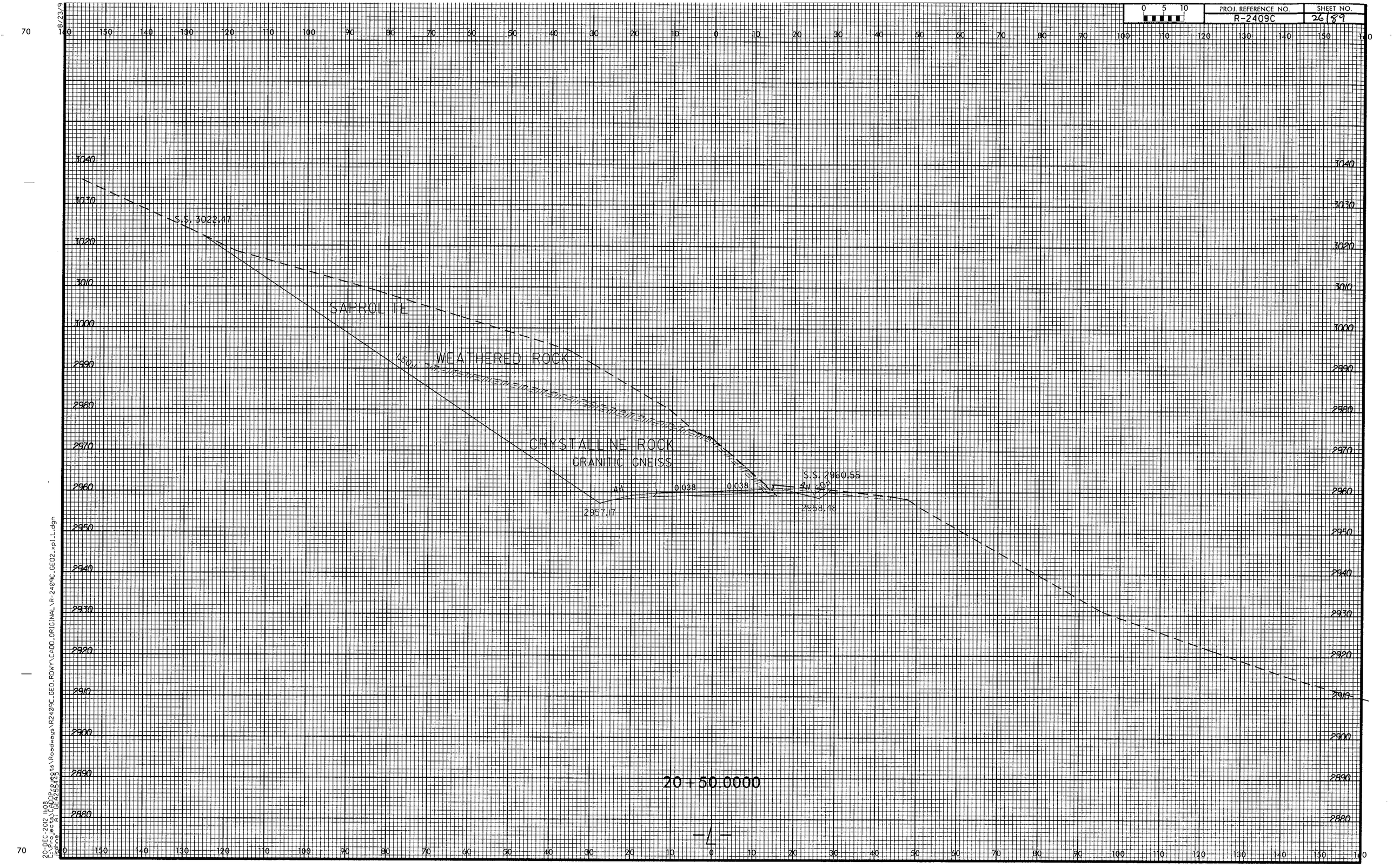
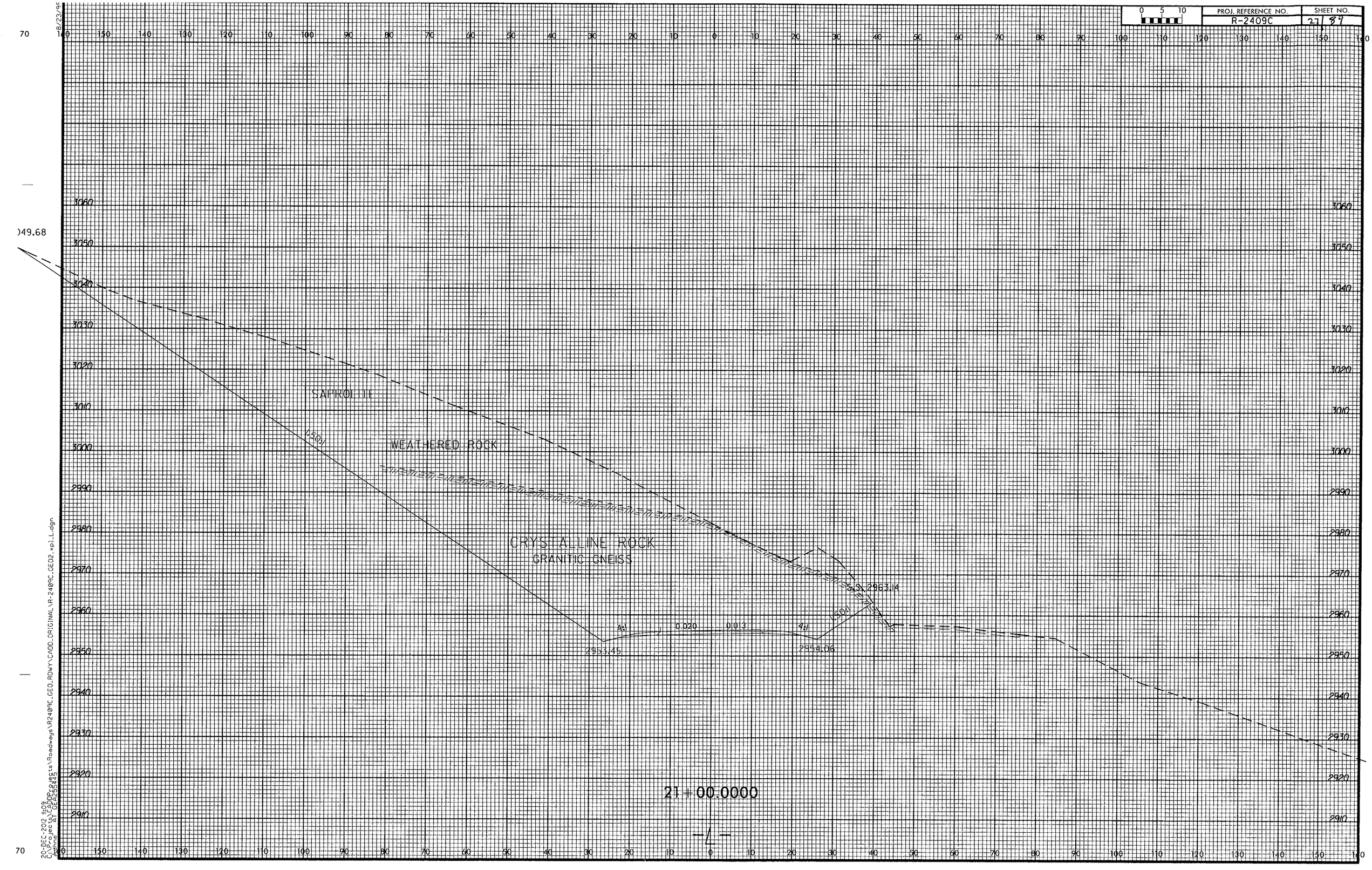
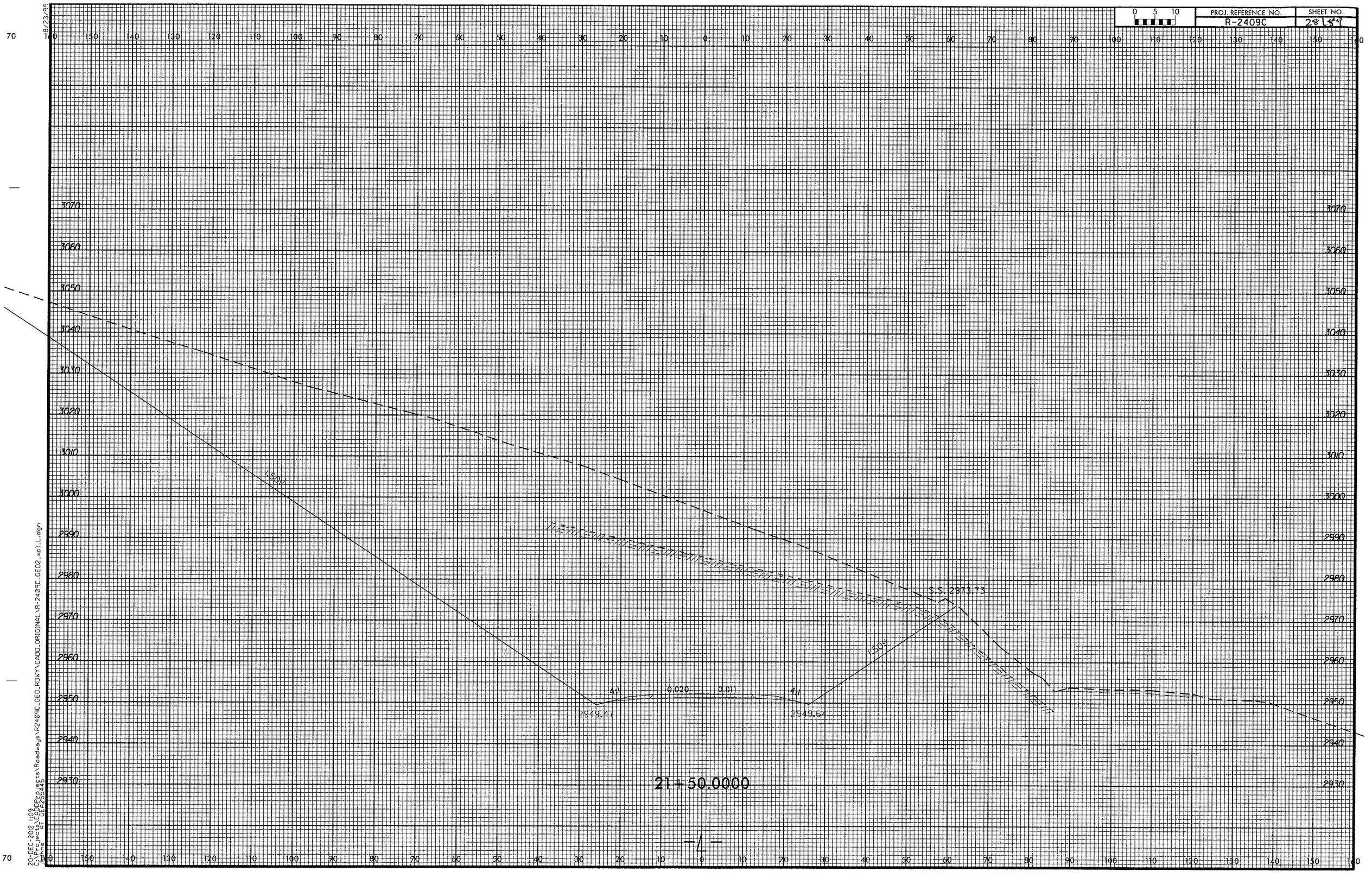
2900
2890



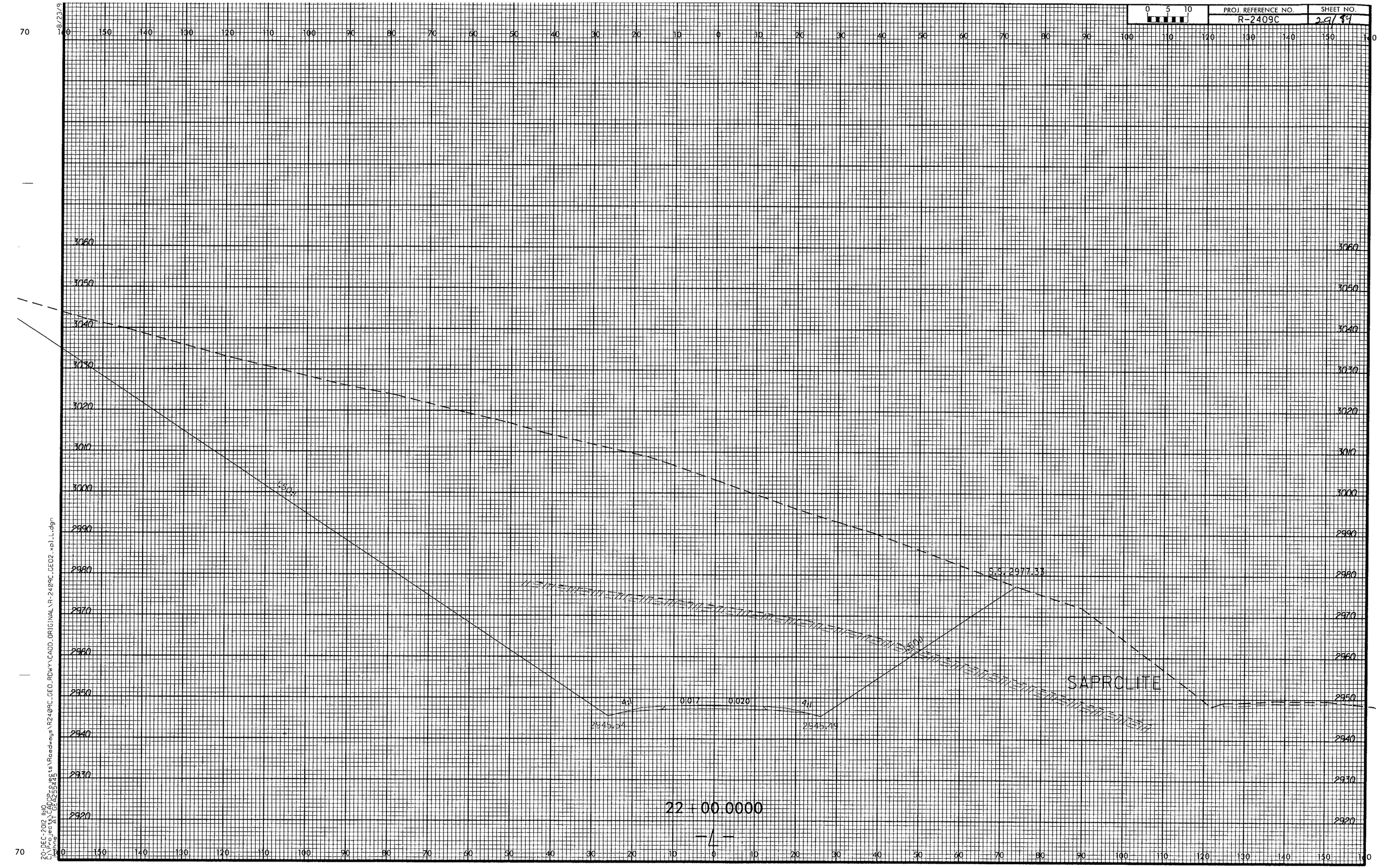
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
26/89
S.S. 3022.47
SAPROLITE
WEATHERED ROCK
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2960.55
2957.17
2958.48
0.038
0.038
20+50.0000
-L-



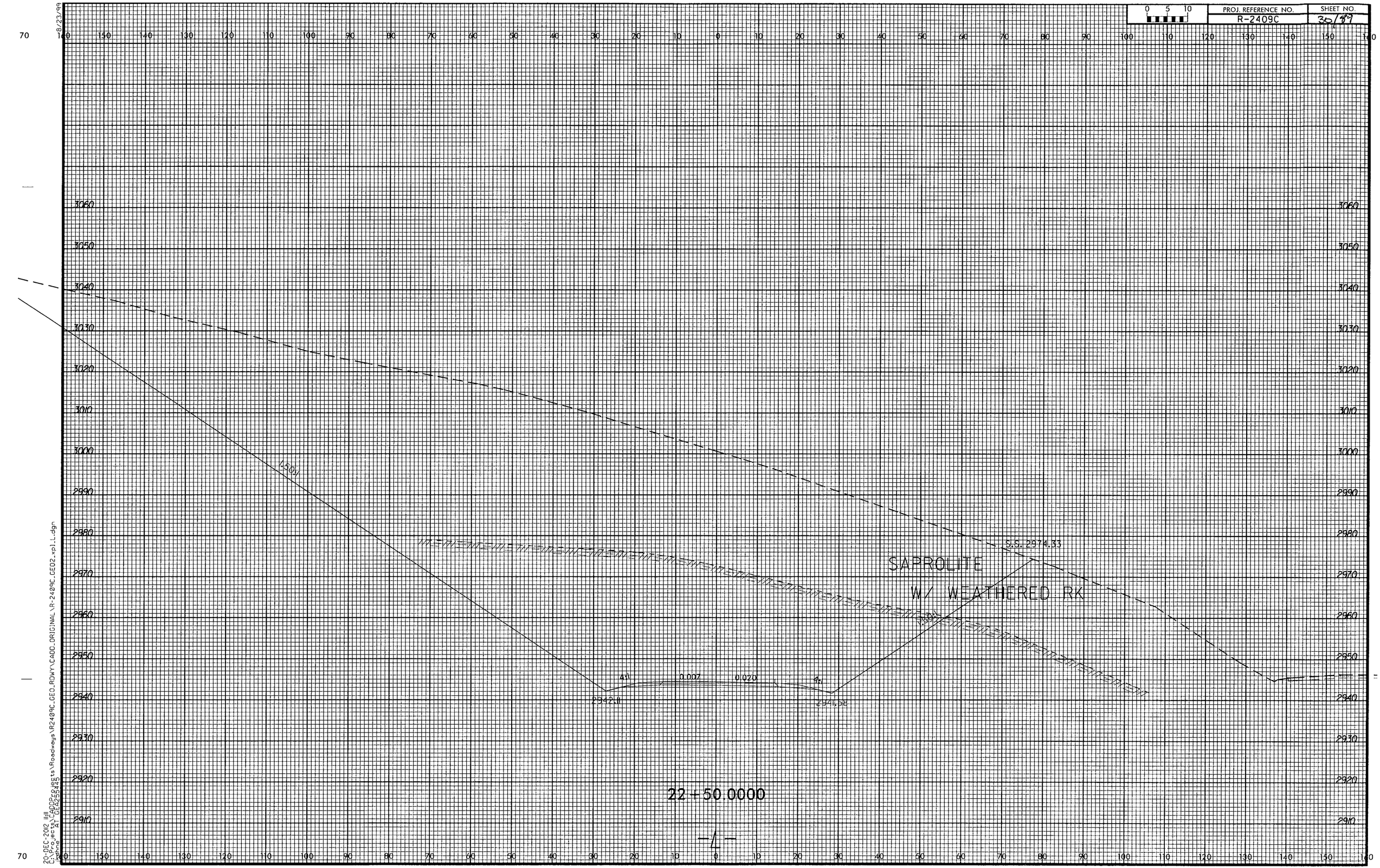
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
27/87
0 5 10
SAPROLITE
WEATHERED ROCK
CRYSTALLINE ROCK
GRANITIC GNEISS
1.50:1
4:1
0.020
0.013
2953.45
2954.06
2963.14
21+00.0000
-L-
3060
3050
3040
3030
3020
3010
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910



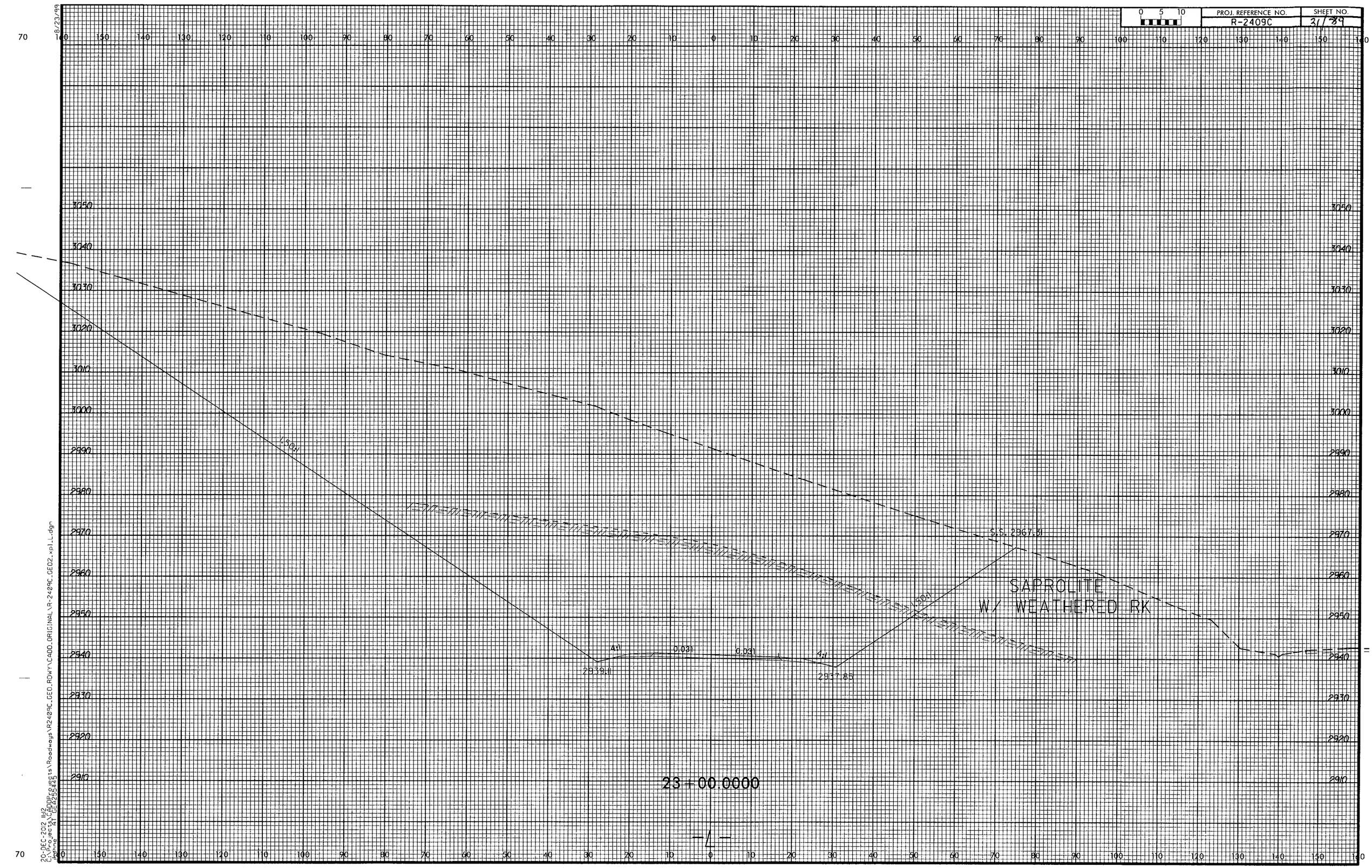
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
28 of 29
0 5 10
1.50:1
S.S. 2973.73
4:1
0.020
0.011
4:1
2949.47
2949.64
21+50.0000
-L-



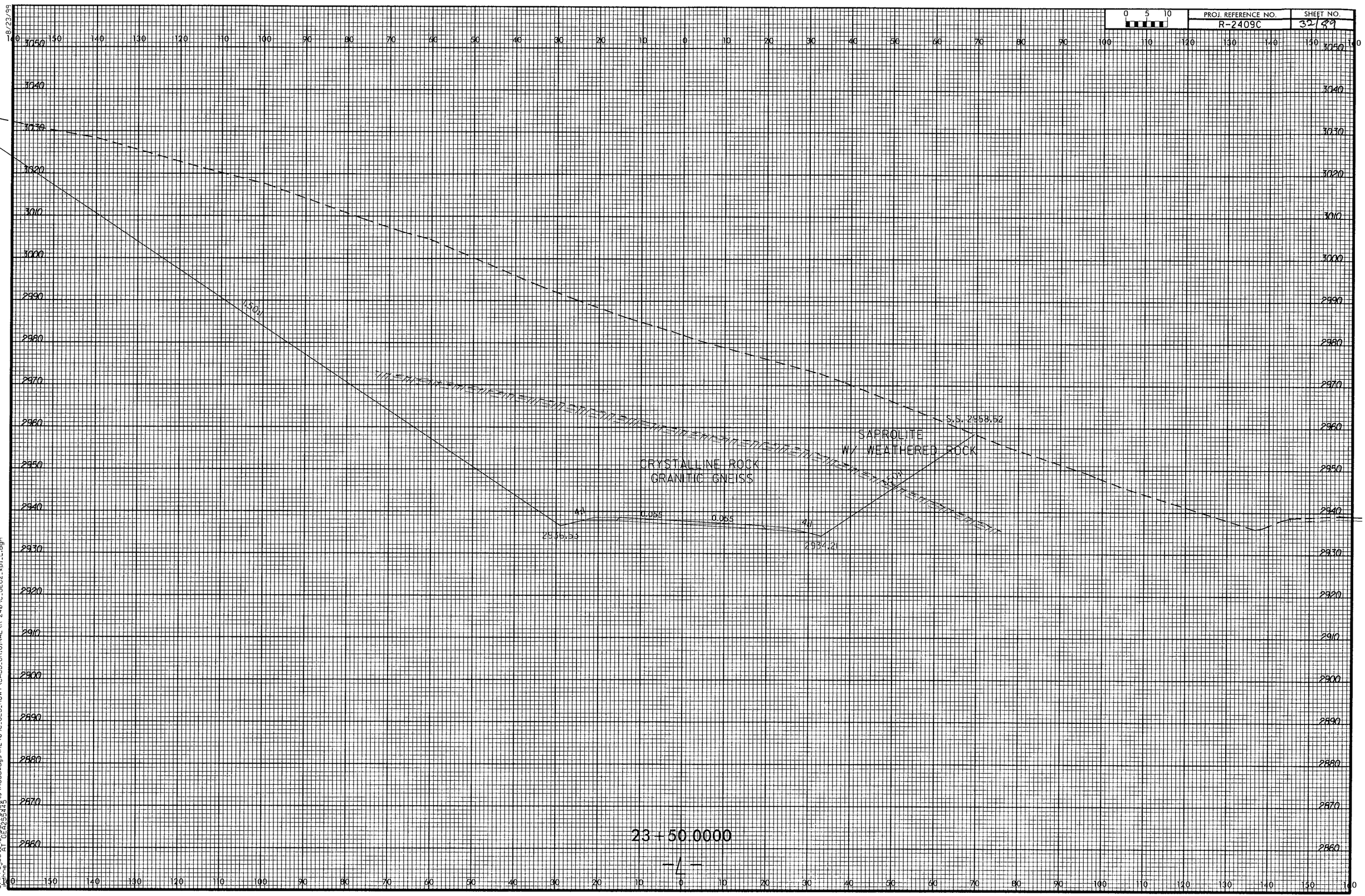
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
29/89
0 5 10
3060
3050
3040
3030
3020
3010
3000
2990
2980
2970
2960
2950
2940
2930
2920
1.50:1
S.S. 2977.33
SAPROLITE
4:1
0.017
0.020
4:1
2945.54
2945.49
22 + 00.0000
-L-



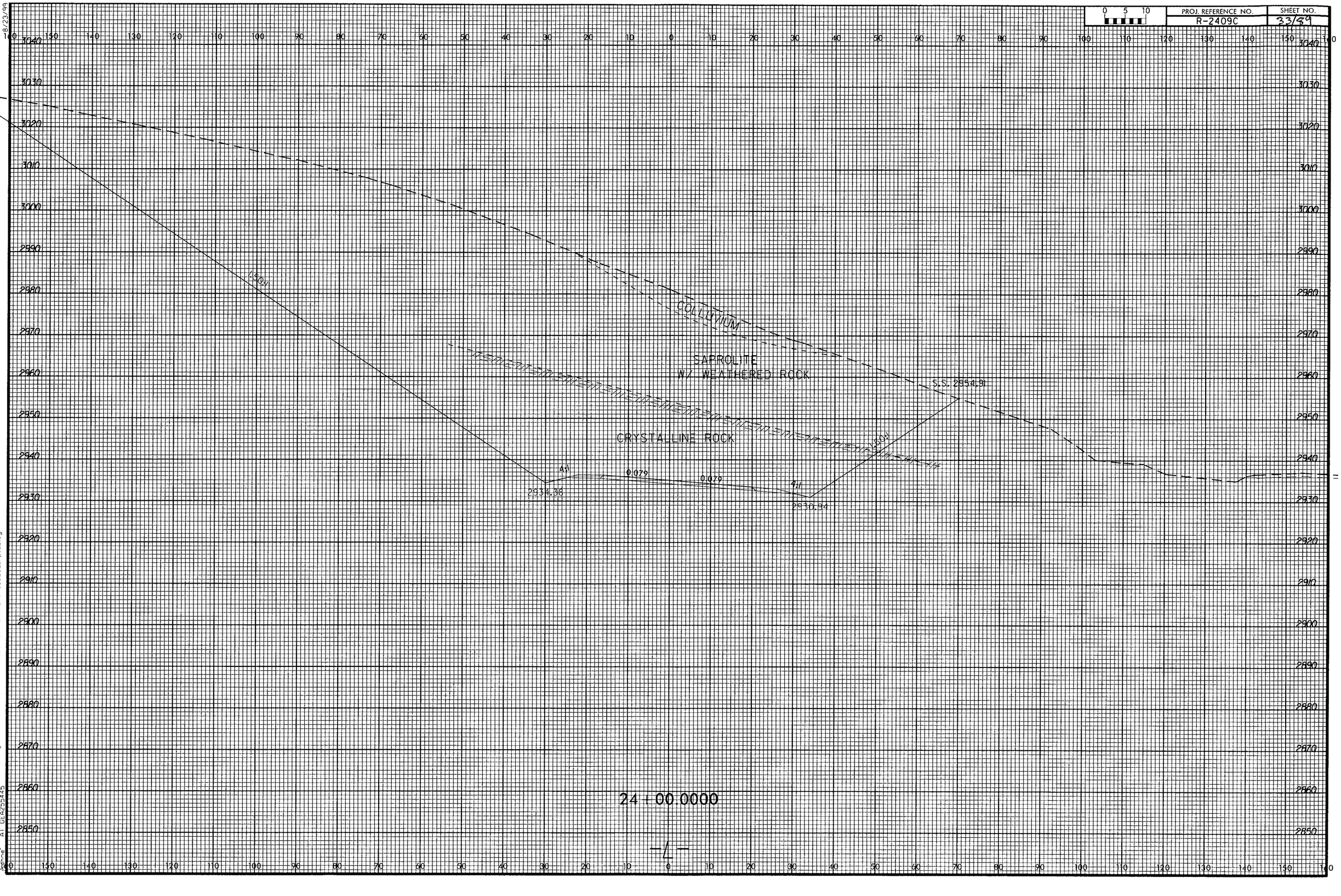
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
30/89
0 5 10
SAPROLITE
W/ WEATHERED RK
S.S. 2974.33
1.50:1
4:1
0.007
0.020
4:1
2942.11
2941.58
22+50.0000
-L-
3060
3050
3040
3030
3020
3010
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910



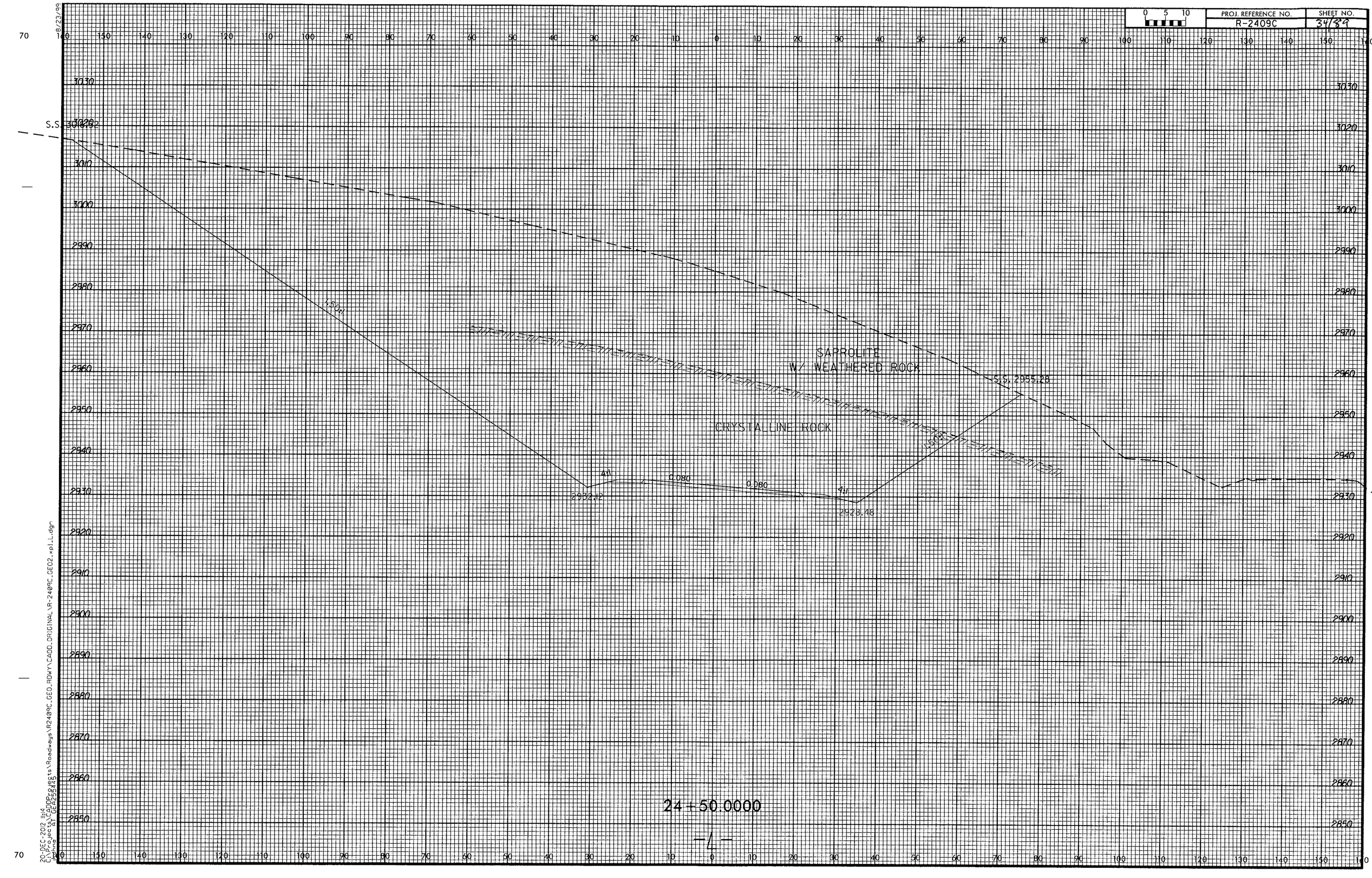
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
31/89
0 5 10
3050
3040
3030
3020
3010
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
1.50:1
S.S. 2967.31
SAPROLITE
W/ WEATHERED RK
4:1
0.031
0.031
4:1
2939.11
2937.85
23+00.0000
-L-



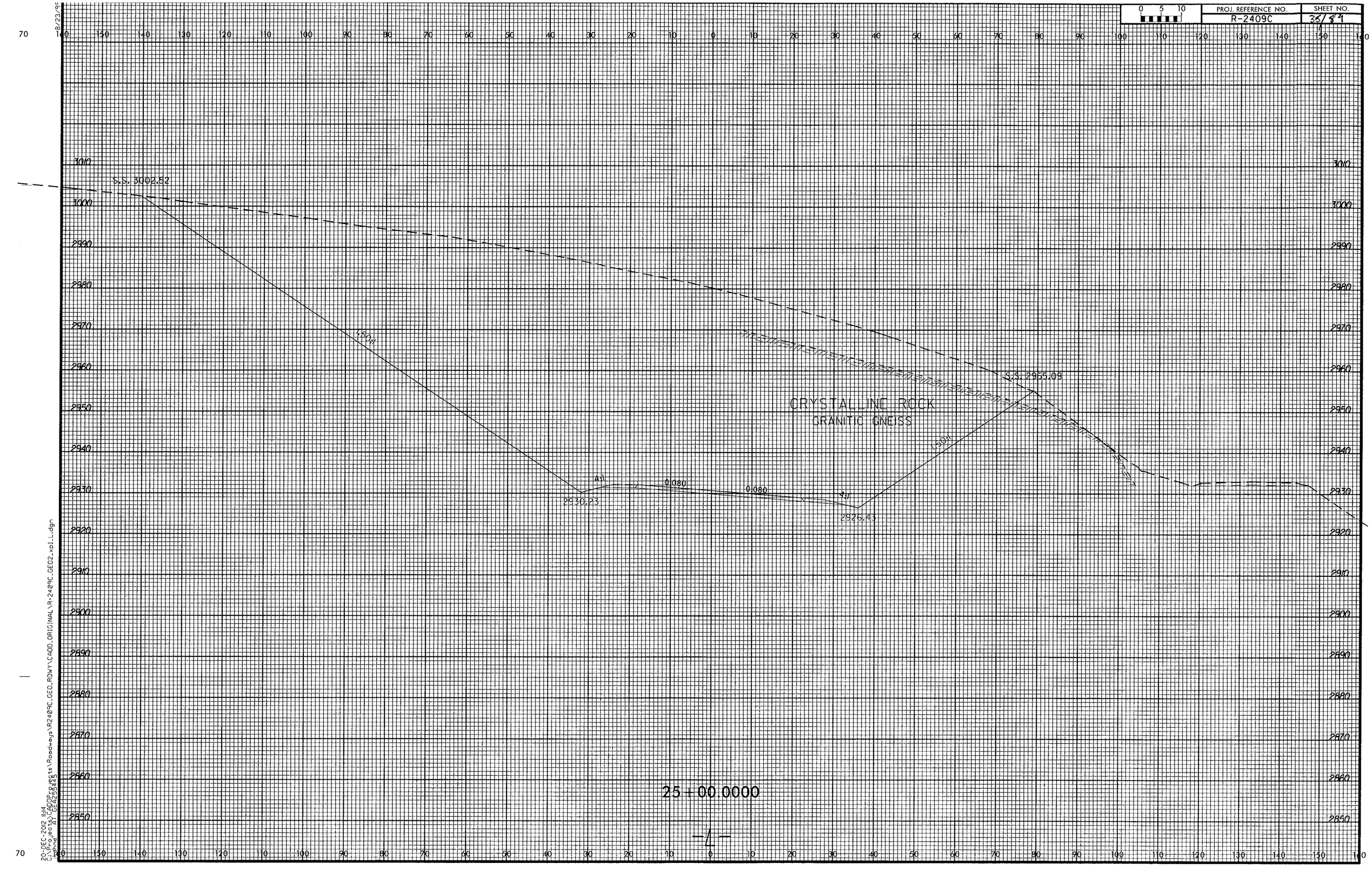
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
32/89
0 5 10
SAPROLITE
W/ WEATHERED ROCK
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2958.52
2936.53
2934.21
4:1
0.055
0.055
4:1
23+50.0000
-L-



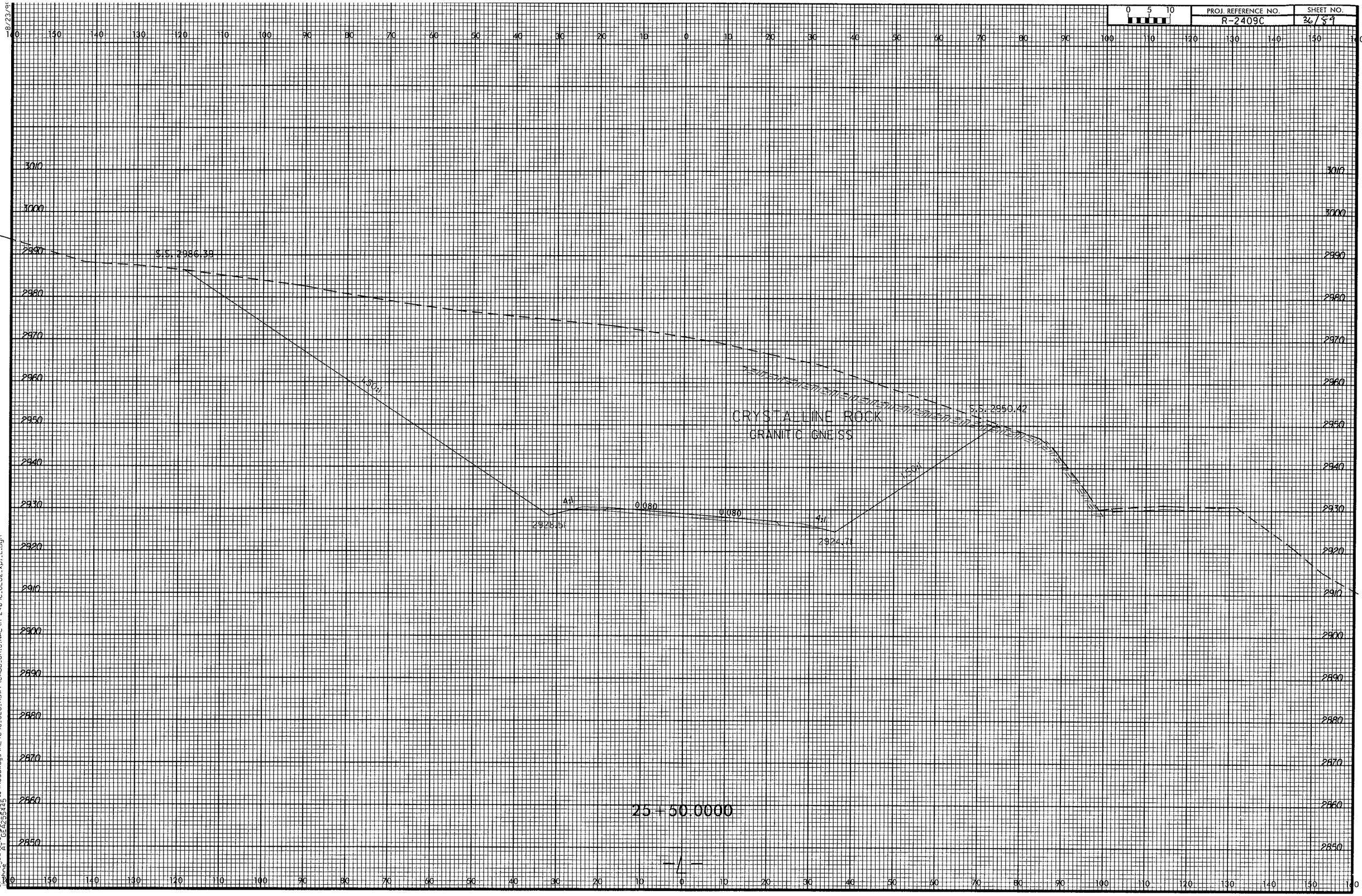
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
33/89
0 5 10
28.92
COLLUVIUM
SAPROLITE
W/ WEATHERED ROCK
CRYSTALLINE ROCK
S.S. 2954.91
2934.38
2930.94
4:1
0.079
0.079
4:1
1.50:1
1.50:1
24+00.0000
-L-



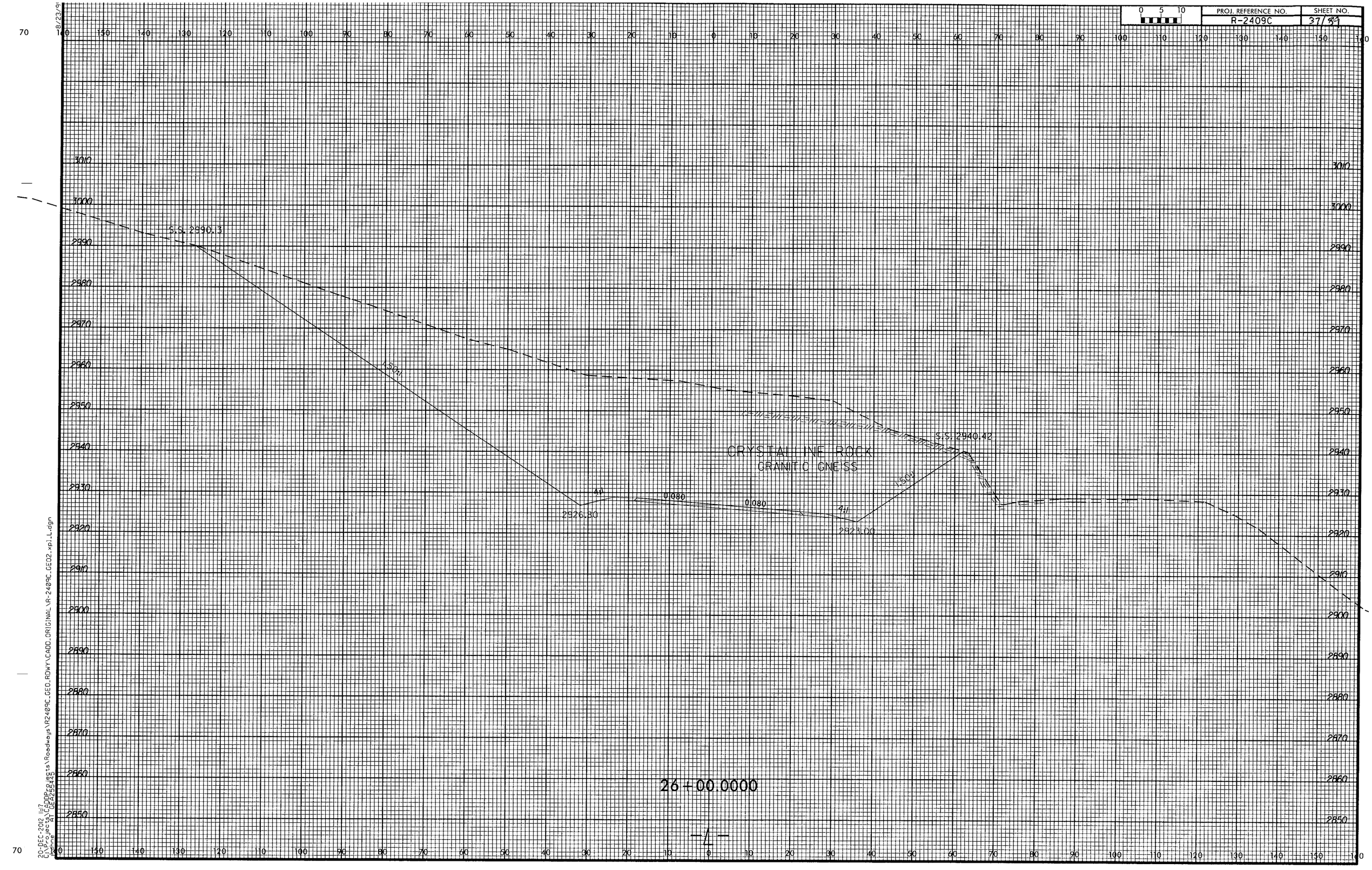
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
34/89
0 5 10
SAPROLITE
W/ WEATHERED ROCK
CRYSTALLINE ROCK
S.S. 2955.28
2932.12
2928.48
4:1
0.080
0.080
4:1
1.50:1
1.50:1
24+50.0000
-L-



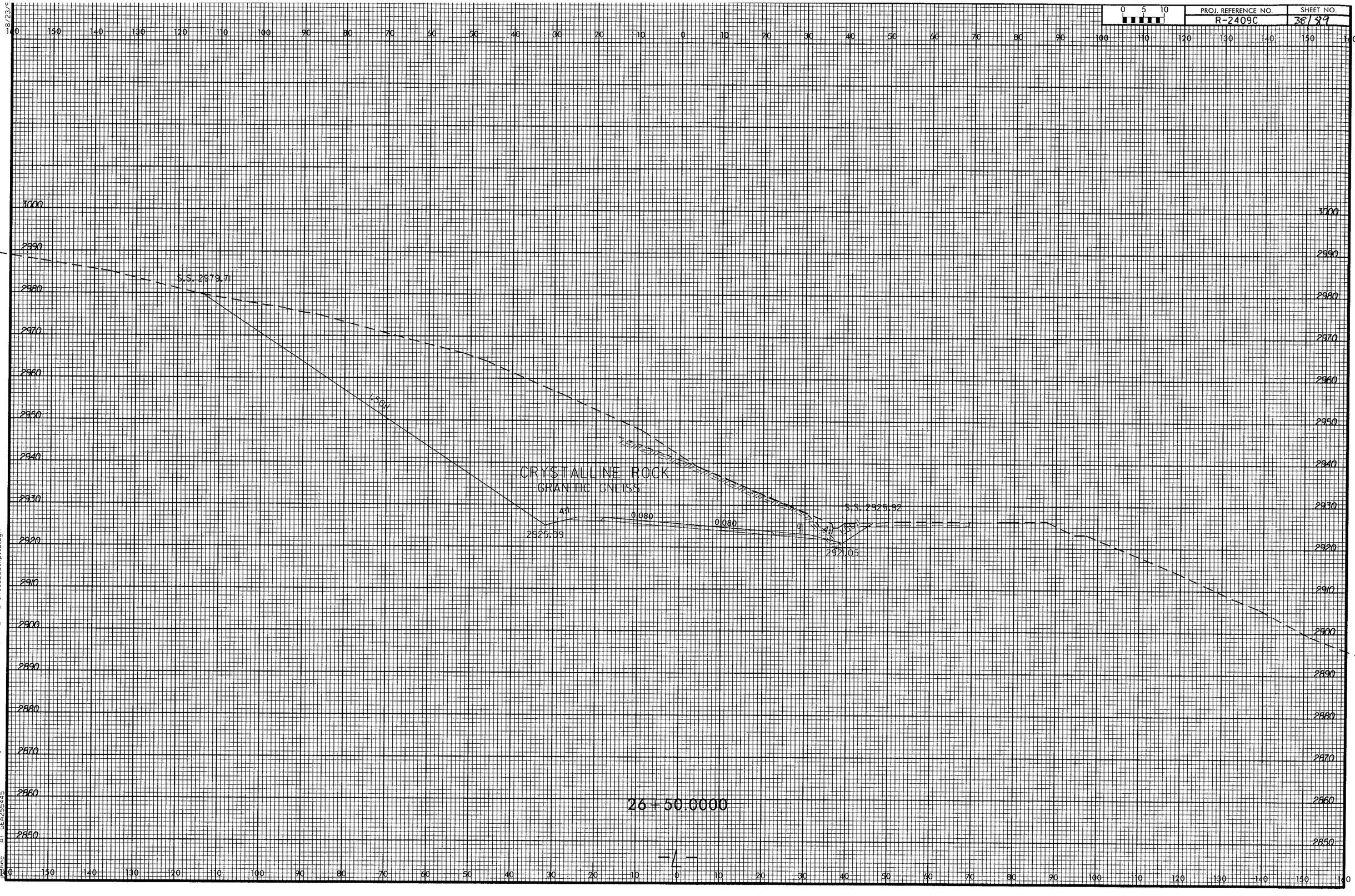
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
35/89
S.S. 3002.52
1.50:1
S.S. 2955.09
CRYSTALLINE ROCK
GRANITIC GNEISS
4:1
0.080
0.080
4:1
1.50:1
2930.23
2926.43
25+00.0000
-L-



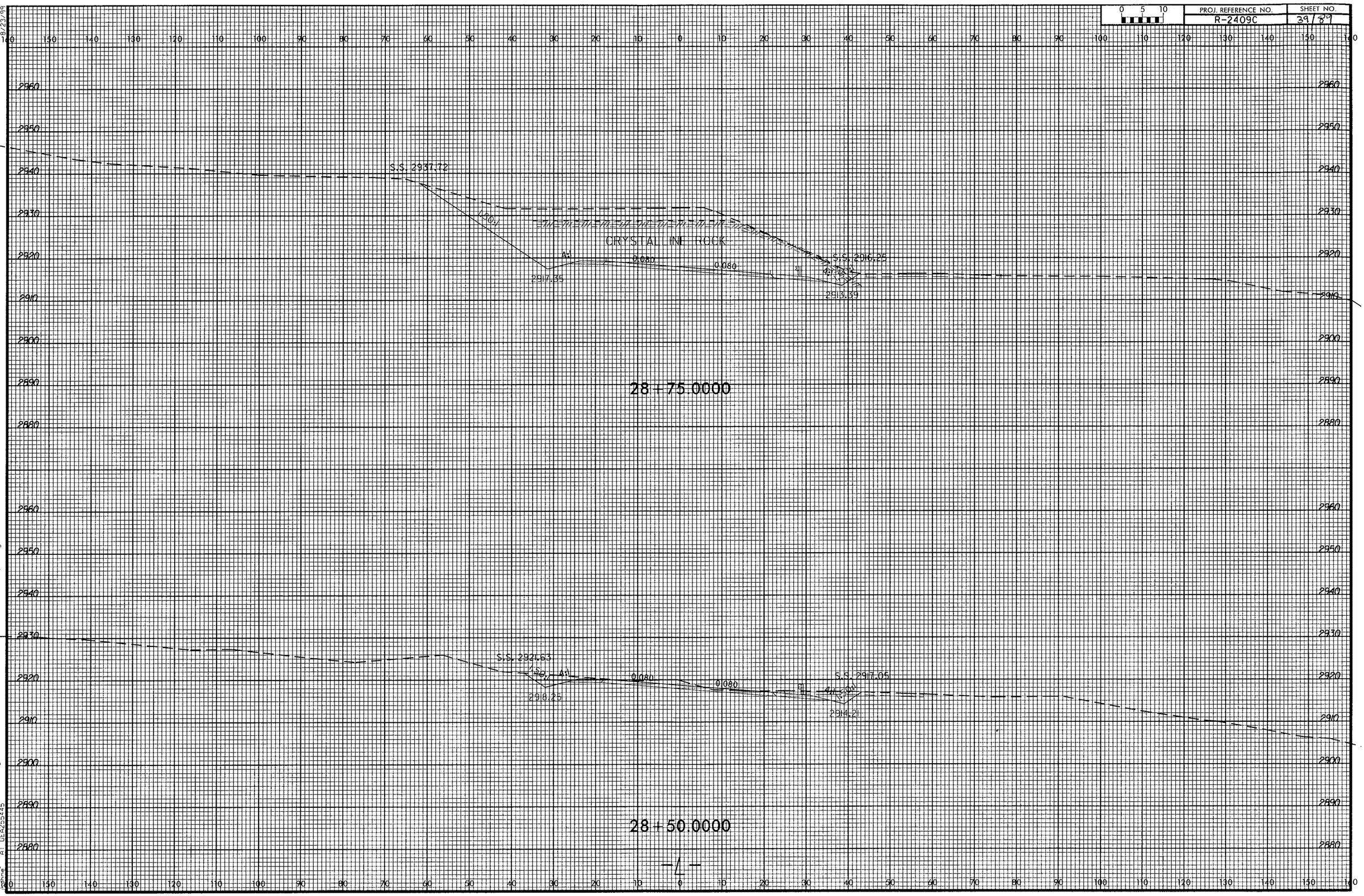
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
36/59
S.S. 2986.39
S.S. 2950.42
CRYSTALLINE ROCK
GRANITIC GNEISS
1.50:1
4:1
0.080
2928.51
2924.71
25+50.0000



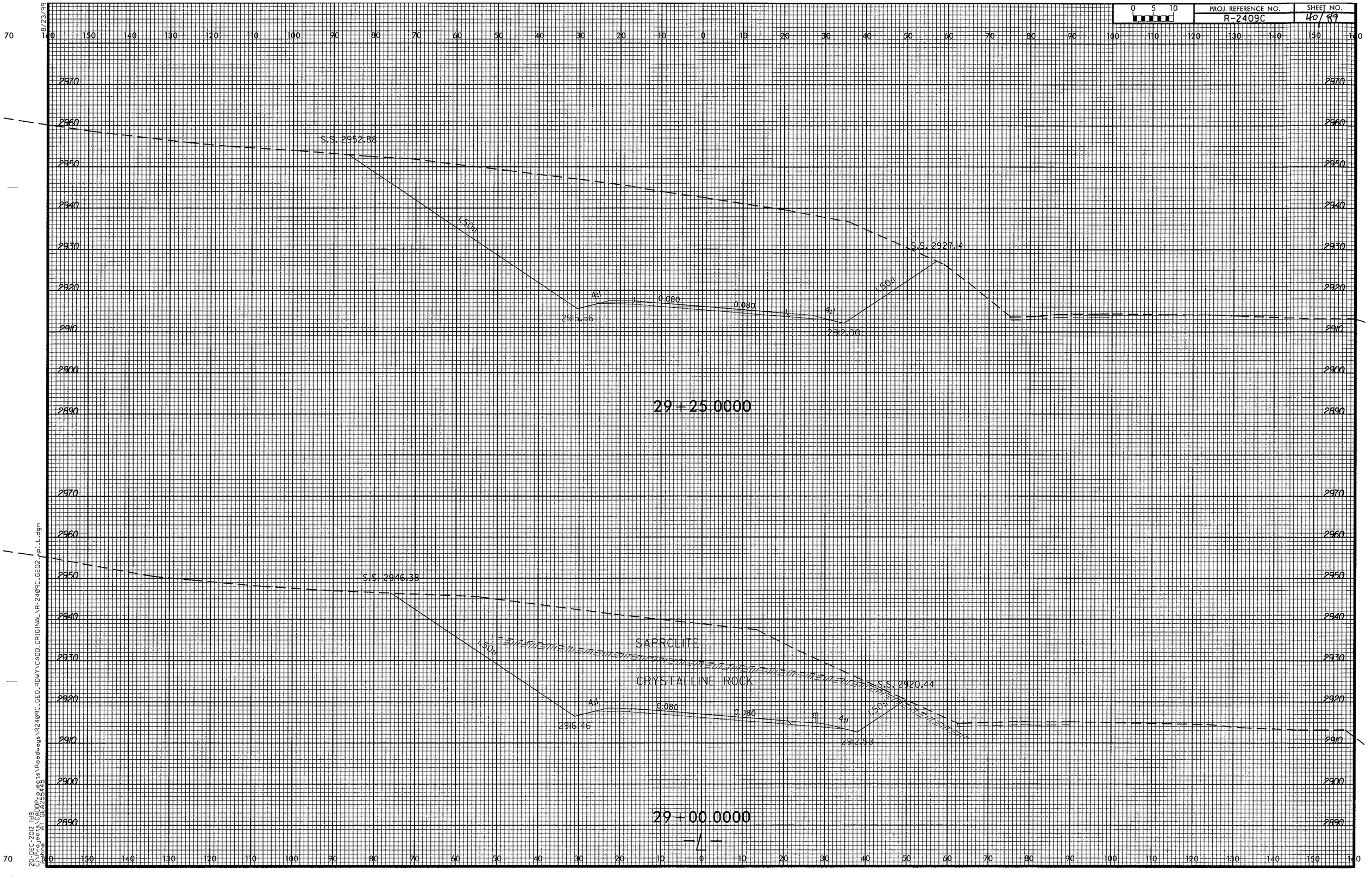
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
37/89
S.S. 2990.3
S.S. 2940.42
CRYSTALLINE ROCK
GRANITIC GNEISS
2926.80
2923.00
0.080
0.080
26+00.0000
-L-



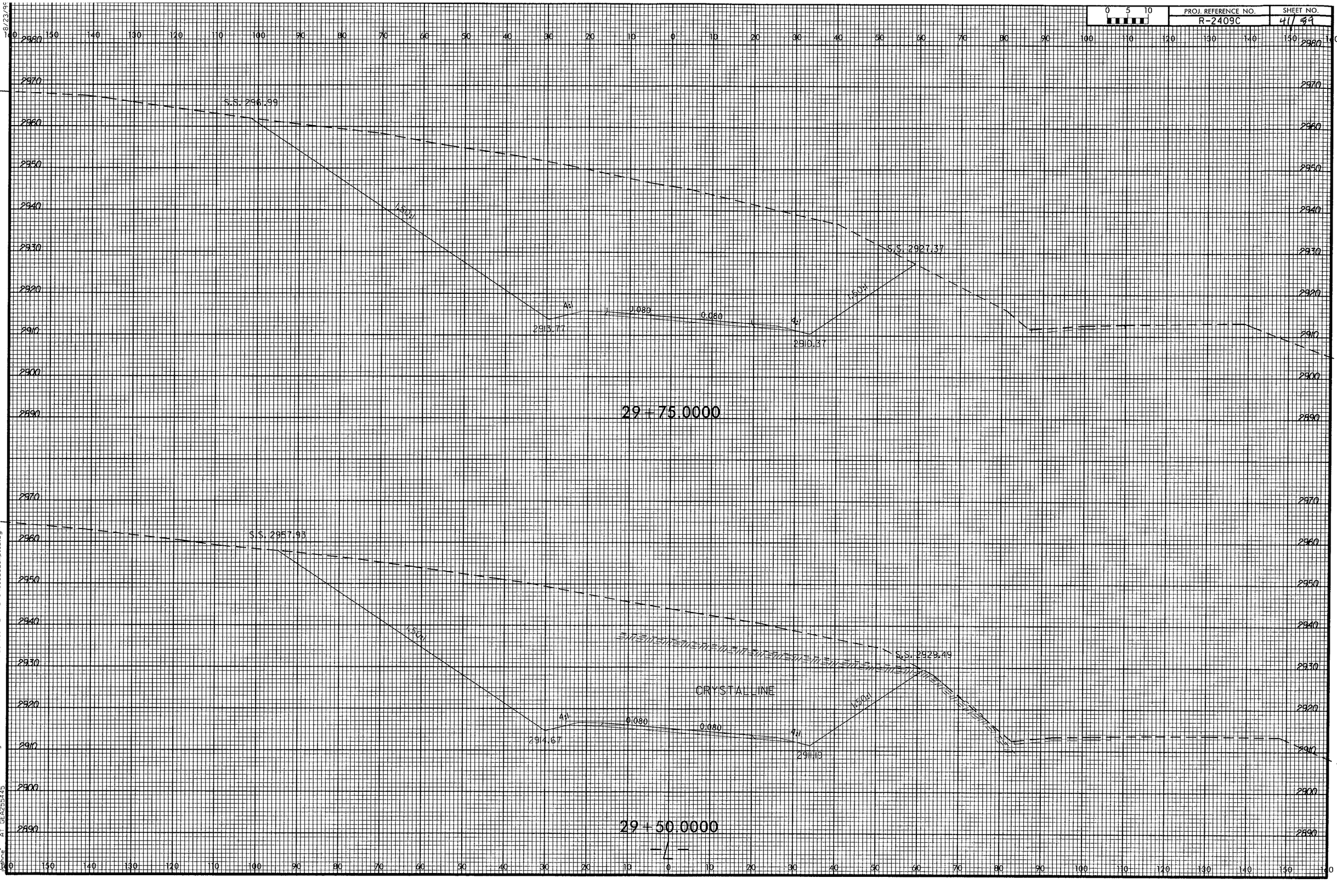
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
38/89
S.S. 2979.71
1.50:1
CRYSTALLINE ROCK
GRANITIC GNEISS
4:1
0.080
0.080
2925.09
S.S. 2925.92
2921.05
26+50.0000
-L-



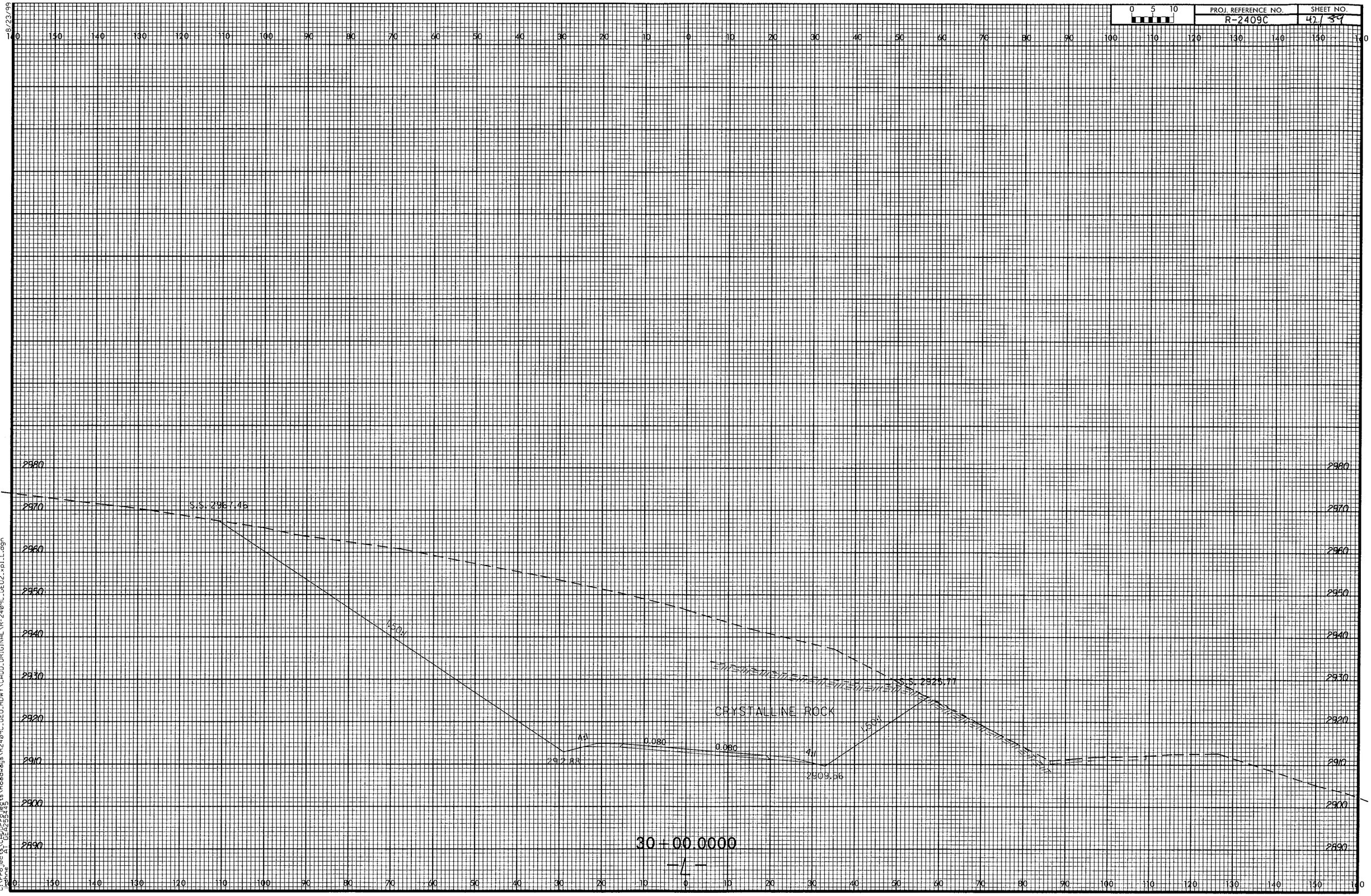
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
39/89
S.S. 2937.72
CRYSTALLINE ROCK
2917.35
0.080
0.080
S.S. 2916.25
2913.39
28+75.0000
S.S. 2921.63
2918.25
0.080
0.080
S.S. 2917.05
2914.21
28+50.0000
-L-



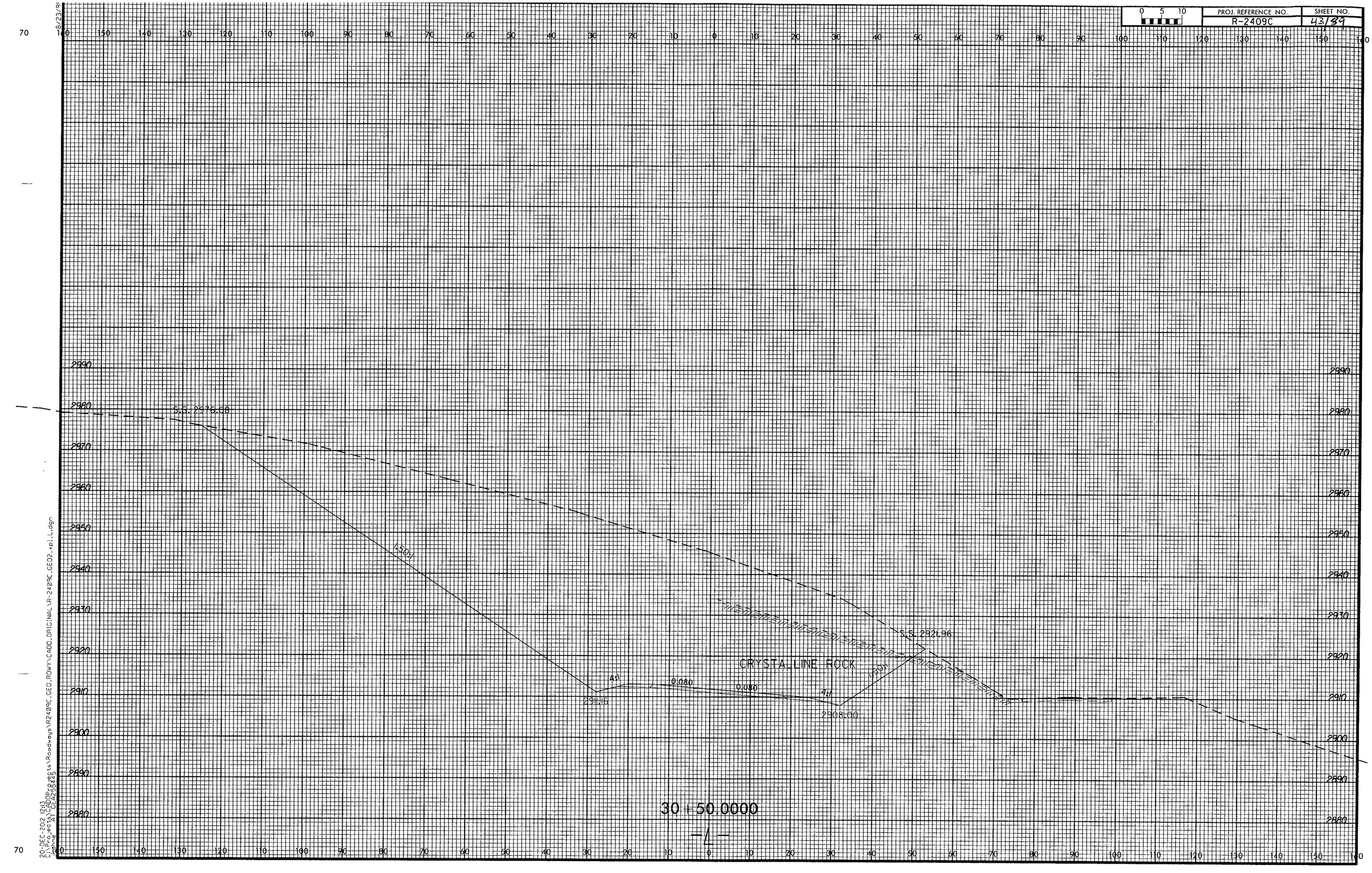
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
40/89
S.S. 2952.88
1.50:1
2915.56
4:1
0.080
0.080
4:1
2912.00
1.50:1
S.S. 2927.14
29+25.0000
S.S. 2946.38
1.50:1
SAPROLITE
CRYSTALLINE ROCK
2916.46
4:1
0.080
0.080
4:1
2912.58
1.50:1
S.S. 2920.44
29+00.0000
-L-



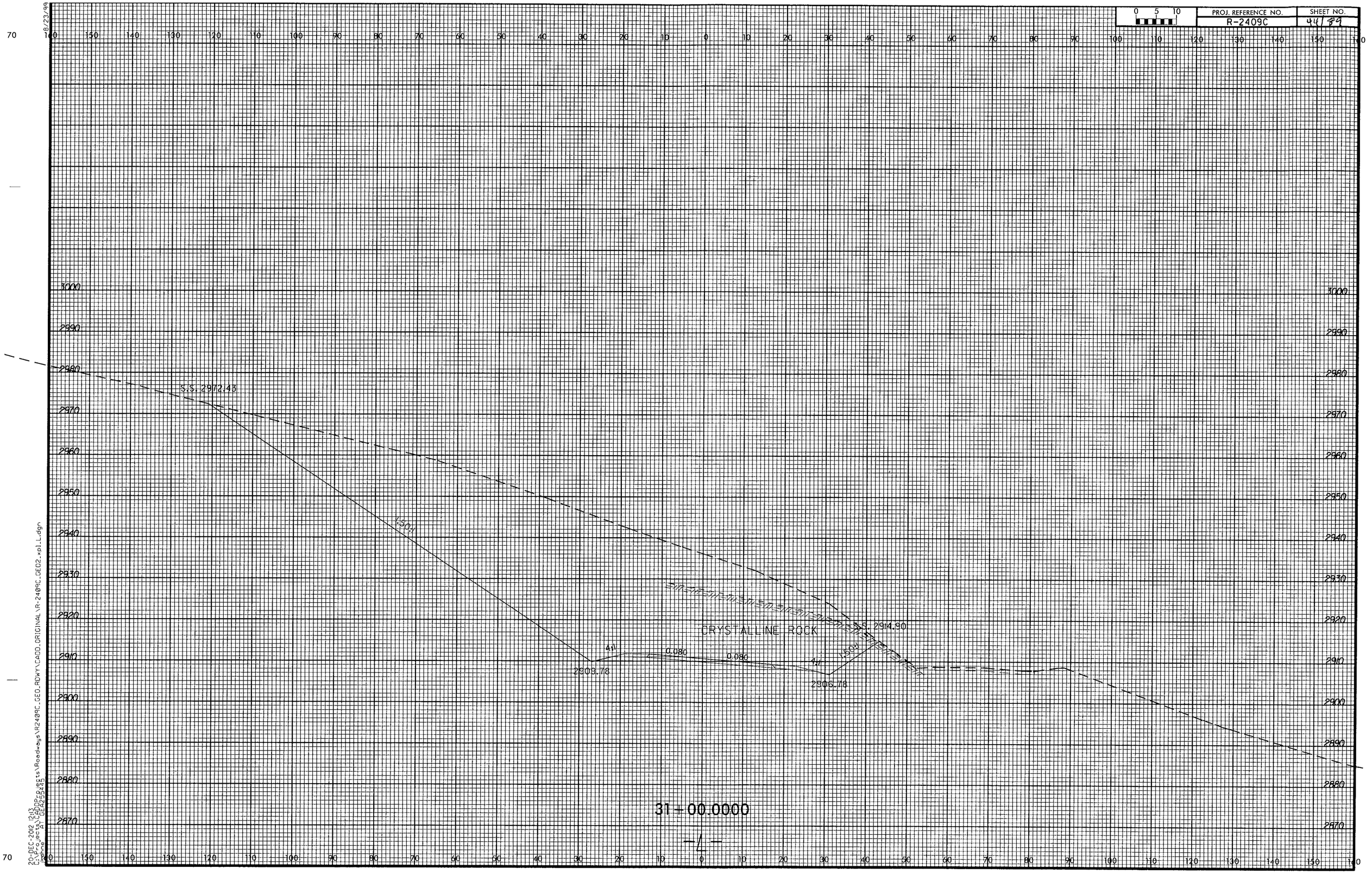
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
41/89
S.S. 2961.99
1.50:1
4:1
0.080
0.080
4:1
1.50:1
2913.77
2910.37
S.S. 2927.37
29+75.0000
S.S. 2957.93
1.50:1
4:1
0.080
0.080
4:1
1.50:1
2914.67
2911.19
S.S. 2929.49
CRYSTALLINE
29+50.0000



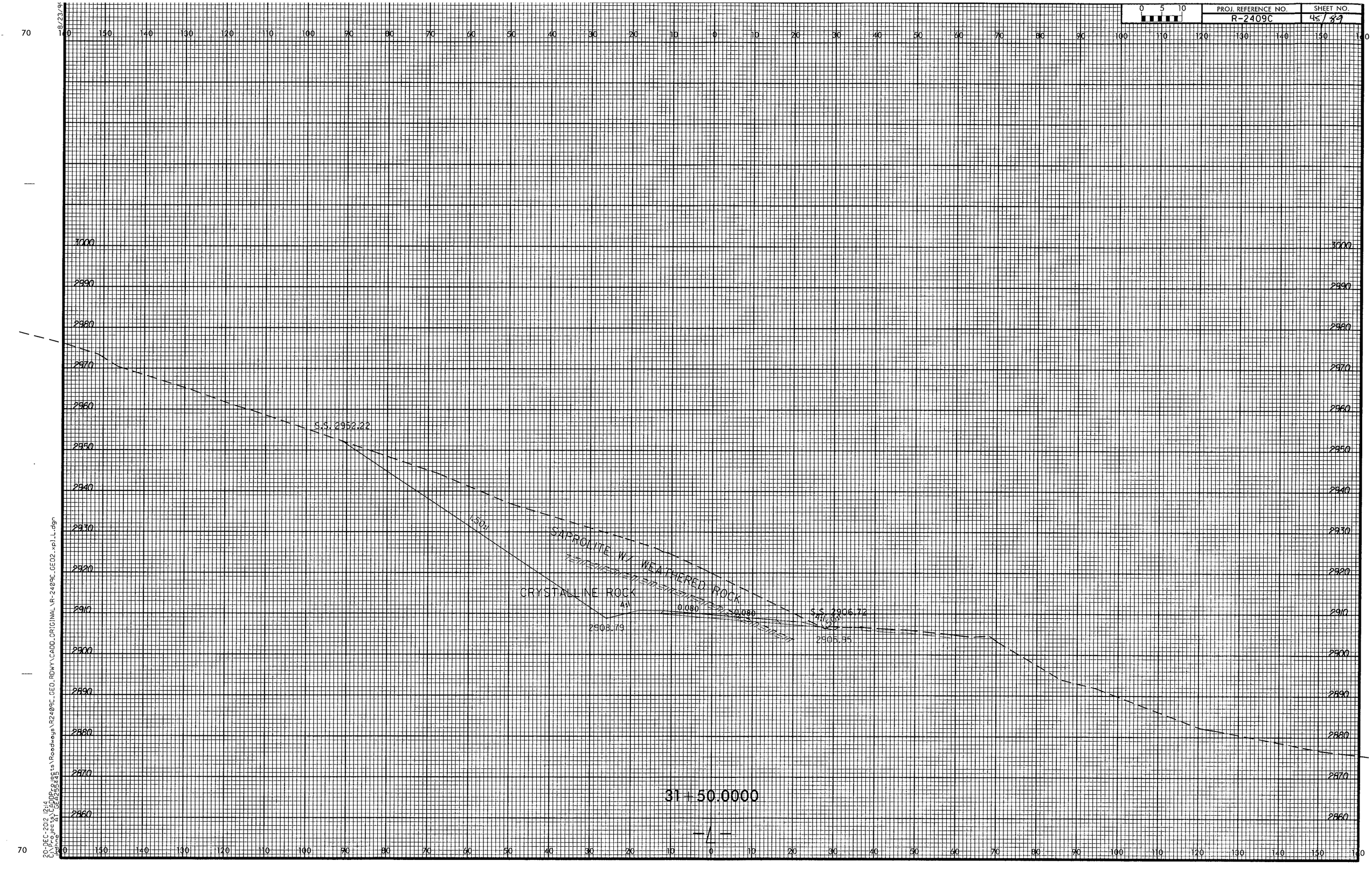
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
42/39
0 5 10
S.S. 2967.46
1.50:1
4:1
0.080
0.080
4:1
1.50:1
S.S. 2925.77
CRYSTALLINE ROCK
2912.88
2909.56
30+00.0000
-L-
2980
2970
2960
2950
2940
2930
2920
2910
2900
2890



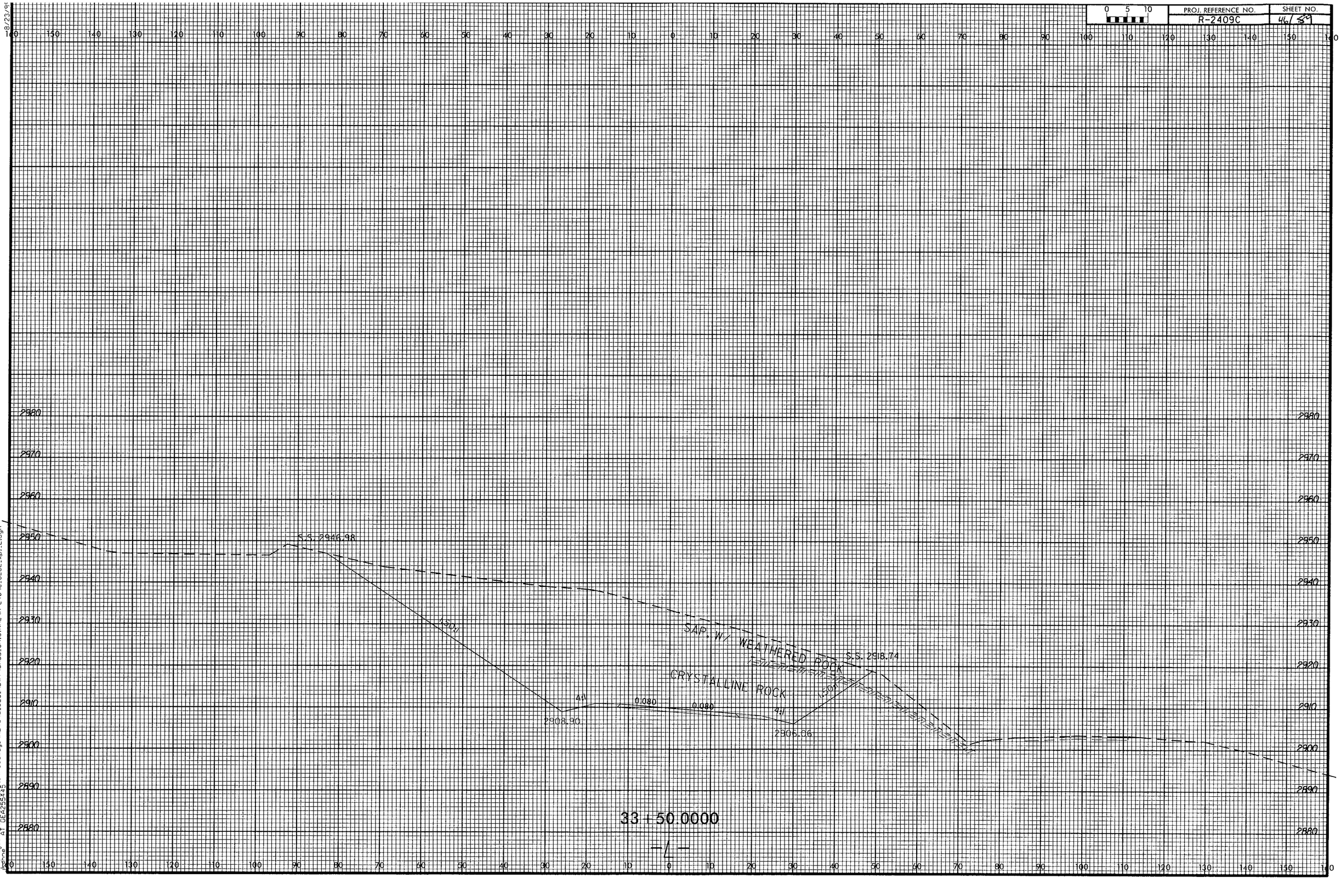
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
43/89
S.S. 2976.68
1.50:1
4:1
0.080
0.080
4:1
1.50:1
S.S. 2921.96
CRYSTALLINE ROCK
2911.16
2908.00
30+50.0000



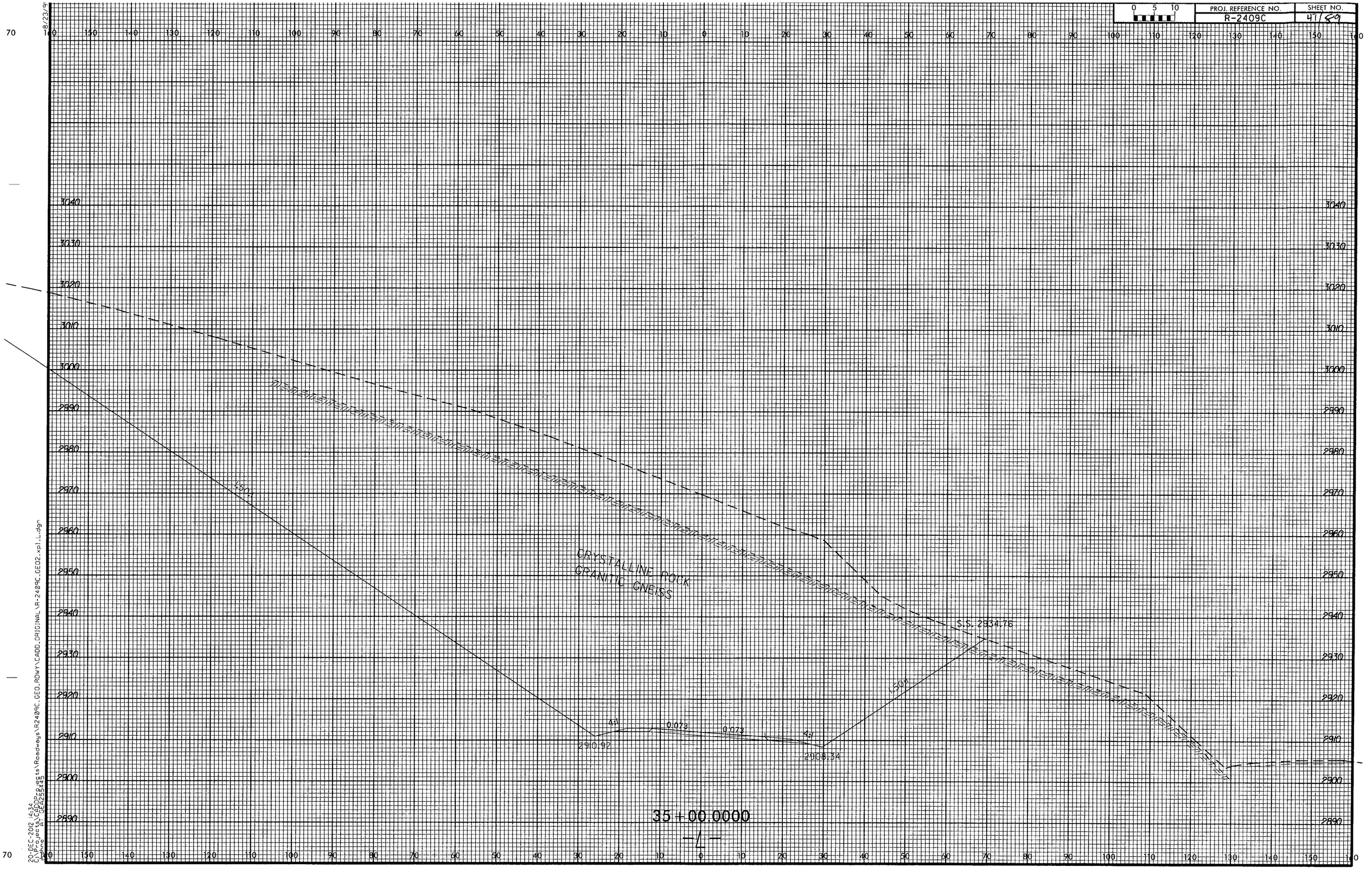
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
44/89
S.S. 2972.43
1.50:1
CRYSTALLINE ROCK
S.S. 2914.90
4:1
0.080
0.080
4:1
1.50:1
2909.78
2906.78
31+00.0000
-L-



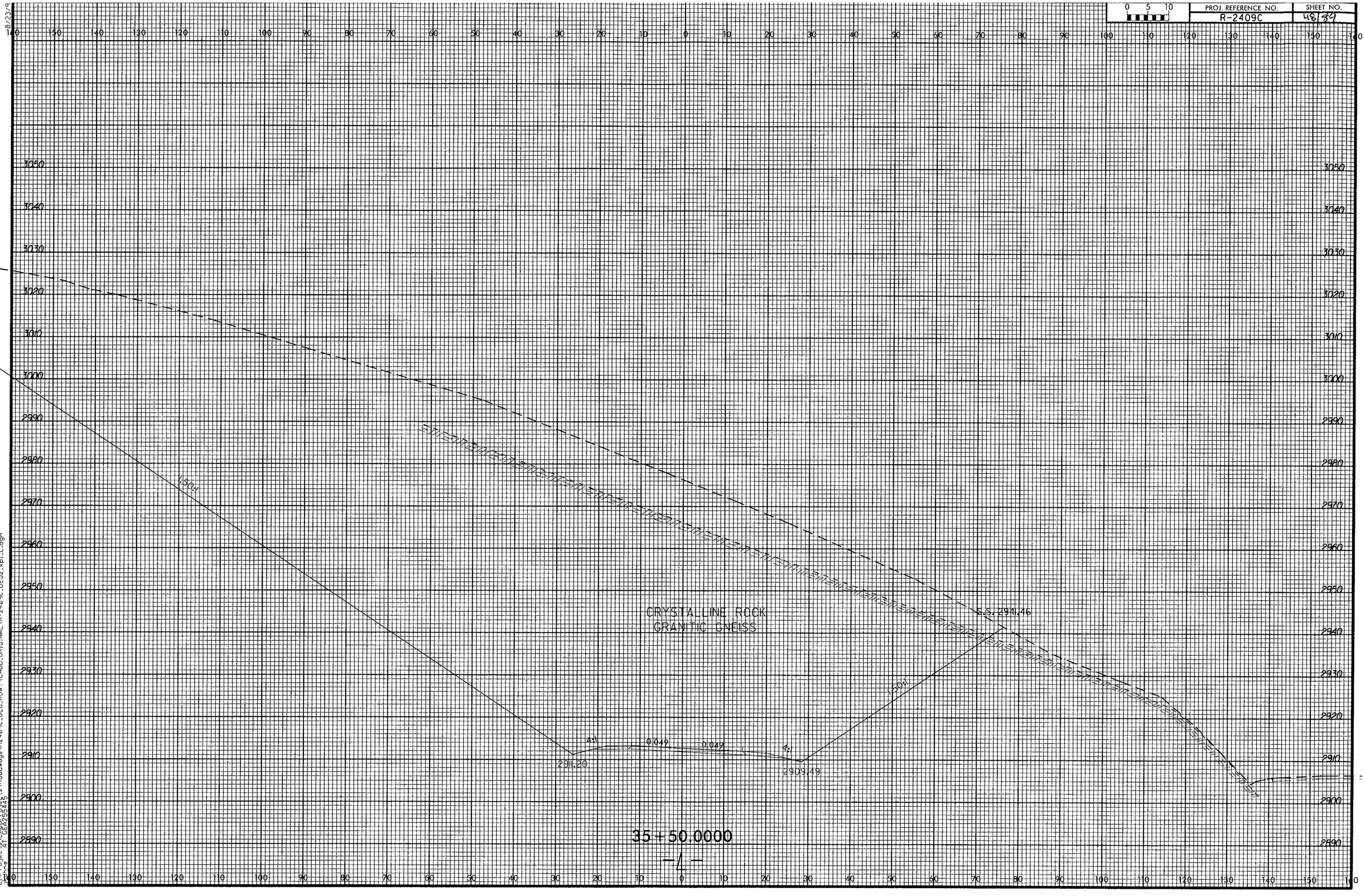
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
45/89
S.S. 2952.22
1.50:1
SAPROLITE W/ WEATHERED ROCK
CRYSTALLINE ROCK
4:1
0.080
0.080
S.S. 2906.72
2908.79
2905.95
31+50.0000
-L-



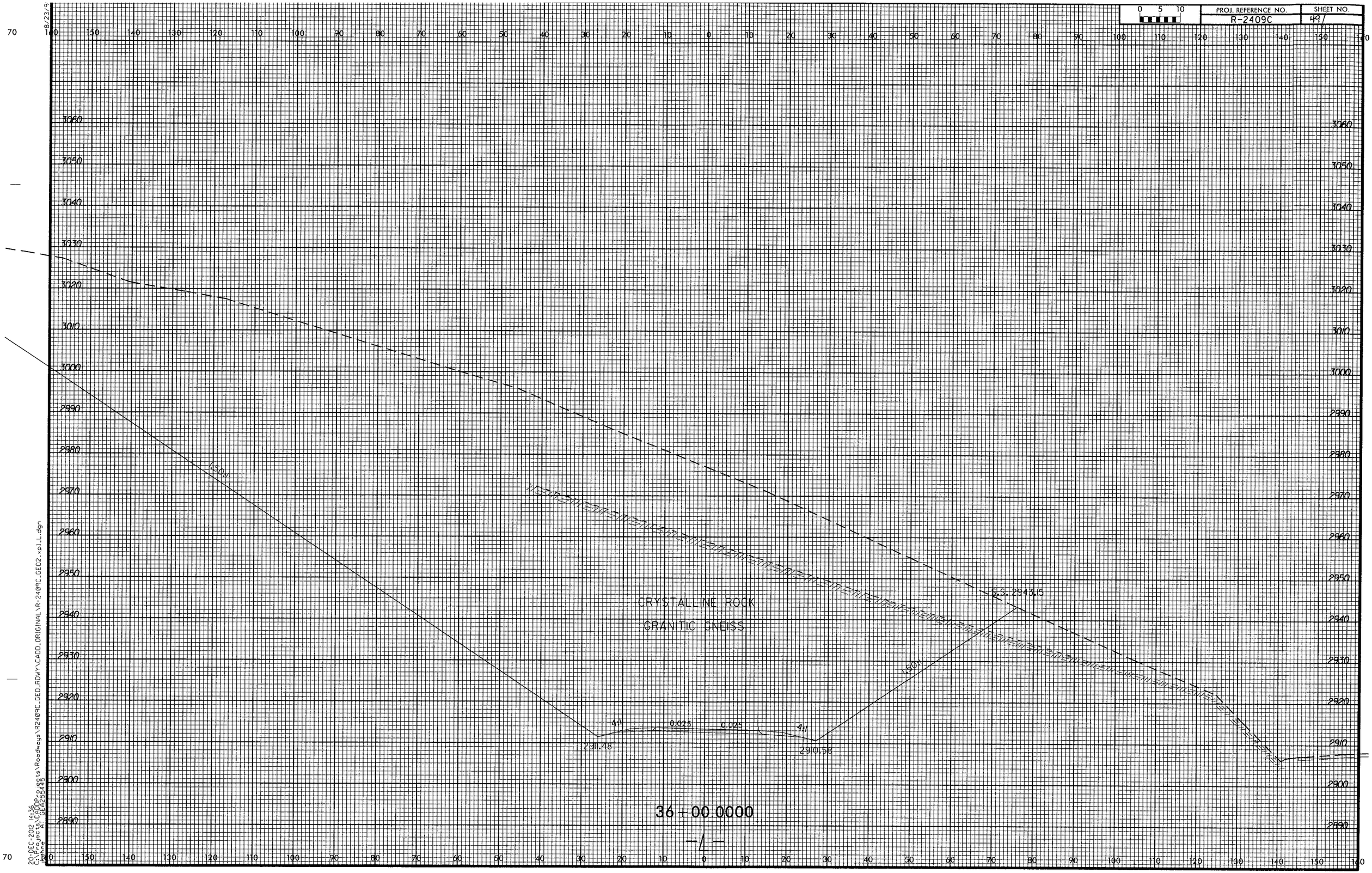
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
46/59
S.S. 2946.98
1.50:1
SAP. W/ WEATHERED ROCK
CRYSTALLINE ROCK
S.S. 2918.74
4:1
0.080
0.080
4:1
1.50:1
2908.90
2906.06
33+50.0000
-L-



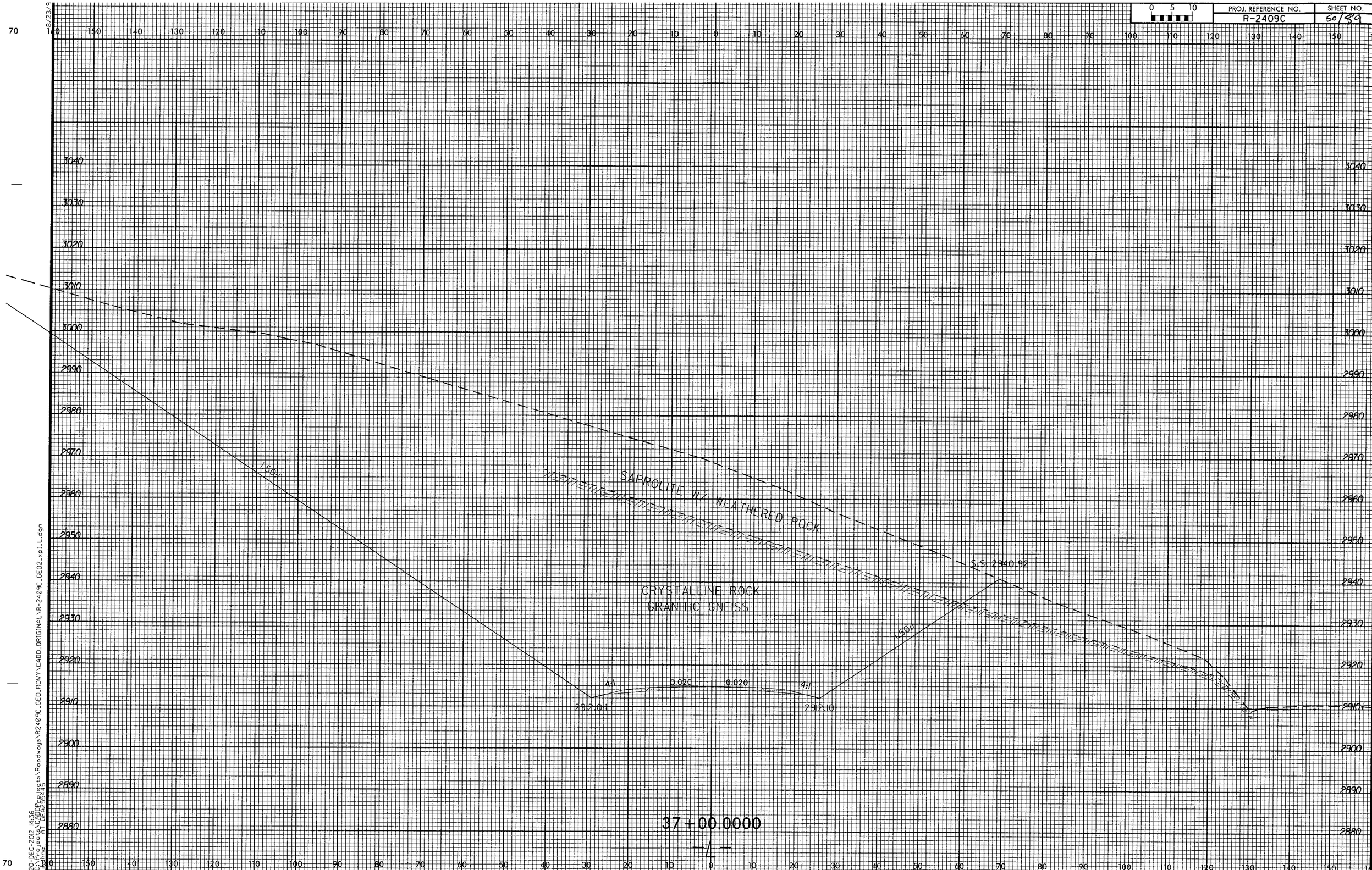
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
47/89
0 5 10
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2934.76
2910.92
2908.34
4:1
0.073
0.073
4:1
1.50:1
1.50:1
35+00.0000
-L-



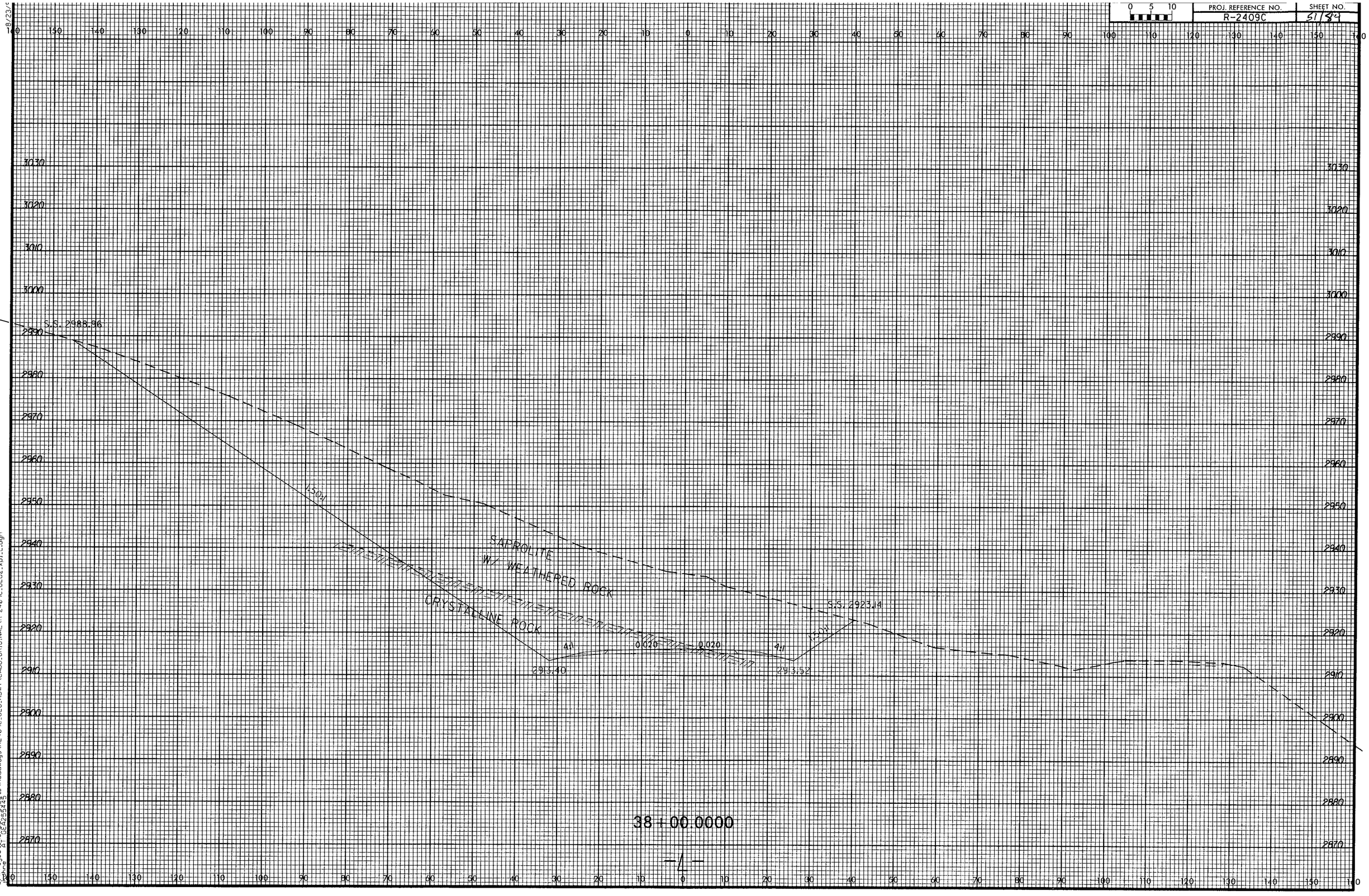
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
48/89
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2941.46
1.50:1
4:1
0.049
0.049
4:1
1.50:1
2911.20
2909.49
35+50.0000
-L-



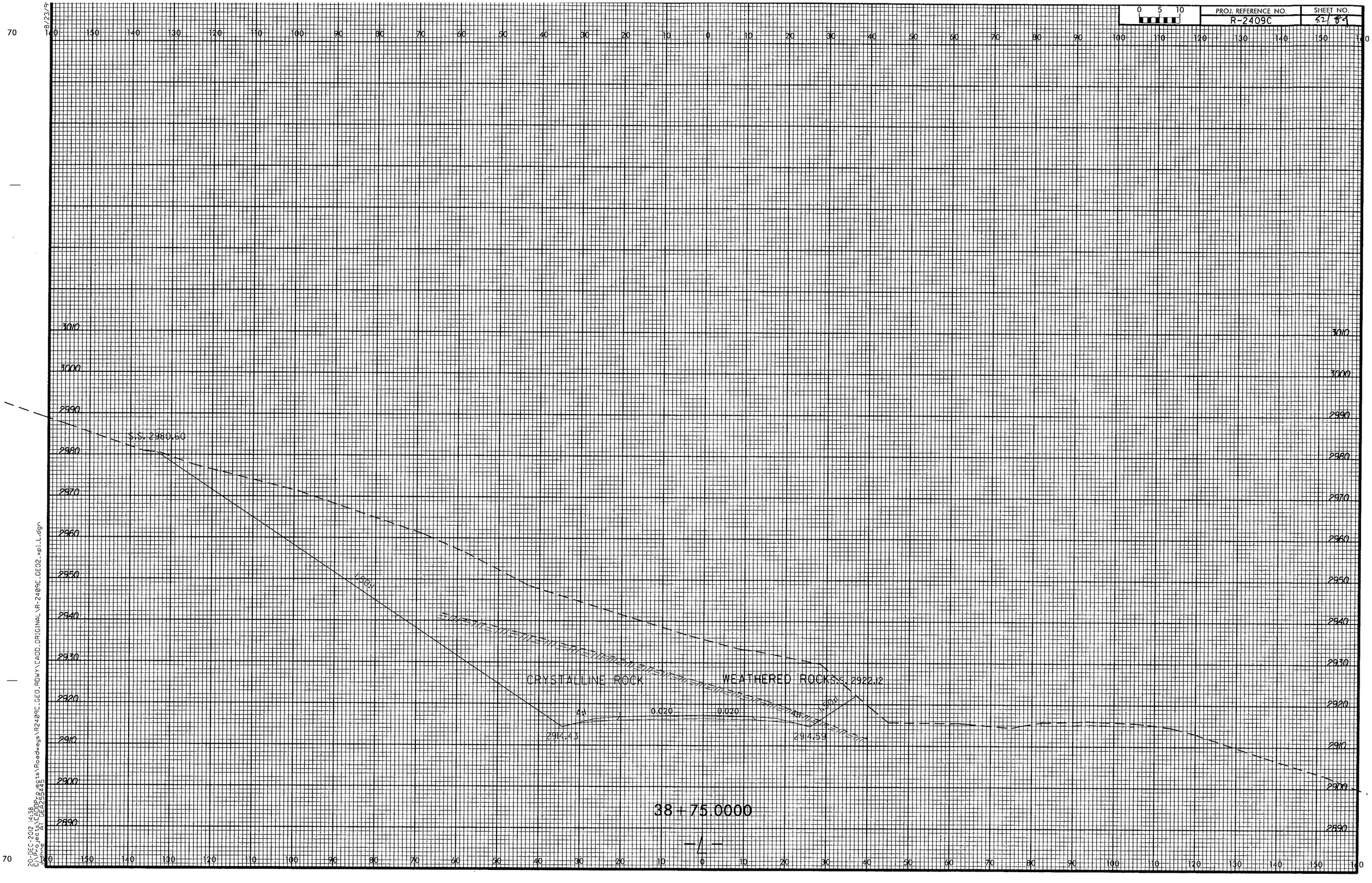
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
49
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2943.15
2911.48
2910.58
4:1
0.025
0.025
4:1
1.50:1
1.50:1
36+00.0000
-L-



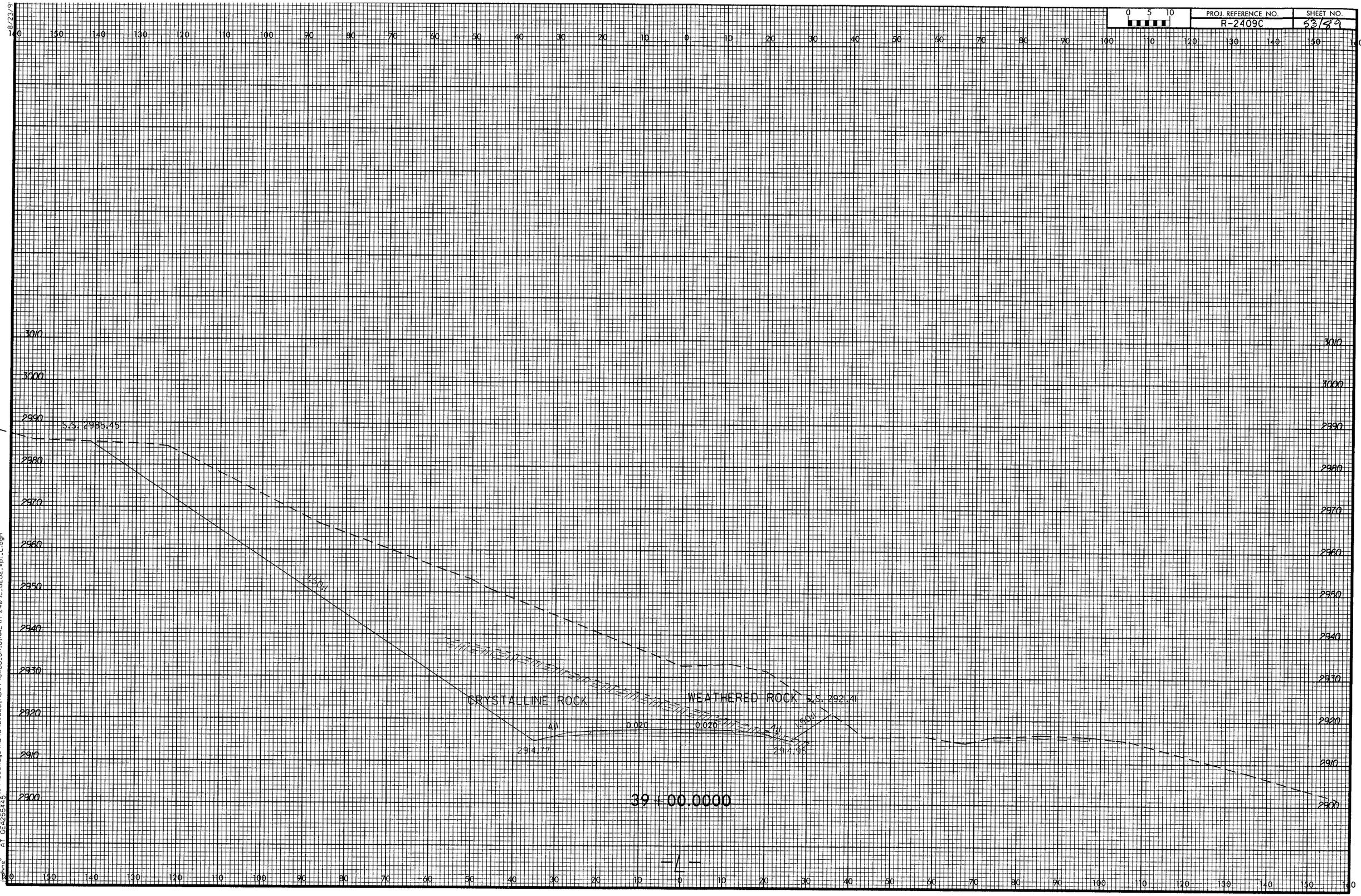
20-DEC-2012 14:36
C:\Projects\CADDProjects\Roadways\R2409C_GEO_RDWY\CADD_ORIGINAL\R-2409C_GEO2_xpl_L.dgn
Kehne AT GEA255445



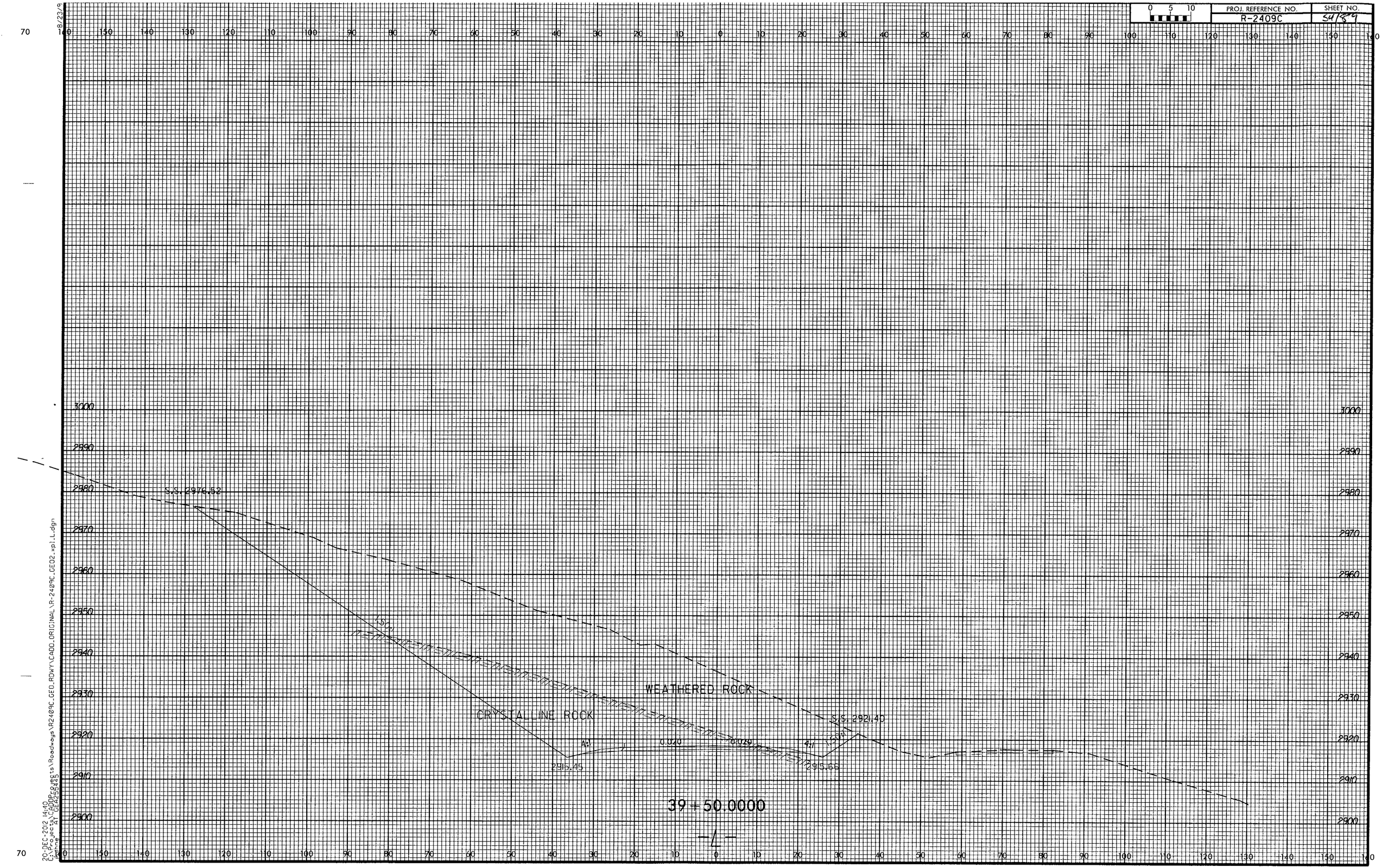
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
51/84
S.S. 2988.96
1.50:1
SAPROLITE
W/ WEATHERED ROCK
CRYSTALLINE ROCK
4:1
0.020
0.020
4:1
1.50:1
S.S. 2923.14
2913.40
2913.52
38+00.0000
-L-



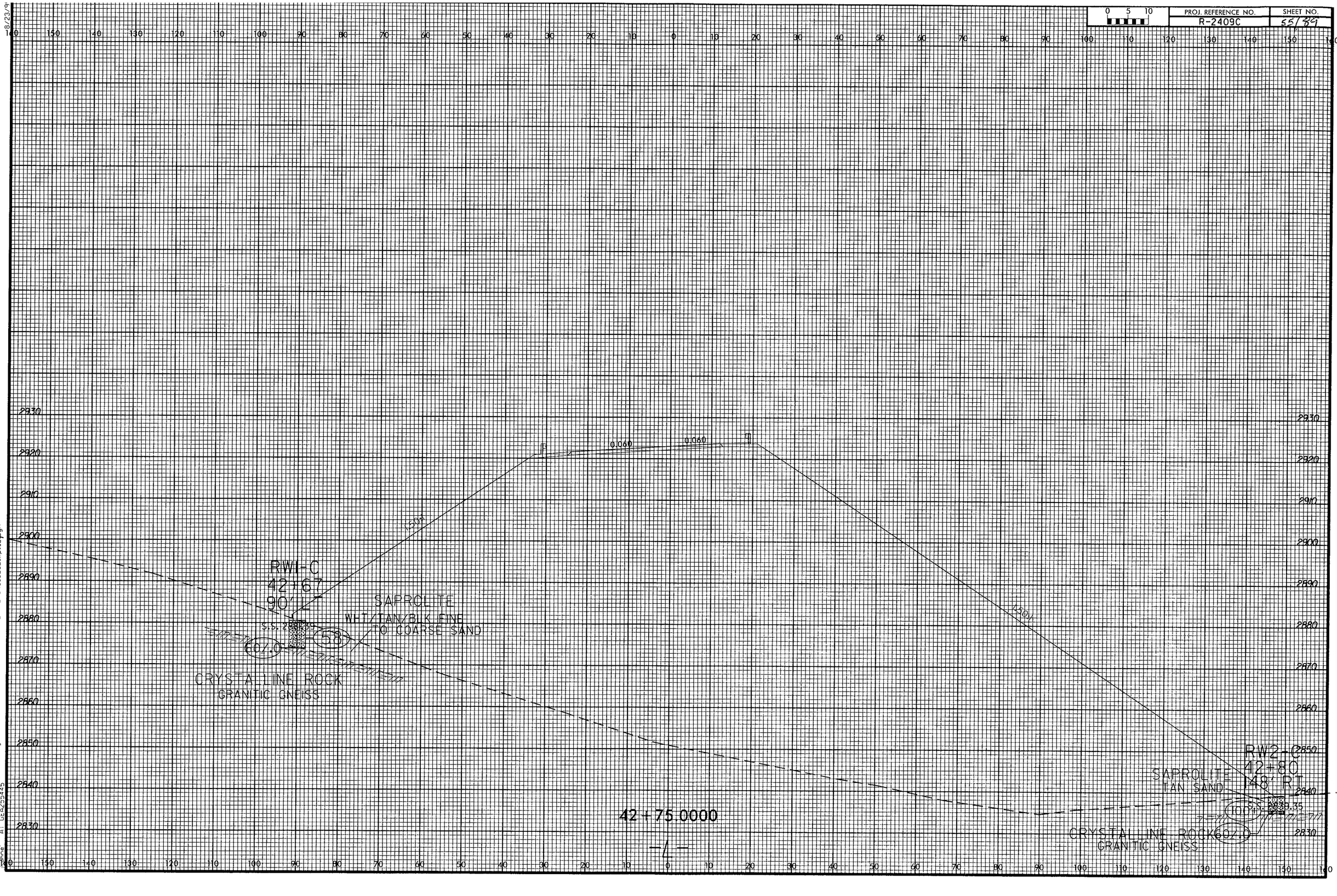
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
52/89
S.S. 2980.60
1.50:1
CRYSTALLINE ROCK
WEATHERED ROCK
S.S. 2922.12
4:1
0.020
0.020
4:1
1.50:1
2914.43
2914.59
38 + 75.0000
-L-



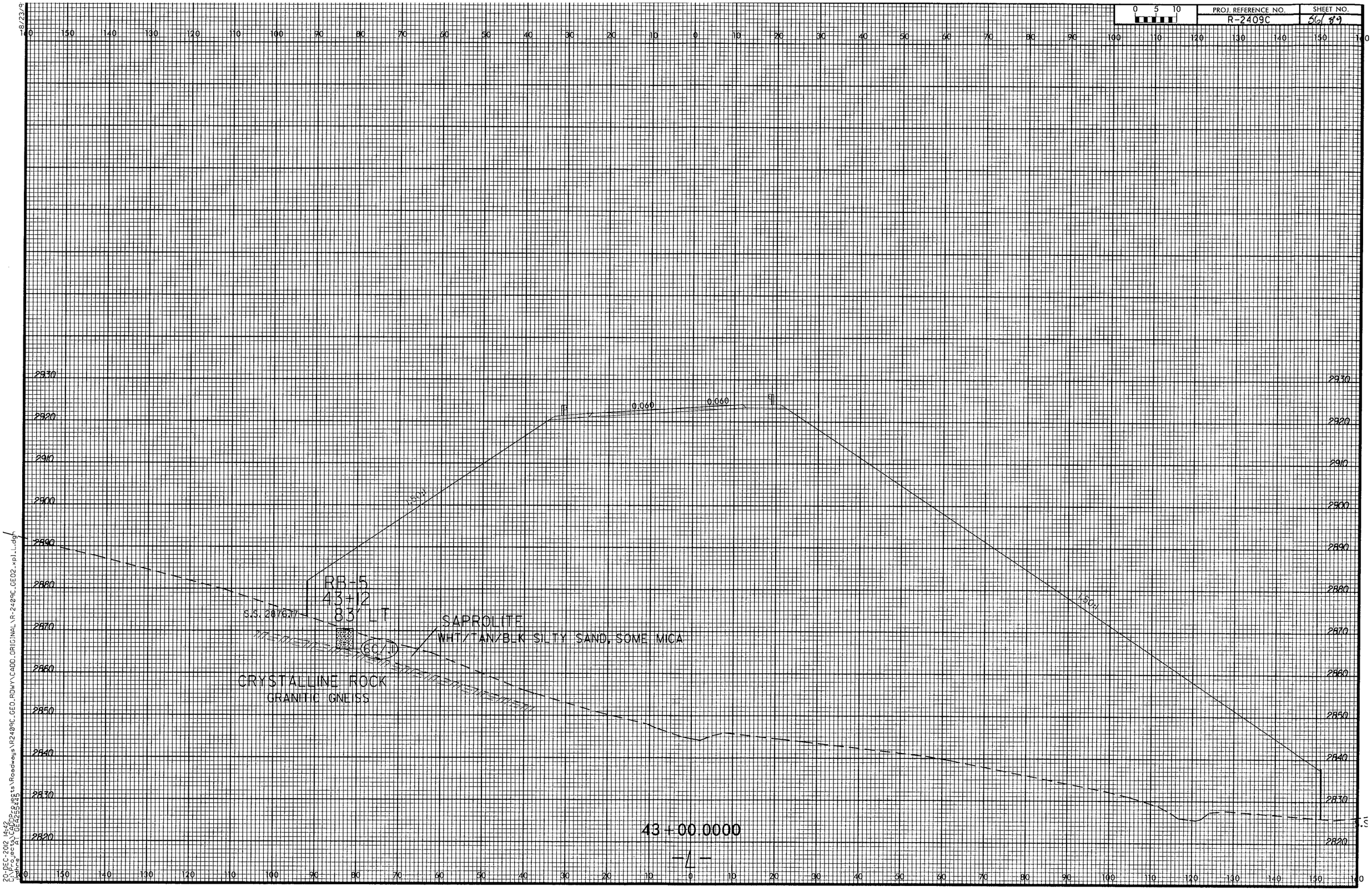
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
53/89
S.S. 2985.45
CRYSTALLINE ROCK
WEATHERED ROCK
S.S. 2921.41
1.50:1
4:1
0.020
0.020
4:1
1.50:1
2914.77
2914.95
39+00.0000
-L-



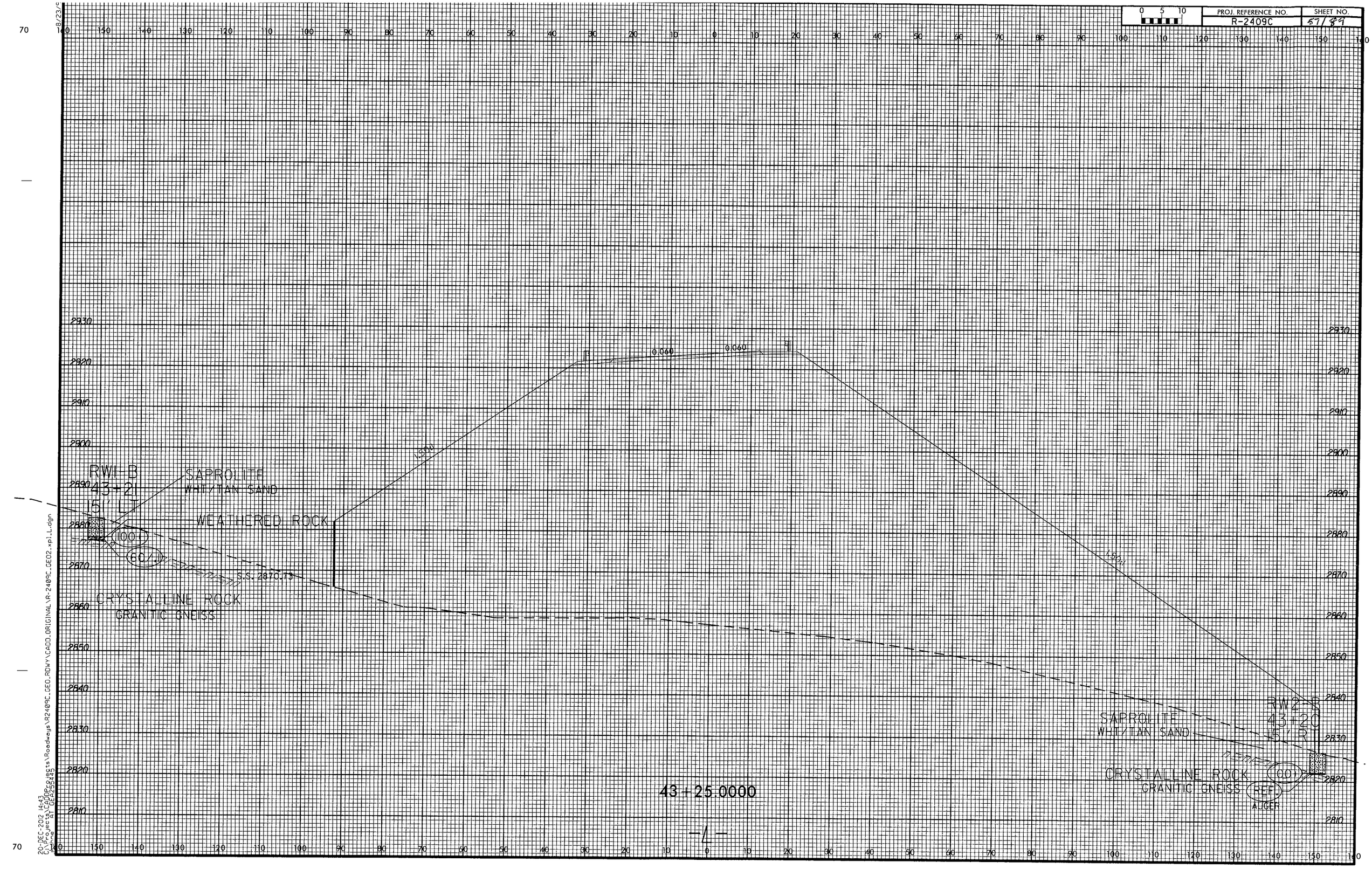
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
54/89
S.S. 2976.52
1.50:1
WEATHERED ROCK
CRYSTALLINE ROCK
S.S. 2921.40
4:1
0.020
0.020
4:1
1.50:1
2916.45
2915.66
39 + 50.0000
-L-
3000
2990
2980
2970
2960
2950
2940
2930
2920
2910
2900



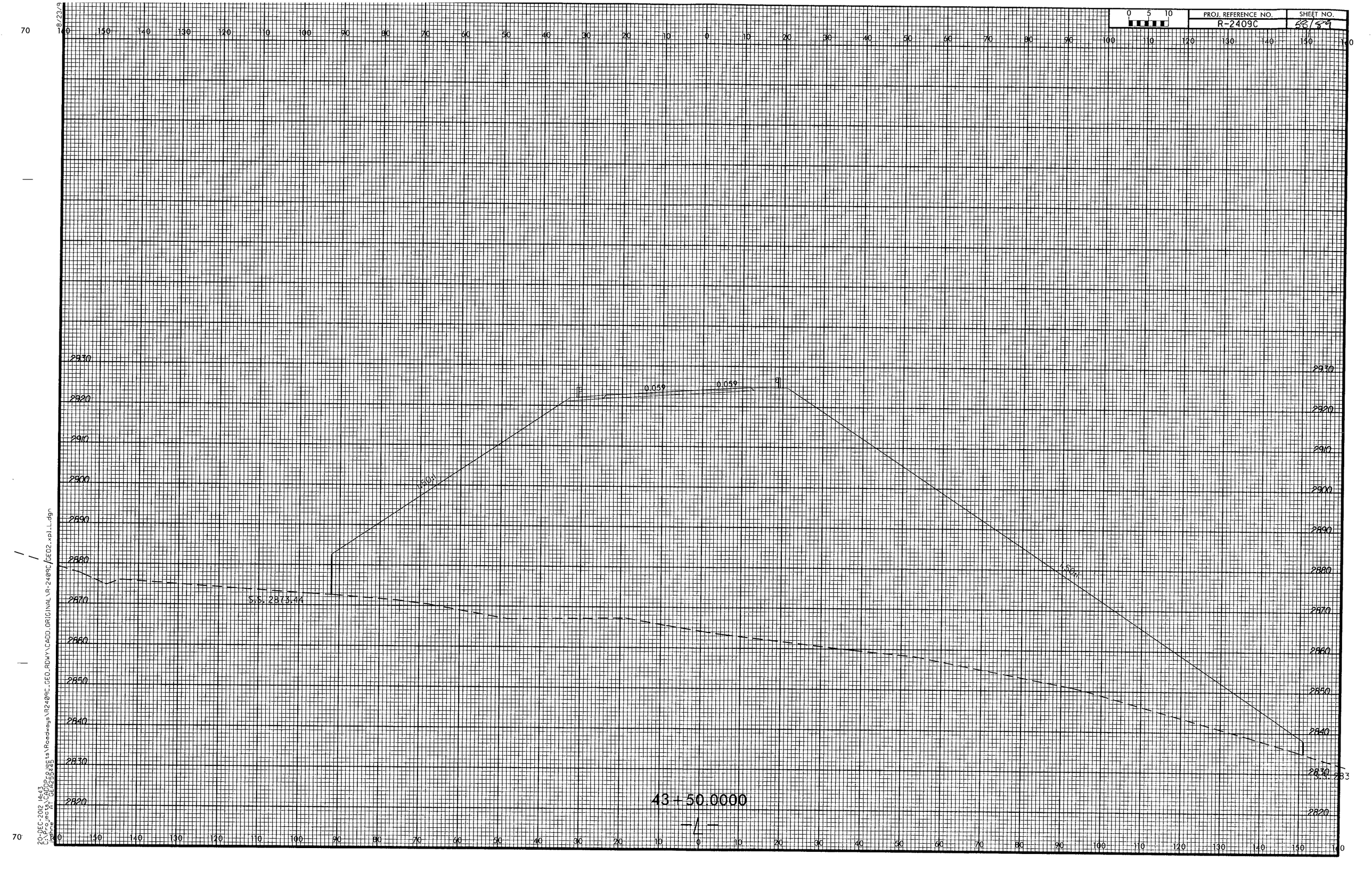
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
55/89
0 5 10
RW1-C
42+67
90' LT
SAPROLITE
WHT/TAN/BLK FINE
TO COARSE SAND
S.S. 2839.39
58
60/.0
CRYSTALLINE ROCK
GRANITIC GNEISS
0.060
0.060
1.50:1
1.50:1
RW2-C
42+80
148' RT
SAPROLITE
TAN SAND
S.S. 2839.35
100+
60/.0
CRYSTALLINE ROCK
GRANITIC GNEISS
42+75.0000
-L-
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830



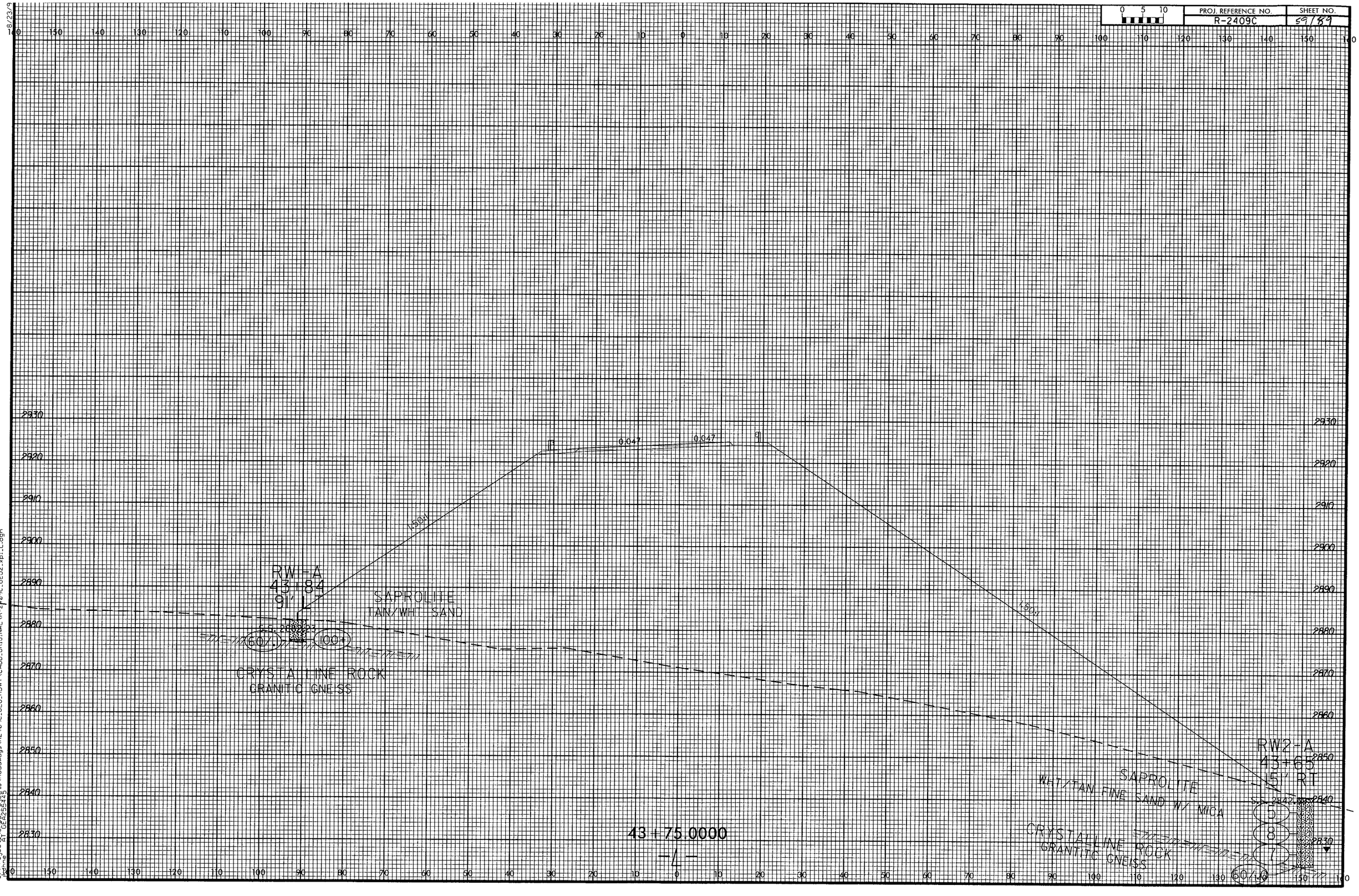
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
56/89
0 5 10
0.060
0.060
1.50:1
1.50:1
RB-5
43+12
83' LT
S.S. 2876.17
SAPROLITE
WHT/TAN/BLK SILTY SAND, SOME MICA
60/.1
CRYSTALLINE ROCK
GRANITIC GNEISS
43+00.0000
-L-
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820



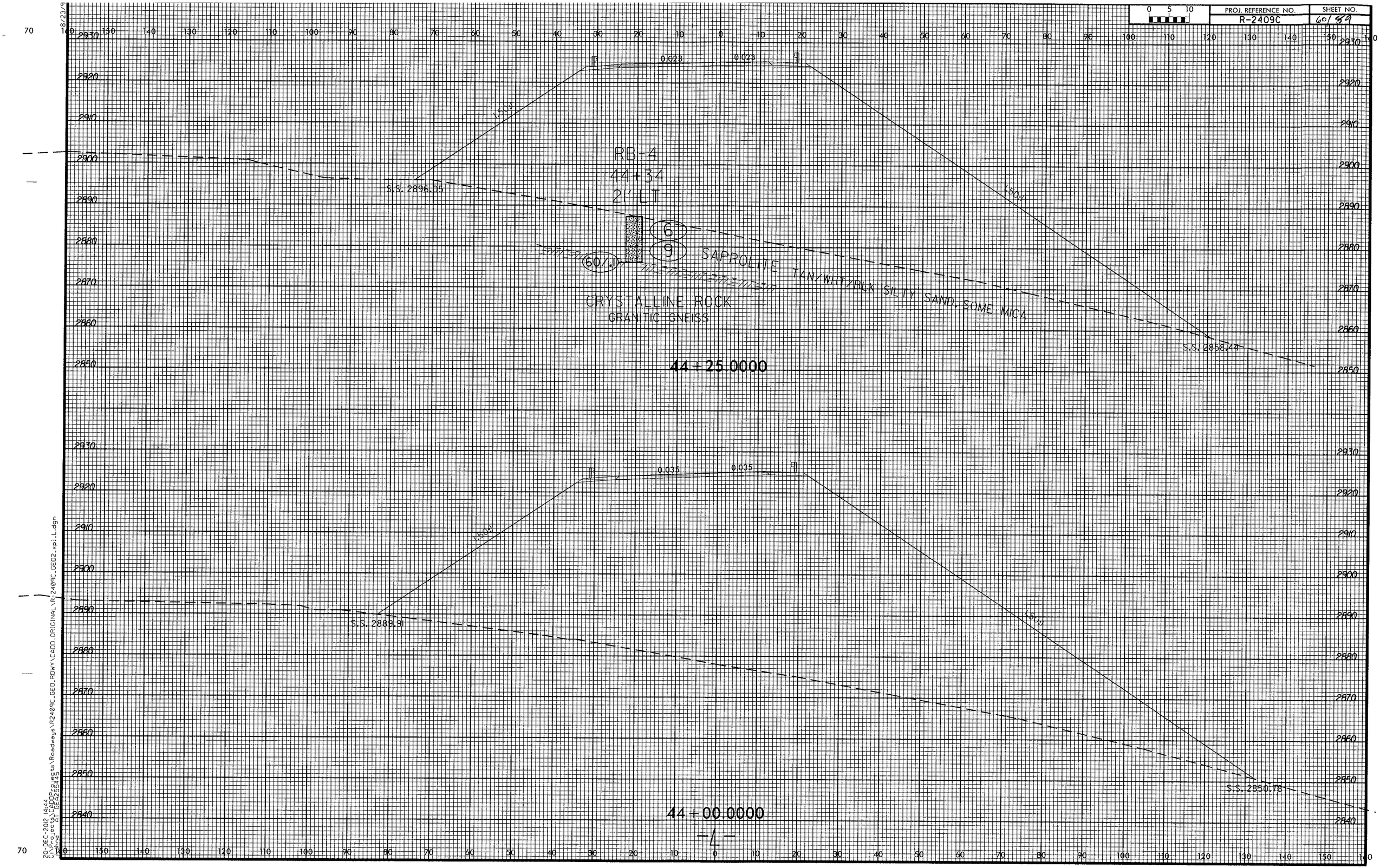
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
57/89
RW1-B
43+21
15' LT
SAPROLITE
WHT/TAN SAND
WEATHERED ROCK
100+
60/.1
S.S. 2870.73
CRYSTALLINE ROCK
GRANITIC GNEISS
0.060
0.060
1.50:1
1.50:1
RW2-B
43+20
15' RT
SAPROLITE
WHT/TAN SAND
CRYSTALLINE ROCK
GRANITIC GNEISS
100+
REF.
AUGER
43+25.0000
-L-



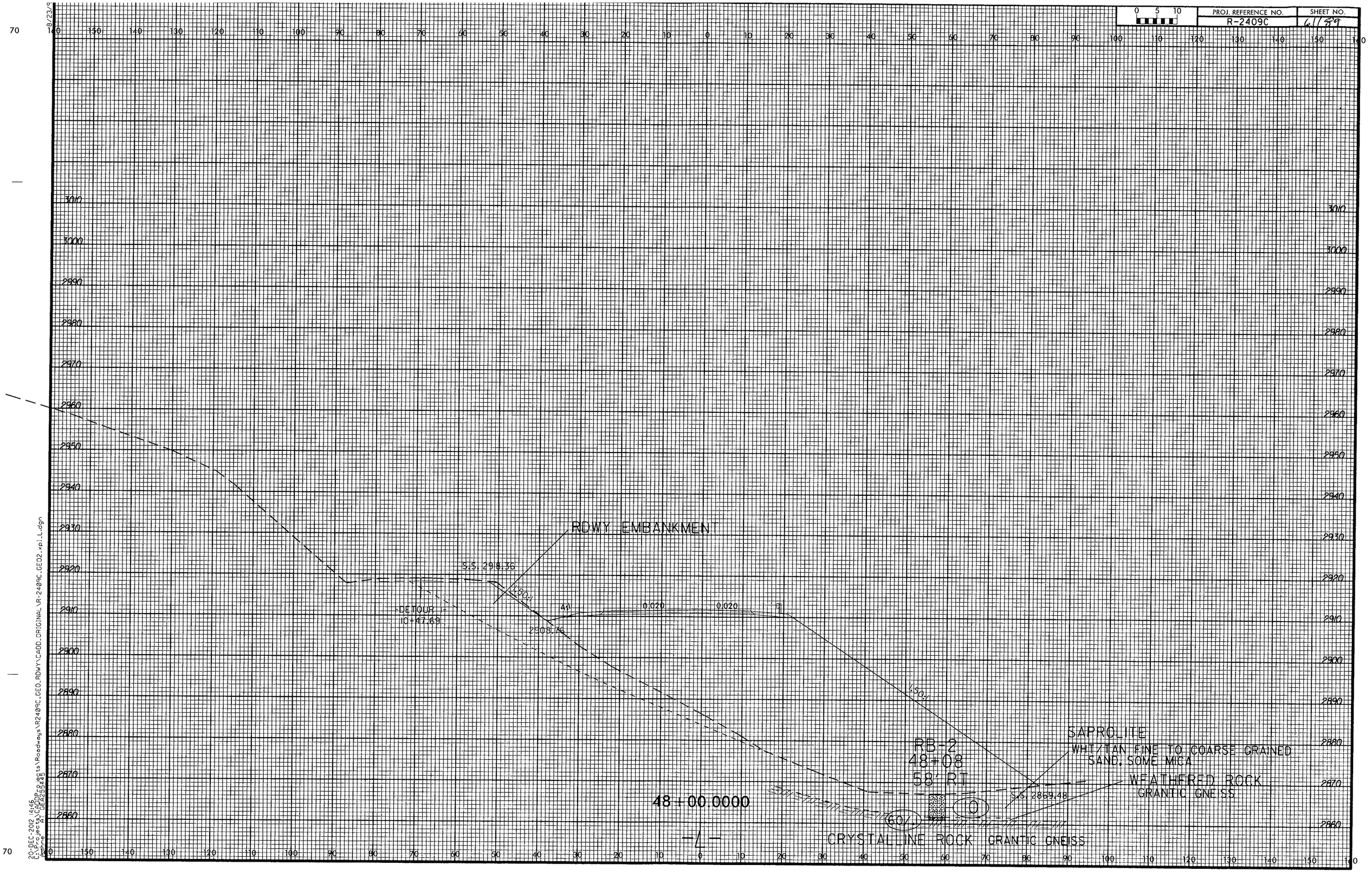
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
58/89
0 5 10
0.059
0.059
1.50:1
1.50:1
S.S. 2873.44
S.S. 283
43+50.0000
-L-
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830
2820



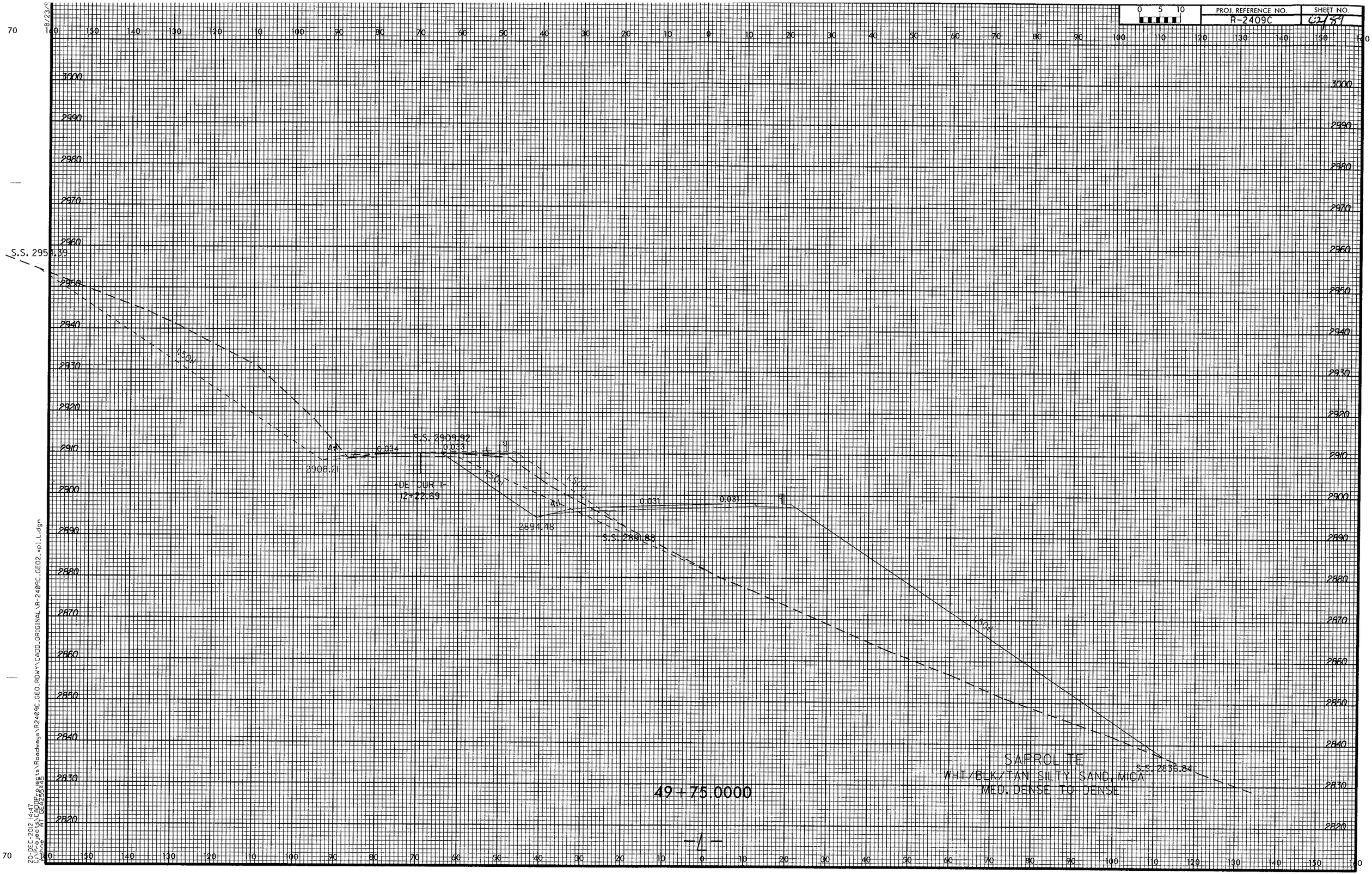
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
59/89
0 5 10
RW1-A
43+84
91' L
SAPROLITE
TAN/WHT SAND
S.S. 2802.23
60%
100+
CRYSTALLINE ROCK
GRANITIC GNEISS
0.047
0.047
1.50:1
1.50:1
RW2-A
43+65
15' RT
SAPROLITE
WHT/TAN FINE SAND W/ MICA
S.S. 2842.
5
8
7
60%
CRYSTALLINE ROCK
GRANITIC GNEISS
43+75.0000
-L-
2930
2920
2910
2900
2890
2880
2870
2860
2850
2840
2830



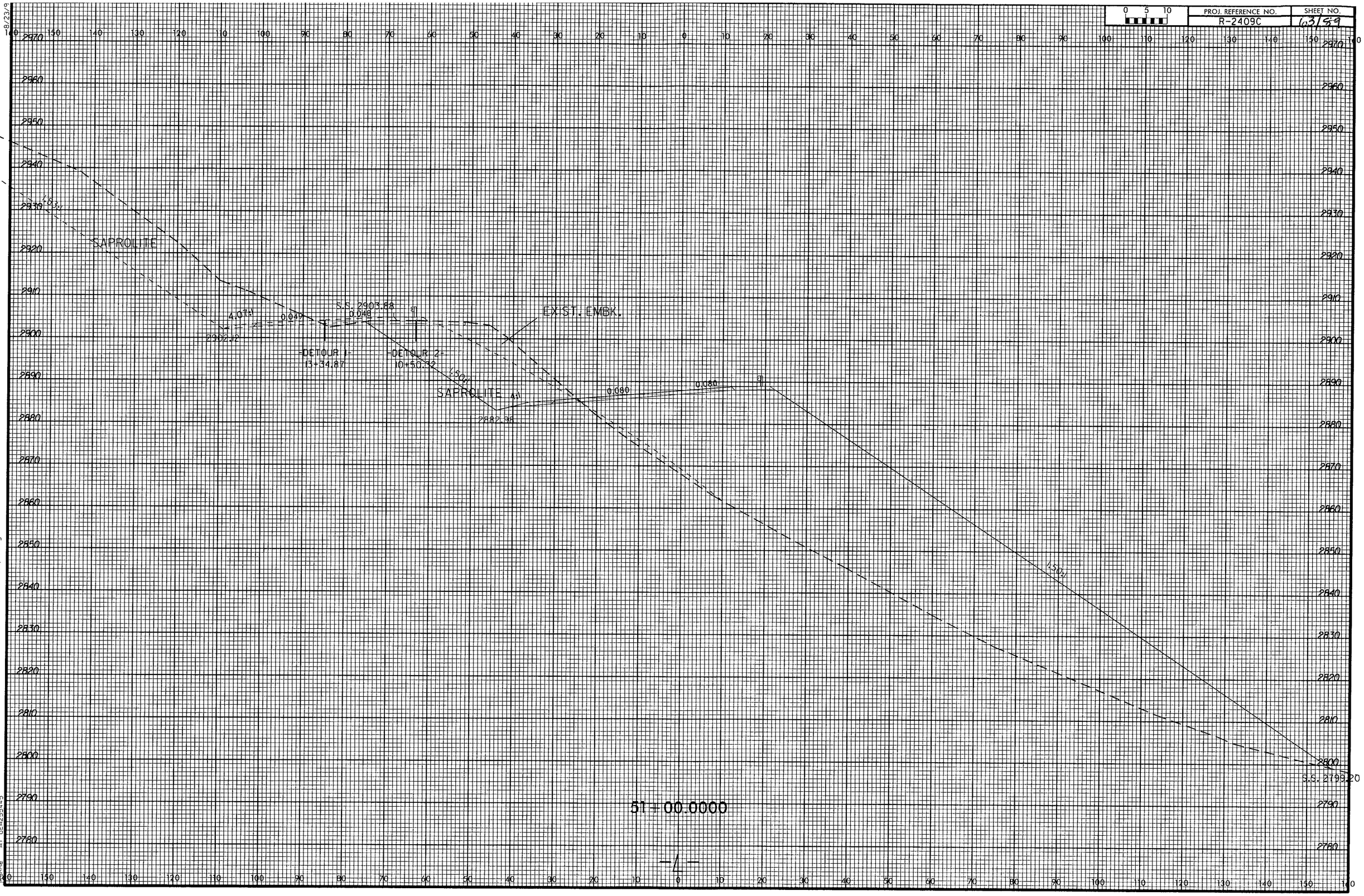
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
60/89
RB-4
44+34
21' LT
S.S. 2896.05
S.S. 2858.44
0.023
0.023
1.50:1
1.50:1
6
9
60/.1
SAPROLITE TAN/WHT/BLK SILTY SAND, SOME MICA
CRYSTALLINE ROCK
GRANITIC GNEISS
44+25.0000
S.S. 2889.91
S.S. 2850.78
0.035
0.035
1.50:1
1.50:1
44+00.0000
-L-



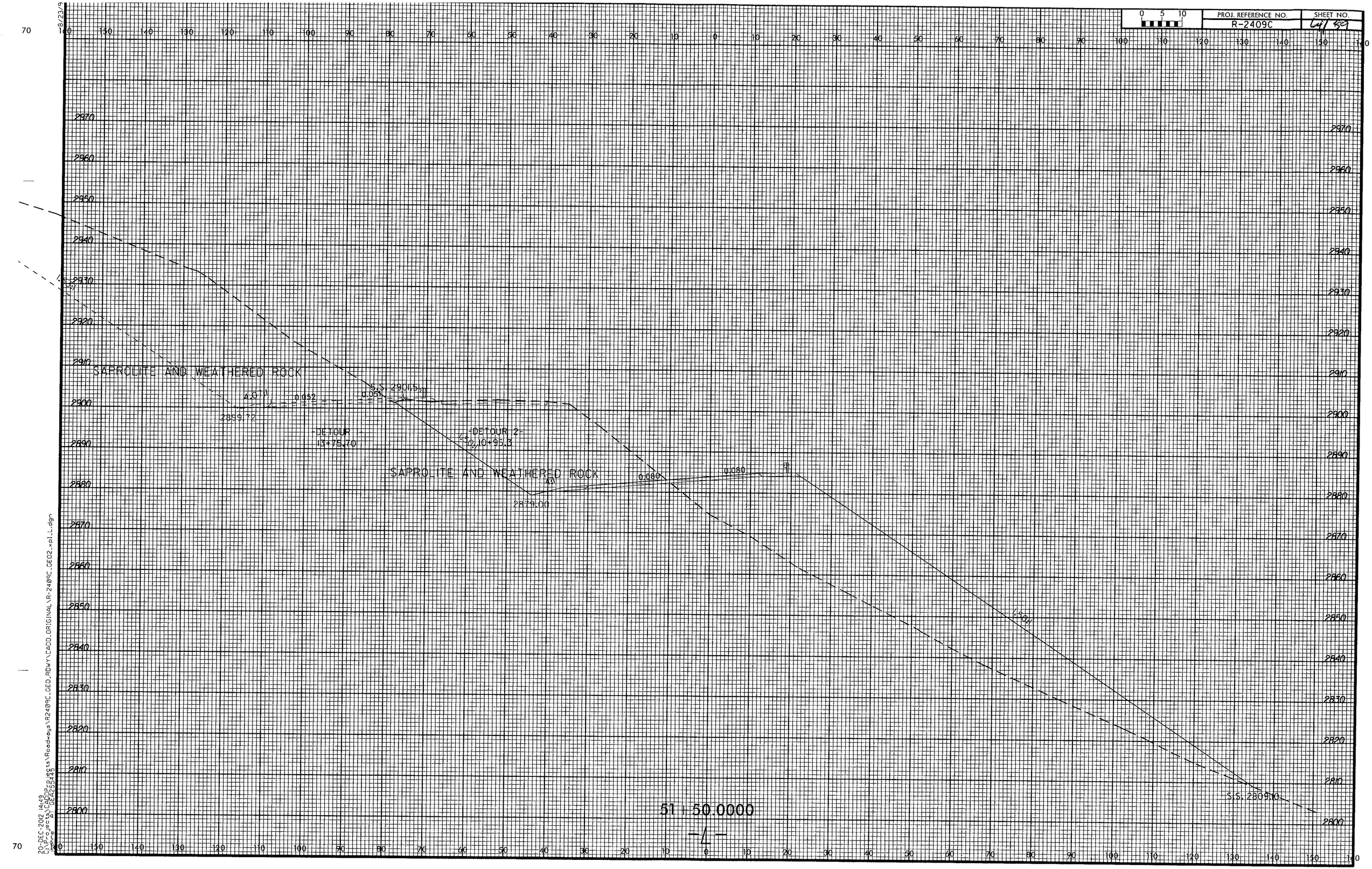
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
61/89
RDWY EMBANKMENT
S.S. 298.36
DETOUR
10+47.69
2908.76
4:1
0.020
0.020
1.50:1
RB-2
48+08
58' RT
SAPROLITE
WHT/TAN FINE TO COARSE GRAINED SAND, SOME MICA
WEATHERED ROCK
GRANTIC GNEISS
S.S. 2869.48
48+00.0000
CRYSTALLINE ROCK GRANTIC GNEISS



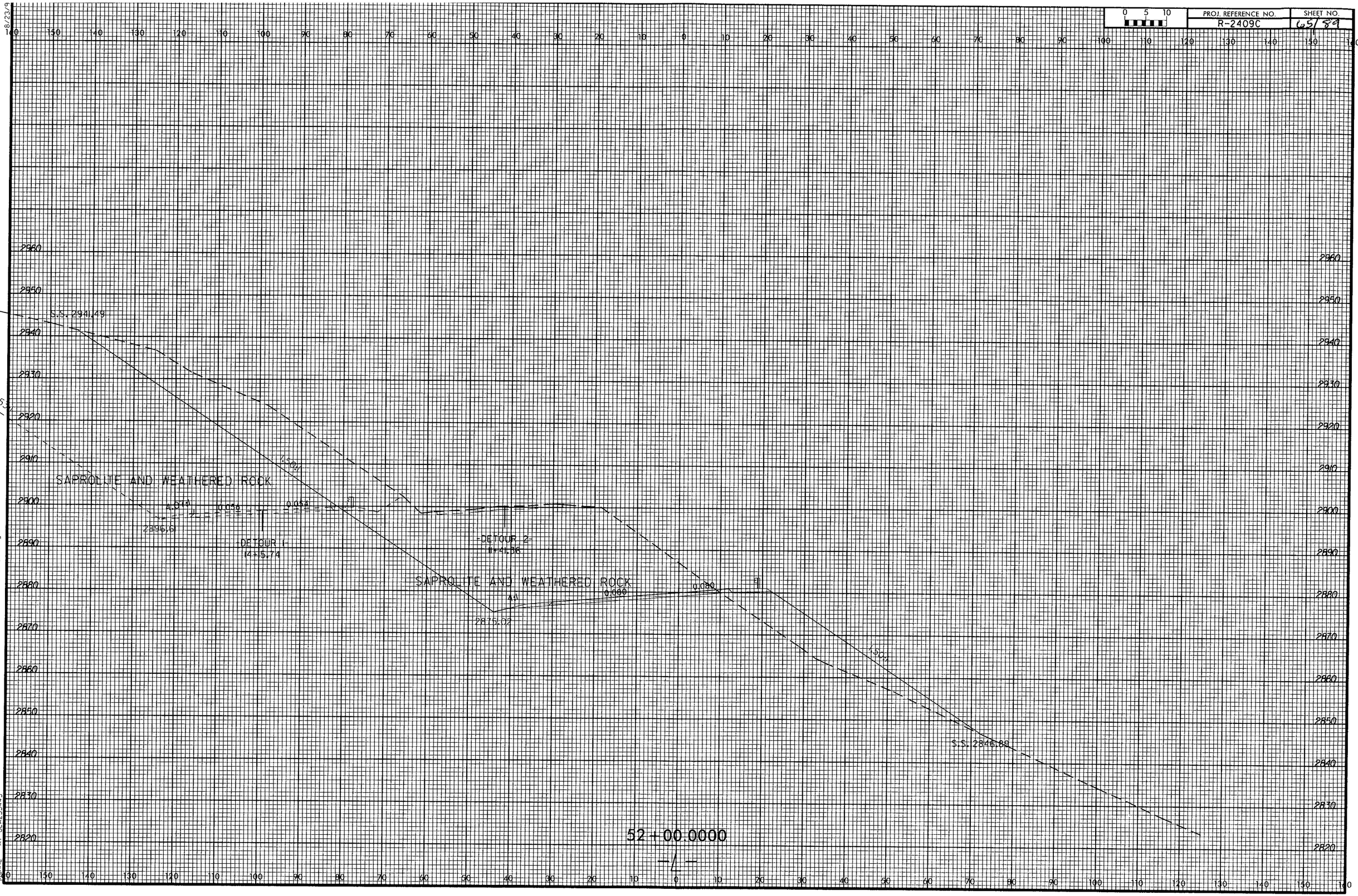
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
62/89
S.S. 2954.39
S.S. 2909.92
0.034
0.033
2908.21
-DETOUR 1-
12+22.69
2894.48
0.031
0.031
S.S. 2891.88
S.S. 2836.84
1.50:1
SAPROLITE
WHT/BLK/TAN SILTY SAND, MICA
MED. DENSE TO DENSE
49+75.0000
-L-



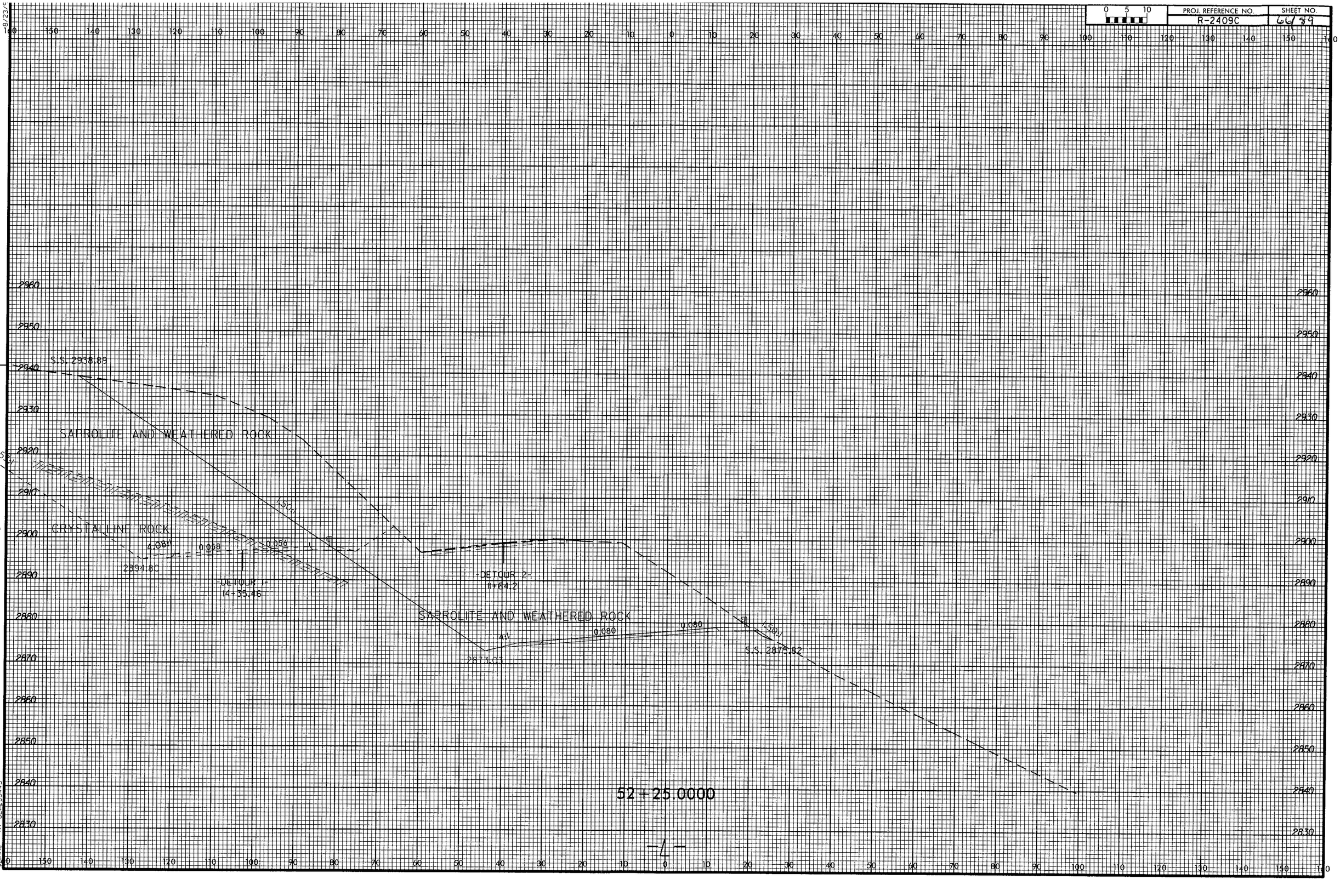
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
63/59
SAPROLITE
4.07:1
0.049
S.S. 2903.88
0.048
EXIST. EMBK.
2902.12
DETOUR 1
13+34.87
DETOUR 2
10+50.32
1.50:1
SAPROLITE
4:1
0.080
0.080
2882.98
1.50:1
S.S. 2799.20
51+00.0000
-L-



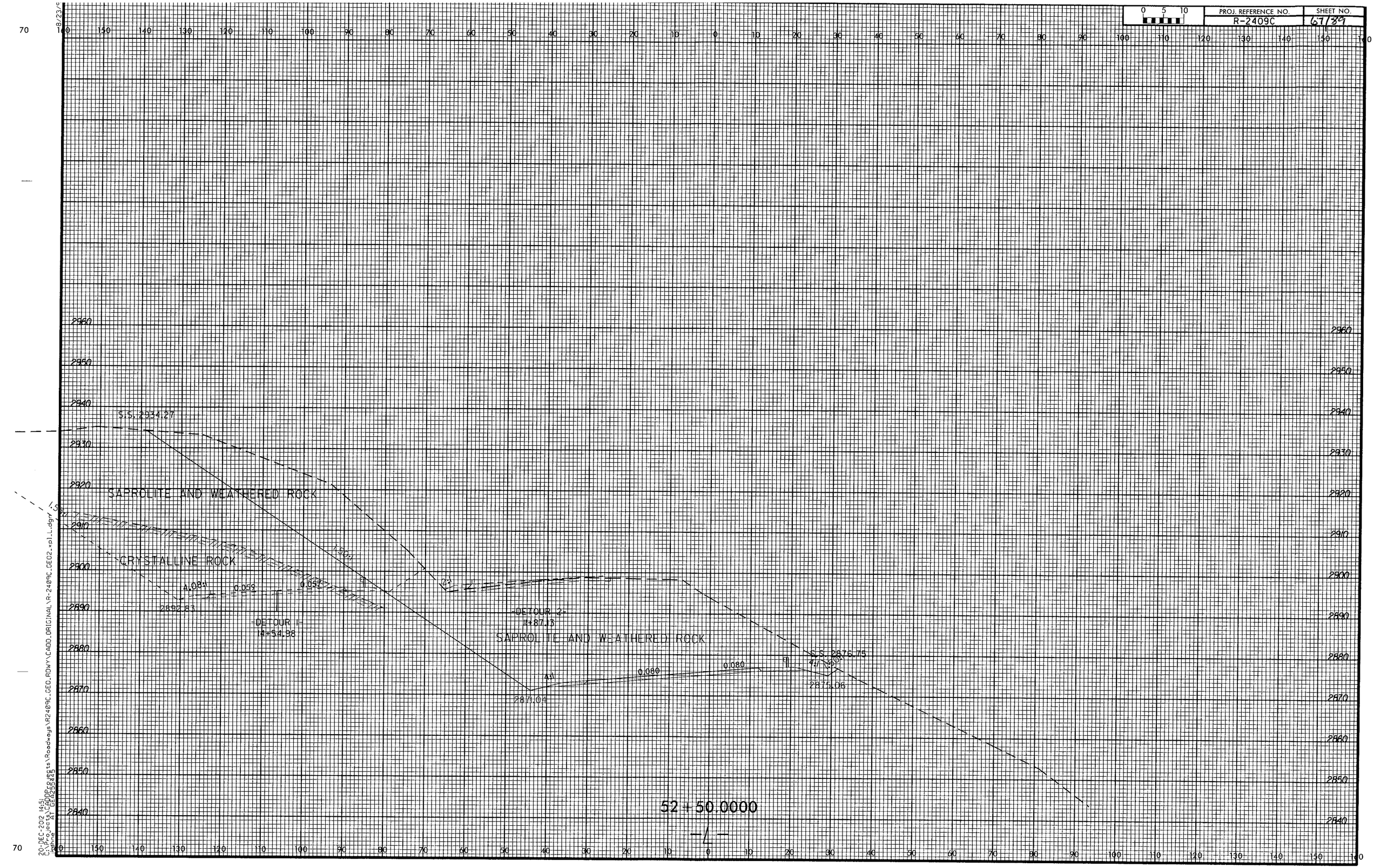
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
64/89
SAPROLITE AND WEATHERED ROCK
S.S. 2901.5
0.052
0.061
2899.72
-DETOUR 1-
13+75.70
-DETOUR 2-
10+95.3
SAPROLITE AND WEATHERED ROCK
0.080
0.080
2879.00
1.50:1
S.S. 2809.10
51 + 50.0000
-L-



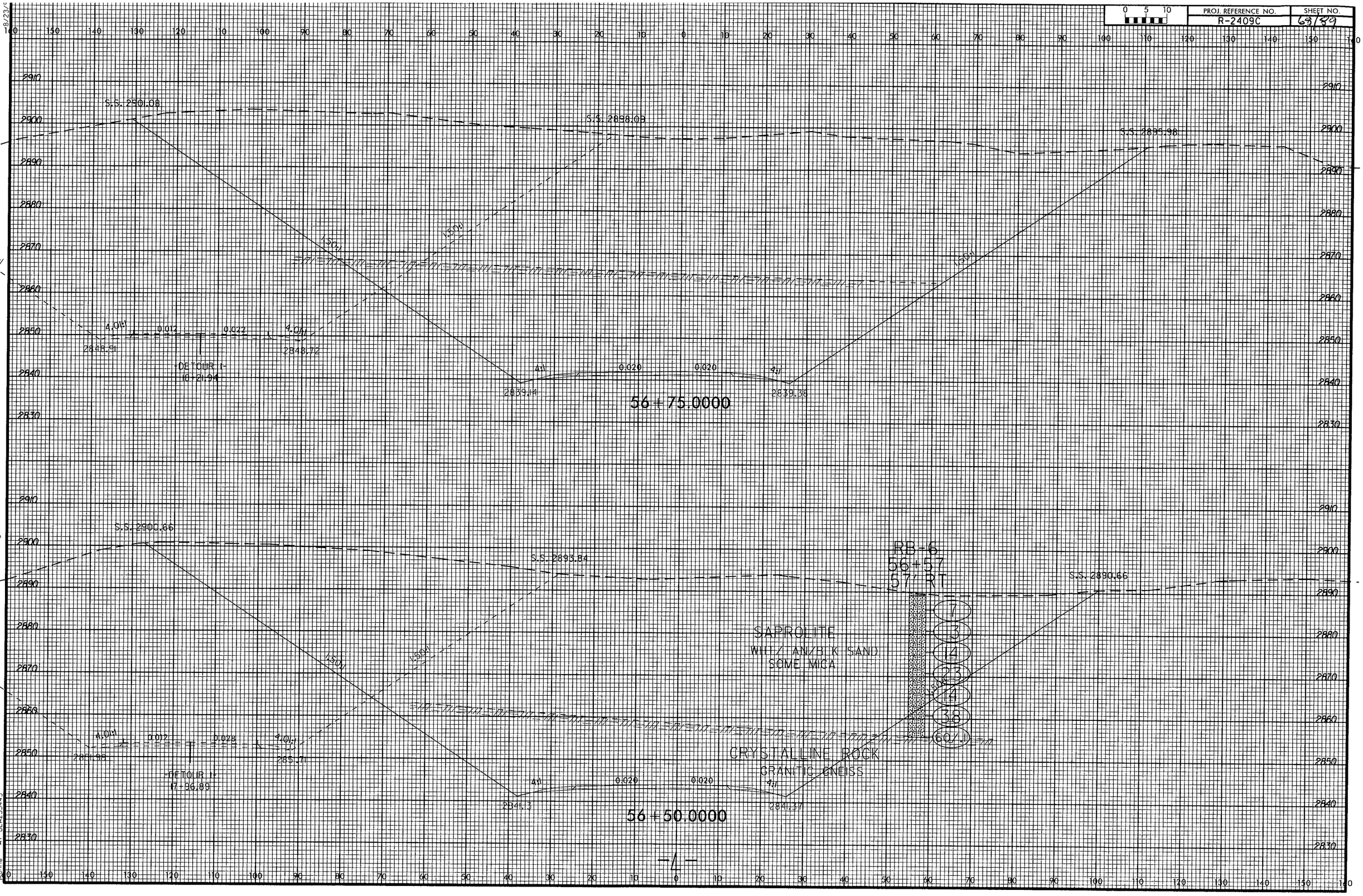
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
65/89
S.S. 2941.49
SAPROLITE AND WEATHERED ROCK
2896.61
DETOUR 1
14+15.74
DETOUR 2
11+41.36
SAPROLITE AND WEATHERED ROCK
2875.02
S.S. 2846.89
52+00.0000



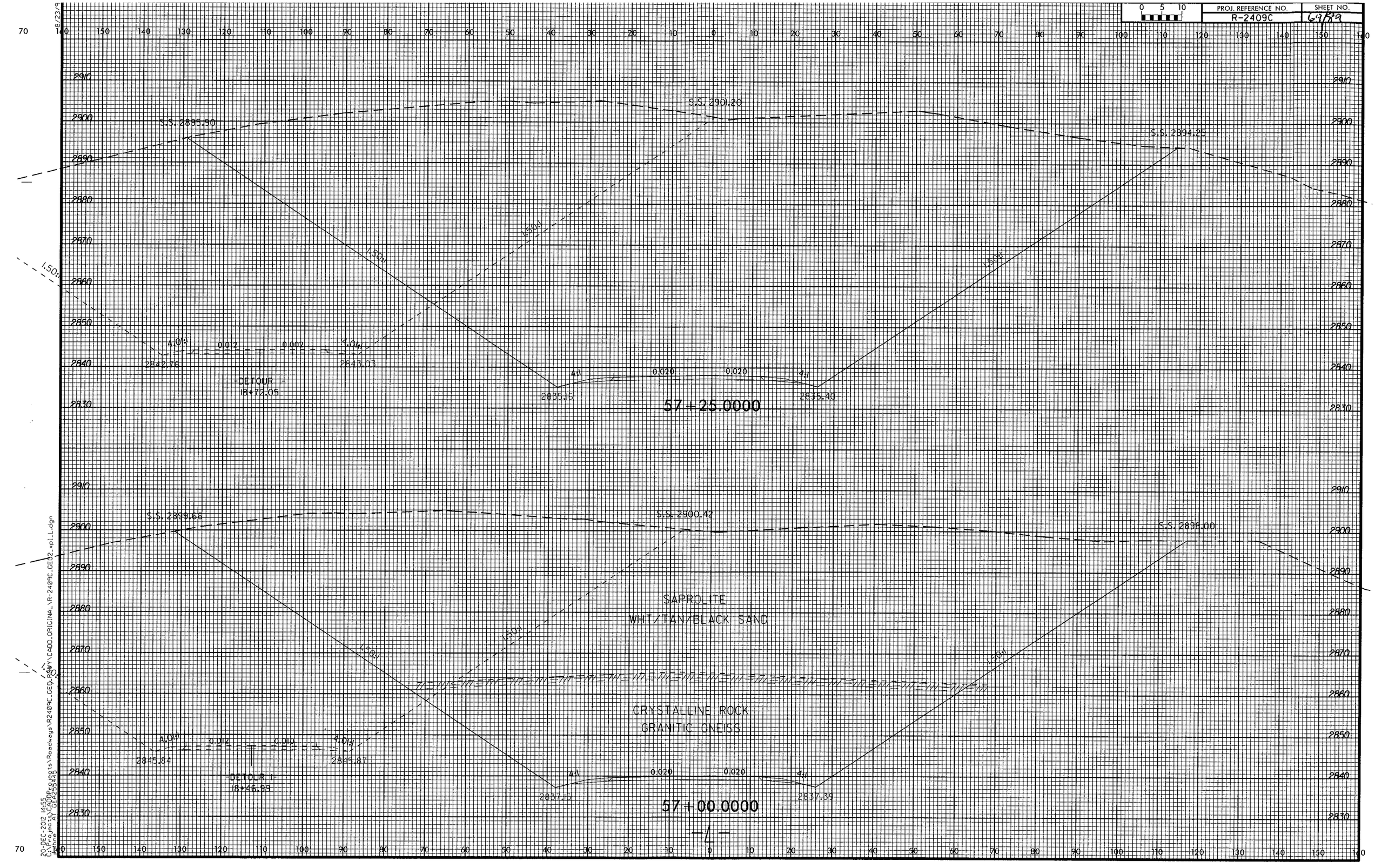
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
66/89
S.S. 2938.89
SAPROLITE AND WEATHERED ROCK
CRYSTALLINE ROCK
4.08:1
0.058
0.056
2894.80
-DETOUR 1-
14+35.46
1.50:1
-DETOUR 2-
11+64.2
SAPROLITE AND WEATHERED ROCK
4:1
0.080
0.080
2873.03
1.50:1
S.S. 2875.82
52+25.0000
-L-



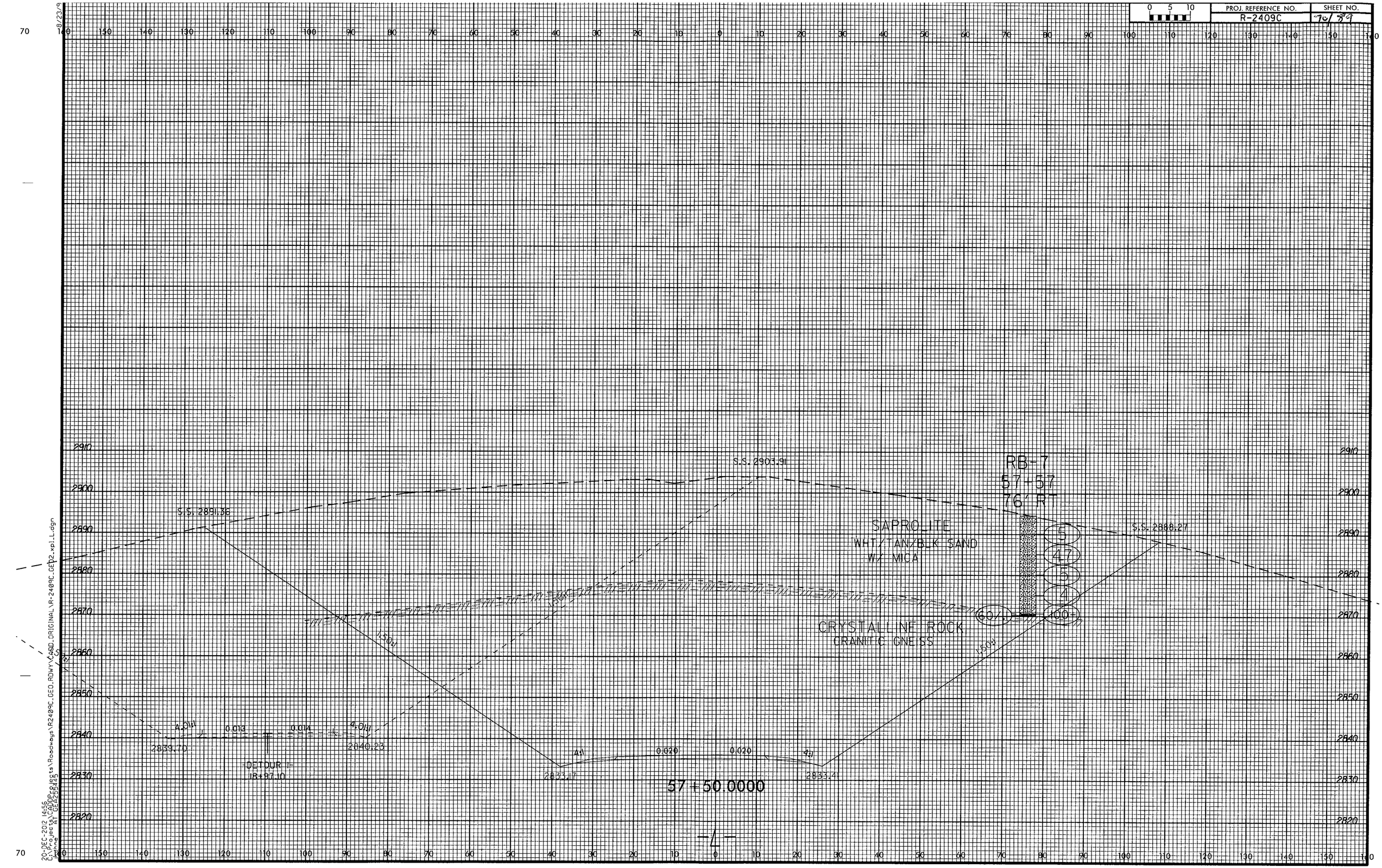
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
67/89
S.S. 2934.27
SAPROLITE AND WEATHERED ROCK
CRYSTALLINE ROCK
4.08:1
0.059
0.057
2892.83
-DETOUR 1-
14+54.98
-DETOUR 2-
11+87.13
SAPROLITE AND WEATHERED ROCK
0.080
0.080
2871.04
S.S. 2876.75
2875.06
52+50.0000



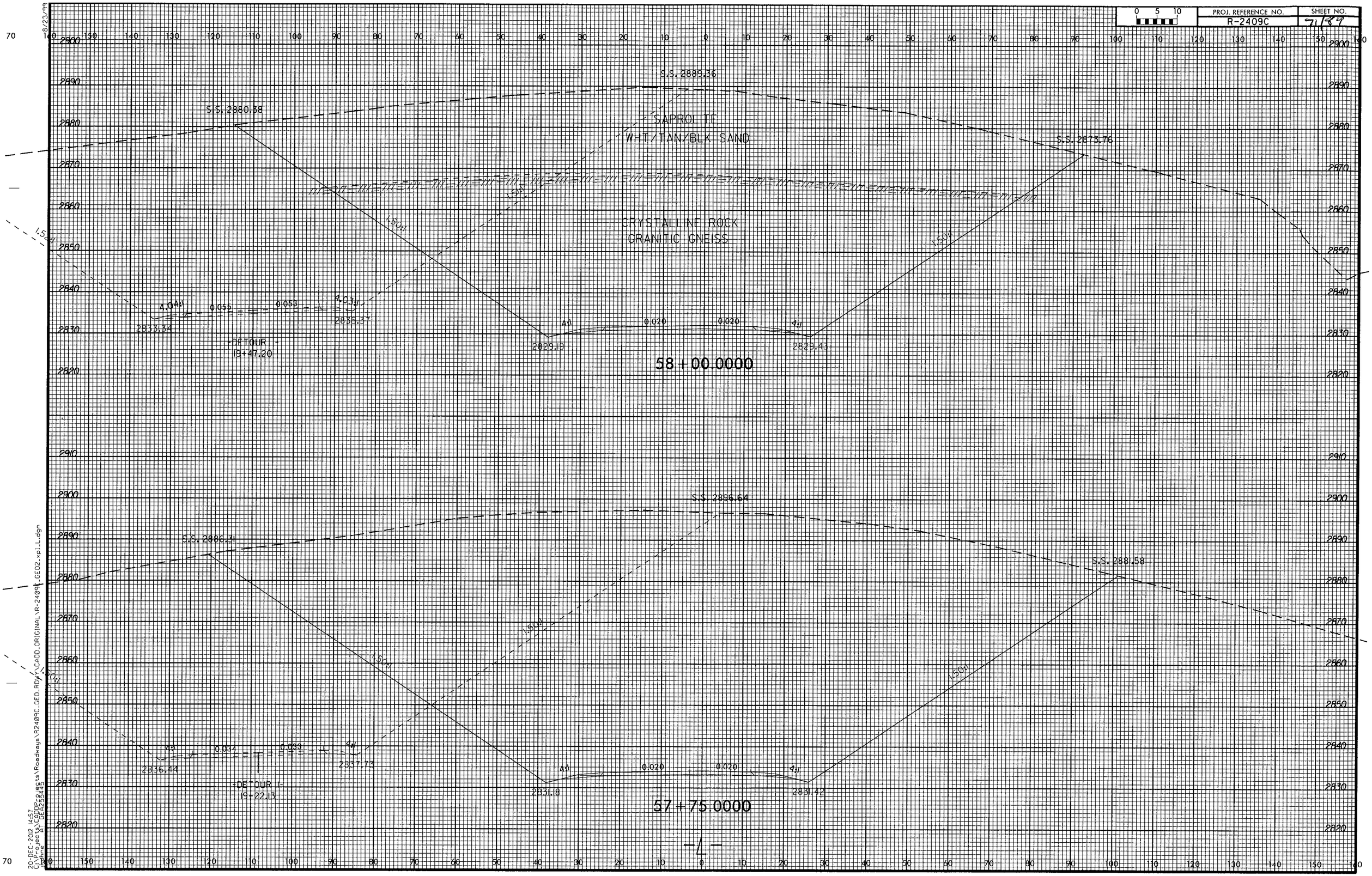
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
68/89
S.S. 2901.08
S.S. 2898.09
S.S. 2895.98
1.50:1
4.01:1
0.012
0.022
2848.91
2848.72
DETOUR 1
18+21.94
4:1
0.020
2839.14
2839.38
56+75.0000
S.S. 2900.66
S.S. 2893.84
S.S. 2890.66
RB-6
56+57
57' RT
SAPROLITE
WHT/ AN/BLK SAND
SOME MICA
CRYSTALLINE ROCK
GRANITIC GNEISS
7
3
14
23
14
38
60/.1
0.028
2851.98
2851.71
DETOUR 1
17+96.89
2841.3
2841.37
56+50.0000
-4-



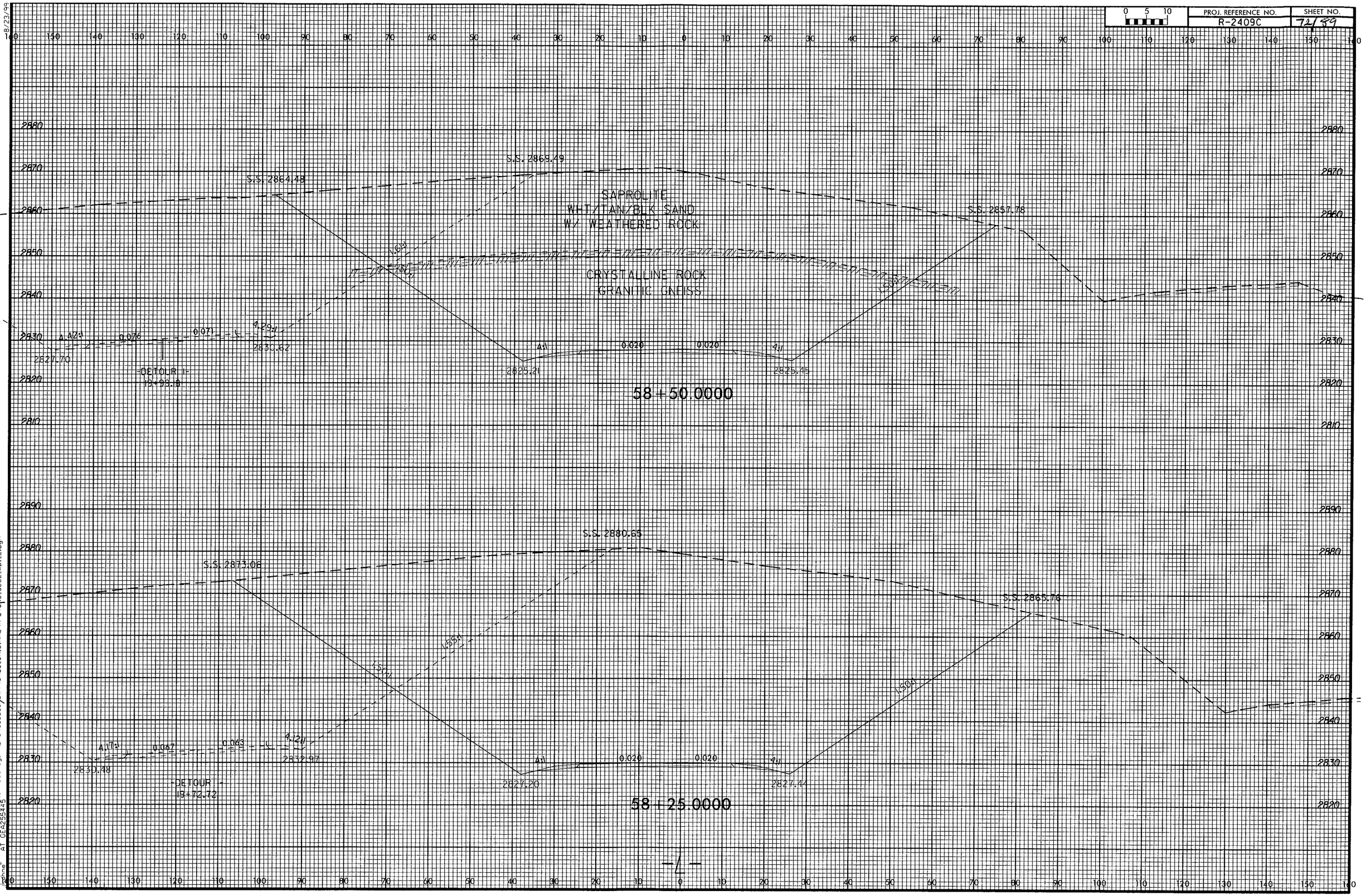
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
69/89
S.S. 2895.90
S.S. 2901.20
S.S. 2894.25
1.50:1
4.01:1
0.012
0.002
2842.76
2843.03
-DETOUR-
18+72.05
4:1
0.020
2835.16
2835.40
57+25.0000
S.S. 2899.66
S.S. 2900.42
S.S. 2898.00
SAPROLITE
WHT/TAN/BLACK SAND
CRYSTALLINE ROCK
GRANITIC GNEISS
0.010
2845.84
2845.87
-DETOUR-
18+46.99
2837.15
2837.39
57+00.0000
-L-



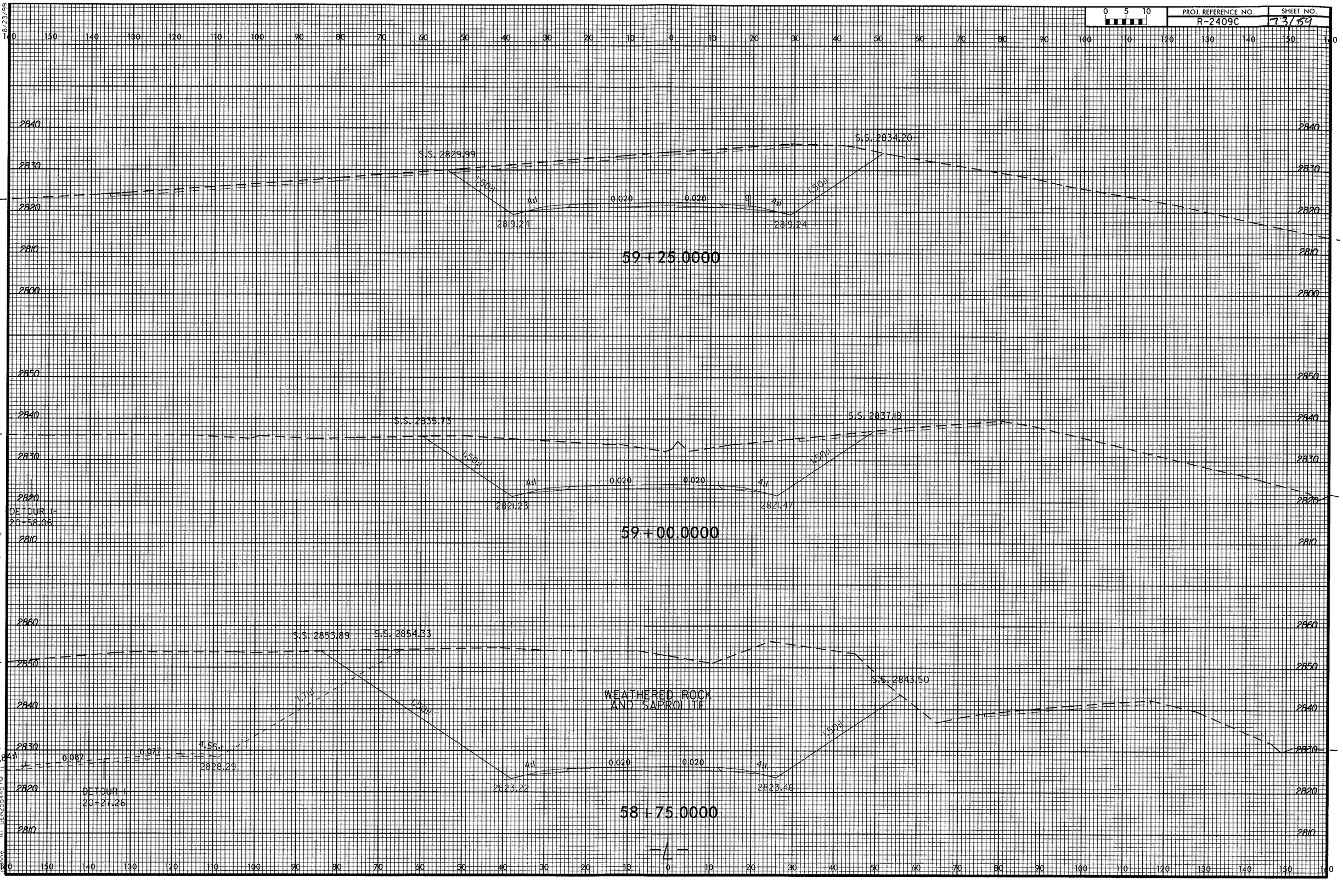
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
70/89
RB-7
57+57
76' RT
S.S. 2903.91
S.S. 2891.36
S.S. 2888.27
SAPROLITE
WHT/TAN/BLK SAND
W/ MICA
CRYSTALLINE ROCK
GRANITIC GNEISS
5
4.7
5
4
60/1
100+
1.50:1
4.01:1
0.013
0.014
2839.70
2840.23
DETOUR 1-
18+97.10
4:1
0.020
2833.17
2833.41
57+50.0000
-L-



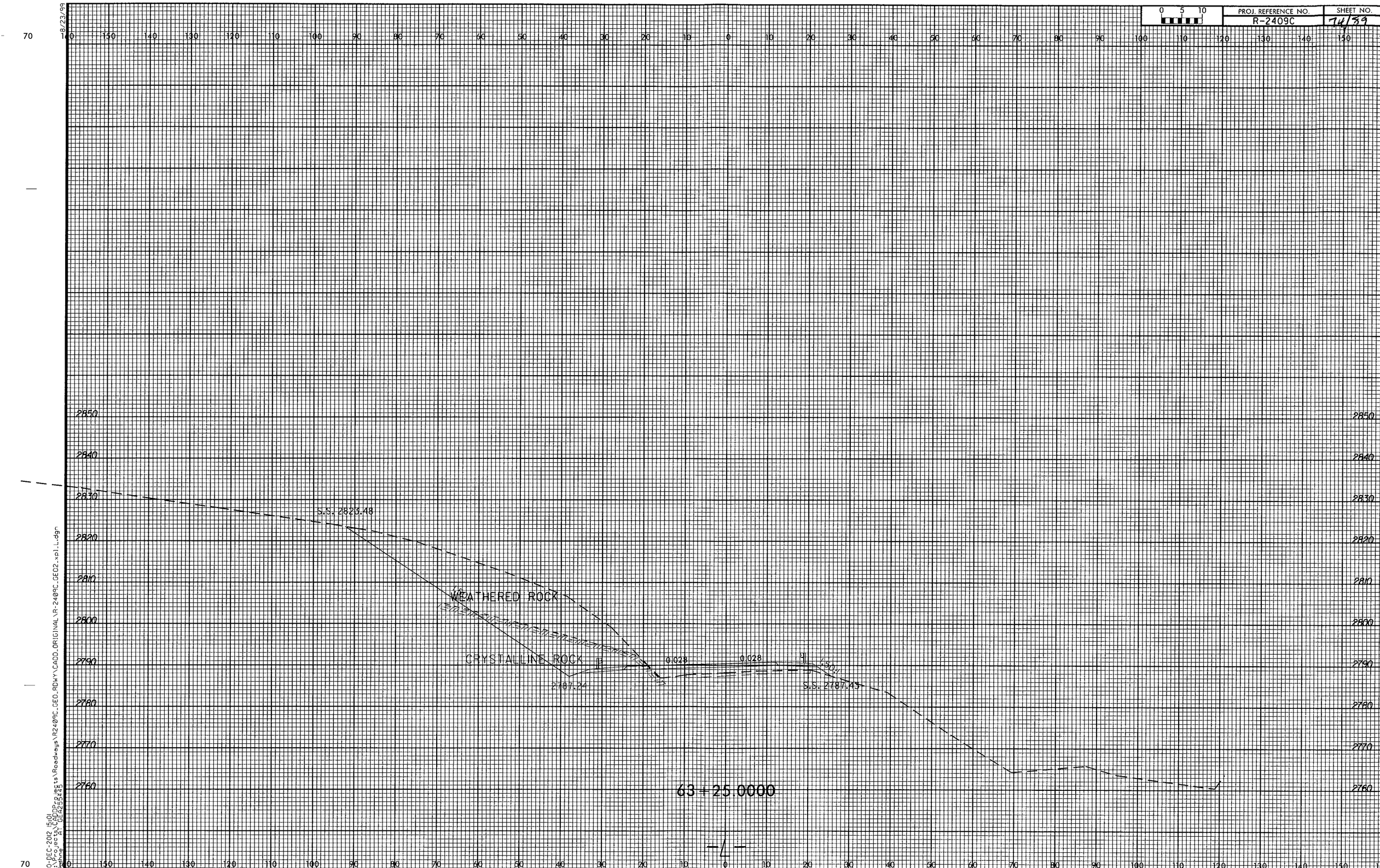
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
71/89
S.S. 2889.36
S.S. 2880.38
S.S. 2873.76
SAPROLITE
WHT/TAN/BLK SAND
CRYSTALLINE ROCK
GRANITIC GNEISS
1.50:1
4.04:1
0.055
0.053
4.03:1
2833.34
2835.37
DETOUR
19+47.20
4:1
0.020
0.020
2829.19
2829.43
58+00.0000
S.S. 2896.64
S.S. 2886.31
S.S. 2881.58
0.034
0.033
2836.44
2837.73
DETOUR
19+22.13
2831.18
2831.42
57+75.0000
-L-



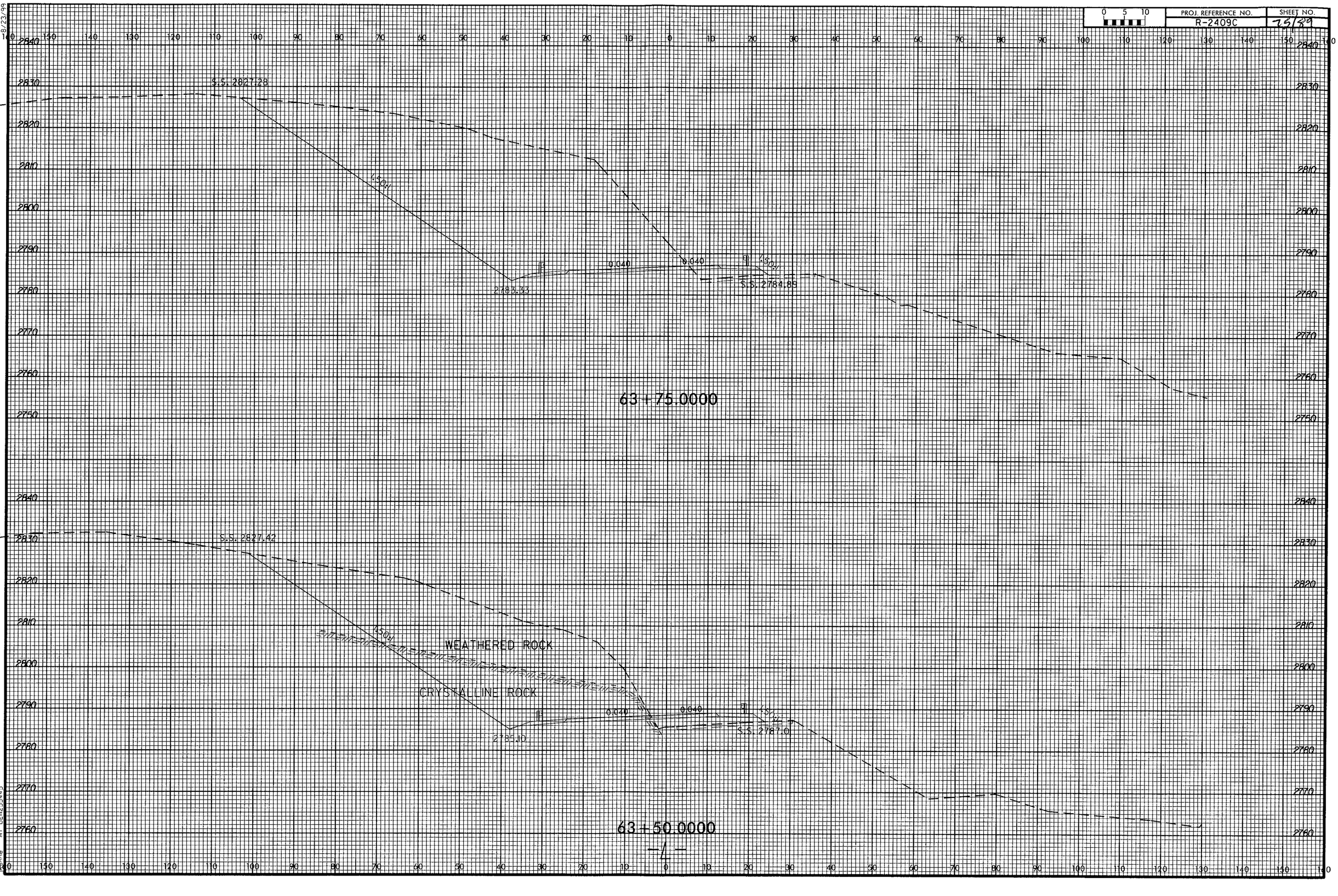
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
72/89
SAPROLITE
WHT/TAN/BLK SAND
W/ WEATHERED ROCK
CRYSTALLINE ROCK
GRANITIC GNEISS
S.S. 2864.48
S.S. 2869.49
S.S. 2857.78
2827.70
2830.62
2825.21
2825.45
DETOUR 1
19+99.8
58+50.0000
S.S. 2873.06
S.S. 2880.65
S.S. 2865.76
2830.48
2832.97
2827.20
2827.44
DETOUR
19+72.72
58+25.0000
-L-



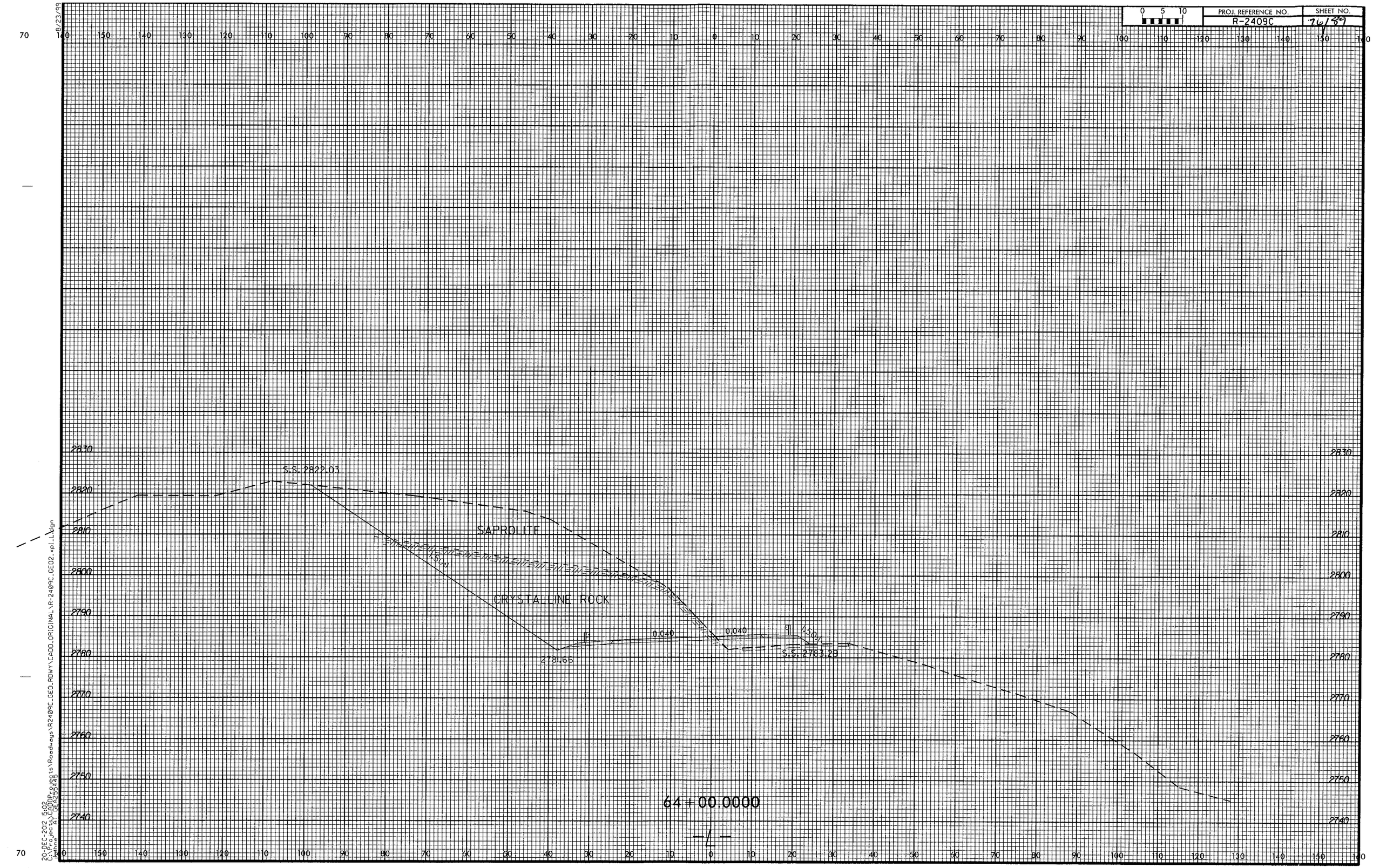
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
73/59
0 5 10
S.S. 2829.99
S.S. 2834.20
1.50:1
4:1
0.020
0.020
4:1
1.50:1
2819.24
2819.24
59+25.0000
S.S. 2835.73
S.S. 2837.18
1.50:1
4:1
0.020
0.020
4:1
1.50:1
2821.23
2821.47
DETOUR I-
20+58.06
59+00.0000
S.S. 2853.89
S.S. 2854.33
S.S. 2843.50
WEATHERED ROCK
AND SAPROLITE
1.71:1
1.50:1
1.50:1
4.84:1
0.082
0.077
4.56:1
2828.29
2824.92
DETOUR I
20+27.26
4:1
0.020
0.020
4:1
2823.22
2823.46
58+75.0000
-L-



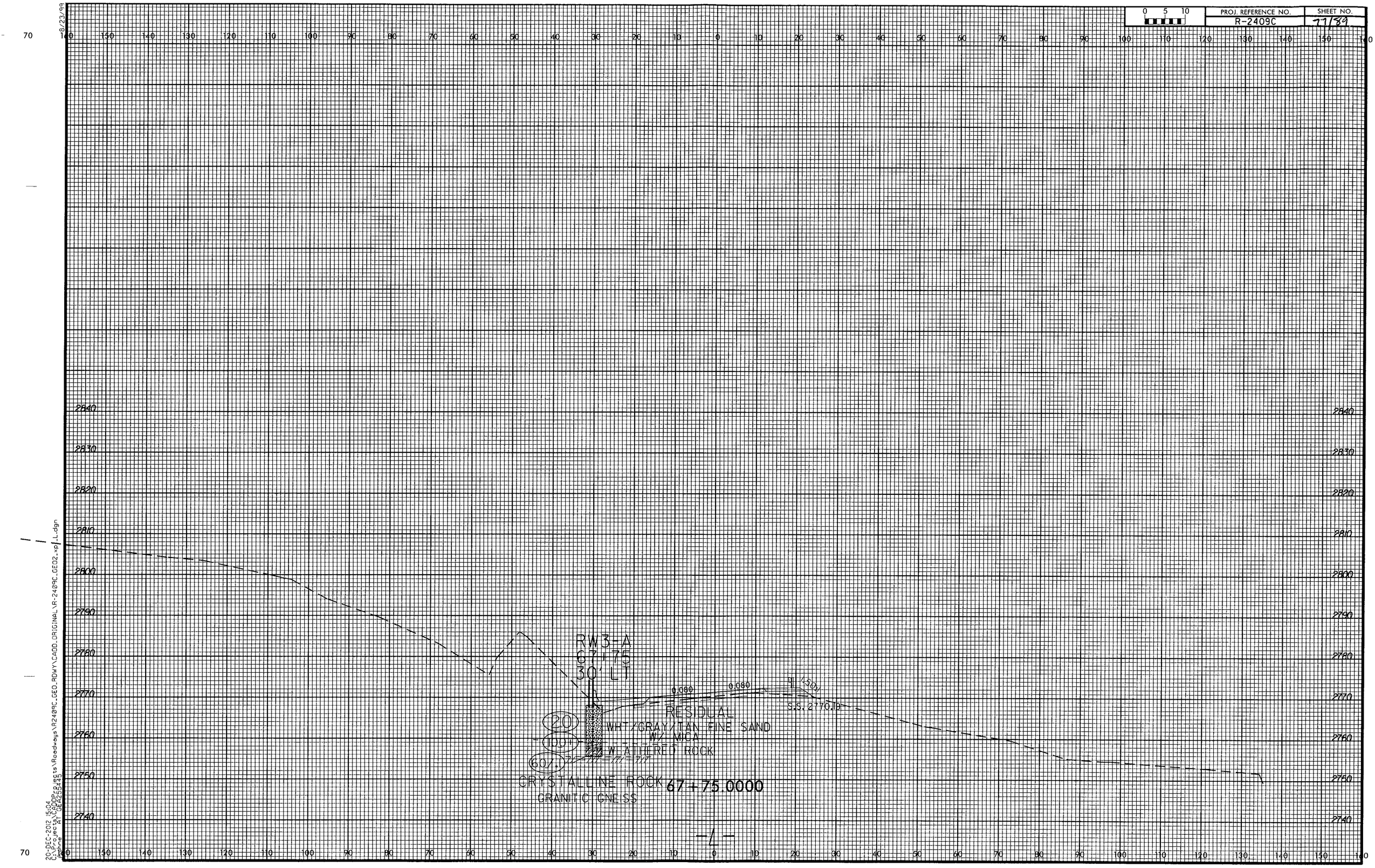
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
74/89
0 5 10
S.S. 2823.48
WEATHERED ROCK
CRYSTALLINE ROCK
0.028
0.028
2787.24
S.S. 2787.43
63+25.0000
-L-
2850
2840
2830
2820
2810
2800
2790
2780
2770
2760



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
75/89
S.S. 2827.28
1.50:1
0.040
0.040
1.50:1
2783.33
S.S. 2784.89
63+75.0000
S.S. 2827.42
1.50:1
WEATHERED ROCK
CRYSTALLINE ROCK
0.040
0.040
1.50:1
2785.10
S.S. 2787.0
63+50.0000
-4-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
76/89
S.S. 2822.03
SAPROLITE
CRYSTALLINE ROCK
0.040
0.040
2781.65
S.S. 2783.29
64+00.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
77/89
RW3-A
67+75
30' LT
0.080
0.080
1.50±
S.S. 2770.19
RESIDUAL
WHT/GRAY/TAN FINE SAND
W/ MICA
WEATHERED ROCK
20
100+
60/.1
CRYSTALLINE ROCK
GRANITIC GNEISS
67+75.0000
-4-

8/23/99

PROJ. REFERENCE NO. R-2409C

SHEET NO. 13/89

RW3-B
68+19
20' LT

0.060 0.060

S.S. 2769.77

RESIDUAL
WHT/TAN/GRAY
FINE SAND W/ MICA

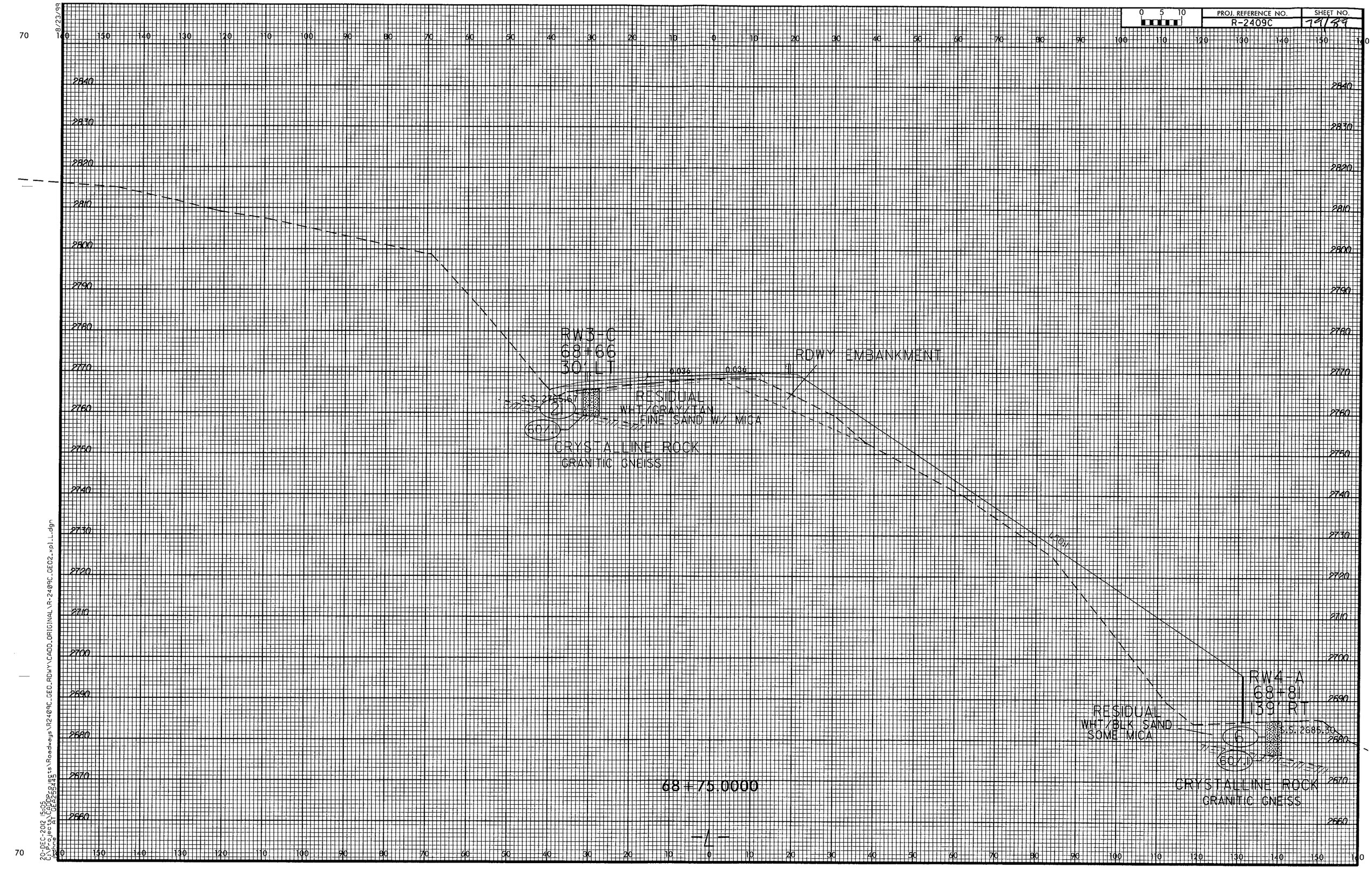
26
39

CRYSTALLINE ROCK
GRANITIC GNEISS

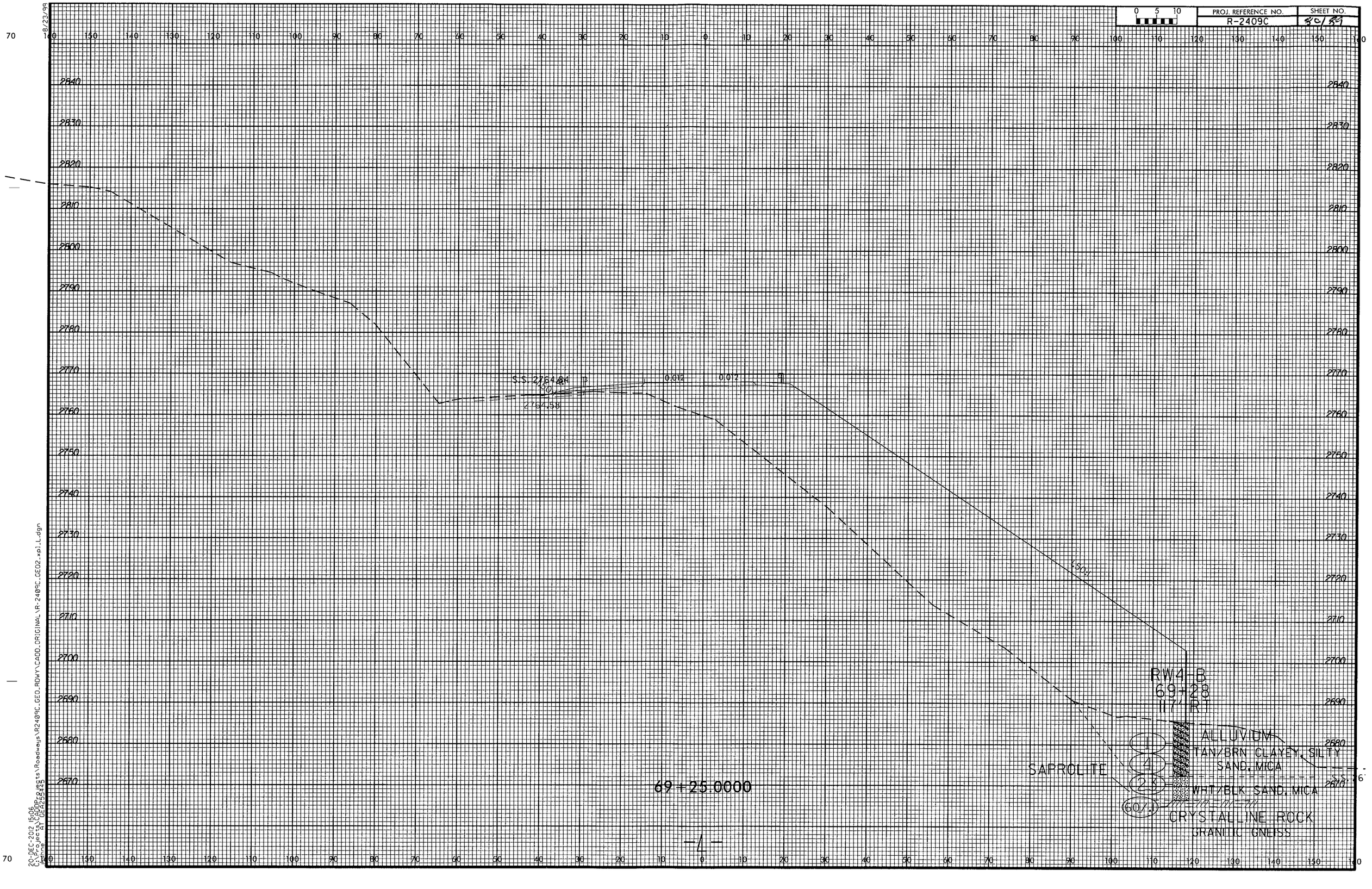
68+25.0000
-L-

2840 2830 2820 2810 2800 2790 2780 2770 2760 2750 2740 2730 2720 2710

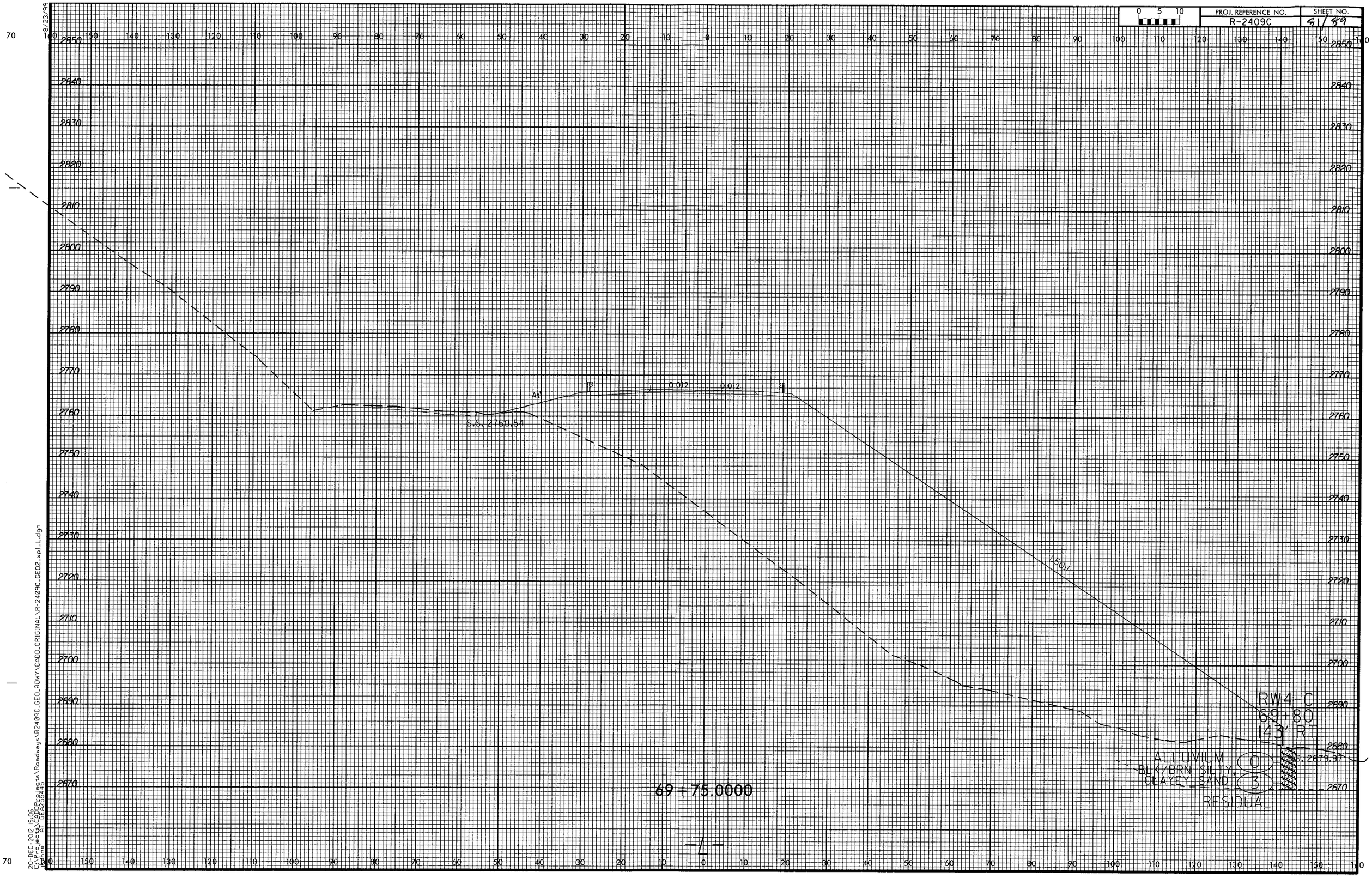
20-DEC-2012 15:04
C:\Projects\Projects\Roadways\R2409C_GEO_RDWY\CADD_ORIGINAL\R-2409C_GE02_xpl_L.dgn



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
79/89
RW3-C
68+66
30' LT
RDWY EMBANKMENT
0.036
0.036
S.S. 2765.67
21
60/.1
RESIDUAL
WHT/GRAY/TAN
FINE SAND W/ MICA
CRYSTALLINE ROCK
GRANITIC GNEISS
1.50:1
RW4-A
68+81
139' RT
RESIDUAL
WHT/BLK SAND
SOME MICA
6
S.S. 2685.30
60/.1
CRYSTALLINE ROCK
GRANITIC GNEISS
68+75.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
0 5 10
S.S. 2764.84
2764.58
0.012
0.012
69+25.0000
RW4-B
69+28
117' RT
ALLUVIUM
TAN/BRN CLAYEY, SILTY SAND, MICA
WHT/BLK SAND, MICA
SAPROLITE
CRYSTALLINE ROCK
GRANITIC GNEISS
-L-



20-DEC-2012 15:06
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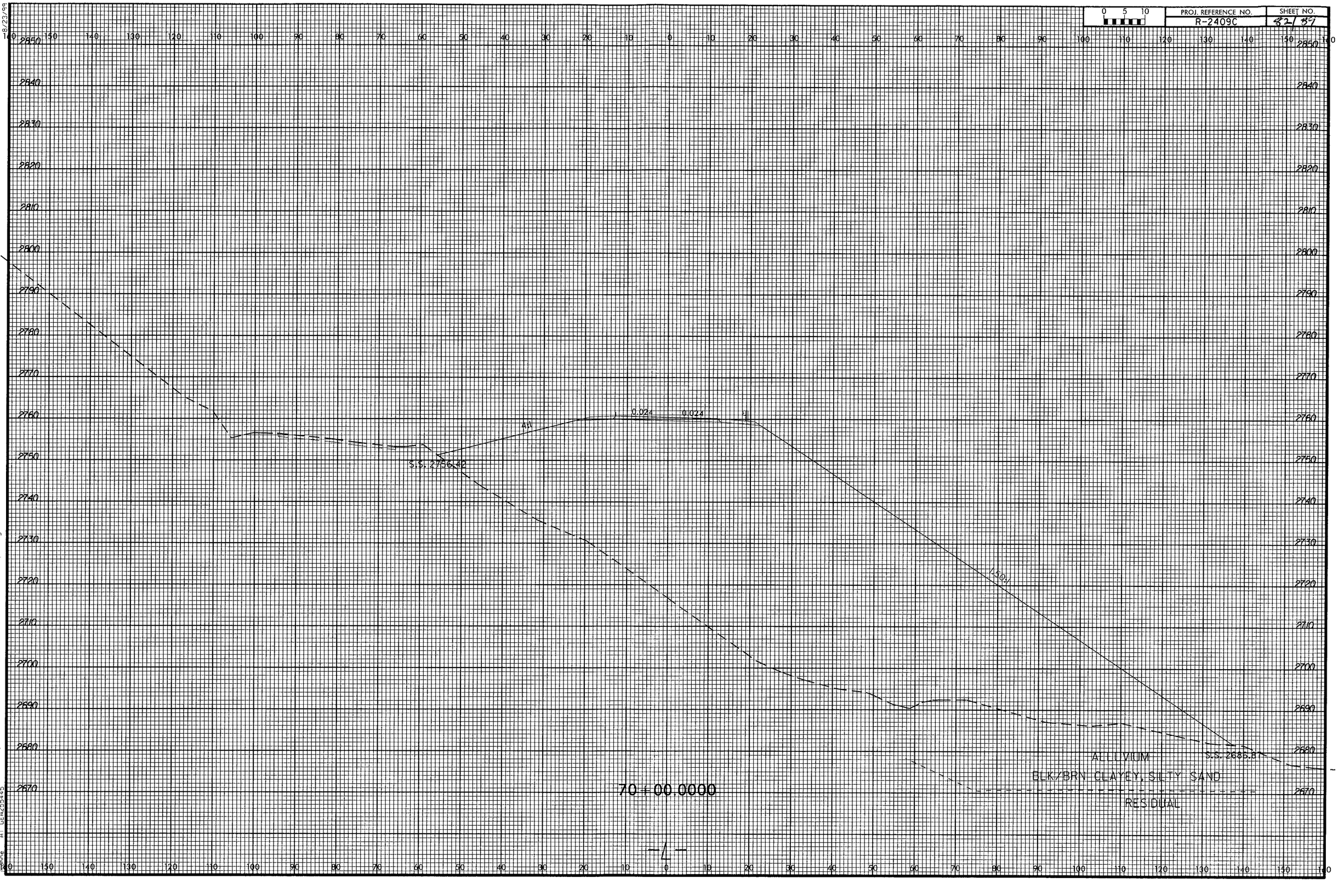
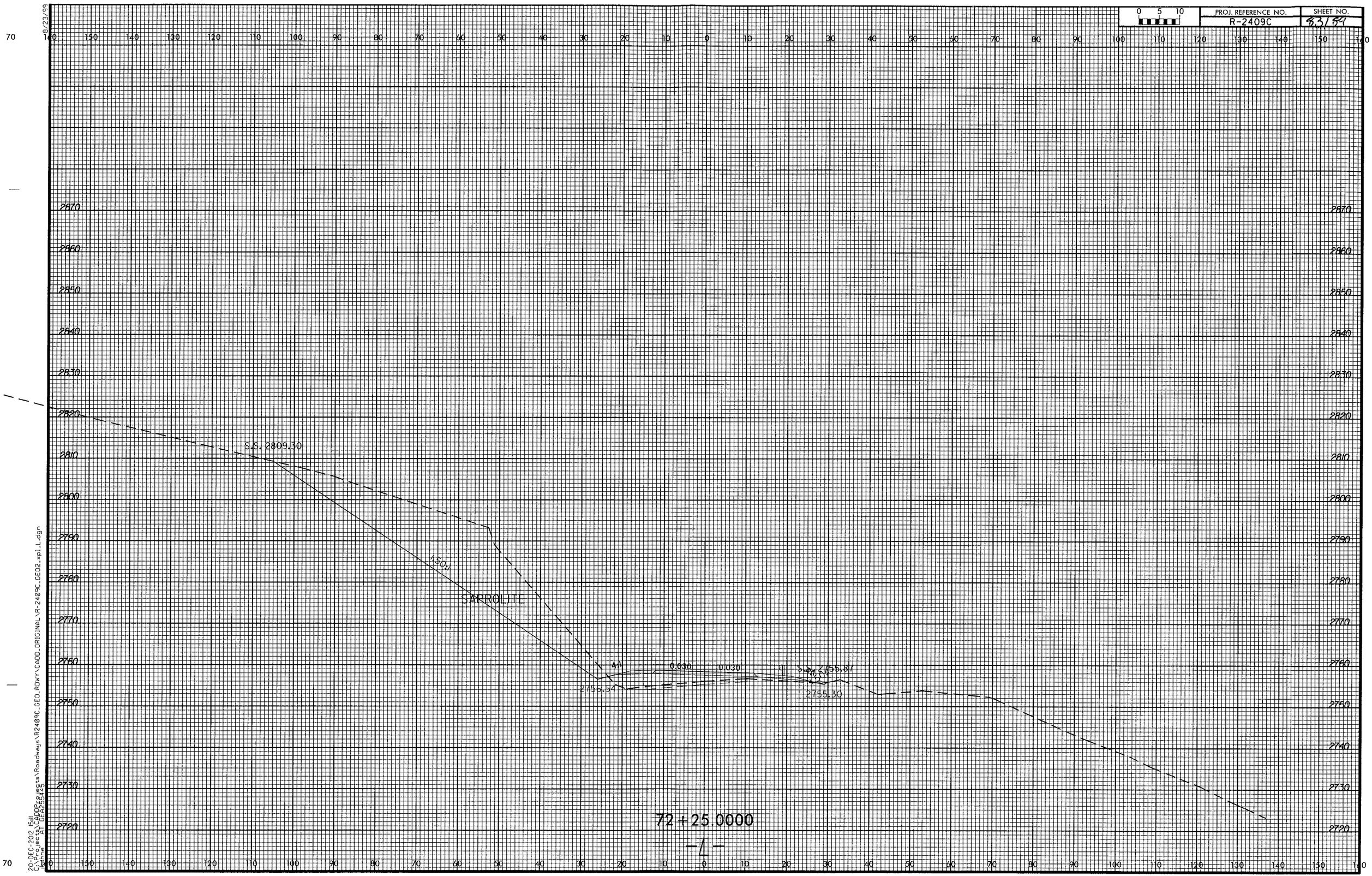
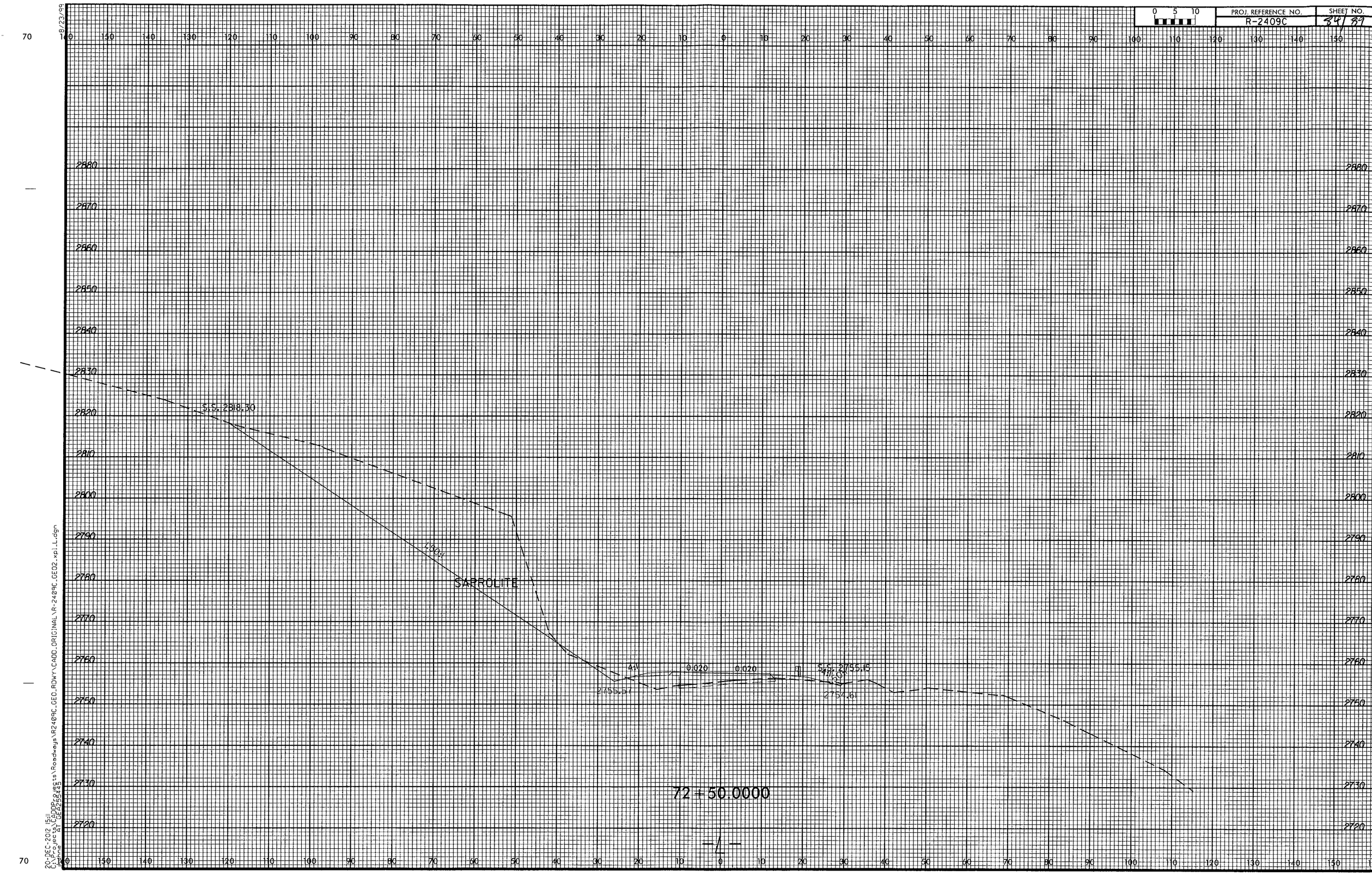
Kohne AT GEA255445



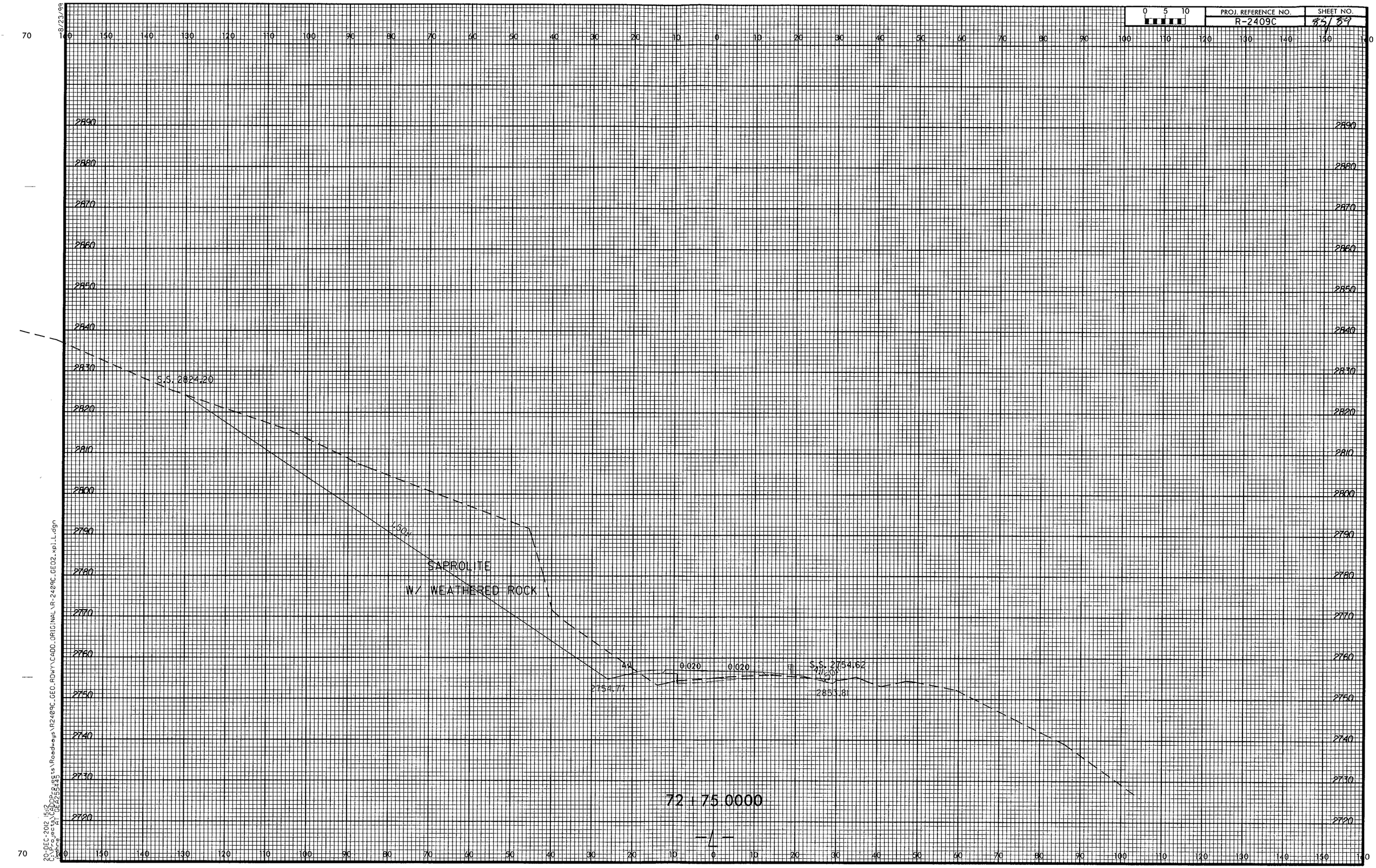
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
82/89
0 5 10
S.S. 2756.42
4:1
0.024
0.024
1.50:1
S.S. 2685.87
ALLUVIUM
BLK/BRN CLAYEY, SILTY SAND
RESIDUAL
70+00.0000
-L-
20-DEC-2012 15:08
C:\Projects\CADDProjects\Roadways\R2409C_GEO_RDWY\CADD_ORIGINAL\R-2409C_GEO2_xpl_L.dgn



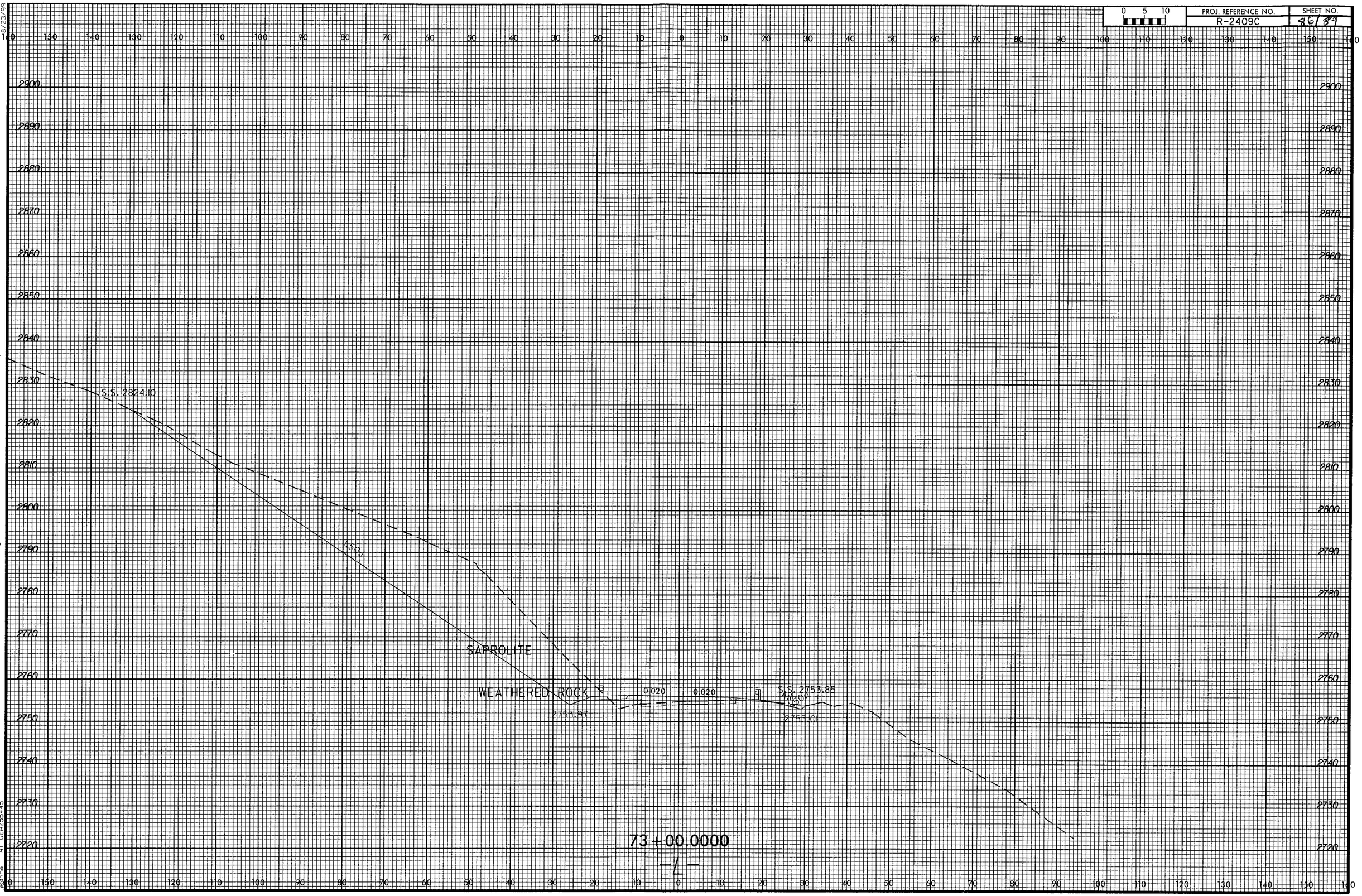
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
83/84
0 5 10
S.S. 2809.30
1.50:1
SARROLITE
4:1
0.030
0.030
2755.87
2756.54
2755.30
72 + 25.0000
-L-



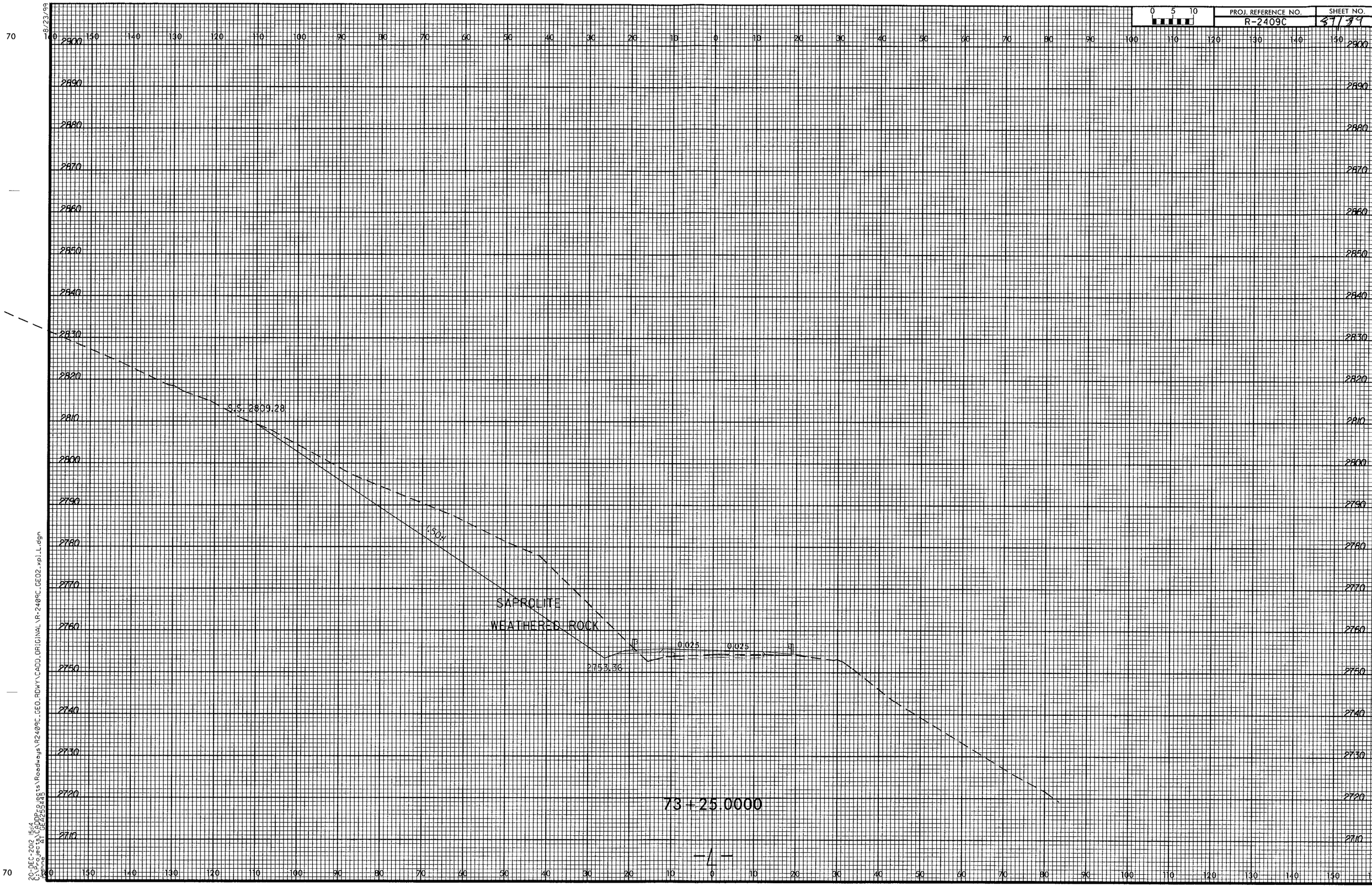
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
84/89
S.S. 2818.30
SAPROLITE
4:1
0.020
0.020
S.S. 2755.15
2755.57
2754.61
72 + 50.0000
-L-



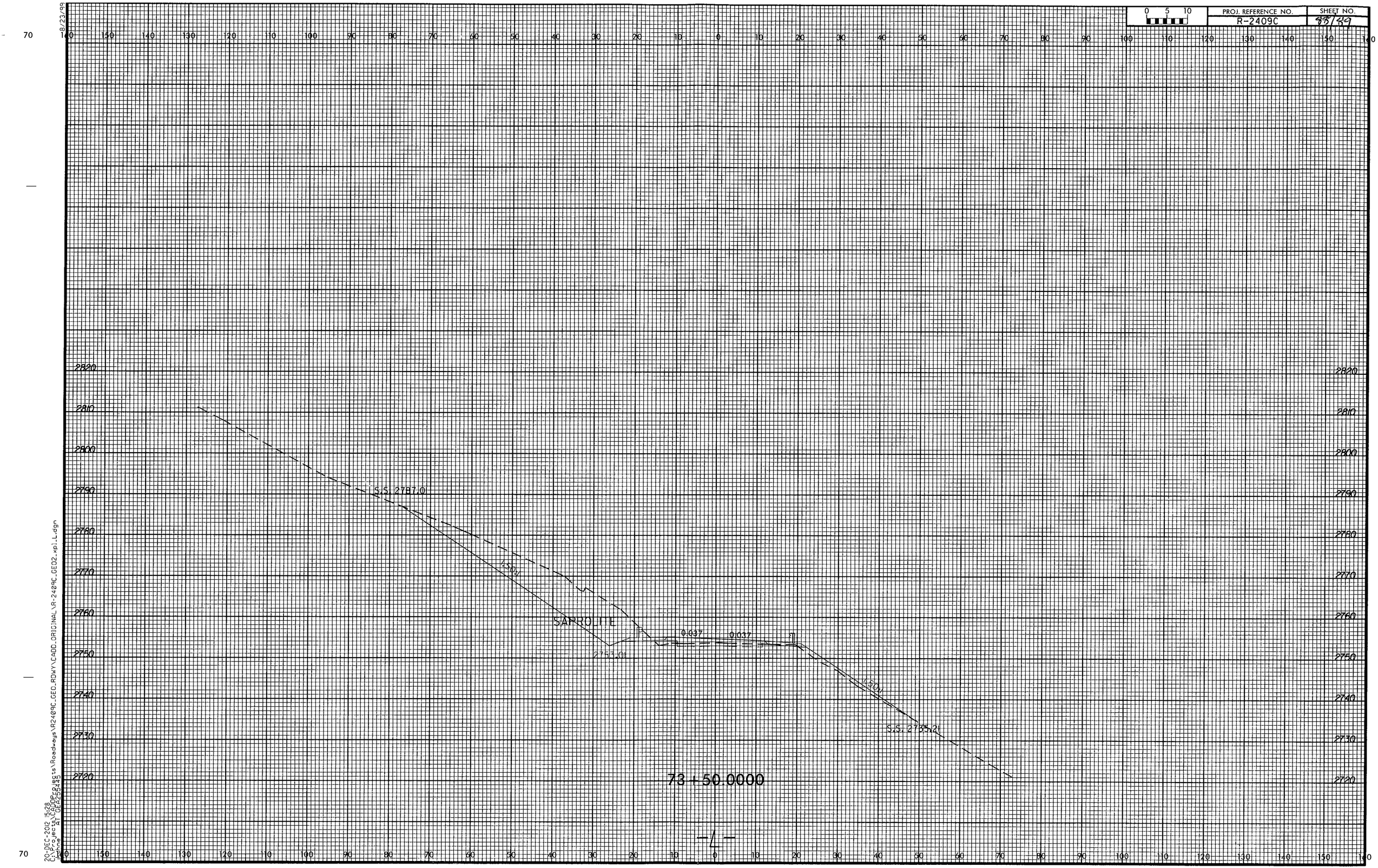
PROJ. REFERENCE NO.
R-2409C
SHEET NO.
85/89
S.S. 2824.20
1.50:1
SAPROLITE
W/ WEATHERED ROCK
4:1
0.020
0.020
S.S. 2754.62
2754.77
2853.81
72 + 75.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
86/89
0 5 10
S.S. 2824.10
SAPROLITE
WEATHERED ROCK
0.020
0.020
S.S. 2753.85
2753.97
2753.01
73+00.0000
-L-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
87/89
S.S. 2809.28
1.50±
SAPROLITE
WEATHERED ROCK
2753.36
0.025
0.025
73+25.0000
-4-



PROJ. REFERENCE NO.
R-2409C
SHEET NO.
0 5 10
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1.50:1
SAPROLITE
2753.0
0.037
0.037
1.50:1
S.S. 2735.2
73 + 50.0000
-L-
2820
2810
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2790
2780
2770
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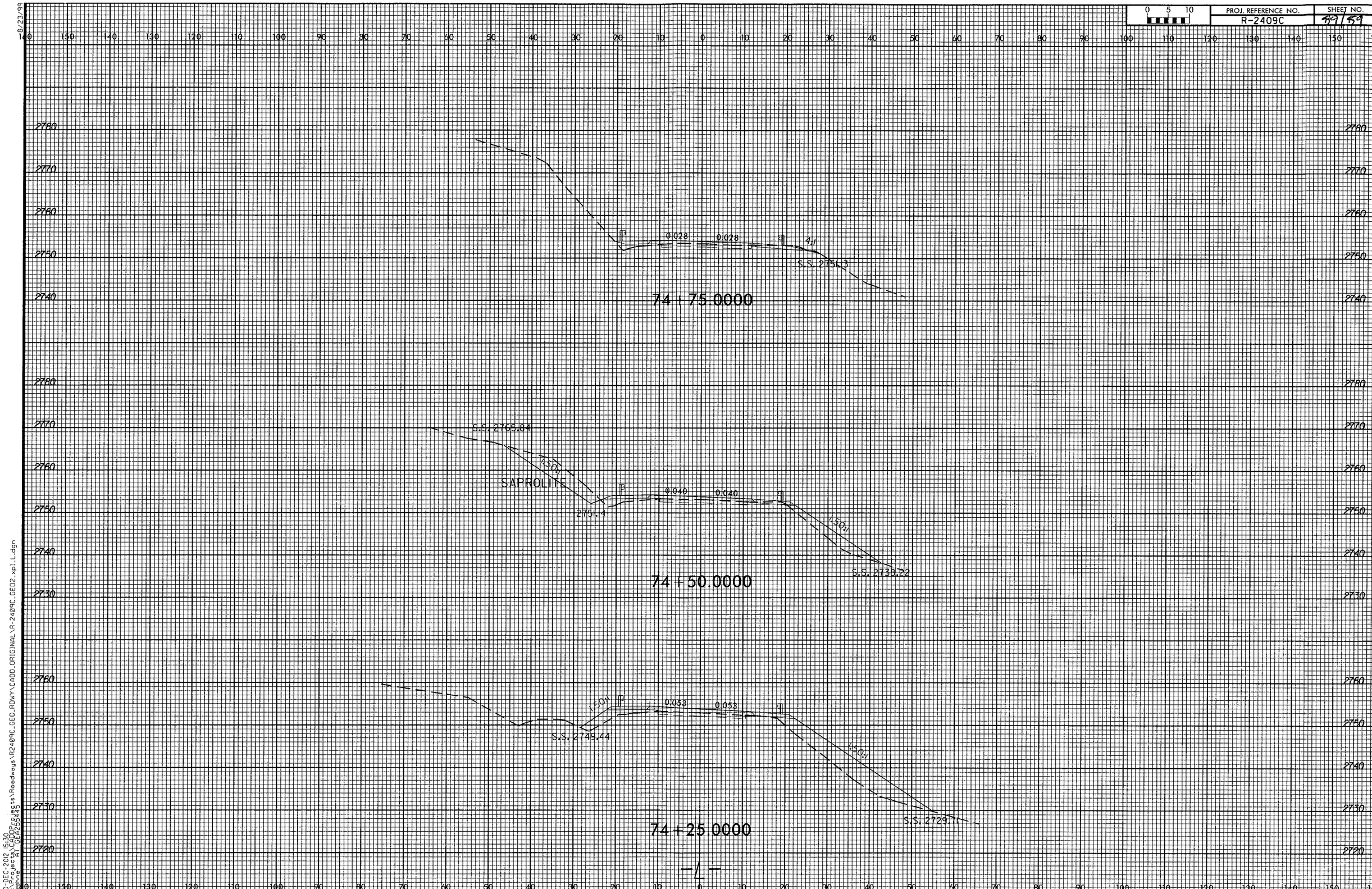
2740
2730
2720



8/23/99
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