

EXPLANATION

SEDIMENTARY ROCKS

- JUDITH RIVER FORMATION
CLAGGETT SHALE
EAGLE SANDSTONE
TRANSITION ZONE
COLORADO SHALE

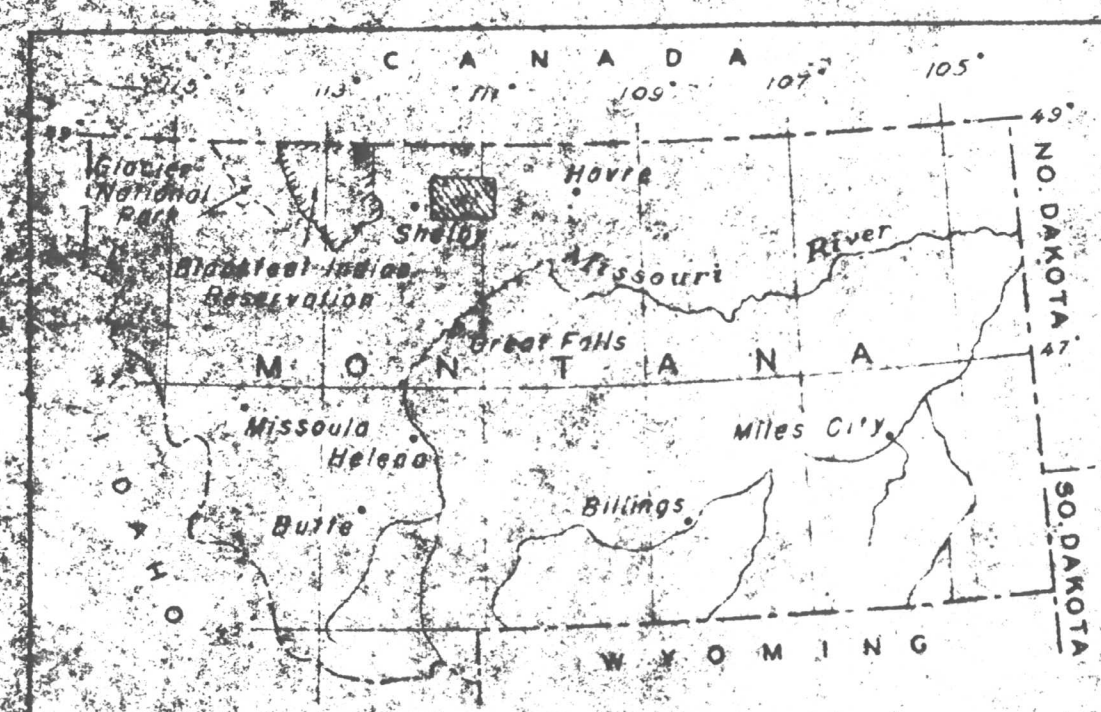
EXTREME AREA HEAVILY COVERED WITH GLACIAL DRIFT
BOUNDARIES INDICATE APPROXIMATE PORTIONS OF FORMATIONS
BELOW THE DRIFT

STRUCTURE CONTOURS

- CONTROL BY SURFACE MAPPING
AND FROM WELL DATA
CONTROL BY INTERPOLATION
CONTROL INADEQUATE, POSITION
OF CONTOURS INFERRED
AVERAGE INTERVAL TO BASE SUNBURST SANDSTONE 2045 FEET
AVERAGE INTERVAL TO TOP MADISON LIMESTONE 2315 FEET

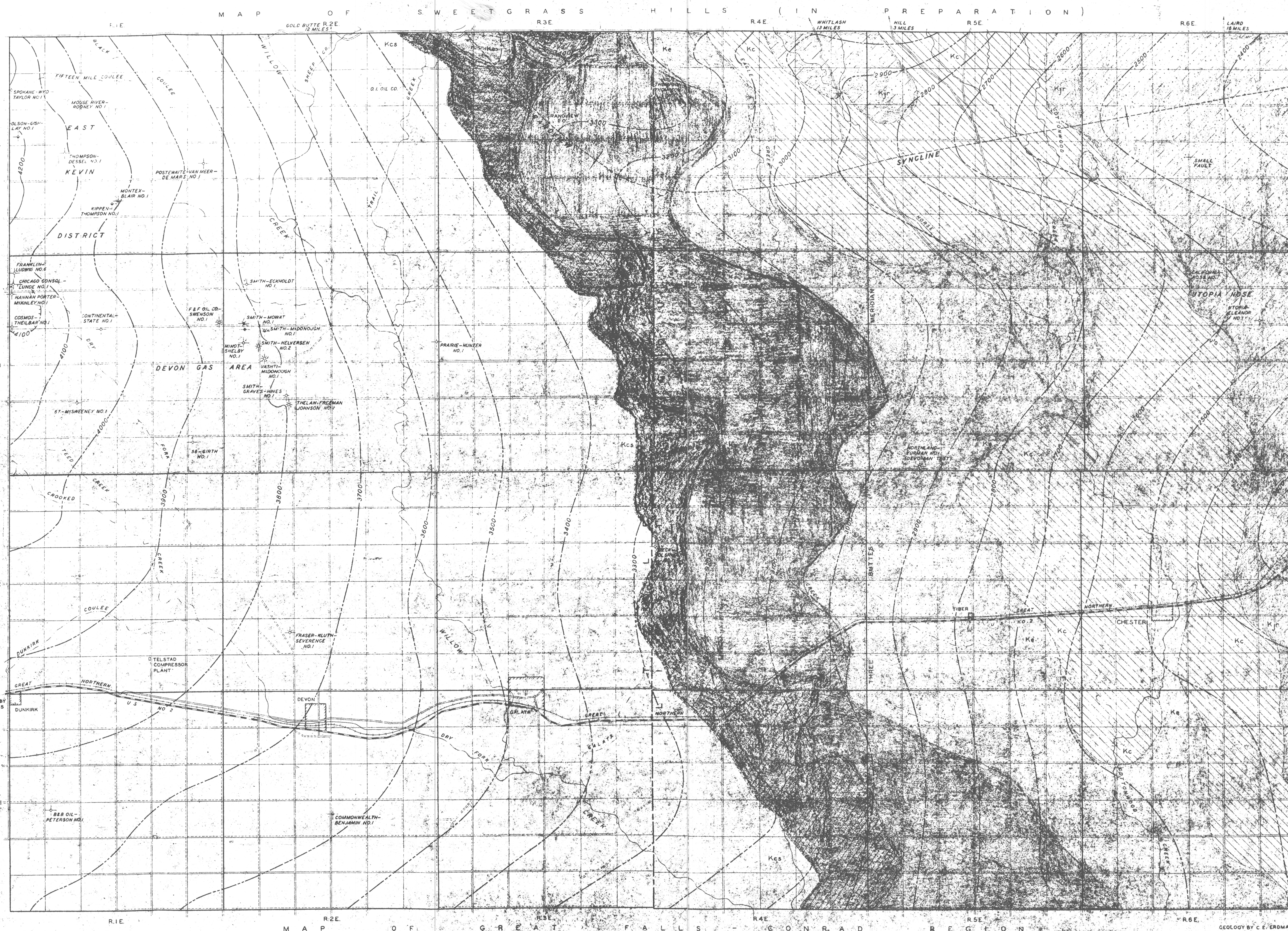
WELL SYMBOLS

- DRILLING
GAS WELL SHUT IN
ABANDONED GAS WELL
ABANDONED OIL WELL
ABANDONED SHOW OF GAS
ABANDONED SHOW OF OIL
BITUMINOUS SURFACED ROAD
IMPROVED ROAD
UNIMPROVED ROAD
FENCELINE
FAULT
WATER COMPLETION FROM TOWNSHIP PLATS AND
MONTANA HIGHWAY OR TRANSPORTATION MAPS OR
TODAY AND LIBERTY COUNTIES



NOTE ON PRODUCTION

THE SUNBURST SAND AND THE RIBBONED SANDSTONE ZONE (CUTBANK
AND EQUIVALENTS) WHICH YIELD OIL AND GAS IN THE KEVIN-SUNBURST
AND DEVON AREAS, ARE REGARDED AS INCAPABLE OF
COMMERCIAL PRODUCTION THROUGHOUT THE MAP AREA. THE BASAL
SAND OF THE DEVON FORMATION AND THE TOP OF THE MADISON LIMESTONE
WHICH YIELD OIL IN THE KEVIN-SUNBURST OIL FIELD, ARE
ALSO CONSIDERED DRY. COMMERCIAL GAS PRODUCTION FROM SANDS
IN THE KEVIN-SUNBURST SAND MEMBER, COLORADO SHALE, HAS BEEN
OBTAINED IN THE DEVON GAS AREA. ACCUMULATION IS DUE TO
LITHOLOGICAL SAND BOWLS LENSING OUT WESTWARD OR UP DIP.



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PRELIMINARY STRUCTURE CONTOUR MAP
OF THE
DUNKIRK-CHESTER REGION
TOOLE AND LIBERTY COUNTIES, MONTANA

SCALE OF MILES
0 1 2 3 4 5
CONTOURS DRAWN ON TOP OF COLORADO SHALE
INTERVAL 100 FEET DATUM MEAN SEA LEVEL
JUNE, 1939

STRATIGRAPHIC COLUMN

QUATERNARY	SYSTEM	FORMATION	THICKNESS (FEET)	DESCRIPTION AND REMARKS
				ALLUVIUM AND STREAM GRAVELS NOT SHOWN ON MAP
				GROUND AND TERMINAL MORAINES KEEPING CONTINENTAL SURFACE GLACIAL LAKE DEPOSITS NOT SHOWN ON MAP
				CONTINENTAL AND BRACKISH WATER DEPOSITS, UPPER PART LIGHT COLORED CLAY SH. AND THIN BEDDED SANDSTONE
				LOWER PART SOMBER COLORED SANDY SHALE, CARBONACEOUS SHALE, LIGNITE, LIGHT COALS, TAN CONCRETIONARY SANDSTONE AND OYSTERS, SHELLS, ETC.
				MARINE, SOFT, GRAY, SANDY SHALE, THIN SANDSTONE AND FISSILE SHALE FORMATION THINS WESTWARD AT 10-15 FEET PER MILE
				BROWN FISSILE SHALE WITH BESS CONCRETIONS, GRAY LIMESTONE
				BENTONITE BEDS NEAR BASE BLACK, CHERT, FISSILE
				UPPER MEMBER, CHIEFLY CONTINENTAL THIN COALS AND CARBONACEOUS SHALE, GREEN, GRAY AND BROWN SHALE, THIN BROWNISH, FINE-GRAINED SANDSTONE
				VIRGELLE SANDSTONE MEMBER MASSIVE, LIGHT COLORED SANDSTONE MARINE
				TRANSITION ZONE, GRAY, SANDY SHALE AND THIN, GRAY-BUFF SANDSTONE
				CONTOUR DATUM BLACK, FISSILE SHALE
				DARK GRAY SANDSTONE
				LIME SHELL
				BLACK, BENTONITIC, CAVY SHALE
				GAS, NORTHLAND-YURMAN WELL NO. 1
				BLACK, BENTONITIC, CAVY SHALE
				SOFT, BLACK, GRAY, SANDY MEMBER
				DARK GRAY
				SHOWS GAS, BECK-OLSRUD WELL NO. 1
				SOFT, BLACK, MURPHY SHALE
				RED SPECKLED ZONE CALCAREOUS SANDS, SHELLS SILTY, CALCAREOUS SHALE
				SHOWS OF GAS IN SMITH-MOWAT FRASER-KLUTH-SEVERANCE WELLS BENTONITIC SANDSTONE AND SHALE, LAMINATED
				LIGHT GRAY SANDSTONE, CHERT PEBBLES SHOWS GAS WITH WATER, BECK-OLSRUD WELL NO. 1
				LIGHT GRAY SANDSTONE, CHERT PEBBLES SHOWS OF GAS IN COMMONWEALTH-BENJAMIN NO. 1 SANDY SHALE, CHERT PEBBLES
				WATER LOCAL DEVON GAS SAND, DARK GRAY, SANDY, MIDDLE FET-SWENSON, SMITH-HALVERSON AND S. SMITH- JOHNSON WELLS AND OTHERS
				DARK GRAY GAS IN THE LAN-FREEMAN- JOHNSON AND BECK-OLSRUD WELLS
				WATER
				LIGHT GRAY GLAUCONITIC
				SHOWS OF GAS IN FRASER-KLUTH-SEVERANCE GLAUCONITIC
				LIGHT GRAY, CHERT PEBBLES SHOWS OF OIL
				SHOWS OF OIL, GAS IN SMITH-MOWAT WELL NO. 1 MAROON OR GREEN SHALE AT TOP
				SHOWS OF OIL IN SMITH-MOWAT WELL NO. 1 CONTINENTAL THICKENS WESTWARD AT ABOUT 14 FT. PER MILE
				GRAY, GREEN AND MAROON SHALE
				RED SHALE
				VARIATED, RED AND GREEN
				DARK GRAY SHALE
				UPPER SUNBURST SAND
				GRAY SHALE
				SUNBURST SANDSTONE
				YELLOW SHALE MARKER
				REBONED S.S. ZONE SHOWS OF OIL AND GAS
				DISCONFORMITY
				GRAY SHALE, MARINE
				BLACK LIMESTONE
				DARK GRAY, CALCAREOUS SHALE
				LIGHT COLORED, CALCAREOUS SAND, THICKNESS HIGHLY VARIABLE, WATER, SHOWS OIL AND GAS
				DISCONFORMITY
				SHOWS OF OIL AND GAS AT TOP SULPHUR WATER
				SHOWS OF GAS, BECK-OLSRUD WELL NO. 1
				MASSIVE, WHITE TO CREAM COLORED, DENSE, CRYSTALLINE LIMESTONE
				GAS, COMMONWEALTH BENJAMIN WELL NO. 1
				MADISON RECORD FROM NORTHLAND-YURMAN WELL NO. 1
				SHOW OF BLACK TAR
				SAMPLES MISSING
				SHALY LIGHT BROWNISH GRAY LIMESTONE INTERBEDDED WITH DARK SHALE
				GREENISH, PYRITIC SHALE
				SAMPLES MISSING
				DARK GRAY TO BLACK, CALCAREOUS SHALE WITH MINOR AMOUNTS OF BROWNISH LIMESTONE
				SAMPLES MISSING
				BOTTOM NORTHLAND-YURMAN WELL NO. 1