DMEA Form 9

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

OFFICIAL DOCKET FILE

Idm-E 965

DMEA NO. 4107

Application (Denied
(Withdrawn
(After disposition, delete items not applicable)

Contract (Terminated - not Certified
(Cancelled
(Terminated - Certified
(Royalty Agreement

This is the official contract file containing all official records of the project. The records contained in the files are checked and are arranged in this order:

Left Side

Interim Royalty Audits
Reports of Royalty Review
Certification of Discovery
✓ Certificate of Audit (Final)
Interim Audit(s)
Report of Review
Termination Notice or Agreement
Recision Notice
Assignment of Contract
Contract Amendments (latest on top)
✓ Contract with all exhibits and annexes
✓ Owner's Consent to Lien (not required)
Subordination Agreement
✓ Leases and assignments of leases
✓ Application and attachments
(3) Envelope for maps

Right Side

✓ Project summary
✓ Work completed analysis
All other material is filed in chronological order with correspondence including the following reports as checked:

✓ Final Field Team Report (Tab)
✓ Operator's Final Report
(2R) ✓ Interim Reports
(2R) ✓ Operator's monthly reports and all attachments (latest on top)
✓ On-site Exam Report(s) (Tab)
(4) Settlement Sheets

When the volume of records is expected to warrant additional folders, or when convenience of reference warrants separate folders for certain records, they should be set up in this order:

Left Side

Folder No. 2: (In chron. order)
Interim Summary Reports by W. O. Engineers

Right Side

Operator's Semi-Annual Report for Certified Project, Field Team Interim Reports, Operator's Monthly Report with transmittal, narrative, maps, and Field Team review.

Folder No. 3: Maps (Use pocket folder or envelope. Fold maps with title block out and show reference to related document or correspondence.)

Folder No. 4: Settlement Sheets

Folder No. 5: Drill Logs

9775

DEFENSE MINERALS EXPLORATION ADMINISTRATION
CONTRACT ADMINISTRATION AND AUDIT DIVISION

EXTRA COPY
DMEA
RECEIVED MAR 1 1957

DATE	INITIALS	CODE
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REPORT OF REVIEW

I have reviewed the Monthly Reports of:

Burmac Exploration Corporation
Williston, North Dakota

pertaining to Exploration Project Contract No. Idm-E965, Docket No. DMEA 4107, dated July 5, 1956, without amendments, for the month of August 1956, covering a project for the exploration of uranium, on property known as the Cox Lease, located in Sections 17 and 18, Township 10 North, Range 61 East, M.P.M. and B., Fallon County, State of Montana.

My review included an examination of the Monthly Report (Form MF-104) and supporting documents attached thereto, comparison of the costs claimed with the contract and pertinent schedules, consultation with the Government representative who visited and examined the project, and a determination of the reasonableness and propriety of the costs.

This review was made in lieu of a final audit of the Operator's accounts and records for the following reasons:

(a) The administrative cost to the Government of an audit would be excessive in relation to the estimated amount of possible further disallowances thereunder;
(b) the Monthly Report was supported by documentary proof of costs incurred under the contract's provisions for contribution by the Government on the basis of actual costs incurred;
(c) a major portion ($3,657.91) of the costs incurred covered work performed at unit rates under independent contracts; and
(d) the balance ($773.44) of the costs incurred were under a contract provision for payment by the Government on the basis of fixed unit costs of units of work actually performed.

The review disclosed the following facts in regard to the amount paid or to be paid the contractor:

Total costs as billed by Contractor		$4,468.72
Exceptions (see schedule attached)		
By DMEA Finance Officer	$ .04	
Herewith	37.33	37.37
Total accepted cost		$4,431.35

The contract calls for a 75 percent participation of exploration expenses by the United States Government. Therefore, payment to the contractor by the Government in the amount of Three thousand three hundred twenty three and 51/100 Dollars

--$3,323.51--

is considered valid and proper, provided that the Regional Executive Officer, the Administrator, or other competent official has accepted, or will accept, the project as having otherwise met the terms of the contract.

C. A. Turner, Auditor

February 26, 1957

Audit Report
of Review

Durmac Exploration Corporati[redacted]

Schedule of Exceptions

D[redacted] 4107 Idm-E965

Independent Contractor Cost	Core Drilling	Non-Core Drilling	Total
Young Southern Exploration Co. - Independent Contractor			
Core Drilling 658 feet 93 3/4 hrs. @ $17.90	$1,678.12	-	$1,678.12
Non-Core Drilling 2423 ft. 100 1/4 hrs. @ $17.90	-	$1,794.48	1,794.48
Moving equipment from Billings to job and return to Billings 14 hrs. @ $12.50	37.37	137.63	175.00
One Mayhew Core Head Bit Used	42.50	-	42.50
One Fishtail Bit Used	-	15.00	15.00
Total Independent Contractor Cost	$1,757.99	$1,947.11	$3,705.10
Cost not claimed on Form MF-104	9.82	-	9.82
Total Cost Claimed on Form MF-104	$1,748.17	$1,947.11	$3,695.28

Moving Equipment Cost	Feet	Percent	Moving Cost
Allocated on Footage Basis			
Core Drilling	658	21.3567	$ 37.37
Non-Core Drilling	2423	78.6433	137.63
Total	3081	100.0000	$175.00

Independent Contract Costs as claimed by Operator on Form MF-104	$1,710.80	$1,984.48	$3,695.28
Costs allowed by Audit			
Core drilling 658 ft. @ $2.60	1,710.80	-	-
Non-Core drilling 2423 ft. @ .8036	-	1,947.11	3,657.91
Disallowance	$ -0-	$ 37.37	$ 37.37

* * * *

Operator's Final Form MF-104 dated August 1956			$4,468.72
Costs Accepted by this Audit			
Independent Contract Cost			
Core drilling 658 ft. @ $2.60		$1,710.80	
Non-Core drilling 2423 ft. @ .8036		1,947.11	
Fixed Unit Costs			
Incidental drilling allowance 3081 ft. @ $ .24		739.44	
Chemical sample analysis 8 @ 4.25		34.00	
Total			$4,431.35
Disallowance			37.37
Previous Disallowance by Certifying Officer			.04
Net Disallowance by this Audit			$ 37.33

C A Turner

C. A. Turner, Auditor

February 26, 1957

RECEIVED

JUL 5 - 1956

Docket Copy

MF-200
(Revised June 1954)

Docket No. DMEA 4107

Commodity Uranium

Contract No. Idm-E 965

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

EXPLORATION PROJECT CONTRACT[1]

It is agreed this JUL 5 1956 day of ....., 195...., between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and [2] Burmac Exploration Corporation, a North Dakota corporation, whose mailing address is P. O. Box 836 Williston, North Dakota, hereinafter called the "Operator," as follows:

ARTICLE 1. *This contract* is entered into under the authority of the Defense Production Act of 1950, as amended. It consists of this form (MF-200), the attached Exhibit "A," Annex I, and two maps (Figure 1 and Figure 2)

The Operator shall not transfer or assign this contract or any right thereunder without the written consent of the Government.

ARTICLE 2. *Operator's property rights.*—(a) The land which is the subject of this contract (hereinafter called "the land") is in the State of Montana, County of Fallon, and is described in Annex I.[3]

(b) The Operator represents and undertakes that:

(1) The Operator is the [4] Lessee of [5] the mineral rights to fissionable materials and non-fissionable materials associated therewith in the land, in possession and entitled to possession for all of the purposes of this contract, under and by virtue of a [6] an assignment of lease, [7] recorded in Book ....., page ....., official records of said County; and

(2) The Operator's right, title, or interest (whether as owner, lessee, or otherwise) is subject only to the following claims, liens, or encumbrances: Royalty as set forth in the lease

(c) The Subordination Agreement of the holder of any claim, lien, or encumbrance listed above, and (if the Operator does not hold the legal title) the Consent to Lien of any holder of the legal title

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] Insert name, and if an organization, its nature (corporation and place of incorporation, partnership with names of partners, etc.).
[3] State on a separate sheet marked "Annex I" the legal description or enough to identify the property, particularly excluding any areas from which the production is not to be subject to the Government's percentage royalty.
[4] Insert "owner," "lessee," "contract purchaser," "locator," etc.
[5] Insert "the entire interest," "the mineral rights," "an undivided one-third," etc.
[6] Insert "deed," "lease," "contract," "location notice," "patent," etc.
[7] If not recorded, so indicate by inserting "un."

of the land (lessor, seller, optionor, etc.), are attached, as follows: Performance bond supplied in lieu of Consent to Lien by George P. Cox and Ruth E. Cox

(d) The Operator shall preserve and maintain his right, title, and interest in the land and his right to the possession thereof for the purposes of this contract, and shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of this contract. Until the lapse of the time within which the Government may make a certification of discovery or development without any such certification having been made, and after any such certification has been made, the Operator shall neither transfer, convey, nor surrender the land nor any right, title, or interest therein, nor permit nor suffer any claim, lien, or encumbrance thereon, without expressly referring to and providing in the instrument of conveyance, lien, or encumbrance for the preservation of the Government's right to a percentage royalty on production and lien for the payment thereof. If the Government makes no certification of discovery or development within the time limited in Article 8, it shall thereafter have no claim against the land or any production therefrom except for any production referred to in Article 8(b)(1).

ARTICLE 3. *The exploration project.*—The project is a search for indicated or undeveloped deposits of Uranium. The work to be performed is described in Exhibit "A." The Operator on or before August 15, 1956 shall commence the work, and on or before October 31, 1956 (unless the Operator's obligation to prosecute the work is terminated—see Article 10) shall either have completed the work [redacted] Exhibit "A," except as otherwise provided in Exhibit "A" with respect to stages of work. (and See Article 13.)

ARTICLE 4. *Performance of the work.*—(a) *Operator's responsibility.*—The work shall be performed with reasonable diligence, efficiently, expertly, in a workmanlike manner, in accordance with good mining standards and State regulations for health and safety and for liability insurance covering employment; and with suitable and adequate equipment, facilities, materials, supplies, and labor, to bring it to completion within the time fixed.

(b) *Independent contracts.*—To the extent that the allowable costs are estimated in Exhibit "A" with express reference to performance by independent contractors on a unit-price basis (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations), the work may be so performed; but if the reference in Exhibit "A" to any such independent contract requires the Government's approval thereof, payments under such contract will not be allowable costs unless the Government gives its written approval of the contract. Any such independent contract shall refer to some specific and identifiable part of the work, and shall be subject to all of the pertinent terms and conditions of this exploration contract; but the Government shall not be considered a party thereto, and its rights under this contract, including the right to terminate its contributions, shall not be affected thereby. Regardless of the provisions of any such independent contract and regardless of the Government's approval thereof, the Government will participate in payments to the independent contractor only on account of work performed in accordance with the provisions of this exploration project contract, and only to the extent that the Government deems the unit prices for the work under the independent contract to be reasonable.

(c) *Government may inspect.*—The Operator shall consult with and inform the Government on all phases of the work as it progresses. The Government may enter at all reasonable times to inspect the work under the contract, and also after a certification of discovery or development to inspect production operations and underground workings. The operator shall provide the Government with all reasonable means of access for such inspections.

ARTICLE 5. *Contribution by the Government.*—The estimated total allowable cost of the project, set forth in Exhibit "A," is the sum of $15,512.00. The Government shall contribute 75 percent of the allowable costs as they are incurred in a total sum not in excess of $11,634.00: *Provided,* That until the Operator has rendered to the Government his final report, and any final auditing required by the Government has been made, and a final settlement of the contract has been made, the Government may withhold from the last

voucher or vouchers such sums as it sees fit not in excess of 10 percent of the estimated total cost of the work or not in excess of the amount of the Government's contribution to the cost of property which is or may become subject to disposal as provided in Article 9(c), whichever is greater. The Government will make its contribution on the basis of the monthly vouchers referred to in Article 7(b), but all payments by the Government are provisional only, subject to audit, until the account between the Operator and the Government is finally audited and settled. "Costs incurred" mean costs that have been paid or have become due and payable, or that in the opinion of the Government have become an obligation. The Government may make payments directly to independent contractors and suppliers for the account of the Operator rather than to the Operator.

ARTICLE 6. *Estimated costs.*—(a) *Categories of costs.*—The allowable costs of the work to which the Government shall contribute are limited to those that are direct, reasonable, necessary, and that are estimated in Exhibit "A" by categories as specified in this article. If any category or subcategory is omitted from the estimate of costs, or if the word "none" is annexed to the listing thereof, costs under such category or subcategory are not allowable. Any excess over any estimate which is indicated as the maximum of any category, subcategory, or item, either as to requirement or related cost, and any excess over the estimated total allowable cost of the work, shall not be allowable. Any excess over the estimate of any category, subcategory, or item, either as to requirement or related cost, not indicated as a maximum shall be allowable within the limit of the estimated total allowable cost of the work. To the extent that excesses over maximums other than the estimated total allowable cost of the work may be necessary for the performance of the work, the Operator shall incur such excesses for his own account without contribution by the Government; but except for any such necessary excesses in categories, subcategories, or items thereunder the Operator is not obligated to incur more than his agreed percentage of the estimated, total allowable cost of the work. **See Article 13.**

To the extent specified in this article or in Exhibit "A" the following categories, subcategories, and elements thereof are maximums; but if not so specified either here or in Exhibit "A" they are not maximums, and may be exceeded within the limit of the estimated total allowable cost of the work:

CATEGORY (1)—INDEPENDENT CONTRACTS.—Work to be performed under independent contracts (see Article 4(b)). The estimated total amount of this category and the estimated cost of each unit of work for performance under an independent contract are maximums.

CATEGORY (2)—PERSONAL SERVICES.

Subcategory (a)—Supervision.—All elements of this subcategory (number of supervisors, periods of employment, rates of pay, and total) are maximums.

Subcategory (b)—Technical services.—All elements of this subcategory (number of technicians, periods of employment, rates of pay, and total) are maximums.

Subcategory (c)—Labor.

CATEGORY (3)—OPERATING MATERIALS AND SUPPLIES.—Includes such items as drill bits and steel, explosives, fuel, pipe, power, small tools costing less than $50 each, timber, track.

CATEGORY (4)—OPERATING EQUIPMENT.

Subcategory (a)—Rental.—The number of each object to be rented [6 mine cars, 1 truck], the rate of rental [$100 per month, $5 per hour], and the total of this subcategory are maximums.

Subcategory (b)—Purchases.—The estimated total of this subcategory is a maximum.

Subcategory (c)—Depreciation.—All elements of this subcategory (time periods, rate of depreciation, and subcategory total) are maximums.

CATEGORY (5)—INITIAL REHABILITATION AND REPAIRS.—Estimates under this category include all requirements and related costs, such as labor, materials and supplies, and supervision at a rate not higher than provided for in Category (2), and shall not be duplicated under any other category. The estimated total of this category is a maximum.

Subcategory (a)—Initial rehabilitation and repairs of existing buildings, fixtures, and installations (exclusive of mine workings).—The estimated total of this subcategory is a maximum.

Subcategory (b)—Initial rehabilitation and repairs of operating equipment.—The estimated total of this subcategory is a maximum.

CATEGORY (6)—NEW BUILDINGS, FIXTURES, AND INSTALLATIONS (EXCLUSIVE OF MINE WORKINGS).—Estimates under this category include all requirements and related costs, such as labor, materials and supplies, and supervision at a rate not higher than provided for in Category (2), and shall not be duplicated under any other category. The estimated total of this category is a maximum.

CATEGORY (7)—MISCELLANEOUS.—Repairs and maintenance (other than initial) of operating equipment, analytical work, prints and other reproductions, accounting, Operator's share of payroll taxes, liability insurance covering employment, travel, communications, and any other items of requirement or cost that do not fall within any of the first 6 categories.

THE ESTIMATED TOTAL ALLOWABLE COST of the work is a maximum.

(b) *Nonallowable costs.*—The following costs are not allowable for contribution by the Government:

(1) *Costs of the land,* such as rental, depreciation, depletion, or other cost of acquiring, owning, or holding possession;

(2) *Indirect costs,* such as general overhead, corporate management, interest, taxes (other than payroll and sales taxes), insurance (other than liability insurance covering employment), damages to persons, damages to property (other than necessary repairs or replacements of equipment or other property used in the work);

(3) *Previous work* performed or costs incurred before the date of this contract; and

(4) *Deferred payments.*—Any costs incurred by the Operator under any rental-purchase agreement, installment-purchase agreement, or any agreement for the purchase of goods under the provisions of which payment of the full purchase price is deferred more than 90 days from the delivery of the goods; unless the purchase agreement is approved by the Government in writing.

(c) *Reductions in costs.*—The Operator shall account for and give the Government credit for any incidental benefits, credits, or money received in the ordinary course of business in prosecuting the work (as by salvage or sale of materials or equipment, furnishing of room or board, furnishing of power or services to third persons, rebates or discounts on purchases, etc.), in the same ratio in which the Government contributes to costs; and such amounts shall be treated as a reduction in costs incurred so that they are available for use within the limit of the original estimated total cost. This provision does not apply to receipts from production which are subject to the Government's percentage royalty under the provisions of Article 9. **See Article 13.**

ARTICLE 7. *Reports, accounts, audits.*—(a) *Operator's records.*—The Operator shall keep suitable records and accounts of the work performed and of any production in which the Government may have an interest; and shall preserve those with respect to work performed for at least three years after final payment by the Government, and those with respect to production for at least three years after any obligation to pay royalties to the Government has terminated. The Government may inspect and audit said records and accounts at any time, either by itself or by a certified public accountant. If the Government elects to audit said records and accounts relating to the exploration work by certified public accountant, it may do so as a cost of the work to which the Operator shall contribute. The Comptroller General of the United States or his representative, until the expiration of said three-year periods, shall have access to and the right to examine any pertinent books, documents, papers, and records of the Operator. All of the Operator's vouchers and records and accounts relating thereto and the Government's payments thereof remain subject to adjustment until final audit by the Government. If work under this contract is carried on in conjunction with any other operations, or if labor, supervision, services, materials, supplies, equipment, facilities, or other requirements for carrying on the work are also used in connection with other operations, the costs shall be segregated and accounted for on a basis and by methods and accounts that are satisfactory to and approved by the Government.

(b) *Progress reports and vouchers.*—The Operator shall provide the Government with five copies of monthly progress reports in three sections as follows: (1) Operator's Monthly Report and Voucher showing detailed costs incurred during the reporting period; (2) Operator's Unit Cost and Progress Report showing the various types of work performed during the reporting period and costs incurred for each type of work; and (3) a Narrative Report of the work performed during the reporting period including adequate engineering-geological maps or sketches, drill hole logs and locations, and assay reports on samples taken concurrently with advance in mineralized ground. (Forms for reporting under (1) and (2) above will be provided by the Government.)

(c) *Final report.*—Upon completion of the work or termination of the Government's obligation to contribute to costs, the Operator shall furnish the Government with five copies of a final report (in addition to the final progress report and voucher). This final report shall include a geological and engineering evaluation of the results of the work performed under the contract with an estimate of the ore reserves resulting from such work, complete assay data, adequate geological and engineering maps or sketches, and a summary of the work performed and related costs incurred.

(d) *Report of sales.*—The Operator shall provide the Government with suitable accounting and documentary evidence covering all production to which the Government's percentage royalty relates, such as copies of smelter or concentrator settlement sheets, and certified accounts of production and sale or other disposition of production.

(e) *Compliance with requirements.*—If in the opinion of the Government any of the Operator's reports, records, or accounts are insufficient or incomplete, or if the Operator fails to make them, the Government may procure the making or completion of such with suitable attachments as an expense of the work to which the Operator shall contribute. The Government may withhold approval and payment of any vouchers relating to insufficient or incomplete reports, records, or accounts.

ARTICLE 8. *Repayment by Operator.*—(a) *Certification.*—If the Government considers that a discovery or development from which production may be made has resulted from the work, the Government, at any time not later than six months after a sufficient final report and final account (see Article 7) has been rendered, may so certify in writing to the Operator. Such certification shall describe broadly or indicate the nature of the discovery or development.

(b) *Royalty on production.*—The Operator, as principal if the Operator is the producer, or as surety if the Operator is not the producer, shall pay to the Government a royalty on all minerals mined or produced from the land, as follows: (1) regardless of any certification of discovery or development, from the date of the contract until the lapse of the time within which the Government may make such certification, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first; or (2) if the Government makes a certification of discovery or development, within a period of ten years from the date of the contract, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first.

(c) *Basis for computation.*—The Government's royalty shall be a percentage of the gross proceeds (including any bonuses, premiums, allowances, or other benefits) from the production sold, in the form sold (ore, concentrates, metal, or equivalent), at the point of delivery (the f. o. b. point); *except,* that charges of *the buyer* arising in the regular course of business, and shown as deductions on the buyer's settlement sheets, on account of the cost of treatment processes performed by *the buyer,* sampling and assaying to determine the value of the production sold, and freight paid by *the buyer* to a carrier (not the Operator), shall be allowed as deductions in arriving at the "gross proceeds" as that term is used herein. Any costs of treatment processes, sampling or assaying, or transportation, performed or paid by the Operator or by anyone other than the buyer, are not deductible in arriving at the "gross proceeds" as that term is here used. The term "treatment processes," as here used, means those processes (such as milling, concentrating, smelting, refining, or equivalent) applied to the crude ore or other production after it is extracted from the ground, to put it into a commercially marketable form; excluding fabricating or manufacturing.

(d) *Unsold production.*—If any production (ore, concentrates, metal, or equivalent), after the lapse of six months from the date the ore was extracted from the ground, remains neither sold nor used by the Operator in integrated manufacturing or fabricating operations (for instance, if it is stockpiled), the Government, at its option, as long as it so remains, may require the computation and payment of its royalty on the value of such production in the form (ore, concentrates, metal, or equivalent) it is in when the Government elects to require computation and payment. If any production is used by the Operator in integrated manufacturing or fabricating operations before the Government makes its election, the Government's royalty on such production shall be computed on the value therof in the form in which and at the time when it is so used. "Value" as here used means what is or would be gross income from mining operations for percentage depletion purposes in Federal income tax determination, or the market value, whichever is greater.

(e) *Percentages of royalty.*—The percentages of the Government's royalty shall be as follows:

One and one-half (1½) percent of amounts ("gross proceeds" or "value") not in excess of eight dollars ($8.00) per ton of production in the form in which sold, held, or used, plus one-half (½)

percent for each additional full fifty cents ($0.50) by which such amounts exceed eight dollars ($8.00) per ton, but not in excess of five (5) percent of such amounts.

(For instance: the royalty on an amount of five dollars ($5.00) per ton would be one and one-half (1½) percent; on an amount of ten dollars ($10.00) per ton, three and one-half (3½) percent.)

(f) *Time for computation and payment.*—The Government's royalty shall be computed and paid currently upon each lot sold, held, or used in integrated operations, as the case may be, as above provided in this article.

(g) *Lien for payment.*—To secure the payment of its percentage royalty, there is hereby granted to the Government a lien upon the land or the Operator's interest in the land and upon any production of minerals therefrom, until the royalty claim is extinguished by lapse of time or is fully paid.

(h) *Notice to purchasers.*—The Operator shall give notice of the Government's claim for royalty to any purchaser of the production, and shall authorize and direct such purchaser to pay the royalty directly to the Government and to furnish the Government with copies of the settlement sheets. If the records of any production and sales or other disposition of production, whether the production is by the Operator or by others, are not made available to the Government, the amount of the royalty may be estimated by the Administrator, Defense Minerals Exploration Administration, or his successor, and his estimate thereof shall be final and binding upon the Operator.

(i) *No obligation to produce.*—Nothing in this contract is to be construed as imposing any obligation on the Operator or the Operator's successor in interest to engage in any production operations.

(j) *Government not obligated to buy.*—Nothing in this contract shall be construed as imposing any obligation on the Government to purchase any minerals mined or produced from the land.

ARTICLE 9. *Interests in purchased property.*—(a) *Title and ownership.*—All costs under this contract shall be incurred by the Operator in the Operator's own name and for the Operator's own account; but any property acquired to the cost of which the Government contributes shall belong to the Operator and the Government jointly in proportion to their respective contributions, although title thereto shall be taken in the name of the Operator.

(b) *Preservation of property.*—Until the final disposal of any property in which the Government has an interest the Operator shall preserve and protect same for the best interest of the Government, any reasonable and necessary costs thereof to be treated as an allowable cost of the project. After the completion of the work or termination of the Government's obligation to contribute, or when such property is not in use for or needed for the work, the Operator shall neither use it without the written consent of the Government nor without paying a reasonable rental to be fixed by the Government for its interest.

(c) *Disposal of property.*—Upon the completion of the work or termination of the Government's obligation to contribute to costs, or when the property is no longer needed for the work, the Operator shall promptly dispose of salable or salvageable property in which the Government has an interest for the joint account of the Government and the Operator, either by return to the vendor, by sale to others, or purchase by the Operator or the Government at a price at least as high as could be obtained from others, unless the Government in writing waives its interest in any such property. Without advance approval of the sales price by the Government the Operator shall not sell at any price any item of property the cost of which was more than $500, and shall not sell at less than 25 percent of the purchase price any item of property which cost $500 or less. The Government, in lieu of approving the sales price for any such item, may itself purchase the item at the best price which the Operator is able to obtain or himself cares to give. Property remaining upon any termination of the work shall be considered in groups or categories (such as drill steel, or explosives, or pipe, or rails), and if the original cost of the remaining unexpended portion of any such group or category is less than $50, the Government waives its interest therein. If necessary to accomplish the disposal of any item the Operator shall dismantle and sever it from the land, the cost thereof to be treated as a cost of the project.

(d) *Default of the Operator re disposal.*—If within 90 days after the completion of the work or termination of the Government's obligation to contribute to costs, or after the property is no longer needed for the work, or after such further time as the Government may in writing allow, the Operator has failed to sell or otherwise liquidate or dispose of any property in which the Government has an interest, the Government, at any time prior to final settlement under the contract, may pursue one of the following two courses: (1) the Government, by written notice to the Operator, may place upon such property what in its opinion is a fair valuation thereof, not in excess of the cost less 1.66 percent per month from the

date such property was purchased under this contract to the termination of said 90-day period; and such property shall thereupon be considered and accounted for as having been purchased by the Operator at the valuation so fixed by the Government; or (2) the Government may enter and take possession of such property wherever it may be found, and remove and dispose of it for the joint account of the parties.

ARTICLE 10. *Termination of the Government's obligations.*—(a) If in the opinion of the Government operations at any time have failed to achieve anticipated results that indicate the probability of making a worthwhile discovery, and in the opinion of the Government further operations are not justified, the Government may give the Operator written notice thereof, and thereupon: (1) the Government shall be free of all obligation to contribute to costs not then incurred other than such as may be allowable under the provisions of the contract as necessary and incidental to winding up, reporting, and accounting; and (2) the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting.

(b) If in the opinion of the Government the Operator is in any manner in default under the terms of the contract, the Government may give the Operator written notice of such default with a specification of reasonable time within which the default must be cured; and if the Operator fails to cure such default as required, thereupon: (1) the Government shall be relieved of all obligation to contribute to costs not incurred when the notice was given, other than such as may be allowable by the provisions of the contract as necessary and incidental to winding up, reporting, and accounting; and (2) the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting. The remedy provided for the Government in this paragraph "(b)" is in addition to any other remedy provided in this contract, and in addition to any other remedy the law may provide for breach of contract.

(c) The giving of any notice by the Government under the provisions of this Article 10 shall not affect the Government's rights as provided for in the contract with respect to a percentage royalty, and such rights shall be fully preserved.

ARTICLE 11. *Notices to be given by the Government* may be delivered to the Operator, or may be sent by registered mail addressed to the Operator at his mailing address stated in this contract. If mailed, notices are deemed to have been delivered five days after the date of mailing.

ARTICLE 12. *Officials not to benefit.*—No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 13. *Changes and added provisions.*

(a) Categories (2) through (7) of Article 6(a) are deleted.
(b) To the extent that costs are set forth in Exhibit "A" as "Fixed Unit Costs" they are in lieu of the actual costs that otherwise would be allowable costs of the project under Article 6 of the Contract. The Government will contribute to the Fixed Unit Costs as they accrue, on the basis of units of work actually performed. The fixed unit costs include all costs of the work necessary to complete the project.
(c) In Article 3, after the reference to Article 10, delete remainder of sentence and substitute "shall have completed the work, except as otherwise provided in Exhibit 'A' with respect to stages of work."
(d) That part of the last sentence in the first paragraph of Article 6(a) commencing after the semicolon, is deleted.
(e) In Article 6(c), the reference to Article 9 is changed to Article 8.

Executed in sextuplicate the day and year first above written.

Indrtz 6/19/56
"Appd. Sol. Off."
Ching

THE UNITED STATES OF AMERICA

By C O Mitterdorf
Administrator, Defense Minerals
Exploration Administration

Ellis
Chambers
Martin
H Johnson

BURMAC EXPLORATION CORPORATION
(Operator)

By Dois D. Dallas

PRESIDENT

I, FRANK F. JESTRAB, certify that I am the secretary of the corporation named as Operator herein; that DOIS D. DALLAS who signed this contract on behalf of the Operator, was then PRESIDENT of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Frank F. Jestrab

[CORPORATE SEAL]

U. S. GOVERNMENT PRINTING OFFICE 16—70617-1

EXPLORATION PROJECT CONTRACT
BURMAC EXPLORATION CORPORATION
DOCKET NO. DMEA-4107

ANNEX I

The land referred to in Article 2 of the Contract consists of all of sections 17 and 18, Township 10 North, Range 61 East, M. P. M. and B., Fallon County, Montana. The land is shown on the map (Figure 1) entitled, "Property Map of the Burmac Exploration Corporation Ollie Prospect," attached hereto and made a part hereof.

EXPLORATION PROJECT CONTRACT
BUNKAS EXPLORATION CORPORATION
DOCKET NO. [illegible]-4167

Exhibit "A"

Description of the Work

General Provisions

The work consists of rotary core and non-core drilling to test sandstone-lignite zones of the Fort Union formation of Paleocene age. The general location of the work is indicated on the map (Figure 1) referred to in Annex I, and on the map (Figure 2) entitled "Proposed Stage I Holes, SW¼ sec. 17," attached hereto and made a part hereof.

Drill core shall be EX in size except where maintenance of this size is impracticable, in which case AX core may be substituted. Core drill holes shall be reamed and cased as necessary. All the core and cuttings from core drill holes shall be saved and checked radiometrically for equivalent uranium. Sections indicating significant mineralization shall be split for samples and such samples shall be analyzed chemically for uranium. All the remaining core and cuttings saved shall be properly stored and labeled for inspection and disposition by the Government.

Non-core holes shall have a minimum diameter of 2½ inches. Drill cuttings shall be collected with a Dunlena sample collector or equivalent unit. Samples shall be taken at 5-foot intervals. Samples shall be checked radiometrically for equivalent uranium and those indicating significant mineralization shall be analyzed chemically for uranium. A portion of each sample taken shall be properly labeled and stored for inspection and disposition by the Government.

All drill holes shall be logged geologically and probed radiometrically, and the record of such logging and probing, together with certified copies of all assay certificates, shall be submitted with the Operator's monthly progress reports.

The project work shall be supervised at all times by a competent mining engineer or geologist, who shall devote full time to the project.

The location, direction, inclination, and extent of all project work are subject to the approval of the Government.

The work is divided into three stages as hereinafter described. The Operator shall complete Stage I, and shall perform as much of the Stage II and Stage III work as the Government approves in writing in advance.

Stage I

In the SW¼ of sec. 17, drill 4 core holes and 22 non-core holes, aggregating approximately 1,440 feet, at the locations indicated on the map (Figure 2). (Each core hole is represented on the map by a circled cross, and each non-core hole is represented on the map by a plain cross.) This work is designed to complete a grid with holes spaced 400 feet apart and at the same time offset certain mineralized holes previously drilled by the Operator. The holes are expected to average approximately 55 feet in depth. The 4 core holes shall be drilled first to establish geological controls.

In the S½ of sec. 18, drill 6 core holes and 24 non-core holes, aggregating approximately 2,100 feet, at the locations indicated on the map (Figure 1). Alternate east-west lines of holes are staggered, with the lines 660 feet apart and the holes in each line also 660 feet apart. The northernmost and southernmost lines are 330 feet from the borders of the area being explored and the easternmost and westernmost holes are 330 feet from the section boundaries. The holes are expected to average approximately 70 feet in depth. The 6 core holes shall be drilled first to establish geological controls.

If the cost of the total footage required to drill the 56 holes to the desired horizon exceeds the cost of 2,900 feet of non-core drilling and 640 feet of core drilling, additional funds therefor shall, upon written approval of the Government, be transferred to Stage I and deducted from Stage III. The footages estimated for the SW¼ of sec. 17 and the S½ of sec. 18 are interchangeable as required.

Stage II

In the SW¼ of sec. 17, drill approximately 36 non-core holes aggregating approximately 1,980 feet as 200-foot offsets to previously drilled holes that show significant mineralization.

In the S½ of sec. 18, drill approximately 30 non-core holes aggregating approximately 2,100 feet as 330-foot offsets to Stage I holes that show mineralization or favorable sandstone-lignite zones.

If the approximately 66 holes of this stage require more than 4,080 feet to reach the desired horizon, the additional footage and funds required may be transferred and deducted from Stage III footage

and funds upon the written approval of the Government. The footages estimated for the SW¼ of sec. 17 and the S½ of sec. 18 are interchangeable as required.

Stage III

In the SW¼ of sec. 17, drill not more than 36 non-core holes aggregating not more than 1,980 feet as offsets to previously drilled holes showing significant mineralization. These holes may be offset from 50 to 100 feet from previously drilled holes.

In the S½ of sec. 18, drill not more than 20 holes aggregating not more than 1,400 feet as offsets to previously drilled holes showing significant mineralization. These holes shall be drilled at least 100 feet from any previously drilled hole.

The footages estimated for the SW¼ of sec. 17 and the S½ of sec. 18 are interchangeable as required.

Estimated Cost of the Project

Stage I

Actual Costs

Category (1) Independent Contracts		
2,900 feet rotary non-core drilling @ $1.00/ft.	$2,900.00	
640 feet core drilling @ $2.60/ft.	1,664.00	
Categories (2) through (7) None		$4,564.00

Fixed Unit Costs (See Article 13)

Incidental allowance for each foot of core and non-core drilling completed 3,540 feet @ $0.24/ft.	$849.60	
50 Chemical sample analyses @ $4.25/sample	212.50	1,062.10
Estimated Total Cost of Stage I		$5,626.10

Stage II

Actual Costs

Category (1) Independent Contracts		
4,080 feet rotary nonecore drilling @ $1.00/ft.	4,080.00	

Categories (2) through (7) None	_____	$4,080.00
Fixed Unit Costs (See Article 13)		
Incidental allowance for each foot of rotary non-core drilling completed 4,080 feet @ $0.24/ft.	$ 979.20	
75 Chemical sample analyses @ $4.25/sample	318.75	1,297.95
Estimated Total Cost of Stage II		$5,377.95

Stage III

Actual Costs

Category (1) **Independent Contracts**		
3,380 feet rotary non-core drilling @ $1.00/ft.	3,380.00	
Categories (2) through (7) None	_____	3,380.00
Fixed Unit Costs		
Incidental allowance for each foot of rotary non-core drilling completed 3,380 feet @ $0.24/ft.	811.20	
75 Chemical sample analyses @ $4.25/sample	318.75	1,129.95
Estimated Total Cost of Stage III		$4,509.95

SUMMARY

Estimated Total Cost of Stage I	(rounded)	$5,626.00
Estimated Total Cost of Stage II	(rounded)	5,377.00
Estimated Total Cost of Stage III	(rounded)	4,509.00
Estimated Total Cost of Project		$15,512.00
Government Participation @ 75%		$11,634.00

3

Not Acceptable

MF-203
Revised March 24, 1955

For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator _____
Docket No. DMEA- _____
Contract No. Idm-E _____
Contract Date _____

CONSENT TO LIEN

RECEIVED
MAY 28 1956

To the United States of America:

Referring to that certain land in the County of Fallon, State of Montana, described as follows:1/

Township 10 North - Range 61 East, M.P.M.

Section 7: SE¼ Section 17: All

Section 8: SW¼ Section 18: All

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned hereby--

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

No exceptions

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: Lines 1, 2 and 3 of paragraph 2 are stricken, and in lieu thereof the following is substituted: The undersigned agree that to secure a DMEA loan for exploration on the above land, the holder of mining lease dated Sept. 28, 1955 from the undersigned as lessors may grant the Government a lien on the leasehold interest and on the lessee's share of production thereunder. Royalty, if any, which may become payable to the Government to repay said loan shall be payable only out of lessee's share of production under said lease and not out of the share reserved by the undersigned as lessors. If the Government issues a certificate of discovery or development on said lands, then if the leasehold terminates for any reason before said loan is repaid, or if the certificate is issued with respect to a mineral not covered by said lease, the undersigned agree that the Government shall have a lien on and shall be entitled to receive a royalty of five percent of the mineral produced with respect to which the certificate issued, until

(continued below)

Dated this 12th day of MAY, 1956.

George D. Cox [Seal]

Ruth E. Cox [Seal]

[Seal]

I, _____ certify that I am the _____ (Secretary, etc.) of the corporation named herein; that _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

[Corporate Seal]

said loan is repaid or for a period of 10 years from the date of the aforesaid contract, whichever is earlier; and the undersigned

Not Required

MF-203
Revised March 24, 1955

For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator _____
Docket No. DMEA- _____
Contract No. Idm-E _____
Contract Date _____

RECEIVED
MAY 28 1956

CONSENT TO LIEN

To the United States of America:

Referring to that certain land in the County of Fallon, State of Montana, described as follows:1/

Township 10 North, Range 61 East

SE ¼ Section 7, SW ¼ Section 8

All of Sections 17 and 18

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned hereby--

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: _____

Dated this 22nd day of March, 1956.

James G. Key [Seal]

_____ [Seal]

_____ [Seal]

I, _____ certify that I am the _____ (Secretary, etc.) of the corporation named herein; that _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

_____

[Corporate Seal]

not Required

MF-203
Revised March 24, 1955

For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator
Docket No. DMEA-
Contract No. Idm-E
Contract Date

RECEIVED
MAY 28 1956

CONSENT TO LIEN

To the United States of America:

Referring to that certain land in the County of Fallon, State of Montana, described as follows:1/

A Mining Lease, dated September 28, 1955; George P. Cox and Ruth E. Cox of Billings, Montana, the Lessors, and the undersigned Lessees, covering the following described lands; the SE¼ of Section 7; the SW¼ of Section 8; All of Section 17; All of Section 18; all in Township 10 North, Range 61 East M.P.M.,

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned hereby--

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

none

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

none

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: none

Dated this 22nd day of March, 1956.

JOE CRISAFULLI & SONS, A Co-Partnership

Joe Crisafulli Jr. [Seal]
Frank Crisafulli (SEAL)
Anthony Crisafulli [Seal] Florence E Schmitz (SEAL)
Joe Crisafulli (SEAL)
Art M Schmitz [Seal] (SEAL)

I, _____ certify that I am the _____ (Secretary, etc.) of the corporation named herein; that _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

_____

[Corporate Seal]

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~

RECEIVED
DEC 22 1955

So. 157 Howard Street
Spokane 4, Washington

December 16, 1955

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: New application (Uranium)
Burmac Exploration Corp.
Cox Lease
Fallon County, Montana

Dear Mr. Selfridge:

Enclosed are three copies of an application submitted by Dois D. Dallas, President, Burmac Exploration Corporation, P. O. Box 836, Williston, N. D. We have retained one copy for our files.

Sincerely yours,

Verne C. Fryklund Jr.

Verne C. Fryklund, Jr.
for: A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW Dist.

Enclosure as indicated

cc: USBM (2)
Alvord

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
926 PARK AVENUE
DICKINSON, NORTH DAKOTA

December 7,1955

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

Field Executive Officer
DMEA, Region 1
South 157 Howard St.
Spokane 4, Washington

RECEIVED
DEC 12 1955
U. S. G. S.
SPOKANE, WASH.

RECEIVED
DEC 22 1955

Dear Sir:

Enclosed is an application for aid in an exploration project pursuant to Defense Minerals Exploration Administration Order 1, under the Defense Production Act of 1950, as amended.

Supporting data is enclosed. The majority of our program to date on this prospect has been witnessed by USAEC geologists.

We propose to carry out the suggested program under the direction of our Exploration Manager, Dr. Donald F. Towse.

We recently conferred with G. M. Young, President of Young Cores, Inc., P. O. Box 5086, Oklahoma City, Oklahoma, and were advised that within a few days after he receives notice from us his company will have a drill on our prospect. We have found his work very satisfactory.

The following enclosures, in order, are included separately bound in four files:

1. MF-103
2. Supplemental Information to MF-103
3. Plat of lands under lease to Burmac Exploration Corp.
4. Mining Lease Copy, Assignment of Lease, & Assignment of Lease
5. Proposed Exploratory Drilling Program under DMEA
6. Report of Exploratory Work in our prospect
7. Topographical Map covering the center of our prospect
8. Test Hole Map showing holes drilled to date
9. Cross Sections based on data acquired to date

Yours Truly,

BURMAC EXPLORATION CORPORATION

BY: Dois D. Dallas
DOIS D. DALLAS, President

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

(1)

RECEIVED
DEC 12 1955
U. S. G. S.
SPOKANE, WASH.

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. DMEA-4107
Metal or Mineral Uranium
Date Received 12-22-55
Estimated Cost $20,000.00
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Burmac Exploration Corporation, a North Dakota Corporation
P.O. Box 836
Williston, North Dakota

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized. A North Dakota Corporation

(*c*) If a corporation, add to above statement, titles, names and addresses of officers. Attached

(*d*) If a partnership, add to the above statement the names and addresses of all partners. Not Applicable

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract South Half (S½) Section 18, Township 10 North, Range 61 East, Fallon County, Montana

Applicant's adjacent lands are shown on accompanying plat

(*b*) State any mine name by which the property is known. Cox Lease

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Lessee

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. Attached

(*e*) If you own the land, describe any liens or encumbrances on it Not Applicable

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. Not Applicable

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes. See accompanying reports

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades. Not Applicable

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you. Attached

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points. Railroad cuts through property, highway & rural roads cross lands

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

All easily available

16—66551-1

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore Uranium Oxide, Vanadium Oxide and associated minerals

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc. Attached

(*c*) The work will start within 30 days and be completed within 6 months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations. Attached

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project: Attached

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.). Attached Supplement

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants. Attached

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel. Attached

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be. Attached

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project. Not Applicable

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project. Not Applicabl

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes. Attached

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs. Attached

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? Yes

(*b*) How do you propose to furnish your share of the costs?

☐ Money ☐ Use of equipment owned by you ☒ Other See Costs Attached

Explain in detail on acompanying paper. Burmac contributes technical supervision, some equipment & expenses

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated December 7, 1955

BURMAC EXPLORATION CORPORATION
(Applicant)

By Dois D. Dallas
DOIS D. DALLAS, President

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

November 24, 1955

SUPPLEMENTAL INFORMATION TO

DMEA FORM MF-103

(2)

Question No.

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1. C) Corporation Officers:

Dois D. Dallas, President, registered professional engineer, North Dakota, and New Mexico.
P. O. Box 836
Williston, North Dakota

Donald F. Towse, Vice-President and Exploration Manager
926 Park Avenue
Dickinson, North Dakota

Frank Jestrab, Secretary and Legal Advisor, a member of the firm of Bjella, Jestrab & Neff
Room 18, Hedderich Building
Williston, North Dakota

William J. McCabe, Treasurer
410 Reeves Drive
Grand Forks, North Dakota

5. D) Technical qualifications.

Donald Towse, exploration manager, Burmac Exploration Corporation.

Education: Massachusetts Institute of Technology, B.Sc. in Geology, 1948; Ph. D. in Geology, 1951.

Experience: Geologist, Amerada Petroleum Corporation, in Wyoming, full-time and part-time, 1948 to 1951.
Geologist, North Dakota Geological Survey, 1951 to 1954.
Consulting geologist, part-time 1951 to 1954, full-time 1954 to date, in oil and uranium geology; for Butler Bros., St. Paul, Minn., Central Oil and Uranium Corp., Dickinson, N. Da., Northgate Uranium and Oil Corp., Ft. Atkinson, Wisc., Wahpeton Exploration Company, Wahpeton, N. D., and many individuals.
Vice president and exploration manager, Burmac Exploration Corp.

Supervised and executed airborne and ground exploration for uranium and evaluation drilling programs in the Dakotas, Montana, and Wyoming area continuously for the last year-and-one-half.

Member, American Institute of Mining and Metallurgical Engineers; Member, American Association of Petroleum Geologists; Member, the Society of the Sigma Xi; Member, North Dakota Geological Society; Member, North Dakota Academy of Science.

6. A) It is contemplated that we will use the services of the Young Cores, Incorporated, Oklahoma City, Oklahoma, for drilling, or a comparable drilling firm. We have previously contracted this firm for drilling on the Ollie Prospect.
This firm has performed satisfactorily with the following equipment:
Rig # 95 Young Exploration Company, Oklahoma City 7, Oklahoma. Post Office box 5086.
Type--Built by Young Machine Company, Oklahoma City, Oklahoma
Compairs to Failing #750, or Franks Model #44

Built in September, 1953
Mud pump sixe--$4\frac{1}{2}$ by 6
Size hole drilled--$4\frac{1}{4}$ inches
Pipe--Mayhue Jr. 2 and three/eights by 10 feet
Tool joint 3 inch diameter.
Tower--26 feet from groung to top of mast when raised.
Truck--International R 160
Power to rig delivered by a split shaft power takeoff from the truck engine, with a combination hydraulic and automatic pulldown.
Rig rated for a 750 foot hole
Kelly--15 ft in length--round fluted

WATER TRUCK
Tank -----900 gal.
Truck-----2 and $\frac{1}{2}$ ton.
Winch-----Tulsa 500

COMPRESSOR
Worthington compressor no. 315 (Blue Brute)
R.P.M. Max 1200
Piston type Delivered 315 CFM--average drilling pressure of 35 lb per sq inch---100 lb build up pressure.
Recommend 600 CFM for deep drilling.

Dust deflector used 10" high 26" diameter with 5" center hole.

Bit---Varel type XH, air blast $4\frac{1}{2}$" bit.

FLAT BED TO CARRY COMPRESSOR
Ford 2 ton truck--butane powered
Winch Tulsa 500 with end roller.

C O P Y

BURKE EXPLORATION CORPORATION
P.O. Box 836
WILLISTON, NORTH DAKOTA

MINING LEASE

(4)

THIS AGREEMENT, dated this 29th day of September, 1955 between GEORGE P. COX and RUTH E. COX, his wife, of 614 Burlington Avenue, Billings, Montana, hereinafter called Lessor, and JOE CRISAFULLI and SONS, consisting of JOE CRISAFULLI, Sr., JOE CRISAFULLI, Jr., FRANK CRISAFULLI, and ANGELO CRISAFULLI, a partnership of Glendive, Montana, and ARTHUR M. SCHMITZ of Wibaux, Montana, hereinafter called Lessee, WITNESSETH:

WHEREAS, Lessor is the owner of the following land in Fallon County, Montana:

Township 10 North, Range 61 E.M.P.M.

Section 7: SE¼
Section 8: SW¼
Section 17: ALL
Section 18: ALL

containing 1600 acres, more or less, and desires to lease said land for the purpose hereinafter expressed;

NOW, THEREFORE, in consideration of the sum of TEN DOLLARS ($10.00) and other consideration, receipt and sufficiency of which Lessor hereby acknowledges:

1. Lessor hereby leases said lands, including such surface as lessee may reasonably require to conduct its operations hereunder, exclusively to lessee, solely for the purposes of exploring for, developing, mining, removing and marketing all the fissionable materials, including but not limited to uranium and thorium, and any non-fissionable materials associated therewith, including but not limited to vanadium and manganese, underlying said lands. Lessee shall have no rights or privileges hereunder to explore for, develop or remove other minerals, including oil and gas, and Lessee's rights hereunder with respect to use of any particular portion of surface shall be subordinate to the rights of any present or future oil and gas lessees actually engaged in drilling operations on such particular portions of said surface.

2. This lease shall continue for a period of two (2) years from the date hereof and so long thereafter as any operations shall be conducted hereunder. If, during the primary term, however, the United States of America, or buyers duly authorized by it, shall suspend the buying of fissionable materials, then if there is no other lawful market for such materials, the primary term of this lease shall be extended by a period equal to that of the suspension, and if the primary term has expired at the time of any such suspension, the lease, if then still in existence, shall continue in existence during the period of suspension, notwithstanding lessee's failure to conduct operations hereunder during that period, and for a reasonable time thereafter to permit lessee to resume operations hereunder after the lifting of the suspension. The term "operations" as herein used and the term "mining operations" as hereinafter used in paragraph 3, shall each mean the production of ore in paying quantities.

3. If mining operations are not commenced on the leased land within one year from the date hereof, this lease shall then terminate as to both parties, unless on or before that date there shall be paid or tendered to the lessor or for lessor's credit in the Security Trust & Savings Bank at Billings, Montana, or its successors, which shall continue as depository regardless of changes of ownership in said lands, the sum of One Thousand Six Hundred and no/100 Dollars ($1600.00), which shall operate as a rental and permit lessee to defer the commencement of such operations for twelve months from said date. In like manner, upon like payments or tenders, the commencement of such operations may be further deferred for successive periods of twelve months. Lessee may at any time release this lease as to all or any

part of the leased lands, and lessee shall thereafter be under no further liability or obligation as to the lands released. In the event of a partial release, the aforesaid annual delay rental shall be reduced proportionately.

4. Lessee shall pay lessor a Royalty of 12½% on any of the aforesaid minerals mined and marketed hereunder. The royalty shall be computed on the price received by lessee for crude ore at the mine, including bonus payments and premiums, but excluding any allowances for transportation or development. If the lessor owns less than the entire undivided fee simple estate in the aforesaid minerals, then the aforesaid rentals and royalties shall be paid to the lessor only in the proportion which lessor's interest bears to said entire undivided fee.

5. Lessee shall pay all royalties in full to lessor, or deposit the same to lessor's credit in the aforesaid bank, on or before the 20th day of the calendar month succeeding the month in which marketed, and shall at the same time furnish lessor with verified monthly statements showing the minerals mined and marketed hereunder. Lessor shall have the privilege at lessor's expense of verifying such statements by examination of lessee's books and records. At lessor's risk, lessor or lessor's representative shall have access to the leased lands and any workings thereon at any reasonable time, for the purpose of examination and inspection and to make extracts from lessee's books and weight sheets showing the production from the leased lands.

6. Lessee shall satisfy in full and as due all taxes and assessments duly levied against its property and its interest hereunder, and all liabilities arising in any way out of its operations hereunder, and will indemnify lessor against all loss and expense arising in any way out of lessee's failure to satisfy any such liabilities.

7. The estate of either party hereto may be assigned in whole or in part, provided however, that the lessee's rights hereunder or interests herein may not be assigned or sublet, in whole or in part, without lessee's consent in writing; but lessee shall not be obligated to recognize any change of ownership in lessor's interest, however accomplished, until thirty days after lessee has received the original, or duly certified copy, of the recorded instrument or court decree evidencing the same.

8. No default by lessee in the performance of any of lessee's express or implied obligations hereunder shall result in termination of this lease, but if any such default remains uncured for more than thirty days, or such longer period as may be reasonably required diligently to correct such default, after written notice thereof by registered mail to lessee at its principal office, then lessor may at its option terminate this lease.

9. Lessee agrees that upon termination of this lease for any reason it will duly record in the county in which the leased land lies, a release or other instrument establishing of record the termination of the lease and of lessee's rights thereunder.

10. Lessor designates _____

of _____

as the person to whom all notices hereunder shall be given, and lessor hereby relinquishes and releases all right of dower, courtesy and homestead, if any.

11. Lessee agrees to compensate lessor for all damage to improvements, including structures, fences, roads or waterholes, and to surface. In this connection, lessee shall repair and restore any fences and gates damaged by its operations, and any other improvements and shall backfill, drag and level any excavations, holes and areas where the surface is rutted and broken by lessee's equipment and machinery, in each instance to the extent necessary to and in a manner sufficient to prevent soil erosion and to permit reseeding, and will reseed all such areas

with native or crested wheat grass.

THIS AGREEMENT shall be binding upon and inure to the benefit of the heirs, successors and assigns of the parties hereto.

GEORGE P. COX

RUTH E. COX

STATE OF MONTANA)
:
COUNTY OF YELLOWSTONE)

On this 29th day of September, 1955 before me personally appeared GEORGE P. COX and RUTH E. COX, his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged to me that they executed the same.

WITNESS my hand and official seal the day and year first above written.

My commission expires:

Notary Public

C O P Y

BURMAC EXPLORATION CORPORATION
P. O. BOX 836
WILLISTON, NORTH DAKOTA

ASSIGNMENT OF MINING LEASE

WHEREAS, On the 28th day of September, 1955, a certain Mining Lease was made and entered into by and between GEORGE P. COX and RUTH E. COX, his wife, of 614 Burlington Avenue, Billings, Montana, Lessors, and JOE CRISAFULLI AND SONS, consisting of JOE CRISAFULLI, SR., JOE CRISAFULLI, JR., FRANK CRISAFULLI and ANGELO CRISAFULLI, a partnership of Glendive, Montana, and ARTHUR M. SCHMITZ of Wibaux, Montana, Lessees, covering the following described land in the County of Fallon, State of Montana, to-wit:

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Township 10 North, Range 61 E.M.P.M.
Section 7: SE$\frac{1}{4}$
Section 8: SW$\frac{1}{4}$
Section 17: All
Section 18: All

Said Lease being recorded in the office of the County Clerk and Recorder of said county in Book_____, page _____, and

WHEREAS, the said Mining Lease and all rights thereunder or incident thereto are now owned by Joe Crisafulli and Sons, consisting of Joe Crisafulli, Sr., Joe Crisafulli, Jr., Frank Crisafulli and Angelo Crisafulli, a partnership of Glendive, Montana, and Arthur M. Schmitz of Wibaux, Montana,

NOW, THEREFORE, for and in consideration of One Dollar and Other Good and Valuable Consideration, the receipt of which is hereby acknowledged, the undersigned, the present owners of the said Mining Lease and all rights thereunder or incident thereto, do hereby bargain, sell, transfer, assign and convey unto JAMES G. KEY of Williston, North Dakota, all of their right, title and interest of the original lessee and present owners in and to the said Mining Lease and rights thereunder insofar as it covers the following described lands situate in the County of Fallon, State of Montana, to-wit:

Township 10 North, Range 61 E.M.P.M.
Section 7: SE$\frac{1}{4}$
Section 8: SW$\frac{1}{4}$
Section 17: All
Section 18: All

together with all personal property used or obtained in connection therewith to JAMES G. KEY and his heirs, successors and assigns.

IN WITNESS WHEREOF, the undersigned owners and assignors have signed and sealed this instrument this 12th day of October, 1955.

JOE CRISAFULLI AND SONS,
A Partnership

By: _____
A Partner

_____
ARTHUR M. SCHMITZ

_____
FLORENCE E. SCHMITZ

STATE OF MONTANA)
: ss
COUNTY OF FALLON)

On this 12th day of October, 1955, before me, a Notary Public in and for said County and State, personally appeared Joe Crisafulli, Jr., a partner of Joe Crisafulli and Sons, A Partnership, known to me to be the person described in and who executed the within and foregoing instrument and acknowledged to me that he executed the same.

_____
NOTARY PUBLIC, FALLON COUNTY, MONTANA

(S E A L)

My commission expires: _____.

STATE OF MONTANA)
: ss
COUNTY OF WIBAUX)

On this 12th day of October, 1955, before me, a Notary Public in and for said County and State, personally appeared Arthur M. Schmitz and Florence E. Schmitz, known to me to be the persons described in and who executed the within and foregoing instrument and acknowledged to me that they executed the same.

_____
NOTARY PUBLIC, COUNTY OF _____, MONTANA.

(S E A L)

My commission expires: _____.

C O P Y

BURMAC EXPLORATION CORPORATION
P. O. BOX 836
WILLISTON, NORTH DAKOTA

ASSIGNMENT OF MINING LEASE

WHEREAS, On the 28th day of September, 1955, a certain Mining Lease was made and entered into by and between GEORGE P. COX and RUTH E. COX, his wife, of 614 Burlington Avenue, Billings, Montana, Lessors, and JOE CRISAFULLI AND SONS, consisting of JOE CRISAFULLI, SR., JOE CRISAFULLI, JR., FRANK CRISAFULLI and ANGELO CRISAFULLI, a partnership of Glendive, Montana, and ARTHUR M. SCHMITZ of Wibaux, Montana, Lessees, covering the following described land in the County of Fallon, State of Montana, to-wit:

Township 10 North, Range 61 E.M.P.M.

Section 7:	SE¼
Section 8:	SW¼
Section 17:	All
Section 18:	All

RECEIVED
DEC 28 1955

Said Lease being recorded in the office of the County Clerk and Recorder of said county in Book_____, page_____, and

WHEREAS, the said Mining Lease and all rights thereunder or incident thereto is now owned by JAMES G. KEY of Williston, North Dakota, by virtue of an Assignment of Mining Lease dated the 29th day of September, 1955, and recorded in the office of the County Clerk and Recorder of said County in Book _____, page _____, on the _____ day of _____, 1955,

NOW, THEREFORE, For and in consideration of One Dollar and Other Good and Valuable Consideration, the receipt whereof is hereby acknowledged, the undersigned, the present owners of the said Mining Lease and all rights thereunder or incident thereto, do hereby bargain, sell, transfer, assign and convey unto BURMAC EXPLORATION CORPORATION of Williston, North Dakota, all of their right, title and interest of the original lessee and present owner in and to the said Mining Lease and rights thereunder insofar as it covers the following described lands situate in the County of Fallon, State of Montana, to-wit:

Township 10 North, Range 61 E.M.P.M.

Section 7:	SE¼
Section 8:	SW¼
Section 17:	All
Section 18:	All

together with all personal property used or obtained in connection therewith to BURMAC EXPLORATION CORPORATION, their heirs, successors and assigns.

IN WITNESS WHEREOF, The undersigned owners and assignors have signed and sealed this instrument this 15th day of October, 1955.

JAMES G. KEY

LORRAINE M. KEY

STATE OF NORTH DAKOTA)
: ss
COUNTY OF WILLIAMS)

On this 15th day of October, 1955, before me, a Notary Public in and for said County and State, personally appeared JAMES G. KEY and LORRAINE M. KEY, known to me to be the persons described in and who executed the within and foregoing instrument and acknowledged to me that they executed the same.

NOTARY PUBLIC, WILLIAMS COUNTY, NORTH DAKOTA.

(S E A L)

My commission expires:_____.

November 7, 1955

(5)

To: Directors, Burmac Exploration Corporation
From: Donald Towse, Exploration manager
Subject: Proposed exploratory drilling program, Ollie prospect.

1. Area: This plan covers the Cox lease on the south half of section 18, T.10N.,R.61E., Fallon county, Montana.

2. Purpose: A regular program of exploratory drilling will outline the stratigraphy, geologic structure, ore-bodies, and the geological factors that control the ore deposition.

This program is not designed to block out ore or prepare the property for mining.

3. Geology: Four holes have already been drilled on the northeast part of the property. One of these radioactivity logs indicated a uranium bearing bed 2.4' thick with an average assay of 0.26 percent uranium oxide. That was hole number 126 in our previously-completed drilling program.

Thirty-two holes have been drilled on section 17, immediately to the east. Several of those indicated ore-grade mineralization, and one small ore-body is indicated.

Five holes were drilled in the north-half of section 18; and one, just north of the half-section line, was ore-bearing.

Four holes drilled 400 feet south of the south line of section 18 and four hundred feet apart were not ore-bearing.

The south half of section 18 lies on the lower part of the ridge that divides the Ollie prospect and is on the northern slope of that ridge. An ore-body now being prepared for mining is about one-half mile south of section 18 in "AREA A" of section 19. The ore-bearing bed is covered over most of the south-half of section 18, except in a few small gullies where it has been eroded.

It is proposed to drill exploratory holes on a regular geometric pattern over the property where the ore-bearing bed is covered. That bed is more than 70 feet deep in the SW¼SW¼ of section 18. Only the deep tests on a wide spacing will be drilled there, unless those tests disclose an economic deposit there.

4. Plan of work: Samples from all holes will be logged for lithology and all will be logged with a Geiger counter logger. Ore-bearing beds will be sampled if possible for assay. The drilling will be based on a regular square geometric pattern and will be divided into the following phases:

a. Test holes to a depth of 150 feet will be drilled on 1000 foot intervals. Purpose of these holes will be to outline geologic structure and to discover deeper ore-bearing beds or beds whose lithologic character may indicate that they should be explored in more detail. Most of the remaining drilling will be directed toward exploring the beds at shallow depths in which ore is already known in the area, unless the deep tests indicate that another course should be followed.

b. Additional holes will be drilled to the main ore-bearing bed at 400 foot intervals.

c. Another series of holes will be drilled at 200 foot intervals where information gained from series "b" indicates that the rock types and structure are favorable, or where mineralization was found.

d. Where mineralization has been found, a more detailed pattern of exploratory drilling on patterns 100 or 50 feet apart will be planned and drilled. Twenty percent of these holes will be cored for assay and radiometric control of the Geiger counter logs.

From holes we have already drilled, I estimate that, in the above program the following numbers and depths of holes will be required:

For series a, b, c, above:

10 holes	150 feet deep, total:	1500'
20 holes	70 feet deep, total:	1400
35 holes	60 feet deep, total:	2100
40 holes	50 feet deep, total:	2000
100 holes	40 feet deep, total:	4000
	subtotal	11000 feet
For detailed drilling:		2000
	Total footage:	13000 feet

Costs: Total estimated cost of this program is $20,000, estimated as follows:

Drilling: 13,000', contracted at total cost of $1.25 per foot:	$16,250.00
Geologists salaries and expense (see note 1)	2,000.00
Purchase price of deep logging equipment.	800.00
Assaying, 50 samples at $5.00.	250.00
Drafting, clerical expense, field office expense and supplies, surveying fees, insurance, and miscellaneous supplies.	700.00
	$20,000.00

Note 1: 1 junior geologist full-time while drilling: Salary $350 per month, expenses $250 per month.
1 supervising geologist 1/4 time: $200 per month salary and expenses.

Rate of drilling should be 5000 to 6000 feet per month, which will require a total drilling time of about two and a half months.

This program should be split into two or three phases to allow time for study of information and detailed planning. The entire program can be completed within a total elapsed time of six months.

Note 2. The drilling rig contracted should be a Failing 750 or comparable machine equipped with a core-barrel and sample catchers for both air and water drilling.

Shallow holes may be most economically drilled by using air for a circulating fluid. A compressor delivering a minimum of 600 cubic feet per minute should be provided.

Deeper holes will have to be drilled with water or mud; and water or mud must be used for coring.

Note 3: The Geiger probing device recommended is a Babbel counter Model 610 Geiger counter, with gear-driven hand-powered reel and stand and deep-hole Geiger tube probe with contained impedance-matching transformers and 500 feet of cable.

A recorder would be convenient but is not absolutely necessary as most of the holes will be shallow.

Yours truly,

Donald Towse

(6)

BURMAC EXPLORATION CORPORATION
Exploration Office
926 Park Avenue
Dickinson, North Dakota

REPORT OF EXPLORATORY WORK ON THE OLLIE PROSPECT
FALLON COUNTY, MONTANA

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Summary

The Ollie prospect, in T. 10N., R. 60 and 61 E., Fallon County, Montana, has ore in outcrops and in drill holes in Fort Union sandstone and carbonaceous shale.

A total of 5799 feet of test holes have been drilled, and 4790 yards of overburden have been moved off one ore-body.

Mineralization is controlled by channel-type sandstone structures with thin carbonaceous shale stringers. Assays of ore range from 0.10 to 1.72 percent uranium oxide. Drill holes in ore indicate an average between 0.20 and 0.23 percent.

Three small areas of concentrated ore are indicated by present drilling. A few thousand tons of ore are semi-proven to date.

Much more exploratory and development drilling and exploratory mining and trenching must be done before reserves are adequately proven or the property is thoroughly explored.

Location

The Ollie prospect is a block of uranium leases of about 4480 acres north of the town of Ollie in Fallon County, Montana. The leases lie in T.10N., R. 60E., Section 24; and in T. 10N., R. 61E., in Sections 7, 8, 16, 17, 18, 19, 20, 21, 28, and 29.

The block is bisected by a graded county road and a spur line of the Northern Pacific Railroad. Most of the area is easily accessible by county roads and farm trails. There is no running water in the block; most of the farmers have stock water ponds and shallow water wells.

General Geology

Surface formation is the fresh-water deposited Paleocene Fort Union formation. This consists mainly of soft sandstones with some shale partings and lignite beds. There is a general alternation of sandstone, lignite, and shale beds in the section.

Assays of ore have ranged from 0.10 and 1.72 percent uranium oxide, and from zero to 0.53 percent vanadium oxide. Radioactivity logs and a few assays of drill cuttings indicate that the average tenor of the ore beds will vary from 0.10 to 0.23 percent uranium oxide.

Mineralization is confined to places where the sandstone grades laterally to gray shale and lignite. Drilling indicates that sedimentation was varied and irregular, and that channel-type structures of sandstone are present. Ore is present where thin stringers of carbonaceous material interfinger with the sandstone. Where the sandstone and shale sequence has been trenched, the beds are contorted and faulted in local spots, but in general the deposits are nearly flat-lying. Two or more ore beds may be present in any one place, but more often only one bed is present. The ore beds are lenticular, and when one pinches out, other ore may be found in beds a few feet higher or lower in the section.

Exploratory work

Preliminary field mapping and aerial radioactivity surveys were done by Burmac geologists in the early part of August.

During August and September 160 test holes were drilled. These varied from 5 to 90 feet deep, and the total footage drilled was 5799 feet. Most of the holes were drilled on a regular pattern on 200 foot centers. A few areas were drilled on smaller intervals in order to get detailed data.

Most of the holes were not sampled; but radioactivity logs were run in all, using a Victoreen Geiger counter with deep-hole probe. No cores were taken, for the formation was not adapted to coring with the equipment used. A few holes were sampled to check the radioactivity logs with assayed samples. Samples were taken by drilling down to the desired depth, then circulating out all cavings with air, and then drilling carefully to the total depth while catching all cuttings blown from the hole.

Data on the holes drilled are given on the large map and in Tables 2 and 3.

In October a large pit was dug in the NE¼SE¼ of Section 19, in order to expose the ore beds for assaying and amenability tests and to begin stripping for a test ore shipment.

A total of 4790 yards, consisting mostly of soft sand, was moved. Of this 4720 yards were bulldozed; 70 yards were moved by drag-line. This work was just finished as this report was being finished.

General geologic structure is simple with very low dips, but in detail the structure may be complicated anywhere by slumping and soft-rock deformation. The Ollie prospect lies on the east flank of the Baker-Glendive anticline and on or near the axis of a minor northwesterly plunging anticlinal nose.

The topography is gently rolling. One major line of hills runs through the block from near the center of Section 20 northwesterly to the southwest quarter of Section 18.

Mineralization

Ore-grade mineralization is present near the base of a sandstone bed that crops out in the southwest quarter of Section 20 and the southwest quarter of Section 17. Elsewhere the bed is covered with from 2 to 90 feet of shale and soft sandstone overburden.

Aerial scintillator survey showed significant anomalous radioactivity in the north half of Section 16, the northeast quarter of section 17, the south half of Section 18, the southeast quarter of Section 19, and the west half of Section 20, all in T. 10N., R. 61E.; and in the northeast quarter of Section 24, T. 10N., R. 60E. No significant radioactivity was found outside of this area. Within it, the ore is covered by enough overburden to mask any radioactivity in the higher hills.

On surface survey, significant radiation was found in many places near the edges of the block where the ore-bearing bed crops out or is lightly covered. Radioactivity of 150 to 300 times background was found in the NW¼SW¼ of Section 20; 150 times background in the NW¼SW¼ of Section 17; 50 times background in the SE¼SW¼ of Section 20; 50 times background in the NE¼SE¼ of Section 19; 40 to 50 times background in the NE¼ of Section 18; and 2 to 10 times background in the SW¼SE¼ of Section 16.

The uranium is localized by thin carbonaceous lignitic shale seams, in which there is a high uranium content. Uranium is present in the sandstones above and below the shale seams; the sandstones are somewhat harder and stained lightly with yellow and brown colors, as contrasted with the softer and lighter colored adjoining non-mineralized sandstones.

Ore extends from 2 to 10 inches into the sandstones on either side of the shale seams. There is little visible mineralization. Some yellow uranium minerals have been found in the sandstone, and rare specks of autunite or meta-autunite are visible in the shale seams. Presence or amount of urano-organic mineral are unknown at this time.

Radioactivity logs

The Victoreen deep-hole probe was used in all holes. The instrument used was calibrated in counts per minute, but by running twin logs with it and an A.E.C. instrument calibrated in milliroentgens per hours, it was possible to derive a calibration ratio and to express the logs in mr./hr.

Data were plotted and continuous curves plotted across the ore beds. It was assumed that 0.70 mr./hr. indicated 0.10% uranium oxide, and that 1.0 mr./hr. indicated 0.15% uranium oxide.

In most cases lines were drawn on the logs at the depths where radioactivity first reached and then where it fell below the 1.0 mr./hr. value. The interval between lines is reported as ore thickness. The average radioactivity in the ore interval was calculated graphically and then converted to equivalent percent uranium oxide (eU_3O_8) by using a curve with values as follows: 0.70 mr./hr.-0.10%; 1.0 mr./hr.-0.15%; 1.40 mr./hr.-0.20%; 1.9 mr./hr.-0.25%.

This procedure was checked by a channel sample at hole #1 and a cuttings sample in hole #A-14. Results of the check were as follows: Hole #1, eU_3O_8 (log): .21%, assay: .32%; Hole #A14, eU_3O_8 (log): .17%, assay: .21%. In the first hole the assay is 1.56 times the log reading, and in the second hole it is 1.24 times. Accordingly, a factor of 1.30 was used to convert log values to estimated true values.

These techniques of calculation may be influenced in their results by natural spread of ore in the sides of the hole, by spread of radioactivity, or by variation in radioactive equilibrium. In area "A", however, the sample checks were reasonably close. In other areas the results are only an indication.

Ore Bodies

Mineralized holes were scattered in the area. These are shown on the map and listed in Table 3. In three spots some detailed drilling was done. Holes and detailed areas are shown on the map.

Area "A" is mainly in the NE$\frac{1}{4}$SE$\frac{1}{4}$ of Section 19. The excavation work was done there, between the holes #A7 and #A12. A preliminary reserve estimation places the maximum total there at 3000 tons, average assay .213%, average thickness 1.14 feet, average overburden 13.6 feet. Samples are too few and drilling density is too small to make more than an approximation. Reserve figures will have to be revised downward if the several beds are lenticular and not connected.

Cross-sections 1 through 4 are in area "A". These show the features of the deposit. No definite correlations are shown between the shallow, medium, and deep beds. It is not known how much of the depth variation is due to local folding and faulting and how much represents different lenticular beds. Much of it is probably due to lenticularity, and the reserve figures will have to be revised downward.

Area "B" is a generally deeper ore-body in the SE$\frac{1}{4}$SW$\frac{1}{4}$ of Section 20. Drilling isn't sufficient for reserve estimates. Cross-sections 5 through 7 show the features there. In some of the holes the ore is too thin and poor to be mined economically at that depth.

Area "C" is in the NW$\frac{1}{4}$SW$\frac{1}{4}$ of Section 17. No estimates have been made for that area. It is shown in cross-sections 8 and 9.

Present development indicates that the ore in the shallower beds already drilled will be found in small lenticular bodies. Exploration is far from complete, and other such ore bodies may be found.

Similar rocks are to be found at greater depths, and deeper drilling may discover better and deeper ore than that now known.

Much pattern and detail drilling and test stripping and mining is yet to be done to thoroughly explore the prospect.

October 30, 1955

BURMAC EXPLORATION CORPORATION

By Donald Towse
Donald Towse, Exploration Manager

TABLE 1. ASSAY DATA

	% U_3O_8	oU_3O_8	%V_2O_5	Assayer	Location and Remarks
1.	.316	---	---	Jerome, Denver	13" channel, near hole R, NW¼SW¼ Sec. 20
2.	.09	---	---	"	Hole A-11, 6½-7½', cuttings sample.
3.	.21	---	---	"	Hole A-14, 7½-10', " "
4.	.12	---	---	"	Hole 154, 34-36', " "
5.	0.00	---	---	"	Hole 154, 36-38', " "
6.	.03	---	---	"	Hole 45A, 36-38', " "
7.	0.00	---	---	"	Hole 45A, 38-40', " "
8.	.05	.13	---	A. E. C.	NE¼NE¼ Sec. 18.
9.	.03	.10	.23	"	10' North of above sample #8
10.	.11	.05	---	"	.3 miles east of road, in Sec. 20; 1' channel.
11.	.10	.14	.10	"	1½' deep, near above sample #10.
12.	.50	.53	.53	"	West side of road, Sec. 19.
13.	.17	.13	---	"	10" channel above sample #12.
14.	.05	.40	---	"	East side of road, Sec. 20; 2-4' deep.
15.	1.72	1.30	.10	"	8 feet North of sample #14.
16.	.15	.22	---	"	7" channel under sample #15.
17.	.51	.51	.37	"	Surface sample ¼ mile West of road; in Sec. 19
18.	.08	---	---	Jerome, Denver	Hand auger hole, sample from 1-6', in NW¼SW¼, Sec. 20.
19.	.08	---	---	"	Sample 1-5', auger hole 50', South of #18.
20.	.053	.20	---	Chem. & Geol. Lab., Casper	Sand, NW¼SW¼ Sec. 20.
21.	.061	.054	---	"	Road cut, NE¼NE¼ Sec. 18.
22.	.030	.018	---	"	10" channel; sand at NE corner Sec. 18.
23.	.061	.083	---	"	12" channel; carbonaceous soil, in road cut in NE¼SE¼ Sec. 7.
24.	.006	.004	---	Jerome, Denver	10' S. of Hole #5, 1-2' deep
25.	.068	.073	---	"	10' S. of Hole #5, 3-4' deep
26.	.031	.017	---	"	10' S. of Hole #5, 4½-5' deep
27.	.011	.008	---	"	10' S. of Hole #5, 5½-6' deep
28.	.027	.021	---	"	Hole #28, 2'4"-3'2" deep

TABLE 2. LIST OF TEST HOLES

Hole Number	Total Depth	Ore Thickness*	Drilled by.	Remarks
1	5'9"	13" plus	Hand auger	10' west of R-1; assay .32%
2	5'	2.6'	Hand auger	50' south of #1
5	7'6"	1.2'	Burmac Hossfeld drill	
6	11'	0.5'	"	
7	8½'	--	"	
8	12'8"	--	"	
9	12½'	--	"	
11	5'	--	"	
12	6½'	--	"	
14	12'	--	"	
15	11'	--	"	
16	12'	--	"	
17	10'	--	"	
24	14'	?	"	Incomplete log.
25	10½'	--	"	
26	8½'	1.7'	"	
27	11'	--	"	
28	6'4"	0.2'	Posthole digger	
29	4'	0.95'	"	
30	20'	1.9'	Burmac Hissfeld drill	
31	7½'	--	"	
32	27'	1.2'	"	
35	10½'	--	"	
36	5'	--	Posthole digger	
38	14'	?	Burmac Acker drill	Incomplete log.
44	36	--	Young Exploration Co.	
45	41'	2.1'	Burmac Acker drill.	

Hole number	Total Depth	Ore Thickness*	Drilled by	Remarks
45A	40'	--	Young	5' east of #45.
46	45'	--	"	
49	40	--	"	
50	50'	--	"	
56	50'	1.3'	"	
66	60'	--	"	
74	40'	--	"	
75	50'	2.7'	"	.12% eUoxide. (log)
75A	50'	--	"	
76	50'	--	"	
79	70'	--	"	
80	60'	--	"	
88	50'	--	"	
97	50'	--	"	
98	60'	--	"	
107	60'	1.4'	"	.115% eUoxide (log)
112	60'	1.8'	"	.135% eUoxide (log)
117	70'	0.6'	"	
125	50'	--	"	
126	45'	2.4'	"	
127	40'	--	"	
151	30'	0.4'	"	
153	40'	--	"	
154	55'	2.0	"	Sample assay .12%
156	60'	--	"	
158	72'	--	"	
160	55'	--	"	
162	55'	--	"	
164	45'	--	"	
166	70'	--	"	
168	35'	--	"	
185	40'	--	"	
187	57'	--	"	
189	65'	--	"	
191	70'	--	"	
215	60'	--	"	
220	50'	--	"	
223	50'	--	"	
225	60'	--	"	
245	50'	--	"	
246	50'	--	"	
248	30'	--	"	
250	59'	--	"	
252	90'	--	"	
254	60'	--	"	
265	17'	--	"	
266	35'	1.5'	"	
267	25'	--	"	
301	40'	1.9'	"	
308	20'	--	"	
309	20'	3.5'	"	
309A	20'	--	"	
310	40'	--	"	
311	40'	0.45'	"	.12% eUoxide (log)
312	50'	--	"	
313	40'	--	"	
314	45'	--	"	
316	60'	--	"	
318	75'	--	"	
319	50'	0.6'	"	.10% eUoxide (log)
320	15'	--	"	
322	40'	2.0'	"	.14% eUoxide (log)
324	60'	2.0'	"	o.08% eUoxide (log)
326	60'	--	"	
327	35'	--	"	
328	90'	--	"	
330	60'	--	"	
332	50'	--	"	
334	60'	--	"	

Hole number	Total Depth	Ore Thickness*	Drilled by.	Remarks
335	60'	--	Young	
336	40'	--	"	
337	30'	--	"	
339	40'	--	"	
341	80'	--	"	
343	80'	--	"	
345	40'	--	"	
401	30'	--	"	
402	40'	--	"	
403	15'	--	"	
501	40'	--	"	
502	75'	--	"	
503	60'	--	"	
508	30'	?	"	
509	30'	?	"	No radio-log.
511	50'	?	"	"
513	50'	?	"	"
515	50'	?	"	"
517	60'	?	"	"
519	30'	?	"	"
A-1	30'	--	"	
A-4	10'	--	"	
A-5	30'	0.8'	"	.13% eUoxide (log)
A-6	30'	--	"	
A-7	30'	2.8'	"	
A-7B	30'	?	"	not logged. Twin to A-7
A-8	30'	--	"	
A-9	30'	--	"	
A-10	30'	--	"	
A-11	30'	1.3'	"	
A-11'	7'	1.0' plus	"	twin spl. hole; .12% (log)
A-12	30'	1.04'	"	
A-13	20'	--	"	
A-14	20'	2.1'	"	
A-14'	10'	2.5'	"	
A-15	20'	--	"	
A-16	30'	--	"	
A-17	30'	--	"	
A-18	30'	--	"	
A-19	30'	--	"	
A-20	20'	--	"	
A-21	20'	--	"	
A-22	20'	--	"	
A-24	20'	--	"	
A-25	20'	--	"	
A-26	20'	--	"	
A-27	20'	--	"	
A-28	20'	--	"	
B	30'	1.56'	"	
C	30'	1.60'	"	
CS-1	11'4"	0.9'	Burmac Hossfeld drill.	
D	30'	--	Young	
E	20'	--	"	
E-1	20'	--	"	
F	30'	--	"	
G	30'	1.9'	"	
H	30'	?	"	Incomplete log, .20% eUoxide.
J	30'	0.9'	"	
K	40'	1.8'	"	
R	30'	0.8'	"	
R-1	5'	?	Dug pit.	1.0 mr./hr. surface.
U308	20'	--	Young	
X	25'	--	"	
Z	40'	--	"	

* Note: Ore thickness is calculated from radioactivity logs. Unless otherwise noted, thickness is that indicated in logs with equivalent uranium oxide content of 0.15% or greater.
See report discussion of radioactivity logs.

Table 3. Mineralized holes.

Hole	Ore * Thickness	** eU_3O_8	*** cU_3O_0	Depth	Location	Remarks
1	13" plus	.205%	.32%	13"	NW¼SW¼ 20	eUoxide is analysis of log, of part of hole, next to channel sample assaying .32%.
2	2.6'	.174	.23	1.8'	50'S of #1	Poor sample from 1-5' assayed 0.08%.
5	1.2'	.186	.22	0.4'	NW¼SW¼ 17	
6	0.5	.155	.20	8.4'	SE¼NE¼ 19	
24	?	.15	--	9.0	Area C (NW¼SW¼ 17)	maximum .15% at T.D.
26	1.7'	.18	.23	6.0'	"	
28	0.2'	.155	.20	3.5'	"	
29	.95'	.16	.21	2.7'	"	
30	1.9'	.196	.25	11.3'	"	
32	1.2'	.15	.19	19.8'	"	
45	2.1'	.19	.25	32.4'	NW¼SW¼ 17	
56	1.3'	.153	.20	34.0'	"	
75	2.7'	.12	.156	37.0'	SW¼SW¼ 17	ore cut-off at .12%e
107	1.4'	.115	.15	44.6'	"	ore cut-off at .10%e
112	1.8'	.135	.175	51.6'	"	ore cut-off at .12%e
117	0.6'	.155	.20	64.8'	"	
126	2.4'	.20	.26	23.0'	NE¼SE¼ 18	
151	0.4'	.15	.20	21.8'	SW¼NW¼ 20	
154	2.0'	--	.12	34.0'	"	spl. 34-36' assay .12%.
266	1.5'	.18	.23	12.5'	SE¼NE¼ 18	
301	1.9'	.16	.21	0.6'	Area B	
309	3.5'	.17	.22	10.7'	(SE¼SW¼ 20)	
311	.45'	.12	.16	32.8'	"	ore cut-off at .10%e
319	0.6'	.10	.13	29.0'	"	"
322	2.0'	.14	.18	32.6'	SE¼SW¼ 20	"
324	2.0'	.08	.10	27.0'	"	ore cut-off at .08%e
A-5	0.8'	.13	.17	13.6'	Area A-	ore cut-off at .10%e
A-7	2.8'	.17	.22	20.8'	(NE¼SE¼ 19)	
A-9	0	.10	--	6.5'	"	maximum .10%e @6.5'
A-10	0	.10	--	5.0	"	maximum .10% @ 5.0'
A-11	1.3'	.17	.22	6.2'	"	
A-11'	1'	.12	.09	6.5'	"	Sample hole: poor spl. 6½-7½ assay .09' ore cut-off at .10%e
A-12	1.04'	.18	.23	18.8'	"	
A-14	2.1'	.17	.22	7.7'	"	
A-14'	2.5'	.17	.21	7.5'	"	Sample hole: 7½-10' assayed .21%.
A-15	0	.12	--	8.5'	"	maximum .12e @ 8.5'
B	1.56'	.18	.23	23.2'	NW¼SW¼ 20	
C	1.6'	.16	.21	5.0'	NE¼SE¼ 19	
CS-1	0.9'	.16	.21	3.5'	SE¼ 19	
G	1.9'	.16	.21	2.3'	Area A	
H	?	.20	--	25.0'	(NW¼SW¼ 20)	Incomplete; .20e @ 15', 25'.
J	0.9'	.18	.23	20.4'	"	
K	1.8'	.17	.22	15.3'	"	
R	0,8'	.15	.20	3.5'	"	
R-1	?	--	--	4.0'	"	Dug pit. 1.0 mr./hr.

Notes:

*Ore thickness is that part of the hole where equivalent uranium oxide as indicated on log is greater than .15%, unless otherwise noted.
** Equivalent percent uranium oxide is calculated from radioactivity logs.
***Unless otherwise noted, chemical percent uranium oxide is calculated by multiplying eUoxide by a factor of 1.3. Factor is estimated from sample date in holes #1 and #A-14', where indicated factor was 1.56 and 1.24 respectively.

See report discussion of radioactivity logs.

Appendix 1 (Cont'd.)

HOLE # D-1
T.D. 74'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above w/ some gray iron stained clay
42-44	Sand, buff and some med. gray fine sand
44-46	As above
46-48	Sand, buff, some med. gray clay
48-50	Sand, dark buff
50-52	As above
52-54	Sand, buff, some med. gray clay (damp)
54-56	As above
56-58	Sand, buff, some med. gray clay
58-60	As above
60-62	As above
62-64	As above
64-66	Clay, med. gray (much water)
66-68	As above
68-70	As above
70-72	As above
72-74 T.D.	As above

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HOLE # D-2
T.D. 60'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Sand, light gray, fine and light gray clay
6-8	Clay, light gray
8-10	Sand, buff w/ some light gray clay
10-12	Sand, buff, fine
12-14	As above
14-16	Sand, buff, fine, w/ few concretion chips
16-18	Sand, buff, fine
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above, w/ some gray clay (very damp)
44-46	Sand, buff, med. grained
46-48	As above
48-50	As above
50-52	Sand, buff, w/ some med. gray clay (very damp)
52-54	Clay, med. gray
54-56	As above
56-58	As above
58-60 T.D.	As above

HOLE # D-3 Sec. 17
T.D. 90'

FEET	LITHOLOGY
2-4	Sand, light gray, fine
4-6	As above
6-8	Sand, buff w/ some light gray clay
8-10	Sand, buff fine
10-12	Sand, light gray, fine
12-14	Sand, light gray w/ some med. gray clay
14-16	As above
16-18	Sand, light gray
18-20	Clay, med. gray w/ some fine light gray sand
20-22	Clay, med. gray w/ much fine light gray sand
22-24	Sand, light gray, fine
24-26	As above
26-28	Sand, light gray, fine, w/ some med. gray clay
28-30	Sand, light gray, fine
30-32	Sand, buff, fine
32-34	As above
34-36	Sand, dark buff w/ some iron stained gray clay
36-38	Clay, iron stained
38-40	Clay, med. gray w/ some fine gray sand
40-42	Sand, light gray w/ some gray clay
42-44	As above
44-46	As above
46-48	As above
48-50	Sand, light gray, w/ some med. gray clay
50-52	Clay, med. gray, w/ some fine gray sand
52-54	Clay, med. gray w/ some iron staining and little fine gray sand
54-56	As above
56-58	Clay as above w/ some buff sand
58-60	Sand, buff, some blk. carb. particles
60-62	As above
62-64	As above
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	As above
82-84	Clay, med. gray, Much water
84-86	As above
86-88	As above
88-90 T.D.	As above

HOLE # D-4
T.D. 110'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, light gray, fine
4-6	Clay, med. gray, some iron staining
6-8	As above
8-10	Sand, gray, fine w/ some iron stained clay
10-12	Sand, gray fine
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Sand, light gray, some iron stained clay
22-24	Sand, light gray
24-26	As above
26-28	Clay, dark gray, some fine gray sand
28-30	As above
30-32	As above
32-34	Sand, fine, light gray, some dark gray clay
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	As above
58-60	Sand as above w/ some dark gray clay
60-62	Sand, buff, fine
62-64	As above
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	As above w/ some gray clay
82-84	Sand, buff, fine
84-86	As above
86-88	As above
88-90	As above w/ little blue clay
90-92	As above
92-94	As above
94-96	As above
96-98	As above
98-100	As above
100-102	Clay, med. gray (much water)
102-104	As above
104-106	As above
106-108	As above
108-110 T.D.	As above

HOLE # D-5 Sec. 17
T.D. 100'

FEET	LITHOLOGY
2-4	Sand. light gray, fine
4-6	Sand, light gray, fine, w/ some iron stained clay
6-8	Sand, gray, fine
8-10	As above
10-12	Sand, gray, fine, some iron staining on light gray clay
12-14	As above
14-16	Clay, brown to gray, much iron staining
16-18	Sand, buff, fine, some clay as above
18-20	As above
20-22	Sand, buff, fine
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	Sand, buff, fine, w/ some blue gray clay
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	Sand as above w/ some med. gray clay
54-56	As above
56-58	As above
58-60	As above
60-62	Sand, buff, fine
62-64	Clay, blue gray, w/ some iron staining
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	Sand, buff, fine
76-78	As above
78-80	As above
80-82	As above
82-84	As above
84-86	Sand, buff w/ some med. blue gray clay
86-88	As above
88-90	As above
90-92	As above
92-94	Clay, blue gray w/ some buff sand
94-96	Clay, blue gray
96-98	As above
98-100 T.D.	As above

HOLE # D-6-C
T.D. 65'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff w/ some light gray clay
	4-6	As above
	6-8	As above
	8-10	As above
	10-12	As above
	12-14	As above
	14-16	As above
	16-18	As above
	18-20	As above
	20-22	As above
	22-24	As above
	24-26	As above
	26-28	As above
	28-30	As above
	30-32	As above
	32-34	As above
	34-36	As above
	36-38	As above
Core 1	38-40 rec. 24"	Sandy clay, light buff
	40-42	Sand, buff, fine
	42-44	As above
	44-46	As above
	46-48	As above
	48-50	As above
	50-52	As above
	52-54	As above
	54-56	As above
	56-58	As above
	58-60	As above
	60-62	As above
Core 2	62-65 T.D. rec. 36"	Clay, med. gray w/ little fine gray sand Few blk. carb. particles

HOLE # D-7 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Surface, light gray clay and soil
4-6	Sand, light gray, fine, w/ some light gray clay
6-8	As above
8-10-	As above
10-12	Sand, buff, some light gray clay
12-14	Sand, buff, fine
14-16	Sand, buff, some light gray clay
16-18	Sand, buff, fine
18-20	Sand, buff, some light gray clay
20-22	As above
22-24	As above
24-26	As above
26-28-	As above
28-30	Sand, buff, fine
30-32	As above
32-34	As above
34-36	As above
36-38	As above w/ some light gray clay
38-40	Sand, buff, med. grained w/ some light gray clay
40-42	Clay, med. gray w/ some fine gray sand
42-44	Clay, med. gray w/ blk. carb. particles
44-46	As above
46-48	As above
48-50 T.D.	As above

D-8-C
T.D. 56'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff, fine w/ little light gray clay
	4-6	As above
	6-8	As above
	8-10	As above
	10-12	As above
	12-14	As above
	14-16	As above
	16-18	As above
	18-20	As above
	20-22	As above
	22-24	As above
	24-26	As above
	26-28	As above
	28-30	As above
	30-32	As above
	32-34	As above
	34-36	As above
	36-38	As above
	38-40	As above
	40-42	As above
	42-44	As above
	44-46	As above
Core 1	46-48 rec. 1"	Sand, buff w/ some med. gray clay
Core 2	50-53 rec. 24"	Sandy clay, med. gray w/ few blk. carb. particles
Core 3	53-56 T.D. rec. 18"	Sandy clay, med. gray w/ few blk. carb. particles

HOLE # D-9
T.D. 50'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray, surface soil
4-6	Clay as above
6-8	Clay, light gray and fine buff sand
8-10	Sand, buff, fine, some light gray clay
10-12	Sand, dark w/ iron staining, fine with some light gray clay
12-14	Sand, buff, fine
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, med. gray, iron stained, some fine gray sand w/ much buff sand
28-30	As above
30-32	Clay, med. gray, much iron staining, much buff sand
32-34	As above
34-36	As above
36-38	As above
38-40	As above (much water)
40-42	Clay, light gray w/ some fine gray sand some iron staining (much water)
42-44	Clay, light gray to med. gray
44-46	Clay, med. gray, some fine gray sand (much water)
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-10 Sec. 17
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Sand, buff, fine
6-8	Sand, buff, fine, some dark iron staining
8-10	Clay, med. gray w/ some fine gray sand, much iron staining and a few iron concretion chips
10-12	Clay, med. gray w/ some fine gray sand
12-14	As above
14-16	As above
16-18	Clay, med. gray, some fine gray sand w/ iron staining
18-20	As above
20-22	Clay, med. gray, some buff sand, fine
22-24	As above
24-26	As above
26-28	Clay, med. gray, some fine gray sand
28-30	As above
30-32	As above
32-34	Clay, med. gray to dark gray, few blk. carb. particles w/ little iron staining
34-36	Clay, med. gray to dark gray, w/ little blue gray clay
36-38	Clay, med. gray w/ some blue gray clay
36-38	Clay, med. gray and blue gray clay 50-50
38-40	As above
40-42	Clay as above
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	Clay, med. gray and blue gray clay (50-50)
54-56	As above
56-58	As above
58-60 T.D.	As above

HOLE # D-11 Sec. 17
T.D. 70'

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, light gray, fine
12-14	As above
14-16	Sand, buff, med. grained
16-18	As above
18-20	As above
20-22	As above
22-24	Clay, med. gray, much buff sand
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, med. grained w/ some med. gray clay w/ iron staining
42-44	As above; very little clay
44-46	As above; very little clay
46-48	As above; very little clay
48-50	As above; very little clay
50-52	As above; very little clay
52-54	Clay, med. gray, much buff sand (up hole?)
54-56	Clay, med. gray w/ blk. carb. particles
56-58	Clay, med. gray (damp) w/ some fine gray sand
58-60	Clay, med. gray w/ some blue gray clay (very wet)
60-62	Clay, med. gray
62-64	As above
64-66	As above
66-68	As above
68-70 T.D.	As above

HOLE # D-12
T.D. 70'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Clay, light gray, some iron staining w/ some fine buff sand
6-8	As above
8-10	As above
10-12	As above
12-14	Clay, light gray w/ some iron staining and a few blk. carb. particles
14-16	As above
16-18	Sand, light gray, fine
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, light gray w/ iron staining and much light gray fine sand
28-30	As above
30-32	As above
32-34	Sand, light gray, fine
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	Sand, buff, fine, some light gray clay and fine gray sand
44-46	Clay, light gray w/ some iron staining w/ much fine gray sand
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	Sand, light gray, some light gray clay
58-60	As above (much water)
60-62	Clay, med. gray
62-64	As above
64-66	As above
66-68	As above
68-70 T.D.	As above

HOLE # D-13
T.D. 54'

Sec. 17

FEET	LITHOLOGY
2-4	Surface clay
4-6	Sand, light gray, fine and light gray clay
6-8	As above
8-10	As above
10-12	Clay, med. gray
12-14	Sand, buff, fine, little iron stained med. gray clay
14-16	Sand, buff, fine
16-18	As above
18-20	Sand, buff, med. grained
20-22	Sand, dark buff, much iron staining w/ some gray clay
22-24	Sand, buff, med. grained
24-26	As above
26-28	Sand, light gray, fine
28-30	As above
30-32	As above
32-34	As above w/ some med. gray clay
34-36	Sand, buff to light gray, med. grained
36-38	Sand, buff, med. grained, some gray clay
38-40	As above
40-42	As above
42-44	As above
44-46	Clay, med. gray, some fine gray sand (damp)
46-48	As above
48-50	As above
50-52	Clay, med. gray
52-54 T.D.	As above

HOLE # D-14
T,D. 60'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Sand, light buff, fine w/ some light gray clay
6-8	Sand, light buff
8-10	Sand, buff, some light gray clay
10-12	As above
12-14	As above
14-16	As above
16-18	Sand, buff, fine
18-20	As above
20-22	Sand, buff, fine w/ some med. gray clay, iron stained
22-24	Sand, buff, fine
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	Sand, med. gray, some buff sand w/ some med. gray clay
40-42	As above
42-44	Sand, buff w/ some med. gray clay
44-46	As above
46-48	Sand, buff and light gray sand; few blk. carb. particles (damp)
48-50	As above
50-52	Clay, med. gray w/ some fine gray sand
52-54	As above
54-56	As above
56-58	Clay, med. gray w/ some fine gray sand
58-60 T.D.	As above

HOLE # D-15
T.D. 50'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, light gray
6-8	Sand, light gray, very fine, some light gray clay
8-10	Sand, light buff, very fine
10-12	As above
12-14	As above
14-16	Clay, light gray, white lime dust
16-18	As above
18-20	Sand, buff, much iron staining and few iron concretion chips
20-22	Sand, dark buff, fine
22-24	As above
24-26	Sand, buff, med. grained
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained, some med. gray clay
34-36	Sand, buff, some med. gray clay and blk. carb. particles
36-38	Clay, med. gray
38-40	As above
40-42	Clay, med. gray and some blue gray clay
42-44	As above (much water)
44-46	As above
46-48	As above
48-50 T.D.	As above

HOLE # D-16
T.D. 40'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, buff w/ some iron stained med. gray clay
12-14	As above
14-16	As above
16-18	Sand, light gray, fine
18-20	As above
20-22	Sand, buff, some iron stained med. gray clay
22-24	As above
24-26	As above
26-28	As above w/ some blk. carb. particles
28-30	As above
30-32	Clay, med. gray w/ blk. carb. particles and some fine gray sand
32-34	Clay, as above
34-36	As above
36-38	As above
38-40 T.D.	As above

HOLE # D-17
T.D. 30'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, some light gray clay
4-6	Sand, buff
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	Sand, buff; little med. gray clay
16-18	Clay, med. gray, some iron staining
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # D-18-C
T.D. 50'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Clay, med. gray w/ some light gray clay and fine gray sand
	4-6	As above
	6-8	Clay, med. gray w/ little iron stained sand
	8-10-	As above
Core 1	10-13 rec. 4" lost 1' reaming	Clay, sandy, med. gray w/ some iron staining
Core 2	14-17 rec. 18"	Top 12" clay, gray w/ some gray fine sand in small patches; some iron staining Bottom 6" clay, dark gray core fractured on blk. organic streaks, one leaf impression on horizontal bedding, clay waxy
Core 3	17-20 rec. 24"	17-18 clay, med. gray, few sandy partings on horizontal bedding core fractured on blk. organic streaks (carbonaceous silt) clay waxy 18-18½ sand, med. gray, fine, iron stained and streaked 18½-20 sandy, med. gray clay, iron stained and streaked
Core 4	20-20½ rec. 6"	Clay, med. gray w/ few patches of fine gray sand
Core 5	20½-23 rec. 18"	Sandy clay, med. gray-blk. organic silt on fractures; plant parts lignitic; vertical lineation of fine gray sand, organic silt and med. gray clay; iron staining in streaks and patches throughout
Core 6	23-26 rec. 8"	Clay, blue gray, no inclusions; no sand
	26-27	1' lost during reaming
Core 6A	27-31 no rec.	Sand, buff (much water)
Core 7	31-36 rec. 44"	Top 7" sandy med. gray clay, organic silt on fractures Bottom 37" clay, dark gray, some fine med. gray sand at very end of core
Core 8	36-40 no rec.	no recovery

HOLE # D-18-C Cont.

CORE	FEET	LITHOLOGY
Core 9	40-43 rec. 29"	Clay, med. gray w/ fine med. gray sand in patches and streaks throughout
Core 10	43-45 no rec.	No recovery
Core 11	45-48 rec. 16"	Top 9" sand, med. gray, fine grained w/ vertical lineation Bottom 7" clay, med. gray, many lignitic plant parts; fine med. gray sand in patches and streaks throughout
Core 12	48-50 T.D. rec. 5"	Sandy, med. gray, clay; many lignitic plant parts; vertical lineation of fine med. gray sand; fine med. gray sand also in patches

HOLE # D-19
T.D. 50'

Sec. 17

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, light gray w/ some fine gray sand
6-8	As above
8-10	Sand, buff, fine w/ some light gray clay
10-12	Clay, light gray, much iron staining.
12-14	As above
14-16	Sand, buff, fine, some light gray clay
16-18	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	Sand, as above, some light gray clay
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained, some light gray clay and fine gray sand
34-36	As above
36-38	Clay, med. gray, some blk. carb. particles
38-40	Clay as above
40-42	Clay, med. gray w/ some fine gray sand
42-44	As above
44-46	As above
46-48	As above
48-50 T.D.	As above

HOLE # D-20-C
T.D. 80'

Sec. 17

CORE #	FEET	
	2-4	Sand, buff, fine
	4-6	As above
	6-8	Sand, dark buff
	8-10	Sand, buff to tan
Cored	10-18 no rec.	As above
Cored	18-19 no rec.	Clay?, med. gray w/ some fine gray sand
Cored	19-20 no rec.	Clay?, med. gray w/ some fine buff and dark buff sand
Core 1	20-23 rec. 20"	Sand, fine, med. gray and buff; iron streaks throughout; horizontal lineation; alternation of fine gray sand and fine buff sand in part
Core 2	23-26 no rec.	No recovery; some sample jamed in mouse-- Sand, fine buff and some fine gray sand w/ some med. gray clay
Core 3	26-29 no rec.	No recovery; some sample jamed in mouse-- Sand, buff, fine w/ some med. gray fine sand some med. gray clay
	29-30	1' lost during reaming
Cored	30-35 no rec.	Sand, buff
Cored	35-40 no rec.	Sand, buff w/ some med. gray clay?
Cored	40-47	Sand, buff w/ some med. gray clay?
Core 4	47-50 rec. 24"	Clay, med. gray, much fine med. gray sand throughout w/ many lignitic plant parts
Core 5	50-53 rec. 31"	Clay, med. gray sandy w/ some blk. lignitic plant parts
Core 6	53-55 rec. 24"	As above
Core 7	55-59 rec. 42"	Top 20" fine sandy med. gray clay w/ some blk. carb. silt patches Middle 10" sand, fine, med. gray; some med. gray clay w/ blk. lignitic plant parts Bottom 12" fine sandy med. gray clay w/ few blk. lignitic plant parts
Cored	59-80 T.D.	Much water was encountered at about 59'; core barrel was pulled every 4 to 5 feet but no core was recovered; 0% core recovery was possibly due to the large amount of water

HOLE # D-21 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Clay, light gray (very dry)
4-6	Clay, light gray w/ some fine buff sand
6-8	Clay, as above
8-10	Clay, med. gray w/ some fine buff sand
10-12	As above
12-14	Sand, buff, fine
14-16	Sand, as above
16-18	Clay, med. gray w/ some fine buff sand
18-20	Clay, med. gray w/ dark iron staining and some fine gray sand
20-22	Sand, dark buff w/ some med. gray clay, iron stained
22-24	Sand, buff, some blk. carb. particles
24-26	Sand, buff, fine
26-28	As above
28-30	As above
30-32	Sand, buff, med. grained
32-34	Sand, dark buff, some blk. carb. particles
34-36	As above
36-38	Sand, buff, med. grained
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-22 Sec. 17
T.D. 44'

FEET	LITHOLOGY
2-4	Sand, light gray, fine grained miked w/ soil
4-6	Sand, fine light gray
4-8	Clay, light gray w/ some fine light gray sand
8-10	Sand, buff fine
10-12	Sand, buff, little brown clay and iron concretion chips
12-14	Sand, buff, fine
14-16	As above
16-18	As above
18-20	As above
20-22	Sand buff, med. grained
22-24	As above
24-26	As above, some light gray clay
26-28	Sand, dark buff, w/ few carb. particles
28-30	Sand as above
30-32	As above
32-34	Sand, dark buff, some blk. carb. particles and dust w/ some light gray clay
34-36	As above
36-38	Clay, med. gray, w/ some fine gray sand
38-40	Clay, sandy, fine gray sand w/ some med. gray clay
40-42	Clay, med. gray
42-44 T.D.	Clay, med. gray

HOLE # D-23 Sec. 17.
T.D. 50'

FEET	LITHOLOGY
2-4	Sand, light gray and some buff
4-6	Sand, light gray
6-8	Sand, light gray w/ some light gray clay
8-10	Sand, light gray w/ some light gray clay
10-12	Sand, light buff, fine grained
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Sand, buff, med. grained
28-30	Sand, buff, med. grained w/ some light gray clay and fine gray sand
30-32	Sandy, med. gray clay
32-34	As above
34-36	Clay, med. gray to dark gray, some iron staining
36-38	Sandy, med. gray clay
38-40	As above
40-42	Clay, med. gray, sticky (damp)
42-44	Clay, med. gray, some fine gray sand
44-46	Clay as above
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-24 Sec. 17
T.D. 40'

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	Clay, med. gray
28-30	Clay, med. gray, some fine gray sand
30-32	Clay, med. gray, much blk. carb. particles
32-34	As above
34-36	Clay, med. gray, some fine gray sand, little carb. material
36-38	Clay, med. gray, some fine gray sand
38-40 T.D.	As above

HOLE # D-25 Sec. 17
T.D. 38'

FEET	LITHOLOGY
2-4	Sand, buff, fine grained
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	Sand, buff, med. grained
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	Sand, buff, much water
30-32	Sand, gray and med. gray clay w/ blk. carb. particles in mud
32-34	Clay, med. gray sticky w/ some fine gray sand and much blk. carb. particles w/ lignite
34-36	Clay, med. gray w/ some gray sand, fine, and blk. carb. particles
36-38 T.D.	Clay, med. gray, some fine gray sand and blk. carb. particles

HOLE # D-26 Sec. 17
T.D. 30'

FEET	LITHOLOGY
2-4	Sand, very fine, light buff w/ some gray clay (light)
4-6	As above
6-8	Sand, light buff, very fine, little gray clay (light) w/ blk. carb. particles; few gypsum flakes and gypsum white powder
8-10	Sand, buff, fine
10-12	Sand, buff, fine, some light gray clay and much blk. carb. particles and blk. dust, iron stain on clay chips
12-14	Clay, med. gray, much blk. carb. particles; some iron staining
14-16	As above
16-18	As above
18-20	Clay, med. gray
20-22	As above
22-24	Clay, dark gray to blk.; some blk. carb. particles
24-26	Clay, med. gray
26-28	As above
28-30 T.D.	Clay, med. gray

Appendix I

HOLE # M-1-C Sec. 18

T. D. 30'

CORE #	FEET	LITHOLOGY
	0-10	Sand, buff w/ some fine gray sand and light gray clay.
Core 1	10-12½ rec. 4"	Sand, buff w/ some gray fine sand.
Core 2	12½-14½ rec. 3½"	Sand, buff, med. grained.
Core 3	14½-16½ rec. 3"	Sand, buff, med. grained.
Core 4	16½-18 rec. 2½"	Sand, buff, few chunks of gray fine sand w/ iron staining; few blk. carb. particles.
Core 5	18-19 rec. 6"	as above.
Core 6	19-20 rec. 6"	Sandy gray clay, some iron staining and few blk. carb. particles.
Core 7	20-20½ rec. 6"	Sandy gray clay w/ little buff fine sand.
Core 8	20½-23 rec. 6"	Clay, dark gray, waxy.
Core 9	23-24½ rec. 12"	Clay, dark gray, much blk. carb. particles waxy.
Core 10	24½-25 rec. 12"	Clay, dark gray many blk. carb. particles.
Core 11	25-26 rec. 12"	Clay as above.
Core 12	26-30 T.D. rec. 24"	Clay, med. gray.

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HOLE # M-2 Sec. 18

T. D. 50'

FEET	LITHOLOGY
2-4	Sand, gray buff fine
4-6	As above
6-8	As above
8-10	Sand buff fine
10-12	As above
12-14	Sand, tan to light gray
14-16	Sand, buff med. grained
16-18	As above
18-20	Sand, buff w/ some light gray sand fine
20-22	Sand, buff med. grained
22-24	As above
24-26	Sand, light gray
26-28	Sand, light gray to med. gray w/ little light gray clay
28-30	Sand, light gray to med. gray w/ some light gray iron stained clay
30-32	As above
32-34	Sand, light gray
34-36	Sand, buff med. grained w/ some med. gray clay
36-38	As above
38-40	As above (wet)
40-42	Sand, buff to light gray w/ blk. carb. particles and lignite
42-44	Sand, buff to light gray
44-46	Clay, med. gray
46-48	As above
48-50 T. D.	As above

HOLE # M-3 Sec. 18

T. D. 40'

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above (wet)
22-24	As above
24-26	As above
26-28	Sand, buff fine w/ blk. carb. material and lignite
28-30	Clay med gray to tan gray
30-32	Clay, med. gray to tan gray, blk. carb. staining
32-34	Clay, blue gray
34-36	As above
36-38	As above
38-40 T. D.	As above

HOLE # M-4

Sec. 18

T. D. 50'

FEET	LITHOLOGY
2-4	Sand, gray fine and surface soil
4-6	Sand, buff fine w/ some light gray clay and fine light gray sand
6-8	As above
8-10	Sand, buff some fine gray sand
10-12	Sand, buff some fine light gray clay
12-14	As above
14-16	Clay, light gray w/ buff sand and some light gray sand, fine
16-18	Sand, buff fine
18-20	Sand, buff fine w/ some light gray clay and light gray fine sand
20-22	Clay, light gray w/ some fine light gray clay
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	Clay med. gray some light fine gray sand
32-34	Clay, med. gray w/ little fine gray sand
34-36	Clay, med. to dark gray
36-38	As above
38-40	As above
40-42	Clay, med. gray
42-44	As above
44-46	As above
46-48	As above
48-50 T.D.	As above

HOLE # M-5

Sec. 18

T. D. 30'

FEET	LITHOLOGY
2-4	Clay, light gray, fine gray sand and surface soil
4-6	Clay light gray w/ some iron staining
6-8	Clay, med. gray w/ some buff sand; some iron staining
8-10	Clay as above, some buff sand
10-12	Sand, buff fine w/ little light gray clay and light gray fine sand
12-14	Clay, med. gray, few blk. carb. particles
14-16	Clay, med. gray, some iron staining
16-18	Clay med. gray
18-20	Clay med. gray w/ blk. carb. particles and chunks of lignite
20-22	Clay, med. gray
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-6-C
T.D. 71'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff fine w/ some light gray clay
	4-6	As above
	6-8	As above
	8-10	Clay, med. gray
Core 1	10-11 no rec.	No recovery
Core 2	11-12 rec. 6"	Clay, med. gray w/ much rust staining; some powdered lime and a chunk of white lithographic limestone
Core 3	12-13½ rec. 8"	Clay, med. gray w/ much iron staining; streaked w/ powdered white lime dust
Core 4	13½-15 rec. 12"	Clay, med. gray w/ spots and streaks of fine gray sand; few lignitic plant parts
Core 5	15-18½ rec. 6"	Clay med. gray to blk. in most part very carbonaceous
Core 6	18½-20½ rec. 6"	Clay as above
Core 7	20½-22½ rec. 18"	Clay, med. gray; streaked w/ jarosite; many gypsum flakes; clay grades to dark gray
Core 8	22½-24½ rec. 1'	Clay, med. to dark gray; few patches of fine gray sand; few brown to blk. carb. particles (lignitic) w/ some carb. silt
Core 9	24½-26½ rec. 12"	Sandy, med. gray clay w/ some tan clay
Core 10	26½-28½ rec. 18"	Top 12" sand, fine tan Bottom 6" clay, light gray w/ some fine tan sand in patches
Core 11	28½-30-3/4 rec. 18"	Top 11" clay med. gray w/ fine gray sand patches few blk. lignitic plant parts w/ some iron staining Bottom 7" clay, med. gray w/ some blk. carb. silt and lignitic plant parts
Core 12	30-3/4-33-3/4 rec. 18"	Top 10" clay, med. gray w/ few blk. lignitic plant parts Bottom 8" sand, tan fine grained, very light iron staining in parts
Core 13	33-3/4-36¼ rec. 21"	Top 2" sand, fine med. gray horizontal bedded by iron staining Bottom 19" clay, med. gray to dark gray; some iron staining in fractures
Core 14	36¼-38-3/4 rec. 24"	Clay, dark blue gray to blk. some gypsum powder at top waxy

HOLE # M-6-C (Cont.)

CORE #	FEET	LITHOLOGY
Core 15	38-3/4-40 rec. 12"	Clay dark blue gray to blk. very waxy
Core 16	40-43	Coal, very light weight, crushed easily to a blk. powder charcoal like; alternation between the coal and clay, dark blue gray
Core 17	43-46 rec. 12"	As above
Core 18	46-47 rec. 12"	Clay, dark gray w/ streaks of blk. lignitic silt; light gray fine sand at very end of core
Core 19	47-50-3/4 rec. 6"	Sand, light gray w/ some med. gray clay, thin streaks
Core 20	50-3/4-51-3/4 rec. 7"	As above
Core 21	51-3/4-54-3/4 rec. 30"	Sandy clay, very fine sand, light blue gray
Core 22	54-3/4-56-3/4 rec. 21"	As above
Core 23	56-3/4-59-3/4 rec. 30"	As above
Core 24	59-3/4-60-3/4 rec. 12"	As above
Core 25	60-3/4-63-3/4 30" rec.	As above
Core 26	63-3/4-66-3/4 rec. 33"	As above
Core 27	66-3/4-70-3/4 rec. 36" T.D.	As above

HOLE # M-7 Sec. 18
T. D. 28'

FEET	LITHOLOGY
2-4	Clay, tan to light gray and surface soil
4-6	As above
6-8	As above w/ some lime dust
8-10	As above
10-12	Clay, med. gray some blk. carb. particles little iron staining
12-14	Clay, med. gray w/ little buff sand some iron staining
14-16	Sand gray light fine, white lime dust; chips of very dark iron stained clay
16-18	Clay, med. gray w/ some fine gray sand
18-20	Sand, gray buff w/ some light gray clay
20-22	Clay, med. gray few blk. carb. particles
22-24	Clay, med. gray few blk. carb. particles
24-26	Clay, med. gray and dark gray
26-28 T. D.	Clay, med. gray

HOLE # M-8
T. D. 80'

Sec. 18

FEET	LITHOLOGY
2-4	Surface soil
4-6	Sand, tan to gray
6-8	Sand, buff med. grained
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Clay, med. gray w/ few blk. carb. particles
48-50	Clay, med. gray w/ some blue gray clay
50-52	As above
52-54	Clay, blue gray
54-56	As above
56-58	As above
58-60	Clay, med. gray w/ some blk. carb. particles
60-62	As above
62-64	Clay, med. gray, w/ some blk. carb. particles
64-66	As above
66-68	Clay, med. gray w/ some blue gray clay
68-70	As above
70-72	As above
72-74	Clay, med. gray
74-76	As above
76-78	As above
78-80 T.D.	As above

HOLE # M-9
T. D. 80'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, tan to light gray
4-6	As above
6-8	As above
8-10	Clay, tan
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	Clay, med. gray to light gray, much buff sand
44-46	As above
46-48	Sand, buff w/ some gray clay
48-50	As above
50-52	Clay, med. gray
52-54	Clay, dark gray to blk. blk. carb. particles
54-56	As above
56-58	Clay, blue gray
58-60	As above
60-62	Clay, med. gray w/ some iron staining
62-64	Clay, light med. gray w/ some iron staining and few blk. carb. particles
64-66	As above
66-68	Clay, med. gray
68-70	Clay, blue gray
70-72	Clay, as above
72-74	As above
74-76	As above
76-78	Clay, med. gray
78-80 T.D.	Clay, med. gray

HOLE # M-10 Sec. 18

T. D. 150'. This hole was drilled with water

FEET	LITHOLOGY
0-2	Shale, rust tan calcareous, w/ some iron stained med. gray clay
2-4	Clay, med. gray
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, buff, med. grained w/ some med. gray clay
12-14	Sand, buff, med. grained
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above, w/ some med. gray clay and fine gray sand
38-40	As above
40-42	Sand, gray buff w/ some fine gray sand and med. gray clay
42-44	As above
44-46	Clay med. gray w/ some fine med. gray sand
46-48	Clay, med. gray
48-50	As above
50-52	As above
52-54	As above
54-56	Clay, med. gray w/ some blue gray clay
56-58	As above
58-60	As above
60-62	As above w/ few blk. carb. particles
62-64	As above
64-66	As above
66-68	Clay, med. gray w/ few blk. carb. particles and some blue gray clay
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	Clay, med. gray w/ some blk. carb. particles
82-84	As above
84-86	As above
86-88	As above
88-90	As above w/ some blue gray clay
90-92	As above
92-94	Clay, med. gray to dark gray
94-96	As above

HOLE # M-10 Cont.

FEET	LITHOLOGY
96-98	Clay, med. gray to dark gray
98-100	Clay med, gray
100-102	As above
102-104	Clay, med. gray to dark gray w/ blk. carb. particles
104-106	As above
106-108	As above
108-110	Clay, med. gray to dark gray w/ blk. carb. particles
110-112	As above
112-114	Clay, med. gray w/ some blue gray clay
114-116	As above
116-118	As above
118-120	Clay, med. gray to dark gray w/ some blk. carb. particles
120-122	As above
122-124	As above
124-126	As above
126-128	As above
128-130	Clay, med. gray w/ some blue gray clay
130-132	As above
132-134	As above
134-136	Clay, med. gray
136-138	Clay, med. gray w/ chunks of lignite coal
138-140	Clay, med. gray w/ some blue gray clay
140-142	As above
142-144	As above
144-146	As above
146-148	As above
148-150 T.D.	As above

HOLE # M-11-C Sec. 18
T. D. 72'

CORE #	FEET	LITHOLOGY
	2-4	Clay, light gray
	4-6	As above
	6-8	Sand, buff, fine
	8-10	As above
Core 1	10-13½ No rec.	No recovery
Core 2	13½-15½ rec. 6"	Clay, med. tan, iron stained throughout
Core 3	15½-17½ rec. 24"	Clay, med. tan; much iron staining on fractures few flakes of gypsum
Core 4	17½-19½ rec. 21"	Clay, med. tan w/ some light gray clay in narrow bands; iron staining on fractures
Core 5	19½-21½ rec. 12"	Clay, med. tan, w/ some gray clay; many blk. carb. plant parts
Core 6	21½-22½ rec. 5"	Clay, med. gray; some fine gray sand in streaks and patches
Core 7	22½-24½ rec. 18"	Clay as above; 6" interval of lignite, charcoal like
Core 8	24½-27½ rec. 8"	Clay, med. gray; some brown carb. particles
Core 9	27½-31½ rec. 36"	Clay, med. gray w/ some fine gray sand grading and alternating
Core 10	31½-33½ rec. 36"	Clay as above
Core 11	33½-36½ rec. 33"	Clay as above
Core 12	36½-39½ rec. 36"	Sand, fine, blue gray w/ few blk. lignitic particles
Core 13	39¼-41½ rec. 12"	Sand as above
Core 14	41½-43½ rec. 24"	Sand as above
Core 15	43½-44½ rec. 12"	Sand as above

M-11-C Cont.

CORE #	FEET	LITHOLOGY
Core 16	$44\frac{1}{2}$-$45\frac{1}{4}$ rec. 9"	Sand as above
Core 17	$45\frac{1}{4}$-$47\frac{1}{4}$ rec. 18"	Sand, fine, blue gray; Bottom 2" grades to clay med. gray
Core 18	$47\frac{1}{4}$-$49\frac{1}{4}$ rec. 18"	Clay, med. gray w/ few blk. carb. particles
Core 19	$49\frac{1}{4}$-$51\frac{1}{2}$ rec. 24"	Clay, as above
Core 20	$51\frac{1}{2}$-$53\frac{1}{2}$ rec. 24"	Clay, med. gray w/ fine gray sand, grading and alternating
Core 21	$53\frac{1}{2}$-$55\frac{1}{2}$ rec. 12"	Clay and sand as above
Core 22	$55\frac{1}{2}$-58 rec. 15"	Clay and sand as above w/ few blk. carb. particles
Core 23	58-$61\frac{1}{2}$ rec. 15"	Clay as above
Core 24	$61\frac{1}{2}$-$65\frac{1}{2}$ rec. 48"	Top 30" clay, med. gray w/ fine gray sand grading and alternating Middle 4" lignite, charcoal like w/ dark gray to blk. clay, waxy Bottom 14" clay, dark gray to blk. grading to med. gray clay w/ fine med. gray sand
Core 25	$65\frac{1}{2}$-$68\frac{1}{2}$ rec. 36"	Clay, dark gray, grading and alternating w/ fine gray sand
Core 26	$68\frac{1}{2}$-$71\frac{1}{2}$ rec. 24"	Clay as above
Core 27	$71\frac{1}{2}$-$72\frac{1}{2}$ T.D. rec. 24"	Clay as above

HOLE # M-12
T. D. 34'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, tan gray to blk.
4-6	As above w/ some blk. carb. particles
6-8	Clay, tan and med. gray w/ iron staining
8-10	Clay, med. gray
10-12	As above
12-14	As above, some iron staining
14-16	As above (wet)
16-18	Clay, med. gray some blk. carb. dust and little iron staining on clay
18-20	Clay, med. gray
20-22	Clay, med. gray w/ white lime dust
22-24	Clay, med. gray to tan gray
24-26	Clay, med. gray little fine gray sand
26-28	Clay, med. gray to tan gray; some fine gray sand
28-30	Clay, med. gray w/ some blue gray clay
30-32	Clay blue gray
32-34 T.D.	As above

HOLE # M-13 Sec. 18
T. D. 60'

FEET	LITHOLOGY
2-4	Sand, buff fine w/ few chips of lime cemented fine tan sand
4-6	Sand, buff fine w/ few iron concretion chips and light gray clay
6-8	Sand, buff fine w/ few chips of lime cemented fine tan sand
8-10	Sand, buff fine
10-12	As above
12-14	As above w/ some fine gray sand
14-16	Sand, buff fine
16-18	Sand, buff fine w/ some light gray clay
18-20	Sand, buff fine
20-22	Sand, buff fine w/ some light gray clay
22-24	As above
24-26	Sand, buff fine w/ some light gray clay
26-28	Sand, buff med. grained
28-30	As above
30-32	As above w/ some light gray clay
32-34	Sand, dark buff med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Sand, buff med. grained w/ some light gray to tan clay some iron staining
48-50	As above
50-52	Clay med. gray to blk. w/ few blk. carb. particles and chips of lignite coal
52-54	Clay med. gray to blk.
54-56	Clay, blue gray and med. gray; few blk. carb. particles
56-58	As above
58-60 T.D.	As above

HOLE # M-14
T. D. 30'

Sec. 18

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand fine tan to gray
12-14	Sand, dark buff fine
14-16	As above
16-18	Sand, buff med. grained little tan to light gray clay w/ some fine gray sand (wet)
18-20	Sand, buff med. grained some med. gray clay w/ iron staining and blk. carb. particles
20-22	Clay, blue gray
22-24	As above
24-26'	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-15 Sec. 18
T. D. 30'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, iron stained w/ buff sand (very damp)
6-8	Sand, buff some gray clay (much water)
8-10	As above
10-12	Sand, buff some gray clay
12-14	As above
14-16	As above w/ some blk. carb. material (very damp)
16-18	Clay, dark gray to blk. much blk. carb. particles
18-20	Clay, as above
20-22	Clay, med. gray
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-16 Sec. 18
T. D. 24'

FEET	LITHOLOGY
2-4	Clay, med. gray to dark gray
4-6	As above
6-8	Clay, med. gray to light gray
8-10	Clay, med. gray to light gray w/ some iron stain and fine gray sand
10-12	As above
12-14	Sand, fine clay light gray
14-16	As above
16-18	As above
18-20	As above
20-22	Clay, med. gray w/ some blue gray clay
22-24 T.D.	Clay, blue gray

HOLE # M-17
T. D. 40'

Sec. 18

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	Clay, med. gray little buff sand and fine gray sand
12-14	Clay, dark gray
14-16	As above
16-18	Clay as above w/ some blk. carb. trash
18-20	Clay, med. gray; little buff sand
20-22	Clay med. gray
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	Clay, med. gray, some blue gray clay
32-34	Clay, blue gray
34-36	As above
36-38	As above
38-40 T.D.	As above

HOLE # M-18-C
T.D. 91'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff fine grained
	4-6	As above
	6-8	Clay, med. gray
	8-10	Clay, med. gray to blk.; blk. dust coating on clay balls; some gypsum white powder
Core 1	10-13 rec. 6"	Clay, med. gray; some iron staining throughout
Core 2	13-15 rec. 18"	Limestone, white to light tan (bottom 6") Top 1' sand, med. gray fine
Core 3	15-18 rec. 24"	Top 6" limestone as above; Bottom 18" sand med. gray fine; streaked with iron color throughout
Core 4	18-19-3/4 rec. 12"	Sand as above
Core 5	19-3/4-24-3/4 rec. 36"	Sand, med. gray fine w/ some med. gray clay; streaks of carb. silt; leaf impressions on some of the fractures
Core 6	24-3/4-27-3/4 rec. 24"	Sand, med. tan fine w/ blk. carb. silt streaks iron staining throughout
Core 7	27-3/4-30 rec. 12"	Sand, med. tan; many blk. lignitic plant parts
Core 8	30-30-3/4 rec. 9"	Sand, med. tan; few blk. carb. particles; iron staining throughout
Core 9	30-3/4-32-3/4 rec. 10"	Sand, blue gray, fine; some iron staining on partings
Core 10	32-3/4-34-3/4 rec. 18"	Sand, as above; center 6" cemented w/ lime
Core 11	34-3/4-37-3/4 rec. 30"	Sand, blue gray, fine
Core 12	37-3/4-39-3/4 rec. 30"	Sand as above
Core 13	39-3/4-42¼ rec. 30"	Sand as above
Core 14	42¼-44¼ rec. 24"	Sand, blue gray, many blk. lignitic plant parts
Core 15	44¼-47¼ rec. 36"	Sand as above

HOLE # M-18-C Cont.

CORE #	FEET	LITHOLOGY
Core 16	47¼-50-3/4	Sand, med. grained, blue gray w/ streaks of blk. carb. silt and blk. lignitic plant parts
Core 17	50-3/4-54¼ rec. 12"	Sand as above
Core 18	54¼-58 rec. 12"	Clay, blue gray w/ some fine med. gray sand a chunk of hard calcareous tan shale
Core 19	58-60-3/4 rec. 18"	Top 6" as above Bottom 12" sand, blue gray, fine w/ blk. carb. silt and blk. lignitic particles
Core 20	60-3/4-64¼ rec. 30"	Sand, blue gray, med. grained w/ blk. carb. silt and blk. carb. particles
Core 21	64¼-68¼ rec. 21"	Sand, med. gray fine w/ blk. carb. particles throughout
Core 22	68¼-70-3/4 rec. 36"	Clay, med. gray; grading and alternating with fine med. gray sand
Core 23	70-3/4-73-3/4 rec. 36"	Clay, med. gray
Core 24	73-3/4-74-3/4 rec. 12"	Lignite coal, w/ much blk. clay; coal poorly developed charcoal like
Core 25	74-3/4-77-3/4 no recovery	Drilling w/ water no recovery; mud blk. and dark blue gray
Core 26	77-3/4-80-3/4 rec. 12"	Clay, med. gray
Core 27	80-3/4-83-3/4 rec. 24"	Clay, med. gray, grading and alternating w/ fine med. gray sand
Core 28	83-3/4-85-3/4 rec. 24"	Clay and sand as above
Core 29	85-3/4-89-3/4 rec. 36"	Clay and sand as above Bottom 12" coal, lignite charcoal like
Core 30	89-3/4-90-3/4 rec. none T.D.	No recovery (probably clay and sand as above)

HOLE # M-19
T.D. 28'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Clay, med. gray, some iron dust coatings on clay balls
6-8	Clay, med. gray, some iron staining
8-10	Clay as above
10-12	Clay, med. gray
12-14	Clay, med. gray w/ few limestone chunks
14-16	Clay med. gray some iron staining
16-18	Sandy med. gray clay, some fine gray to tan sand
18-20	As above
20-22	As above
22-24	Clay, med. gray
24-26	As above
26-28 T.D.	As above

HOLE # M-20
T.D. 39'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, tan
4-6	As above
6-8	Clay, tan some iron staining
8-10	As above
10-12	Clay, as above w/ some blk. carb. particles
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Clay, tan sandy
22-24	Sand, tan, some tan clay few blk. carb. particles
24-26	As above
26-28	Clay, tan, some iron staining
28-30	Clay, dark gray
30-32	As above
32-34	As above
34-36	As above
36-38	As above w/ some blue gray fine sand
39 T.D.	As above very limey

HOLE # M-21 Sec. 18
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, tan sandy
4-6	As above
6-8	Sand, buff fine some light gray clay
8-10	Clay, light gray
10-12	Clay, med. gray w/ some fine buff sand
12-14	As above
14-16	As above
16-18	Clay, med. gray w/ some fine buff sand
18-20	Sand, tan fine w/ some iron stained gray clay
20-22	Sand, tan fine
22-24	Clay, gray w/ some fine buff sand
24-26	Clay, dark gray w/ some fine buff sand
26-28	Clay, dark gray, few blk. carb. particles
28-30	As above
30-32	Clay, dark gray
32-34	As above
34-36	As above
36-38	As above w/ some lignite
38-40	Clay, dark gray
40-42	Clay, dark gray little iron staining
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	Clay, dark gray to blk.
58-60 T.D.	Clay, dark gray

HOLE # M-22 Sec. 18
T.D. 62'

FEET	LITHOLOGY
2-4	Sand, tan fine
4-6	As above
6-8	Sand, buff fine
8-10	As above
10-12	As above
12-14	Sand, buff, some light gray clay
14-16	As above
16-18	Sand, buff fine
18-20	As above
20-22	As above
22-24	Sand, buff fine some light gray clay
24-26	Sand, buff fine
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff some light gray clay
42-44	As above
44-46	As above
46-48	As above
48-50	Sand, buff med. grained
50-52	Sand, buff fine, some light gray clay
52-54	Sand, buff fine w/ some light gray clay and blk. carb. particles
54-56	As above
56-58	Sand, fine to med. grained w/ blk. carb. particles
58-60	Clay, dark blue gray
60-62 T.D.	As above

HOLE # M-23
T.D. 40'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, light gray iron stained
4-6	As above
6-8	Clay, light gray, some fine buff sand
8-10	Clay, light gray, sandy, little iron stained clay
10-12	Clay, brown iron stain
12-14	Clay, med. gray
14-16	Clay, med. gray, few gypsum flakes
16-18	As above
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	Clay, med. gray to blk. few blk. carb. particles
26-28	As above
28-30	Clay, dark gray
30-32	Clay, med. gray w/ some fine buff sand
32-34	Clay, dark gray
34-36	Clay, dark gray, some blk. carb. particles
36-38	As above
38-40 T.D.	As above

HOLE # M-24-C
T.D. 91'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Surface soil, some light gray clay
	4-6	Clay, med. gray
	6-8	As above
	8-10	Clay, med. gray w/ some iron staining
Core 1	10-13 rec. 30"	Top 4 " clay, dark gray to blk. Bottom 26" sand, med. gray, fine, much med. gray clay; iron staining throughout
Core 2	13-16 rec. 30"	Sandy, med. gray clay, sand fine; iron staining on fractures; blk. carb. particles throughout
Core 3	16-18 rec. 24"	As above
Core 4	18-21 rec. 30"	Sand, med. gray fine; iron staining in fractures blk. carb. particles throughout
Core 5	21-25 rec. 18"	As above
Core 6	25-29 rec. 24"	Top 18" as above Bottom 6" clay med. gray w/ few gypsum flakes Many blk. carb. particles
Core 7	29-31 rec. 18"	As above
Core 8	31-32 rec. 4"	As above
Core 9	32-35 rec. 6"	Top 2" clay, dark gray Bottom 4" clay, blk. waxy
Core 10	35-37 rec. 24"	Clay, med. gray w/ many blk. carb. particles
Core 11	37-40 rec. 36"	Clay, blk. many blk. carb. particles w/ very little dark gray clay; lignite, charcoal like from 39-39½; last 6" of core blk. clay waxy
Core 12	40-41½ rec. 12"	Clay, blk. to med. gray; many blk. carb. particles waxy
Core 13	41½-45½ rec. 36"	Top 18" clay, blk. to med. gray Bottom 18" sand, light gray, fine w/ few blk. carb. particles, some iron staining

HOLE # M-24-C Cont.

CORE #	FEET	LITHOLOGY
Core 14	45½-51½ rec. 36"	Sand, light gray, fine, few blk. carb. particles
Core 15	51½-60½ rec. 12"	As above
Core 16	60½-66½ rec. 15"	Sand as above, cemented w/ lime, hard
Core 17	66½-70½ no rec.	Sand, light gray, fine
Core 18	70½-81 no rec.	As above
Core 19	81-90½ T.D. no rec.	As above

HOLE # M-25
T.D. 40'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, tan to light gray, some iron staining, few chips of silicous rock
4-6	Clay, med. gray
6-8	As above
8-10	Clay, med. gray and some tan clay
10-12	Clay, med. gray
12-14	Clay, med. gray, some powdered iron dust
14-16	Clay, med. gray
16-18	Clay, med. gray, few blk. carb. particles
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, med. gray, little tan and iron stained med. gray sand and fine gray sand
28-30	Clay, med. gray
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40 T.D.	As above w/ some blue gray clay

HOLE # M-26 Sec. 18
T.D. 54'

FEET	LITHOLOGY
2-4	Clay, med. gray, some iron staining
4-6	Sand, med. gray fine w/ some iron stained clay
6-8	Clay, med. gray, some iron staining
8-10	Clay, med. gray
10-12	Clay, med. gray to blk. (blk. dust) coal?
12-14	Clay, med. gray w/ some fine tan to gray sand some iron staining
14-16	Clay, med. gray brown to tan fine sand; little
16-18	Clay, med. gray
18-20	Clay, med. gray, some blk. carb. particles and some fine light gray sand
20-22	As above
22-24	Sandy clay, tan to gray, few blk. carb. particles
24-26	As above
26-28	As above
28-30	Sand, tan to gray, fine, much light gray clay
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Sand, tan to gray w/ some clay blue gray
48-50	Clay, med. gray (damp)
50-52	Clay, med. gray, some lime dust
52-54 T.D.	Clay, med. gray

HOLE # M-27 Sec. 18
T.D. 44'

FEET	LITHOLOGY
2-4	Sand, fine light gray and surface soil
4-6	Clay, light gray, some fine tan sand
6-8	Clay, light gray fine tan sand and iron concretion chips
8-10	Clay, light gray fine tan sand
10-12	Sandy light buff clay, much iron staining
12-14	Sand, buff fine little light gray clay
14-16	As above
16-18	Clay, light gray w/ some fine buff sand
18-20	As above
20-22	Clay, light gray
22-24	As above
24-26	As above
26-28	Clay, med. gray w/ some blk. carb. particles
28-30	Sand, blue gray very fine w/ some blue gray clay
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44 T.D.	As above

HOLE # M-28 Sec. 18
T.D. 40'

FEET	LITHOLOGY
2-4	Clay, med. gray, some white lime dust
4-6	Clay, med. gray w/ some iron stained clay
6-8	Clay as above
8-10	Clay, med. gray, blk. carb. dust (coal) and some dark gray to blk. clay
10-12	Clay, med. gray w/ little iron staining
12-14	Clay, med. gray w/ some blk. carb. particles
14-16	As above
16-18	Clay, med. gray w/ some buff sand and a few blk. carb. particles
18-20	Clay, med. gray w/ some buff sand and some iron stained clay
20-22	As above
22-24	As above
24-26	Clay, blue gray w/ fine blue gray to gray sand
26-28	As above
28-30	As above
30-32	Clay, blue gray, w/ some blk. carb. particles
32-34	As above
34-36	Clay, light gray, caco dust
36-38	As above
38-40 T.D.	Clay, med. gray

HOLE # M-29-C
T.D. 52'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff med. grained w/ a little med. gray clay iron stained
	4-6	Clay, med. gray w/ fine gray sand and some iron staining
	6-8	As above
	8-10	Sand, buff fine w/ some med. gray clay, iron stained
Core 1	10-21½ no rec.	Sand, buff, fine; bottom 2 feet contained some blk. carb. particles
Core 2	21½-22½ no rec.	Sand, buff fine, w/ little med. to light gray clay
Core 3	22½-24½ rec. 8"	Clay, med. gray w/ few blk. carb. particles iron staining on fractures; waxy
Core 4	24½-25½ rec. 6"	Clay, med. gray
Core 5	25½-28½ no rec.	Clay
Core 6	28½-31½ rec. 9"	Sandy, med. gray clay; little iron staining few blk. carb. particles
Core 7	31½-34 rec. 30"	Sand, fine tan few blk. carb. particles; top 21" Bottom 9" sand, blue gray fine, few blk. carb. particles w/ little iron staining on fractures
Core 8	34-37 no rec.	Sand, gray fine, some blk. carb. particles
Core 9	37-41½ rec. 36"	Top 2' clay, med. gray w/ some fine gray sand; Bottom 1' sandy, clay, med. gray w/ some fine gray sand
Core 10	41½-44½ rec. 30"	Clay, blue gray
Core 11	44½-47½ rec. 24"	Clay, blue gray grading and alternating w/ fine gray to blue gray sand
Core 12	47½-48½ rec. 12"	As above w/ few blk. carb. particles
Core 13	48½-52½ T.D. rec. 18"	As above

HOLE # M-30
T.D. 20'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, med. gray
4-6	Clay, med. gray, some buff sand and iron stained clay
6-8	Sand, buff, med. grained, few concretion chips and iron stained clay (water)
8-10	Clay, med. gray w/ buff sand and some light gray clay
10-12	Clay, med. gray (much water)
12-14	Clay, med. gray
14-16	As above
16-18	As above
18-20 T.D.	As above

Appendix 2

HOLE # M-1-C RADIOMETRIC LOG

FEET	READING MR/HR
$24\frac{1}{2}$-25	.038
25-$25\frac{1}{2}$	.057
$25\frac{1}{2}$-26	.065
26-	.038

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HOLE # M-2 RADIOMETRIC LOG

FEET	READING MR/HR
41-41½	.038
41½-42	.079
42-42½	.065
42½-43	.079
43-43½	.079
43½-44	.093
44-44½	.038
44½-45	.051
45-45½	.024

HOLE # M-13 RADIOMETRIC LOG

FEET	READING MR/HR
$47\frac{1}{2}$-48	.024
48-$48\frac{1}{2}$	.024
$48\frac{1}{2}$-49	.051
49-$49\frac{1}{2}$	.065
$49\frac{1}{2}$-50	.051
50-$50\frac{1}{2}$	.038
$50\frac{1}{2}$-51	.024

HOLE # M-14 RADIOMETRIC LOG

FEET	READING MR/HR
18½-19	.038
19-19½	.051
19½-20	.29
20-20½	.27
20½-21	.079
21-21½	.065
21½-22	.065
22-22½	.065
22½-23	.051
23-23½	.038

HOLE # M-15 RADIOMETRIC LOG

FEET	READING MR/HR
12½-13	.038
13-13½	.17
13½-14	.69
14-14½	.59
14½-15	.37
15-15½	.18
15½-16	.18
16-16½	.13
16½-17	.079
17-17½	.051
17½-18	.038

HOLE # M-18-C

RADIOMETRIC LOG

FEET	READING MR/HR
$7\frac{1}{2}$-8	.038
8-$8\frac{1}{2}$	.065
$8\frac{1}{2}$-9	.37
9-$9\frac{1}{2}$	.47
$9\frac{1}{2}$-10	.27
10-$10\frac{1}{2}$	.057
$10\frac{1}{2}$-11	.057
$11\frac{1}{2}$-12	.057
12-$12\frac{1}{2}$	.038

HOLE # M-22

RADIOMETRIC LOG

FEET	READING MR/HR
53-53½	.038
53½-54	.065
54-54½	.072
54½-55	.093
55-55½	.093
55½-56	.065
56-56½	.065
56½-57	.051
57-57½	.038

HOLE # M-29-C

RADIOMETRIC LOG

FEET	READING MR/HR
19-19½	.026
19½-20	.038
20-20½	.038
20½-21	.038
21-21½	.038
21½-22	.057
22-22½	.065
22½-23	.093
23-23½	.065
23½-24	.038

Appendix 2 (Cont'd.)

HOLE # D-2 RADIOMETRIC LOG

FEET	READING MR/HR
51½-52	.038
52-52½	.051
52½-53	.093
53-53½	.37
53½-54	.37
54½-55	.27
55-55½	.079
55½-56	.065
56-56½	.038

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DATE	INITIALS	CODE

HOLE # D-5 RADIOMETRIC LOG

FEET	READING MR/HR
92½-93	.038
93-93½	.051
93½-94	.093
94-94½	.093
94½-95	.17
95-95½	.17
95½-96	.093
96-96½	.079
96½-97	.065
97-97½	.038
97½-98	.051
98-98½	.024

67½-68	.038
68-68½	.051
68½-69	.065
69-69½	.079
69½-70	.093
70-70½	.17
70½-71	.038
71-71½	.051
71½-72	.051
72-72½	.065
72½-73	.17
73-73½	.065
73½-74	.051
74-74½	.038

HOLE # D-9 RADIOMETRIC LOG

FEET	READING MR/HR
43½-44	.038
44-44½	.065
44½-45	.065
45-45½	.079
45½-46	.093
46-46½	.051
46½-47	.079
47-47½	.093
47½-48	.051
48-48½	.065
48½-49	.038

HOLE # D-15

RADIOMETRIC LOG

FEET	READING MR/HR
34-34½	.038
34½-35	.051
35-35½	.065
35½-36	.27
36-36½	.65
36½-37	1.38
37-37½	1.58
37½-38	1.5
38-38½	1.26
38½-39	.57
39½-40	.47
40-40½	.22
40½-41	.17
41-41½	.079
41½-42	.079
42-42½	.038

HOLE # D-19 RADIOMETRIC LOG

FEET	READING MR/HR
32-32½	.038
32½-33	.27
33-33½	.57
33½-34	.67
34-34½	.55
34½-35	.39
35-35½	.17
35½-36	.079
36-36½	.065
36½-37	.051
37-37½	.038

HOLE # D-20-C

RADIOMETRIC LOG

FEET	READING MR/HR
47-47½	.024
47½-48	.038
48½-49	.038
49-49½	.057
49½-50	.065
50-50½	.079
50½-51	.065
51-51½	.065
51½-52	.065
52-52½	.038
52½-53	.024

HOLE # D-21 RADIOMETRIC LOG

FEET	READING MR/HR
42-42½	.024
42½-43	.065
43-43½	.10
43½-44	.079
44-44½	.17
44½-45	.37
45-45½	.37
45½-46	.37
46-46½	.34
46½-47	.051
47-47½	.038
47½-48	.038

HOLE # D-24

RADIOMETRIC LOG

FEET	READING MR/HR
23½-24	.038
24-24½	.051
24½-25	.051
25-25½	.079
25½-26	.079
26-26½	.079
26½-27	.079
27-27½	.079
27½-28	.079
28-28½	.051
28½-29	.038

HOLE # D-25 RADIOMETRIC LOG

FEET	READING MR/HR
28½-29	.026
29-29½	.079
29½-30	.079
30-30½	.32
30½-31	.47
31-31½	.55
31½-32	.49
32-32½	.39
32½-33	.45
33-33½	.39
33½-34	.20
34-34½	.11
34½-35	.051
35-35½	.051
35½-36	.026

HOLE # D-26

RADIOMETRIC LOG

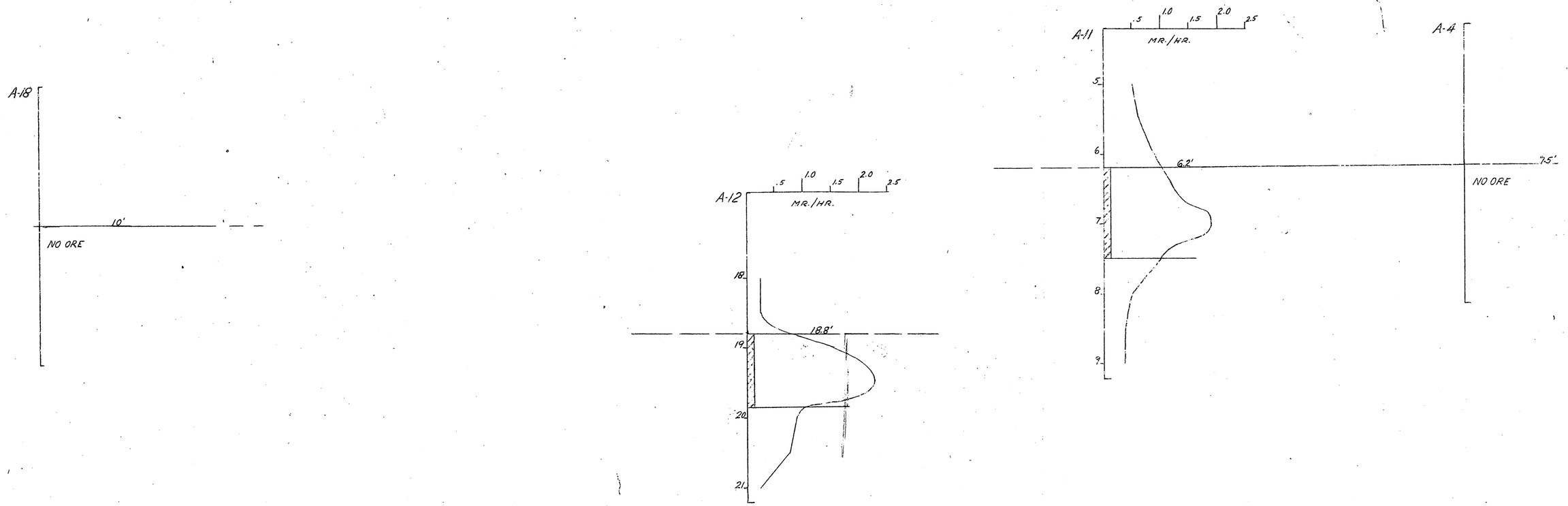
FEET	READING MR/HR
10-10½	.038
10½-11	.051
11-11½	.079
11½-12	.42
12-12½	1.0
12½-13	.51
13-13½	.37
13½-14	.093
14-14½	.051
14½-15	.024

Recd w/ F.T. Final Report
w/memo of 7-31-57

9

NORTH

SOUTH



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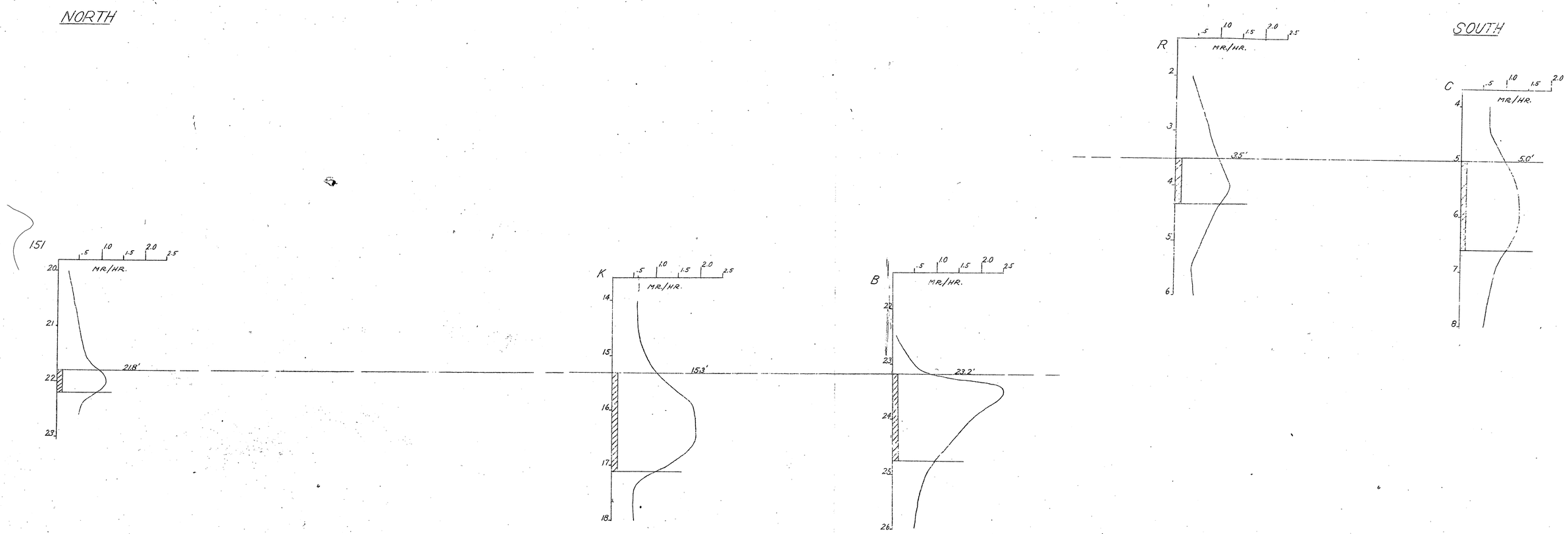

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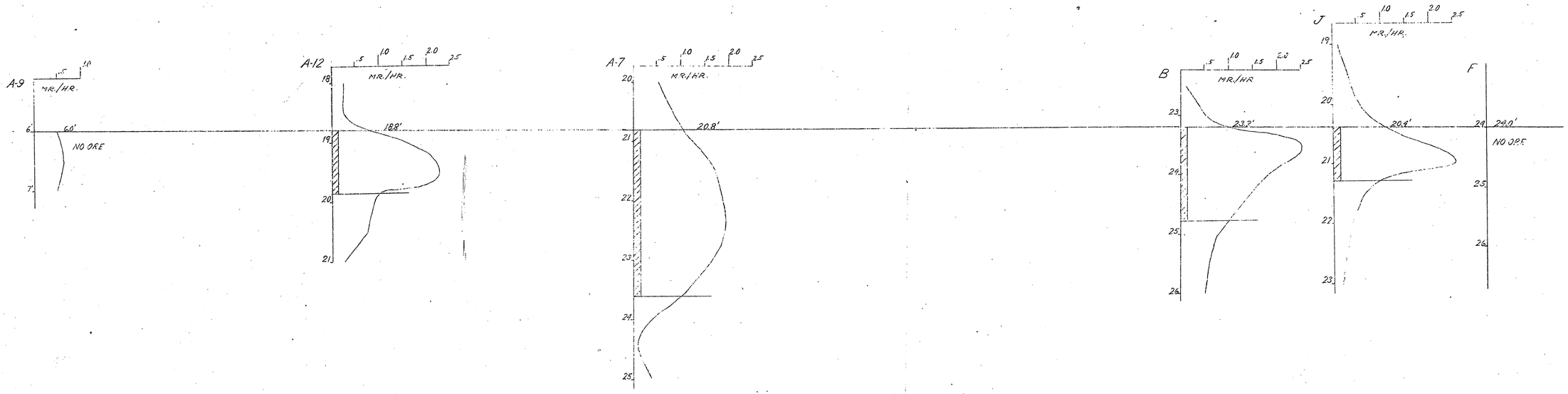
WEST

EAST



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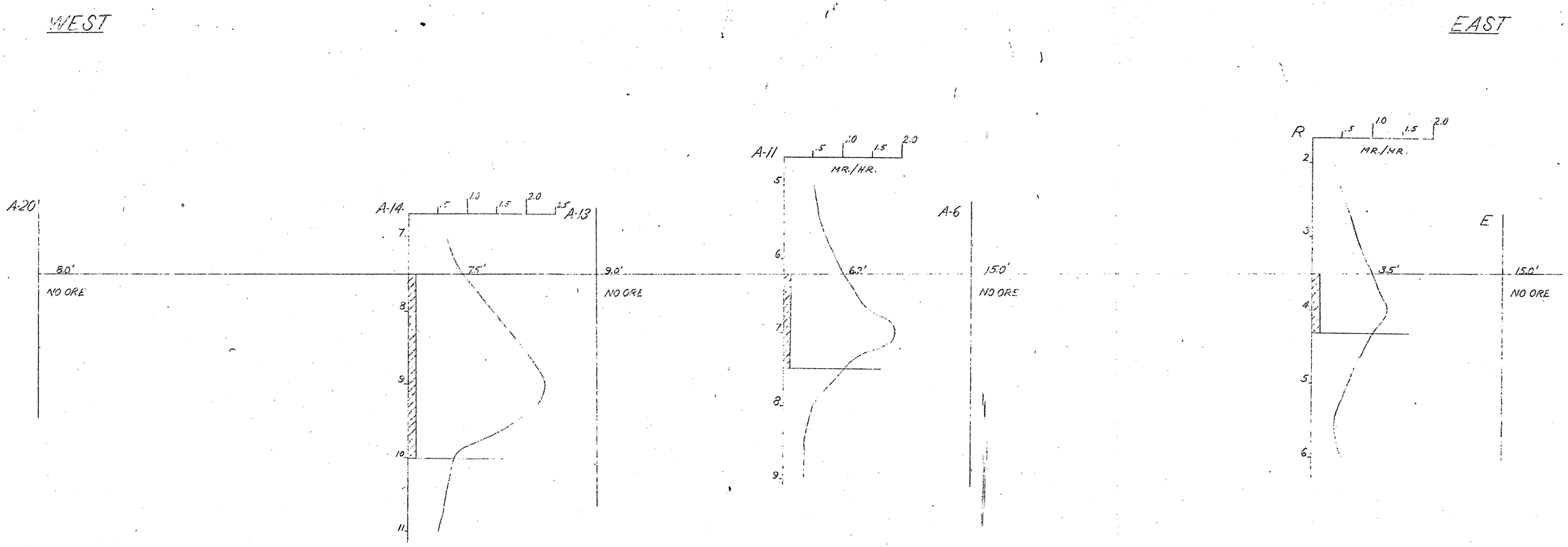

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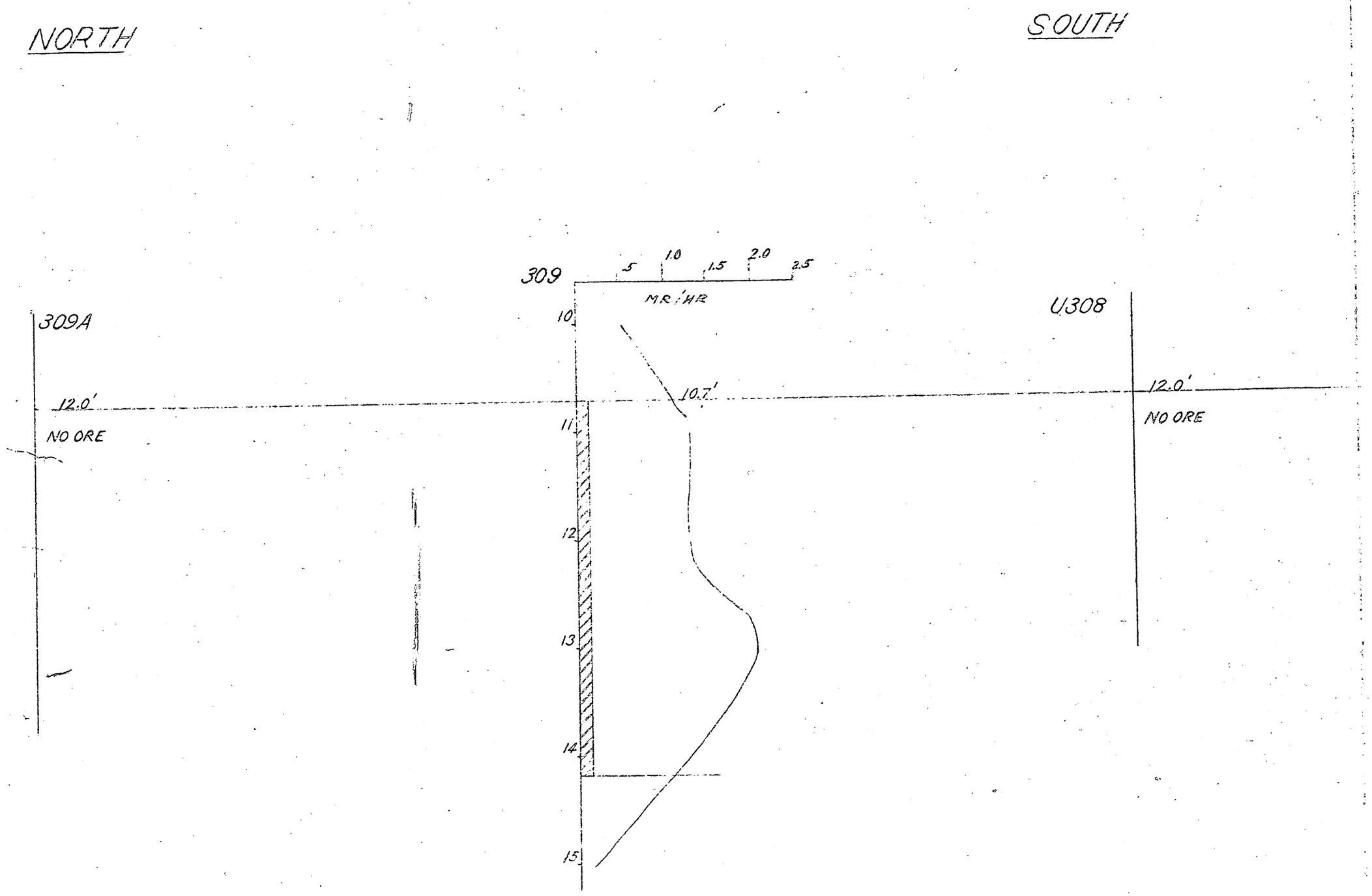

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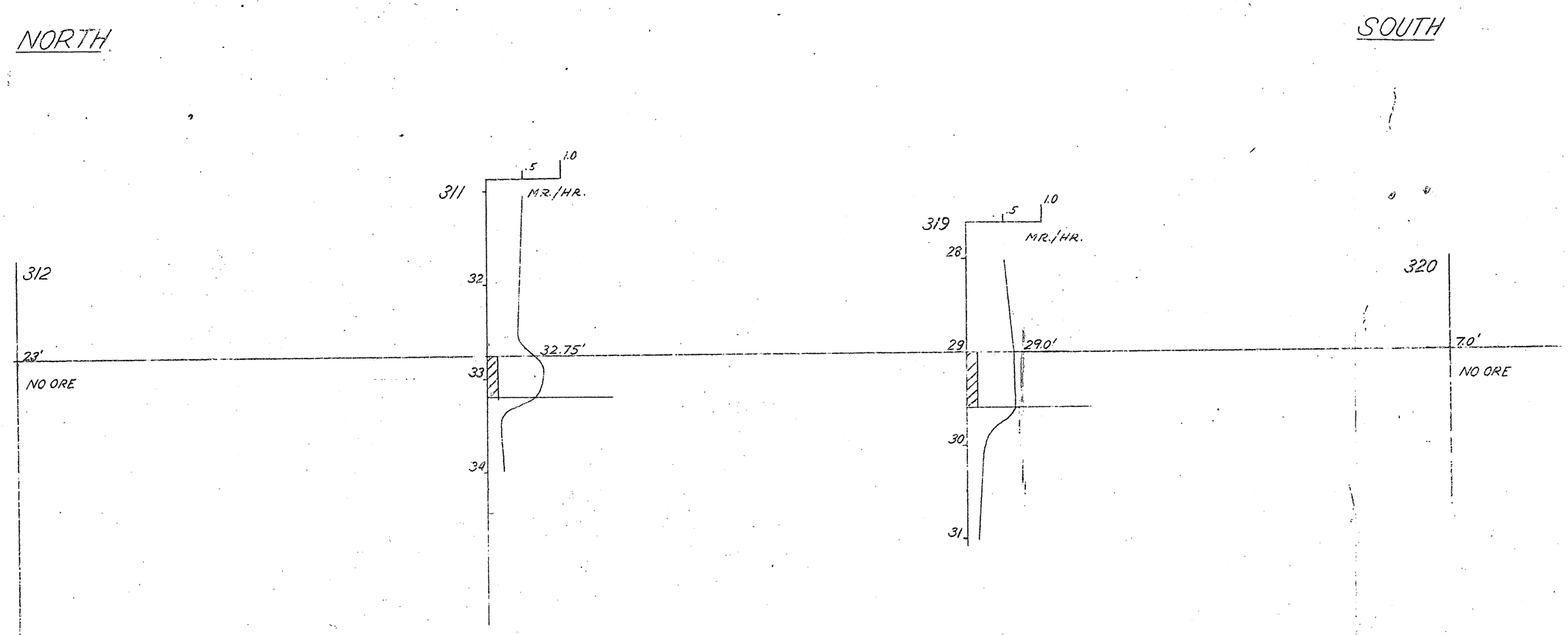

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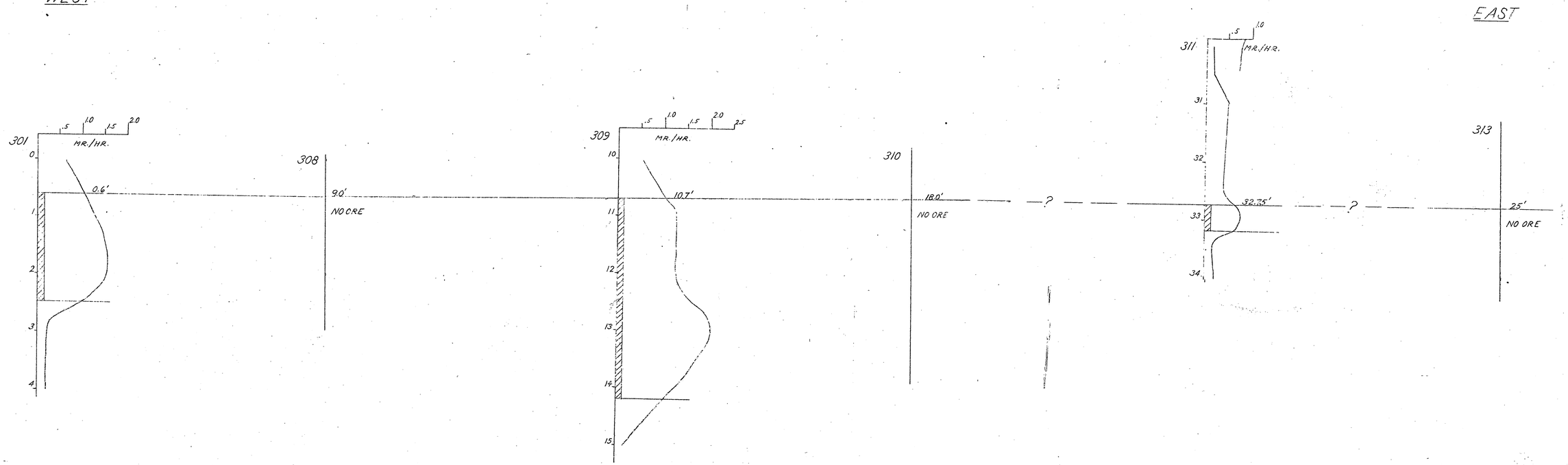

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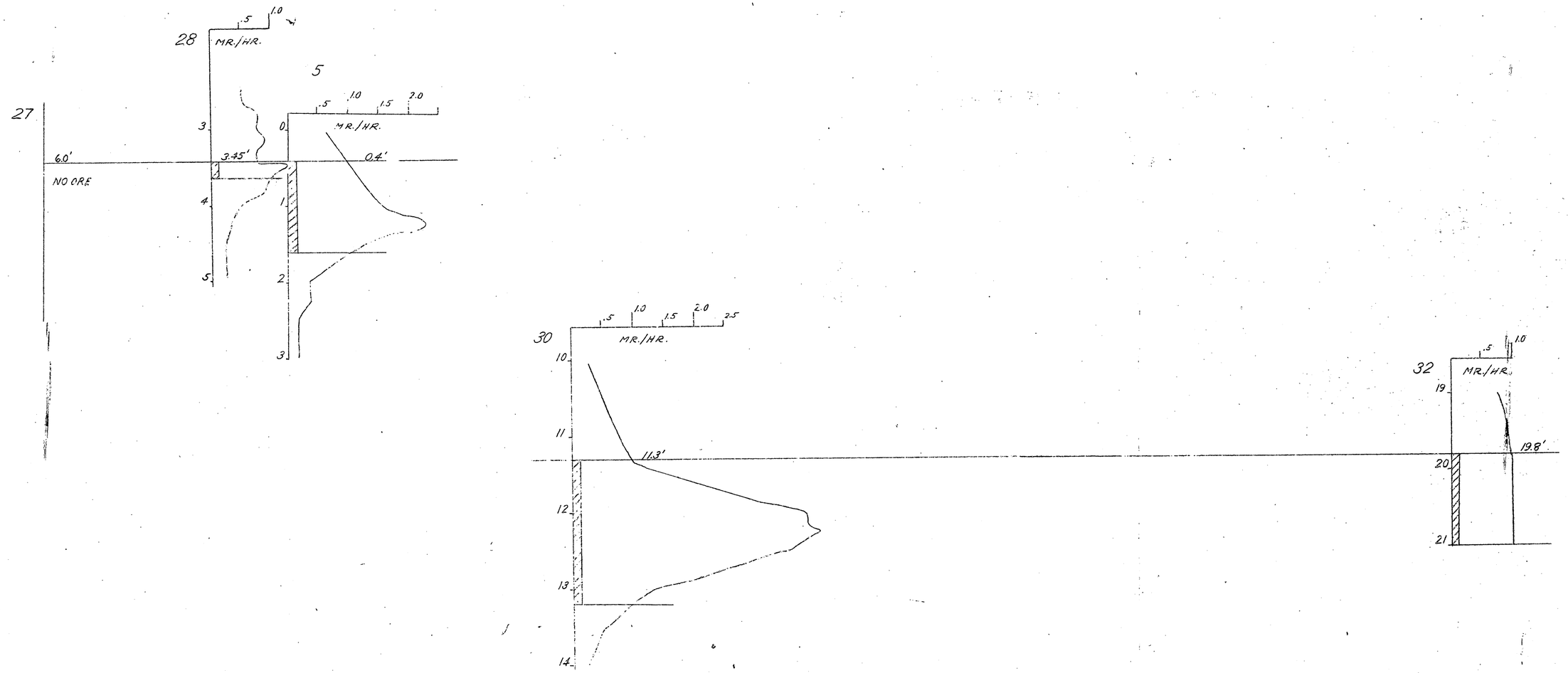
SOUTH WEST

NORTHEAST



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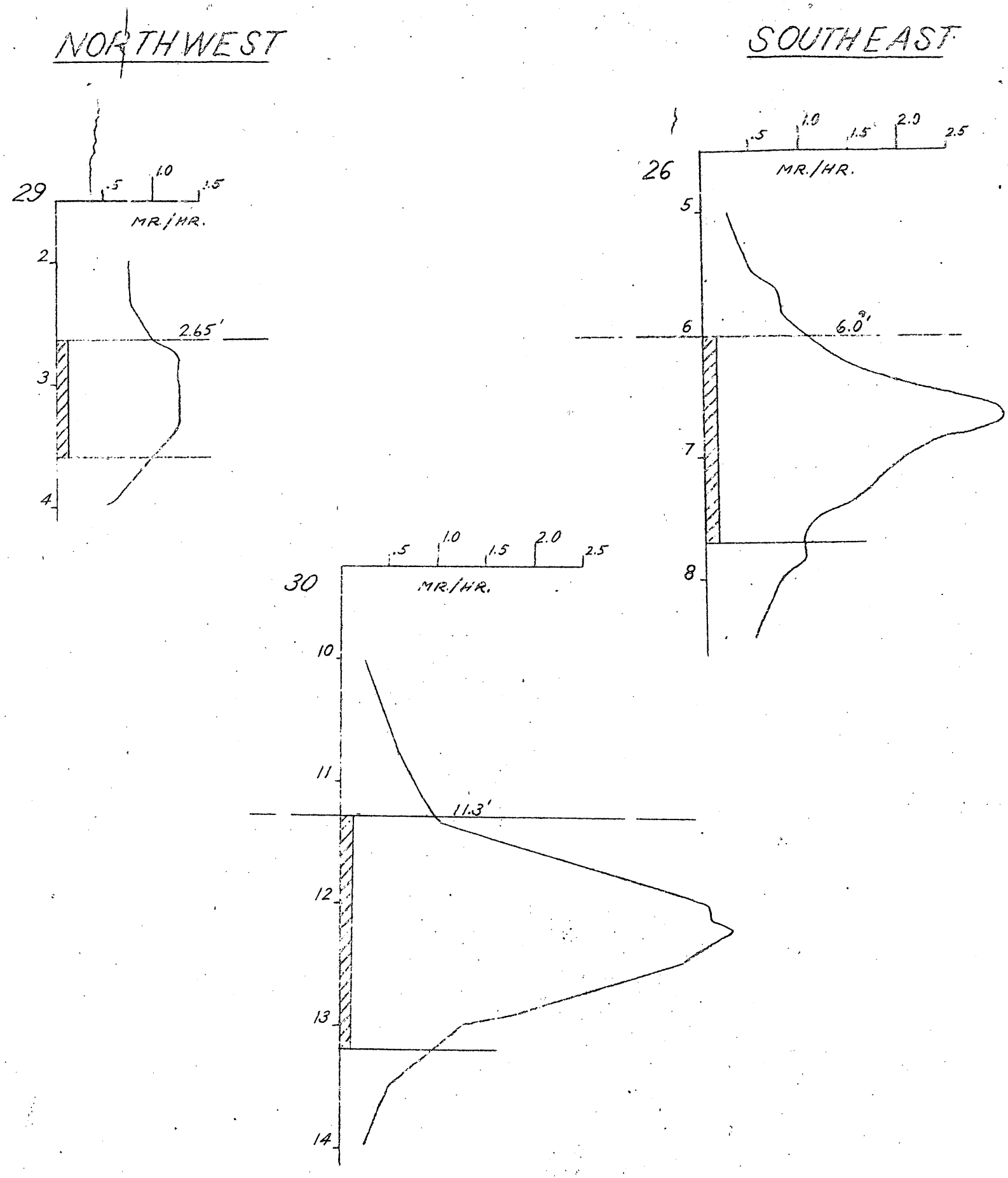

AREA C X-SECT. 9 5"=50' horiz. scale.

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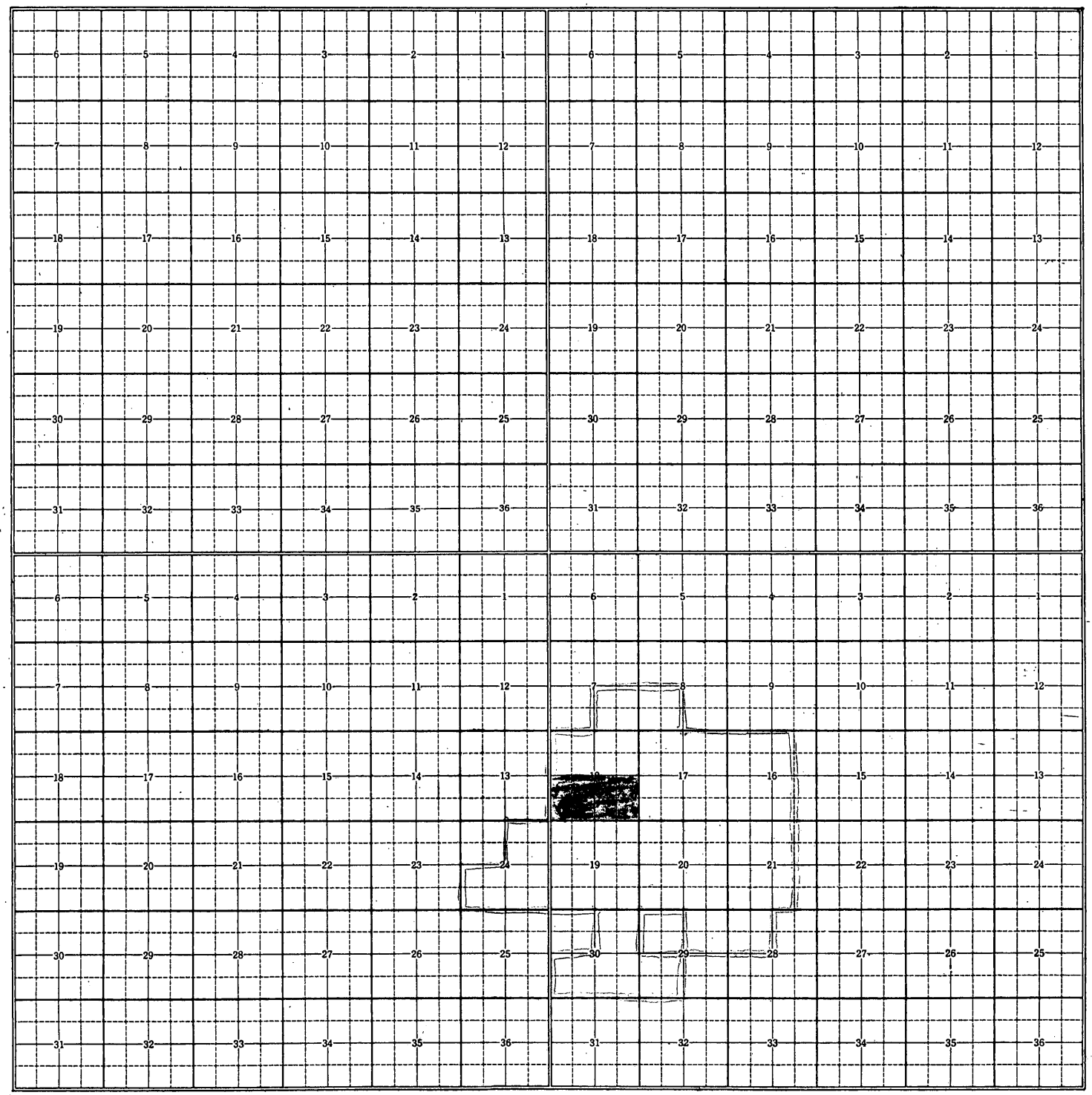
BURMAC EXPLORATION CORPORATION
P.O. BOX 836
WILLISTON, NORTH DAKOTA

Fallon County, Montana

Township _____ Range _____ Township _____ Range _____

Township 10N. Range 60E. Township 10N. Range 61E.

(3)



Burmac Leases outlined in red
Subject acreage shaded in blue

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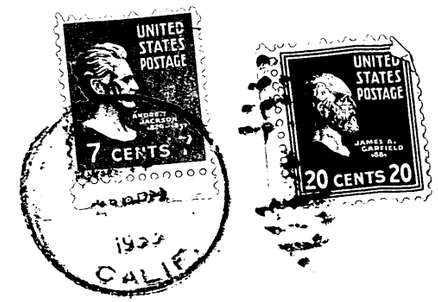
1281 - Montgomery St
Oroville. Calif.



Defense Minerals Exploratio Administration

Department of Interior.

Washington - 25

D. C.

Docket

Ellis

Project Summary Report

Michael Ching

Date: August 28, 1957

Docket No. DMEA-4107 (Uranium)
Contract No. Idm-E965

Operator - Burmac Exploration Corporation, a North Dakota corporation
P. O. Box 836
Williston, North Dakota

Property - All of secs. 17 and 18, T. 10 N., R. 61 E., M.P.M.&B., Fallon County, Montana. Applicant is the Lessee.

Operator's Property Rights - Lessee. Performance Bond dated July 18, 1956, furnished in lieu of Consent to Lien by owners George P. and Ruth E. Cox.

2. Contract (Long Form) - dated July 5, 1956
Final starting date - August 15, 1956
Actual starting date - August 1, 1956
Contract terminated - August 25, 1956 (end of Stage I)

Work Authorized:

Stage I - SW¼ of sec. 17 - 4 core and 22 non-core holes aggregating approximately 1,440 feet on 400-ft. grid.

S½ of sec. 18 - 6 core and 24 non-core holes aggregating approximately 2,100 feet with staggered rows and holes 660 feet apart.

Stage II - SW¼ of sec. 17 - 36 non-core holes aggregating approximately 1,980 feet as 200-foot offsets to favorable holes.

S½ of sec. 18 - 30 non-core holes aggregating approximately 2,100 feet as 330-foot offsets to favorable holes.

Stage III - SW¼ of sec. 17 - 36 non-core holes aggregating not more than 1,980 feet as 50 to 100-ft. offsets.

S½ of sec. 18 - 20 non-core holes aggregating not more than 1,400 feet as 100-ft. (min.) offsets.

Estimated Costs:

10,360 ft. non-core drilling @ $1/ft.	$10,360.00	
640 ft. core drilling @ $2.60/ft.	1,664.00	
11,000 ft. @ $0.24/ft. incidental allowance	2,640.00	
200 chemical sample analyses @ $4.25/each	850.00	
Estimated Total Cost of the Project (rounded)		$15,512.00
Government Participation @ 75%		$11,634.00

Amendments - None

Work Completed:

Stage I only -

658 ft. (10 holes) core drilling @ $2.60/ft.	$1,710.80
2,423 ft. (46 holes) non-core drilling @ $0.8036/ft.	1,947.11
3,081 ft. @ $0.24/ft. incidental allowance	739.44
8 chemical sample analyses @ $4.25/sample	34.00

Total Cost of Project $4,431.35
Government Participation @ 75% $3,323.51

Final Reports Received:

Operator - dated Sept. 28, 1956, received Nov. 1, 1956

Field Team - dated June, 1957 - received Aug. 7, 1957

3. Auditor's Report of Review - dated Feb. 26, 1957

Total Cost as billed by Operator	$4,468.72
Exceptions	37.37
Total Accepted Cost	$4,431.35
Government Participation @ 75%	$3,323.51

4. Certification of Discovery - None

5. Results and Comments:

The potential ore-bearing unit on the subject property is in a sandstone-lignite zone of the Fort Union formation of Paleocene age.

10 core and 46 non-core holes were completed to depths ranging from 20 to 150 feet. 6 of the holes penetrated mineralization, but only one showed material 1 foot or more thick assaying 0.10% or more U_3O_8. Because the drilling failed to penetrate material equal to or better than 0.20% U_3O_8, no commercial ore can be said to have been found by the project and a certification of discovery is not warranted.

Material penetrated consisted of unconsolidated sand and clay. Core recovery was difficult and low. Special provisions were necessary for collecting cuttings because of the moisture present.

Structural control of ore zones on the property is indicated by the fact that uranium-bearing sandstone-carbonaceous trash zones are largely confined to the lowermost portions of a buff-colored channel sandstone within structural lows in the underlying mudstone surface.

Drilling prior to the subject project indicated the presence of three mineralized zones on the property. The project work showed that the three zones are more or less connected by mineralized ground. Mineralized zones having maximum horizontal dimensions up to 200 or 300 feet probably underly the property. Such deposits are not likely to contain more than 2,000 tons of material averaging 0.10% U_3O_8.

The project work was carried out in a workmanlike manner.

Michael Ching

Michael Ching

udited

Certified

WORK ANALYSIS SHEET - DMEA PROJECT

Analysis as of Aug 27, 1957
Incl. Voucher for August, 1956

[X] Actual Cost

[ ] Agreed Unit Costs

Burmac Exploration Corporation

Docket No. DMEA-4107

te Montana

Commodity Uranium

Idm-E No. 965

OPERATION	AUTHORIZED Units	AUTHORIZED Cost	COMPLETED Units	COMPLETED Cost	NET COST
rifting & Crosscutting					
aising					
hafts					
inzes					
rilling Core	640	1,817.60	658	1,868.72	1,868.72
Specify) Non-Core	10,360	12,846.40	2,423	2,528.63	2,528.63
rface Excavation					
derground Excavation					
ds and Trails					
rating Equipment Purchased					
face Rehabilitation & Repairs					
rground Rehabilitation					
Building, Improvements, etc.					
r (Specify) Chem. Analyses		850.00		34.00	34.00
Totals (Rounded)		$ 15,512.00		$ 4,431.35	4,431.35

Prepared by Michael Ching

71626

Form 7
2-56)

OFFICIAL FILE COPY

Date	Surname	Code
8/28	Ching	700
8/28	Ellis	700
9-29	Crawford	800
9/2	Selfridge	120
9/3	Ogden	110
"	Mittendorf	100
9/4	P	220
		700

SEP 3 1957

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
Post Office Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Contract No. Idm-E965
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

Reference is made to your completed exploration contract with the Government.

We sincerely regret that the work performed did not result in a certification of discovery or development under the provisions of the contract. In the absence of such certification, the Government retains no claim or lien against the property subject to the contract or any future production therefrom. We, therefore, are closing our books and records on this project. Your attention, however, is called to the provisions of the contract which require the operator to keep and preserve certain records for the period indicated.

Your interest in the DMEA exploration program and participation therein are fully appreciated.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

Copy to: Royal Indemnity Company
MChing/izm 8-28-57
cc to: Mr. Ching
Admr.'s Reading File
Contract Adm. & Audit Div.
DMEA FT Reg. I (2)

8623

DMEA Form 7
(12-56)

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Date	Surname	Code
8/28	Ching	700
8/28	Ellis	700
8-29	Chambers	800
9/2	Selfridge	120
9/3	Johnson	110
"	Mittendorf	100
		220
		700

SEP 3 1957

Mr. Gerald A. Stenehjem, Attorney-in-Fact
Royal Indemnity Company
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Contract No. Idm-E965
Burmac Exploration Company
Cox Lease
Fallon County, Montana

Dear Mr. Stenehjem:

Enclosed is a copy of a self-explanatory letter of today to the Operator under the above-cited contract.

The property as set forth in the contract is covered by your Performance Bond, dated July 18, 1956, under the captioned name and contract number.

In the absence of certification, the Government retains no claim against the bonding company that assumed the responsibility for performance under the contract.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

Enclosure

MChing/izm 8-28-57
cc to: Mr. Ching
Admr.'s Reading File
Contract Adm. & Audit Div.
DMEA FT Reg. I (2)

8623

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

Memorandum August 30, 1957

To: E. W. Ellis, Defense Minerals Exploration Administration

From: T. H. Kiilsgaard, U. S. Geological Survey

Subject: Review of Field Team Final Report, Burmac Exp. Co., Fallon Co., Montana, DMEA Docket 4107 (Uranium).

Field examiners report that exploration work proposed in Stage I of the contract was completed but with such disappointing results that further stages were not entered into. The contract was therefore terminated by mutual agreement, with no further work being done.

Of the 36 holes drilled under contract, mineralized rock was penetrated by six of them but only one, hole D-15, is believed to have found ore. Ore is defined in the report as being 1 foot of 0.10 percent U_3O_8 or better. The authors point out, however, that in practice material must be 0.20 percent U_3O_8 or better to be commercial, thus they note that no significant discovery has been made.

I concur with the Field Team and recommend that no Certification of Discovery be issued to this contract.

T. H. Kiilsgaard

T. H. Kiilsgaard

8/9 220 700

FILE COPY DMEA ED AUG 14 1957		
E	INITIALS	CODE
14	P	220
"	Cherry	700
Memorandum		

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Washington 25, D. C.

Date August 13, 1957

DMEA Docket No. 4107
DMEA Contract No.
Commodity Uranium
Name of applicant Burmac Exploration Corp.
Name of property Cox Lease
Location of property Fallon County, Montana
Estimated cost of project $15,512.00

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee
From: James Paone, Bureau of Mines Member JP
Uranium Commodity Committee
Subject: Review of Final Report
(Application, Field Team Report, etc.)

1. Date of subject document: June 1957. 2. Date received by reviewer: 8/13/57

3. Prior reports on this property known to reviewer: Yes ☐ No ☐

4. Prior reports on nearby properties known to reviewer: Yes ☐ No ☐

5. Information available on past production: Yes ☐ No ☐

6. Other pertinent factors known to reviewer: Yes ☐ No ☐

7. Explain items marked yes above:

8. Factors needing special consideration:
   a. Location ☐
   b. Ownership ☐
   c. Evidence of mineralization ☐
   d. Geology ☐
   e. Proposed exploration method ☐
   f. Alternate exploration method ☐
   g. Costs ☐
   h. _____ ☐

9. Action advised:
   a. Obtain information from applicant ☐
   b. Refer to Field Team ☐
   c. Denial ☐
   d. Agree with Field Team [x]
   e. Disagree with Field Team ☐
   f. Suggest alternate plan ☐
   g. Request another examination ☐
   h. Approval ☐
   i. Consult with Mr. _____ at _____ AEC office.

10. Remarks: (Use back of page if necessary)

Termination of exploration recommended.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
So. 157 Howard Street
Spokane 4, Washington

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DATE	INITIALS	CODE
8/7	P.K.	220
8/9	FEJ	100
		1303
8/12	P.	220
13	COM	100
8-13	JC	800
8/14	Chm	700

July 31, 1957

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Selfridge:

Enclosed are three copies of a Field Team final report by John A. Bowsher, mining engineer, U. S. Bureau of Mines, and D. C. Alvord, geologist, U. S. Geological Survey, on the above-referenced project.

The project comprised core and noncore drilling, set up in three stages. Work was started August 1, 1956. Under Stage I, 10 core holes and 46 noncore holes were drilled to depths ranging from 20 feet to 150 feet, totaling 658 feet of core holes and 1,553 feet of noncore holes. Zones, 1 foot or more thick, containing 0.10 percent U_3O_8 or more were penetrated by only one hole; 5 holes penetrated weakly mineralized zones; and 50 holes were barren. Stages II and III were not started, and the contract was terminated August 25, 1956.

No significant deposits of ore were found and Certification of Discovery or Development is not recommended. Unless evidence of potentially larger and higher grade zones in another target area is presented, the expenditure of Government funds for further exploration of this property is not recommended.

Final F.T. Report

Reviewed by
DMEA OPERATING COMMITTEE
8-12-57
(date)

By Field Team, Region I

A. E. Weissenborn
A. E. Weissenborn, Exec. Officer
U. S. Geological Survey

Wing G. Agnew
Wing G. Agnew, Member
U. S. Bureau of Mines

Enclosures

(Maps, logs, in envelope pocket)

cc: USBM (2)
USBM (AD)
Alvord
USGS (SRO)
AEC (SLC)
AEC (Billings, Mont.)

DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS EXPLORATION ADMINISTRATION

FIELD TEAM, REGION I
Northwest District

OFFICIAL FILE COPY
DMEA
RECEIVED AUG 7 1957

DATE	INITIALS	CODE
		130
		220

FINAL REPORT

Contract Idm-E965

by

John A. Bowsher
Mining Engineer
U. S. Bureau of Mines

Donald C. Alvord
Geologist
U. S. Geological Survey

BURMAC EXPLORATION CORPORATION
Post Office Box 836
Williston, North Dakota

Docket No.:	DMEA-4107
Commodity:	Uranium
Contract date:	July 5, 1956
Completion date:	August 25, 1956

Reviewed by
DMEA OPERATING COMMITTEE
8-12-57
(date)

COX LEASE
Secs. 17 and 18, T. 10 N., R. 61 E. M.P.M.
Fallon County, Montana

Spokane, Washington

June 1957

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ILLUSTRATIONS

Plate 1	- Drill Hole Map, Cox Lease	In pocket
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APPENDICES

Appendix 1	- Operator's litholigic logs	In pocket
Appendix 2	- Operator's radiometric logs	In pocket

FINAL REPORT

BURMAC EXPLORATION CORPORATION
Cox Lease
Secs. 17 and 18, T. 10 N., R. 61 E. M.P.M.
Fallon County, Montana

Contract Idm-E965

OFFICIAL FILE COPY
DMEA
RECEIVED AUG 7 1957

DATE	INITIALS	CODE

* * * *

INTRODUCTION

This report describes an exploration project for uranium at the Cox Lease, northeast of Baker, Fallon County, Montana. The project was conducted by Burmac Exploration Corporation under Defense Minerals Exploration Administration Project Contract No. Idm-E965.

Summary

The purpose of the project was to search for and test the thickness and lateral continuity of uranium deposits known, by pre-contract drilling, to exist in a sandstone-lignite zone of the Fort Union formation.

Ten core holes and 46 noncore holes were completed to depths ranging from 20 to 150 feet and totaling 658 feet of core holes and 1,553 feet of noncore holes. Of these holes 1 penetrated zones 1 foot or more thick, containing 0.10 percent eU_3O_8 or more, 5 penetrated weakly mineralized zones, and 50 were barren.

No calculable reserves were developed.

Recommendation

Results of the project were disappointing. No minable ore deposits were found, and Certification of Discovery or Development is not recommended.

No further exploration on the property nor in the vicinity of the Ollie prospect is warranted unless evidence for potentially larger and higher grade zones in another target area is presented.

LOCATION AND ACCESSIBILITY

The ground included in the contract consists of secs. 17 and 18, T. 10 N., R. 61 E. M.P.M., a portion of the Cox Lease, Ollie Prospect, Fallon County, Montana (pl. 1). It lies between the almost deserted towns of Ollie and Carlyle, Montana. It is readily accessible over well-graded state and county roads southward about 25 miles from either Wilbaux, Montana, or Beach, North Dakota, and northward about 25 miles from either Baker, Montana, or Marmarth, North Dakota. From Beach, North Dakota, a spur line of the Northern Pacific Railroad passes through the property to Ollie, Montana, on the southern edge of the Ollie Prospect. The roads are open year-round, except for a month or so during the spring thaw when mud makes the roads impassable.

PROPERTY

The Cox Lease consists of secs. 17 and 18 and SE¼ sec. 7 and SW¼ sec. 8, T. 10 N., R. 61 E., of which the contract included secs. 17 and 18. The Burmac Exploration Corporation holds the third lease on the property by assignment as follows:

1. George P. Cox and Ruth E. Cox of 614 Burlington Avenue, Billings, Montana, owners in fee simple.

2. Joe Crisafulli, Sr., Joe Crisafulli, Jr., Frank Crisafulli, and Angelo Crisafulli, a partnership of Glendive, Montana, and Arthur M. Schmitz of Wilbaux, Montana, lessees of the mineral rights as of September 29, 1955, the terms of which continue 2 years from the preceding date and so long thereafter as any operations shall be conducted.

3. James G. Key of Williston, North Dakota, lessee of the mineral rights as acquired by the Crisafulli-Schmitz partnership and as of October 12, 1955.

4. Burmac Exploration Corporation of Williston, North Dakota, lessee of the mineral rights as acquired by James G. Key and as of October 15, 1955.

The property is in an area of gently rolling wheat and grazing land that has an average altitude of 3,200 feet. Small ridges and hillocks rise above the general area from 50 to 100 feet or more, with slopes that are generally moderate and subrounded.

From 1 to 3 feet of alkaline-saline, brownish-gray, fine sandy loam covers most of the area. Outcrops of bedrock are restricted to small areas on the steeper slopes of ridges and washes and along road cuts.

There are no surface facilities on the property other than the Northern Pacific spur line, the county road, and a few field and truck trails. Before the contract, development on secs. 17 and 18 consisted of 43 shallow test holes of which 12 penetrated ore-grade material as defined in this report (table 1 and pl. 1). There has been no production from the property.

Table 1.--Ore grade and mineralized drill holes completed by Burmac Exploration Corporation in secs. 17 and 18, Cox Lease, prior to Contract No. Idm-E965 1/

Area	Hole No.	Total depth (feet)	Depth to top of ore (feet)	Ore 2/ thickness (feet)	eU_3O_8 3/ (percent)	Remarks
Sec. 17	5	7.5	0.4	1.2	0.19	
	24	14.0	9.0	?	--	0.15% eU_3O_8 maximum at bottom
	26	8.5	6.0	1.7	0.18	
	28	6.3	3.5	0.2	0.16	
	29	4.0	2.7	1.0	0.16	
	30	20.0	11.3	1.9	0.2	
	32	27.0	19.8	1.2	0.15	
	45	41.0	32.4	2.1	0.19	
	56	50.0	34.0	1.3	0.15	
	75	50.0	37.0	2.7	0.12	Ore cut-off at 0.12% eU_3O_8
	107	60.0	44.6	1.4	0.12	Ore cut-off at 0.10% eU_3O_8
	112	60.0	51.6	1.8	0.14	Ore cut-off at 0.12% eU_3O_8
	117	70.0	64.8	0.6	0.16	
Sec. 18	126	45.0	23.0	2.4	0.20	
	266	35.0	12.5	1.5	0.18	

1/ Compiled from tables 2 and 3 of Burmac's report of exploratory work, attachment 6 of application.
2/ Ore thickness is calculated from radioactivity logs. Unless otherwise noted, thickness is that indicated in logs with equivalent U_3O_8 content of 0.15 percent or greater.
3/ eU_3O_8 in this table is Burmac's eU_3O_8 of table 3 in attachment 6 of application.

GEOLOGY

The general geology of the area in the vicinity of the Ollie prospect is reported in the following:

1. Dobbin, C. E. and Erdman, C. E., 1955, Structure contour map of the Montana Plains: U. S. Geol. Survey Oil and Gas Investigations Map OM 178A.

2. Perry, E. S., 1953, Oil and gas in Montana: State of Montana Bureau of Mines and Geology Memoir No. 35.

3. Perry, E. S., 1935, Geology and ground-water resources of southeastern Montana: State of Montana Bureau of Mines and Geology Memoir No. 14.

The property contains uranium-bearing carbonaceous trash and lignitic zones in sandstones of the Fort Union formation. Recent treatments of the geology and origin of similar occurrences are to be found in the following:

1. Denson, N. M., and Gill, J. R., 1956, Uranium-bearing lignite and its relation to volcanic tuffs in eastern Montana and North and South Dakota: U. S. Geol. Survey Prof. Paper 300, p. 413-418.

2. Vine, J. D., 1956, Uranium-bearing coal in the United States: U. S. Geol. Survey Prof. Paper 300, p. 405-411.

An unpublished report on the geology of the Burmac property by L. Y. Marks and D. L. Curry of the U. S. Atomic Energy Commission, is available in the files.

The area of drilling on the Cox Lease is underlain by sediments of the Fort Union formation of Paleocene age. Drilling has revealed lenses of friable medium- to fine-grained buff sandstone up to 80 feet thick that locally grade to light-gray and tan sandstones (pl. 3). The sandstone lenses, invariably underlain and overlain by gray siltstone or mudstone, are of undetermined length and width, but their edges, where encountered, are marked by a fairly abrupt intertonguing and intergrading of sandstone with the surrounding mudstone. Carbonaceous silt and trash zones and lignite zones are present throughout the sequence but appear to be more common in the lower portions of the sandstone and in the underlying mudstone. Surface exposures reveal that scour-and-fill structures are abundant and that slump features such as the convolution and breaking up of clay lenses within the sandstone are common. Apparently, the sediments drilled are a portion of a mudstone-siltstone flood deposit laced with stream channel deposits of sandstone interbedded with thin lenses and beds of mudstone and carbonaceous trash.

From regional maps it is estimated that about 300 feet of beds of the Fort Union formation underly the property, below which the Hell Creek member of the Lance formation of Upper Cretaceous age is inferred. The lithologic nature of the Fort Union formation below the general depth of the contract drilling is not specifically known; indications are, however, that for some depth at least, the beds consist dominantly of gray mudstone and probably other deposits of buff- to tan-colored sandstones containing carbonaceous trash zones similar to those encountered in the zone of drilling. Whether or not these also contain uranium occurrences is strictly a matter of conjecture.

The property is located about 12 miles east of the axis of the Cedar Creek anticline and the formations of the area generally dip from that structure gently to the northeast; however, due to the lenticular nature of the sandstones and the difficulty of finding beds in the more consistent mudstone deposits, a meaningful strike and dip for the beds underlying the property has not been determined. A structure contour map of the mudstone contact beneath the sandstone indicates an uneven but generally eastward dip of the surface (pl. 2).

The uranium deposits occur in carbonaceous trash zones at or near the bottom of the buff-colored sandstone lenses and generally in the vicinity of the structural lows of the mudstone surface (pls. 2 and 3 and Appendix I). The carbonaceous material occurs both as disseminated fragments and layers or lenses of material, generally charcoal-like but locally lignitic, within both the sandstones and the underlying mudstone. The uranium occurs as incompletely identified disseminated particles in both the carbonaceous material and the surrounding sandstones and is concentrated almost entirely within the sandstone-carbonaceous zone, although small amounts may also occur immediately below this zone in the underlying carbonaceous mudstone. According to D. F. Towse, vice-president and exploration manager of the company, a positive identification of metatyuyamunite has been made from one sample of sandstone ore, but on the basis of work done on related deposits in other areas, it is improbable that the bulk of the uranium in the ore occurs as metatyuyamunite (Denson and Gill, 1956, p. 416).

The deposits are irregular tabular-shaped masses that lie more or less parallel to the underlying mudstone surface. Because none of the deposits in the area have been mined and because none are completely blocked out by close-spaced drilling, very little is known regarding the details of their dimensions. The information available, however, indicates that deposits of ore grade and thickness on the Cox Lease range from a few tens of tons to about 2,000 tons of material averaging about 0.16 percent eU_3O_8. The average vertical thickness of such deposits is about 1.7 feet; their horizontal continuity may be as much as 200 feet or even more (holes 75 and D-15), and their areal extent probably ranges from a few hundred or so to more than 20,000 square feet.

The deposits are probably epigenetic in origin. Uranium-bearing ground waters percolating through the buff-colored sandstone lenses deposited the uranium just above structural lows in the underlying mudstone surfaces particularly in the vicinity of carbonaceous trash zones.

The uranium in the ground waters was probably leached from the tufaceous White River formation of Oligocene age which overlaps the Tongue River formation at localities to the east of the Ollie prospect (Denson and Gill, 1956, p. 413-418).

THE PROJECT

The Cox Lease is situated on the northwestern edge of the eastern Montana-western Dakotas Great Plains region of uranium-bearing lignite deposits and is underlain by beds of the Fort Union formation known to contain promising uraniferous-lignite deposits at several localities. Prior to the contract 27 holes out of a total of 160 drilled on and in the immediate vicinity of the Cox Lease had penetrated uranium-bearing sandstone-lignite zones estimated to average 1.8 feet thick and to contain 0.13 percent eU_3O_8. As most of the drilling had been wide-spaced and the size and habit of the ore zones were largely unknown, a program of closer-spaced drilling was recommended to test the lateral continuity of the deposits in the eastern portion of the Cox Lease and to search for new occurrences in the western portion of the Lease which, at that time, appeared promising on the basis of an inferred structural low.

The program originally proposed included three stages of rotary drilling totaling 640 feet of core holes and 10,360 feet of noncore holes. Stage I included four core holes and 22 noncore holes, aggregating 1,440 feet, to be drilled in the SW¼ of sec. 17 and six core holes and 24 noncore holes, aggregating approximately 2,100 feet, to be drilled in the S½ of sec. 18 (pl. 1). The drilling in the SW¼ of sec. 17 was designed to complete a grid with holes spaced on 400-foot centers and at the same time offset certain mineralized holes previously drilled by the Operator. The drilling in the S½ of sec. 18 was designed to establish a grid of holes on about 660-foot centers both to establish geologic control and to search for deposits in an area inferred to be underlain with favorable beds and to contain a structural low.

Stage II included 36 noncore holes in the SW¼ of sec. 17, aggregating 1,980 feet, as 200-foot offsets to previously drilled holes that showed significant mineralization. Stage II also included 30 noncore holes in the S½ of sec. 18, aggregating 2,100 feet as 330-foot offsets to Stage I holes that showed mineralization or favorable sandstone-lignite zones.

Stage III included not more than 36 noncore holes in the SW¼ of sec. 17, aggregating not more than 1,980 feet, as offsets from 50 to 100 feet from previously drilled holes showing significant mineralization, and not more than 20 noncore holes in the S½ of sec. 18, aggregating not more than 1,400 feet, as 100-foot or greater offsets to the previously drilled holes showing significant mineralization.

Work under Stage I of the contract was started August 1, 1956, and was completed August 25, 1956. The specifications of the contract were followed without significant modification. The results of this work were not considered sufficiently encouraging to justify Stages II and III. (See Field Team letter to the Operator dated October 24, 1956, and Operator's narrative report on Stage I transmitted to the Spokane office on September 28, 1956.)

All the holes, core and noncore, were 4½-inch diameter. In the cored holes a Mayhew 3.5 core barrel was used which gave a 2½-inch diameter core when recovery was possible. There was no core recovery of the unconsolidated sand lying above the clay. All core recovered by conventional coring methods came from the clay below the unconsolidated sand. Coring the clay was slow since only a 3- to 4-foot run was made to allow removing of the core without dismantling the core barrel. This was accomplished by pounding on top of the core with a 2-inch capped lead pipe.

A plug core method was used to recover core from the radioactive intervals (determined by cable and probe) of previously drilled holes. A second hole at an interval of about 1-3 feet from the first hole was driven with air and finger bit to the top of the radioactive section of the adjoining hole. The outside of the core barrel was removed and then run in to the top of the radioactive section and thence with the pressure of the hydraulic pull down the core barrel was pushed into the sand and clay and through the radioactive section.

An attempt to use a Duclone dust collector to gather cuttings from the noncore holes proved unsatisfactory because of the moisture in the sand which resulted in balling of the clay. As a substitute a 1-foot joint of 8-inch diameter casing with a 4-inch shielded hole was used to carry the cuttings away from the top of the hole. Samples every 2 feet of depth were collected at the end of the 4-inch shielded hole. This method proved satisfactory since a large volume of material was gathered from each 2-foot interval.

All holes were sampled radiometrically by cable and probe, cuttings were checked with a scintillator, and all mineralized sand recovered was chemically analyzed.

Mineralized rock was penetrated by six of the 36 holes drilled under the contract (table 2). Of these six holes, one (D-15)

Table 2.--Ore grade and mineralized drill holes completed by Burmac Exploration Corporation in secs. 17 and 18, Cox Lease, under Contract No. Idm-E965.

Drill hole No.	Total depth (ft.)	Radioactivity in hole 1/ Interval (ft.)	MR/hr	Sample No.	Sample interval (ft.)	Grade of samples eU_3O_8 %	cU_3O_8 %	Lithology of samples	Remarks
M-14	30	--	0.4	M14:18-20	18-20	0.01	0.04	Buff sand; some gray clay with much black carbonaceous material.	Not mineralized by definition.
M-15	30	13.5-14.0	.69	--	--	--	--	--	Not assayed.
		14.0-14.5	.59	--	--	--	--	--	Not assayed.
2/M-15-2	--	--	--	M15-2:14-15	14-15	.01	.01	Medium-grained buff and medium-gray sand.	
M-18-C	91	9.0- 9.5	.47	--	--	--	--	--	Not assayed. Not assayed.
D-15	50	36.0-36.5	.65	D15:36-38	36-38	.07	.11	Medium-gray clay with some buff sand.	Sample interval questionable due to caving.
		36.5-37.0	1.38	D15:36-38A	36-38	.07	.09	Medium-gray clay with fine-gray and some buff sand.	do.
		37.0-37.5	1.58	--	--	--	--	--	--
		37.5-38.0	1.5	--	--	--	--	--	--
		38.0-38.5	1.26	D15:38-40	38-40	.03	.04	Medium-gray clay with some buff sand.	Sample interval questionable due to caving
		38.5-39.0	.57	--	--	--	--	--	--
		39.5-40.0	.47	--	--	--	--	--	--
2/D-15-2	--	--	--	D15-2:33-38	3/37-38.5	.11	.13	Buff and medium-gray sand with much gray clay.	--
				D15-2:38-41	3/38-38.5	.09	.14	Medium-gray clay.	--
				D15-2:33-38-1	3/36-38.0	.01	.04	Buff and medium-gray sand with some medium-gray clay.	--
D-19	50	33.0-33.5	.57	--	--	--	--	--	Not assayed.
		33.5-34.0	.67	--	--	--	--	--	do.
		34.0-34.5	.55	--	--	--	--	--	do.
D-25	50	30.5-31.0	.47	--	--	--	--	--	Not assayed.
		31.0-31.5	.55	--	--	--	--	--	do.
		31.5-32.0	.49	--	--	--	--	--	do.
		32.5-33.0	.45	--	--	--	--	--	do.
D-26	30	11.5-12.0	.42	--	--	--	--	--	Not assayed.
		12.0-12.5	1.0	--	--	--	--	--	do.
		12.5-13.0	.51	--	--	--	--	--	do.

1/ 0.4 MR/hr is roughly equivalent to the radioactivity of probed ground averaging 0.05 percent U_3O_8; 0.7 MR/hr is equivalent to material averaging 0.1 percent U_3O_8.

2/ Offset hole drilled 1.5 feet west of original hole for plug core sampling; radioactivity logs of these offsets were not submitted by Operator.

3/ Channel sample of core.

is in material designated as ore in this report (material 1 foot or more thick containing 0.10 percent or more U_3O_8 based on chemical assay and/or gamma ray data). Hole D-15 is 200 feet north of ore hole 75 drilled by the Operator prior to the contract, but as these holes are isolated from any other ore holes, no reserve block is considered developed (pl. 1). Holes D-19, D-25, and D-26 are in mineralized ground and indicate a "dog leg" shaped zone of mineralized ground extending north and west from ore hole 75 to ore holes 5, 26, 29, 30, and 32, a linear distance of about 2,100 feet. This zone of mineralized ground, located roughly at the structurally lowest portion of the property (pls. 2 and 3), contains only one reserve unit, that drilled by holes 5, 26, 29, 30, and 32. The reserve developed by these holes is calculated to occur as two lenses, one containing 400 tons of material averaging 0.18 percent cU_3O_8 and the other 750 tons of the same grade (Examination Report, Alvord, 1956).

Holes M-15 and M-18C penetrated zones of weakly mineralized ground in the SE¼ of sec. 18. These occurrences, however, are isolated from other mineralized ground and occur where the favorable buff-colored sandstone is very thin.

Although 0.10 percent cU_3O_8 is defined as ore in this report, in practice only material averaging slightly better than 0.20 percent cU_3O_8 is mined in most commercial ventures. Because the drilling failed to penetrate material equal to or better than 0.20 percent cU_3O_8, no commercial ore can be said to have been found by DMEA drilling.

Summary of Factual Data

Stage I

	Authorized	Completed	Cost
Actual Costs			
Rotary noncore drilling @ $1.00/ft.	2,900 ft.	2,423 ft.	$1,947.11
Rotary core drilling @ $2.60/ft.	640 ft.	658 ft.	1,710.80
Fixed Unit Costs			
Incidental allowance for all drilling @ $0.24/ft.	3,540 ft.	3,081 ft.	739.44
Chemical analysis @ $4.25/sample	50 samples	8 samples	34.00
Total cost			$4,431.35

Total amount of contract	$15,512.00
Government's share at 75 percent	11,634.00
Total amount expended	4,431.35
Government's participation	3,323.51
Total amount unexpended	11,080.65
Government's share unexpended	8,310.49

Drilling Cost Calculations

Coring

93.75 hrs. @ $17.90/hr.	=	$1,678.12
1 core head bit	=	42.50
Total		$1,720.62

658 feet cored

$\frac{1,720.62}{658}$ = $2.615/ft.

Allowed by contract - $2.60/ft.

Noncoring

100.25 hrs. @ $17.90/hr.	=	$1,794.48
14 hrs. (travel) @ $12.50/hr.	=	175.00
1 fishtail bit	=	15.00
		$1,984.48
Less travel disallowance		37.37
Total		$1,947.11

2,423 feet drilled

$\frac{1,947.11}{2,423}$ = $0.8036/ft.

Allowed by contract - $1.00/ft.

Discussion of Conclusions

Although the project failed to discover deposits of uranium capable of commercial exploitation, additional information was obtained concerning the structural control of the ore zones. It now appears certain that the uranium-bearing sandstone-carbonaceous trash zones occurring on the Burmac property are essentially confined to the lowermost portions of the buff-colored channel sandstones within structural lows in the underlying mudstone surface.

The only systematic information available regarding the size, shape, and grade of the deposits is from drill holes. All factors considered, the deposits apparently are fairly homogeneous in grade and are in irregular grossly tabular-shaped masses that lie more or less parallel to the underlying mudstone surface. Experience in other regions with roughly tabular-shaped deposits of secondary uranium minerals in sandstone-mudstone environments has shown that the thickness and grade of such deposits can be estimated with only a few vertical drill hole penetrations per deposit but that the lateral dimensions of such ore bodies can only be determined with fairly dense drill-hole patterns. With the exception of some fairly close-spaced holes drilled prior to the contract, the holes completed on the Ollie Prospect are on 200-foot centers or larger. None of the ore-grade zones are completely blocked out, and although the contract completed a grid on 400-foot centers in the SW¼ of sec. 17 and on 650-foot centers in the S½ of sec. 18, there is insufficient data on hand to base a reasonably detailed description of the planar outlines of the uranium occurrences in the prospect area.

The ore-grade zones penetrated by drilling prior to the contract, which includes the Cox lease, averaged 1.8 feet thick and contained 0.13 percent eU_3O_8 (Alvord, 1956, p. 1, Exam. Report, Docket No. DMEA-4107); the ore-grade zones penetrated on the Cox Lease by the DMEA drilling averaged 1.7 feet thick and 0.16 percent eU_3O_8. The known ore-grade zones underlying the Cox Lease apparently occur as six seemingly discrete deposits of unknown lateral dimensions. The new data obtained by the contract drilling, although inconclusive, does not significantly alter the picture except to show that three of the ore-grade zones are connected by mineralized ground (pls. 1 and 3). A study of plates 1 and 3 indicates that ore-grade zones having maximum horizontal dimensions up to at least 200 feet almost certainly underly the property and that one deposit (holes 45 and 126) may extend at least 300 feet in one direction. In view of the location of barren and mineralized holes in the 400-foot center drill-hole pattern completed by the contract, however, the probability appears remote that any of the deposits contain more than about 2,000 short tons of material averaging 0.10 percent eU_3O_8 or better.

Enclosures
Distribution:

DMEA(3)	USGS(SRO)	Docket
USBM(5)	AEC, Salt Lake	Alvord

APPENDIX I
(In pocket)

Operator's lithologic logs of 10 rotary core holes and 46 rotary noncore holes completed under Contract No. Idm-E965.

(M-1 - M-30, incl., and D-1 - D-26, incl.)

APPENDIX 2
(In pocket)

Operator's radiometric logs of the 18 most radioactive holes drilled under Contract No. Idm-E965.

(M-1, -2, -13, -14, -15, -18, -22, -29 and D-2, -5, -9, -15, -19, -20, -21, -24, -25, -26)

Standard Form No. 1034a—Revised
Form prescribed by
Comptroller General, U. S.
September 7, 1950
(Gen. Reg. No. 51, Supp. No. 11)

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

D. O. Vou. No. W

Bu. Vou. No. 1955

U. S. _____
(Department, bureau, or establishment)

Voucher prepared at Spokane, Washington (Give place and date) 3/19/57

THE UNITED STATES, Dr., Payee's Account No. Idm-E965 - DMEA 4107

To Burmac Exploration Corporation (Payee)

Box 636 (Address) Williston, North Dakota (City) (State)

PAID BY

(For use of Paying Office)

No. and Date of Order	Date of Delivery or Service	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary) Discount Terms	QUANTITY	UNIT PRICE Cost	UNIT PRICE Per	AMOUNT Dollars	AMOUNT Cts.
	August 1956	Balance withheld under Voucher No. 1893, paid 10/16/56, adjusted to audit				222	00
PAYMENT: Complete ☐ Partial ☐ Final ☐		FINAL PAYMENT					
		Use continuation sheet(s) if necessary					

Shipped from to Weight Government B/L No. Total 222 00

(Payee must NOT use this space)

Differences

Account verified; correct for 222 00

(Signature or initials) D. L.

Contract No. Date Req. No. Date Invoice Rec'd.

222.00

MEMORANDUM

ACCOUNTING CLASSIFICATION (For completion by Administrative Office)

Appropriation, limitation, or project symbol	Appropriation title	Limit'n. or Proj't. Amount	Appropriation Amount

Allotment symbol	Amount	Obligations liquidated	COST ACCOUNT Symbol	COST ACCOUNT Amount	OBJECTIVE CLASSIFICATION Symbol	OBJECTIVE CLASSIFICATION Amount

Paid by { Check No. _____ dated _____, 19____, for $_____ / Cash, $_____, on _____, 19____. } on Treasurer of the United States in favor of payee named above.

16—22900a-2

METHOD OF OR ABSENCE OF ADVERTISING

METHOD OF ADVERTISING

1. Advertising in newspapers Yes ☐ No ☐.
2. (*a*) Advertising by circular letters sent to ..... dealers.
   (*b*) And by notices posted in public places Yes ☐ No ☐.

   (If notices were not posted in addition to advertising by circular letters sent to dealers, explanation of such omission must be made below.)

ABSENCE OF ADVERTISING

3. Without advertising, under an exigency of the service which existed prior to the order and would not admit of the delay incident to advertising.
4. Without advertising in accordance with .....
5. Without advertising, it being impracticable to secure competition because of .....

.....

.....

.....

.....

(Here state in detail the nature of the exigency or circumstances under which the securing of competition was impracticable under 3 and 4)

NOTE.—The above form "Method of or Absence of Advertising" is to be used when purchases are made or services secured under proper authority without written agreement in any form. In case of a written agreement (formal contract, proposal, and acceptance, or less formal agreement) Standard Form No. 1036—Revised should be used for abstracting the method of or absence of advertising and award of contract. (See General Regulations No. 51, as amended.)

☆ U. S. GOVERNMENT PRINTING OFFICE : 1950 O—75805

16—22000a-2

1201 N. Division Street
Spokane 2, Washington

March 10, 1957

Mrs. Dorothy F. Long, Certifying Officer
DMEA Field Team, Region I, NW
1201 N. Division Street
Spokane 2, Washington

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Fallon County, Montana
Contract No. Idm-5,65

Dear Mrs. Long:

The work completed under the contract was done to the satisfaction of the Government. A final report evaluating the results of the exploration program has been presented by the Operator and accepted by the Executive Officer.

The Government has no interest in supplies or equipment purchased for use on the project.

A Certification of Discovery will not be recommended by the Field Team.

A final Report of Review dated February 26, 1957 by DMEA Auditor C. A. Turner has been received.

As all contract requirements have been met, it is requested that final settlement of our account with the Operator be made.

Sincerely yours,

A. E. Weissenborn, Exec. Officer
DMEA Field Team, Region I, NW

cc: DMEA (2)
USGS (2)
Contract Admin. (2)
Docket

RECEIVED
MAR
D.M.E.A.

Form 7
(6)

OFFICIAL FILE COPY

Date	Surname	Code
3/4	Talbert	800
3/5	C	220
		225

MAR 4 1957

Mr. Charles A. Turner
DMEA Auditor
1201 North Division Street
Spokane 2, Washington

Re: Report of Review
Idm-E965, DMEA-4107
Burmac Exploration Corp.

Dear Mr. Turner:

Your revised Report of Review covering the referenced project is acceptable and release of all copies is authorized after changing the amount in reason (c) from $3,607.78 to $3,657.91.

This change has been made on the three Washington copies.

Sincerely yours,

(Signed) J. L. Chambers

Jay L. Chambers, Chief
Contract Administration
and Audit Division

EDTalbert/wb
March 4, 1957

Copy to: Docket
Admr. Reading File
Mr. Chambers

8623

Form 7
56)

OFFICIAL FILE COPY

Date	Surname	Code
2/15	Jackson	800
2/18	C	220
		225

FEB 15 1957

Mr. Charles A. Turner
DMEA Auditor
1201 North Division Street
Spokane 2, Washington

Re: Report of Review
Idm-E965, DMEA-4107
Burmac Exploration Corporation

Dear Mr. Turner:

The recently submitted copies of your Report of Review in lieu of a final audit covering the referenced project are returned herewith for further review and revision as may be necessary.

In the third paragraph your reasons (a) and (b) for the review in lieu of an audit should be stated as reasons (c) and (d) preceded by the following reasons:

"(a) the administrative cost to the Government of an audit would be excessive in relation to the estimated amount of possible further disallowances thereunder;
(b) the Monthly Report was supported by documentary proof of the costs incurred under the contract's provisions for contribution by the Government on the basis of actual costs incurred;"

Both of these reasons, or variations thereof, are required to be given in any case where any portion of the costs claimed are under a contract provision for contribution by the Government on the basis of actual costs incurred (see page 70 of the audit manual).

The Schedule of Exceptions attached to the Report of Review indicates allocation of the moving expenses on a 50-50 basis to the core and noncore drilling. Our files, however, contain a copy of a memorandum signed by D. R. MacLaren under date of August 21, 1956 (confirming a telephone conversation between Mr. McCabe, the Operator's geologist, and Messrs. Erickson, Bowsher and MacLaren, representing the Field Team), in which the Operator "was advised to prorate the total estimated cost of the move to so-much-per-foot." Under this agreement, which appears equitable, the moving charge of $175.00 would be allocated

8623

on a 21.4-78.6 percent basis, resulting in your disallowance being reduced from $87.50 to $37.45. It is suggested that you discuss this matter with Mr. Weissenborn before revising the Report of Review.

Sincerely yours,

(Signed) J. L. Chambers

Jay L. Chambers, Chief
Contract Administration
and Audit Division

Enclosure

EDTalbert/wb
February 15, 1957

Copy to: Docket
Admr. Reading File
Mr. Chambers

ACTION ON INTERIM
OR FINAL FIELD TEAM REPORT
Date 12-6

Referred to:

1. ~~Mr. Mittendorf~~
2. ~~Mr. Johnson~~
3. ~~Mr. Chambers~~
4. Docket Control Mails and Files
5. _____ Division
6. Docket Control Mails and Files

Note comments in report regarding:

1. Some!

2.

3.

4.

and take appropriate action.

- - - - - - - -

Action taken by Division

Robert E. Adams

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~

1201 N. Division St.
Spokane 2, Washington
November 20, 1956

MEMORANDUM

To: DMEA Field Team, Region I, Northwest District

From: John A. Bowsher, Mining Engineer, Bureau of Mines

Subject: Final interim report, Docket No. DMEA-4107 (uranium), Burmac Exploration Corporation, Cox Lease, Fallon County, Montana, Contract No. Idm-E965

Stage I of the subject contract was entered into August 1 and completed August 25, 1956. Discouraging results from the evaluation of the completed work did not justify the authorization of Stages II and III (see Field Team letter to the Operator dated October 24, 1956). Therefore, the Operator's first and only voucher (August 1956) and narrative report have been accepted as the Operator's final report.

A final field check of completed work under Stage I was not made since a footage check of the authorized work, consisting of core and non-core drill holes in unconsolidated sandstone and shale, is not feasible except where casing is specified to keep the holes open.

The final tabulation of the status of the completed work is taken from the Operator's voucher and supporting invoices. There is no reason to doubt the accuracy of the information therein.

Status of Completed Work

	Authorized	Completed	Vouchered
Stage I - Actual Costs			
Rotary non-core drilling @ $1.00/ft.	2900 ft.	2423 ft.	2423 ft., $1984.44
Rotary core drilling @ $2.60/ft.	640 ft.	658 ft.	658 ft., 1710.80
Fixed Unit Costs			
Incidental allowance for all drilling @ $0.24/ft/	3540 ft.	3081 ft.	3081 ft., 739.44
Chem. analysis @ $4.25/sample	50 samples	8	8 34.00

Distribution:
DMEA (4) Turner
USGS (2) Docket
USBM (AD) Bowsher

John A. Bowsher

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

D.M.E.A.

October 24, 1956

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Selfridge:

Enclosed are two copies of the Operator's report submitted after completion of Stage I of the contract and two copies of our letter to the Operator acknowledging receipt of the report and advising him that Stages II and III will not be authorized.

The results of the Stage I drilling were so discouraging that we do not feel justified in approving the Stage II drilling.

A final Field Team report will be prepared in which it will be recommended that no discovery or development be certified.

By Field Team, Region I, NW District

A. E. Weissenborn

A. E. Weissenborn, Executive Officer
U. S. Geological Survey

Thomas E Howard

for: Wing G. Agnew, Member
U. S. Bureau of Mines

Enclosures
cc: USBM(2)
USBM(AD)
Alvord

xxxxxxxxxxxxxxxxxx
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
NOV 1 1956
O.M.E.A.

October 24, 1956

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Dallas:

This will acknowledge receipt of your letter of September 28, 1956, addressed to Mr. John A. Bowsher of the Bureau of Mines, and the accompanying report covering the Stage I drilling.

As the results of Stage I drilling were so discouraging, Stages II and III will not be authorized and therefore this report will be accepted as the final project report.

We are sorry that the drilling did not have a more satisfactory outcome. Thank you for your cooperation with us in administering the contract and for your interest in the Defense Minerals Exploration Administration program.

By Field Team, Region I, NW District

A. E. Weissenborn, Executive Officer
U. S. Geological Survey

Wing G. Agnew, Member
U. S. Bureau of Mines

cc: DMEA(2)
[illegible](2)
[illegible](AD)
Alvord

RECEIVED
NOV 1 1956
D.M.E.A.

BURMAC EXPLORATION CORPORATION
P. O. Box 836
Williston, North Dakota

PROJECT REPORT

Docket No. DMEA-4107
Commodity - Uranium
Contract No. Idm-E965

Cox Lease - Fallon County - Montana

September 28, 1956

3 maps submitted are in the envelope pocket,

Fin. Op's.
Report.
Recd. 11-1-56
Dated: 9-28-56

September 28, 1956

RECEIVED
NOV 1 1956
D.M.E.A.

U. S. Department of the Interior
Defense Minerals Exploration Administration
So. 157 Howard Street
Spokane 4, Washington

Attn: Mr. A. E. Weissenborn
Executive Officer
Field Team, Region I, N. W. Dist.

Re: Docket No DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Weissenborn:

I am submitting to you, in five copies, the report in accordance with Article 7 (b) and (c) of the captioned contract.

In view of the rather discouraging results obtained from the Stage I drilling program we have made the decision not to proceed to Stage II. Hence will you please consider this report as our monthly progress report for the month of August 1956, our narrative report on Stage I and our final report.

These reports as well as the necessary vouchers are being sent first to Mr. John A. Bowsher of the U. S. Bureau of Mines in Butte, Montana.

It has been a pleasure to work with you and your representatives as well as with the members of the U. S. Bureau of Mines on this project. I trust that our report will be satisfactory and in compliance with the terms of the contract.

Sincerely yours,

Dois D. Dallas

Dois D. Dallas

DDD:hl

D.M.E.A.
VOM 1 1988
DATED

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Grand Forks, N. Dak.
September 5, 1956

RECEIVED NOV 1 1956 D.M.E.A.

Dois D. Dallas, President
Burmac Exploration Corporation
Box 836
Williston, North Dakota

Dear Mr. Dallas,

Enclosed herewith is the geologic and engineering data gathered from Stage I of the exploration project D.M.E.A. 4107, preformed on the Ollie prospect, SW¼, Sec. 17 & S ½ Sec. 18; Township 10 North Range 61 East M.P.M. and B, Fallon County, Montana from August 1, 1956 to August 25, 1956.
The gathering of data consisted of rotary core and non-core drilling to test sandstone-lignite seams of the Fort Union formation. All holes were logged geologically and probed radiometrically and sampled. Samples indicating mineralization were analyzed chemically and radiometerically. A total of 3081 feet were drilled; 658 feet of coring and 2423 feet of non-coring. Although conventional coring of the unconsolidated sand gave 0% recovery the plug-coring method described in the report gave sufficient information as to the character of sedimentation and mineralization.

If you have any questions relative to this report do not hesitate to write me at the following address;

Wm. J. McCabe
308 Belmont Rd.
Grand Forks, North Dakota

Kindest personal regards,

Sincerely,

Wm J. McCabe

Wm. J. McCabe

NARRATIVE REPORT

General geology

The presence of radioactive material in drill holes which penetrated the base of a sand, buff to medium gray, fine to medium grained, and the top of an underlying medium gray clay of the Paleocene Fort Union formation is evident from radiometric deep hole probe readings and chemical and radiometric analysis of samples from the mineralized sections. Water was encountered and is intimately associated with the mineralized sections in all holes except M-14, as well as with many non-mineralized holes. A sub-surface map of the clay indicates a dipping of the clay surface to the east and a northeasterly strike. A terrace effect can be noted down the dip of the clay surface. Generally speaking, all mineralized holes in the SW$\frac{1}{4}$ of Section 17, and the SE$\frac{1}{4}$ of Section 18 are where the clay surface reaches its minimum elevation in the drilling area, and where the sand section overlies the clay surface. Changes in color and grain size of the sand section indicates varied sedimentation and mineral content.

Mineralization of the sand and clay may have been controlled by the structurally lower portion of the drilled area, as well as preferential mineralization in the sand and clay that has a high organic content. Megascopic examination of the radioactive samples did not reveal any visible mineralization, nor is the presence or amount of urano-organic mineral known. The mineralization in this area is probably epigenetic in origin. The Oligocene White River formation, which would have been possibly 200 feet above the present surface of the drilled area, may have been the source of the radioactive material. Because of the higher elevation of the Ollie prospect relative to the surrounding country, the possibility of mineralization from the White River formation is greatly enhanced.

From previous exploratory drilling and trenching in the area and from the character of the mineralization around hole M-15, it is possible that the mineralization is confined to relatively small lenticular patches at the sand clay contact. Projection of an ore body with a radius of 10 feet from the drill hole would be a maximum distance. Mineralization is not confined to places where the sand grades laterally to gray clay. It, however, is confined to places where carbonaceous silt and organic trash stringers are enclosed in the sand or at the base of the sand and top of the underlying clay. Mineralization occurs in the clay where the clay at the sand-clay contact contains much sand and consequently has some porosity.

Drilling and coring methods

All core and non-core holes are 4$\frac{1}{2}$ inches in diameter. The first 10 feet were not cored because it was impossible to run the core barrel through the hydraulic pull-down on the drilling rig. Coring of the unconsolidated sand above the clay gave no recovery. A Mayhew 3.5 core barrel was used and a 2$\frac{1}{2}$ inch core was recovered when possible. All core that was recovered by conventional coring methods came from the clay below the unconsolidated sand. The method described below was used to recover core from the radioactive intervals of previously drilled holes. When hole M-15 was drilled and found to be mineralized, a second hole M-15-1 was drilled 3$\frac{1}{2}$ feet to the east. M-15-1 was drilled to 10 feet with air and finger bit. The outside of the core barrel was removed and run in the

hole to 10 feet. By setting the inside of the core barrel on the bottom of the hole and applying pressure with the hydraulic pull down, the core barrel was pushed into the sand and clay from the interval 10 to 12 feet, recovering 1 foot of sand. The next core likewise was taken from 12 to 17 feet, recovering 4 feet of sand and clay. Core number three was taken from 17 to 20 feet, recovering 3 feet of medium gray clay. The M-15-1 hole was not mineralized, however, and M-15-2 was drilled 1½ feet west of hole M-15, using the plug coring method described above. Hole M-15-2 was plug cored from 13 to 17 feet, recovering 4 feet. The mineralized sand recovered was sampled and analyzed chemically and radiometrically for uranium (see analysis of sample M-15214-15). Hole D-15-2 was drilled 1½ feet west of D-15 and cored from 34 to 44 feet, recovering 6½ feet of core. (See analysis of samples D-15233-38, D-15238-41 and D-15233-381.)

Coring the clay was slow. Only 3 or 4 feet were cut at a time so the clay core could be removed without disassembling the core barrel. If more than three or four feet of core were cut, the barrel had to be disassembled and the core removed by pounding on the top of the core with a 2 inch capped lead pipe.

Mineralization

Mineralization in the drill holes was confined to the contact of the sand and clay, the only exception being hole D-5 where anomalous readings were from 67½ to 74½ feet. This section is apparently a clay stringer in the sand above the clay, but it was not significantly mineralized. In all mineralized holes except M-14, the mineralized section contained water. At the point of contact between the sand and underlying clay, much organic material is usually found. Black carbonaceous silt, lignite coal chips, charcoal-like particles and plant remains were found in the samples through the contact. No visible mineralization could be detected in the samples, and the presence and amount of urano-organic mineral are unknown. The mineralization of the clay, as may be observed on the combined lithologic and radiometric logs, occurs when, at the point of contact of the sand and underlying clay, the underlying clay would be more sandy. Where the underlying clay was not sandy, the radioactive interval extended only into the clay as a result of the hole being salted by the drill rods. Chemical analysis of both the sand and clay indicate that both the sand and clay may be mineralized.

Ore reserves

Holes D-26, D-19, D-15 and M-15 are designated as significantly mineralized holes. There is at least one radiometric log reading in these holes that has 0.10% eU_3O_8 or greater. However, the only drill hole which indicates mineralization of ore grade and thickness is drill hole D-15. The D-15 radiometric log indicates an ore thickness of 1.75 feet, and would average 0.14% eU_3O_8 (see sample analysis D-15238-41). The vanadium content of this sample is not known.

Hole #	Ore Thickness	% eU_3O_8
M-15	6 inches	0.10%
D-19	6 inches	0.10%
D-26	6 inches	0.15%

Because of the thinness and low grade of the ore in holes M-15, D-19 and D-26, ore reserves for these holes is not calculated.

Criteria for estimating ore reserves:

Thickness cut off --- minimum thickness 1 foot

Grade cut off: High cut off, 1 foot or more of 0.10% eU_3O_8

Low cut off, less than 1 foot thick with 0.10% or more eU_3O_8 or 1 foot or more of less than 0.10% eU_3O_8.

With our present knowledge of the characteristics of concentrated mineralization in this area, it is not practical to project more than a 10 foot mineralized radius around the drill hole.

Calculated ore reserve for hole D-15

Depth to top of ore bed	35 feet
Average tenor of the ore	0.14%
Ore thickness	1.75 feet
Volume tonnage	15 cu. ft./ton
Estimated ore reserve for hole D-15	36 tons of 0.14% U_3O_8 ore.

Hole Location Map

For this report the color blue is used to indicate holes that have a non-commercial mineralized section. Red indicates a commercially mineralized section irrespective of thickness. This color distinction is used on the hole location map.

Hole Number Designation

All holes drilled in the SW¼. Sec. 17 have the prefix letter "D" (e.g. D-5); holes in S½. Sec. 18 have the prefix letter "M" (e.g. M-5); all core holes have a last letter "C" designation (e.g. M-6-C).

Hole Locations and Elevations

Drill hole locations were placed by Brunton compass and steel tape. Elevations of the holes were taken with a surveyor's level. All holes that have an elevation to the first decimal point were leveled in. The other elevations were taken with an altimeter. A line was run from the Montana highway bench mark in the town of Ollie, Montana where the elevation is 3114.5 feet above mean sea level.

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Plug Core Recovery

Hole #	Cored Interval	Feet Recovered	% Recovered
M-15-1	10-20 feet	8	80
M-15-2	13-17 feet	4	100
D-15-2	34-44 feet	6.5	65

Average of 81.6% recovery

Sample Number Identification and Lithologic Description
(These samples were analyzed chemically)

D-1536-38A	Sample from hole D-15, foot interval 36-38 feet; wet sample, mostly med. gray clay w/ fine gray sand and some buff sand.
D-1538-40	Sample from hole D-15, foot interval 38-40 feet; wet sample, med. gray clay w/ some buff sand.
D-1536-38	Sample from hole D-15, foot interval 36-38 feet; wet sample, med. gray clay w/ some buff sand; footage interval questionable because hole was caving.
M-1418-20	Sample from hole M-14, foot interval 18-20 feet; dry sample, buff sand, med. gray clay w/ much blk. carb. particles and dust.
M-15214-15	Sample from hole M-15-2, 1½ feet west of M-15; foot interval 14-15 feet; plug core sample; sand buff and med. gray sand, med. grained.
D-15233-38	Sample from hole D-15-2, 1½ feet west of D-15; sampled interval from 37-38½ feet; channel sample of core; sand, buff and med. gray sand w/ much gray clay.
D-15238-41	Sample from hole D-15-2, 1½ feet west of D-15; sampled interval from 38-38½ feet; channel sample of core; med. gray clay.
D-15233-381	Sample from hole D-15-2, 1½ feet west of D-15; sampled interval from 36-38 feet; channel sample of core; sand, buff and med. gray sand w/ some med. gray clay.

Sample Collecting

A Duclone dust collector was mounted on the drill truck. However because of the dampness of the sand and the balling of the clay, sample collecting with this device was not satisfactory. In place of the Duclone dust collector a one-foot joint of casing 8 inches in diameter with a four-inch shielded hole was used to direct the cuttings away from the top of the hole. Every two feet samples were collected on a shovel placed at the end of the four-inch shielded hole. This method of sample collecting proved to be satisfactory and a large volume of sample from each two-foot interval was collected. Each two-foot sample was checked with a scintillator (Model 111 B, Ser. No. 111TTB8527, Precision Radiation Instruments, Inc.) and placed either in paper bags or

cloth bags, depending on the dampness of the sample. All cores recovered were boxed, labeled and stored with the other samples on the Carl Sliper farm, ½ mile north of SW¼, Sec. 17. Because of the water encountered at the base of the sand, and up hole contamination of the samples, most of the samples through the radioactive intervals did not give anomalous readings; consequently the presence of radioactive material was not often known until the hole was logged radiometrically with the deep hole probe. This alone was sufficient reason to drill offset holes to try to obtain samples of the minteralized interval. The samples from hole M-14 gave anomalous readings and was analyzed chemically and radiometrically. (See sample M-1418-20.) All other samples from holes indicating mineralization were obtained by the plug core method described under the heading of Drilling and Coring Methods. Samples D-1536-38A, D-1538-40, and D-1536-38 are of questionable footage interval because of the large amount of water encountered and caving in the hole at the mineralized section. Collecting a sample by drilling down to the radioactive interval, circulating out the cuttings and then drilling the interval, collecting only the radioactive interval, was attempted. Because of the water encountered at this interval in all mineralized holes except M-14, a true sample of the interval could not be recovered. Samples from the mineralized interval of holes D-26, D-25, D-24, D-20-C, D-21, D-19, D-5, D-2, M-1-C, M-2, M-13, M-18-C, M-29-C and M-22 do not indicate significant mineralization.

COLLAR ELEVATIONS SECTION 18

M-1-C	3211.0	M-27	3186.6
M-2	3220	M-28	3190.4
M-3	3222	M-29-C	3214.7
M-4	3231.5	M-30	3192
M-5	3204.6		
M-6-C	3203.4		
M-7	3202		
M-8	3242		
M-9	3258		
M-10	3258		
M-11-C	3211.9		
M-12	3201		
M-13	3243		
M-14	3204.3		
M-15	3199		
M-16	3184		
M-17	3209		
M-18-C	3200.1		
M-19	3184.7		
M-20	3206.1		
M-21	3230		
M-22	3258		
M-23	3145.8		
M-24-C	3187.8		
M-25	3143.3		
M-26	3206.4		

COLLAR ELEVATIONS SECTION 17

D-1	3225
D-2	3216.8
D-3	3240.3
D-4	3263
D-5	3252
D-6-C	3227.4
D-7	3217
D-8-C	3209.7
D-9	3200.8
D-10	3200.9
D-11	3216
D-12	3231
D-13	3209
D-14	3204.2
D-15	3196.6
D-16	3192.0
D-17	3181.4
D-18-C	3179.9
D-19	3186.4
D-20-C	3197.7
D-21	3201
D-22	3195
D-23	3188.5
D-24	3186.5
D-25	3178.9
D-26	3172.9

HOLE	COLLARED	COMPLETED	TOTAL DEPTH FT.	TOTAL CORE RECOVERED IN FT.	% RECOVERY
D-18-C	8/1	8/2	50	14.83	29.6
D-20-C	8/2	8/3	80	11.75	14.7
D-6-C	8/13	8/14	65	5.00	8.33
D-8-C	8/13	8/13	56	3.5	6.25
M-1-C	8/4	8/4	30	6.12	20.1
M-6-C	8/4	8/6	71	37.25	52.5
M-18-C	8/6	8/8	91	49.08	53.8
M-11-C	8/8	8/9	72	45.08	62.5
M-24-C	8/10	8/11	91	29.08	35.90
M-29-C	8/13	8/13	52	14.58	28.03
			658 feet		

DATE	HOLE	FEET DRILLED	DAILY FOOTAGE TOTAL	HOURS
8/1	D-18-C	0-20	20	10
8/2	D-18-C	20-50		
	D-20-C	0-50	80	10
8/3	D-20-C	50-80	30	10½
8/4	M-1-C	0-30		
	M-6-C	0-26½	56½	10
8/6	M-6-C	26½-71		
	M-18-C	0-27	71½	10
8/7	M-18-C	27-70	43	9
8/8	M-18-C	70-91		
	M-11-C	0-37	57	10
8/9	M-11-C	37-72	35	10
8/10	M-24-C	0-21	21	4½
8/11	M-24-C	21-91	70	7½
8/13	M-29-C	0-52		
	D-8-C	0-56		
	D-6-C	0-40	148	10
8/14	D-6-C	40-65		
	D-25	0-38		
	D-26	0-30		
	D-24	0-40		
	D-23	0-50	158	10
8/15	D-22	0-44		
	D-21	0-50		
	D-19	0-50		
	D-15	0-50		
	D-10	0-60	254	10
8/16	D-14	0-60		
	D-13	0-54		
	D-16	0-40		
	D-7	0-50		
	D-1	0-74		
	D-2	0-60		
	D-3	0-90	428	10
8/1	D-17	0-30	30	

DATE	HOLE	FEET DRILLED	DAILY TOTAL FOOTAGE	HOURS
8/20	D-4	110		
	D-5	100		
	D-12	70		
	D-11	40	320	10
8/21	D-11	30		
	D-9	50		
	M-4	50		
	M-5	30		
	M-15	30	190	10
8/22	M-30	20		
	M-28	40		
	M-27	44		
	M-19	28		
	M-26	54	186	10½
8/23	M-25	40		
	M-23	40		
	M-22	62		
	M-21	60		
	M-20	39	241	9
8/24	M-17	40		
	M-13	60		
	M-2	50		
	M-3	40		
	M-14	30		
	M-16	24		
	M-12	34		
	M-10	80	358	11
8/25	M-10	70		
	M-9	80		
	M-8	80		
	M-7	28	258	12
			1553 feet	

TOTAL DEPTH OF HOLES SW $\frac{1}{4}$ SEC. 17

D-1	74'
D-2	60'
D-3	90'
D-4	110'
D-5	100'
D-6-C	65'
D-7	50'
D-8-C	56'
D-9	50'
D-10	60'
D-11	70'
D-12	70'
D-13	54'
D-14	60'
D-15	50'
D-16	40'
D-17	30'
D-18-C	50'
D-19	50'
D-20-C	80'
D-21	50'
D-22	44'
D-23	50'
D-24	40'
D-25	38'
D-26	30'

TOTAL DEPTH OF HOLES IN S $\frac{1}{2}$ SEC. 18

M-1-C	30'	M-28	40'
M-2	50'	M-29-C	52'
M-3	40'	M-30	20'
M-4	50'		
M-5	30'		
M-6-C	71'		
M-7	28'		
M-8	80'		
M-9	80'		
M-10	150'		
M-11-C	72'		
M-12	34'		
M-13	60'		
M-14	30'		
M-15	30'		
M-16	24'		
M-17	40'		
M-18-C	91'		
M-19	28'		
M-20	39'		
M-21	60'		
M-22	62'		
M-23	40'		
M-24-C	91'		
M-25	40'		
M-26	54'		
M-27	44'		

HOLE # M-1-C Sec. 18

T. D. 30'

CORE #	FEET	LITHOLOGY
	0-10	Sand, buff w/ some fine gray sand and light gray clay.
Core 1	10-12½ rec. 4"	Sand, buff w/ some gray fine sand.
Core 2	12½-14½ rec. 3½"	Sand, buff, med. grained.
Core 3	14½-16½ rec. 3"	Sand, buff, med. grained.
Core 4	16½-18 rec. 2½"	Sand, buff, few chunks of gray fine sand w/ iron staining; few blk. carb. particles.
Core 5	18-19 rec. 6"	as above.
Core 6	19-20 rec. 6"	Sandy gray clay, some iron staining and few blk. carb. particles.
Core 7	20-20½ rec. 6"	Sandy gray clay w/ little buff fine sand.
Core 8	20½-23 rec. 6"	Clay, dark gray, waxy.
Core 9	23-24½ rec. 12"	Clay, dark gray, much blk. carb. particles waxy.
Core 10	24½-25 rec. 12"	Clay, dark gray many blk. carb. particles.
Core 11	25-26 rec. 12"	Clay as above.
Core 12	26-30 T.D. rec. 24"	Clay, med. gray.

HOLE # M-2 Sec. 18

T. D. 50'

FEET	LITHOLOGY
2-4	Sand, gray buff fine
4-6	As above
6-8	As above
8-10	Sand buff fine
10-12	As above
12-14	Sand, tan to light gray
14-16	Sand, buff med. grained
16-18	As above
18-20	Sand, buff w/ some light gray sand fine
20-22	Sand, buff med. grained
22-24	As above
24-26	Sand, light gray
26-28	Sand, light gray to med. gray w/ little light gray clay
28-30	Sand, light gray to med. gray w/ some light gray iron stained clay
30-32	As above
32-34	Sand, light gray
34-36	Sand, buff med. grained w/ some med. gray clay
36-38	As above
38-40	As above (wet)
40-42	Sand, buff to light gray w/ blk. carb. particles and lignite
42-44	Sand, buff to light gray
44-46	Clay, med. gray
46-48	As above
48-50 T. D.	As above

HOLE # M-3 Sec. 18

T. D. 40'

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above (wet)
22-24	As above
24-26	As above
26-28	Sand, buff fine w/ blk. carb. material and lignite
28-30	Clay med gray to tan gray
30-32	Clay, med. gray to tan gray, blk. carb. staining
32-34	Clay, blue gray
34-36	As above
36-38	As above
38-40 T. D.	As above

HOLE # M-4 Sec. 18

T. D. 50'

FEET	LITHOLOGY
2-4	Sand, gray fine and surface soil
4-6	Sand, buff fine w/ some light gray clay and fine light gray sand
6-8	As above
8-10	Sand, buff some fine gray sand
10-12	Sand, buff some fine light gray clay
12-14	As above
14-16	Clay, light gray w/ buff sand and some light gray sand, fine
16-18	Sand, buff fine
18-20	Sand, buff fine w/ some light gray clay and light gray fine sand
20-22	Clay, light gray w/ some fine light gray clay
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	Clay med. gray some light fine gray sand
32-34	Clay, med. gray w/ little fine gray sand
34-36	Clay, med. to dark gray
36-38	As above
38-40	As above
40-42	Clay, med. gray
42-44	As above
44-46	As above
46-48	As above
48-50 T.D.	As above

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HOLE # M-5 Sec. 18

T. D. 30'

FEET	LITHOLOGY
2-4	Clay, light gray, fine gray sand and surface soil
4-6	Clay light gray w/ some iron staining
6-8	Clay, med. gray w/ some buff sand; some iron staining
8-10	Clay as above, some buff sand
10-12	Sand, buff fine w/ little light gray clay and light gray fine sand
12-14	Clay, med. gray, few blk. carb. particles
14-16	Clay, med. gray, some iron staining
16-18	Clay med. gray
18-20	Clay med. gray w/ blk. carb. particles and chunks of lignite
20-22	Clay, med. gray
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-6-C
T.D. 71'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff fine w/ some light gray clay
	4-6	As above
	6-8	As above
	8-10	Clay, med. gray
Core 1	10-11 no rec.	No recovery
Core 2	11-12 rec. 6"	Clay, med. gray w/ much rust staining; some powdered lime and a chunk of white lithographic limestone
Core 3	12-13½ rec. 8"	Clay, med. gray w/ much iron staining; streaked w/ powdered white lime dust
Core 4	13½-15 rec. 12"	Clay, med. gray w/ spots and streaks of fine gray sand; few lignitic plant parts
Core 5	15-18½ rec. 6"	Clay med. gray to blk. in most part very carbonaceous
Core 6	18½-20½ rec. 6"	Clay as above
Core 7	20½-22½ rec. 18"	Clay, med. gray; streaked w/ jarosite; many gypsum flakes; clay grades to dark gray
Core 8	22½-24½ rec. 1'	Clay, med. to dark gray; few patches of fine gray sand; few brown to blk. carb. particles (lignitic) w/ some carb. silt
Core 9	24½-26½ rec. 12"	Sandy, med. gray clay w/ some tan clay
Core 10	26½-28½ rec. 18"	Top 12" sand, fine tan Bottom 6" clay, light gray w/ some fine tan sand in patches
Core 11	28½-30-3/4 rec. 18"	Top 11" clay med. gray w/ fine gray sand patches few blk. lignitic plant parts w/ some iron staining Bottom 7" clay, med. gray w/ some blk. carb. silt and lignitic plant parts
Core 12	30-3/4-33-3/4 rec. 18"	Top 10" clay, med. gray w/ few blk. lignitic plant parts Bottom 8" sand, tan fine grained, very light iron staining in parts
Core 13	33-3/4-36¼ rec. 21"	Top 2" sand, fine med. gray horizontal bedded by iron staining Bottom 19" clay, med. gray to dark gray; some iron staining in fractures
Core 14	36¼-38-3/4 rec. 24"	Clay, dark blue gray to blk. some gypsum powder at top waxy

HOLE # M-6-C (Cont.)

CORE #	FEET	LITHOLOGY
Core 15	38-3/4-40 rec. 12"	Clay dark blue gray to blk. very waxy
Core 16	40-43	Coal, very light weight, crushed easily to a blk. powder charcoal like; alternation between the coal and clay, dark blue gray
Core 17	43-46 rec. 12"	As above
Core 18	46-47 rec. 12"	Clay, dark gray w/ streaks of blk. lignitic silt; light gray fine sand at very end of core
Core 19	47-50-3/4 rec. 6"	Sand, light gray w/ some med. gray clay, thin streaks
Core 20	50-3/4-51-3/4 rec. 7"	As above
Core 21	51-3/4-54-3/4 rec. 30"	Sandy clay, very fine sand, light blue gray
Core 22	54-3/4-56-3/4 rec. 21"	As above
Core 23	56-3/4-59-3/4 rec. 30"	As above
Core 24	59-3/4-60-3/4 rec. 12"	As above
Core 25	60-3/4-63-3/4 30" rec.	As above
Core 26	63-3/4-66-3/4 rec. 33"	As above
Core 27	66-3/4-70-3/4 rec. 36" T.D.	As above

HOLE # M-7
T. D. 28'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, tan to light gray and surface soil
4-6	As above
6-8	As above w/ some lime dust
8-10	As above
10-12	Clay, med. gray some blk. carb. particles little iron staining
12-14	Clay, med. gray w/ little buff sand some iron staining
14-16	Sand gray light fine, white lime dust; chips of very dark iron stained clay
16-18	Clay, med. gray w/ some fine gray sand
18-20	Sand, gray buff w/ some light gray clay
20-22	Clay, med. gray few blk. carb. particles
22-24	Clay, med. gray few blk. carb. particles
24-26	Clay, med. gray and dark gray
26-28 T. D.	Clay, med. gray

HOLE # M-8 Sec. 18
T. D. 80'

FEET	LITHOLOGY
2-4	Surface soil
4-6	Sand, tan to gray
6-8	Sand, buff med. grained
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Clay, med. gray w/ few blk. carb. particles
48-50	Clay, med. gray w/ some blue gray clay
50-52	As above
52-54	Clay, blue gray
54-56	As above
56-58	As above
58-60	Clay, med. gray w/ some blk. carb. particles
60-62	As above
62-64	Clay, med. gray, w/ some blk. carb. particles
64-66	As above
66-68	Clay, med. gray w/ some blue gray clay
68-70	As above
70-72	As above
72-74	Clay, med. gray
74-76	As above
76-78	As above
78-80 T.D.	As above

HOLE # M-9 Sec. 18
T. D. 80'

FEET	LITHOLOGY
2-4	Clay, tan to light gray
4-6	As above
6-8	As above
8-10	Clay, tan
10-12	As above
12-14	As above
14-16	As above
16-18-	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	Clay, med. gray to light gray, much buff sand
44-46	As above
46-48	Sand, buff w/ some gray clay
48-50	As above
50-52	Clay, med. gray
52-54	Clay, dark gray to blk. blk. carb. particles
54-56	As above
56-58	Clay, blue gray
58-60	As above
60-62	Clay, med. gray w/ some iron staining
62-64	Clay, light med. gray w/ some iron staining and few blk. carb. particles
64-66	As above
66-68	Clay, med. gray
68-70	Clay, blue gray
70-72	Clay, as above
72-74	As above
74-76	As above
76-78	Clay, med. gray
78-80 T.D.	Clay, med. gray

HOLE # M-10 Sec. 18

T. D. 150' This hole was drilled with water

FEET	LITHOLOGY
0-2	Shale, rust tan calcareous, w/ some iron stained med. gray clay
2-4	Clay, med. gray
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, buff, med. grained w/ some med. gray clay
12-14	Sand, buff, med. grained
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above, w/ some med. gray clay and fine gray sand
38-40	As above
40-42	Sand, gray buff w/ some fine gray sand and med. gray clay
42-44	As above
44-46	Clay med. gray w/ some fine med. gray sand
46-48	Clay, med. gray
48-50	As above
50-52	As above
52-54	As above
54-56	Clay, med. gray w/ some blue gray clay
56-58	As above
58-60	As above
60-62	As above w/ few blk. carb. particles
62-64	As above
64-66	As above
66-68	Clay, med. gray w/ few blk. carb. particles and some blue gray clay
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	Clay, med. gray w/ some blk. carb. particles
82-84	As above
84-86	As above
86-88	As above
88-90	As above w/ some blue gray clay
90-92	As above
92-94	Clay, med. gray to dark gray
94-96	As above

HOLE # M-10 Cont.

FEET	LITHOLOGY
96-98	Clay, med. gray to dark gray
98-100	Clay med. gray
100-102	As above
102-104	Clay, med. gray to dark gray w/ blk. carb. particles
104-106	As above
106-108	As above
108-110	Clay, med. gray to dark gray w/ blk. carb. particles
110-112	As above
112-114	Clay, med. gray w/ some blue gray clay
114-116	As above
116-118	As above
118-120	Clay, med. gray to dark gray w/ some blk. carb. particles
120-122	As above
122-124	As above
124-126	As above
126-128	As above
128-130	Clay, med. gray w/ some blue gray clay
130-132	As above
132-134	As above
134-136	Clay, med. gray
136-138	Clay, med. gray w/ chunks of lignite coal
138-140	Clay, med. gray w/ some blue gray clay
140-142	As above
142-144	As above
144-146	As above
146-148	As above
148-150 T.D.	As above

HOLE # M-11-C
T. D. 72'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Clay, light gray
	4-6	As above
	6-8	Sand, buff, fine
	8-10	As above
Core 1	10-13½ No rec.	No recovery
Core 2	13½-15½ rec. 6"	Clay, med. tan, iron stained throughout
Core 3	15½-17½ rec. 24"	Clay, med. tan; much iron staining on fractures few flakes of gypsum
Core 4	17½-19½ rec. 21"	Clay, med. tan w/ some light gray clay in narrow bands; iron staining on fractures
Core 5	19½-21½ rec. 12"	Clay, med. tan, w/ some gray clay; many blk. carb. plant parts
Core 6	21½-22½ rec. 5"	Clay, med. gray; some fine gray sand in streaks and patches
Core 7	22½-24½ rec. 18"	Clay as above; 6" interval of lignite, charcoal like
Core 8	24½-27½ rec. 8"	Clay, med. gray; some brown carb. particles
Core 9	27½-31½ rec. 36"	Clay, med. gray w/ some fine gray sand grading and alternating
Core 10	31½-33½ rec. 36"	Clay as above
Core 11	33½-36½ rec. 33"	Clay as above
Core 12	36½-39¼ rec. 36"	Sand, fine, blue gray w/ few blk. lignitic particles
Core 13	39¼-41½ rec. 12"	Sand as above
Core 14	41½-43½ rec. 24"	Sand as above
Core 15	43½-44½ rec. 12"	Sand as above

M-11-C Cont.

CORE #	FEET	LITHOLOGY
Core 16	$44\frac{1}{2}$-$45\frac{1}{4}$ rec. 9"	Sand as above
Core 17	$45\frac{1}{4}$-$47\frac{1}{4}$ rec. 18"	Sand, fine, blue gray; Bottom 2" grades to clay med. gray
Core 18	$47\frac{1}{4}$-$49\frac{1}{4}$ rec. 18"	Clay, med. gray w/ few blk. carb. particles
Core 19	$49\frac{1}{4}$-$51\frac{1}{2}$ rec. 24"	Clay, as above
Core 20	$51\frac{1}{2}$-$53\frac{1}{2}$ rec. 24"	Clay, med. gray w/ fine gray sand, grading and alternating
Core 21	$53\frac{1}{2}$-$55\frac{1}{2}$ rec. 12"	Clay and sand as above
Core 22	$55\frac{1}{2}$-58 rec. 15"	Clay and sand as above w/ few blk. carb. particles
Core 23	58-$61\frac{1}{2}$ rec. 15"	Clay as above
Core 24	$61\frac{1}{2}$-$65\frac{1}{2}$ rec. 48"	Top 30" clay, med. gray w/ fine gray sand grading and alternating Middle 4" lignite, charcoal like w/ dark gray to blk. clay, waxy Bottom 14" clay, dark gray to blk. grading to med. gray clay w/ fine med. gray sand
Core 25	$65\frac{1}{2}$-$68\frac{1}{2}$ rec. 36"	Clay, dark gray, grading and alternating w/ fine gray sand
Core 26	$68\frac{1}{2}$-$71\frac{1}{2}$ rec. 24"	Clay as above
Core 27	$71\frac{1}{2}$-$72\frac{1}{2}$ T.D. rec. 24"	Clay as above

HOLE # M-12 Sec. 18
T. D. 34'

FEET	LITHOLOGY
2-4	Clay, tan gray to blk.
4-6	As above w/ some blk. carb. particles
6-8	Clay, tan and med. gray w/ iron staining
8-10	Clay, med. gray
10-12	As above
12-14	As above, some iron staining
14-16	As above (wet)
16-18	Clay, med. gray some blk. carb. dust and little iron staining on clay
18-20	Clay, med. gray
20-22	Clay, med. gray w/ white lime dust
22-24	Clay, med. gray to tan gray
24-26	Clay, med. gray little fine gray sand
26-28	Clay, med. gray to tan gray; some fine gray sand
28-30	Clay, med. gray w/ some blue gray clay
30-32	Clay blue gray
32-34 T.D.	As above

HOLE # M-13 Sec. 18
T. D. 60'

FEET	LITHOLOGY
2-4	Sand, buff fine w/ few chips of lime cemented fine tan sand
4-6	Sand, buff fine w/ few iron concretion chips and light gray clay
6-8	Sand, buff fine w/ few chips of lime cemented fine tan sand
8-10	Sand, buff fine
10-12	As above
12-14	As above w/ some fine gray sand
14-16	Sand, buff fine
16-18	Sand, buff fine w/ some light gray clay
18-20	Sand, buff fine
20-22	Sand, buff fine w/ some light gray clay
22-24	As above
24-26	Sand, buff fine w/ some light gray clay
26-28	Sand, buff med. grained
28-30	As above
30-32	As above w/ some light gray clay
32-34	Sand, dark buff med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Sand, buff med. grained w/ some light gray to tan clay some iron staining
48-50	As above
50-52	Clay med. gray to blk. w/ few blk. carb. particles and chips of lignite coal
52-54	Clay med. gray to blk.
54-56	Clay, blue gray and med. gray; few blk. carb. particles
56-58	As above
58-60 T.D.	As above

HOLE # M-14 Sec. 18
T. D. 30'

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand fine tan to gray
12-14	Sand, dark buff fine
14-16	As above
16-18	Sand, buff med. grained little tan to light gray clay w/ some fine gray sand (wet)
18-20	Sand, buff med. grained some med. gray clay w/ iron staining and blk. carb. particles
20-22	Clay, blue gray
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-15 Sec. 18
T. D. 30'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, iron stained w/ buff sand (very damp)
6-8	Sand, buff some gray clay (much water)
8-10	As above
10-12	Sand, buff some gray clay
12-14	As above
14-16	As above w/ some blk. carb. material (very damp)
16-18	Clay, dark gray to blk. much blk. carb. particles
18-20	Clay, as above
20-22	Clay, med. gray
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # M-16 Sec. 18
T. D. 24'

FEET	LITHOLOGY
2-4	Clay, med. gray to dark gray
4-6	As above
6-8	Clay, med. gray to light gray
8-10	Clay, med. gray to light gray w/ some iron stain and fine gray sand
10-12	As above
12-14	Sand, fine clay light gray
14-16	As above
16-18	As above
18-20	As above
20-22	Clay, med. gray w/ some blue gray clay
22-24 T.D.	Clay, blue gray

HOLE # M-17 Sec. 18
T. D. 40'

FEET	LITHOLOGY
2-4	Sand, buff fine
4-6	As above
6-8	As above
8-10	As above
10-12	Clay, med. gray little buff sand and fine gray sand
12-14	Clay, dark gray
14-16	As above
16-18	Clay as above w/ some blk. carb. trash
18-20	Clay, med. gray; little buff sand
20-22	Clay med. gray
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	Clay, med. gray, some blue gray clay
32-34	Clay, blue gray
34-36	As above
36-38	As above
38-40 T.D.	As above

HOLE # M-18-C
T.D. 91'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff fine grained
	4-6	As above
	6-8	Clay, med. gray
	8-10	Clay, med. gray to blk.; blk. dust coating on clay balls; some gypsum white powder
Core 1	10-13 rec. 6"	Clay, med. gray; some iron staining throughout
Core 2	13-15 rec. 18"	Limestone, white to light tan (bottom 6") Top 1' sand, med. gray fine
Core 3	15-18 rec. 24"	Top 6" limestone as above; Bottom 18" sand med. gray fine; streaked with iron color throughout
Core 4	18-19-3/4 rec. 12"	Sand as above
Core 5	19-3/4-24-3/4 rec. 36"	Sand, med. gray fine w/ some med. gray clay; streaks of carb. silt; leaf impressions on some of the fractures
Core 6	24-3/4-27-3/4 rec. 24"	Sand, med. tan fine w/ blk. carb. silt streaks iron staining throughout
Core 7	27-3/4-30 rec. 12"	Sand, med. tan; many blk. lignitic plant parts
Core 8	30-30-3/4 rec. 9"	Sand, med. tan; few blk. carb. particles; iron staining throughout
Core 9	30-3/4-32-3/4 rec. 10"	Sand, blue gray, fine; some iron staining on partings
Core 10	32-3/4-34-3/4 rec. 18"	Sand, as above; center 6" cemented w/ lime
Core 11	34-3/4-37-3/4 rec. 30"	Sand, blue gray, fine
Core 12	37-3/4-39-3/4 rec. 30"	Sand as above
Core 13	39-3/4-42¼ rec. 30"	Sand as above
Core 14	42¼-44¼ rec. 24"	Sand, blue gray, many blk. lignitic plant parts
Core 15	44¼-47¼ rec. 36"	Sand as above

HOLE # M-18-C Cont.

CORE #	FEET	LITHOLOGY
Core 16	47¼-50-3/4	Sand, med. grained, blue gray w/ streaks of blk. carb. silt and blk. lignitic plant parts
Core 17	50-3/4-54¼ rec. 12"	Sand as above
Core 18	54¼-58 rec. 12"	Clay, blue gray w/ some fine med. gray sand a chunk of hard calcareous tan shale
Core 19	58-60-3/4 rec. 18"	Top 6" as above Bottom 12" sand, blue gray, fine w/ blk. carb. silt and blk. lignitic particles
Core 20	60-3/4-64¼ rec. 30"	Sand, blue gray, med. grained w/ blk. carb. silt and blk. carb. particles
Core 21	64¼-68¼ rec. 21"	Sand, med. gray fine w/ blk. carb. particles throughout
Core 22	68¼-70-3/4 rec. 36"	Clay, med. gray; grading and alternating with fine med. gray sand
Core 23	70-3/4-73-3/4 rec. 36"	Clay, med. gray
Core 24	73-3/4-74-3/4 rec. 12"	Lignite coal, w/ much blk. clay; coal poorly developed charcoal like
Core 25	74-3/4-77-3/4 no recovery	Drilling w/ water no recovery; mud blk. and dark blue gray
Core 26	77-3/4-80-3/4 rec. 12"	Clay, med. gray
Core 27	80-3/4-83-3/4 rec. 24"	Clay, med. gray, grading and alternating w/ fine med. gray sand
Core 28	83-3/4-85-3/4 rec. 24"	Clay and sand as above
Core 29	85-3/4-89-3/4 rec. 36"	Clay and sand as above Bottom 12 coal, lignite charcoal like
Core 30	89-3/4-90-3/4 rec. none T.D.	No recovery (probably clay and sand as above)

HOLE # M-19
T.D. 28'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Clay, med. gray, some iron dust coatings on clay balls
6-8	Clay, med. gray, some iron staining
8-10	Clay as above
10-12	Clay, med. gray
12-14	Clay, med. gray w/ few limestone chunks
14-16	Clay med. gray some iron staining
16-18	Sandy med. gray clay, some fine gray to tan sand
18-20	As above
20-22	As above
22-24	Clay, med. gray
24-26	As above
26-28 T.D.	As above

HOLE # M-20 Sec. 18
T.D. 39'

FEET	LITHOLOGY
2-4	Clay, tan
4-6	As above
6-8	Clay, tan some iron staining
8-10	As above
10-12	Clay, as above w/ some blk. carb. particles
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Clay, tan sandy
22-24	Sand, tan, some tan clay few blk. carb. particles
24-26	As above
26-28	Clay, tan, some iron staining
28-30	Clay, dark gray
30-32	As above
32-34	As above
34-36	As above
36-38	As above w/ some blue gray fine sand
39 T.D.	As above very limey

HOLE # M-21 Sec. 18
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, tan sandy
4-6	As above
6-8	Sand, buff fine some light gray clay
8-10	Clay, light gray
10-12	Clay, med. gray w/ some fine buff sand
12-14	As above
14-16	As above
16-18	Clay, med. gray w/ some fine buff sand
18-20	Sand, tan fine w/ some iron stained gray clay
20-22	Sand, tan fine
22-24	Clay, gray w/ some fine buff sand
24-26	Clay, dark gray w/ some fine buff sand
26-28	Clay, dark gray, few blk. carb. particles
28-30	As above
30-32	Clay, dark gray
32-34	As above
34-36	As above
36-38	As above w/ some lignite
38-40	Clay, dark gray
40-42	Clay, dark gray little iron staining
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	Clay, dark gray to blk.
58-60 T.D.	Clay, dark gray

HOLE # M-22 Sec. 18
T.D. 62'

FEET	LITHOLOGY
2-4	Sand, tan fine
4-6	As above
6-8	Sand, buff fine
8-10	As above
10-12	As above
12-14	Sand, buff, some light gray clay
14-16	As above
16-18	Sand, buff fine
18-20	As above
20-22	As above
22-24	Sand, buff fine some light gray clay
24-26	Sand, buff fine
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff some light gray clay
42-44	As above
44-46	As above
46-48	As above
48-50	Sand, buff med. grained
50-52	Sand, buff fine, some light gray clay
52-54	Sand, buff fine w/ some light gray clay and blk. carb. particles
54-56	As above
56-58	Sand, fine to med. grained w/ blk. carb. particles
58-60	Clay, dark blue gray
60-62 T.D.	As above

HOLE # M-23 Sec. 18
T.D. 40'

FEET	LITHOLOGY
2-4	Clay, light gray iron stained
4-6	As above
6-8	Clay, light gray, some fine buff sand
8-10	Clay, light gray, sandy, little iron stained clay
10-12	Clay, brown iron stain
12-14	Clay, med. gray
14-16	Clay, med. gray, few gypsum flakes
16-18	As above
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	Clay, med. gray to blk. few blk. carb. particles
26-28	As above
28-30	Clay, dark gray
30-32	Clay, med. gray w/ some fine buff sand
32-34	Clay, dark gray
34-36	Clay, dark gray, some blk. carb. particles
36-38	As above
38-40 T.D.	As above

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HOLE # M-24-C
T.D. 91'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Surface soil, some light gray clay
	4-6	Clay, med. gray
	6-8	As above
	8-10	Clay, med. gray w/ some iron staining
Core 1	10-13 rec. 30"	Top 4 " clay, dark gray to blk. Bottom 26" sand, med. gray, fine, much med. gray clay; iron staining throughout
Core 2	13-16 rec. 30"	Sandy, med. gray clay, sand fine; iron staining on fractures; blk. carb. particles throughout
Core 3	16-18 rec. 24"	As above
Core 4	18-21 rec. 30"	Sand, med. gray fine; iron staining in fractures blk. carb. particles throughout
Core 5	21-25 rec. 18"	As above
Core 6	25-29 rec. 24"	Top 18" as above Bottom 6" clay med. gray w/ few gypsum flakes Many blk. carb. particles
Core 7	29-31 rec. 18"	As above
Core 8	31-32 rec. 4"	As above
Core 9	32-35 rec. 6"	Top 2" clay, dark gray Bottom 4" clay, blk. waxy
Core 10	35-37 rec. 24"	Clay, med. gray w/ many blk. carb. particles
Core 11	37-40 rec. 36"	Clay, blk. many blk. carb. particles w/ very little dark gray clay; lignite, charcoal like from 39-39½; last 6" of core blk. clay waxy
Core 12	40-41½ rec. 12"	Clay, blk. to med. gray; many blk. carb. particles waxy
Core 13	41½-45½ rec. 36"	Top 18" clay, blk. to med. gray Bottom 18" sand, light gray, fine w/ few blk. carb. particles, some iron staining

HOLE # M-24-C Cont.

CORE #	FEET	LITHOLOGY
Core 14	$45\frac{1}{2}$-$51\frac{1}{2}$ rec. 36"	Sand, light gray, fine, few blk. carb. particles
Core 15	$51\frac{1}{2}$-$60\frac{1}{2}$ rec. 12"	As above
Core 16	$60\frac{1}{2}$-$66\frac{1}{2}$ rec. 15"	Sand as above, cemented w/ lime, hard
Core 17	$66\frac{1}{2}$-$70\frac{1}{2}$ no rec.	Sand, light gray, fine
Core 18	$70\frac{1}{2}$-81 no rec.	As above
Core 19	81-$90\frac{1}{2}$ T.D. no rec.	As above

HOLE # M-25 Sec. 18
T.D. 40'

FEET	LITHOLOGY
2-4	Clay, tan to light gray, some iron staining, few chips of silicous rock
4-6	Clay, med. gray
6-8	As above
8-10	Clay, med. gray and some tan clay
10-12	Clay, med. gray
12-14	Clay, med. gray, some powdered iron dust
14-16	Clay, med. gray
16-18	Clay, med. gray, few blk. carb. particles
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, med. gray, little tan and iron stained med. gray sand and fine gray sand
28-30	Clay, med. gray
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40 T.D.	As above w/ some blue gray clay

HOLE # M-26 Sec. 18
T.D. 54'

FEET	LITHOLOGY
2-4	Clay, med. gray, some iron staining
4-6	Sand, med. gray fine w/ some iron stained clay
6-8	Clay, med. gray, some iron staining
8-10	Clay, med. gray
10-12	Clay, med. gray to blk. (blk. dust) coal?
12-14	Clay, med. gray w/ some fine tan to gray sand some iron staining
14-16	Clay, med. gray brown to tan fine sand; little
16-18	Clay, med. gray
18-20	Clay, med. gray, some blk. carb. particles and some fine light gray sand
20-22	As above
22-24	Sandy clay, tan to gray, few blk. carb. particles
24-26	As above
26-28	As above
28-30	Sand, tan to gray, fine, much light gray clay
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Sand, tan to gray w/ some clay blue gray
48-50	Clay, med. gray (damp)
50-52	Clay, med. gray, some lime dust
52-54 T.D.	Clay, med. gray

HOLE # M-27 Sec. 18
T.D. 44'

FEET	LITHOLOGY
2-4	Sand, fine light gray and surface soil
4-6	Clay, light gray, some fine tan sand
6-8	Clay, light gray fine tan sand and iron concretion chips
8-10	Clay, light gray fine tan sand
10-12	Sandy light buff clay, much iron staining
12-14	Sand, buff fine little light gray clay
14-16	As above
16-18	Clay, light gray w/ some fine buff sand
18-20	As above
20-22	Clay, light gray
22-24	As above
24-26	As above
26-28	Clay, med. gray w/ some blk. carb. particles
28-30	Sand, blue gray very fine w/ some blue gray clay
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44 T.D.	As above

HOLE # M-28 Sec. 18
T.D. 40'

FEET	LITHOLOGY
2-4	Clay, med. gray, some white lime dust
4-6	Clay, med. gray w/ some iron stained clay
6-8	Clay as above
8-10	Clay, med. gray, blk. carb. dust (coal) and some dark gray to blk. clay
10-12	Clay, med. gray w/ little iron staining
12-14	Clay, med. gray w/ some blk. carb. particles
14-16	As above
16-18	Clay, med. gray w/ some buff sand and a few blk. carb. particles
18-20	Clay, med. gray w/ some buff sand and some iron stained clay
20-22	As above
22-24	As above
24-26	Clay, blue gray w/ fine blue gray to gray sand
26-28	As above
28-30	As above
30-32	Clay, blue gray, w/ some blk. carb. particles
32-34	As above
34-36	Clay, light gray, caco dust
36-38	As above
38-40 T.D.	Clay, med. gray

HOLE # M-29-C
T.D. 52'

Sec. 18

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff med. grained w/ a little med. gray clay iron stained
	4-6	Clay, med. gray w/ fine gray sand and some iron staining
	6-8	As above
	8-10	Sand, buff fine w/ some med. gray clay, iron stained
Core 1	10-21½ no rec.	Sand, buff, fine; bottom 2 feet contained some blk. carb. particles
Core 2	21½-22½ no rec.	Sand, buff fine, w/ little med. to light gray clay
Core 3	22½-24½ rec. 8"	Clay, med. gray w/ few blk. carb. particles iron staining on fractures; waxy
Core 4	24½-25½ rec. 6"	Clay, med. gray
Core 5	25½-28½ no rec.	Clay
Core 6	28½-31½ rec. 9"	Sandy, med. gray clay; little iron staining few blk. carb. particles
Core 7	31½-34 rec. 30"	Sand, fine tan few blk. carb. particles; top 21" Bottom 9" sand, blue gray fine, few blk. carb. particles w/ little iron staining on fractures
Core 8	34-37 no rec.	Sand, gray fine, some blk. carb. particles
Core 9	37-41½ rec. 36"	Top 2' clay, med. gray w/ some fine gray sand; Bottom 1' sandy, clay, med. gray w/ some fine gray sand
Core 10	41½-44½ rec. 30"	Clay, blue gray
Core 11	44½-47½ rec. 24"	Clay, blue gray grading and alternating w/ fine gray to blue gray sand
Core 12	47½-48½ rec. 12"	As above w/ few blk. carb. particles
Core 13	48½-52½ T.D. rec. 18"	As above

HOLE # M-30
T.D. 20'

Sec. 18

FEET	LITHOLOGY
2-4	Clay, med. gray
4-6	Clay, med. gray, some buff sand and iron stained clay
6-8	Sand, buff, med. grained, few concretion chips and iron stained clay (water)
8-10	Clay, med. gray w/ buff sand and some light gray clay
10-12	Clay, med. gray (much water)
12-14	Clay, med. gray
14-16	As above
16-18	As above
18-20 T.D.	As above

HOLE # D-1 Sec. 17
T.D. 74'

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above w/ some gray iron stained clay
40-42	Sand, buff and some med. gray fine sand
42-44	As above
44-46	Sand, buff, some med. gray clay
46-48	Sand, dark buff
48-50	As above
50-52	Sand, buff, some med. gray clay (damp)
52-54	As above
54-56	Sand, buff, some med. gray clay
56-58	As above
58-60	As above
60-62	As above
62-64	Clay, med. gray (much water)
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74 T.D.	As above

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HOLE # D-2 Sec. 17
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Sand, light gray, fine and light gray clay
6-8	Clay, light gray
8-10	Sand, buff w/ some light gray clay
10-12	Sand, buff, fine
12-14	As above
14-16	Sand, buff, fine, w/ few concretion chips
16-18	Sand, buff, fine
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	As above
40-42	As above
42-44	As above, w/ some gray clay (very damp)
44-46	Sand, buff, med. grained
46-48	As above
48-50	As above
50-52	Sand, buff, w/ some med. gray clay (very damp)
52-54	Clay, med. gray
54-56	As above
56-58	As above
58-60 T.D.	As above

HOLE # D-3 Sec. 17
T.D. 90'

FEET	LITHOLOGY
2-4	Sand, light gray, fine
4-6	As above
6-8	Sand, buff w/ some light gray clay
8-10	Sand, buff fine
10-12	Sand, light gray, fine
12-14	Sand, light gray w/ some med. gray clay
14-16	As above
16-18	Sand, light gray
18-20	Clay, med. gray w/ some fine light gray sand
20-22	Clay, med. gray w/ much fine light gray sand
22-24	Sand, light gray, fine
24-26	As above
26-28	Sand, light gray, fine, w/ some med. gray clay
28-30	Sand, light gray, fine
30-32	Sand, buff, fine
32-34	As above
34-36	Sand, dark buff w/ some iron stained gray clay
36-38	Clay, iron stained
38-40	Clay, med. gray w/ some fine gray sand
40-42	Sand, light gray w/ some gray clay
42-44	As above
44-46	As above
46-48	As above
48-50	Sand, light gray, w/ some med. gray clay
50-52	Clay, med. gray, w/ some fine gray sand
52-54	Clay, med. gray w/ some iron staining and little fine gray sand
54-56	As above
56-58	Clay as above w/ some buff sand
58-60	Sand, buff, some blk. carb. particles
60-62	As above
62-64	As above
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	As above
82-84	Clay, med. gray, Much water
84-86	As above
86-88	As above
88-90 T.D.	As above

HOLE # D-4 Sec. 17
T.D. 110'

FEET	LITHOLOGY
2-4	Sand, light gray, fine
4-6	Clay, med. gray, some iron staining
6-8	As above
8-10	Sand, gray, fine w/ some iron stained clay
10-12	Sand, gray fine
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Sand, light gray, some iron stained clay
22-24	Sand, light gray
24-26	As above
26-28	Clay, dark gray, some fine gray sand
28-30	As above
30-32	As above
32-34	Sand, fine, light gray, some dark gray clay
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	As above
58-60	Sand as above w/ some dark gray clay
60-62	Sand, buff, fine
62-64	As above
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	As above
76-78	As above
78-80	As above
80-82	As above w/ some gray clay
82-84	Sand, buff, fine
84-86	As above
86-88	As above
88-90	As above w/ little blue clay
90-92	As above
92-94	As above
94-96	As above
96-98	As above
98-100	As above
100-102	Clay, med. gray (much water)
102-104	As above
104-106	As above
106-108	As above
108-110 T.D.	As above

HOLE # D-5 Sec. 17
T.D. 100'

FEET	LITHOLOGY
2-4	Sand. light gray, fine
4-6	Sand, light gray, fine, w/ some iron stained clay
6-8	Sand, gray, fine
8-10	As above
10-12	Sand, gray, fine, some iron staining on light gray clay
12-14	As above
14-16	Clay, brown to gray, much iron staining
16-18	Sand, buff, fine, some clay as above
18-20	As above
20-22	Sand, buff, fine
22-24	As above
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	Sand, buff, fine, w/ some blue gray clay
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	Sand as above w/ some med. gray clay
54-56	As above
56-58	As above
58-60	As above
60-62	Sand, buff, fine
62-64	Clay, blue gray, w/ some iron staining
64-66	As above
66-68	As above
68-70	As above
70-72	As above
72-74	As above
74-76	Sand, buff, fine
76-78	As above
78-80	As above
80-82	As above
82-84	As above
84-86	Sand, buff w/ some med. blue gray clay
86-88	As above
88-90	As above
90-92	As above
92-94	Clay, blue gray w/ some buff sand
94-96	Clay, blue gray
96-98	As above
98-100 T.D.	As above

HOLE # D-6-C
T.D. 65'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff w/ some light gray clay
	4-6	As above
	6-8	As above
	8-10	As above
	10-12	As above
	12-14	As above
	14-16	As above
	16-18	As above
	18-20	As above
	20-22	As above
	22-24	As above
	24-26	As above
	26-28	As above
	28-30	As above
	30-32	As above
	32-34	As above
	34-36	As above
	36-38	As above
Core 1	38-40 rec. 24"	Sandy clay, light buff
	40-42	Sand, buff, fine
	42-44	As above
	44-46	As above
	46-48	As above
	48-50	As above
	50-52	As above
	52-54	As above
	54-56	As above
	56-58	As above
	58-60	As above
	60-62	As above
Core 2	62-65 T.D. rec. 36"	Clay, med. gray w/ little fine gray sand Few blk. carb. particles

HOLE # D-7 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Surface, light gray clay and soil
4-6	Sand, light gray, fine, w/ some light gray clay
6-8	As above
8-10-	As above
10-12	Sand, buff, some light gray clay
12-14	Sand, buff, fine
14-16	Sand, buff, some light gray clay
16-18	Sand, buff, fine
18-20	Sand, buff, some light gray clay
20-22	As above
22-24	As above
24-26	As above
26-28-	As above
28-30	Sand, buff, fine
30-32	As above
32-34	As above
34-36	As above
36-38	As above w/ some light gray clay
38-40	Sand, buff, med. grained w/ some light gray clay
40-42	Clay, med. gray w/ some fine gray sand
42-44	Clay, med. gray w/ blk. carb. particles
44-46	As above
46-48	As above
48-50 T.D.	As above

D-8-C
T.D. 56'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Sand, buff, fine w/ little light gray clay
	4-6	As above
	6-8	As above
	8-10	As above
	10-12	As above
	12-14	As above
	14-16	As above
	16-18	As above
	18-20	As above
	20-22	As above
	22-24	As above
	24-26	As above
	26-28	As above
	28-30	As above
	30-32	As above
	32-34	As above
	34-36	As above
	36-38	As above
	38-40	As above
	40-42	As above
	42-44	As above
	44-46	As above
Core 1	46-48 rec. 1"	Sand, buff w/ some med. gray clay
Core 2	50-53 rec. 24"	Sandy clay, med. gray w/ few blk. carb. particles
Core 3	53-56 T.D. rec. 18"	Sandy clay, med. gray w/ few blk. carb. particles

HOLE # D-9 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Clay, light gray, surface soil
4-6	Clay as above
6-8	Clay, light gray and fine buff sand
8-10	Sand, buff, fine, some light gray clay
10-12	Sand, dark w/ iron staining, fine with some light gray clay
12-14	Sand, buff, fine
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, med. gray, iron stained, some fine gray sand w/ much buff sand
28-30	As above
30-32	Clay, med. gray, much iron staining, much buff sand
32-34	As above
34-36	As above
36-38	As above
38-40	As above (much water)
40-42	Clay, light gray w/ some fine gray sand some iron staining (much water)
42-44	Clay, light gray to med. gray
44-46	Clay, med. gray, some fine gray sand (much water)
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-10 Sec. 17
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Sand, buff, fine
6-8	Sand, buff, fine, some dark iron staining
8-10	Clay, med. gray w/ some fine gray sand, much iron staining and a few iron concretion chips
10-12	Clay, med. gray w/ some fine gray sand
12-14	As above
14-16	As above
16-18	Clay, med. gray, some fine gray sand w/ iron staining
18-20	As above
20-22	Clay, med. gray, some buff sand, fine
22-24	As above
24-26	As above
26-28	Clay, med. gray, some fine gray sand
28-30	As above
30-32	As above
32-34	Clay, med. gray to dark gray, few blk. carb. particles w/ little iron staining
34-36	Clay, med. gray to dark gray, w/ little blue gray clay
36-38	Clay, med. gray w/ some blue gray clay
36-38	Clay, med. gray and blue gray clay 50-50
38-40	As above
40-42	Clay as above
42-44	As above
44-46	As above
46-48	As above
48-50	As above
50-52	As above
52-54	Clay, med. gray and blue gray clay (50-50)
54-56	As above
56-58	As above
58-60 T.D.	As above

HOLE # D-11 Sec. 17
T.D. 70'

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, light gray, fine
12-14	As above
14-16	Sand, buff, med. grained
16-18	As above
18-20	As above
20-22	As above
22-24	Clay, med. gray, much buff sand
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, med. grained w/ some med. gray clay w/ iron staining
42-44	As above; very little clay
44-46	As above; very little clay
46-48	As above; very little clay
48-50	As above; very little clay
50-52	As above; very little clay
52-54	Clay, med. gray, much buff sand (up hole?)
54-56	Clay, med. gray w/ blk. carb. particles
56-58	Clay, med. gray (damp) w/ some fine gray sand
58-60	Clay, med. gray w/ some blue gray clay (very wet)
60-62	Clay, med. gray
62-64	As above
64-66	As above
66-68	As above
68-70 T.D.	As above

HOLE # D-12 Sec. 17
T.D. 70'

FEET	LITHOLOGY
2-4	Clay, light gray, and surface soil
4-6	Clay, light gray, some iron staining w/ some fine buff sand
6-8	As above
8-10	As above
10-12	As above
12-14	Clay, light gray w/ some iron staining and a few blk. carb. particles
14-16	As above
16-18	Sand, light gray, fine
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Clay, light gray w/ iron staining and much light gray fine sand
28-30	As above
30-32	As above
32-34	Sand, light gray, fine
34-36	As above
36-38	As above
38-40	As above
40-42	Sand, buff, fine
42-44	Sand, buff, fine, some light gray clay and fine gray sand
44-46	Clay, light gray w/ some iron staining w/ much fine gray sand
46-48	As above
48-50	As above
50-52	As above
52-54	As above
54-56	As above
56-58	Sand, light gray, some light gray clay
58-60	As above (much water)
60-62	Clay, med. gray
62-64	As above
64-66	As above
66-68	As above
68-70 T.D.	As above

HOLE # D-13 Sec. 17
T.D. 54'

FEET	LITHOLOGY
2-4	Surface clay
4-6	Sand, light gray, fine and light gray clay
6-8	As above
8-10	As above
10-12	Clay, med. gray
12-14	Sand, buff, fine, little iron stained med. gray clay
14-16	Sand, buff, fine
16-18	As above
18-20	Sand, buff, med. grained
20-22	Sand, dark buff, much iron staining w/ some gray clay
22-24	Sand, buff, med. grained
24-26	As above
26-28	Sand, light gray, fine
28-30	As above
30-32	As above
32-34	As above w/ some med. gray clay
34-36	Sand, buff to light gray, med. grained
36-38	Sand, buff, med. grained, some gray clay
38-40	As above
40-42	As above
42-44	As above
44-46	Clay, med. gray, some fine gray sand (damp)
46-48	As above
48-50	As above
50-52	Clay, med. gray
52-54 T.D.	As above

HOLE # D-14 Sec. 17
T.D. 60'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Sand, light buff, fine w/ some light gray clay
6-8	Sand, light buff
8-10	Sand, buff, some light gray clay
10-12	As above
12-14	As above
14-16	As above
16-18	Sand, buff, fine
18-20	As above
20-22	Sand, buff, fine w/ some med. gray clay, iron stained
22-24	Sand, buff, fine
24-26	As above
26-28	As above
28-30	As above
30-32	As above
32-34	As above
34-36	As above
36-38	As above
38-40	Sand, med. gray, some buff sand w/ some med. gray clay
40-42	As above
42-44	Sand, buff w/ some med. gray clay
44-46	As above
46-48	Sand, buff and light gray sand; few blk. carb. particles (damp)
48-50	As above
50-52	Clay, med. gray w/ some fine gray sand
52-54	As above
54-56	As above
56-58	Clay, med. gray w/ some fine gray sand
58-60 T.D.	As above

HOLE # D-15 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, light gray
6-8	Sand, light gray, very fine, some light gray clay
8-10	Sand, light buff, very fine
10-12	As above
12-14	As above
14-16	Clay, light gray, white lime dust
16-18	As above
18-20	Sand, buff, much iron staining and few iron concretion chips
20-22	Sand, dark buff, fine
22-24	As above
24-26	Sand, buff, med. grained
26-28	As above
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained, some med. gray clay
34-36	Sand, buff, some med. gray clay and blk. carb. particles
36-38	Clay, med. gray
38-40	As above
40-42	Clay, med. gray and some blue gray clay
42-44	As above (much water)
44-46	As above
46-48	As above
48-50 T.D.	As above

HOLE # D-16
T.D. 40'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	Sand, buff w/ some iron stained med. gray clay
12-14	As above
14-16	As above
16-18	Sand, light gray, fine
18-20	As above
20-22	Sand, buff, some iron stained med. gray clay
22-24	As above
24-26	As above
26-28	As above w/ some blk. carb. particles
28-30	As above
30-32	Clay, med. gray w/ blk. carb. particles and some fine gray sand
32-34	Clay, as above
34-36	As above
36-38	As above
38-40 T.D.	As above

HOLE # D-17
T.D. 30'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, some light gray clay
4-6	Sand, buff
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	Sand, buff; little med. gray clay
16-18	Clay, med. gray,some iron staining
18-20	Clay, med. gray
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30 T.D.	As above

HOLE # D-18-C
T.D. 50'

Sec. 17

CORE #	FEET	LITHOLOGY
	2-4	Clay, med. gray w/ some light gray clay and fine gray sand
	4-6	As above
	6-8	Clay, med. gray w/ little iron stained sand
	8-10-	As above
Core 1	10-13 rec. 4" lost 1' reaming	Clay, sandy, med. gray w/ some iron staining
Core 2	14-17 rec. 18"	Top 12" clay, gray w/ some gray fine sand in small patches; some iron staining Bottom 6" clay, dark gray core fractured on blk. organic streaks, one leaf impression on horizontal bedding, clay waxy
Core 3	17-20 rec. 24"	17-18 clay, med. gray, few sandy partings on horizontal bedding core fractured on blk. organic streaks (carbonaceous silt) clay waxy 18-18½ sand, med. gray, fine, iron stained and streaked 18½-20 sandy, med. gray clay, iron stained and streaked
Core 4	20-20½ rec. 6"	Clay, med. gray w/ few patches of fine gray sand
Core 5	20½-23 rec. 18"	Sandy clay, med. gray-blk. organic silt on fractures; plant parts lignitic; vertical lineation of fine gray sand, organic silt and med. gray clay; iron staining in streaks and patches throughout
Core 6	23-26 rec. 8"	Clay, blue gray, no inclusions; no sand
	26-27	1' lost during reaming
Core 6A	27-31 no rec.	Sand, buff (much water)
Core 7	31-36 rec. 44"	Top 7" sandy med. gray clay, organic silt on fractures Bottom 37" clay, dark gray, some fine med. gray sand at very end of core
Core 8	36-40 no rec.	no recovery

HOLE # D-18-C Cont.

CORE	FEET	LITHOLOGY
Core 9	40-43 rec. 29"	Clay, med. gray w/ fine med. gray sand in patches and streaks throughout
Core 10	43-45 no rec.	No recovery
Core 11	45-48 rec. 16"	Top 9" sand, med. gray, fine grained w/ vertical lineation Bottom 7" clay, med. gray, many lignitic plant parts; fine med. gray sand in patches and streaks throughout
Core 12	48-50 T.D. rec. 5"	Sandy, med. gray, clay; many lignitic plant parts; vertical lineation of fine med. gray sand; fine med. gray sand also in patches

HOLE # D-19 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Clay, light gray and surface soil
4-6	Clay, light gray w/ some fine gray sand
6-8	As above
8-10	Sand, buff, fine w/ some light gray clay
10-12	Clay, light gray, much iron staining
12-14	As above
14-16	Sand, buff, fine, some light gray clay
16-18	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	Sand, as above, some light gray clay
28-30	As above
30-32	As above
32-34	Sand, buff, med. grained, some light gray clay and fine gray sand
34-36	As above
36-38	Clay, med. gray, some blk. carb. particles
38-40	Clay as above
40-42	Clay, med. gray w/ some fine gray sand
42-44	As above
44-46	As above
46-48	As above
48-50 T.D.	As above

HOLE # D-20-C
T.D. 80'

Sec. 17

CORE #	FEET	
	2-4	Sand, buff, fine
	4-6	As above
	6-8	Sand, dark buff
	8-10	Sand, buff to tan
Cored	10-18 no rec.	As above
Cored	18-19 no rec.	Clay?, med. gray w/ some fine gray sand
Cored	19-20 no rec.	Clay?, med. gray w/ some fine buff and dark buff sand
Core 1	20-23 rec. 20"	Sand, fine, med. gray and buff; iron streaks throughout; horizontal lineation; alternation of fine gray sand and fine buff sand in part
Core 2	23-26 no rec.	No recovery; some sample jamed in mouse-- Sand, fine buff and some fine gray sand w/ some med. gray clay
Core 3	26-29 no rec.	No recovery; some sample jamed in mouse-- Sand, buff, fine w/ some med. gray fine sand some med. gray clay
	29-30	1' lost during reaming
Cored	30-35 no rec.	Sand, buff
Cored	35-40 no rec.	Sand, buff w/ some med. gray clay?
Cored	40-47	Sand, buff w/ some med. gray clay?
Core 4	47-50 rec. 24"	Clay, med. gray, much fine med. gray sand throughout w/ many lignitic plant parts
Core 5	50-53 rec. 31"	Clay, med. gray sandy w/ some blk. lignitic plant parts
Core 6	53-55 rec. 24"	As above
Core 7	55-59 rec. 42"	Top 20" fine sandy med. gray clay w/ some blk. carb. silt patches Middle 10" sand, fine, med. gray; some med. gray clay w/ blk. lignitic plant parts Bottom 12" fine sandy med. gray clay w/ few blk. lignitic plant parts
Cored	59-80 T.D.	Much water was encountered at about 59'; core barrel was pulled every 4 to 5 feet but no core was recovered; 0% core recovery was possibly due to the large amount of water

HOLE # D-21 Sec. 17
T.D. 50'

FEET	LITHOLOGY
2-4	Clay, light gray (very dry)
4-6	Clay, light gray w/ some fine buff sand
6-8	Clay, as above
8-10	Clay, med. gray w/ some fine buff sand
10-12	As above
12-14	Sand, buff, fine
14-16	Sand, as above
16-18	Clay, med. gray w/ some fine buff sand
18-20	Clay, med. gray w/ dark iron staining and some fine gray sand
20-22	Sand, dark buff w/ some med. gray clay, iron stained
22-24	Sand, buff, some blk. carb. particles
24-26	Sand, buff, fine
26-28	As above
28-30	As above
30-32	Sand, buff, med. grained
32-34	Sand, dark buff, some blk. carb. particles
34-36	As above
36-38	Sand, buff, med. grained
38-40	As above
40-42	As above
42-44	As above
44-46	As above
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-22
T.D. 44'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, light gray, fine grained miked w/ soil
4-6	Sand, fine light gray
4-8	Clay, light gray w/ some fine light gray sand
8-10	Sand, buff fine
10-12	Sand, buff, little brown clay and iron concretion chips
12-14	Sand, buff, fine
14-16	As above
16-18	As above
18-20	As above
20-22	Sand buff, med. grained
22-24	As above
24-26	As above, some light gray clay
26-28	Sand, dark buff, w/ few carb. particles
28-30	Sand as above
30-32	As above
32-34	Sand, dark buff, some blk. carb. particles and dust w/ some light gray clay
34-36	As above
36-38	Clay, med. gray, w/ some fine gray sand
38-40	Clay, sandy, fine gray sand w/ some med. gray clay
40-42	Clay, med. gray
42-44 T.D.	Clay, med. gray

HOLE # D-23
T.D. 50'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, light gray and some buff
4-6	Sand, light gray
6-8	Sand, light gray w/ some light gray clay
8-10	Sand, light gray w/ some light gray clay
10-12	Sand, light buff, fine grained
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	As above
22-24	As above
24-26	As above
26-28	Sand, buff, med. grained
28-30	Sand, buff, med. grained w/ some light gray clay and fine gray sand
30-32	Sandy, med. gray clay
32-34	As above
34-36	Clay, med. gray to dark gray, some iron staining
36-38	Sandy, med. gray clay
38-40	As above
40-42	Clay, med. gray, sticky (damp)
42-44	Clay, med. gray, some fine gray sand
44-46	Clay as above
46-48	Clay, med. gray
48-50 T.D.	As above

HOLE # D-24 Sec. 17
T.D. 40'

FEET	LITHOLOGY
2-4	Sand, buff, fine
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	As above
20-22	Sand, buff, med. grained
22-24	As above
24-26	As above
26-28	Clay, med. gray
28-30	Clay, med. gray, some fine gray sand
30-32	Clay, med. gray, much blk. carb. particles
32-34	As above
34-36	Clay, med. gray, some fine gray sand, little carb. material
36-38	Clay, med. gray, some fine gray sand
38-40 T.D.	As above

HOLE # D-25
T.D. 38'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, buff, fine grained
4-6	As above
6-8	As above
8-10	As above
10-12	As above
12-14	As above
14-16	As above
16-18	As above
18-20	Sand, buff, med. grained
20-22	As above
22-24	As above
24-26	As above
26-28	As above
28-30	Sand, buff, much water
30-32	Sand, gray and med. gray clay w/ blk. carb. particles in mud
32-34	Clay, med. gray sticky w/ some fine gray sand and much blk. carb. particles w/ lignite
34-36	Clay, med. gray w/ some gray sand, fine, and blk. carb. particles
36-38 T.D.	Clay, med. gray, some fine gray sand and blk. carb. particles

HOLE # D-26
T.D. 30'

Sec. 17

FEET	LITHOLOGY
2-4	Sand, very fine, light buff w/ some gray clay (light)
4-6	As above
6-8	Sand, light buff, very fine, little gray clay (light) w/ blk. carb. particles; few gypsum flakes and gypsum white powder
8-10	Sand, buff, fine
10-12	Sand, buff, fine, some light gray clay and much blk. carb. particles and blk. dust, iron stain on clay chips
12-14	Clay, med. gray, much blk. carb. particles; some iron staining
14-16	As above
16-18	As above
18-20	Clay, med. gray
20-22	As above
22-24	Clay, dark gray to blk.; some blk. carb. particles
24-26	Clay, med. gray
26-28	As above
28-30 T.D.	Clay, med. gray

HOLE # M-1-C RADIOMETRIC LOG

FEET	READING MR/HR
$24\frac{1}{2}$-25	.038
25-$25\frac{1}{2}$	.057
$25\frac{1}{2}$-26	.065
26-	.038

HOLE # M-2 RADIOMETRIC LOG

FEET	READING MR/HR
41-41½	.038
41½-42	.079
42-42½	.065
42½-43	.079
43-43½	.079
43½-44	.093
44-44½	.038
44½-45	.051
45-45½	.024

HOLE # M-13

RADIOMETRIC LOG

FEET	READING MR/HR
47½-48	.024
48-48½	.024
48½-49	.051
49-49½	.065
49½-50	.051
50-50½	.038
50½-51	.024

HOLE # M-14

RADIOMETRIC LOG

FEET	READING MR/HR
18½-19	.038
19-19½	.051
19½-20	.29
20-20½	.27
20½-21	.079
21-21½	.065
21½-22	.065
22-22½	.065
22½-23	.051
23-23½	.038

HOLE # M-15

RADIOMETRIC LOG

FEET	READING MR/HR
12½-13	.038
13-13½	.17
13½-14	.69
14-14½	.59
14½-15	.37
15-15½	.18
15½-16	.18
16-16½	.13
16½-17	.079
17-17½	.051
17½-18	.038

HOLE # M-18-C

RADIOMETRIC LOG

FEET	READING MR/HR
7½-8	.038
8-8½	.065
8½-9	.37
9-9½	.47
9½-10	.27
10-10½	.057
10½-11	.057
11½-12	.057
12-12½	.038

HOLE # M-22

RADIOMETRIC LOG

FEET	READING MR/HR
53-53½	.038
53½-54	.065
54-54½	.072
54½-55	.093
55-55½	.093
55½-56	.065
56-56½	.065
56½-57	.051
57-57½	.038

HOLE # M-29-C

RADIOMETRIC LOG

FEET	READING MR/HR
19-19½	.026
19½-20	.038
20-20½	.038
20½-21	.038
21-21½	.038
21½-22	.057
22-22½	.065
22½-23	.093
23-23½	.065
23½-24	.038

HOLE # D-2

RADIOMETRIC LOG

FEET	READING MR/HR
51½-52	.038
52-52½	.051
52½-53	.093
53-53½	.37
53½-54	.37
54½-55	.27
55-55½	.079
55½-56	.065
56-56½	.038

HOLE # D-5

RADIOMETRIC LOG

FEET	READING MR/HR
92½-93	.038
93-93½	.051
93½-94	.093
94-94½	.093
94½-95	.17
95-95½	.17
95½-96	.093
96-96½	.079
96½-97	.065
97-97½	.038
97½-98	.051
98-98½	.024

67½-68	.038
68-68½	.051
68½-69	.065
69-69½	.079
69½-70	.093
70-70½	.17
70½-71	.038
71-71½	.051
71½-72	.051
72-72½	.065
72½-73	.17
73-73½	.065
73½-74	.051
74-74½	.038

HOLE # D-9

RADIOMETRIC LOG

FEET	READING MR/HR
43½-44	.038
44-44½	.065
44½-45	.065
45-45½	.079
45½-46	.093
46-46½	.051
46½-47	.079
47-47½	.093
47½-48	.051
48-48½	.065
48½-49	.038

HOLE # D-15

RADIOMETRIC LOG

FEET	READING MR/HR
34-34½	.038
34½-35	.051
35-35½	.065
35½-36	.27
36-36½	.65
36½-37	1.38
37-37½	1.58
37½-38	1.5
38-38½	1.26
38½-39	.57
39½-40	.47
40-40½	.22
40½-41	.17
41-41½	.079
41½-42	.079
42-42½	.038

HOLE # D-19

RADIOMETRIC LOG

FEET	READING MR/HR
32-32½	.038
32½-33	.27
33-33½	.57
33½-34	.67
34-34½	.55
34½-35	.39
35-35½	.17
35½-36	.079
36-36½	.065
36½-37	.051
37-37½	.038

HOLE # D-20-C RADIOMETRIC LOG

FEET	READING MR/HR
47-47½	.024
47½-48	.038
48½-49	.038
49-49½	.057
49½-50	.065
50-50½	.079
50½-51	.065
51-51½	.065
51½-52	.065
52-52½	.038
52½-53	.024

HOLE # D-21

RADIOMETRIC LOG

FEET	READING MR/HR
42-42½	.024
42½-43	.065
43-43½	.10
43½-44	.079
44-44½	.17
44½-45	.37
45-45½	.37
45½-46	.37
46-46½	.34
46½-47	.051
47-47½	.038
47½-48	.038

HOLE # D-24

RADIOMETRIC LOG

FEET	READING MR/HR
23½-24	.038
24-24½	.051
24½-25	.051
25-25½	.079
25½-26	.079
26-26½	.079
26½-27	.079
27-27½	.079
27½-28	.079
28-28½	.051
28½-29	.038

HOLE # D-25

RADIOMETRIC LOG

FEET	READING MR/HR
28½-29	.026
29-29½	.079
29½-30	.079
30-30½	.32
30½-31	.47
31-31½	.55
31½-32	.49
32-32½	.39
32½-33	.45
33-33½	.39
33½-34	.20
34-34½	.11
34½-35	.051
35-35½	.051
35½-36	.026

HOLE # D-26

RADIOMETRIC LOG

FEET	READING MR/HR
10-10½	.038
10½-11	.051
11-11½	.079
11½-12	.42
12-12½	1.0
12½-13	.51
13-13½	.37
13½-14	.093
14-14½	.051
14½-15	.024

COLOR CHART FOR COLORED LITHOLOGIC LOGS

COAL or carbonaceous plant parts or carbonaceous silt;

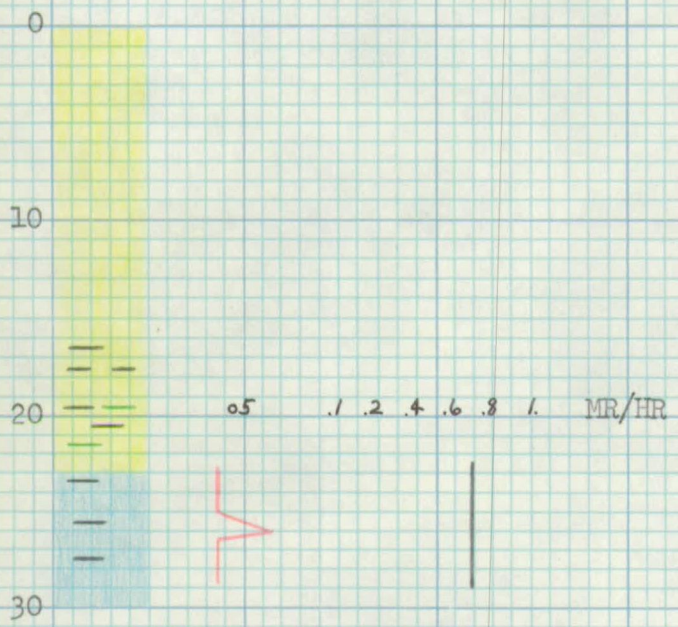
SAND, buff;

CLAY

SAND, gray

SAND, tan

SAND, light gray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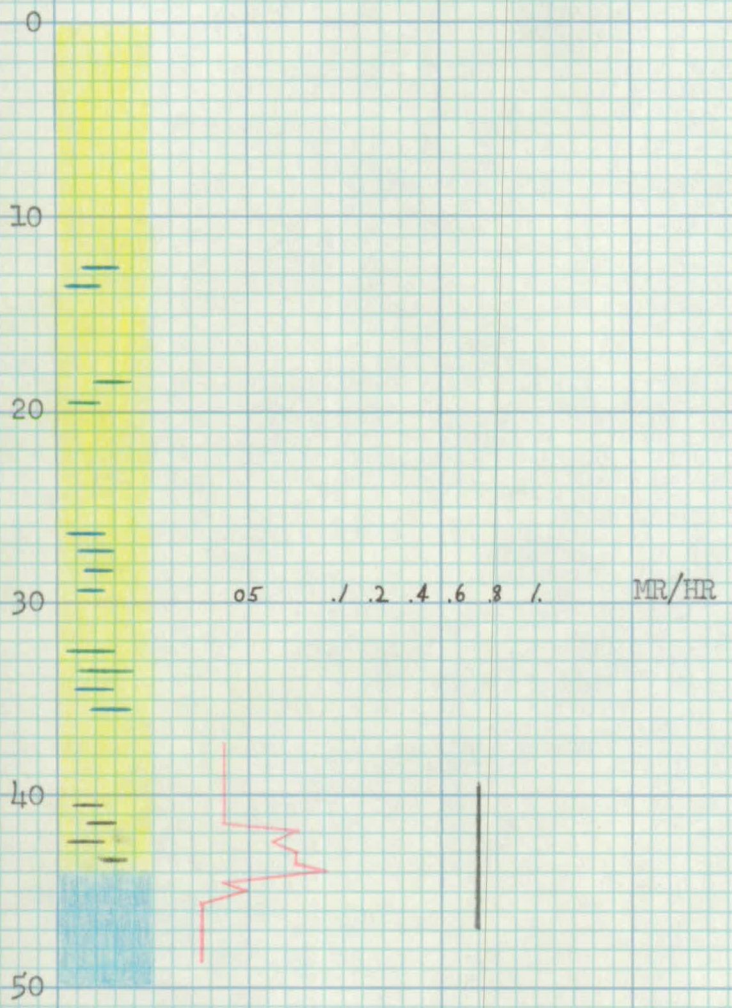
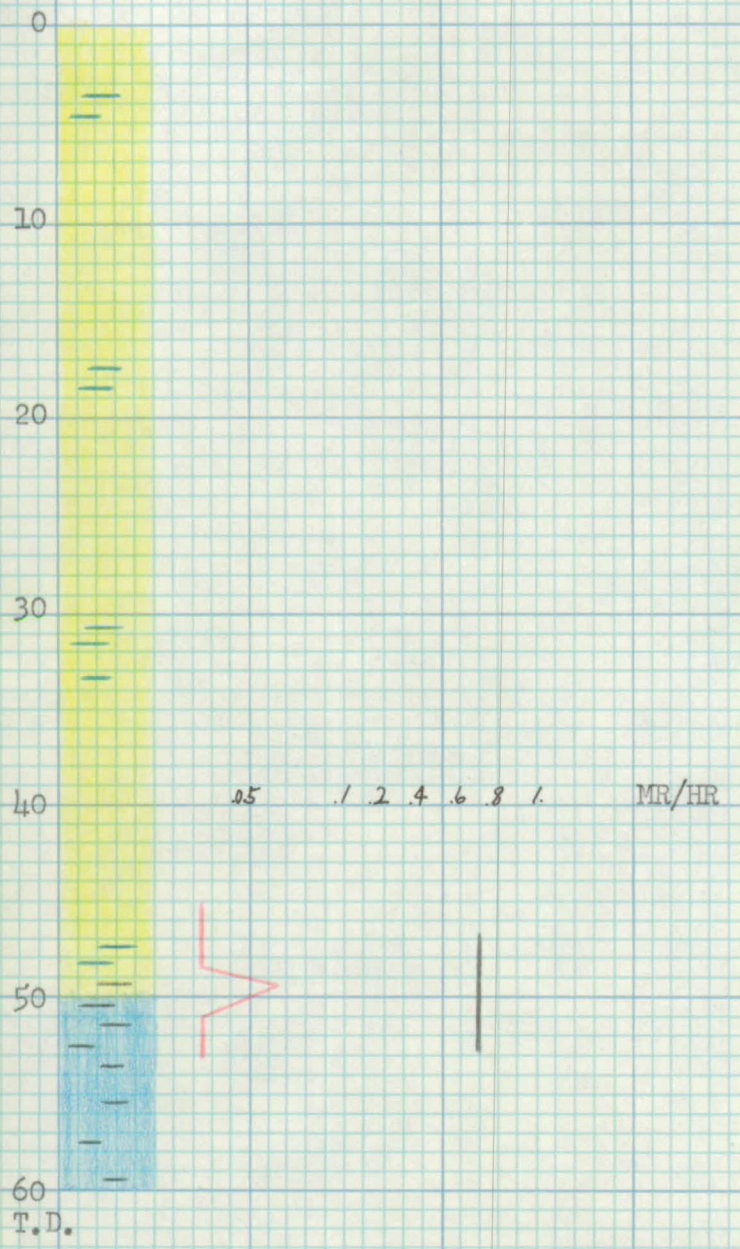
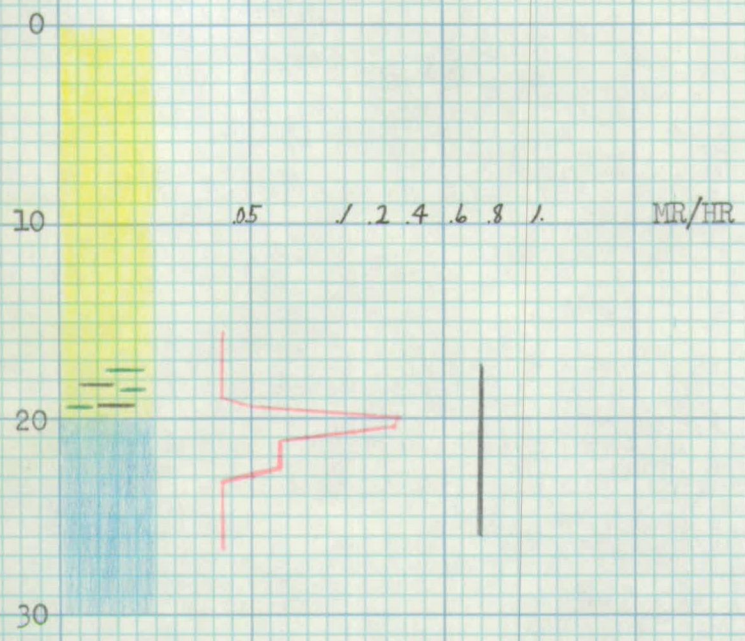
M-2 Sec. 18



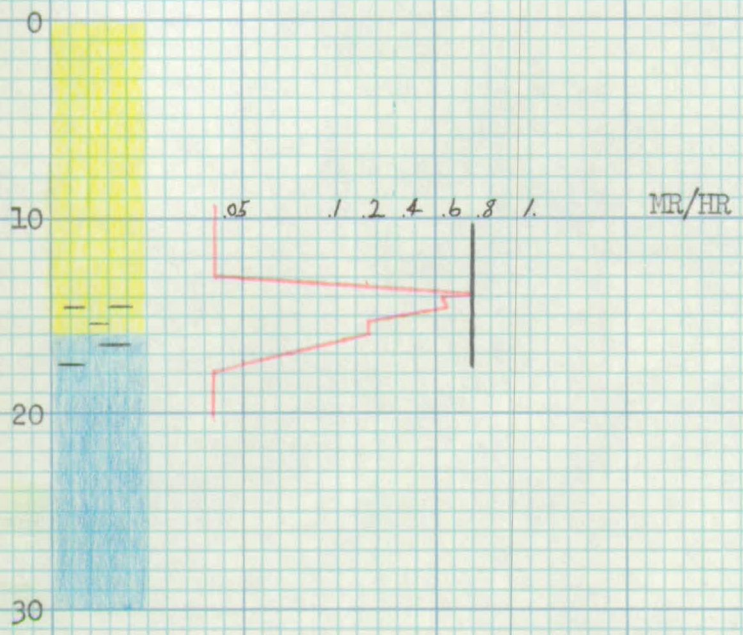
M-13 Sec. 18



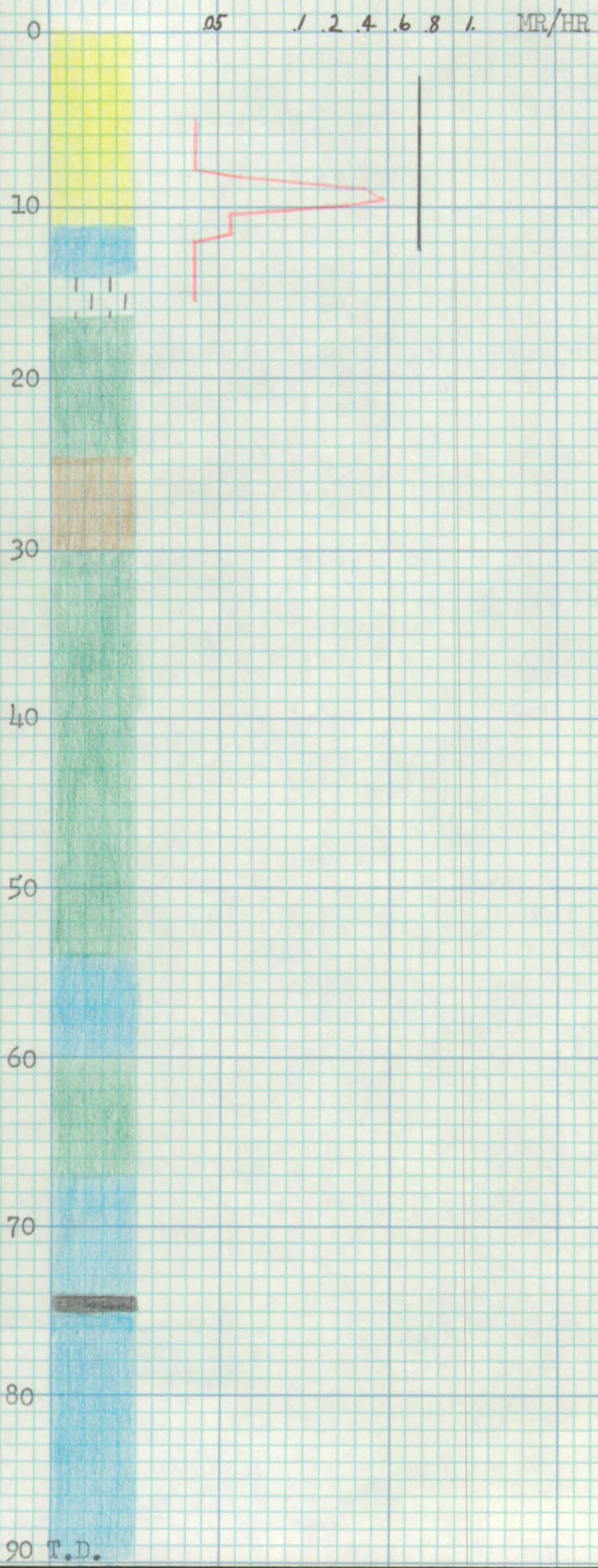
M-14 Sec. 18



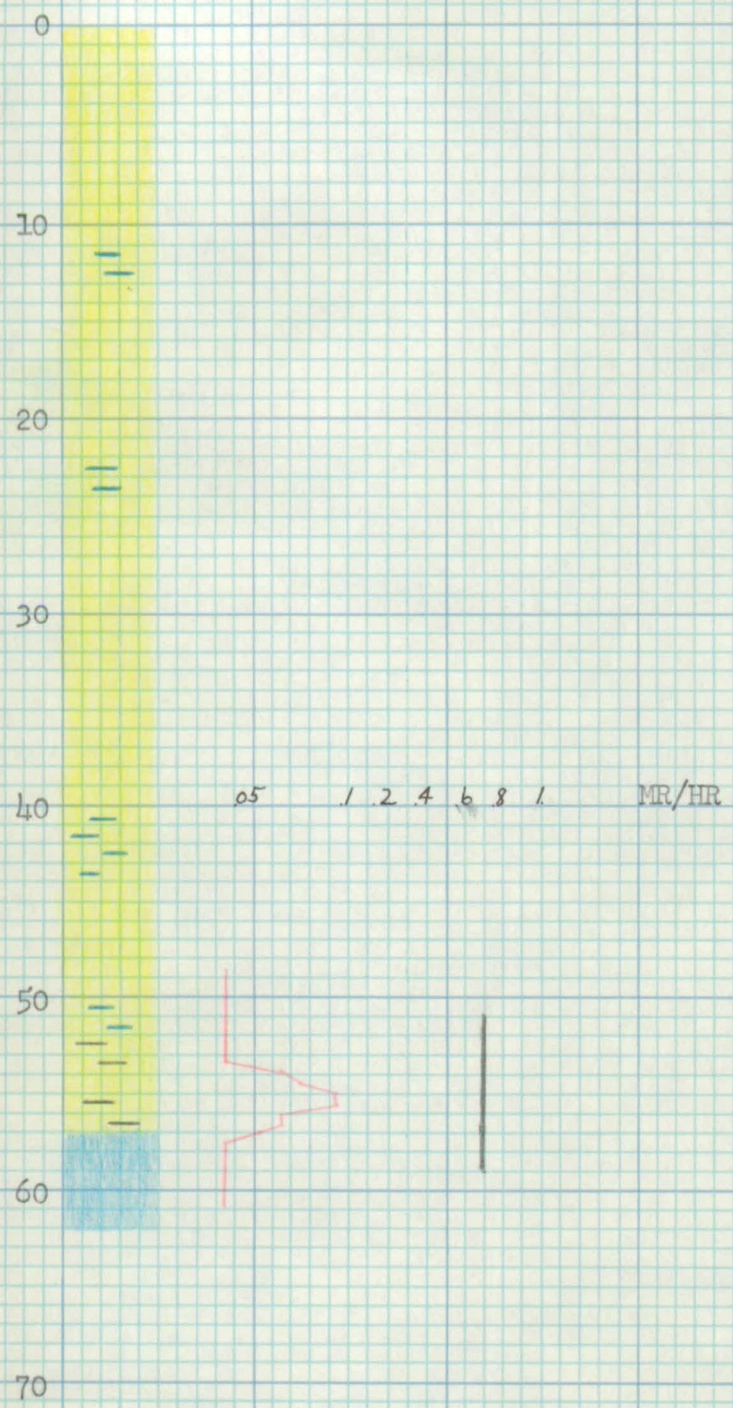
M-15 Sec. 18



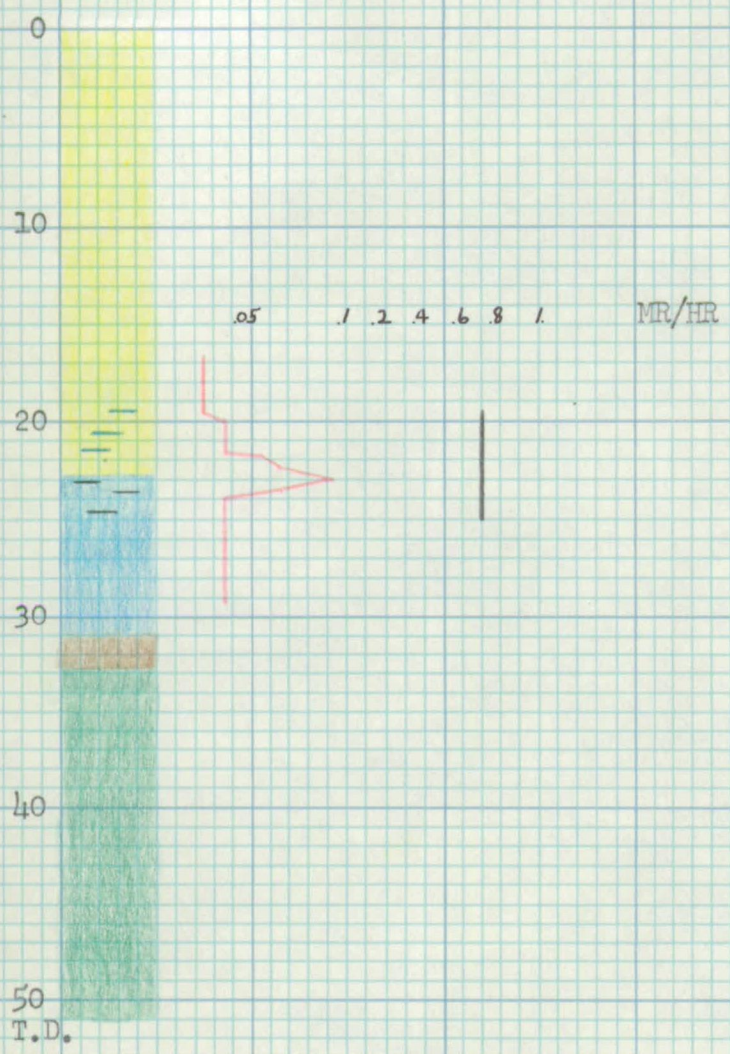
M-18-C Sec. 18

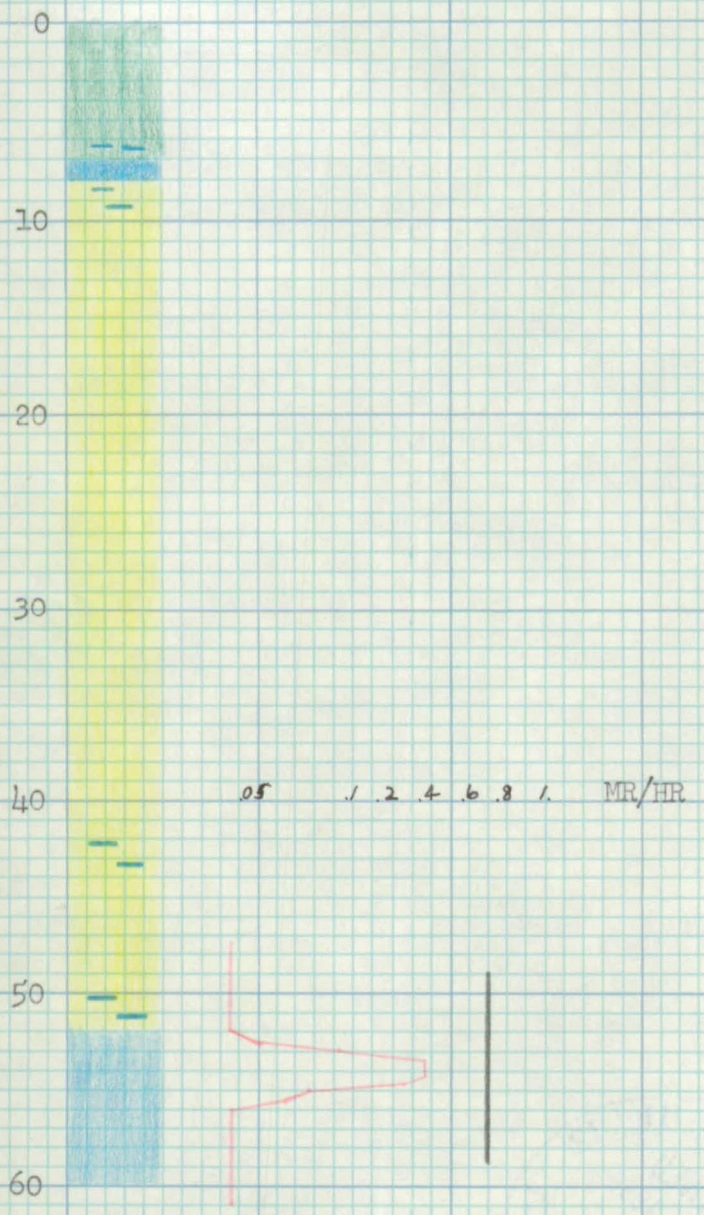


M-22 Sec. 18



M-29-C Sec. 18

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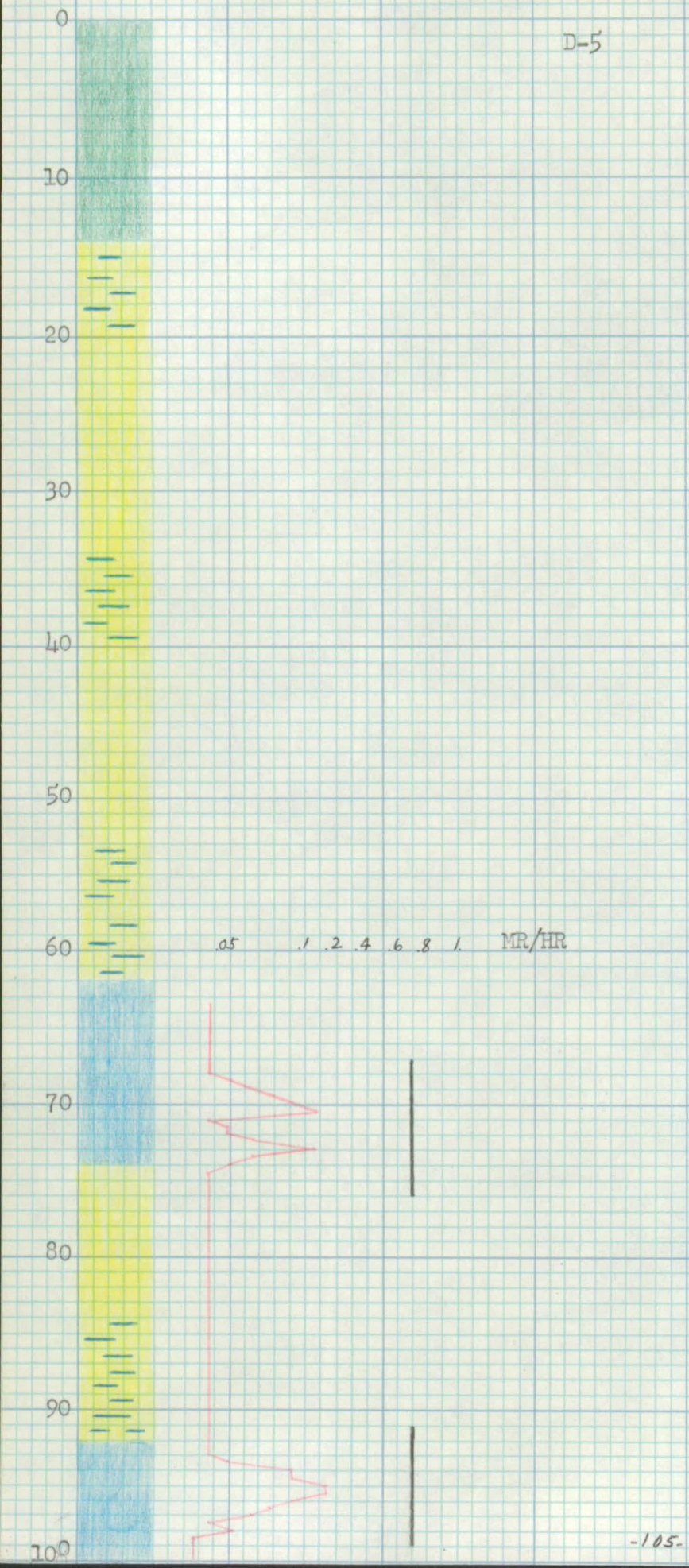
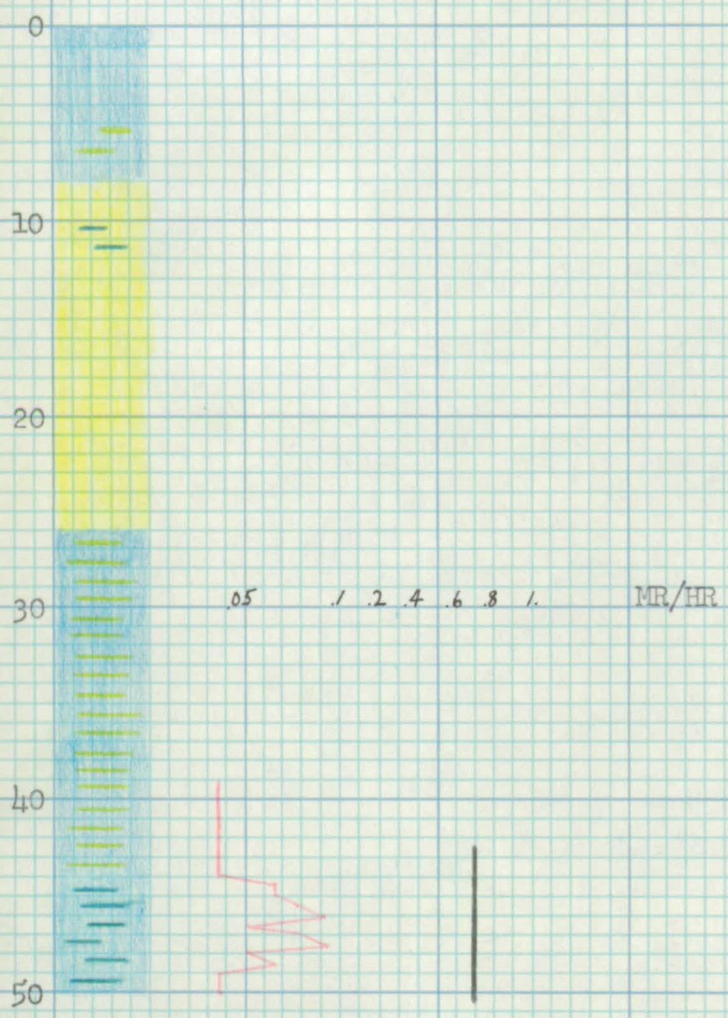
D-5 Sec. 17

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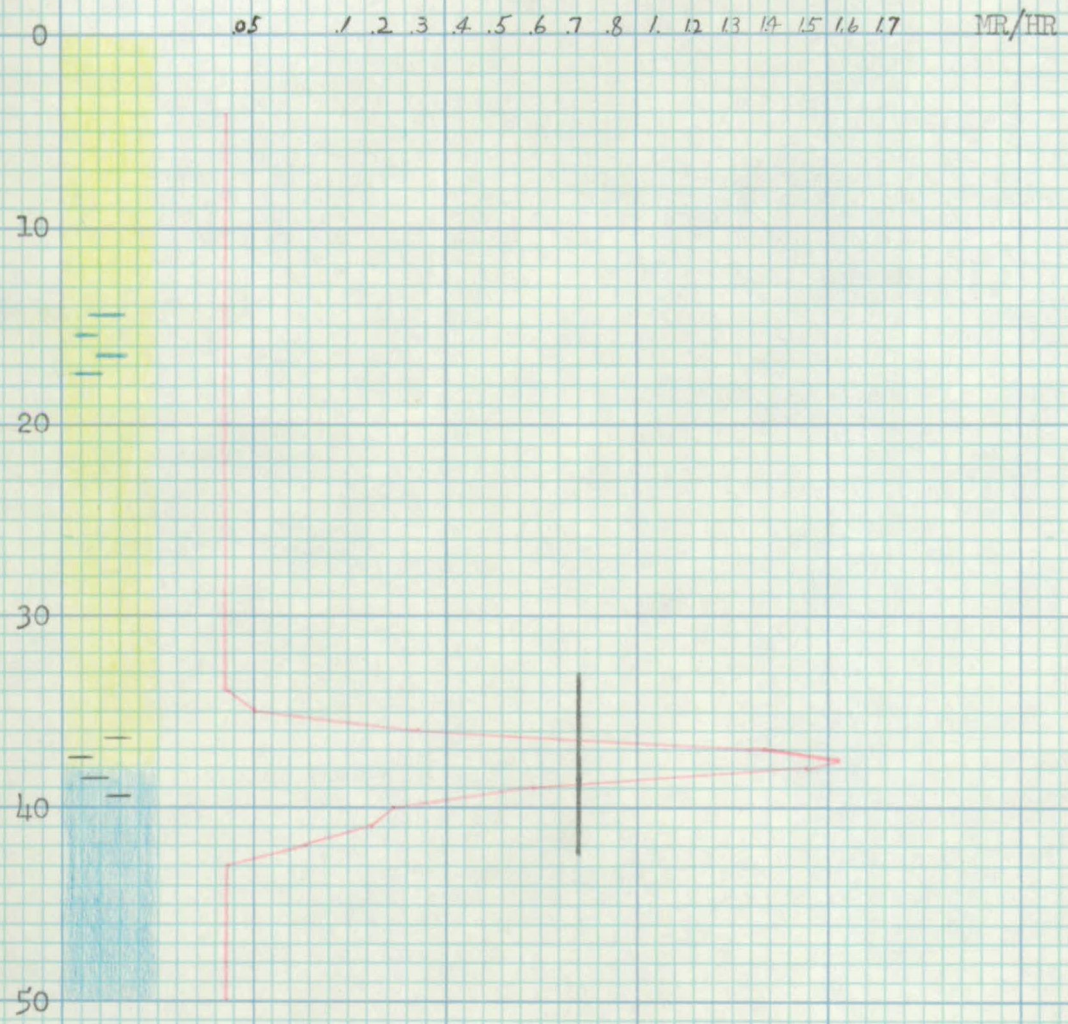
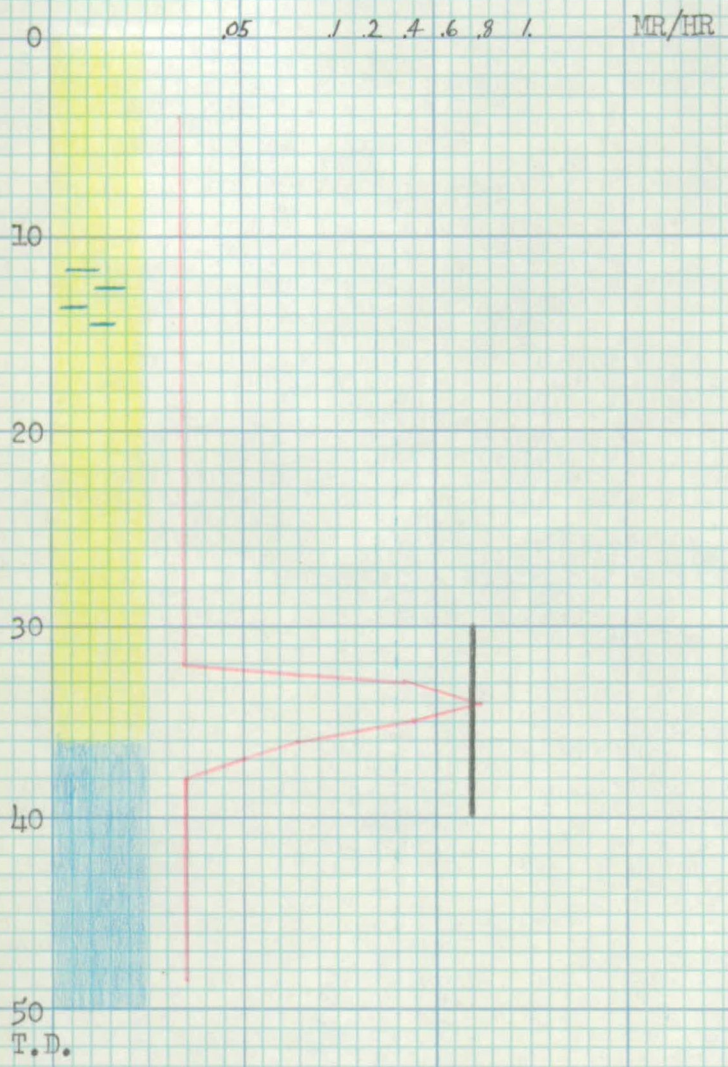
MR/HR

D-15 Sec. 17

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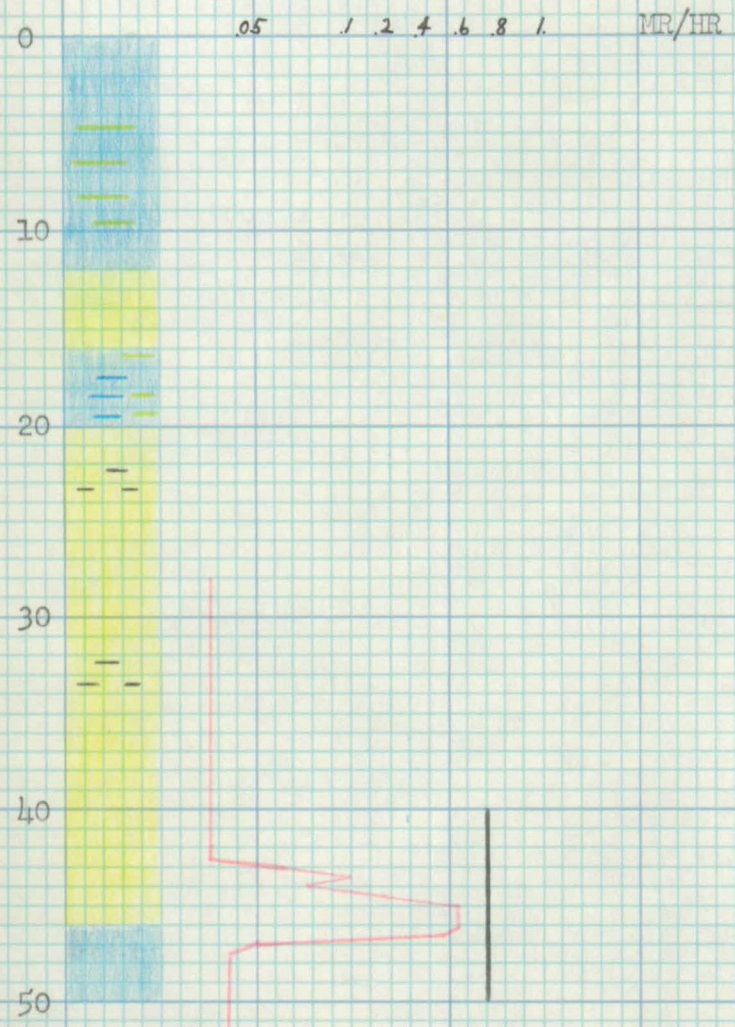
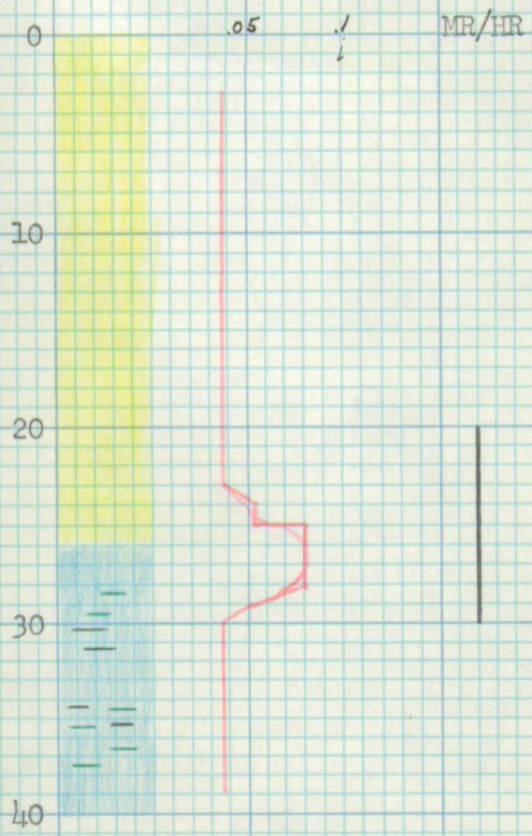
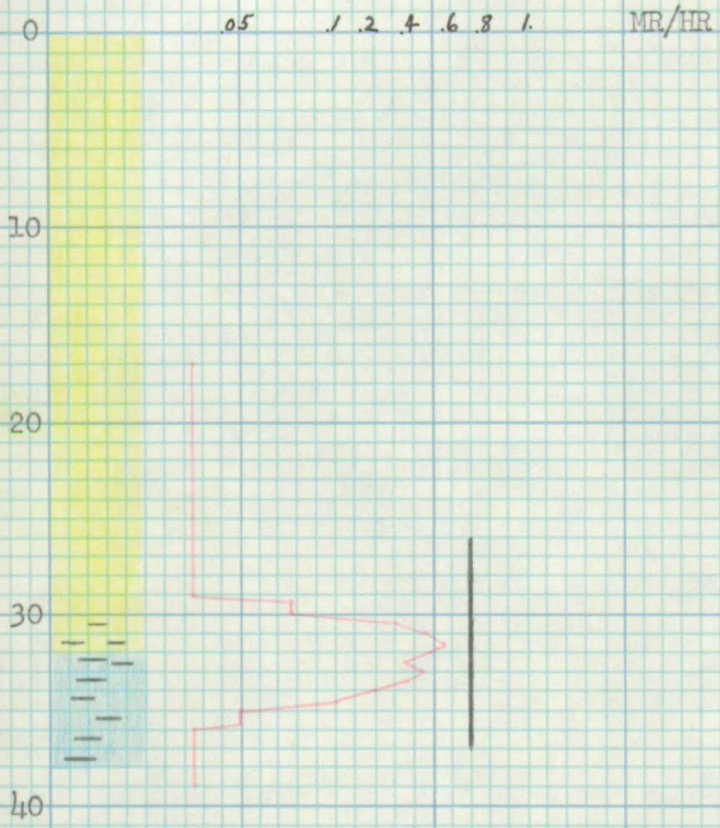
D-21 Sec. 17



D-24 Sec. 17

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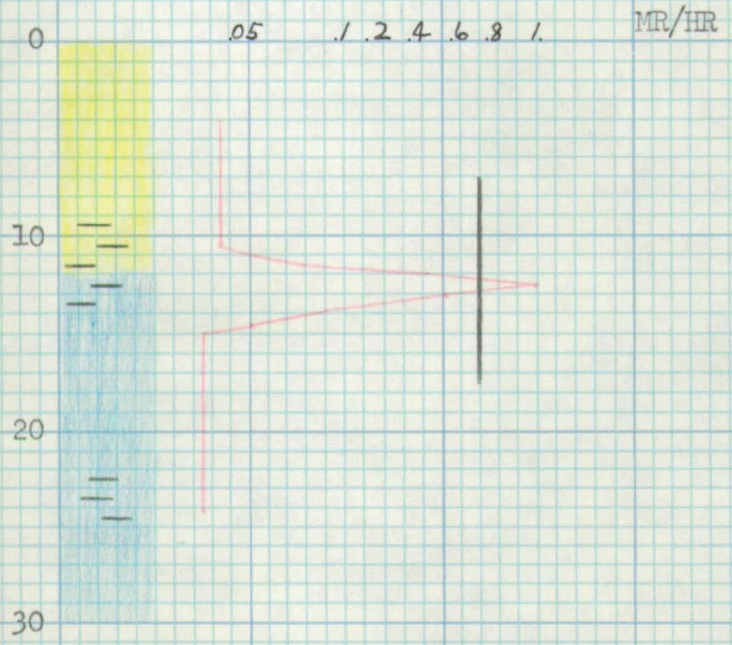
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MR/HR

Results of Sample Analysis

	eU_3O_8%	cU_3O_8%
D-15233-38	.11	.13
D-15238-41	.09	.14
D-15233-381	.01	.04
M-15214-15	.01	.01
M-1418-20	.01	.04
D-1536-38A	.07	.09
D-153840	.03	.04
D-153638	.07	.11

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DEFENSE TECHNICAL INFORMATION CENTER
DTIC
1 JAN 1989

YOUNG EXPLORATION COMPANY RIG # 95

Type -- Built by YOUNG MACHINE COMPANY
OKLAHOMA CITY, OKLAHOMA

Compares to a Franke Model #44

Built in September, 1953
Mud pump size -- $4\frac{1}{2}$ by 6
Size hole drilled -- $4\frac{1}{4}$ inches
Pipe -- Mayhue Jr. two and three eighths by ten feet
Tool joint three inch diameter
Tower -- 26 feet from ground to top when raised
Truck -- International R160
Power delivered to rig by a split power takeoff from the truck engine, with a combination hydraulic and automatic pulldown;
Rig rated for a 750 foot hole;
Kelly -- 15 feet in length -- round fluted

WATER TRUCK

Tank -- 900 gal.;
Truck -- $2\frac{1}{2}$ ton
Wench -- Tulsa 500

COMPRESSOR

Blower type -- delivers 400 CFM at an average drilling pressure of 40 PSI -- 50 PSI build up pressure.

DRILLING COST CALCULATIONS

Coring

93.75 hours at $17.90 =	$1678.12
1 core head bit	42.50
Total	$1720.62

658 feet cored

$\frac{\$1720.62}{658}$ = $2.615/ft.

Allowed by contract - $2.60/ft.

Non-Coring

100.25 hours at $17.90 =	$1794.48
14 hours at $12.50 = (Travel)	175.00
1 fish tail bit	15.00
	$1984.48

2423 feet drilled

$\frac{\$1984.48}{2423}$ = $0.819/ft.

Allowed by contract - $1.00/ft.

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NOV 1 6 39 AM '56 OCT 32 3 39 AM '56
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NOV 1 1956
DMEA

DXXXXXX-179K

YWB129 WAF SP 20 I-BOM

SPOKANE WASH 10-31-56 425P

GEORGE C. SELFRIDGE

CHAIRMAN OPERATING COMMITTEE

DMEA, DEPT OF INTERIOR, WA

RE BURMAC EXPLORATION CORPORATION CONTRACT NUMBER IDM-E965, DOCKET DMEA 4107. OPERATOR ADVISED BY LETTER DATED OCTOBER 24 THAT STAGES 2 AND 3 WILL NOT BE AUTHORIZED BECAUSE OF DISCOURAGING RESULTS OF STAGE 1. COPIES OF THIS LETTER AND OF THE OPERATOR'S REPORT ON STAGE 1 WERE MAILED TO YOU OCTOBER 25.

WING G. AGNEW, ACTING EXECUTIVE OFFICER-BOM, SP

IDM-E965 4107 24 2 3 1 1 25

VA 427P

Surname copy

Dep[illegible]ment of the Interior

DMEA

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.

14X4401(01) Revolving Fund, Defense Production Act, Interior (Allocated Revolving Fund to the Office of the Secy.)

T E L E T Y P E

OCT 31 1956

(Uranium)

Ching
Ellis
Lamb
Kiilsgaard
Selfridge
Gilman
Whitehorn

A. E. WEESENDORN, EXECUTIVE OFFICER
DMEA FIELD TEAM, REGION I, NORTHWEST DISTRICT
SOUTH 157 HOWARD STREET
SPOKANE 4, WASHINGTON

RE BUNRAC EXPLORATION CORPORATION DOCKET 4107 PLEASE ADVISE STATUS THIS PROJECT. IF NO WORK TO BE APPROVED AFTER STAGE I NO FORMAL TERMINATION OF CONTRACT NECESSARY PROVIDED YOU FORMALLY ADVISE OPERATOR THAT WORK UNDER STAGES 2 AND 3 WILL NOT BE APPROVED.

George C. Selfridge
(EST)
CHAIRMAN, OPERATING COMMITTEE

MCHING/gla
10-30-56
cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, 3643
THKiilsgaard, 5224
JOHosted, 3210, GSA
Code 700
Mr. Ching
Confirmation to DMEA Field Team, Region I, NWDist.

R.C.S.

RECEIVED

OCT 23 1956

xxxxxxxxxxxxxxxxxxx
1201 N. Division Street
Spokane 2, Washington

October 17, 1956

Burmac Exploration Corporation
Box 836
Williston, North Dakota

Re: Docket No. DMEA 4107 (Uranium)
Contract Idm-E 965
Burmac Exploration Corporation
Monthly operating report for
August 1956

Gentlemen:

The subject operating report has been received and processed for payment.

You will note from the enclosed copy that a very small disallowance has been made from the cost claimed for non-core drilling. This was necessary because of a mathematical error.

As this will be your final voucher, we are obliged to withhold a portion of the Government's contribution to project costs pending a final audit of your records by a representative of the Contract Administration and Audit Division of DMEA. The amount being withheld is $250.00. This is standard procedure for all contracts.

We take this opportunity to thank you for submitting your final engineering report on the project so promptly.

By Field Team, Region I, NW District

Wing G. Agnew, Acting Executive Officer
U. S. Bureau of Mines

Donald R. MacLaren, Acting Member
U. S. Geological Survey

cc: DMEA (2)
USGS (2)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

RECEIVED
OCT 23 1956

~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

October 16, 1956

MEMORANDUM

To: DMEA Field Team, Region I, Northwest District

From: Donald C. Alvord, Geologist, U. S. Geological Survey

Subject: Interim inspection report, Docket No. DMEA-4107 (Uranium), Burmac Exploration Corporation, Cox Lease, Fallon County, Montana, Contract No. Idm-E965.

The property was inspected on August 17, 1956, in company with R. D. Sample, geologist, Geological Survey, and Cesar Ibanez, Point IV trainee. William J. McCabe, geologist-in-charge and treasurer of the Burmac Exploration Corporation, was present during the examination.

Under the contract Stage I drilling comprises four core holes and 22 non-core holes aggregating 1,440 feet to be drilled on about a 400-foot grid pattern in the SW$\frac{1}{4}$ of sec. 17; and six core holes and 24 non-core holes aggregating 2,100 feet to be drilled on about a 650-foot grid in the S$\frac{1}{2}$ of sec. 18. At the time of the examination all 10 core holes, aggregating 658 feet, had been completed as had 17 non-core holes in the SW$\frac{1}{4}$ of sec. 17, which aggregated 870 feet. One of the core holes (M18C) penetrated material averaging 0.44 MR/hr but none of the others penetrated ground that was even weakly radioactive, all registering 0.10 MR/hr or less. Of the 17 completed non-core holes, six penetrated ground exceeding 0.10 MR/hr, but only one of these, D-15, penetrated ground containing radioactivity equivalent to 0.1 percent U_3O_8 or better. At a depth of 37 feet this hole penetrated 2 feet of material estimated to contain 0.11 percent eU_3O_8. Hole 75 located about 200 feet south of D-15, was drilled prior to the contract. This hole penetrated 2.7 feet of material averaging 0.12 percent eU_3O_8 at approximately the same elevation as the 0.11 percent eU_3O_8 material found in D-15.

All but five of the non-core holes scheduled for the SW$\frac{1}{4}$ of sec. 17 were completed. The results are considered discouraging. Non-core hole drilling in the S$\frac{1}{2}$ of sec. 18 will be started shortly but the results are not expected to be exciting because a promising target, an inferred structural low, has been shown by the core holes to be a structural high which contains thin unpromising sandstone beds.

The program is being carried out in a workmanlike manner. The geologic control appears to be adequate. As the sandstone beds in the ore zone proved impossible to core by conventional methods, core recovery from the 10 holes ranged from 3.5 to 49.08 percent and averaged only 32.8 percent; nevertheless, by closely checking the cuttings adequate geologic logs of the holes were prepared.

Initially, a Duclone dust collector was used to sample non-core hole cuttings but proved unsatisfactory because of the wet ground encountered. A baffle collector made of 8-inch casing was devised and proved satisfactory in operation. As specified in the contract, cuttings from each 2-foot run was being collected, classified, and stored for future examination, and all holes were being probed with a geiger counter.

Distribution:
DMEA (Orig. & 3)
USBM (2)
USBM (AD)
Docket
Alvord

10-23-56

Form MF-104 (Rev.)
(April 1952)

Budget Bureau No. 42-R1036.5

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

RECEIVED OCT 1956

OCT 3 REC'D

OPERATOR'S MONTHLY REPORT AND VOUCHER

Month of August, 1956 Docket No. DMEA 4107 Contract No. Idm-E965

Operator's Name Burmac Exploration Corporation Minerals Uranium

Address Box 836, Williston, North Dakota

Contract Amount, $15,512.00 Government Participation: 75 % Amount, $11,634.00

ITEMS OF COSTS	FOR OPERATOR'S USE			FOR GOVERNMENT USE ONLY		
	Monthly Total	Totals Previously Reported	Totals To Date	Approved Monthly Total	Approved Totals Previously Reported	Approved Totals To Date
(1) Independent Short Form Contracts:						
Drilling Core	$1710.80	0.00	$1710.80	1710.80	—0—	1710.80
~~Bulldozing~~ Non-core	1984.48	0.00	1984.48	1984.44	—0—	1984.44
Crosscutting						
Drifting						
(2) Labor and Supervision:						
Labor						
Supervision						
Technical Services						
(3) Operating Mat'ls. and Supplies:						
Timber						
Explosives						
Pipe						
Track						
(4) Operating Equipment:						
Rental						
Purchase						
Depreciation						
(5) Initial Rehabilitation and Repairs						
(6) New Bldgs., Improvements, etc.						
(7) Miscellaneous:						
Repairs to Equipment						
Sampling and Analysis						
Payroll Taxes						
Liability Insurance						
Incidental Allow.	739.44	0.00	739.44	739.44	—0—	739.44
Chem. Analysis	34.00	0.00	34.00	34.00	—0—	34.00
(8) Contingencies (specify):						
TOTALS	$4468.72	0.00	$4468.72	4468.68	—0—	4468.68

rtify that the above bill is correct and just and that payment therefor has not eceived.

9 SEPT 1956 *Payee Burmac Exploration Corporation

Title President

ucher is signed or receipted in the name of a company or corporation, the name of the person writing or corporate name, as well as the capacity in which he signs, must appear. For example: "John , per John Smith, Secretary," or "Treasurer," as the case may be.

E.—Title 18, U. S. Code (Crimes), section 1001, makes it a criminal offense to make a willfully or representation to any department or agency of the United States as to any matter within its

(Instructions on reverse)

Withheld 3351.51
250.00
3101.51

Pursuant to authority vested in me, I certify that this account is correct and proper for payment in the amount of:

$ 3101 51

Signature M. P.
(Authorized Certifying Officer)

Date 10/16/56 Vou. No. 1893
(See other side)

(For Government use only)

CERTIFICATION BY GOVERNMENT REPRESENTATIVE:

I certify that to the best of my knowledge and belief the contractor submitting this voucher is operating a Defense Minerals Exploration Administration project under Contract No. E-965 in accordance with the terms of the contract.

Signature /S/ George J. Krempasky Title Mining Engr. Date 10/10/56

APPROVAL BY DMEA EXECUTIVE OFFICER OR ALTERNATE:

Signature /S/ A. E. Weissenborn Title Executive Officer Date 10/15/56

MONTHLY REPORT OF OPERATOR

The Operator (Contractor) of an exploration project is required to make a monthly report to the Government through the Regional Executive Officer. This report consists of three parts as follows:

(a) *Form MF-104—Operator's Monthly Report and Voucher.*—This form details expenditures and constitutes a voucher for reimbursing the Operator for the Government's share of costs;

(b) *Form MF-104A—Operator's Unit Cost and Progress Report.*—This is a statistical report of expenditures which shows costs for the various types of operation; and

(c) *Narrative.*—A concise narrative description of progress made, results accomplished, and any unusual difficulties encountered must be furnished as an attachment to this Report and Voucher. Wherever possible, the narrative is to be illustrated with maps or sketches showing formations penetrated and location and assays of samples taken as well as advances in workings. In the case of diamond drilling or churn drilling, the location and inclination of holes is to be shown on a map; logs and assays also are to be submitted.

The Monthly Report of Operator should be prepared in an original and four copies all of which must be sent to the Executive Officer of the Region not later than the 15th of the month following.

Preparation of Form MF-104—Operator's Monthly Report and Voucher.—All the applicable spaces in Form MF-104 should be filled in by the Operator, and the Operator or his agent should sign the certification in the lower left corner of the form.

The items of costs are arranged in the order they appear in Article 6 (a) of Form MF-200 (Revised February 1952), however, this form is readily adaptable for use in reporting activities under other contract forms.

Under Item (1) delete words "Short Form" if the contract is a sub-contract under Form MF-200; and delete word "Independent" if the contract reported is on Form MF-200 (A). Also, report work paid for on a unit basis under contract Form MF-200 as though it were performed under an independent contract.

Under Item (2) include labor, supervision and technical services incurred for the exploratory operations. Do not include labor, supervision and technical services used for work performed under items (5) and (6).

Under Item (3) include the costs of material and supplies used in the project other than that used under items (5) and (6).

Under Item (4) appear the three types of operating equipment expenditures, that is, rental, purchase and depreciation. The expenditures made for renting equipment belonging to a third party will be reported under "Rental". The amount paid or duly obligated for payment for the purchase of equipment will be reported under "Purchase". The amount of expenditures due the Operator to reimburse him for depreciation of equipment owned will be reported under "Depreciation".

Item (5) comprises costs of labor, supervision, technical services, materials, etc., which are used in the initial rehabilitation and repair of existing buildings, installations, fixtures, and equipment. These costs, therefore, should not be reported under items (2) and (3).

Item (6) includes the labor, supervision, technical services, materials, etc., used in the installation or construction of new buildings, fixed improvements, etc., necessary for the project. These costs, therefore, should not be reported under items (2) and (3).

Item (7) covers miscellaneous types of expenditure such as payroll taxes, liability insurance, workmen's compensation insurance, repairs to equipment and sampling and analysis. Only that part of payroll taxes, liability insurance and workmen's compensation which are paid by the operator should be reported under item (7). The share paid by the employee as a payroll deduction is to be included under item (2) as labor costs.

Item (8) includes any unforeseen costs not included in the other seven categories.

The original of Form MF-104 when submitted for reimbursable expenses incurred under contract Form MF-200 must be supported by original documentation or by certified copies of purchase orders, payrolls or transcripts of payrolls, unless such documentation has been waived by the Regional Executive Officer. This certification may be stated thus, "Certified True Copy (or Transcript)", followed by appropriate signature. If the Executive Officer of the Region determines that a contract under Form MF-200 should have an "on-site" audit, that is, a Government auditor should make an audit of the Operator's books and records of account, the Operator need not support his monthly voucher with original or certified documents except in cases of equipment purchases whose individual costs exceed $50.00. In these cases the original or a certified copy of the purchase order or invoice should be attached to the Monthly Voucher. N. B.—Only the *original* of Form MF-104 is required to be documented. The four copies of Form MF-104 are not to be thus supported.

Form MF-104 submitted for reimbursement under fixed price contracts on Form MF-200 (A), however, are not required to be supported by documentation of any kind. The Operator will submit his claim under item (1) of Form MF-104 by deleting as stated above the word "Independent" and by showing the number of feet or other units immediately after the appropriate descriptive word, such as, drilling, bulldozing, crosscutting, drifting, etc., and giving the "Monthly Total" amount due. "Totals Previously Reported", and "Totals to Date" columns should also be filled in.

Form MF-104A
(April 1952)

Budget Bureau No. 42-R1151.2

UNITED STATES
DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS EXPLORATION ADMINISTRATION

OCT 3 REC'D
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OCT 22 1956

OPERATOR'S UNIT COST AND PROGRESS REPORT

Month of August 1956 Docket No. DMEA 4107 Contract No. Idm-E965

Operator's Name Burmac Exploration Corporation Minerals Uranium

Address Box 836, Williston, North Dakota

OPERATION	UNIT	COSTS THIS MONTH	UNITS THIS MONTH	COSTS TO DATE	UNITS TO DATE	UNIT COSTS TO DATE	AUTHORIZED BY CONTRACT	
							Units	Unit Costs
Drifting								
Crosscutting								
Raising								
Shafts								
Winzes								
Drilling: Core	ft.	$1710.80	658	$1710.80	658	2.60/ft.	640	$2.60/ft.
~~Churn~~ Non-core	ft.	1984.~~68~~ 44	2423	1984.~~68~~ 44	2423	0.819/ft	10360	1.00/ft.
Auger								
Stripping								
Trenching								
~~Test Pits~~ Chem. Anal.	ea.	34.00	8	34.00	8	4.25 ea	200	4.25/ea.
Roads and Trails								
Incidental Allow.	ft.	739.44	3081	739.44	3081	0.24/ft	11000	0.24/ft.
TOTAL DISTRIBUTED COSTS		$4468.~~72~~ .68		$4468.~~72~~ .68				TOTAL COSTS AUTHORIZED BY CONTRACT
Operating Equipment Purchased								
Initial Rehabilitation and Repairs								
New Buildings, Improvements, etc.								
TOTAL COSTS								

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this report is correct and complete to the best of their knowledge and belief.

REMARKS:

Date SEPT 29, 1956 Operator Burmac Exploration Corp.

Per Dris D. Dallas Title President

NOTE.—Title 18, U. S. Code (Crimes), section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

(Instructions on reverse)

(For Government use only)

/s/ George J. Krempasky

INSTRUCTIONS

Preparation of Form MF–104A—Operator's Unit Cost and Progress Report.—Applicable places on Form 104A should be filled in by the Operator. The purpose of this form is twofold as follows: (1) to furnish the supervising engineers and other administrators with statistical information necessary to better determine the progress of the project; and (2) to furnish more permanent information on mining costs for future use. The more important phases of operation on which permanent information is desired have been outlined in the form. There are blank lines, however, for those unusual phases which may need to be reported for a particular project. It will be necessary for the Operator to distribute his costs among the applicable phases reported with the exception of three items the costs of which are not to be distributed by the Operator. These three items are: "Operating Equipment Purchased", "Initial Rehabilitation and Repairs", and "New Buildings, Improvements, etc." The reason for not distributing these items on a monthly basis is doubtless clear to the Operator, since such distribution might well overstate the cost for any one month or period short of the entire contract period.

Form MF–104A has been designed to tie in with Form MF–104 for both monthly and cumulative costs. The "Total Costs" on Form MF–104A for each month should equal the monthly "Total Costs" as reported on Form MF–104. This is also true of the "Total Costs To Date".

In preparing Form MF–104A, it will be necessary frequently to distribute certain costs over a number of items. For instance, supervisory and engineering costs may have to be distributed over several phases, such as, drifting, crosscutting, raising, etc., provided that these items were reported active for the month. Such distributions should be made on the basis of time spent on the various phases, on man days of labor charged to such phases, or on some other equitable basis. "Operating Equipment", "Initial Rehabilitation and Repairs", and "New Buildings Improvements, etc.", will be distributed to the several phases of the project by the Washington Office of DMEA at the close of the project if determined necessary. The last two columns headed "Authorized by Contract" will be filled in by the Operator if such information is found in the contract. This information is usually a part of Exhibit "A" of the contract. A space for remarks has been provided for the use of the Operator to call attention to any unusual circumstances causing excessive or disproportionate unit costs.

GPO 872894

YAPUNCICH, SANDERSON & BROWN
LABORATORIES

P. O. Box 593
PHONE 9-8979

20 NORTH 31ST STREET
BILLINGS, MONTANA

RECEIVED
OCT 22 1956

Date 9-6-56

Lab. No. 77-U & 84-U

Invoice No.

Total Charges $

To: Burmac Exploration Corporation
P.O. Box 836
Williston, North Dakota

% D. D. Dallas

CERTIFIED URANIUM ASSAY REPORT

SAMPLE	RADIOMETRIC ASSAY Equivalent U_3O_8, % by weight	CHEMICAL ASSAY U_3O_8, % by weight
Lab No. 77-U		
D-153840	0.03	0.04
D-153638	0.07	0.11
D-153638A	0.07	0.09
Lab No. 84-U		
D-15233-38	0.11	0.13
D-15238-41	0.09	0.14
D-15233-381	0.01	0.04
M-141820	0.01	0.01
M-141820	0.01	0.04

Signed by A. S. Brown
Chemist

OCT 3 REC'D

RECEIVED
OCT 22 1956

September 28, 1956

COPY

Mr. John A. Bowsher
U. S. Bureau of Mines
301 Administration Building
Montana School of Mines
Butte, Montana

Re: Docket No. [illegible]-4197 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. IBm-8965

Dear Mr. Bowsher:

I am enclosing five signed copies of Forms MF-104 and MF-104A. Also enclosed are five copies of the invoice from Young Southern Exploration Company and five copies of the Certified Uranium Assay Report.

You will note that the cost per foot for coring averaged slightly more than the $2.60 allowed in the contract. The cost per foot for straight drilling, however, averaged only $0.819, whereas $1.00 per foot was allowed. Also in my calculations for the straight drilling costs, I included the entire cost for fourteen hours of travel time. Mr. Weissenborn stated in a telephone conversation with me that he thought this method of calculation would be approved so long as we do not exceed the total allowable cost for the 56 holes in Stage I.

Under this same cover I am sending five copies of a combined report which includes monthly progress, narrative and final reports.

Please contact me by phone or mail if you wish to have any additional information concerning these reports.

Sincerely yours,

Dois D. Dallas

Dois D. Dallas

DDDthl
Enc.

RECEIVED
OCT 22 1956

Grand Forks, N. Dak.
September 5, 1956

Dois D. Dallas, President
Burmac Exploration Corporation
Box 836
Williston, North Dakota

Dear Mr. Dallas,

Enclosed herewith is the geologic and engineering data gathered from Stage I of the exploration project D.M.E.A. 4107, preformed on the Ollie prospect, SW¼, Sec. 17 & S½ Sec. 18; Township 10 North Range 61 East M.P.M. and B, Fallon County, Montana from August 1, 1956 to August 25, 1956.
The gathering of data consisted of rotary core and non-core drilling to test sandstone-lignite seams of the Fort Union formation. All holes were logged geologically and probed radiometrically and sampled. Samples indicating mineralization were analyzed chemically and radiometorically.
A total of 3081 feet were drilled; 658 feet of coring and 2423 feet of non-coring. Although conventional coring of the unconsolidated sand gave 0% recovery the plug-coring method described in the report gave sufficient information as to the character of sedimentation and mineralization.

If you have any questions relative to this report do not hesitate to write me at the following address;

Wm. J. McCabe
308 Belmont Rd.
Grand Forks, North Dakota

Kindest personal regards,

Sincerely,

Wm. J. McCabe

RECEIVED
OCT 22 1956

xxxxxxxxxxxxxxxxxx
1201 N. Division Street
Spokane 2, Washington

October 17, 1956

Burmac Exploration Corporation
Box 836
Williston, North Dakota

Re: Docket No. DMEA 4107 (Uranium)
Contract Idm-2 965
Burmac Exploration Corporation
Monthly operating report for
August 1956

Gentlemen:

The subject operating report has been received and processed for payment.

You will note from the enclosed copy that a very small disallowance has been made from the cost claimed for non-core drilling. This was necessary because of a mathematical error.

As this will be your final voucher, we are obliged to withhold a portion of the Government's contribution to project costs pending a final audit of your records by a representative of the Contract Administration and Audit Division of DMEA. The amount being withheld is $250.00. This is standard procedure for all contracts.

We take this opportunity to thank you for submitting your final engineering report on the project so promptly.

By Field Team, Region I, NW District

Wing G. Agnew, Acting Executive Officer
U. S. Bureau of Mines

Donald R. MacLaren, Acting Member
U. S. Geological Survey

cc: DMEA (2)
USGS (2)
Wash. (2)
JDB
AD

C
O
P
Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

So. 157 Howard Street
Spokane 4, Washington

For Immediate Release

July 31, 1956

The Defense Minerals Exploration Administration announced today through its Field Team for Region I (Northwest District) that a contract has been executed with Burmac Exploration Corporation (a North Dakota corporatiln) for the exploration of a uranium deposit at the Cox Lease, Fallon County, Montana. The contract is in the amount of $15,512, of which the Government participation will be $11,634.

s/ A. E. WEISSEMBORN
A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW Dist.

RECEIVED
SEP - 3 1956

August 27, 1956

Mr. William McCabe, Geologist
Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. McCabe:

This will confirm our telephone conversation of this morning, in which I stated Stage II cannot be started before the results of Stage I have been received by us and evaluated. While you are compiling the results of Stage I, your own evaluation might indicate to you that you do not care to undertake Stage II.

Very truly yours,

Wing G. Agnew, Member
U. S. Bureau of Mines

cc: DMEA (2)
USGS (2)

vw

xxxxxxxxxxxxxxxxxx
So. 157 Howard Street
Spokane 4, Washington

August 21, 1956

MEMORANDUM

To: The Files

From: D. R. MacLaren

Subject: Telephone conversation with Mr. McCabe, geologist for Burmac Exploration Corporation, Docket No. DMEA-4107 (Uranium), Cox Lease, Fallon County, Montana, Contract Idm-E965

In accordance with a letter from Mr. Dois D. Dallas, Mr. McCabe called the Survey office to clarify certain points. Erickson and Bowsher of the Bureau were on extension phones and took part in the conversation. Points discussed were:

1. The independent drilling contract between Burmac and its driller calls for payment of $12.50 per hour while moving to the property from Billings, Montana, and while moving back to Billings. McCabe wanted to know if part of this cost could be included in its charges to DMEA should actual drilling costs prove to be less than the maximum allowed by the contract. He was advised to prorate the total estimated cost of the move to so-much-per-foot and include it with other items that will go to make up his total actual cost per foot; that is, if all items came to more than $2.60 per foot for core drilling, or more than $1.00 per foot for noncore drilling, the Government would pay only the maximum allowed.

2. McCabe wished to know whether or not authorization for Stage II and Stage III drilling would be entirely dependent upon the results of Stage I. He was told that they most certainly would, and was advised to send in hole data as soon as it was available without waiting for the due date of the 104's or until Stage I had been completed.

D. R. MacLaren

cc: DMEA (2)
USBM (2)
USBM (AD)
Alvord

RECEIVED
AUG 27 1956

xxxxxxxxxxxxxxxxx
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
AUG 13 1956

August 8, 1956

Air Mail

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Dallas:

In reply to your letter of July 28, 1956, the possibility of a delay between the conclusion of Stage I drilling and the authorization to start Stage II can be greatly reduced if you will have your holes logged radiometrically, and desired samples taken as drilling progresses, and have your samples assayed as soon as possible after they have been taken. If you will let us know a week or ten days before you expect Stage I to be completed, we will endeavor to have a representative of either the Survey or the Bureau of Mines make an inspection. There must be some evidence of ore, however, in one or more Stage I holes before Stage II drilling can be approved. This evidence would necessarily come from radiometric logs and chemical assays.

The contract calls for a progress report at the end of each month, but if you will send us the results of your radiometric logs and your assays as soon as you receive them, with a sketch that will identify each hole for location and collar elevation, we can evaluate the results of Stage I in the office as drilling progresses and will be able to decide, with a minimum of delay, what Stage II holes can be drilled.

By Field Team, Region I, NW District

A. E. Reissenborn, Exec. Officer
U. S. Geological Survey

Wing G. Agnew, Member
U. S. Bureau of Mines

cc: DMEA (2)
USBM (2)
USBM (AD)
Alvord

700

FILE COPY
Surname:
Ching
Elias
F. Johnson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

JUL 23 1956

Mr. Dois D. Dallas
Burmac Exploration Corporation
Post Office Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Contract No. Idm-E965
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

In reference to your letter of July 17, to Mr. A. E. Weissenborn, DMEA Executive Officer, Spokane, Washington, enclosed are the Consent to Lien forms submitted with your letter of July 10, 1956.

Sincerely yours,

Frank E. Johnson

ACTING Administrator

Enclosures

MChing/izm 7-20-56

cc to: Docket
Code 700
Mr. Ching
Admr.'s Reading File
DMEAField Team. Reg. I, NW Dist. (2)
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

R.C.

RECEIVED
JUL 27 1956

xxxxxxxxxxxxxxxxxx
So. 157 Howard Street
Spokane 4, Washington

July 23, 1956

Mr. Dois D. Dallas, President
Burmac Exploration Corp.
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA 4107 (Uranium)
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Dallas:

We are in receipt of your letter of July 17, 1956, with which you enclosed two copies of your Performance Bond in lieu of the qualified Consent to Lien which was not acceptable to the Government. Enclosed is your copy of Contract Idm-E965. As you request, the copies of the Consent to Lien forms are returned herewith. Forms and instructions for submitting your monthly progress report will be sent to you by the U. S. Bureau of Mines and should reach you within the next few days.

Progress inspections are made periodically by members of the U. S. Geological Survey and the U. S. Bureau of Mines, but it will not be necessary for us to have a representative on the property when the work starts. However, we will send someone over as soon as we can after the project has been started. The locations of the core and noncore holes are shown on the map accompanying the contract and your engineer should not have any difficulty locating them on the ground. While the holes should be located as closely as possible to their positions as indicated on the map, should an indicated hole fall at some inaccessible point, such as at the edge of a bluff or within an area of boulders, there is no objection to moving it as much as 25 or 30 feet. Before any significant departure from the terms of the contract, you should request authorization in a letter to the Field Team, giving the nature of the departure and the reasons therefor.

By Field Team, Region I, NW Dist.

A. E. Weissenborn, Exec. Officer
U. S. Geological Survey

Enclosures

Wing G. Agnew, Member
U. S. Bureau of Mines

cc: DMEA (2)
USBM (2)
USBM(AD) w/ 1 copy Contr. + Perf. Bond
Alvord

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
JUL 23 1956

July 18, 1956

Mr. George C. Selfridge, Chairman
DMEA Operating Committee
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corp.
Cox Lease
Fallon County, Montana
Contract No. Idm-E965

Dear Mr. Selfridge:

In accordance with your letter of July 10, enclosed are the original of the Performance Bond and two copies of a letter dated July 17 from Mr. Dallas. The Operator's copy of the contract will be forwarded to him in the next day or two.

Sincerely yours,

D R Mackaven
for A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW Dist.

Enclosures

cc: USBM (2)
USBM (AD)
Alvord

7-19-56

RECEIVED
JUL 19 1956

JULY 17, 1956

MR. A. E. WEISSENBORN
EXECUTIVE OFFICER, DMEA
SOUTH 157 HOWARD STREET
SPOKANE 4, WASHINGTON

RE: DOCKET NO. DMEA-4107
(URANIUM)
COX LEASE
FALLON COUNTY, MONT.
CONTRACT NO IDM-E965

COPY

DEAR MR. WEISSENBORN:

I AM ENCLOSING TWO COPIES OF THE PERFORMANCE BOND IN ACCORDANCE WITH THE TELEGRAM OF JULY 10 FROM MR. MITTENDORF.

IT IS STILL ANTICIPATED THAT WE WILL START THE DRILLING PROGRAM ON AUGUST 1, 1956. THE SURVEYING AND STAKING OF HOLES WILL TAKE PLACE ON THE TWO OR THREE DAYS PRECEDING AUGUST 1.

MR. WILLIAM J. MC CABE WILL BE THE GEOLOGIST WHO WILL DEVOTE FULL TIME TO THE PROJECT IN ACCORDANCE WITH THE GENERAL PROVISIONS UNDER EXHIBIT "A" OF THE CONTRACT. HIS ADDRESS AFTER WORK STARTS WILL PROBABLY BE C/O WESTGATE MOTEL, BEACH, N. D.

I AM ASSUMING THAT YOU WILL HAVE A REPRESENTATIVE VISIT AND INSPECT OUR OPERATIONS. SINCE I PLAN TO BE PRESENT FOR THE BEGINNING OF THE PROGRAM I WILL BE ANXIOUS TO MEET WITH YOUR REPRESENTATIVE AND DISCUSS THE DETAILS OF THE CONTRACT AS WELL AS OUR PLAN OF OPERATION.

WOULD YOU KINDLY ADVISE ME IF THERE ARE ANY SPECIAL FORMS, VOUCHERS, ETC. WHICH I WILL NEED IN ORDER TO COMPLY WITH THE TERMS OF THE CONTRACT.

FURTHER, WOULD YOU PLEASE RETURN THE "CONSENT TO LIEN" FORMS WHICH WERE ENCLOSED WITH THE COPY OF MY LETTER OF JULY 10 TO MR. MITTENDORF. YOU PROBABLY KNOW THAT THE FORMS WERE NOT ACCEPTABLE TO THE GOVERNMENT.

SINCERELY YOURS,

Dois D Dallas

DOIS D. DALLAS

ENCL: PERFORMANCE BOND (2 COPIES)
CC: C. O. MITTENDORF
W. J. MC CABE

700

Dept. the Interior

UNITED STATES DMEA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Surname copy
Ching
Ellis

COLLECT

JUL 13 1956

DOIS D. DALLA, PRESIDENT
BURMAC EXPLORATION CORPORATION
P. O. BOX 836
WILLISTON, NORTH DAKOTA

REURLET JULY 10 DOCKET DMEA-4107 QUALIFICATIONS ON CONSENT TO LIEN UNCLEAR AND UNACCEPTABLE. UNQUALIFIED CONSENT TO LIEN OR PERFORMANCE BOND SHOULD BE SUPPLIED.

C. O. Mittendorf

C. O. MITTENDORF

MChing/ai
7-13-56
cc to: Docket
Admr.'s Reading File
Operating Committee
Code 700
Mr. Ching
DMEA Field Team, Region I, NW District
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

7-13-56

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
952 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

JULY 10, 1956

U. S. DEPT. OF INTERIOR
DEFENSE MINERALS EXPLORATION ADM.
WASHINGTON 25, D. C.

ATTN: C. O. MITTENDORF,
ADMINISTRATOR

RE: DOCKET NO. DMEA-4107
COX LEASE (URANIUM)
FALLON COUNTY, MONT.

DEAR MR. MITTENDORF:

THIS WILL ACKNOWLEDGE RECEIPT OF YOUR TELEGRAM CONCERNING CONTRACT NO. IDM-E965.

I ALSO RECEIVED TODAY FROM MR. COX A REVISED CONSENT TO LIEN. APPARENTLY THE ATTORNEY FOR MR. COX, WHO PREPARED THE FORMER CONSENT TO LIEN, FEARED THAT MR. COX WAS GRANTING RIGHTS IN ADDITION TO THOSE TO URANIUM AND ASSOCIATED MATERIALS.

I REALIZE THAT THE SUBMITTAL OF THIS CONSENT TO LIEN IS SOMEWHAT IRREGULAR AND IF IT IS NOT ACCEPTABLE PLEASE ADVISE ME BY WIRE (COLLECT) AND WE WILL PROCEED WITH OBTAINING THE BOND. FOUR COPIES OF THE CONSENT TO LIEN ARE ENCLOSED AND THE REMAINING TWO WILL BE SENT TO MR. A. E. WEISSENBORN WITH A COPY OF THIS LETTER.

IF NECESSARY ARRANGEMENTS CAN BE MADE WE EXPECT TO START STAGE NO. 1 OF THE CONTRACT ON AUGUST 1, 1956.

SINCERELY YOURS,

Dois D. Dallas

DOIS D. DALLAS

ENCL: 4 MF-203, REVISED
CC: A. E. WEISSENBORN

RECEIVED
JUL 12 1956

Surname copy

700

Ching
Selfridge
Mr. Meuler

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

JUL 10 1956

Mr. A. E. Weissenborn
Executive Officer
DMEA Field Team, Region I
Northwest District
South 157 Howard Street
Spokane 4, Washington

Re: Docket No. DMEA-4107 (Uranium)
Contract No. Idm-R965
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

Dear Mr. Weissenborn:

Enclosed are the Operator, Field Team, and Finance Office copies of the subject contract, properly dated and executed.

We have wired the necessary information to the Operator for making out a Performance Bond. Upon receipt of two properly executed copies of the bond, please forward the Operator's copy of the contract to him. One copy of the bond should be forwarded to this office and one copy retained for the Finance Officer.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

Enclosures

APPROVED:

/s/ Robert W. Geehan

Member, Bureau of Mines

Thor H. Kiilsgaard

Member, Geological Survey

MChing/gla
7-5-56
cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700
Mr. Ching

Surname copy

DE[redacted]NT OF THE INTERIOR

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

DMEA
14X4401(01) Revolving Fund, Defense Production Act, Interior (Allocated Working Fund to the Office of the Secy.)

JUL 10 1956

(Uranium)

DOIS D. DALLAS, PRESIDENT
BURMAC EXPLORATION CORPORATION
P. O. Box 836
WILLISTON, NORTH DAKOTA

Ching
Kis
Guhon
Kielgaard
Selfridge
Pelmeon
Chambers

RECEIPT JUNE 4 DOCKET DMEA-4107, FOR PERFORMANCE BOND UNE CONTRACT NO. IEM-2965, CONTRACT DATE JULY 5, 1956. AMOUNT OF BOND $11,634.00. FORWARD TWO COPIES PERFORMANCE BOND TO A. E. WEISSENBORN, SOUTH 157 HOWARD STREET, SPOKANE 4, WASHINGTON. WEISSENBORN WILL FORWARD YOU YOUR COPY EXECUTED CONTRACT UPON RECEIPT OF BOND.

C. O. Mittendorf (for)

C. O. MITTENDORF, ADMINISTRATOR

MChing/gla
7-5-56
cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700
Mr. Ching
DMEA FieldTeam, Region I, NW Dist.(2)
Confirmation to Burmac Exploration Corporation

R.C.H.

7-5-56

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
952 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

JULY 3, 1956

U. S. DEPARTMENT OF INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

ATTN: MR. C. O. MITTENDORF,
ADMINISTRATOR

RE: DOCKET NO. DMEA-4107
(URANIUM) COX LEASE
FALLON COUNTY, MONT.

DEAR MR. MITTENDORF:

ENCLOSED ARE THE ORIGINAL AND FIVE COPIES OF THE PROPOSED LONGFORM DMEA CONTRACT WHICH WE RECEIVED YESTERDAY FROM THE SPOKANE OFFICE. WE HAVE FOUND THIS CONTRACT TO BE SATISFACTORY TO US AND HAVE EXECUTED SAME.

PLEASE NOTIFY US AS SOON AS POSSIBLE AFTER THE DATE ON WHICH THE CONTRACT BECOMES EFFECTIVE.

SINCERELY YOURS,

Dois D. Dallas

DOIS D. DALLAS

ENCL: FIVE COPIES AND
ORIGINAL OF DMEA
PROPOSED CONTRACT

CC: A. E. WEISSENBORN

RECEIVED
JUL 5 - 1956

7/2/56

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
JUL 2 - 1956

June 29, 1956

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

Enclosed are an original and five copies of a proposed long-form contract prepared in the Washington office of the DMEA. If you find it in order, would you please sign and return all six copies to Mr. C. O. Mittendorf, Administrator, Defense Minerals Exploration Administration, Washington 25, D. C., as soon as possible, and inform this office when you have done so. When the contract shall have been signed and dated by the Administrator, your copy will be forwarded to you. The final starting date of August 15, 1956 has been inserted in Article 3. We believe that this should give adequate time. You actually can start as soon after the date the contract is signed by the Administrator as you wish, as long as work begins before August 15.

This procedure is slightly different than is customary, but is necessary because the Defense Production Act, by which the DMEA program is promulgated, has not yet been extended by the Congress beyond June 30, 1956. Washington, however, wanted to have the contract signed by you so that it could be signed by the Administrator without loss of time, provided the Defense Production Act is extended. In view of these circumstances, the contract has not been numbered, dated or signed by the Administrator. We wish to make clear there is no contract in effect until it has been signed by the Administrator. Therefore, any work done by you prior to the effective date of the contract (to be inserted by Washington) will be for your own account and cannot be participated in by the Government.

As you were informed in a letter dated June 4, 1956, signed by Ernest Wm. Ellis, Chief of the Rare and Miscellaneous Metals Division, you will be supplied with the details for filling out the Performance Bond when the contract is signed by the Administrator.

By Field Team, Region I, NW Dist.

A. E. Weissenborn, Exec. Officer
U. S. Geological Survey

Wing G. Agnew, Member
U. S. Bureau of Mines

Enclosure as above

cc: DMEA (2)
USBM (2)
Alvord

Surname copy

DEPARTMENT OF THE INTERIOR

DMEA

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.

14X44C1(C1) Revolving Fund, Defense Production Act, Interior (Allocated Working Fund to the Office of the Secy.)

Ching
Selfridge
Johnson
Weissenborn

TELETYPE

A. K. WEISSENBORN
EXECUTIVE OFFICER
DMEA FIELD TEAM, REGION I
NORTHWEST DISTRICT
SCFD. 157 HOWARD STREET
SPOKANE 4, WASHINGTON

JUN 28 1956

(Uranium)

RECURLET JUNE 25 DUBBLE EXPLORATION CORPORATION DOCKET 4107.

BECAUSE OF CHANGED PROCEDURE DESCRIBED IN POSTSCRIPT, REQUIREMENT NO. 2

CANCELLED TO ENABLE OPERATOR SIGN CONTRACT. DETAILS FOR PERFORMANCE

BOND WILL BE SUPPLIED OPERATOR WHEN CONTRACT SIGNED BY ADMINISTRATOR.

George C. Selfridge

GEORGE C. SELFRIDGE (GCS)
CHAIRMAN, OPERATING COMMITTEE

MChing/gla
6/27/56
cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700
Mr.Ching
Confirmation to Region I, NWDist.

R.G.

Surname copy

Ching
Ellis
Alexander
Johnson
Mattenson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Mr. A. E. Weissenborn
Executive Officer,
DMEA Field Team, Region I
Northwest District
South 157 Howard Street
Spokane 4, Washington

JUN 25 1956

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

Dear Mr. Weissenborn:

Enclosed are the original and five copies of a proposed long-form contract between the Government and Burmac Exploration Corporation, ~~signed by the Administrator~~. The contract consists of Form MF-200, Annex I, Exhibit "A" and two maps (Figure 1 and Figure 2). Also enclosed are two extra copies each of Annex I, Exhibit "A" and the maps (Figure 1 and Figure 2) for the use of the Field Team.

If you find the contract in order, it is ready for the signature of the Operator, provided that the following requirements are met:

1. The insertion of a suitable final starting date under Article 3.

2. Receipt by you of the Performance Bond referred to in Article 2(c) of the contract. In this connection, details for filling out the Performance Bond will be supplied to the Operator by this office as indicated in Ernest Wm. Ellis' letter of June 4, 1956, to Burmac Exploration Corporation.

As you know there has been a considerable difference of opinion both in the field and among the members of our commodity group in Washington as to whether an exploration project is warranted in this case. In view of the widespread mineralization exposed by the preliminary work of the Operator, the rather inconclusive results regarding continuity of the deposits, reported to date, the geological possibility of encountering thicker and higher grade ore

R.C.S.

zones in structural lows such as local flexures and basins, and the fact that this is a new area warranting a somewhat greater risk than better known areas, we believe that a small project such as that covered by the attached contract is in order.

The program outlined by the examining geologist has been modified somewhat in order to more thoroughly test two well-defined areas, the SW¼ of sec. 17 and the S½ of sec. 18. The total footage remains the same. The area covered by the contract has been enlarged to include the whole of sections 17 and 18. We understand that this is agreeable to the Operator.

Since no costs were included with the Report of Examination, we have estimated costs which are reasonable and consistent with costs included with the application.

Sincerely yours,

W. S. Martin
ACTING Chairman, Operating Committee (WSM)

Enclosures

APPROVED:

P. F. Yopes (PFY)
Member, Bureau of Mines

Thor H. Kiilsgaard (THK)
Member, Geological Survey

MChing/ai 6/21/56
cc to: Docket
Admr.'s Reading File
Operating Committee
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700
Mr. Ching

P.S. Contracts to be signed by Operator before execution by the Government. This action is necessary as administrative safeguard until Defense Production Act is extended by the Congress. Please do not date.

DRAFT
6/11/56
MChing/ai

DOCKET COPY

MF-200
(Revised June 1954)

Docket No. DMEA - 4107

Commodity Uranium

Contract No. Idm-E

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

EXPLORATION PROJECT CONTRACT[1]

It is agreed this ..... day of ....., 195...., between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and [2] Burmac Exploration Corporation, a North Dakota Corporation, whose mailing address is P. O. Box 836 Williston, North Dakota, hereinafter called the "Operator," as follows:

ARTICLE 1. *This contract* is entered into under the authority of the Defense Production Act of 1950, as amended. It consists of this form (MF-200), the attached Exhibit "A," Annex I, and two maps (Figure 1 and Figure 2).
The Operator shall not transfer or assign this contract or any right thereunder without the written consent of the Government.

ARTICLE 2. *Operator's property rights.*—(a) The land which is the subject of this contract (hereinafter called "the land") is in the State of Montana, County of Fallon, and is described in Annex I.[3]

(b) The Operator represents and undertakes that:

(1) The Operator is the [4] Lessee of [5] the mineral rights in the land, in possession and entitled to possession for all of the purposes of this contract, under and by virtue of an [6] assignment of lease, [7] recorded in Book ....., page ....., official records of said County; and

(2) The Operator's right, title, or interest (whether as owner, lessee, or otherwise) is subject only to the following claims, liens, or encumbrances: None

(c) The Subordination Agreement of the holder of any claim, lien, or encumbrance listed above, and (if the Operator does not hold the legal title) the Consent to Lien of any holder of the legal title

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] Insert name, and if an organization, its nature (corporation and place of incorporation, partnership with names of partners, etc.).
[3] State on a separate sheet marked "Annex I" the legal description or enough to identify the property, particularly excluding any areas from which the production is not to be subject to the Government's percentage royalty.
[4] Insert "owner," "lessee," "contract purchaser," "locator," etc.
[5] Insert "the entire interest," "the mineral rights," "an undivided one-third," etc.
[6] Insert "deed," "lease," "contract," "location notice," "patent," etc.
[7] If not recorded, so indicate by inserting "un."

of the land (lessor, seller, optionor, etc.), are attached, as follows: Performance Bond supplied in lieu of Consent to Lien by George P. Cox and Ruth E. Cox.

(d) The Operator shall preserve and maintain his right, title, and interest in the land and his right to the possession thereof for the purposes of this contract, and shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of this contract. Until the lapse of the time within which the Government may make a certification of discovery or development without any such certification having been made, and after any such certification has been made, the Operator shall neither transfer, convey, nor surrender the land nor any right, title, or interest therein, nor permit nor suffer any claim, lien, or encumbrance thereon, without expressly referring to and providing in the instrument of conveyance, lien, or encumbrance for the preservation of the Government's right to a percentage royalty on production and lien for the payment thereof. If the Government makes no certification of discovery or development within the time limited in Article 8, it shall thereafter have no claim against the land or any production therefrom except for any production referred to in Article 8(b)(1).

ARTICLE 3. *The exploration project.*—The project is a search for indicated or undeveloped deposits of Uranium. The work to be performed is described in Exhibit "A." The Operator on or before ..... shall commence the work, and on or before October 31, 1956 (unless the Operator's obligation to prosecute the work is terminated—see Article 10) shall either have completed the work or shall have incurred allowable costs (see Article 6) in a sum not less than the estimated total allowable cost set forth in Exhibit "A."

ARTICLE 4. *Performance of the work.*—(a) *Operator's responsibility.*—The work shall be performed with reasonable diligence, efficiently, expertly, in a workmanlike manner, in accordance with good mining standards and State regulations for health and safety and for liability insurance covering employment; and with suitable and adequate equipment, facilities, materials, supplies, and labor, to bring it to completion within the time fixed.

(b) *Independent contracts.*—To the extent that the allowable costs are estimated in Exhibit "A" with express reference to performance by independent contractors on a unit-price basis (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations), the work may be so performed; but if the reference in Exhibit "A" to any such independent contract requires the Government's approval thereof, payments under such contract will not be allowable costs unless the Government gives its written approval of the contract. Any such independent contract shall refer to some specific and identifiable part of the work, and shall be subject to all of the pertinent terms and conditions of this exploration contract; but the Government shall not be considered a party thereto, and its rights under this contract, including the right to terminate its contributions, shall not be affected thereby. Regardless of the provisions of any such independent contract and regardless of the Government's approval thereof, the Government will participate in payments to the independent contractor only on account of work performed in accordance with the provisions of this exploration project contract, and only to the extent that the Government deems the unit prices for the work under the independent contract to be reasonable.

(c) *Government may inspect.*—The Operator shall consult with and inform the Government on all phases of the work as it progresses. The Government may enter at all reasonable times to inspect the work under the contract, and also after a certification of discovery or development to inspect production operations and underground workings. The operator shall provide the Government with all reasonable means of access for such inspections.

ARTICLE 5. *Contribution by the Government.*—The estimated total allowable cost of the project, set forth in Exhibit "A," is the sum of $15,512.00. The Government shall contribute 75 percent of the allowable costs as they are incurred in a total sum not in excess of $11,634.00: *Provided,* That until the Operator has rendered to the Government his final report, and any final auditing required by the Government has been made, and a final settlement of the contract has been made, the Government may withhold from the last

voucher or vouchers such sums as it sees fit not in excess of 10 percent of the estimated total cost of the work or not in excess of the amount of the Government's contribution to the cost of property which is or may become subject to disposal as provided in Article 9(c), whichever is greater. The Government will make its contribution on the basis of the monthly vouchers referred to in Article 7(b), but all payments by the Government are provisional only, subject to audit, until the account between the Operator and the Government is finally audited and settled. "Costs incurred" mean costs that have been paid or have become due and payable, or that in the opinion of the Government have become an obligation. The Government may make payments directly to independent contractors and suppliers for the account of the Operator rather than to the Operator.

ARTICLE 6. *Estimated costs.*—(a) *Categories of costs.*—The allowable costs of the work to which the Government shall contribute are limited to those that are direct, reasonable, necessary, and that are estimated in Exhibit "A" by categories as specified in this article. If any category or subcategory is omitted from the estimate of costs, or if the word "none" is annexed to the listing thereof, costs under such category or subcategory are not allowable. Any excess over any estimate which is indicated as the maximum of any category, subcategory, or item, either as to requirement or related cost, and any excess over the estimated total allowable cost of the work, shall not be allowable. Any excess over the estimate of any category, subcategory, or item, either as to requirement or related cost, not indicated as a maximum shall be allowable within the limit of the estimated total allowable cost of the work. To the extent that excesses over maximums other than the estimated total allowable cost of the work may be necessary for the performance of the work, the Operator shall incur such excesses for his own account without contribution by the Government; but except for any such necessary excesses in categories, subcategories, or items thereunder the Operator is not obligated to incur more than his agreed percentage of the estimated, total allowable cost of the work. See Article 13

To the extent specified in this article or in Exhibit "A" the following categories, subcategories, and elements thereof are maximums; but if not so specified either here or in Exhibit "A" they are not maximums, and may be exceeded within the limit of the estimated total allowable cost of the work:

CATEGORY (1)—INDEPENDENT CONTRACTS.—Work to be performed under independent contracts (see Article 4(b)). The estimated total amount of this category and the estimated cost of each unit of work for performance under an independent contract are maximums.

CATEGORY (2)—PERSONAL SERVICES.

Subcategory (a)—Supervision.—All elements of this subcategory (number of supervisors, periods of employment, rates of pay, and total) are maximums.

Subcategory (b)—Technical services.—All elements of this subcategory (number of technicians, periods of employment, rates of pay, and total) are maximums.

Subcategory (c)—Labor.

CATEGORY (3)—OPERATING MATERIALS AND SUPPLIES.—Includes such items as drill bits and steel, explosives, fuel, pipe, power, small tools costing less than $50 each, timber, track.

CATEGORY (4)—OPERATING EQUIPMENT.

Subcategory (a)—Rental.—The number of each object to be rented [6 mine cars, 1 truck], the rate of rental [$100 per month, $5 per hour], and the total of this subcategory are maximums.

Subcategory (b)—Purchases.—The estimated total of this subcategory is a maximum.

Subcategory (c)—Depreciation.—All elements of this subcategory (time periods, rate of depreciation, and subcategory total) are maximums.

CATEGORY (5)—INITIAL REHABILITATION AND REPAIRS.—Estimates under this category include all requirements and related costs, such as labor, materials and supplies, and supervision at a rate not higher than provided for in Category (2), and shall not be duplicated under any other category. The estimated total of this category is a maximum.

Subcategory (a)—Initial rehabilitation and repairs of existing buildings, fixtures, and installations (exclusive of mine workings).—The estimated total of this subcategory is a maximum.

Subcategory (b)—Initial rehabilitation and repairs of operating equipment.—The estimated total of this subcategory is a maximum.

CATEGORY (6)—NEW BUILDINGS, FIXTURES, AND INSTALLATIONS (EXCLUSIVE OF MINE WORKINGS).—Estimates under this category include all requirements and related costs, such as labor, materials and supplies, and supervision at a rate not higher than provided for in Category (2), and shall not be duplicated under any other category. The estimated total of this category is a maximum.

CATEGORY (7)—MISCELLANEOUS.—Repairs and maintenance (other than initial) of operating equipment, analytical work, prints and other reproductions, accounting, Operator's share of payroll taxes, liability insurance covering employment, travel, communications, and any other items of requirement or cost that do not fall within any of the first 6 categories.

THE ESTIMATED TOTAL ALLOWABLE COST of the work is a maximum.

(b) *Nonallowable costs.*—The following costs are not allowable for contribution by the Government:

(1) *Costs of the land,* such as rental, depreciation, depletion, or other cost of acquiring, owning, or holding possession;

(2) *Indirect costs,* such as general overhead, corporate management, interest, taxes (other than payroll and sales taxes), insurance (other than liability insurance covering employment), damages to persons, damages to property (other than necessary repairs or replacements of equipment or other property used in the work);

(3) *Previous work* performed or costs incurred before the date of this contract; and

(4) *Deferred payments.*—Any costs incurred by the Operator under any rental-purchase agreement, installment-purchase agreement, or any agreement for the purchase of goods under the provisions of which payment of the full purchase price is deferred more than 90 days from the delivery of the goods; unless the purchase agreement is approved by the Government in writing.

(c) *Reductions in costs.*—The Operator shall account for and give the Government credit for any incidental benefits, credits, or money received in the ordinary course of business in prosecuting the work (as by salvage or sale of materials or equipment, furnishing of room or board, furnishing of power or services to third persons, rebates or discounts on purchases, etc.), in the same ratio in which the Government contributes to costs; and such amounts shall be treated as a reduction in costs incurred so that they are available for use within the limit of the original estimated total cost. This provision does not apply to receipts from production which are subject to the Government's percentage royalty under the provisions of Article 9. See Article 13.

ARTICLE 7. *Reports, accounts, audits.*—(a) *Operator's records.*—The Operator shall keep suitable records and accounts of the work performed and of any production in which the Government may have an interest; and shall preserve those with respect to work performed for at least three years after final payment by the Government, and those with respect to production for at least three years after any obligation to pay royalties to the Government has terminated. The Government may inspect and audit said records and accounts at any time, either by itself or by a certified public accountant. If the Government elects to audit said records and accounts relating to the exploration work by certified public accountant, it may do so as a cost of the work to which the Operator shall contribute. The Comptroller General of the United States or his representative, until the expiration of said three-year periods, shall have access to and the right to examine any pertinent books, documents, papers, and records of the Operator. All of the Operator's vouchers and records and accounts relating thereto and the Government's payments thereof remain subject to adjustment until final audit by the Government. If work under this contract is carried on in conjunction with any other operations, or if labor, supervision, services, materials, supplies, equipment, facilities, or other requirements for carrying on the work are also used in connection with other operations, the costs shall be segregated and accounted for on a basis and by methods and accounts that are satisfactory to and approved by the Government.

(b) *Progress reports and vouchers.*—The Operator shall provide the Government with five copies of monthly progress reports in three sections as follows: (1) Operator's Monthly Report and Voucher showing detailed costs incurred during the reporting period; (2) Operator's Unit Cost and Progress Report showing the various types of work performed during the reporting period and costs incurred for each type of work; and (3) a Narrative Report of the work performed during the reporting period including adequate engineering-geological maps or sketches, drill hole logs and locations, and assay reports on samples taken concurrently with advance in mineralized ground. (Forms for reporting under (1) and (2) above will be provided by the Government.)

(c) *Final report.*—Upon completion of the work or termination of the Government's obligation to contribute to costs, the Operator shall furnish the Government with five copies of a final report (in addition to the final progress report and voucher). This final report shall include a geological and engineering evaluation of the results of the work performed under the contract with an estimate of the ore reserves resulting from such work, complete assay data, adequate geological and engineering maps or sketches, and a summary of the work performed and related costs incurred.

(d) *Report of sales.*—The Operator shall provide the Government with suitable accounting and documentary evidence covering all production to which the Government's percentage royalty relates, such as copies of smelter or concentrator settlement sheets, and certified accounts of production and sale or other disposition of production.

(e) *Compliance with requirements.*—If in the opinion of the Government any of the Operator's reports, records, or accounts are insufficient or incomplete, or if the Operator fails to make them, the Government may procure the making or completion of such with suitable attachments as an expense of the work to which the Operator shall contribute. The Government may withhold approval and payment of any vouchers relating to insufficient or incomplete reports, records, or accounts.

ARTICLE 8. *Repayment by Operator.*—(a) *Certification.*—If the Government considers that a discovery or development from which production may be made has resulted from the work, the Government, at any time not later than six months after a sufficient final report and final account (see Article 7) has been rendered, may so certify in writing to the Operator. Such certification shall describe broadly or indicate the nature of the discovery or development.

(b) *Royalty on production.*—The Operator, as principal if the Operator is the producer, or as surety if the Operator is not the producer, shall pay to the Government a royalty on all minerals mined or produced from the land, as follows: (1) regardless of any certification of discovery or development, from the date of the contract until the lapse of the time within which the Government may make such certification, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first; or (2) if the Government makes a certification of discovery or development, within a period of ten years from the date of the contract, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first.

(c) *Basis for computation.*—The Government's royalty shall be a percentage of the gross proceeds (including any bonuses, premiums, allowances, or other benefits) from the production sold, in the form sold (ore, concentrates, metal, or equivalent), at the point of delivery (the f. o. b. point); *except,* that charges of *the buyer* arising in the regular course of business, and shown as deductions on the buyer's settlement sheets, on account of the cost of treatment processes performed by *the buyer,* sampling and assaying to determine the value of the production sold, and freight paid by *the buyer* to a carrier (not the Operator), shall be allowed as deductions in arriving at the "gross proceeds" as that term is used herein. Any costs of treatment processes, sampling or assaying, or transportation, performed or paid by the Operator or by anyone other than the buyer, are not deductible in arriving at the "gross proceeds" as that term is here used. The term "treatment processes," as here used, means those processes (such as milling, concentrating, smelting, refining, or equivalent) applied to the crude ore or other production after it is extracted from the ground, to put it into a commercially marketable form; excluding fabricating or manufacturing.

(d) *Unsold production.*—If any production (ore, concentrates, metal, or equivalent), after the lapse of six months from the date the ore was extracted from the ground, remains neither sold nor used by the Operator in integrated manufacturing or fabricating operations (for instance, if it is stockpiled), the Government, at its option, as long as it so remains, may require the computation and payment of its royalty on the value of such production in the form (ore, concentrates, metal, or equivalent) it is in when the Government elects to require computation and payment. If any production is used by the Operator in integrated manufacturing or fabricating operations before the Government makes its election, the Government's royalty on such production shall be computed on the value therof in the form in which and at the time when it is so used. "Value" as here used means what is or would be gross income from mining operations for percentage depletion purposes in Federal income tax determination, or the market value, whichever is greater.

(e) *Percentages of royalty.*—The percentages of the Government's royalty shall be as follows:

One and one-half (1½) percent of amounts ("gross proceeds" or "value") not in excess of eight dollars ($8.00) per ton of production in the form in which sold, held, or used, plus one-half (½)

percent for each additional full fifty cents ($0.50) by which such amounts exceed eight dollars ($8.00) per ton, but not in excess of five (5) percent of such amounts.

(For instance: the royalty on an amount of five dollars ($5.00) per ton would be one and one-half (1½) percent; on an amount of ten dollars ($10.00) per ton, three and one-half (3½) percent.)

(f) *Time for computation and payment.*—The Government's royalty shall be computed and paid currently upon each lot sold, held, or used in integrated operations, as the case may be, as above provided in this article.

(g) *Lien for payment.*—To secure the payment of its percentage royalty, there is hereby granted to the Government a lien upon the land or the Operator's interest in the land and upon any production of minerals therefrom, until the royalty claim is extinguished by lapse of time or is fully paid.

(h) *Notice to purchasers.*—The Operator shall give notice of the Government's claim for royalty to any purchaser of the production, and shall authorize and direct such purchaser to pay the royalty directly to the Government and to furnish the Government with copies of the settlement sheets. If the records of any production and sales or other disposition of production, whether the production is by the Operator or by others, are not made available to the Government, the amount of the royalty may be estimated by the Administrator, Defense Minerals Exploration Administration, or his successor, and his estimate thereof shall be final and binding upon the Operator.

(i) *No obligation to produce.*—Nothing in this contract is to be construed as imposing any obligation on the Operator or the Operator's successor in interest to engage in any production operations.

(j) *Government not obligated to buy.*—Nothing in this contract shall be construed as imposing any obligation on the Government to purchase any minerals mined or produced from the land.

ARTICLE 9. *Interests in purchased property.*—(a) *Title and ownership.*—All costs under this contract shall be incurred by the Operator in the Operator's own name and for the Operator's own account; but any property acquired to the cost of which the Government contributes shall belong to the Operator and the Government jointly in proportion to their respective contributions, although title thereto shall be taken in the name of the Operator.

(b) *Preservation of property.*—Until the final disposal of any property in which the Government has an interest the Operator shall preserve and protect same for the best interest of the Government, any reasonable and necessary costs thereof to be treated as an allowable cost of the project. After the completion of the work or termination of the Government's obligation to contribute, or when such property is not in use for or needed for the work, the Operator shall neither use it without the written consent of the Government nor without paying a reasonable rental to be fixed by the Government for its interest.

(c) *Disposal of property.*—Upon the completion of the work or termination of the Government's obligation to contribute to costs, or when the property is no longer needed for the work, the Operator shall promptly dispose of salable or salvageable property in which the Government has an interest for the joint account of the Government and the Operator, either by return to the vendor, by sale to others, or purchase by the Operator or the Government at a price at least as high as could be obtained from others, unless the Government in writing waives its interest in any such property. Without advance approval of the sales price by the Government the Operator shall not sell at any price any item of property the cost of which was more than $500, and shall not sell at less than 25 percent of the purchase price any item of property which cost $500 or less. The Government, in lieu of approving the sales price for any such item, may itself purchase the item at the best price which the Operator is able to obtain or himself cares to give. Property remaining upon any termination of the work shall be considered in groups or categories (such as drill steel, or explosives, or pipe, or rails), and if the original cost of the remaining unexpended portion of any such group or category is less than $50, the Government waives its interest therein. If necessary to accomplish the disposal of any item the Operator shall dismantle and sever it from the land, the cost thereof to be treated as a cost of the project.

(d) *Default of the Operator re disposal.*—If within 90 days after the completion of the work or termination of the Government's obligation to contribute to costs, or after the property is no longer needed for the work, or after such further time as the Government may in writing allow, the Operator has failed to sell or otherwise liquidate or dispose of any property in which the Government has an interest, the Government, at any time prior to final settlement under the contract, may pursue one of the following two courses: (1) the Government, by written notice to the Operator, may place upon such property what in its opinion is a fair valuation thereof, not in excess of the cost less 1.66 percent per month from the

date such property was purchased under this contract to the termination of said 90-day period; and such property shall thereupon be considered and accounted for as having been purchased by the Operator at the valuation so fixed by the Government; or (2) the Government may enter and take possession of such property wherever it may be found, and remove and dispose of it for the joint account of the parties.

ARTICLE 10. *Termination of the Government's obligations.*—(a) If in the opinion of the Government operations at any time have failed to achieve anticipated results that indicate the probability of making a worthwhile discovery, and in the opinion of the Government further operations are not justified, the Government may give the Operator written notice thereof, and thereupon: (1) the Government shall be free of all obligation to contribute to costs not then incurred other than such as may be allowable under the provisions of the contract as necessary and incidental to winding up, reporting, and accounting; and (2) the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting.

(b) If in the opinion of the Government the Operator is in any manner in default under the terms of the contract, the Government may give the Operator written notice of such default with a specification of reasonable time within which the default must be cured; and if the Operator fails to cure such default as required, thereupon: (1) the Government shall be relieved of all obligation to contribute to costs not incurred when the notice was given, other than such as may be allowable by the provisions of the contract as necessary and incidental to winding up, reporting, and accounting; and (2) the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting. The remedy provided for the Government in this paragraph "(b)" is in addition to any other remedy provided in this contract, and in addition to any other remedy the law may provide for breach of contract.

(c) The giving of any notice by the Government under the provisions of this Article 10 shall not affect the Government's rights as provided for in the contract with respect to a percentage royalty, and such rights shall be fully preserved.

ARTICLE 11. *Notices to be given by the Government* may be delivered to the Operator, or may be sent by registered mail addressed to the Operator at his mailing address stated in this contract. If mailed, notices are deemed to have been delivered five days after the date of mailing.

ARTICLE 12. *Officials not to benefit.*—No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 13. *Changes and added provisions.*—

~~(a) Categories (2) through (7) of Article 6(a) are deleted.~~

~~(b) To the extent that costs are set forth in Exhibit "A" as "Fixed Unit Costs" they are in lieu of the actual costs that otherwise would be allowable costs of the project under Article 6 of the contract. The Government will contribute to the Fixed Unit Costs as they accrue, on the basis of units of work actually performed.~~

The fixed unit costs include all costs of the work necessary to complete the project.

16—70617-1

(c) That part of the last sentence in the first paragraph of Article 6(a) commencing after the semicolon, is deleted.

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

By .....

.....
(Operator)

By .....

.....

I, ..., certify that I am the ..... secretary of the corporation named as Operator herein; that ..... who signed this contract on behalf of the Operator, was then ..... of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

.....

[CORPORATE SEAL]

U. S. GOVERNMENT PRINTING OFFICE 16—70617-1

DRAFT
6/11/56
MChing/ai

EXPLORATION PROJECT CONTRACT
BURMAC EXPLORATION CORPORATION
DOCKET NO. DMEA-4107

ANNEX I

The land referred to in Article 2 of the Contract consists of all of sections 17 and 18 Township 10 North, Range 61 East, M. P. M. and B., Fallon County, Montana. The land is shown on the map (Figure 1) entitled, "Property Map of the Burmac Exploration Corporation Ollie Prospect," attached hereto and made a part hereof.

DRAFT
6/11/56
MChing/ai

EXPLORATION PROJECT CONTRACT
BURMAC EXPLORATION CORPORATION
DOCKET NO. DMEA-4107

Exhibit "A"

Description of the Work

General Provisions

The work consists of rotary core and non-core drilling to test sandstone-lignite zones of the Fort Union formation of Paleocene age. The general location of the work is indicated on the attached maps (Figures 1 and 2).

Drill core shall be BX in size except where maintenance of this size is impracticable , in which case AX core may be substituted. Core drill holes shall be reamed and cased as necessary. All the core and cuttings from core drill holes shall be saved and checked radiometrically for equivalent uranium. Sections indicating significant mineralization shall be split for samples and such samples shall be analyzed chemically for uranium. All the remaining core and cuttings saved shall be properly stored and labeled for inspection and disposition by the Government.

Non-core holes shall have a minimum diameter of 2½ inches. Drill cuttings shall be collected with a Duclone sample collector or equivalent unit and samples taken at 2-foot intervals. Samples shall be checked radiometrically for equivalent uranium and those indicating significant mineralization shall be analyzed chemically for uranium. A portion of each sample taken shall be properly labeled and stored

for inspection and disposition by the Government.

All drill holes shall be logged geologically and probed radiometrically, and the record of such logging and probing, together with certified copies of all assay certificates, shall be submitted with the Operator's monthly progress reports.

The project work shall be supervised at all times by a competent mining engineer or geologist, who shall devote full time to the project.

The location, direction, inclination, and extent of all project work are subject to the approval of the Government.

The work is divided into three stages as described hereinafter. The Operator shall complete Stage I, and shall perform as much of the work under Stages II and III as the Government approves in writing in advance.

Stage I

In the SW¼ of sec. 17 drill 4 core holes and 22 non-core holes, aggregating approximately 1440 feet, at the locations indicated on the map (Figure 2). A circled cross represents a core hole and a plain cross represents a non-core hole. This work is designed to complete a grid with holes spaced 400 feet apart and at the same time offset certain mineralized holes previously drilled by the Operator. The holes are expected to average approximately 55 feet in depth. The 4 core holes shall be drilled first to establish geological controls.

In the S½ of sec. 18 drill 6 core holes and 24 non-core holes, aggregating approximately 2100 feet, at the locations indicated on the

map (Figure 1). Alternate east-west lines of holes are staggered, with the lines 660 feet apart and the hol s in each line also 660 feet apart. The northernmost and southernmost lines are 330 feet from the borders of the area being explored and the easternmost and westernmost holes are 330 feet from the section boundaries. The holes are expect d to average approximately 70 feet in depth. The 6 core holes shall be drilled first to establish geological controls.

If the 56 hole require more than 3540 feet to reach the desired horizon, the additional footage and funds required may be transferred and deducted from Stage III footage and funds upon the written approval of the Government. The footages estimated for the S½ of sec. 17 and the S½ of sec. 18 are interchangeable as required.

Stage II

In the SW¼ of sec. 17 drill approximate 36 non-core holes aggregating approximately 1980 feet as 200-foot offsets to previously drilled holes that show significant mineralization.

In the S½ of sec. 18 drill approximately 30 non-core holes aggregating approximate y 2,100 feet as 330-foot of sets to Stage I holes that show mineralization or favorable sandstone-lignite zones.

If the approximately 66 holes of this stage require more than 4080 feet to reach the desired horizon, the additional footage and funds required may be transferred and deducted from Stage III footage and

funds upon the written approval of the Government. The footages estimated for the SW¼ of sec. 17 and the S½ of sec. 18 are interchangeable as required.

Stage III

In the SW¼ of sec. 17 drill not more than 36 non-core holes aggregating not more than 1980 feet as offsets to previously drilled holes showing significant mineralization. These holes may be offset from 50 to 100 feet from previously drilled holes.

In the S½ of sec. 18 drill not more than 20 holes aggregating not more than 1400 feet as offsets to previously drilled holes showing significant mineralization. These holes shall be drilled at least 100 feet from any previously drilled hole.

The footages estimated for the SW¼ of sec. 17 and the S½ of sec 18 are interchangeable as required.

Estimated Cost of the Project

Stage I

Actual Costs

Category (1) Independent Contracts		
2,900 ft. rotary non-core drilling @ $1.00/ft.	$ 2,900.00	
640 ft. core drilling @ $2.60/ft	1,664.00	
Categories (2) through (7) None	--	
Total		$ 4,564.00

Fixed Unit Costs (See Article 13)

Incidental allowance for each foot of core and non-core drilling completed 3,540 ft. @ $0.24/ft.	849.60	
50 chemical sample analyses @ $4.25/sample	212.50	
Total		1,062.10
Estimated total cost of Stage I		$ 5,626.10

Stage II

Actual Costs

Category (1) Independent Contracts		
4,080 ft. rotary non-core drilling @ $1.00/ft.	$ 4,080.00	
Categories (2) through (7) None	--	
Total		$ 4,080.00

Fixed Unit Costs (See Article 13)

Incidental allowance for each foot of rotary non-core drilling completed

4,080 ft. @ $0.24/ft.	$ 979.20	
75 chemical sample analyses @ $4.25/sample	318.75	
Total		$ 1,297.95
Estimated total cost of Stage II		$ 5,377.95

Stage III

Actual Costs

Category (1) Independent Contracts

3,380 ft. rotary non-core drilling @ $1.00/ft.	$ 3,380.00	
Categories (2) through (7) None	—	
Total		$ 3,380.00

Fixed Unit Costs

Incidental allowance for each foot of rotary non-core drilling completed

3,380 ft. @ $0.24/ft.	811.20	
75 chemical sample analyses @ $4.25/sample	318.75	
Total		1,129.95
Estimated total cost of Stage III		$ 4,509.95

S U M M A R Y

Estimated total cost of Stage I	$ 5,626.00
" " " " " II	5,377.00
" " " " " III	4,509.00
Estimated total cost of project	$15,512.00
Government participation @ 75%	$11,634.00

Surname copy
Ellis

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

June 21, 1956

Memorandum

To: The Files

From: Michael Ching, Mining Engineer
Rare and Miscellaneous Metals Division

Subject: Justification for Proposed Contract
Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

There has been a considerable difference of opinion in the field as well as among the members of the commodity group in Washington as to whether an exploration project is warranted in this case.

E. W. Parsons, USBM member of the examining team recommends denial of the application because the ore lenses found to date in the area are thin, associated with lignite, and limited in extent, and the grade is too low for economical mining by open cut methods when consideration is taken of the thickness of the overburden, its unconsolidated nature, and the large amount of dilution that would take place.

D. C. Alvord, USGS member of the examining team, recommends an exploration project because a considerable amount of ore grade material has been encountered in preliminary drilling by the Applicant. The deposits may prove to have more continuity than indicated by the drilling to date, and there is a possibility that thicker and richer ore bodies may be found in a structural low in the S½ of sec. 18. The bulk of the uranium is in sandstone and thus could be recovered by standard concentrating methods. Potential deposits could feasibly be strip mined.

Lawrence Y. Marks and Donald L. Curry of the Casper, Wyoming office of the AEC believe that there are possibilities for producing small tonnages of low-grade ore in the area and that the S½ of sec. 18 would be a suitable place for exploratory drilling directed at locating new ore bodies. They point out the need for testing of stratigraphic units other than those already known.

Eugene W. Grutt, Jr., Manager, Casper Branch Office of the AEC, believes along with Marks and Curry that the subject area is promising enough to justify a DMEA project.

The Field Team, in a letter dated April 20, 1956, believes that in order to encourage exploration in the new area, we should be prepared to take a greater risk than in better known areas. Nevertheless, it recommended denial of the application because the ore beds were too thin and too low grade for a DMEA project. (While in Washington shortly thereafter Mr. Weissenborn appeared to be in favor of a project and certainly was not opposed to it.)

In the Washington commodity group John E. Crawford, USBM, favors denial of the application and W. P. Williams, USGS, lists some strong points in favor of a project.

Joseph O. Hosted, the Washington representative of the AEC, is in favor of a project.

In view of the widespread mineralization exposed by the preliminary work of the Operator, the rather inconclusive results regarding continuity of the deposits reported to date, the geological possibility of encountering thicker and higher grade ore zones in structural lows such as local flexures and basins, and the fact that this is a new area warranting a somewhat greater risk than better known areas, it is believed that a small exploration project is in order. Such a project will not only give more conclusive answers to questions regarding continuity of the ore zones and the possible presence of thicker and richer ore bodies, but the results will serve as a guide in appraising other applications of a marginal nature from this new area. It is believed that the question of the economics of mining in this area should be considered only after the nature and potential size of the ore bodies have been definitely ascertained.

In the proposed contract the exploration program outlined by the examining geologist has been modified somewhat in order to more thoroughly test two well-defined areas, the SW$\frac{1}{4}$ of sec. 17 and the S$\frac{1}{2}$ of sec. 18. The total footage of drilling remains the same. The area covered by the contract has been enlarged to include the whole of sections 17 and 18. It is understood that this is agreeable to the Operator.

Since no costs were included with the Report of Examination, estimated costs that are reasonable and consistent with those included with the application were used in the proposed contract. These estimated costs include Independent Contract costs of $1.00 per foot for rotary non-core drilling and $2.60 per foot for core drilling. The only other costs are fixed unit costs of $4.25 per sample for chemical analyses and an incidental allowance of $0.24 per foot of core and non-core drilling completed. The incidental allowance was arrived at as follows:

Total footage 11,000
Total drilling time $2\frac{1}{2}$ months

	Total Cost	Cost/ft.
Labor and supervision ($2\frac{1}{2}$ mos. @ $800/mo.)	$2,000.00	$ 0.18
Miscellaneous ($2\frac{1}{2}$ mos. @ $250/mo.)	625.00	0.06
Total incidental allowance	$2,625.00	$ 0.24

Michael Ching

Michael Ching

Surname copy

Ching

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

June 13, 1956

Memorandum

To: Associate Solicitor, Division of Mineral Resources

From: Ernest Wm. Ellis, Chief
Rare and Miscellaneous Metals Division

Subject: Docket No. DMEA-4107
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

Will you kindly prepare a long-form contract between the Government and Burmac Exploration Corporation in accordance with the attached draft.

The two maps referred to are in process of being photostated.

Applicant has advised that it is willing to furnish a Performance Bond in lieu of a Consent to Lien by George P. Cox and Ruth E. Cox.

Ernest Wm. Ellis

MChing/ai
6/13/56
cc to: Docket
Code 700
Mr. Ching

6/11/56 gla

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
952 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

June 8, 1956

RECEIVED
JUN 11 1956

Mr. Ernest Wm. Ellis, Chief
Rare and Miscellaneous Metals Division
U. S. Department of Interior
Defense Minerals Exploration Administration
Washington 25, D. C.

Re: Docket No. DMEA - 4107 (Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Ellis:

I am enclosing a confirmation telegram expressing the willingness of Burmac to substitute a "Performance Bond" in lieu of a satisfactory Consent to Lien form which we were unable to obtain from Mr. Cox.

Our local insurance representative does not have a supply of the "standard form 25" mentioned in your letter of June 4, 1956. If you have this form available in your office, will you please send a few copies. Otherwise, we will ask the insurance representative to make other arrangements for them.

Sincerely yours,

Dois D. Dallas

Dois D. Dallas

DDD:hl
Enc.

DOMESTIC SERVICE	
Check the class of service desired; otherwise this message will be sent as a full rate telegram	
FULL RATE TELEGRAM	
DAY LETTER	
NIGHT LETTER	

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S
E

WESTERN UNION

W. P. MARSHALL, PRESIDENT

1213 (Rev. 10-51)

INTERNATIONAL SERVICE	
Check the class of service desired; otherwise the message will be sent at the full rate	
FULL RATE	
LETTER TELEGRAM	
SHIP RADIOGRAM	

NO. WDS.-CL. OF SVC.	PD. OR COLL.	CASH NO.	CHARGE TO THE ACCOUNT OF	TIME FILED
			RECEIVED JUN 11 1956	

Send the following message, subject to the terms on back hereof, which are hereby agreed to

To ERNEST WM. ELLIS, CHIEF
RARE AND MISCELLANEOUS METALS DIVISION — JUNE 7, 1956 19

Street and No. U. S. DEPARTMENT OF INTERIOR, DEFENSE MINERALS EXPLORATION
Care of or Apt. No. ADMINISTRATION — Place WASHINGTON 25, D. C.

RE: DOCKET NO. DMEA-4107 (URANIUM)
COX LEASE
FALLON COUNTY, MONTANA

PLEASE BE ADVISED THAT BURMAC IS WILLING TO SUBSTITUTE A PERFORMANCE BOND IN LIEU OF A SATISFACTORY CONSENT TO LIEN.

Dois D. Dallas
BY: DOIS D. DALLAS, PRESIDENT
BURMAC EXPLORATION CORPORATION
BOX 836
WILLISTON, NORTH DAKOTA

Sender's name and address (For reference) — *Sender's telephone number*

ALL MESSAGES TAKEN BY THIS COMPANY ARE SUBJECT TO THE FOLLOWING TERMS:

To guard against mistakes or delays, the sender of a message should order it repeated, that is, telegraphed back to the originating office for comparison. For this, one-half the unrepeated message rate is charged in addition. Unless otherwise indicated on its face, this is an unrepeated message and paid for as such, in consideration whereof it is agreed between the sender of the message and the Telegraph Company as follows:

1. The Telegraph Company shall not be liable for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the unrepeated-message rate beyond the sum of five hundred dollars; nor for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the repeated-message rate beyond the sum of five thousand dollars, unless specially valued; nor in any case for delays arising from unavoidable interruption in the working of its lines.

2. In any event the Telegraph Company shall not be liable for damages for mistakes or delays in the transmission or delivery, or for the non-delivery, of any message, whether caused by the negligence of its servants or otherwise, beyond the actual loss, not exceeding in any event the sum of five thousand dollars, at which amount the sender of each message represents that the message is valued, unless a greater value is stated in writing by the sender thereof at the time the message is tendered for transmission, and unless the repeated-message rate is paid or agreed to be paid and an additional charge equal to one-tenth of one per cent of the amount by which such valuation shall exceed five thousand dollars.

3. The Telegraph Company is hereby made the agent of the sender, without liability, to forward this message over the lines of any other company when necessary to reach its destination.

4. The applicable tariff charges on a message destined to any point in the continental United States listed in the Telegraph Company's Directory of Stations cover its delivery within the established city or community limits of the destination point. Beyond such limits and to points not listed in the Telegraph Company's Directory of Stations, the Telegraph Company does not undertake to make delivery but will endeavor to arrange for delivery by any available means as the agent of the sender, with the understanding that the sender authorizes the collection of any additional charge from the addressee and agrees to pay such additional charge if it is not collected from the addressee.

5. No responsibility attaches to the Telegraph Company concerning messages until the same are accepted at one of its transmitting offices; and if a message is sent to such office by one of the Telegraph Company's messengers, he acts for that purpose as the agent of the sender; except that when the Telegraph Company sends a messenger to pick up a message, the messenger in that instance acts as the agent of the Telegraph Company in accepting the message, the Telegraph Company assuming responsibility from the time of such acceptance.

6. The Telegraph Company will not be liable for damages or statutory penalties when the claim is not presented in writing to the Telegraph Company, (a) within ninety days after the message is filed with the Telegraph Company for transmission in the case of a message between points within the United States (except in the case of an intrastate message in Texas) or between a point in the United States on the one hand and a point in Alaska, Canada, Mexico, or St. Pierre-Miquelon Islands on the other hand, or between a point in the United States and a ship at sea or in the air, (b) within 95 days after the cause of action, if any, shall have accrued in the case of an intrastate message in Texas, and (c) within 180 days after the message is filed with the Telegraph Company for transmission in the case of a message between a point in the United States and a foreign or overseas point other than the points specified above in this paragraph; provided, however, that this condition shall not apply to claims for damages or overcharges within the purview of Section 415 of the Communications Act of 1934, as amended.

7. It is agreed that in any action by the Telegraph Company to recover the tolls for any message or messages the prompt and correct transmission and delivery thereof shall be presumed, subject to rebuttal by competent evidence.

8. Special terms governing the transmission of messages according to their classes, as enumerated below, shall apply to messages in each of such respective classes in addition to all the foregoing terms.

9. No employee of the Telegraph Company is authorized to vary the foregoing.

4-54

CLASSES OF SERVICE

DOMESTIC SERVICES

TELEGRAM

The fastest domestic service.

DAY-LETTER (DL)

A deferred same-day service, at low rates.

NIGHT LETTER (NL)

Economical overnight service. Accepted up to 2 A. M. for delivery the following morning, at rates lower than the Telegram or Day Letter rates.

INTERNATIONAL SERVICES

FULL RATE (FR)

The fastest overseas service. May be written in code, cipher, or in any language expressed in Roman letters.

LETTER TELEGRAM (LT)

For overnight plain language messages, at half-rate. Minimum charge for 22 words applies.

SHIP RADIOGRAM

For messages to and from ships at sea.

6-8-56

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

1201

RECEIVED JUN - 8 1956

The filing time shown in the date line on domestic telegrams is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

MA379

M WLA076 NL PD= WILLISTON NDAK 7= 1956 JUN 7 PM 9 09

ERNEST WM ELLIS CHIEF RARE AND MISCELLANEOUS METALS
DIVISION = U S DEPARTMENT OF INTERIOR DEFENSE
MINERALS EXPLORATION ADMINISTRATION WASHDC=

RE DOCKET NO DMEA-4107 (URANIUM) COX LEASE FALLON COUNTY MONTANA PLEASE BE ADVISED THAT BURMAC IS WILLING TO SUBSTITUTE A PERFORMANCE BOND IN LIEU OF A SATISFACTORY CONSENT TO LIEN=

DOIS D DALLAS PRESIDENT BURMAC EXPLORATION
CORPORATION BOX 836 WILLISTON NDAK=

RECEIVED
JUN - 8 1956

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

700

FILE COPY
Surname:
Chang
Ellis
Mathewson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

JUN - 4 1956

Mr. Dois D. Dallas
Burmac Exploration Corporation
Post Office Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

This is to advise you that the Consent to Lien executed by George P. Cox and Ruth E. Cox in connection with the subject application is not acceptable by the Government because of the added provision under Article 5.

In view of the difficulty you have had in securing a satisfactory Consent to Lien, you may wish to substitute a Performance Bond in lieu thereof. Such a bond is executed on Standard Form 25, prescribed by the General Services Administration. You will find that most surety companies have these forms and are familiar with the requirements connected with them. The amount of the bond would be the amount of the Government's participation in the proposed exploration project.

Inasmuch as a contract is yet to be approved by this office, the contract number, contract date, and amount of the bond is not presently available for incorporation in a Performance Bond. However, if you are agreeable to supplying a Performance Bond, we suggest that you advise us accordingly, and make preliminary arrangements for securing such a bond. When and if a contract is approved, we will wire you the required information for inclusion in the bond. For the purposes of your preliminary inquiry, the amount of the bond would be in the neighborhood of $12,000.00.

At this time we wish to thank you for your letter of May 18 in answer to ours of May 14, 1956. The information contained in your letter was rather disappointing as we had hoped that your open pit tests were complete and that they would give us some proof of the favorable characteristics of the deposits on your property.

We shall continue to process your application pending word from you regarding a satisfactory Consent to Lien or a Performance Bond in lieu thereof.

Sincerely yours,

SIGNED

Ernest Wm. Ellis, Chief
Rare and Miscellaneous Metals Division

R.L.

Messrs. JECrawford, Rm. 3643*
THKilsgaard, Rm. 5224*
JOHosted, Rm. 3210, GSA

Admr.'s Reading File
DMEA Field Team, Reg. I, NW Dist. (2)*

MChing/izm 6-4-56
cc to: Docket, Code 700*
Mr. Ching
*w/cc Aps. let. of 5-18 & cc memo to Dois Dallas from Dr. Donald Towse, Exploration Manager, dated 2-8-56.

5/29/56 gla

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D. C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
MAY 28 1956

May 25, 1956

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

Dear Mr. Selfridge:

Enclosed are six each Consents to Lien signed by George P. and Ruth E. Cox; Joe Crisafulli & Sons; and James G. Key.

Sincerely yours,

A. E. Weissenborn
A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW District

Enclosures

cc: USBM (2)
Alvord

Note: The Consent to Lien by the Coxes is not satisfactory and those by the Crisafullis and Keys are not required for the purposes of a contract.
MLE.

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
926 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 834
WILLISTON, NORTH DAKOTA

May 24, 1956

Yours
Dra
al

RECEIVED
MAY 2 5 1956

Mr. A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, N. W. District
South 157 Howard Street
Spokane 4, Washington

Re: Docket No DMEA - 4107
(Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Weissenborn:

The final effort we made to get Mr. Cox's "consent to lien" was successful. This matter was discussed in my letter to you dated May 9, 1956.

You will please find enclosed (6 each) "consent to lien" forms signed by Cox, The Crisafulli-Schmitz partnership, and James Key.

If there is any additional information which you need in connection with our application, please advise me.

Sincerely yours,

/s/ Dois D. Dallas

Dois D. Dallas

DDD:hl
Enc.

RECEIVED
MAY 25 1956
U.S.G.S.
SPOKANE, WASH.

5/21/56

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
926 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

RECEIVED
MAY 21 1956

May 18, 1956

U. S. Department of Interior
Defense Minerals Exploration Administration
Washington 25, D. C.

Attn: Ernest Wm. Ellis, Chief
Rare and Miscellaneous Metals Division

Re: Docket No. DMEA-4107 (Uranium)
Cox lease, S½ Sec. 18,
T. 10 N., R. 61 E.
Fallon County, Montana

Dear Mr. Ellis:

I am very pleased to supply you with the supplementary information requested in your letter of May 14 to me.

The test load of ore which we shipped to the ore buying station in Edgemount, South Dakota was taken from the pit in area "A", however, it was not obtained from the bed indicated by holes A7 and A12, rather it was obtained near hole A11.

Our objective had been to secure the test load from the bed found in holes A7 and A12. We stripped the overburden to this level, finishing the operation late one evening, then before our geologists had an opportunity to collect samples and study the bed the water level rose to some two feet above the bed. Pumping equipment was moved to the pit and the water level lowered sufficiently to complete a preliminary geological investigation. The water level again rose above the bed within less than 24 hours and the early cold weather the following night caused the freezing reported to you by your field examiners.

In the process of excavating for the ore between holes A7 and A12, another thin mineralized bed was encountered at the south edge of the inclined excavation. Since this bed was encountered at about 7' from the surface we believe it reasonable to assume that it was the north extension of the bed encountered in hole A11.

Since we were unsuccessful in securing the test load from holes A7 and A12, the decision was made to attempt securing a test load from the bed exposed in the pit just a few feet northeast (not more than 25 feet) of hole A11.

Our test load was not commercial according to reports received from the Grand Junction office of the AEC. I am enclosing a copy of a letter written to our exploration manager Dr. Towse by Mr. P. W. Simmons of the Grand Junction office. Also enclosed is a copy of a memorandum sent to me by Dr. Towse concerning the amenability test. We were quite naturally disappointed with the results of the test load, however, it was somewhat

expected since we were working under hazardous weather conditions on a substitute bed which was less promising as indicated on the radioactivity logs.

The following is in reply to the 6 points raised in your letter and the information is applicable to the ore bed between holes A7 and A12 unless so indicated:

1. The average thickness of the overburden excavated was 19½ feet.

2. The average thickness of the ore bed exposed was 2 feet.

3. The only ore removed from the bed was done so with a dragline while preparing a trench through the bed for geological investigation; consequently, the small amount of ore which was removed was thoroughly diluted with overlying and underlying material.

4. See enclosed letters by Towse and Simmons for results of amenability tests.

5. No dilution factor was employed in this operation. A substitute bed was being used which was of inferior quality.

6. In the matter of other pertinent information, I would like to state that we have found the water level in the pit to be considerably higher this spring after the thaw. It is now some 10 to 12 feet below the surface and we do not plan to commence operations again for a few weeks. We hope the water level will again lower to near the top of the bed.

It is rather difficult to understand why there should be such a great variation in the separate sample analysis. Perhaps it can be attributed to not mixing thoroughly before shipping to the various laboratories. In any event, we are confident that a commercial and amenable test will be obtained when the conditions are favorable.

We will have no objection to having the contract, if approved, apply to any other portion or all of the Cox lease if the government so desires.

If there is any additional information which you wish in order to process our application, please write to me.

Sincerely yours,

Dois D. Dallas

Dois D. Dallas

DDD:hl
Enc.

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
926 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

C O P Y

MEMORANDUM Feb. 8, 1956

RECEIVED
MAY 21 1956

To: Dois Dallas
From: Donald Towse
Subject: Samples for amenability test, Waldron lease.

Appended hereto is the report from P. W. Simmons of the AEC Ore Procurement branch. He reports that, due to expense of amenability tests, mineral identification was tried on our samples instead. They couldn't separate the uranium minerals by gravity separation.

The assays given from Simmons' report are different from those we have had before. A different method, wherein all the uranium wasn't extracted may have been used. This table gives the comparisons:

Sample 1024C	Jerome	AEC Miles City	Simmons
U_3O_8	.212%	-----	0.04%
eU_3O_8	0.18	-----	0.34
Sample 29-1			
U_3O_8	0.18%	0.12%	0.10%
eU_3O_8	0.19	0.12	0.19
Middle #2 bed	Minerals Assay Lab		Simmons
U_3O_8	0.06%		0.04%
eU_3O_8	---		0.09

(Middle number 2 bed is sample of trial shipment)

Assays being by the same method, all these should have been similar, they being identical samples.

Due to the extremely small size of the uranium mineral particles in the ore, it is not surprising that they made no separation by heavy liquid separation. Mineral has been identified as meta-tyuyamunite, an amenable mineral, by X-ray diffraction. (see memo on reports from AEC Miles City office)

Another carefully selected sample might be obtained from near the surface, and certainly could be mined from the deep #3 bed when the country thaws.

Perhaps we should have amenability check made by a private laboratory at our expense.

Further checks on assayers by sending duplicate samples to a number of different places should be used to determine which assayers are reliable on this particular type of ore.

/S/ Donald F. Towse

UNITED STATES
ATOMIC ENERGY COMMISSION
Grand Junction Operations Office
Grand Junction, Colorado

C O P Y

In Reply Refer to: MD:MWS

February 2, 1956

Burmac Exploration Corporation
926 Park Avenue
Dickinson, North Dakota

Attention: Dr. Donald Towse, Exploration Manager

Gentlemen:

We acknowledge receipt of your letter of November 29, 1955, announcing your shipment of three samples from your Waldon lease, and requesting that amenability tests be made on them. Also acknowledged is receipt of your follow-up letter of January 20, 1956. The three samples were received in good condition.

Radiometric and chemical assays were made of the three samples with the following results:

		% U_3O_8	% eU_3O_8	% $CaCO_3$
Sample 1024C	upper No. 1 bed	0.04	0.34	3.7
Sample 29-1	lower No. 3 bed	0.10	0.19	0.6
Sample	middle No. 2 bed	0.04	0.09	5.0

A comparison of the radiometric and chemical assays indicates that your material is far out of equilibrium.

Because the U_3O_8 content of the material did not warrant the considerable expenditure of money for amenability tests, mineralogic identifications were made in lieu thereof. The identification of the uranium minerals in a sample usually will indicate the amenability of a uranium ore. This was not possible in the case of your samples as a heavy medium separation failed to provide sufficient radioactive material for uranium mineral identification. Minerals found in your samples are biotite-muscovite, hypersthene, quartz, feldspars, zircon, and tourmaline, with clay as a cementing agent.

We are sorry for the long delay in replying to your request and hope that this information will be helpful to you.

Very truly yours,

/S/ P. W. Simmons, Acting Chief
Ore Procurement Branch
Mining Division

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
MAY 18 1956

May 15, 1956

Mr. Dale D. Dallas, President
Bureau Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

Thank you for your letter of May 9, 1956.

Inasmuch as you are having difficulty in obtaining a Consent to Lien from Mr. Cox, I would suggest that you postpone further efforts to have a Consent signed until you hear from our Washington office.

Sincerely yours,

Wing G. Agnew
Acting Executive Officer, DMEA
Field Team, Region I, NW District

cc: DMEA (2) w/incoming
USGM (2) "
Alvord "

BURMAC EXPLORATION CORPORATION

DR. DONALD TOWSE, Exploration Manager
902 PARK AVENUE
DICKINSON, NORTH DAKOTA

DOIS D. DALLAS, President
POST OFFICE BOX 836
WILLISTON, NORTH DAKOTA

May 9, 1956

vrs

RECEIVED
MAY 18 1956

Mr. A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, N. W. District
South 157 Howard Street
Spokane 4, Washington

Re: Docket No DMEA - 4107
(Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Weissenborn:

We have been having a most difficult time negotiating with Mr. Cox's attorney for the "consent to lien" which was requested by your office. There is a cash consideration involved which we believe to be unreasonable.

We are making one final effort in the form of a counter proposal to get this instrument signed by Mr. Cox and I expect to know the result by May 15, 1956. In the event we are unsuccessful in these negotiations do you think either of the following plans would receive approval:

(1) Filing with you "consent to lien" forms signed by all other interested parties except Mr. Cox.

(2) Amend our original DMEA application to have the contract apply to one of the adjacent tracts.

I will greatly appreciate having your recommendation in this matter.

Sincerely yours,

Dois D. Dallas

DDD:hl

Appl. went in April 20 - denial recommended. Should hear soon.
Gmk

700

FILE COPY
Surname: Chang

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

MAY 14 1956

Mr. Reis D. Dallas, President
Burmac Exploration Corporation
Post Office Box 636
Williston, North Dakota

Re: Docket No. DMEA-4197 (Uranium)
S½ sec. 18 T. 10 N., R. 61 E.
Fallon County, Montana

Dear Mr. Dallas:

In reviewing the reports by your Mr. Towse and by our field examiners on your property in Fallon County, we note that a large pit approximately 75 feet wide and 100 feet long was excavated in the NE¼ of the SW¼ of Section 19 to expose the ore beds for assaying and amenability tests, and for stripping and mining tests. The pit was excavated in Area "A," shown on the map accompanying your application, between the two ore holes A7 and A12. The area undoubtedly represented the most favorable area found up to that time.

It is our understanding that 4,790 cubic yards of material were removed from the pit, and that your application was forwarded to us before the results of the work were available for appraisal. Our field examiners report that the bottom of the pit was covered with ice at the time of their inspection and the results of the amenability and other tests made by you were not then available.

A detailed analysis of the results of the work done on the aforementioned pit is desired by this office in connection with the processing of your application. Such analysis should include, if possible, the following information:

1. The average thickness of the overburden excavated.

2. The average thickness of the ore bed exposed.

3. The quantity of ore extracted from the pit and the average U_3O_8 content of such ore.

4. The results of the amenability tests on the ore.

5. An analysis of the dilution factor connected with the operation.

6. Other pertinent information resulting from the work.

RCh.

Your application included only the S½, sec. 18, T. 10 N., R. 61 E. It is our understanding that in the event an exploration contract is approved by the Government, you would be willing to include the SW¼ of sec. 17 in the project. Your confirmation of this understanding is requested.

We shall continue to process your application upon receipt of the above-requested information.

Sincerely yours,

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

MChing/izm 5-11-56
cc to: Docket
Code 700
Mr. Ching
Admr.'s Reading File
DMEA Field Team, Reg. 1, NW distirct (1)
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

5-11-56

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
MAY 11 1956

May 10, 1956

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

From: John E. Crawford, Bureau of Mines Member
Uranium Commodity Committee

Subject: Report of Examination, DMEA Docket 4107, Burmac Exploration Corp., Cox Lease, Fallon County, Montana

I have reviewed the report of examination, DMEA Docket 4107, Burmac Exploration Corp., Cox Lease, Fallon County, Mont., dated April 26, and received in this office May 3, 1956. I have also discussed it with Joseph O. Hosted, Washington representative of the Atomic Energy Commission.

The Burmac Exploration Corp. has discovered radioactive lignite material on the Montana-North Dakota Border. Drilling by the applicant on the subject claims indicates the presence of small, discontinuous, irregular lenses, or long narrow patches of sandy lignite which is capped with crossbedded, loosely cemented, unconsolidated sand.

The examining engineer recommends that the application be denied because the size, distribution, and continuity of the deposits are too small, too sparsely scattered, and too irregular over the area to constitute commercial ore. Other reasons for denial are (1) marginal grade of the ore, (2) questionable minability of the deposits, (3) unavoidable dilution of the marginal ore, (4) amenability of the lignitic material, (5) known trends of ore deposition, and (6) expense of restoration of surface after mining operations.

The field team, Region I, concur in the recommendation that the application be denied. Mr. Hosted recommends that the proposal to drill the S½ Sec. 18 be favorably considered. He feels that further testing of the uraniferous sandstones and lignites is warranted.

I concur in the recommendation of the examining engineer and the field team that the application be denied.

John E Crawford

John E. Crawford

5-9-56

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
MAY 8 - 1956

May 7, 1956

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of field examination reports, DMEA 4107 (uranium), Burmac Exploration Corporation, Cox lease, Fallon County, Montana.

The subject property has been examined in the field by two geologists from the U. S. Geological Survey, two geologists from the Atomic Energy Commission, and an engineer from the U. S. Bureau of Mines.

From the field examiner's separate reports it is seen that the four geologists are all agreed that exploration work is desirable on the property and that the geologic feasibility of making a discovery exists. The engineer, on the other hand, concludes that geologic conditions are unfavorable, and the known ore deposits may not be economically minable.

Unfavorable features of the property are quoted from the engineer's report and are discussed below:

1. "The deposits which are lens-shaped . . . are too thin, too small, . . . and too sparsely scattered . . . to constitute commercial ore."

Nowhere in DMEA regulations does there exist the stipulation or the prerequisite that "commercial ore" must exist on the property before favorable consideration will be given by DMEA. The primary aim of the examining team should be to determine the possibility of significant ore reserves existing on the property and to determine the chances of discovering any such possible reserves by known exploration methods.

According to the geologists' reports ore deposits in the area are found in rapidly thinning and thickening beds which are often in stream channel structures. Under such conditions many holes must be expected to be drilled before favorable structures

are located and the thicker, better grade deposits are discovered. Furthermore, under the same geologic conditions, to extrapolate the results of exploration work in one area to an unexplored area, or to say that since a small amount of drilling has discovered only small deposits all deposits in the district will be small would seem to be questionable exploration philosophy.

2. "The indicated average grade of the . . . material . . . is about the minimum grade acceptable."

Here, again, primary consideration should be given the chances of finding as good or higher grade ore than that already discovered by the limited work. Curiously, the fact that the known mineralization is of acceptable grade is in favor of, rather than against, the proposed project.

3. "Stripping ratio is too great . . . " (ranges between 15 to 1 and 50 to 1 by engineer's estimate; geologists estimate 22 to 1).

Stripping is being done at the Rattlesnake uranium mine in Lisbon Valley, Utah, at a ratio of 30 to 1, and the grade of the ore is not exceptionally high.

4. " . . . unavoidable dilution . . . would lower the grade . . . to the submarginal point."

The examining engineer estimates a maximum dilution of 100 percent. The geologists estimate a maximum of 7-1/2 percent dilution. Close, constant supervision and careful use of a good radiation detection instrument during stripping and mining would serve to reduce dilution. As experience is gained in mining the deposits the dilution percentage should become quite low.

5. "No amenability tests have been completed so it is not known whether the material can be classed as ore."

The geologic report points out that most of the uranium is in sandstone, not lignite, and the uranium would, therefore, be recoverable by standard methods.

6. "Drilling has already indicated the type of ore bodies that can be expected . . ."

This statement has been covered in item 1 above, and no further comment is offered.

Reasons have been presented as support for denial of the application. The principal thesis, however, of the arguments against the proposed work seem to be that because minable ore deposits have not been found by a very restricted amount of exploration by the applicant, minable deposits will not be found by the proposed work.

The favorable geologic reports on the property attempt to show that present knowledge is inadequate concerning the size, grade, and distribution of the deposits and that the geologic possibility exists that larger, minable deposits may be present on the little-explored area described in the application.

I am of the opinion that the property warrants further exploration with DMEA participation. I recommend that a contract be approved to provide for the work as outlined in the examining geologist's report.

W. P. Williams

W. P. Williams

5-1-56

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
APR 26 1956

April 20, 1956

Mr. George C. Selfridge, Chairman
Operating Committee, DMEA
Department of the Interior
Washington 25, D. C.

Re: Docket No. DMEA-4107 (Uranium)
Burmac Exploration Corporation
Cox Lease
Fallon County, Montana

Dear Mr. Selfridge:

Enclosed are reports from E. W. Parsons, Bureau of Mines, and D. C. Alvord, Geological Survey, concerning a proposed project by Burmac Exploration Corporation in Fallon County, Montana. Max H. Burgendahl of the Denver office of the Geological Survey was detailed to assist Alvord because of his familiarity with similar geology in South Dakota and Wyoming.

Although recognizing the marginal nature of the deposit, Alvord and Burgendahl recommend approval of the project, as do AEC geologists (report enclosed) from the Commission's Casper, Wyoming office who also have examined it. The favorable recommendation is based on the fact that the deposit is incompletely explored, that it is in some ways similar to deposits in Wyoming that are being exploited, and that it is in a new locality where a success would open a new area to prospecting.

Parsons recommends denial. He points out the amount of stripping that would be required; the fact that the uranium is in part in lignite, and that the average thickness of the bed is only about 1.6 feet and its grade less than 0.20 percent U_3O_8; that a high proportion of the holes already drilled are barren or very low in uranium content and that the known ore lenses are small.

Parsons' statement that the overburden may average nearly 50 feet in thickness appears only partly true as over much of the area the uranium-bearing bed is at much shallower depth. His concern over the high lignite content of the ore bed may not be too significant for from present knowledge much of the uranium appears to be in a

ON-SITE EXAM.

Reviewed by
DMEA OPERATING COMMITTEE
4-30-56
(date)

"trashy" sandstone -- not in a lignite bed. Likewise, his concern about the high proportion of "dry" holes and the probable small size of the ore bodies can perhaps to some degree be discounted for in most instances the holes are widely spaced, the habit of the ore bodies is not known, and closer drilling could conceivably show a greater continuity of the ore lenses than that now apparent. His comments on the low grade of the ore bed, its thinness, and the resultant high dilution that would result if the bed were strip-mined are extremely pertinent.

Because of the apparent marginal character of the deposit the Field Team hesitated for some time before reaching a decision. It is our opinion that this part of eastern Montana is one in which significant uranium discoveries might be made, and consequently we believe that in order to encourage exploration in a new area DMEA should be prepared to take a greater risk than it would in a better known area such as the Colorado Plateau. The Burmac ore bed, however, seems too thin and too low grade to warrant DMEA participation and we recommend denial of the application.

By Field Team, Region I, NW District

A. E. Weissenborn / O.H.

A. E. Weissenborn, Executive Officer
U. S. Geological Survey

Wm G. Agnew

Wm G. Agnew, Member
U. S. Bureau of Mines

Enclosures 3 (in quad.)

cc: USBM (2)
AEC
Alvord
USGS(SRO)

UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF RAW MATERIALS

EWG:et

Casper Branch Office

Casper, Wyoming
April 5, 1956

Mr. A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region 1, NW District
South 157 Howard Street
Spokane 4, Washington

RE: Docket DMEA-4107

Dear Mr. Weissenborn:

Since our telephone conversation yesterday concerning proposed Federal aid to the Burmac Corporation, I have reviewed a copy of the geologic report by Curry and Marks.

We believe that the Burmac area is promising enough to justify Federal aid in the form of a DMEA loan. Even though Curry's report made no definite recommendation, I know from conversation with him that he believes some Federal aid is justified.

If we can be of assistance to you in Southeastern Montana, please feel free to call on us.

Sincerely yours,

Eugene W. Grutt, Jr.
Manager, Casper Branch Office

AIR MAIL

DMEA

Reviewed by
DMEA OPERATING COMMITTEE
4-30-56
(date)

RECEIVED
APR 2 6 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
APR 26 1956

March 30, 1956

MEMORANDUM

To: DMEA Field Team, Region I, Northwest District

From: D. C. Alvord, Geologist, U. S. Geological Survey

Subject: Field Examination Report, Docket No. DMEA-4107 (Uranium), Burmac Exploration Corporation, Cox Lease, Fallon County, Montana

DMEA

INTRODUCTION AND SUMMARY

The property was examined on February 21, 1956. The Field Team was represented by Edward W. Parsons, Engineer, U. S. Bureau of Mines, Max H. Burgendahl, Geologist, U. S. Geological Survey, and myself. Donald F. Towse, the applicant's vice-president and exploration manager, assisted during the entire examination. At our request, D. L. Curry and L. Y. Marks, Geologists, U. S. Atomic Energy Commission, met us near the property and contributed generously to the discussions. A strong wind and zero temperature, together with snow locally covering some of the more promising exposures, made mapping unfeasible.

The property controlled by the applicant is on the western edge of an extensive region of uranium-bearing lignite deposits that are mostly in Paleocene sediments. The property is unusual in that in the underlying beds of the Fort Union formation ore-grade uranium is present in sandstone-lignite zones. The bulk of the uranium is in sandstone and thus the uranium could probably be recovered by standard methods.

One hundred sixty rotary drill test holes averaging 36 feet in depth have been drilled on the property; twenty-seven penetrated material of ore grade and thickness. None of the deposits thus discovered have been blocked out in sufficient detail to indicate reserves but inferred reserves are considered to approach 23,000 short tons in 6 blocks averaging 1.8 feet thick and 0.13 percent eU_3O_8. These reserve units are apparently unique in the uranium-bearing lignite region in that the average grade of these deposits exceeds the average grade of the deposits throughout the region by a factor of 15 and that the bulk of their contained uranium (70 to 80 percent) is in the sandstone enclosing the lignite seams rather than being confined to the lignite.

Reviewed by
DMEA OPERATING COMMITTEE
4-30-56
(date)

The proposed exploration would consist of 2,000 feet of wide-spaced and 6,000 feet of close- and moderate-spaced rotary drill holes to be drilled concurrently in two stages. A third stage of 3,000 feet of close-spaced drilling is proposed should the results of the first drilling warrant this.

Recommendation

I recommend that the application be approved.

APPLICANT

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Dois D. Dallas is trained in petroleum engineering and has considerable experience in the petroleum industry. Donald F. Towse has a Ph.D. in Geology and has since 1948 accumulated a variety of experience as both employee of and consultant to petroleum and uranium companies. He was with the North Dakota Geological Survey from 1951 to 1954.

The applicant is apparently able to finance its share of the exploration program and is undoubtedly well qualified to conduct such a program.

LOCATION

The Ollie prospect includes secs. 16, 17, 18, 19, 20, 21 and parts of secs. 7, 8, 28, 29 and 30, T. 10 N., R. 61 E., and part of sec. 24, T. 10 N., R. 60 E., E.M.P.E., Fallon County, Montana (fig. 1). It lies between the almost deserted towns of Ollie and Carlyle, Montana. It is readily accessible over well-graded state and county roads southward about 25 miles from either Wilbaux, Montana, or Beach, North Dakota, and northward about 25 miles from either Baker, Montana, or Marmarth, North Dakota. From Beach, North Dakota, a spur line of the Northern Pacific Railroad passes through the property to Ollie, Montana, on the southern edge of the property. The roads are open year-round, except for a month or so during the spring thaw when mud makes trucking inadvisable.

PROPERTY RIGHTS

The Burmac Exploration Corporation controls the mineral rights of several sections east and south of the Cox Lease, but the application concerns only the Cox Lease which consists of secs. 17 and 18 and SE$\frac{1}{4}$ sec. 7 and SW$\frac{1}{4}$ sec. 8, T. 10 N., R. 61 E. (fig. 1). The Burmac Exploration Corporation holds the third lease on the property as follows:

1. George P. Cox and Ruth E. Cox of 614 Burlington Avenue, Billings, Montana, owners in fee simple;

2. Joe Crisafulli, Sr., Joe Crisafulli, Jr., Frank Crisafulli, and Angelo Crisafulli, a partnership of Glendive, Montana, and Arthur M. Schmitz of Wilbaux, Montana, lessees of the mineral rights as of September 29, 1955;

3. James G. Key of Williston, North Dakota, lessee of the mineral rights as acquired by the Crisafulli-Schmitz partnership and as of October 12, 1955.

4. Burmac Exploration Corporation of Williston, North Dakota, lessee of the mineral rights as acquired by James G. Key and as of October 15, 1955.

Copies of the leases pertaining to the Cox Lease are in the application. Consents to lien are being obtained from the owners.

Description of the Property

The property is in an area of gently rolling wheat and grazing land that has an average altitude of 3,200 feet. Small ridges and hillocks rise above the general area 50 to 100 feet or more, with slopes that are generally moderate and subrounded.

Precipitation usually amounts to 10 to 14 inches, about 60 percent of which falls as sudden showers during May through September.

From one to three feet of alkaline-saline, brownish-gray, fine sandy loam (solonetz) covers most of the area. Outcrops of the bedrock are restricted to small areas on the steeper slopes of ridges and washes and along road cuts.

There are no surface facilities on the property other than the Northern Pacific spur line, the county road, and a few field and truck trails. Except when wet, however, the unimproved surface of the area is readily traversed by drill rigs and attendant trucks.

copy in envelope pocket.

Development on the Ollie prospect consists of 160 test holes averaging 36 feet in depth (fig. 2) and a small open pit developed by dozer and dragline. During the examination the floor of the pit was covered with ice and slump material.

LITERATURE

The general geology of the area in the vicinity of the Ollie prospect is reported in the following:

1. Dobbin, C. E. and Erdman, C. E., 1955, Structure contour map of the Montana Plains: U. S. Geol. Survey Oil and Gas Investigations Map OM 178A.

2. Perry, E. S., 1953, Oil and gas in Montana: State of Montana Bureau of Mines and Geology Memoir No. 35.

3. Perry, E. S., 1935, Geology and ground-water resources of southeastern Montana: State of Montana Bureau of Mines and Geology Memoir No. 14.

The applicant's property contains uranium deposits associated with carbonaceous trash and lignite zones in sandstones of the Fort Union formation. The geology of similar occurrences is discussed in the following:

1. Gill, J. R. and Denson, N. M., 1955, Lignite investigations, Regional synthesis, eastern Montana and North and South Dakota: U. S. Geol. Survey Trace Elements Investigations Report 590.

2. McKelvey, V. E., 1954, Search for Uranium in the United States: U. S. Geol. Survey Trace Elements Investigations Report 476.

3. Gill, J. R., 1954, Reconnaissance for uranium-bearing lignite in the Ekalaka lignite field, Carter County, Montana: U. S. Geol. Survey Trace Elements Investigations Report 452.

4. Moore, G. W., Malin, R. E., and Kepferle, R. C., 1954, Uranium-bearing lignite in southwestern North Dakota: U. S. Geol. Survey Trace Elements Investigations Report 463.

5. Beroni, E. P. and Bauer, Jr., H. L., 1952, Reconnaissance for uraniferous lignites in North Dakota, South Dakota, Montana, and Wyoming: U. S. Geol. Survey Trace Elements Investigations Report 123.

6. Denson, N. M., Bachman, G. O., and Zeller, H. D., 1951, Summary of new information on uraniferous lignites in the Dakotas: U. S. Geol. Survey Trace Elements Memorandum Report 175.

7. Wyant, D. G., and Beroni, E. P., 1950, Reconnaissance for Trace Elements in North Dakota and eastern Montana: U. S. Geol. Survey Trace Elements Investigations Report 61.

GEOLOGIC SETTING

The Ollie prospect is in a region of uranium-bearing lignites first discovered, in North Dakota, in 1948 by D. G. Wyant and E. P. Beroni of the U. S. Geological Survey (Wyant and Beroni, 1950). This region now includes a major portion of western North Dakota, and parts of eastern Montana, northeastern Wyoming and the extreme northwestern portion of South Dakota (fig. 1, Beroni and Bauer, 1952).

In an introductory part of U. S. Geol. Survey TEM Report 175 (Denson and others) the following statement is made:

> "Lignites in this general area are found in the Cretaceous Hell Creek formation, and in the Ludlow, Tongue River and Sentinel Butte members of the Paleocene Fort Union formation * * *.
>
> "The distribution of uranium in the lignite is apparently controlled by proximity of the lignite to the tuffaceous Oligocene White River formation, which unconformably overlies the Cretaceous and Paleocene formations, and by the permeability of the rocks overlying the lignite, whether this permeability is inherent, as in sandstones, or induced by fracturing or faulting. In other words, it seems probable that the uranium is derived from the volcanic ash of the White River and absorbed by the lignite from percolating waters. Thus at any given locality the bed next below the White River formation is uraniferous, provided the rocks between it and the White River are pervious, whether the lignite be in the Hell Creek, Ludlow, Tongue River, or Sentinel Butte formations * * *. The uranium content decreases almost to the vanishing point in suddeeding lower beds. If the beds between the highest lignite and the White River are impervious, such as shale or clay, even the uppermost lignite is only weakly uraniferous."

Most of the uranium at the Ollie prospect is in the sandstone over- and underlying a lignite seam but the source of the uranium is undoubtedly the same as that uranium in the lignite beds of the region.

Gill and Denson (1955) have prepared a structure contour map of the pre-Oligocene erosion surface (base of White River formation) in the uranium-bearing lignite region and conclude this surface had a marked influence on the localization of uranium deposits.

Although most of the known uranium-bearing beds of the general area are lignites, Curry and Macks have discerned a poorly defined northeast-trending zone of uranium-bearing sandstone-lignite occurrences within the Fort Union formation. This zone averages about 4 miles in width and extends from the Ollie prospect about 8 miles northeastward and 4 miles or more southwestward (unpublished report).

Research on methods of recovery of uranium from lignite is active but immediate production from this area will depend upon development of this uranium-bearing lignitic sandstone zone. The search for other lignitic sandstone zones in this general four state area appears to be of interest.

Geology of the Ollie Prospect

The Ollie prospect is underlain by beds of the Fort Union formation that are tentatively correlated with the Tongue River member. Curry and Macks (unpublished manuscript) have mapped the Ollie prospect and vicinity at large scale and recognize the following beds or groups of beds on the Ollie prospect:

1. Five feet or more of gray to tan clay with minor carbonaceous trash zones and sparse veinlets and crystals of gypsum, overlying

2. Ninety feet of light gray to buff very weakly consolidated finer-grained sandstone; abundant crossbedding and scour and fill structures; locally calcite-limonite staining is conspicuous and in places is concentrated to form concretions; contains sparse, thin, uranium-bearing beds and lenses of carbonaceous and in places lignitic material, especially near the bottom, overlying

3. Forty feet or more of medium to dark gray clay with sparse carbonaceous and lignitic trash zones; the total thickness of this clay has not been determined.

Silicified sandstones and beds of mudstone overlie the upper clay near the tops of the ridges and hillocks but would not be penetrated in the proposed exploration drilling.

Curry and Macks estimate that about 300 feet of beds of the Fort Union formation underly the property, below which the Hell Creek member of the Upper Cretaceous Lance formation is inferred.

Due to the lenticular nature and rapid thickening and thinning of the beds in the area, a useful strike and dip for them has not as yet been determined. For purposes of estimating hole depths they may be considered flat-lying although over an area of several square miles beds of the Fort Union formation will approximately conform to the attitude of the base of the Colorado shale as shown on Dobbin and Erdman's map (1955). Locally however, minor flexures and basins on the order of hundreds of feet to a mile or two in maximum length may be superimposed on the regional structures. These structures very likely have had important influence on the movement of uranium-bearing ground-water systems. Curry, Macks, and Towse believe the northwest-trending ridge crossing the SW 1/4 sec. 18 (fig. 1) may be the axial trace of a structural low such as a sediment-filled basin of an old erosion surface or perhaps a minor flexure of the beds roughly paralleling the Cedar Creek anticline. In such local lows the uranium-bearing sandstone-lignite ore zones might be thicker and of higher grade than those already discovered.

As previously stated, Gill & Dobson (1955) believe that the flanks of synclines guided the circulation of mineralizing ground water.

According to Towse, the applicant's geologist, the sandstone unit as described by Curry and Macks actually contains considerable mudstone or clay and a more accurate concept of this zone, which contains the uranium-bearing sandstone and carbonaceous trash and lignite zones, would be that of a mudstone-siltstone flood plain deposit laced with lenticular stream channel deposits of sandstone. Towse's information is based on prospecting and drilling conducted by the applicant in 1955.

Towse's study indicates that the stream channel sandstones are composits of interfingering scour-and-fill sandstone lenses interbedded with minor amounts of lignite. These sandstone beds are of unknown length but will be for the most part only a few hundred to two or three thousand feet wide. Although these sandstone beds are benerally thicker towards the middle, they do not thin markedly towards the edges but rather their margins are marked by a comparatively abrupt interfingering of sandstone with the surrounding mudstone. The uranium-bearing zones of economic promise are confined to the proximity of the carbonaceous trash and lignite beds within the stream channel sandstones, particularly near the margins of the channels. Two or more ore-bearing sandstone-lignite zones may be present at a given locality but usually only one ore zone is present. Interpretation is complicated by the probable lenticular nature of the ore zones and locally by penecontemporaneous deformation of the beds.

Uranium-bearing sandstone-lignite beds are present near the base of the sandstone unit where it crops out in the SW¼ of sec. 20 and the SW¼ of sec. 17. Elsewhere the sandstone unit is covered with from 2 to 90 feet of mudstone and poorly consolidated quartzose sandstone.

The uranium occurs as incompletely identified disseminated particles in both the carbonaceous zone and the surrounding sandstone. A positive determination of metatyuyamunite was made from one sample of the sandstone ore sent to J. W. Gruner of the University of Minnesota, but it is improbable that all of the ore mineral will be the same. Autunite or meta-autunite has been tentatively identified in the shale or lignite seams.

From 20 to 30 percent of the contained uranium is in the carbonaceous and lignitic portion of the ore zones, the remainder being in the surrounding sandstone.

Chemical assays of selected ore samples from the property have ranged from 0.10 to 1.72 percent U_3O_8, and from nothing to

0.53 percent V_2O_5 (table 1). Estimates based from both chemical assay of drill cuttings and radioactivity logs (eU_3O_8) indicate that the grade of the deposits will vary from 0.13 to 0.21 percent U_3O_8.

The uranium-bearing lignite deposits over the Dakota-Montana-Wyoming region ranges from less than 0.001 to 0.033 percent U_3O_8 in rare instances and averages around 0.009 percent U_3O_8 (Moore and others 1954, Gill 1954, Beroni and Bauer, 1952). Thus the uranium-bearing lignitic-sandstone deposits of the Ollie prospect are unique within the region not only because most of the ore-bearing material in its deposits is in the sandstone that encloses the carbonaceous trash and lignite zone but also because its deposits are of higher average grade by a factor of 15 or more.

Exploration on the Ollie prospect is as yet insufficient to predict with much confidence the probable distribution pattern of the deposits regarding grade, size, shape, continuity, or thickness; nor can more be said concerning their probable horizontal or vertical distribution pattern other than that the carbonaceous and lignitic beds are most abundant in the lower portions of the sandstone channels, with the uranium concentrations highest near the margins of the channels.

Past Exploration

The reader should refer to attachment 6 of the application, "Report of Exploratory Work on the Ollie Prospect", by Donald Towse, 1955, in which the drilling and sampling of the applicant's 1955 exploration is described.

Early in August 1955, geologists of the Burmac Corporation made a preliminary field study of the Ollie prospect. This work included a small amount of mapping, ground and aerial radioactivity surveys, and test pitting at promising localities. Several areas of anomalous radioactivity were found (Towse, p. 2, 1955, and fig. 2 of this examination report).

During the later part of August and September 1955, the Burmac Exploration Corporation drilled 160 rotary drill holes totaling 5,799 feet. These holes ranged from 5 to 90 feet in depth and tested some of the mineralized areas disclosed by the field studies. In the immediate vicinity of known mineralized areas exploratory holes were drilled on about 200-foot centers, but away from these areas holes were mostly drilled on 400-foot centers. A few holes were drilled on 50- and 100-foot centers where mineralized zones of ore grade were encountered (fig. 2).

Unfortunately the lithology penetrated during drilling was seldom recorded, it being felt at the time that merely penetrating the

TABLE 1. ASSAY DATA

	$\%U_3O_8$	$\%eU_3O_8$	$\%V_2O_5$	Assayer	Location and Remarks
1.	.316	---	---	Jerome, Denver	13" channel, near hole R, NW¼SW¼ sec. 20.
2.	.09	---	---	"	Hole A-11, 6½-7½', cuttings sample.
3.	.21	---	---	"	Hole A-14, 7½-10', " "
4.	.12	---	---	"	Hole 154, 34-36', " "
5.	0.00	---	---	"	Hole 154, 36-38', " "
6.	.03	---	---	"	Hole 45A, 36-38', " "
7.	0.00	---	---	"	Hole 45A, 38-40', " "
8.	.05	.13	---	AEC	NE¼NE¼ sec. 18.
9.	.03	.10	.23	"	10' north of above sample #8.
10.	.11	.05	---	"	.3 mile east of road, in sec. 20, 1' channel.
11.	.10	.14	.10	"	1½' deep, near above sample #10.
12.	.50	.53	.53	"	West side of road, sec. 19.
13.	.17	.13	---	"	10" channel above sample #12.
14.	.05	.40	---	"	East side of road, sec. 20, 2-4' deep.
15.	1.72	1.30	.10	"	8 feet north of sample #14.
16.	.15	.22	---	"	7" channel under sample #15.
17.	.51	.51	.37	"	Surface sample ¼ mile west of road, in sec. 19.
18.	.08	---	---	Jerome, Denver	Hand auger hole, sample from 1-6', in NW¼SW¼, sec. 20.
19.	.08	---	---	"	Sample 1-5', auger hole 50' south of #18.
20.	.053	.20	---	Chem. & Geol. Lab., Casper	Sand, NW¼SW¼ sec. 20.
21.	.061	.054	---	"	Road cut, NE¼NE¼ sec. 18.
22.	.030	.018	---	"	10" channel; sand at NE corner sec. 18.
23.	.061	.083	---	"	12" channel; carbonaceous soil, in road cut in NE¼SE¼ sec. 7.
24.	.006	.004	---	Jerome, Denver	10' S. of Hole #5, 1-2' deep.
25.	.068	.073	---	"	10' S. of Hole #5, 3-4' deep.
26.	.031	.017	---	"	10' S. of Hole #5, 4½-5' deep.
27.	.011	.008	---	"	10' S. of Hole #5, 5½-6' deep.
28.	.027	.021	---	"	Hole #28, 2'4"-3'2" deep.

ore-zone sand and bottoming in the underlying mudstone bed would suffice in a practical exploration program. Also very few holes were sampled even where mineralized. However, all holes were probed with a Geiger-Mueller tube and recording device that had been standardized against an instrument of the U. S. Atomic Energy Commission. The radioactivity logs of the holes were used to calculate the average radioactivity over a given interval and then converted to equivalent U_3O_8. Chemical analyses were made of samples from two holes in order to determine an equilibrium constant. The constant (1.30) was used to convert the values (eU_3O_8) of mineralized intervals to what the applicant refers to as "estimated true values". Basing an equilibrium constant on only two samples is probably a bit far-fetched. Accordingly, Chi-square and "t" tests were made of 19 samples (table 1) on which both chemical U_3O_8 and eU_3O_8 had been determined. Both tests showed that the differences between the two populations (eU_3O_8 - chemical U_3O_8) are entirely random and therefore due to sampling and analytical variation. The mean value of these 19 samples is 0.21 percent eU_3O_8 and 0.20 percent (chemical) U_3O_8. It is reasonable to infer from these 19 samples that most of the uranium in the Burmac property is in equilibrium with its daughter products. In this report, therefore, the grade values as determined with the AEC-calibrated probe (eU_3O_8) were used instead of the applicant's "estimated true values".

The drill holes are shown on figure 2. Depth to ore horizon and eU_3O_8 determination for ore holes are taken from the application. Depth to the ore horizon ranges from 0.4 foot to 65 feet and averages 18 feet.

Although mining practices vary from region to region as well as with individual operators, under 1956 mining conditions most uranium ore bodies on the Colorado Plateau are being mined to a minimum thickness of about 1 foot. Layers of material less than 1 foot thick are mined if the grade is high. In this report mineralized material is classified by two grade-thickness cutoffs. The higher cutoff -- material one foot or more in thickness containing 0.10 percent or more eU_3O_8 -- corresponds to the U. S. Atomic Energy Commission purchase cutoff. The lower cutoff -- material less than one foot in thickness containing 0.10 percent or more eU_3O_8, or material one foot or more in thickness containing at least 0.05 percent eU_3O_8 but not as much as 0.10 percent eU_3O_8 -- is recorded on the possibility that conditions in the future might demand or permit the mills to accept lower grade ore. Holes penetrating material of the higher cutoff are called "ore holes", whereas holes penetrating material of the lower cutoff are called "mineralized holes".

Using this classification, the Burmac drilling penetrated ore-grade material in 27 holes and significantly mineralized material in 12 holes. Towse explains this by stating (oral communication) that nearly all the holes drilled would have been considered mineralized if the lower cutoff had been used but, for the most part, radioactivity logs were recorded and evaluated only where the material exceeded

1.0 mr/hr (0.15 percent eU_3O_8). Thus, "barren" holes between or near ore holes as in Areas A, D, and F (fig. 2) might actually have penetrated mineralized material approaching ore grade.

For purposes of discussion, seemingly discrete groups of two or more ore holes have been designated by letters (fig. 2). An examination of figure 2 should make it obvious that not one uranium occurrence has thus far been blocked out. It can readily be observed that at any given occurrence there are several "freeways" through which an ore body could connect with nearby ore holes not presently inferred as having penetrated the same ore block. All of the ore blocks are hazily defined and are open in two or more directions. Thus, with additional drilling, the ore block penetrated by holes 30 and 32 of Area A might easily be shown to connect with the ore zone penetrated by hole 266, 300 feet to the northwest. At the present stage of drilling one cannot dismiss the possibility that all the presently known ore holes in the SW¼ sec. 17 and along the eastern edge of sec. 18 are more or less in one interconnected ore body. The ore block underlying Area C is open to the north, east, and south and could easily extend indefinitely in any of these directions. Areas D and E are not sufficiently partitioned to be written off as separate blocks and certainly block D is open to the north, west and south and block E is open at least to the south and east.

Experience on the Colorado Plateau has shown that neither 200- nor 100-foot centers can adequately delimit essentially flat-lying tabular-shaped uranium deposits. Experience gained from millions of feet of drilling in this type of deposit by the Geological Survey, Atomic Energy Commission, and mining companies shows that drill holes on 25-foot centers will not completely delimit such deposits and that in most areas patterns ranging between 25- and 50-foot centers are necessary to even indicate reserves.

Reserves

Drilling by Burmac is not sufficiently detailed to indicate reserves and the known reserves calculated in this report are classed as inferred. Inferred reserves are projected to the assumed economic limits of the deposits, as determined by geologic evidence and interpretation. Reserves are not projected more than 100 feet beyond sample points where the edge of the deposit has not been located. On the other hand, reserves are projected as much as 200 feet between drill holes. Reserve projections were not made for isolated holes that penetrated material of ore grade and thickness (i.e., ore holes greater than 200 feet apart). The average thickness of drill hole samples

that can be combined within the specified grade class is assumed to be the average thickness of the reserve unit. A constant of 15 cubic feet per ton was used to calculate tonnage.

The average grade of the inferred reserves is calculated by weighting the thickness and assay values of all samples that qualify as reserves within the grade and thickness limits. The grades and thicknesses used in calculating the reserves are taken from table 2 (fig. 2).

The inferred limits, grade, thickness, depth, and tonnage of the reserve units are shown on figure 2.

Although none of the deposits have been completely delimited, the present drill-hole information does permit the tentative conclusion that the individual deposits thus far discovered average 3,800 tons of 0.13 percent eU_3O_8 in tabular bodies 1.8 feet thick (fig. 2). A tentative maximum total for all areas drilled so far is 22,850 tons of ore averaging 1.8 feet thick and 0.13 percent eU_3O_8.

By Colorado Plateau standards the foot-ton yield of Burmac's exploration drilling is remarkable. Drilling on the Colorado Plateau, in areas known to be geologically favorable for the occurrence of carnotite deposits and with the aid of such tools as highly refined ore guides and close geologic supervision usually only yields from 0.5 to 1.0 ton of ore per foot drilled (foot-ton yield). Dividing my optimistic reserve estimate by 2 or 4, Burmac's yield falls somewhere between 1 and 2 foot-tons.

The foot-ton yield will fall off with drilling at increased depths but is useful in comparing drilling results and in making economic evaluations of proposed drilling programs. Thus, if Burmac's original drilling program averaged 35-foot holes, a program averaging an equal number of 70-foot holes would be expected to yield 0.5 to 1.0 foot-ton, all other factors being equal.

Mining

The deposits thus far disclosed range in depth from 3 feet to 48 feet and may be found at depths up to 100 or more feet in the area of proposed drilling. The bulk of the deposits, however, would be found at depths of 50 feet or less (fig. 1). The tabular nature of these deposits together with the soft sandstone overburden suggests strip mining. Conversations held with two experienced stripping operator-contractors and with an earth-moving equipment representative came up with variable estimates of which none exceeded 30 cents per yard for pits down to 40 feet and none of which exceeded 40 cents for pits down to 60 feet. Account was taken of the locality, abrasiveness of the overburden, seasonal limitations, etc. It was concluded that

140,000 yards of material would be moved to mine a body of ore 150 by 400 feet in horizontal dimensions at a depth of 40 feet, allowing for necessary access to the pit. If the ore body is 1.8 feet thick averaging 0.13 percent U_3O_8 such a deposit would contain 7,200 tons of ore and be worth, before dilution, roughly $88,000 under the present AEC purchasing program (does not include AEC haulage allowance of $6/ton). Thus at 30 cents a yard it would cost approximately $42,000 to contract strip and haul to stockpile $88,000 worth of undiluted ore. Allowing for 5 to 7½ percent dilution, the applicant's operational overhead, etc., it would still appear feasible to strip mine such a deposit. The stripping ratio would be 22 to 1. Such a ratio is not out of order in uranium mining. (Dayton, S. H., 1956, The trend to U_3O_8 open pitting: Mining World, Vol. 18, No. 2, pp 48-52.)

Strip mining of similar-sized deposits at depths of less than 40 feet would appear to be a routine operation and larger and thicker deposits might be economically handled to greater depths.

APPLICANT'S PROPOSAL

The applicant proposed to explore the S½ sec. 18 with a rotary drill rig. The following is a quote from attachment 5 of the application:

> "It is proposed to drill exploratory holes on a regular geometric pattern over the property where the ore-bearing bed is covered. That bed is more than 70 feet deep in the SW¼SW¼ of section 18. Only the deep tests on a wide spacing will be drilled there, unless those tests disclose an economic deposit there.
>
> "4. Plan of work: Samples from all holes will be logged for lithology and all will be logged with a Geiger counter logger. Ore-bearing beds will be sampled if possible for assay. The drilling will be based on a regular square geometric pattern and will be divided into the following phases.
>
> a. Test holes to a depth of 150 feet will be drilled on 1000-foot intervals. Purpose of these holes will be to outline geologic structure and to discover deeper ore-bearing beds or beds whose lithologic character may indicate that they should be explored in more detail. Most of the remaining drilling will be directed toward exploring the beds at shallow depths in which ore is already known in the area, unless the deep tests indicate that another course should be followed
>
> b. Additional holes will be drilled to the main ore-bearing bed at 400-foot intervals.
>
> c. Another series of holes will be drilled at 200 foot intervals where information gained from series "B" indicates that the rock types and structure are favorable, or where mineralization was found.

d. Where mineralization has been found, a more detailed pattern of exploratory drilling on patterns 100 or 50 feet apart will be planned and drilled. Twenty percent of these holes will be cored for assay and radiometric control of the Geiger counter logs.

"From holes we have already drilled, I estimate that, in the above program the following numbers and depths of holes will be required:

For series a, b, c, above:			
10 holes	150 feet deep, total:	1500'	
20 holes	70 feet deep, total:	1400	
35 holes	60 feet deep, total:	2100	
40 holes	50 feet deep, total:	2000	
100 holes	40 feet deep, total:	4000	
	subtotal	11000	feet
For detailed drilling:		2000	
	Total footage:	13000	feet

"This program should be split into two or three phases to allow time for study of information and detailed planning. The entire program can be completed within a total elapsed time of six months."

PROPOSED DMEA EXPLORATION

The proposed DMEA exploration should be done in three stages. Stages I and II should be done concurrently.

Stage I. Work of this stage would be confined to the SW¼ sec. 17 and SE¼ sec. 18 where a uranium-bearing bed of known ore grade and thickness exists (fig. 2). The uranium-bearing bed is near the surface and rotary drilling on moderate to close centers could readily determine the limits of these presently known deposits, test the continuity between Areas A and B and discover other similar deposits in this part of the property.

The close-spaced holes should be on 50-foot centers although some fence holes could be drilled at greater intervals.

At this time a rigid exploration program does not seem desirable but it is felt that provision should be made for about 6,000 feet of wagon drill holes for this stage.

Stage II. Stage II should be done concurrently with Stage I. The purpose of this stage is to determine the structural and lithologic conditions in the south half of section 18. In particular, Curry and Marks (as noted above) believe that the present topographic high that cuts the SW¼ sec. 18 may be a remnant of beds that were deposited in a basin and that the underlying beds, that would include the ore horizon,

may be thicker than elsewhere on the property. If this is the case, the ore horizon might be much thicker in this portion of the property than it is at Areas A and B. Thicker ore-bearing beds might be exploitable even at depths of 70 feet below the surface. This drilling should be done on 1,000-foot centers (fig. 3). At least 2,000 feet of drilling should be made available for this stage.

Stage III. About 3,000 feet of rotary drilling should be provided for testing any ore indications developed as a result of Stage II drilling or to extend any ore bodies found in Stage I work.

Control

In the contract specifications the following controls influencing the quality and usability of information gathered by the exploration program should be specified:

1. Full-time geologist on the property during active drilling.

2. One-fourth time supervising geologist or exploration manager.

3. Transit or plane-table control of drill-hole collars.

4. Core drilling in at least 25 percent of the offset holes and 20 percent of the wide-spaced holes. All core to be boxed and saved.

5. All holes must be logged for lithology and probed with a Geiger-Mueller tube and recording instrument.

6. All drill hole information should be on a standard log form agreed upon before drilling commences. It is strongly urged that a form such as used by the Geological Survey on Colorado Plateau exploration programs be adopted.

7. Sludge or cutting samples must be taken of all mineralized intervals.

8. An allowance for 200 chemical assays should be made.

Attachments (3)

Distribution:
DMEA (4)
USBM (2)
USGS(SRO)
AEC,SLC
Docket
Alvord

Docket No. DMEA 4107

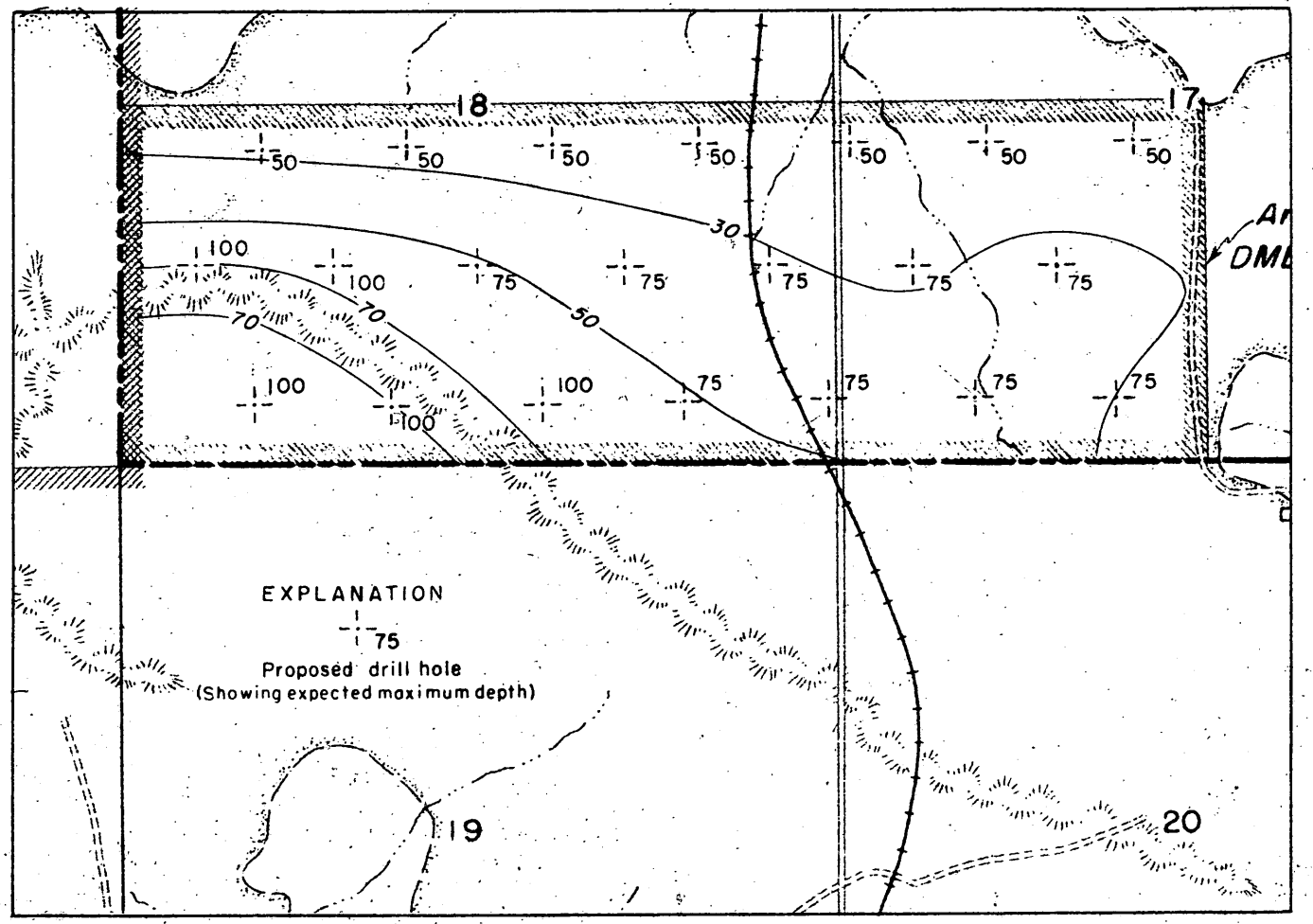

Figure 3 - Map of Drilling Area, Showing Proposed Stage 1 Drill Holes
Burmac Property, Fallon County, Montana

1 inch = 1320 feet

SUMMARY REPORT ON THE GEOLOGY AND EXPLORATION OF THE
BUEMAC EXPLORATION COMPANY HOLDINGS
NORTHEASTERN FALLON COUNTY, MONTANA

RECEIVED
APR 26 1956

prepared for DMEA

By

Lawrence Y. Marks
and
Donald L. Curry

U.S. Atomic Energy Commission

Stratigraphy

The rocks that will be encountered in drilling in the S½ of sec. 18 are sands, silts, clays, carbonaceous trash lenses, and lignite beds of the Fort Union formation of Paleocene age, probably part of the Tongue River member.

Below is a table of some of the rocks in the area:

Description	Thickness (feet)	Remarks
Unconsolidated tan argillaceous silt. Contains iron and calcareous concretions. Locally cemented by calcite. Rarely contains fine cross-bedded sandstone.	38+	Frequently caps hills.
Light to dark-gray clays with some silt layers. Contains leaf and twig impressions, carbonaceous trash zones, and thin lignites. Gypsum present, sometimes as a cement.	30-+	Carbonaceous trash and lignite, sometimes radioactive. Contains 18" partly radioactive lignite bed at some localities.
Unconsolidated tan argillaceous silt. Contains local iron and calcareous concretions. Locally cemented by calcite.	30+	Sometimes caps hills.

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MAR 1956

Description	Thickness (feet)	Remarks
Gray to tan clay and silty clay. Contains carbonaceous trash zones and some gypsum.	54	Interfingers with unit below. May be locally absent. Darker layers sometimes radioactive.
Gray to tan unconsolidated sand. Conspicuously crossbedded. Sometimes limonite or hematite-stained. Locally cemented by calcite. Contains carbonaceous trash fragments and lenses, especially in the lower part.	90+	Local radioactivity is associated with carbonaceous trash and is usually near the lower contact. Burmac test drilled part of this unit and located uranium ore in secs. 17, 19, and 20 near the contact with the unit below.
Medium-to dark-gray clay. Contains carbonaceous trash lenses and thin lignites.	40+	Locally radioactive near upper contact. Some of the ore in secs. 17, 19, and 20 is in this unit.

Structure

The area is located about 10 miles east of the Cedar Creek anticline, and the formations dip generally northeast from that structure (Ross, C. P., Andrews, D. A., and Witkin, I. J., 1955, Geologic map of Montana: U. S. Geol. Survey map). Smaller folds are superimposed on the east flank of the anticline and a small synclinal basin exists southwest of and bordering on the area in which the drilling program is proposed in sec. 18 (Dobbin, C. E. and Erdmann, C. E., 1946, Structure contour map of the Montana plains: U. S. Geol. Survey Map).

Limited surface mapping in the area has indicated that there are minor folds present in the area north of Ollie, Montana. The surface formations seem to dip north-northeast toward the S½, sec. 18 from sec. 19 (see sketch).

Uranium Deposits

All known uraniferous deposits in the area are associated with carbonaceous trash or lignite, which are either disseminated as fragments in the host rock or occur as layers or lenses. The most promising deposits have occurred in lenses and thin layers of carbonaceous trash near the bottom of a sand unit or at its contact with an underlying clay unit.

It is unlikely that the uranium was deposited by ground water which had previously leached it from younger tuffaceous rocks of Oligocene or Miocene age.

The synclinal basin near Ollie, Montana has probably influenced the accumulation of uranium by controlling the flow of uranium-bearing ground water. Minor structures have probably had some effect on ore deposition and later redistribution by ground water.

Previous work by Burmac

The best indications for ore production have been in secs. 17, 19, and 20, T. 10N, R. 61E, Fallon County, Montana where the Burmac Exploration Corporation has conducted most of their exploratory drilling and excavation. Radiometric logs were made by personnel of that company in drill holes, and geiger probe readings were converted by them to percent U308.

An estimate was made of the ore reserves in the most favorable areas, using those radiometric values for grade in the drill holes. The most promising area, which is mostly in the NE¼, SE¼, sec. 19, showed 250 tons of indicated, 650 tons of inferred, and 850 tons of potential ore. A second area, in the SE¼, SW¼, sec. 20, showed 100 tons of indicated and 300 tons of inferred ore. A third area, in the NW¼, SW¼, sec. 17, showed 100 tons of indicated, 350 tons of inferred, and 200 tons of potential ore. From miscellaneous drill holes, an additional 100 tons of indicated, 300 tons of inferred, and 300 tons of potential ore was calculated. The total reserve calculated in the three sections is about 550 tons of indicated, 1600 tons of inferred, and 1350 tons of potential ore.

Calculations were made assuming the ore to be in equilibrium and using an average grade of 0.17 percent u308. Later information obtained from excavation work in sec. 19 indicates that the oretends to occur in lenses, at least at more shallow depths, and the above figures, though conservatively estimated, are possibly high. Assays in the pit have shown that shallow samples are very much out of equilibrium, generally in favor of radiometric assay, while the few samples taken at depths below the water table were in equilibrium. This would also tend to lower the calculated reserve figures as some of the calculated ore is above the water table.

A sample load of about 10 tons was shipped to Edgemont, South Dakota, from the excavation pit in sec. 19, for an amenability test. The only information available concerning the load is that the average chemical assay was 0.05 percent U308. It is likely that this does not represent the average material considered ore in the pit, as the method used in collecting the load was not selective enough to prevent considerable dilution. A bulldozer was used to assemble the stockpile.

It is believed that there are, in secs. 17, 19, and 20, possibilities for producing small tonnages of low-grade ore from carbonaceous trash lenses and layers within and at the base of the unconsolidated sand unit.

Need for more test drilling

All of the above-mentioned exploration done by the Burmac Exploration Corporation and all other exploration drilling and excavation done nearby by other operators seems to have been stratigraphically located within only two of the units which crop out in the area. At most drill-hole sites, drilling began somewhere in the lower half of a sand unit, and none of the holes have penetrated more than 40 feet of the underlying clay, the thickness of which is not know. Although the most promising uranium deposits known in the area occur near the contact of these two units, smaller anomalies have been found in other stratigraphic units. The lack of subsurface information in these other units has made it impossible to evaluate them as uranium host rocks.

Value of testing in sec. 18

The geological personnel of the Burmac Exploration Corporation have proposed a test-drilling program in the S½, sec. 18 which is owned by G. P. Cox. According to the present limited knowledge of the stratigraphic and structural conditions in the area, it is believed that the S½, sec. 18 would be a suitable place for exploratory drilling directed at locating new ore bodies. The following are some reasons for choosing the S½, sec. 18:

1. It is adjacent to areas of known ore-grade uraniferous rock.
2. The stratigraphic units which have indicated ore at other localities crop out in part of the half-section.
3. Because of the topography, it is believed that stratigraphically younger units are also exposed in the half-section and can be tested for uranium content.
4. Anomalous radioactivity has been found in adjacent areas in at least two units believed to be stratigraphically younger.
5. One of the younger units contains a lignite bed about 18 inches thick at localities less than a mile southeast of the half-section. This lignite bed seems to be traceable for more than a mile in other directions, although it was seen to grade into a highly carbonaceous clay 18 inches thick at one locality. The lignite and carbonaceous clay bed is locally anomalously radioactive.
6. Due to the fact that drilling can begin in the S½, sec. 18 in stratigraphically younger units than those which contained low-grade ore and sub-ore-grade material in

secs. 19 and 20, any extensions of those bodies of uraniferous material that might be encountered in the S½, sec. 18 may be found below the water table. Indications are that within the area uranium deposits are more likely to be in equilibrium below the water table where recent leaching has been less active.

Recommendations

A systematic surface radiometric survey, perhaps followed by the preparation of an isoradioactivity map may prove helpful in determining the locations of proposed drill holes. This information may later be of value when correlated with early drill holes to decide later action.

Accurate lithologic logs should be made of all drill holes for determination of structure, stratigraphy, and relationship of both to uranium mineralization.

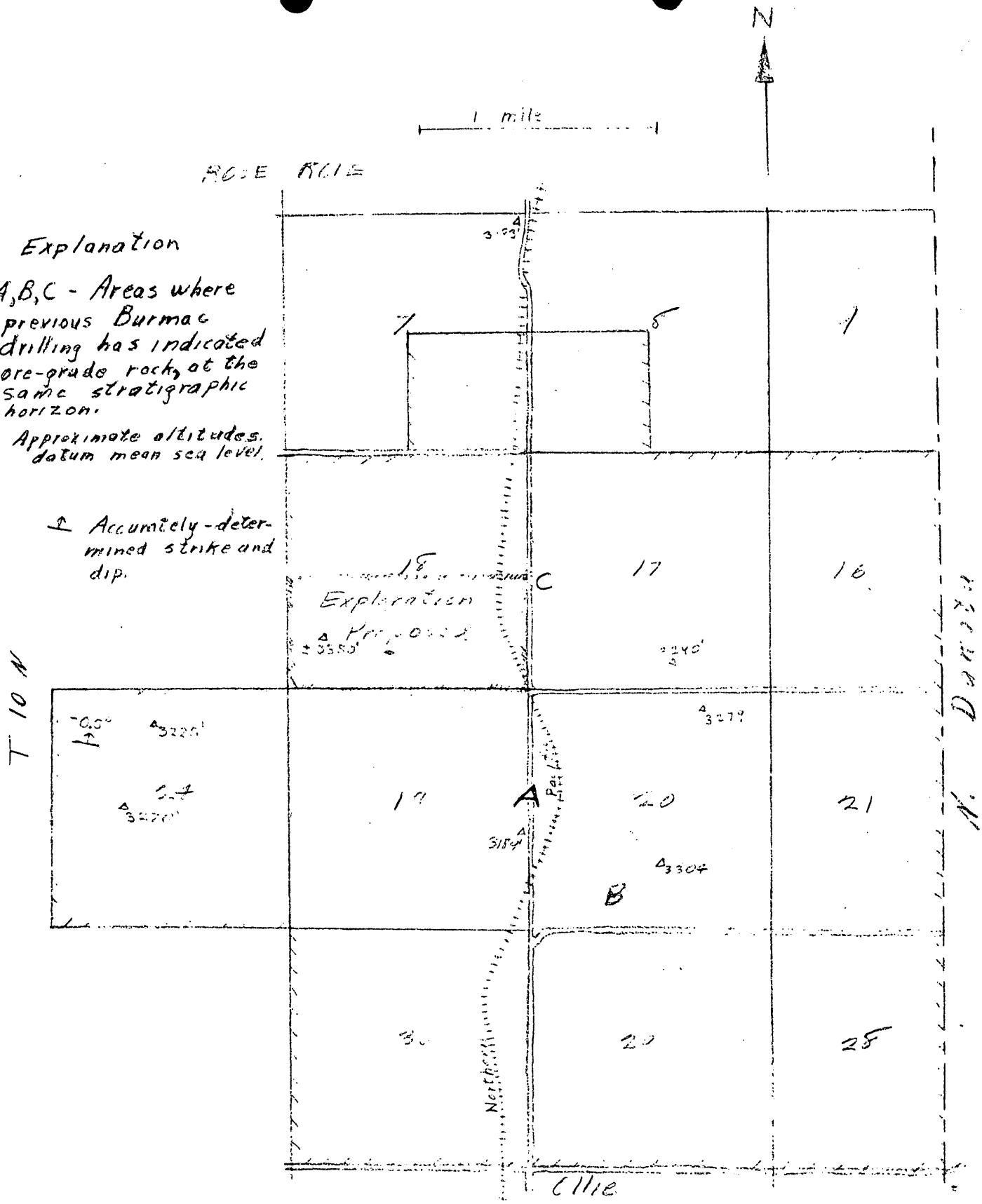
Radiometric logs should be made of all drill holes immediately after drilling, and all departures from normal reading should be accurately recorded.

Indications are that core recovery may be poor, but some coring should be attempted to augment stratagraphic data acquired from non-core holes.

Several deep holes should be drilled to test units below those involved in previous drilling activities. Although the deepest unit previously tested is a compact, relatively impervious clay, some occurrences of uranium in this part of the state show evidence of having been deposited by laterally moving ground water from a source structurally up dip where the older units crop out and have been recharged with uraniferous water.

Abandoned [illegible] Prospect.

	% U_3O_8	eU_3O_8	V_2O_5	Assayer	Location and Remarks
1.	.316	---	---	Jerome, Denver.	13" channel, near hole A, NW¼SW¼ sec.20
2.	.09	---	---	"	Hole A-11, 6½-7½', cuttings sample.
3.	.21	---	---	"	Hole A-14, 7½-10', " "
4.	.12	---	---	"	Hole 15½, 34-36', " "
5.	0.00	---	---	"	Hole 15½, 36-38', " "
6.	.03	---	---	"	Hole 45A, 36-38', " "
7.	0.00	---	---	"	Hole 45A, 38-40', " "
8.	.05	.13	---	A. E. C.	NE¼NE¼ sec. 18.
9.	.08-.03	.10	.21	"	10' north of above sample #3.
10.	.11	.05	---	"	.3 miles east of road, in sec. 20, 1' channel.
11.	.10	.14	.10	"	1½' deep, near above sample #10.
12.	.50	.53	.53	"	west side of road, sec. 19.
13.	.17	.13	---	"	10" channel above sample #12.
14.	.05	.10	---	"	East side of road, sec. 20, 2-4' deep.
15.	1.72	1.37	.10	"	6 feet north of sample #14.
16.	.15	.12	---	"	7" channel under sample #15.
17.	.51	.51	.37	"	surface sample, mile west of road, in section 19.
18.	.04	---	---	Jerome, Denver.	Hand auger hole, sample from 1-6', in NW¼SW¼ sec. 20.
19.	.04	---	---	"	Sample 1-5', auger hole 50' south of #18.
20.	.053	.20	---	Chem. and Mol. Lab., Denver.	Sand, NW¼SW¼ sec. 20.
21.	.061	.054	---	"	Road cut, NE¼NE¼ sec. 18.
22.	.030	.013	---	"	10" channel; same at NE corner sec.18.
23.	.061	.033	---	"	12" channel; [illegible], in road cut in NW¼SW¼ sec. 20.



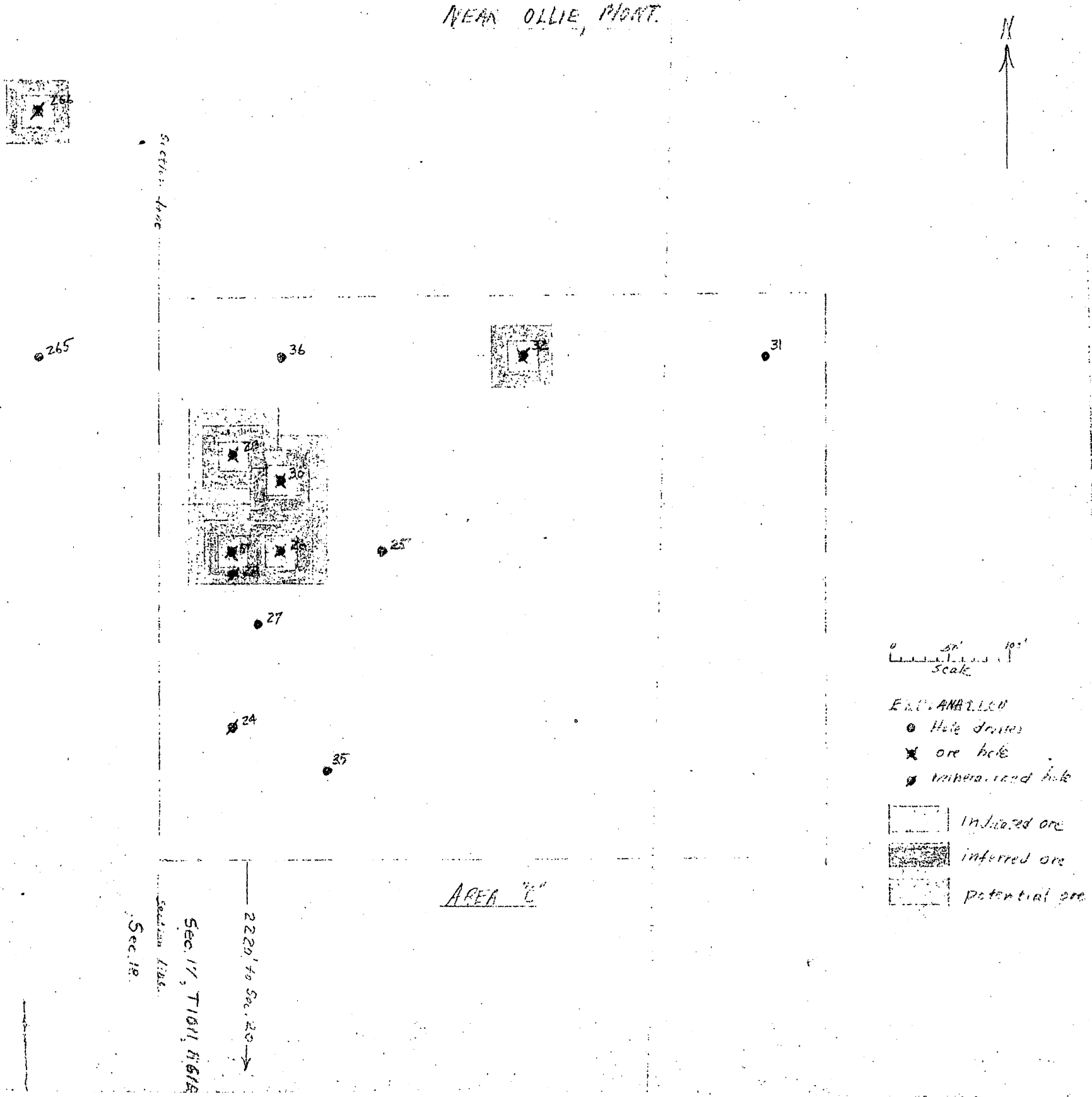
Map showing relation of areas of indicated ore reserves on holdings of the Burmac Exploration Company to area of proposed exploration, Fallon County, Montana

ACCOMPANYS DMEA

10/20/55

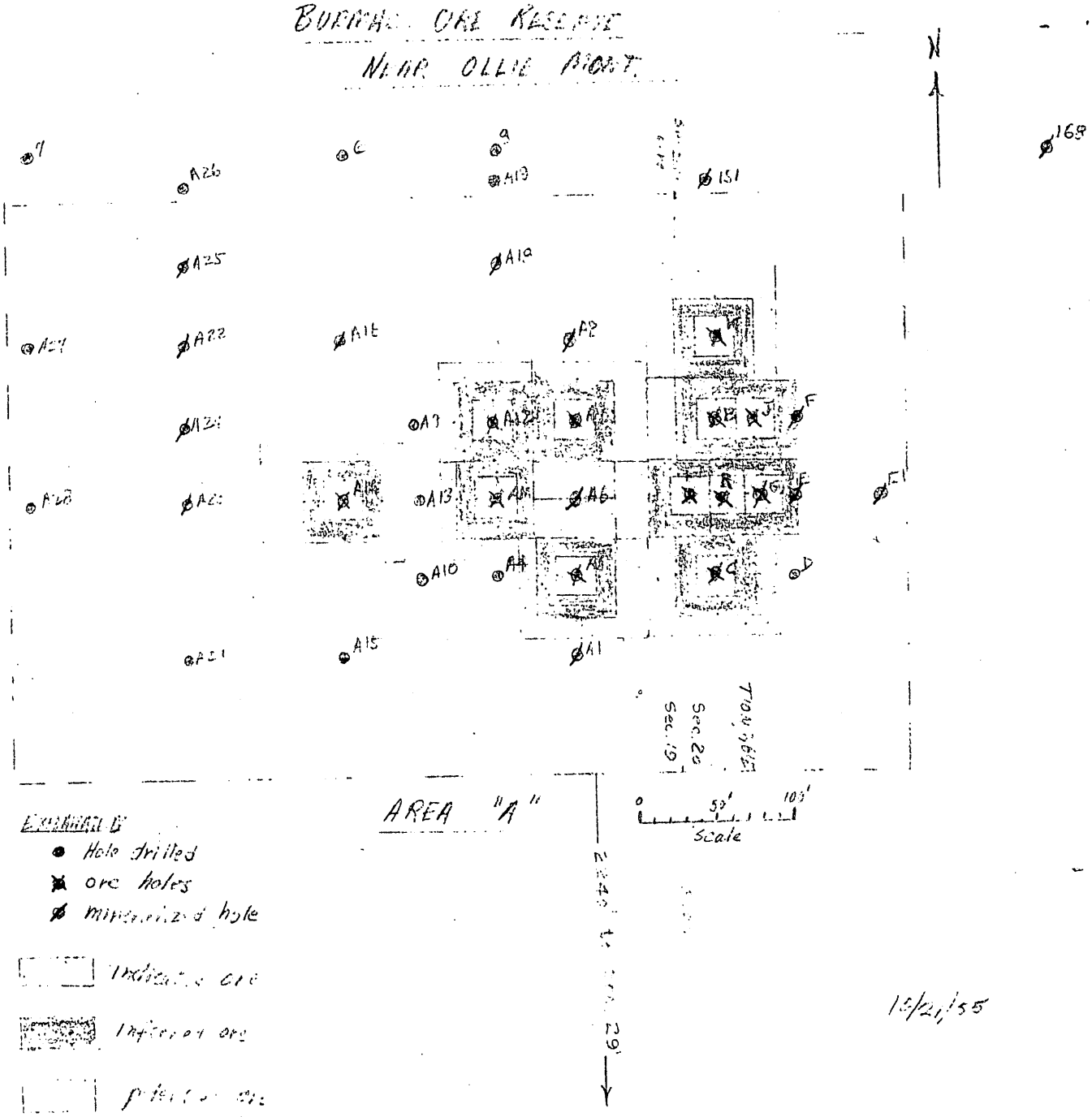
BURMAC ORE RESERVE

NEAR OLLIE, MONT.



BURMAH ORE RESERVE

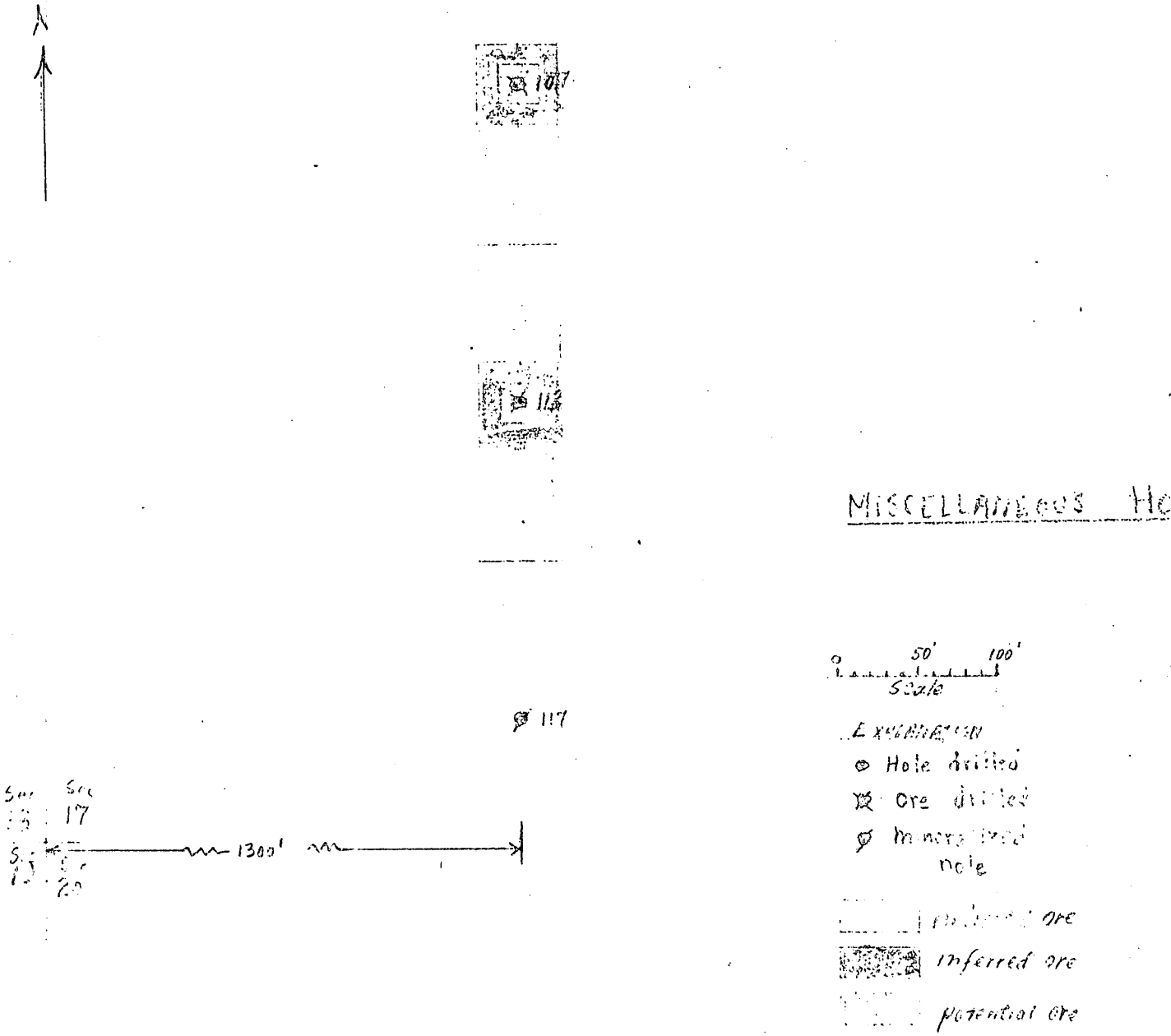
NEAR OLLIE PORT

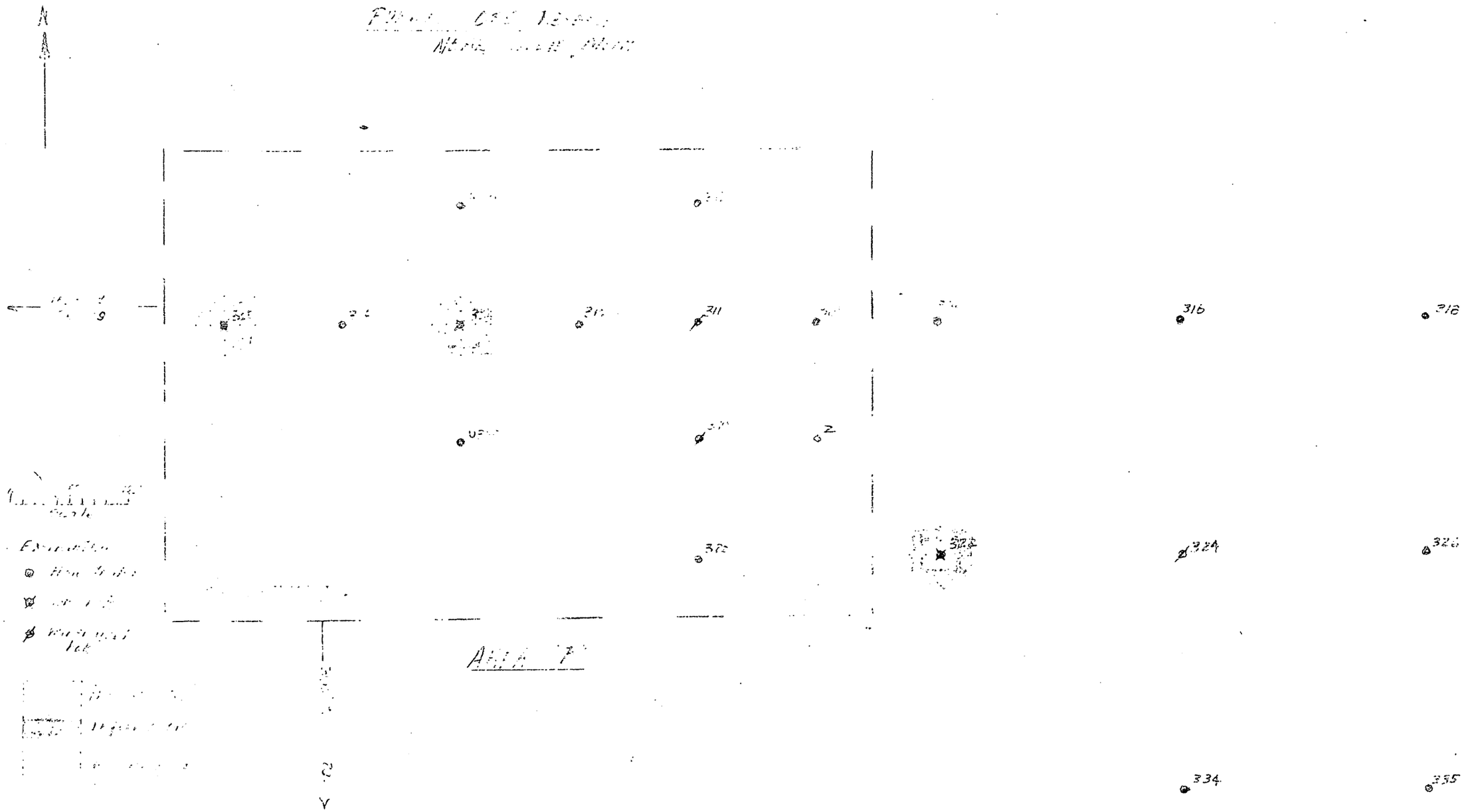


12/21/55

BURNING ORE RESERVE
NEAR OLLIE MONT

10-20-




N
311
316
318
324
326
334
335
AREA 7

RECEIVED
APR 26 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
1201 N. Division St.
Spokane 2, Washington

RECEIVED
APR 26 1956

March 1, 1956

MEMORANDUM

To: DMEA Field Team, Region I, Northwest District

From: E. W. Parsons, Mining Engineer, Bureau of Mines

Subject: Field examination, Docket No. DMEA-4107 (uranium), Burmac Exploration Corp., Cox Lease, Fallon County, Montana

Burmac Exploration Corporation
Mr. Dois D. Dallas, President
P. O. Box 836
Williston, North Dakota

SUMMARY

Radioactive lignitic material has been found on the Montana-North Dakota border, 25 miles south of Beach, North Dakota, in a formation which may be the Tongue River member of the Fort Union formation of Tertiary age. The surface beds are estimated to dip locally about 60 feet to a mile to the northeast. The discovery site is in the center of a zone which contains a radioactive bed that is estimated to be 3 miles wide by 12 miles long extending northeast across the border, and lies about 2 miles north of the village of Ollie, Montana. Deep drilling has indicated a structural basin at a depth of 5,000 feet below the surface that trends northwest-southeast, is about 7 miles wide by 20 miles long, and is centered a few miles south of Ollie. This structure apparently is not reflected in the surface beds.

Shallow drilling by the Burmac Corporation on a 4,480-acre block, centered about 2 miles north of Ollie, indicates the presence of small, discontinuous, irregular lenses, or long narrow patches possibly connected with Tertiary stream bank deposits, of sandy lignite which lie on a gray clay formation and are capped with crossbedded, loosely cemented to practically unconsolidated sand. Maximum thickness of radioactive material drilled is 3.5 feet but the average of all ore-bearing holes is slightly more than 1 foot and usually consists of about 10 inches of lignite and a few inches of the enclosing sand and clay. A total of 160 holes have been drilled of which 35 contained values in excess of 0.15 cU_3O_8. Lenses are probably not longer than

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4-30-56
(date)

200 feet and vary in width. Overburden on the half section described in the application ranges from 10 to over 100 feet in thickness, averaging possibly 50 feet. Radiometric readings up to 0.205 percent eU_3O_8 were obtained by probing holes but the average of the 44 mineralized holes probed on company leases was 0.152 eU_3O_8. Two samples were chemically assayed which indicated that a factor of 1.3 was needed to correct radiometric assays to equivalent chemical assays. The best sample from the property ran 1.72% U_3O_8, the next best 0.316. These were not drill hole samples.

From a study of aerial photographs and work on the surface by the Burmac geologist a line of the probable outcrop of the lignite formation was plotted on the map and practically encircled the Burmac holdings. No notable occurrences of radioactive material were found along this outcrop line.

A bulldozer pit roughly 75 by 100 feet, 15 feet deep, had been made on ground held under lease by the Burmac Corporation. This pit is approximately one-half mile south of the half section described in the application. The radioactive lignitic lens found in the pit, under 15 feet of overburden, was not visible at the time of the examination because of ice in the bottom of the pit; however, large pieces of lignite were seen in the material moved by the bulldozer. When the lignite is exposed to the air and dried it disintegrates to powder. A brown radioactive lens about 7 inches thick was seen in one wall of the pit 10 feet above the bottom and 5 feet below the ground surface. No ore has been shipped from this pit or any place in the area. A 50-pound sample was taken from the pit for mineral determination but no uranium mineral has been identified.

AEC publications, Geologic Investigations of Radioactive Deposits, TEI 490 and 540, June 1954 and May 155, note the occurrence of radioactive lignitic material in 12 areas in western North and South Dakota and eastern Montana. In most of these occurrences the lignitic material apparently is in continuous beds instead of lenses as in the Burmac property, but is similar in thickness and uranium content. At least two large samples, 100 and 200 tons, are reported to have been shipped for amenability tests but no amenability tests have been completed on these sandy lignitic ores.

CONCLUSIONS

The radioactive lignitic occurrence described in the application or its continuation in the adjoining property is not considered suitable for a DMEA exploration loan for the following reasons:

Size, distribution and continuity: The deposits which are lens-shaped and in the same general horizon are too thin, too small and irregular in shape, and too sparsely scattered over the area to constitute commercial ore.

Grade of radioactive material: The indicated average grade of the radioactive lignitic material in place is about the minimum grade acceptable in plants treating amenable ores.

Overburden and minability: The ratio of overburden to indicated thickness of ore would range from 15 to 1 where the capping is light to more than 50 to 1 where the capping is heavy, and this ratio would be increased due to the lenticular nature of the ore. This stripping ratio is too great for recovery of the grade of material indicated. Underground mining on the thin bed and below the practically unconsolidated sand capping is not practical.

Dilution: Whatever type of mining used to mine a deposit of this type would be handicapped by unavoidable dilution which would lower the grade of ore produced to the submarginal point.

Amenability: No amenability tests have been completed so it is not known whether the material can be classed as ore. As mined the lignite content of the material can be expected to range from 20 to 50 percent.

Knowledge to be gained: Drilling has already indicated the type of ore bodies that can be expected and the outcrop line has failed to give evidence of a large continuous body.

Surface after mining: By terms of the lease the surface of the land must be restored after mining operations cease so that the land can be cultivated. For a marginal producer this added expense would be an important item.

RECOMMENDATION

It is recommended that the application be denied.

PERSONNEL ON EXAMINATION

The property was visited on February 21, 1956, at which time approximately 3 hours were spent in the immediate vicinity examining drill holes, road cuts, outcrops, and one bulldozer pit. The party included Donald Towse, Geologist and Exploration Manager for the Burmac Exploration Corporation, Max Bergandahl, Geologist, Denver office of the U. S. Geological Survey, D. C. Alvord, Geologist,

Spokane office of the U. S. Geological Survey, and E. W. Parsons, Mining Engineer, Spokane office of the U. S. Bureau of Mines. While in the area, but not on the property, the group had a 1-1/2 hour conference with Don L. Curry and Larry V. Marks, Geologists, Casper, Wyoming office of A.E.C. who have been working in the area described in the application.

LOCATION

The Burmac Exploration Corporation has leased a block of land totaling 4,480 acres of which the Cox lease, with an area of 2-1/2 sections or approximately 1,600 acres, is a part. The application applies to a half section of the Cox lease. Access to the property is by all-weather blacktop and gravel roads, a distance of 25 miles south and a little to the west of Beach, North Dakota. The cross-roads settlement of Carlyle, Montana, is 2 miles north of the discovery point and Ollie, Montana, lies about 2 miles to the south. The portion of the land included in the DMEA application is the S 1/2, sec. 18, T. 10 N., R. 61 E., Fallon County, Montana. The land in the immediate area is rolling and has a maximum difference in elevation of less than 200 feet. The low point on the property is about 3,150 feet above sea level. The land surface is being used for pasture or raising wheat. There has been no mining in the area.

ACCESSIBILITY

The property is accessible throughout the year with the possible exception that snowdrifts might block the roads for short periods during the winter months.

COMPETENCY OF THE APPLICANT

The president of Burmac Exploration Corporation is Dois D. Dallas, a petroleum engineer working out of Williston, North Dakota.

Donald Towse, Geologist and Exploration Manager, has a PhD. in geology, has worked for petroleum companies, North Dakota Geological Survey, and as a consulting geologist within the last 5 years.

Frank Jestrab, Secretary and Legal Adviser, is a lawyer in Williston, North Dakota.

William J. McCabe, Treasurer, lives in Grand Forks, North Dakota.

No public offering of stock has been made but some stock has been sold to friends of the officers of the corporation.

The company has other uranium holdings in North Dakota and Wyoming, none of which are active at present though some drilling has been done.

The financial position of the company seems to be adequate for the proposed work.

APPLICANT'S PROPERTY RIGHTS

The land described in the application is held under lease which is part of the application. Mr. Towse states that a consent to lien can be obtained.

DESCRIPTION OF PROPERTY

The land surface is rolling and is used at present for raising wheat and as pasture land. The land is fenced but there are no buildings or other improvements. The Beach-Ollie branch of the Northern Pacific Railway crosses north-south the eastern end of the property.

There are no mine workings, cuts, or pits on the property included in the application. Four shallow test holes have been drilled through the ore horizon along the eastern edge of the half section, one of which encountered radioactive material.

Test work on the block of ground held by the company but not included in the application includes a bulldozer pit 75 by 100 feet with a maximum depth of 15 feet, and 156 holes ranging from 5 to 90 feet deep. Thirty-five holes cut through radioactive mineralization which ranged from 0.5 to 3.5 feet thick and was encountered at depths from 0 to 64 feet. Values ranged from 0.08 to 0.205 percent eU_3O_8, or after applying the factor of 1.3 the assumed values ranged from 0.09 to 0.32 percent eU_3O_8. Fourteen of these holes were in three areas where close spacing was used to define possible blocks of ore for mining. A small lens of brown, radioactive material 7 inches thick is visible in one wall of the pit, 10 feet above the bottom and 5 feet below the ground surface.

Twenty-eight samples were assayed, apparently radiometrically, eight of which were cuttings from drill holes. One sample gave 1.72 percent U_3O_8 and the balance ranged from 0 to 0.316 percent. Of these assays Jerome of Denver supplied 14; the AEC, 10; and the Chemical and Geological Laboratory of Casper, 4.

It should be noted that the factor 1.3 used for changing equivalent values to chemical values was obtained from only two chemical assays, one of which indicated a factor of 1.56 and the other 1.24.

GEOLOGY AND ORE RESERVES

A thin bed of sandy lignite containing uranium occurs as small, scattered lenses or irregularly shaped deposits over an area about 3 miles in diameter in Fallon County, Montana, between the settlements of Carlyle and Ollie. Apparent outcrops enclose this area. There is some evidence of a zone containing radioactive material extending over an area 3 miles wide by 12 miles long, trending northeast-southwest from the discovery site.

The exposed formation is thought to be the Tongue River member of the Fort Union formation of Tertiary age. The local dip of the beds is to the northeast and is estimated to be about 60 feet to a mile. The thin bed containing the lenses of lignite lies on a gray clay and is capped with crossbedded, loosely cement or practically unconsolidated sand. Soil depth in the area averages about 1-1/2 feet.

Deep drilling has indicated a structural basin at a depth of 5,000 feet below the surface. This basin is centered a few miles south of Ollie, is approximately 7 miles wide by 20 miles long, and trends northwest-southeast. The surface beds apparently do not reflect this structure.

Radioactivity is found in the lignitic material and to some extent in the sand and clay above and below the bed. No uranium minerals have been identified.

Ore reserves in one block, Block A, have been tentatively calculated by the applicant at 3,000 tons with a eU_3O_8 content of 0.213 percent, average thickness 1.14 feet, and average overburden of 13.6 feet. This data was obtained from drill holes and the exposure in the bulldozer pit. Other small lenses are indicated by drill holes.

PAST OPERATION

Past operations consist of 160 drill holes totaling 5,799 feet of bore, one bulldozer pit about 75 by 100 feet with a maximum depth of 15 feet, and a number of samples taken from outcrops and roadcuts. One 50-pound sample was taken from the pit for mineral determination. No ore has been produced from the area. Little or no water was encountered in drilling but difficulty was experienced due to caving holes.

AVAILABILITY OF MANPOWER AND SUPPLIES

The applicant has approached 3 or 4 drill contractors who are willing to drill on contract and furnish necessary equipment and supplies. Contract cost per foot is estimated to be $1.25. One junior geologist at $500 to $600 per month would handle drill cuttings, cores, and samples. Mr. Towse would act as consulting geologist at $200 per month.

EXPLOITATION POSSIBILITIES

The thickness of the uranium-bearing material is definitely known only in the bulldozer pit and on some of the outcrops. The recorded thicknesses were deduced from the radiometric logs of the holes. The statement in the application that radioactivity extended 2 to 10 inches into the sandstone on either side of the shale seams cannot be based on physical observation in any but the cases listed above. Since so little is known of the deposits other than from the radiometric logs of the holes, only a guess can be made of the proportion of uranium in the lignite to that in the sandstone.

A.E.C. geologists, Curry and Marks, stated that no uranium minerals had been identified from the area and that they were in error when they advised D. Towse that identifications had been made.

No surveying or leveling has been done on the property, so height of local topography and depth of overburden are estimated. The high point on the ridge in the S½, sec. 18 is at least 150 feet higher than the railroad grade and the railroad grade is at least 10 feet above any known uranium-bearing material on the half section.

From drilling in the W½, SW¼, sec. 17 it is calculated that possibly 8.79 percent of the area may be underlain by uraniferous lignitic material which has an average thickness of 1.625 feet and carries 0.1586 percent eU_3O_8. A logical estimate of the area bearing uraniferous material would be much less, possibly 3 percent; therefore, it is inferred that the half section could contain from 43,900 to 144,000 tons of possible uranium-bearing material capped by overburden ranging from 10 to 150 feet and averaging more than 50 feet thick. This would mean a stripping ratio of more than 30 to 1 for lenses scattered throughout the half section. The consistancy of the uranium-bearing material and the overburden is about the same, being soft and practically unconsolidated. If open pit mining was used the unavoidable dilution would be in the order of 100 percent or more as it would be impossible to make a clean separation of the two soft materials. Fresh lignite from the formation is apparently firm but on exposure to air and drying disintegrates to a fine powder.

Having mined uranium in New Mexico and knowing the policy of a number of producing companies in regard to shipping grade of ore, I know that 0.20 eU_3O_8 is considered to be minimum shipping grade. On this basis ore assaying between 0.15 and 0.20 U_3O_8 diluted by an equal amount of barren waste would be well below the economic limit of mining. Even though buying stations accept 0.10 percent ore, no company can mine and deliver ore of this grade at a profit under present prices or at any foreseeable time.

Underground mining of this deposit would be impractical because of the unconsolidated nature of the material, uneven distribution of lenses and values, and thickness of the lenses. Recovery of 50 to 60 percent of the uranium-bearing lenses could probably be made but with a high dilution and at an excessive cost for timber and labor.

In general, there is no basis for comparison between these lignitic deposits and the Plateau uranium deposits as to type, size, continuity, minability, or uranium content.

It appears possible that lenses on the property may be found with dimensions up to 400 feet long, 200 feet wide, and 1.5 feet thick which may contain up to 0.20 percent U_3O_8. Such a lens would contain 8,000 tons. To strip such a deposit of overburden 40 feet thick, at least 280,000 tons would have to be moved. With no dilution the first 2,500 tons would be worth $75,000 and the remaining 5,500 tons $88,000 for a total of $163,000. With a 100 percent dilution the first 5,000 tons would return $35,000 and the remaining 11,000 tons $44,000 for a total of $79,000.

Estimated expenses of mining 0.2 U_3O_8 ore 1.5 feet thick under 40 feet of overburden are as follows:

	No dilution	100% dilution
Stripping 280,000 tons @ $0.20/ton	$ 56,000	$ 56,000
Mining 8,000 tons @ $0.60/ton	4,800	9,600
Royalty - 12½%	20,375	9,875
Initial prospect drilling	3,000	3,000
Restoring land surface	28,000	28,000
Total cost	$112,175	$106,475
Return	$163,000	$ 79,000

Estimated expenses of mining 0.1586 U_3O_8 ore 1.5 feet thick under 40 feet of overburden are as follows:

	No dilution	50% dilution	100% dilution
Stripping 280,000 tons @ $0.20/ton	$ 56,000	$ 56,000	$ 56,000
Mining 8,000 tons @ $0.60/ton	4,800	7,200	9,600
Royalty - 12½ percent	13,615	9,404	none
Initial prospect drilling	3,000	3,000	3,000
Restoring land surface	28,000	28,000	28,000
Total cost	$105,415	$103,604	$ 96,600
Return	$108,900	$ 75,639	none

Estimated expenses of mining 0.1586 U_3O_8 ore 2.0 feet thick under 40 feet of overburden are as follows:

	No dilution	50% dilution	100% dilution
Stripping 280,000 tons @ $0.20/ton	$ 56,000	$ 56,000	$ 56,000
Mining 10,666 tons @ $0.60/ton	6,400	9,600	12,800
Royalty - 12½%	17,027	11,906	none
Initial prospect drilling	3,000	3,000	3,000
Restoring land surface	28,000	28,000	28,000
Total cost	$110,427	$108,506	$ 99,800
Return	$136,220	$ 95,249	none

These figures do not portend to represent accurate or inclusive costs but will serve to indicate the marginal character of the uranium-bearing material on the property. Lenses on the property will probably average about one-fourth the size of the one used in the illustration and costs will be greater.

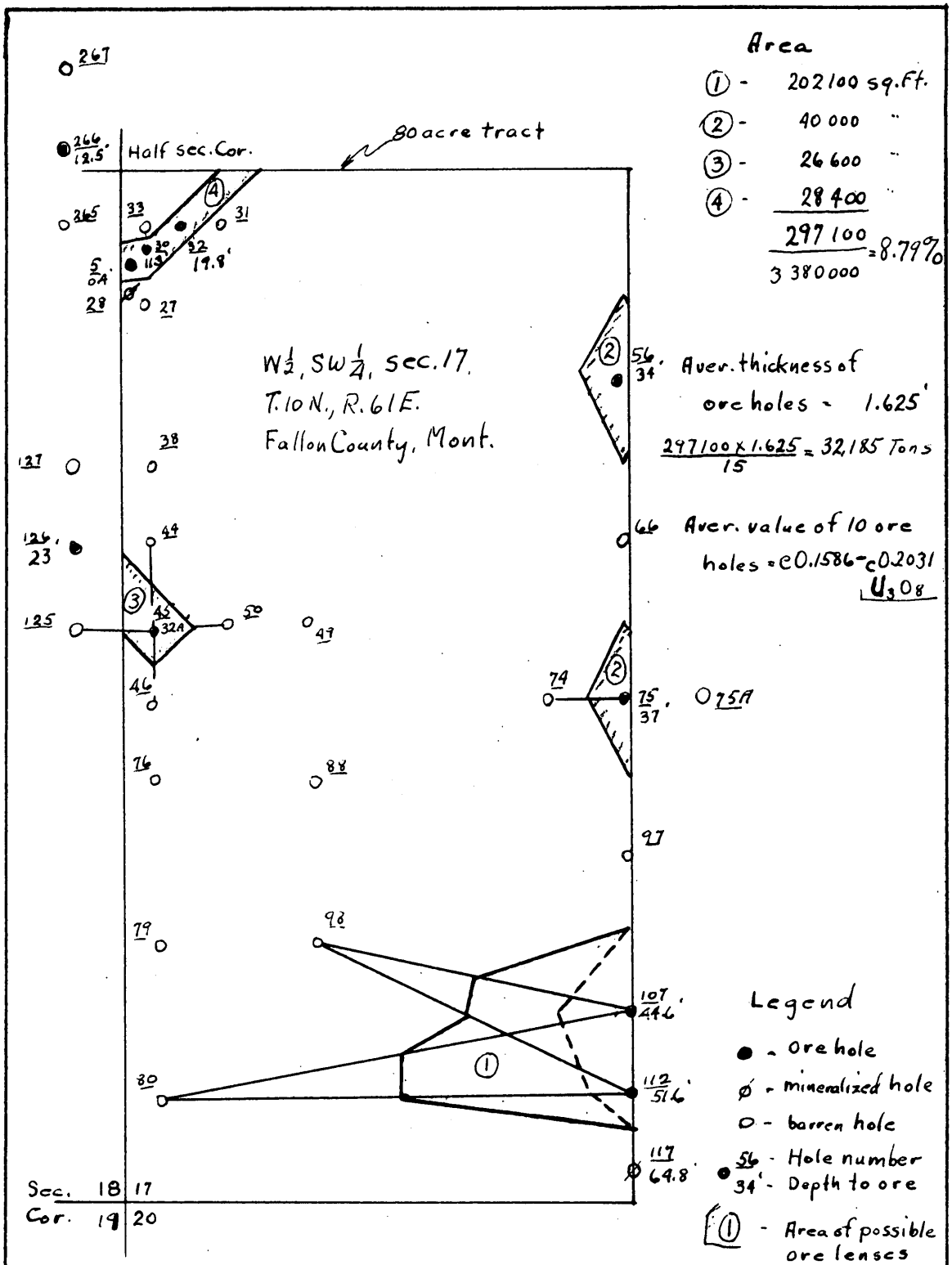
APPLICANT'S PROPOSAL

The applicant's proposal calls for drilling 13,000 feet of hole on a grid pattern, starting with holes 150 feet deep on 1000-foot centers and continuing with holes to the ore horizon, filling in the grid at gradually reduced spacing, allowing some flexibility in order to delineate size and shape of ore lenses. The half section of land was chosen from the block under lease as offering the best possibilities for finding minable ore. This was deducted from an airplane survey over the property and ground work. The applicant is willing to include more land or change the grid pattern to be followed.

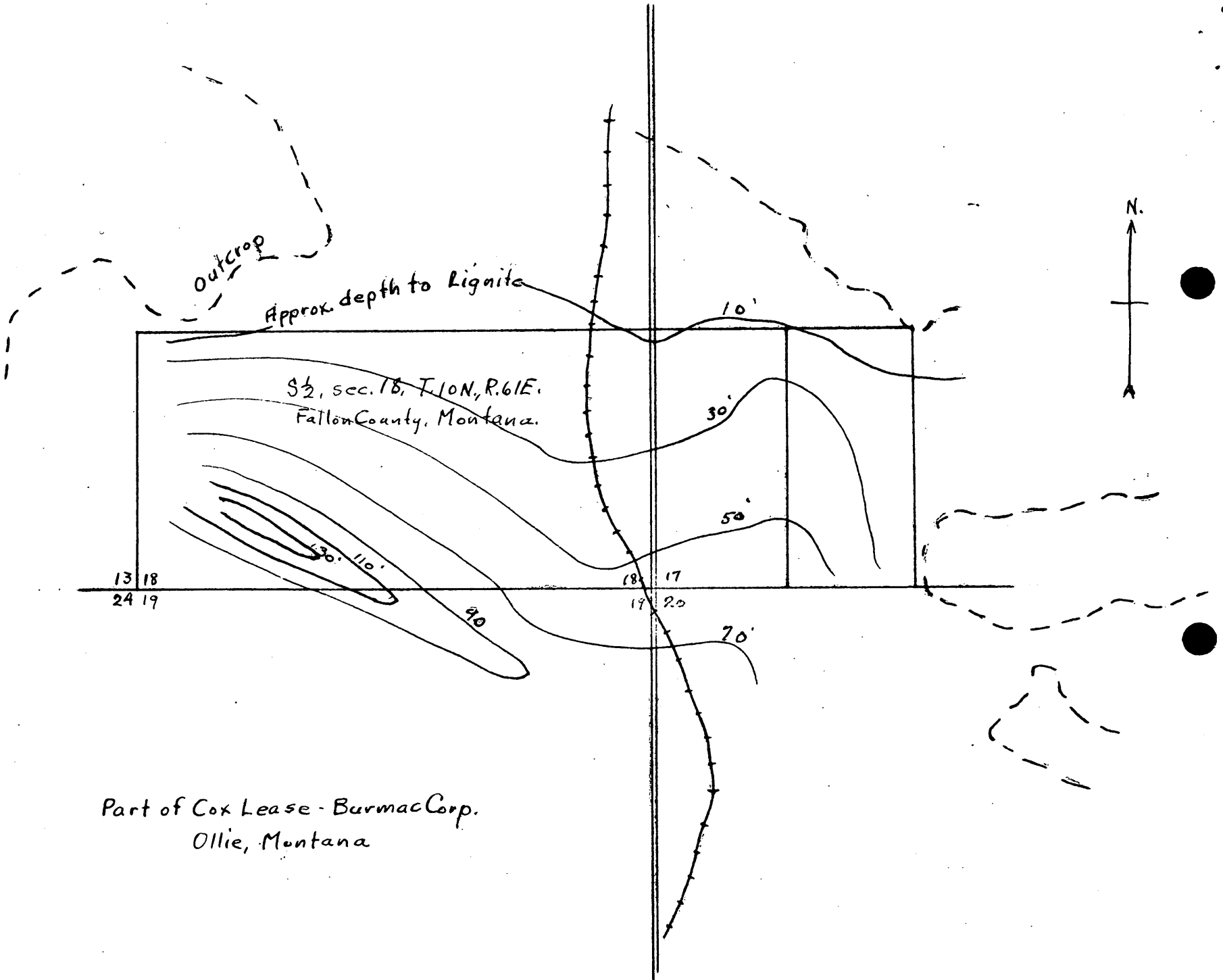
The overlying sediments are very loosely cemented or practically unconsolidated, and some difficulty was encountered in previous drilling due to moisture. Holes sloughed in and became blocked within a relatively short time.

Indications from previous drilling are that possible ore-bearing lenses will be widely scattered and small, possibly less than 200 feet in the longest dimension and with an average thickness of slightly more than 1 foot, and with a ratio of overburden to ore ranging from 15 to 1 to more than 50 to 1. The ore in place will probably be of a minimum shipping grade. The minimum shipping grade of uranium ore or the grade most producing companies consider the minimum is 0.2% cU_3O_8. It does not appear feasible to find deposits in the land described in the application or adjoining land which would be more than submarginal in the foreseeable future.

Distribution:
DMEA (4)
USGS (2)
USBM (2)



Partially drilled area - Cox Lease of Burmac Corp.
Fallon County, Montana



Part of Cox Lease - Burmac Corp.
Ollie, Montana

RECEIVED
APR 26 1956

3/12/56 dym

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D. C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
MAR 12 1956

March 7, 1956

Air Mail

Mr. D. L. Everhart, Chief
Denver Exploration Branch
Atomic Energy Commission
P. O. Box 7647, Lakewood Branch
Denver 15, Colorado

Re: Docket No. 4107 (Uranium)
Durmac Exploration Corporation
Cox Lease
Fallon County, Montana

Dear Mr. Everhart:

Ernie Thurlow wrote me that the Durmac application had been referred to your office as the property lies within your jurisdiction.

Our report is essentially completed but we would like to have the AEC's evaluation before we send our recommendations to Washington. Our man did meet AEC geologists Don Curry and Larry Hicks in the field and we appreciate the assistance they gave; however, we are desirous of obtaining your opinion as soon as possible as to whether the DMEA should enter into a contract to explore this property.

Sincerely yours,

A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW Dist.

cc: DMEA (2)
USBM (2)
Alvord

2-23-56 [illegible]

X

WESTERN UNION

DAY LETTER

February 16, 1956

MR. DOUG D. MALIAS, PRESIDENT

BURMAC EXPLORATION CORPORATION

c/o P. O. BOX 836

WILLISTON, NORTH DAKOTA

REGRETS FEBRUARY 6. DMEA REPRESENTATIVES WILL BE IN CHICAMOCK FEBRUARY TWENTY FIRST TO EXAMINE PROPERTY UNLESS YOU ADVISE US TO THE CONTRARY.

A. L. WEISSENBORN
EXECUTIVE OFFICER, DMEA
FIELD TEAM REGION I, NORTHWEST DISTRICT

CC: Confirmation
Docket
Albord
Outgoing TT file
Chrono
URDM
DMEA (2)

(Re Docket No. DMEA-41D7-Uranium
Cox Lease, Fallon Co., Mont.)

CHARGE TO: U. S. GEOLOGICAL SURVEY
S. 157 HOWARD STREET
SPOKANE 4, WASHINGTON

2/9/56 [illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
FEB - 9 1956

February 6, 1956

Mr. Ernest A. Thurlow
Atomic Energy Commission
P. O. Box 2196
Salt Lake City, Utah

Re: Docket No. [illegible]-4107 (Uranium)
Burmac Exploration Corp.
Cox Lease
Fallon County, Montana

Dear Ernie:

Enclosed is a copy of an application submitted by Burmac Exploration Corp. of Williston, N. D. According to the applicant, Commission geologists are familiar with the area in question.

On the face of the application we believe that an exploration program may be justified; we would appreciate your comments and any information about the property that you can give us.

Sincerely yours,

A. L. Weissenborn
Executive Officer, DMEA
Field Team, Region 1
Northwest District

Enclosure
cc: [illegible](2) ✓
[illegible](2)
Alvord

2/9/56 Lgm

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
FEB - 9 1956

February 3, 1956

Air Mail

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
Cox Lease
Fallon County, Montana

Dear Mr. Dallas:

We have been asked to make a field examination of your property in connection with your recent DMEA application.

The field examiners would want to examine any pertinent drill core, or cuttings, as well as review the general geology of the area. Will you inform us when such an examination will be feasible?

If you can provide transportation to the property, our men will come to Baker, or any other place you suggest, by train.

Sincerely yours,

A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region 1
Northwest District

cc: DMEA(2)
USGS(2)
Alvord

700

FILE COPY
Surname:
Ching
Selfridge

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

JAN 17 1956

Mr. A. E. Weissenborn
Executive Officer
DMEA Field Team, Region I, N.W. District
South 157 Howard Street
Spokane 4, Washington

Re: Docket No. DMEA-4107 (Uranium)
Burnes Exploration Corporation
S½ Section 18, T. 20 N., R. 63 E.
Fallon County, Montana

Dear Mr. Weissenborn:

The subject application is being referred to you for investigation, a field examination if warranted, and recommendation. A copy of the application was retained in your office.

Enclosed are two copies each of memoranda, dated January 4 and 6, 1956, from J. E. Crawford, WSGS, and H. E. Nelson, WSGS, respectively.

In the event a contract is recommended by the Field Team, six copies of a Consent to Lien executed by George F. Cox and Ruth E. Cox will be required. It is suggested that arrangements be made to secure such Consent to Lien in time to be attached to the report of examination.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

Enclosures

APPROVED:

/s/ Robert W. Geehan (GCS)
Member, Bureau of Mines

Thor H. Kiilsgaard (GCS)
Member, Geological Survey

MChing/izm 1-13-56
cc to: Docket
Code 700
Admr.'s Reading File
Operating Committee
Mr. Ching
~~DMEA Field Team, Region I NW District (2)~~
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

R.C.H.

700

FILE COPY
Surname:
Ching
Ely
~~Kuibagard~~
~~Gehegt~~
Selfridge
Fleman

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.

JAN 17 1956

Mr. Dois B. Dallas, President
Burnac Exploration Corporation
Post Office Box 896
Williston, North Dakota

Re: Docket No. DMEA-4107 (Uranium)
S½ Section 18, T. 10 N., R. 61 E.
Fallon County, Montana

Dear Mr. Dallas:

The application for assistance in exploring the subject property in Fallon County, Montana, under the captioned docket number, has been reviewed by the Rare and Miscellaneous Metals Division of the Defense Minerals Exploration Administration. It has been referred to the Executive Officer of Region I, at the following address:

Mr. A. E. Weissenborn
Executive Officer, Northwest District
DMEA Field Team, Region I
South 157 Howard Street
Spokane 4, Washington

The Regional Office will contact you in regard to your project if additional information is required.

Sincerely yours,

J. D. Mitten

Administrator

MChing/izm 1-13-56
cc to: Admr.'s Reading File
Docket
Code 700
Mr. Ching
DMEA Field Team, Region I, NW District (2)

N.A.

1-10-56 Lgm

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

January 6, 1956

Re: DMEA 4107
Burmac Exploration Corp.
Cox Lease
Fallon Co. Montana
$20,000 - Uranium

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of application

The applicant asks assistance in exploring a small part of a large "prospect" (Ollie) in which near-surface uranium-bearing beds of the Fort Union formation have been shown to exist by outcrop sampling and drilling. Samples taken assayed from 0.10 to 1.72% U_3O_8 and from zero to 0.53 percent V_2O_5.

The Fort Union formation here consists mainly of soft sandstones with some shale partings and lignite beds. There is a general alternation of sandstone, lignite, and shale beds in the section.

Mineralization is confined to places where the sandstone grades laterally to grey shale and lignite. Ore is present where thin stringers of carbonaceous material interfinger with the sandstone. In general the deposits are flat-lying but the beds are contorted and faulted in local spots as shown where trenching has been done. Two or more ore beds may be present in anyone place, but more often only one bed is present. The ore beds are lenticular and when one pinches out, other ore may be found in beds a few feet higher or lower in the section.

160 test holes totalling 5,799 feet have been drilled on the "prospect" of which 4 are in the south half of Section 18, the block within the "prospect" to which the application pertains. Hole No. 126 in the application block showed 2.4 feet of .26 percent U_3O_8 at a depth of 23 feet. Ten holes in Sec. 17 on the east of 18 showed ore grade material as did one hole just over the line in the north half of 18, but it is not possible to so pair the holes with Hole No. 126 as to indicate an ore body though one may be suggested by pairing No. 126 with No. 45, 150 feet to the southeast.

RECEIVED
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Some groups of holes, outside the application block, suggest concentrations that shape up as probable orebodies. A cluster of holes in Sec. 19 south of the application block, suggests 3,000 tons of 0.21 percent material in one body 1.14 feet thick but more work is needed to make the estimate valid. The ore is only 13.6 feet below the surface and the ore bed is being stripped for open cut mining.

Aerial radioactivity surveys show anomalous conditions in the south half of Sec. 18 and in quarter-section blocks to the north, east, south and southwest of the application block. No results of ground surveys in the block are given, but nearby 1/4 sections showed marked radiation.

The work proposed consists of:

10 holes (@ 1,000 ft. intervals)	150 feet deep	1,500 feet
20 holes	70 feet deep	1,400 feet
35 holes	60 feet deep	2,100 feet
40 holes	50 feet deep	2,000 feet
100 holes	40 feet deep	4,000 feet
'Detail' drilling		2,000 feet
		13,000 feet

13,000 feet at $1.25	$16,250.000
Geologists, assaying, etc.	3,750.00
Total	$20,000.00

Much work with well recorded results, has been done on the "prospect" lands and ore grade material has been found in 4 adjoining or cornering quarter sections and in 1 hole in the application block.

The stripping operation 1/2 mile south in Sec. 19 should give good information concerning the habits of the type of mineralization under investigation and the mining problems to be faced. An examination is warranted. Referral to the Field Team is recommended.

N. E. Nelson

N. E. Nelson

1-5-56 [illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

January 4, 1956

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4445

From: John E. Crawford, Bureau of Mines Member
Uranium Commodity Committee

Subject: Application for Assistance, DMEA Docket 4107, Burmac Exploration Corp., Fallon County, Montana

I have reviewed the attached application of the Burmac Exploration Corp., DMEA Docket 4107, dated December 7 and received in this office December 30. I have also discussed it with Joseph O. Hosted, Washington representative of the Atomic Energy Commission.

The applicant has requested Federal participation in a uranium exploration program on a portion of the applicant's property in Fallon County, Montana. The program includes 205 holes totaling 13,000 feet of drilling at a total project cost of $20,000.

The applicant has done some exploration with encouraging results in the area; therefore, a field examination is probably warranted.

Inasmuch as the area included for consideration in the application, known as the Cox Lease, will benefit the entire Burmac Lease, some consideration should be given to the matter by the DMEA.

We recommend that the application be referred to the Field Team, and that they be requested to consult with D. L. Everhart, Acting Chief, AEC, Denver, Colorado.

John E. Crawford

John E. Crawford

Attachment

RECEIVED
JAN 5 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
So. 157 Howard Street
Spokane 4, Washington

RECEIVED
DEC 27 1955

December 22, 1955

Mr. Dois D. Dallas, President
Burmac Exploration Corporation
P. O. Box 836
Williston, N. D.

Re: New application (Uranium)
Cox Lease
Fallon County, Montana
DMEA-4107

Dear Mr. Dallas:

We are in receipt of your very well prepared application for exploration assistance at the Cox Lease. The application has been forwarded to Washington where it will receive a docket number and preliminary processing.

Sincerely yours,

A. E. Weissenborn
Executive Officer, DMEA
Field Team, Region I, NW Dist.

cc: DMEA (2)
USBM (2)
Alvord

December 29, 1955
Subject: DMEA-4107
Re: Exploration Assistance
Cox Lease

Burmac Exploration Corporation
P. O. Box 836
Williston, North Dakota

Gentlemen:

The receipt of your application dated December 7, 1955, for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-4107 and referred to the Rare & Misc. Metals Division.

Kindly identify all future correspondence relating to your application by this docket number.

Sincerely yours,

Robert E. Adams, Chief
Operations Control and
Statistics Division

December 29, 1955

Memorandum

To: Executive Officer, DMEA Field Team, Region I NW

From: Chief, Operation's Control and Statistics Division

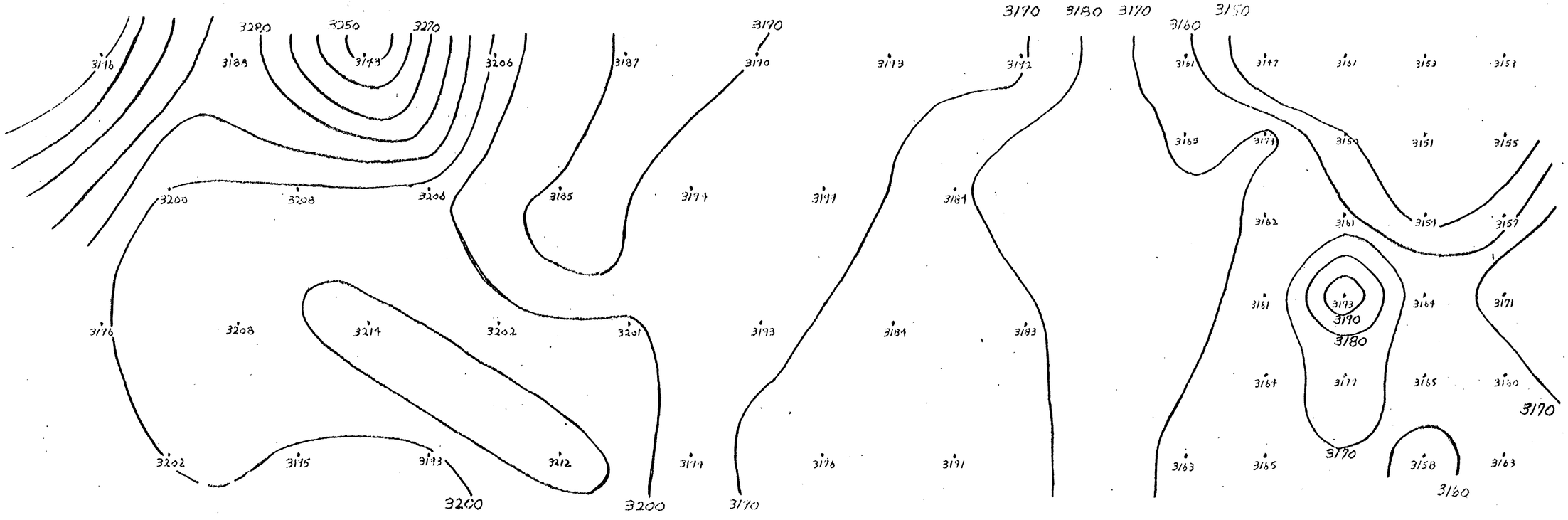
Subject: Assignment of Docket Number

There is listed below the assigned docket number to an application recently received from Region I NW

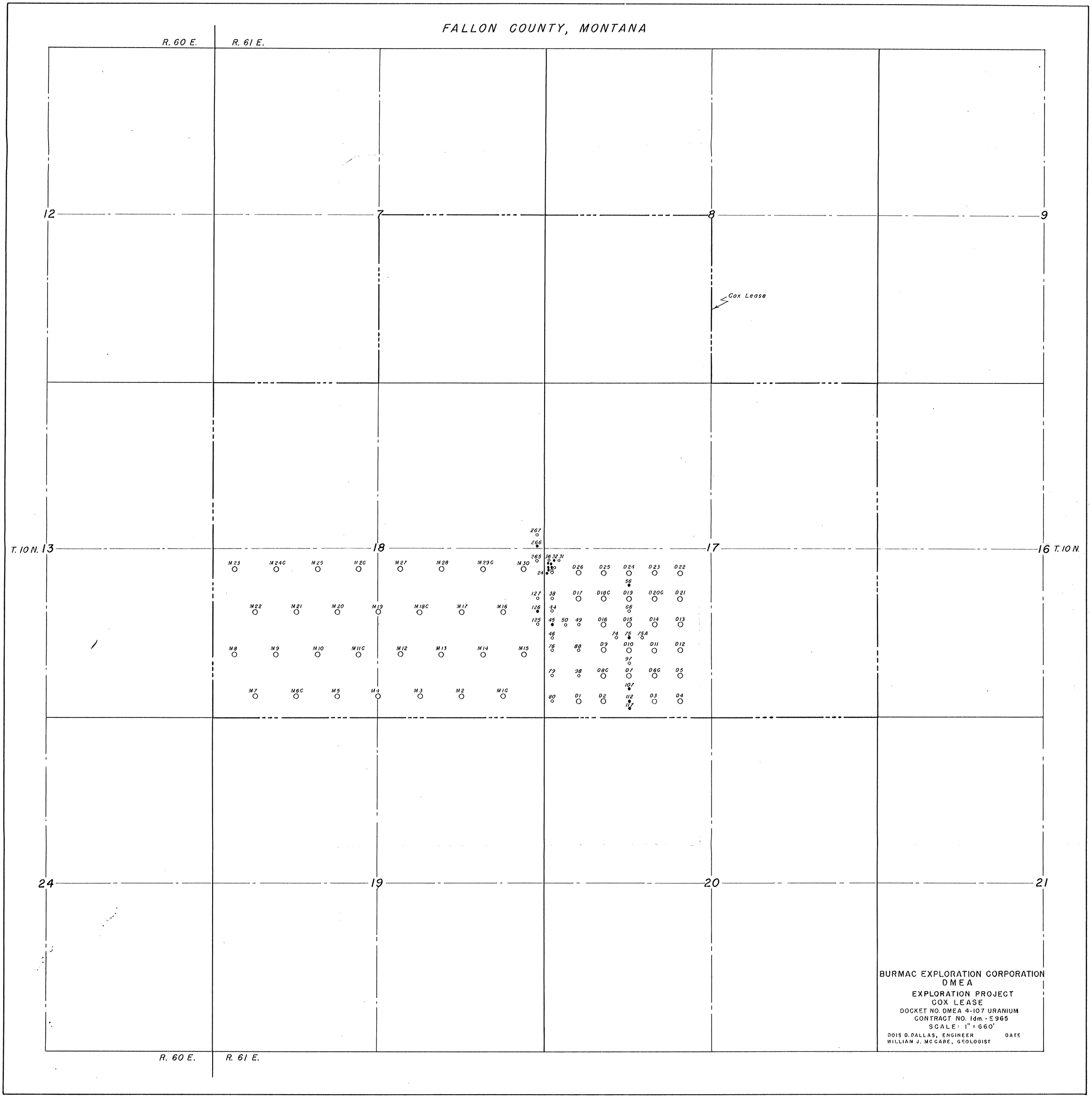
DMEA - 4107 Burmac Exploration Corporation

Robert E. Adams
Chief, Operation's Control
and Statistics Division

Structure - Clay surface
1" = 400'



FALLON COUNTY, MONTANA



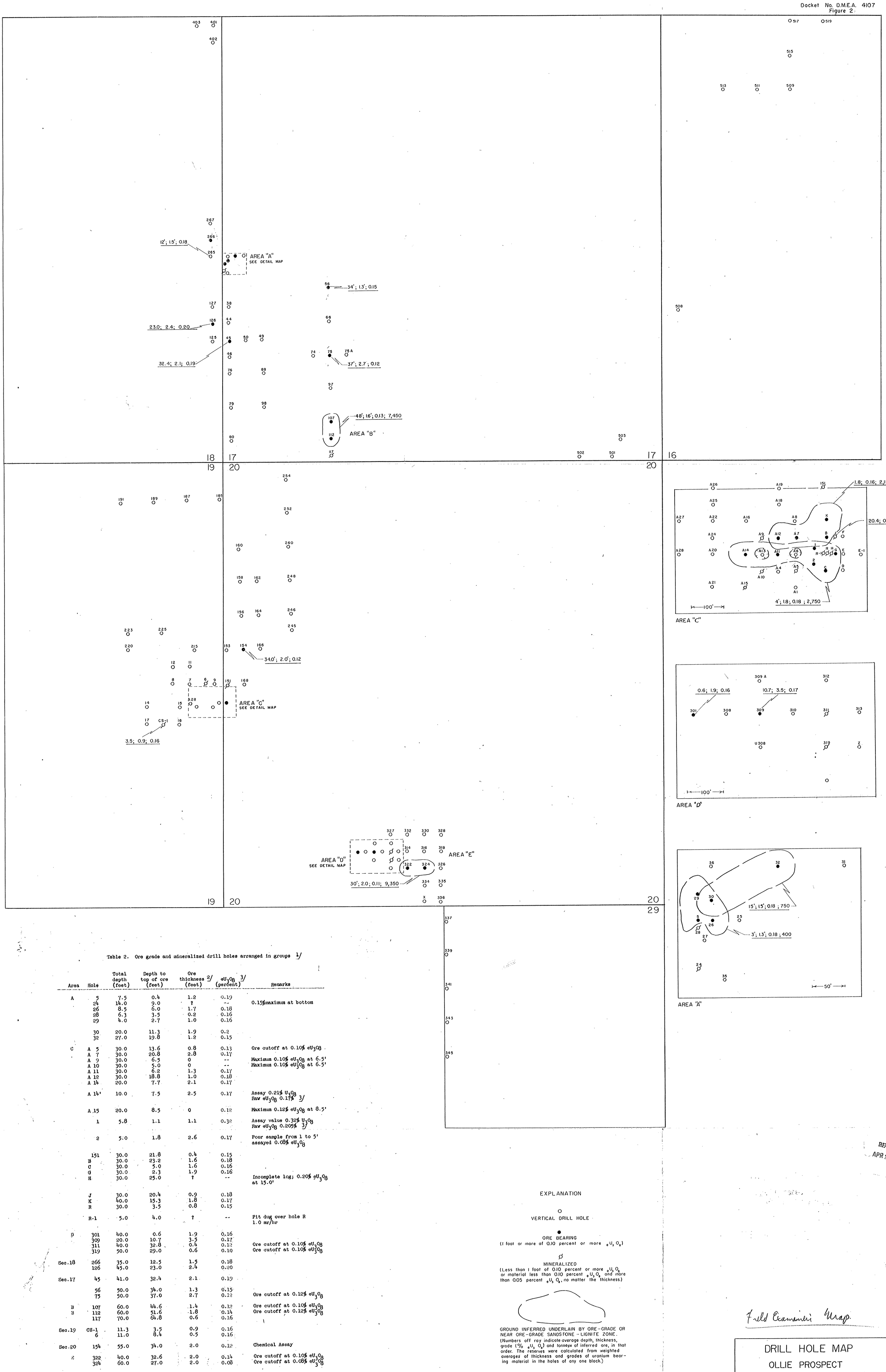


Table 2. Ore grade and mineralized drill holes arranged in groups 1/

Area	Hole	Total depth (feet)	Depth to top of ore (feet)	Ore thickness 2/ (feet)	eU_3O_8 3/ (percent)	Remarks
A	5	7.5	0.4	1.2	0.19	
	24	14.0	9.0	?	--	0.15% maximum at bottom
	26	8.5	6.0	1.7	0.18	
	28	6.3	3.5	0.2	0.16	
	29	4.0	2.7	1.0	0.16	
	30	20.0	11.3	1.9	0.2	
	32	27.0	19.8	1.2	0.15	
C	A 5	30.0	13.6	0.8	0.13	Ore cutoff at 0.10% eU_3O_8
	A 7	30.0	20.8	2.8	0.17	
	A 9	30.0	6.5	0	--	Maximum 0.10% eU_3O_8 at 6.5'
	A 10	30.0	5.0	0	--	Maximum 0.10% eU_3O_8 at 6.5'
	A 11	30.0	6.2	1.3	0.17	
	A 12	30.0	18.8	1.0	0.18	
	A 14	20.0	7.7	2.1	0.17	
	A 14'	10.0	7.5	2.5	0.17	Assay 0.21% U_3O_8 Raw eU_3O_8 0.17% 3/
	A 15	20.0	8.5	0	0.12	Maximum 0.12% eU_3O_8 at 8.5'
	1	5.8	1.1	1.1	0.32	Assay value 0.32% U_3O_8 Raw eU_3O_8 0.205% 3/
	2	5.0	1.8	2.6	0.17	Poor sample from 1 to 5' assayed 0.08% eU_3O_8
	151	30.0	21.8	0.4	0.15	
	B	30.0	23.2	1.6	0.18	
	C	30.0	5.0	1.6	0.16	
	G	30.0	2.3	1.9	0.16	
	H	30.0	25.0	?	--	Incomplete log; 0.20% eU_3O_8 at 15.0'
	J	30.0	20.4	0.9	0.18	
	K	40.0	15.3	1.8	0.17	
	R	30.0	3.5	0.8	0.15	
	R-1	5.0	4.0	?	--	Pit dug over hole R 1.0 mr/hr
D	301	40.0	0.6	1.9	0.16	
	309	20.0	10.7	3.5	0.17	
	311	40.0	32.8	0.4	0.12	Ore cutoff at 0.10% eU_3O_8
	319	50.0	29.0	0.6	0.10	Ore cutoff at 0.10% eU_3O_8
Sec.18	266	35.0	12.5	1.5	0.18	
	126	45.0	23.0	2.4	0.20	
Sec.17	45	41.0	32.4	2.1	0.19	
	56	50.0	34.0	1.3	0.15	
	75	50.0	37.0	2.7	0.12	Ore cutoff at 0.12% eU_3O_8
B	107	60.0	44.6	1.4	0.12	Ore cutoff at 0.10% eU_3O_8
B	112	60.0	51.6	1.8	0.14	Ore cutoff at 0.12% eU_3O_8
	117	70.0	64.8	0.6	0.16	
Sec.19	CS-1	11.3	3.5	0.9	0.16	
	6	11.0	8.4	0.5	0.16	
Sec.20	154	55.0	34.0	2.0	0.12	Chemical Assay
2	322	40.0	32.6	2.0	0.14	Ore cutoff at 0.10% eU_3O_8
	324	60.0	27.0	2.0	0.08	Ore cutoff at 0.08% eU_3O_8

1/ Compiled from tables 2 and 3 of applicant's exploration report, attachment 6 of application.

2/ Ore thickness is calculated from radioactivity logs. Unless otherwise noted, thickness is that indicated in logs with equivalent uranium oxide content of 0.15% or greater.

3/ eU_3O_8 in this table is applicant's $_eU_3O_8$ of table 3 in his exploration report.

EXPLANATION

○
VERTICAL DRILL HOLE

●
ORE BEARING
(1 foot or more of 0.10 percent or more $_eU_3O_8$)

Ø
MINERALIZED
(Less than 1 foot of 0.10 percent or more $_eU_3O_8$ or material less than 0.10 percent $_eU_3O_8$ and more than 0.05 percent $_eU_3O_8$, no matter the thickness.)

GROUND INFERRED UNDERLAIN BY ORE-GRADE OR NEAR ORE-GRADE SANDSTONE - LIGNITE ZONE.
(Numbers off ray indicate average depth, thickness, grade (% $_eU_3O_8$) and tonnage of inferred ore, in that order. The reserves were calculated from weighted averages of thickness and grades of uranium bearing material in the holes of any one block.)

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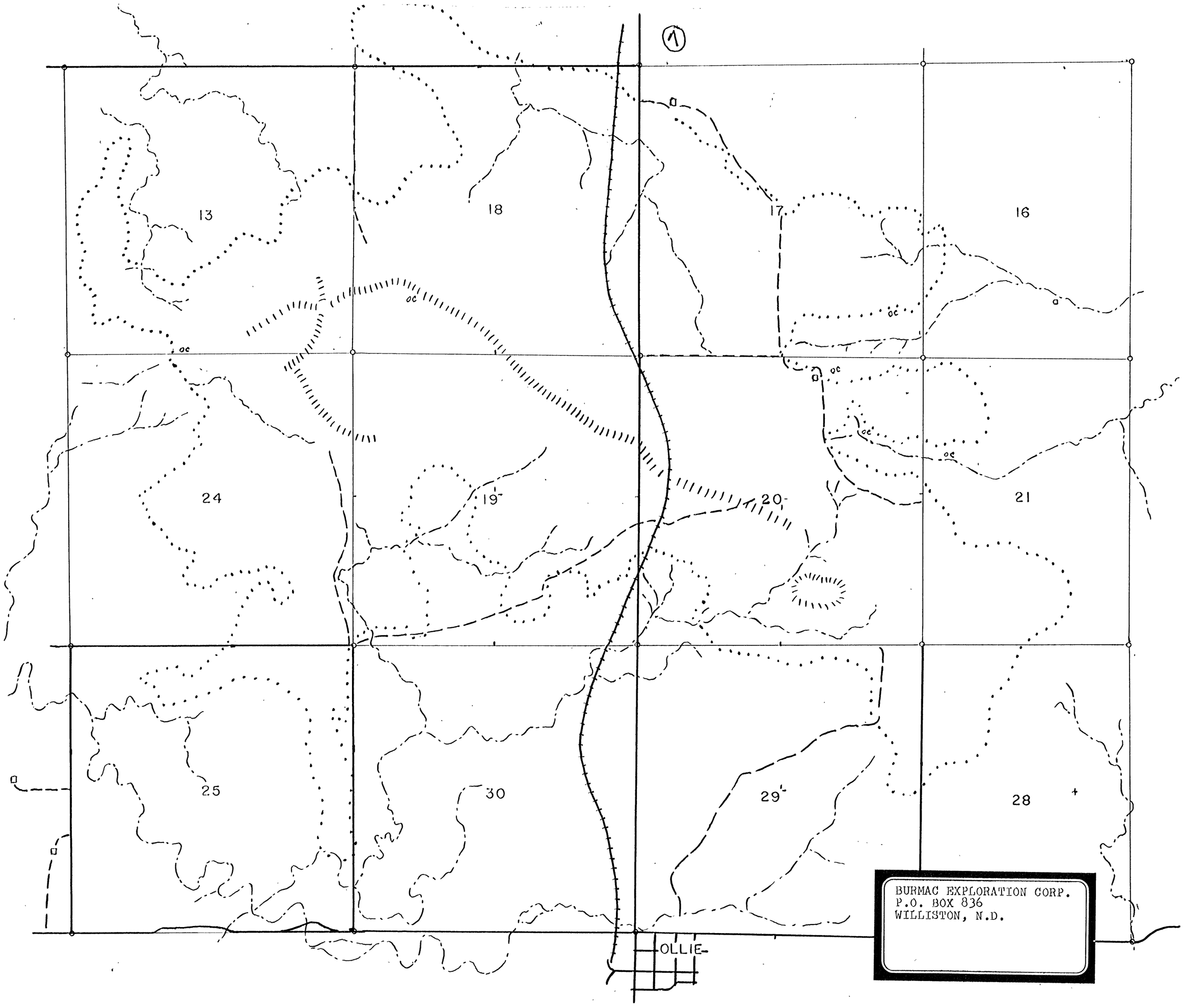
Field Examiner's Map.

DRILL HOLE MAP
OLLIE PROSPECT
BURMAC EXPLORATION COMPANY
T. 10 N., R. 61 E., FALLON COUNTY MONTANA
SCALE 1" = 400 FEET

AFTER MAPS AND DRILL HOLE DATA FURNISHED BY BURMAC EXPLORATION CORPORATION.

T. 10 N., R. 60, 61 E.


1
13
18
17
16
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19
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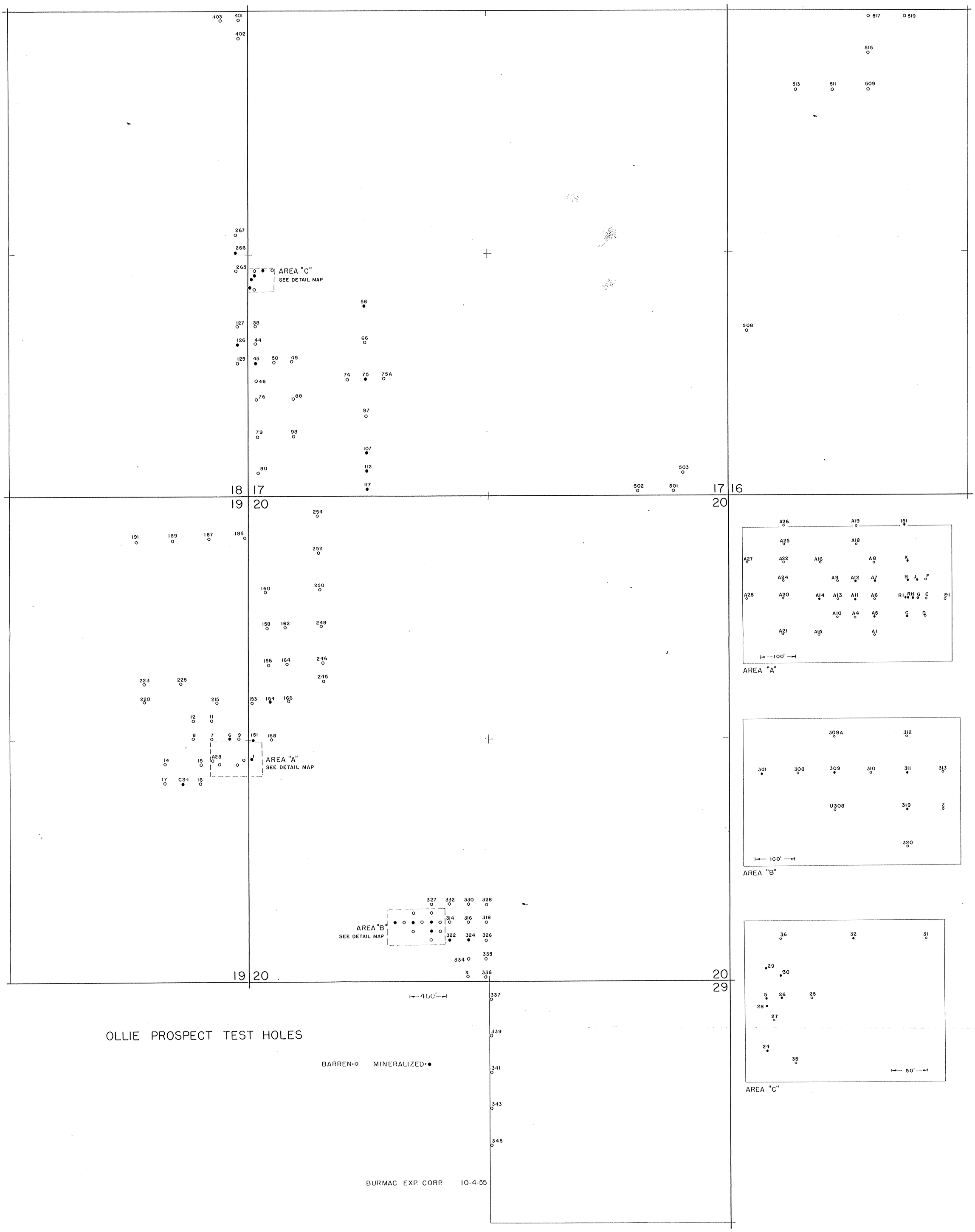
28
OLLIE
BURMAC EXPLORATION CORP.
P.O. BOX 836
WILLISTON, N.D.

(8)

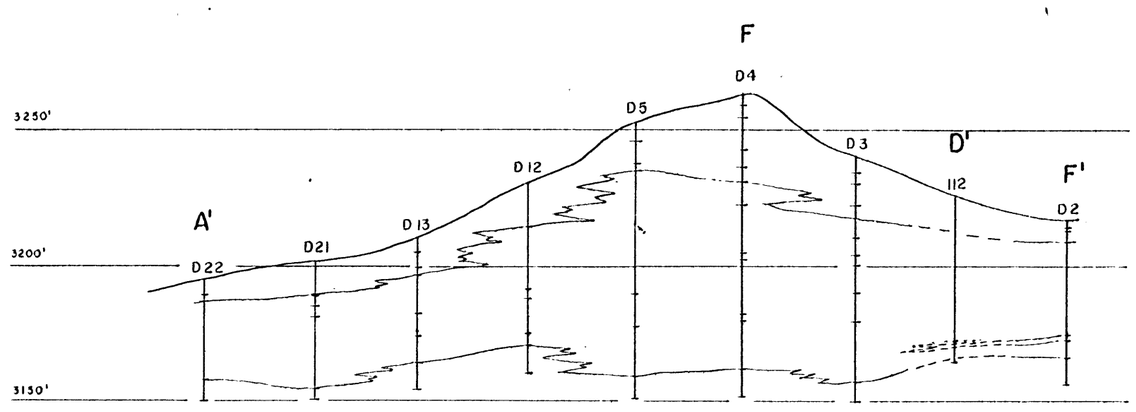
BURMAC EXPLORATION CORP.
P.O. BOX 836
WILLISTON, N.D.

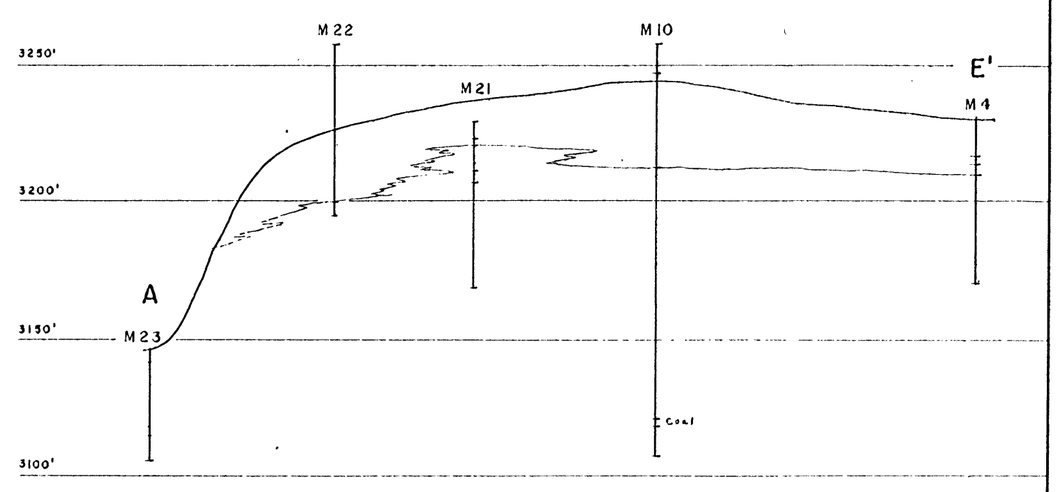


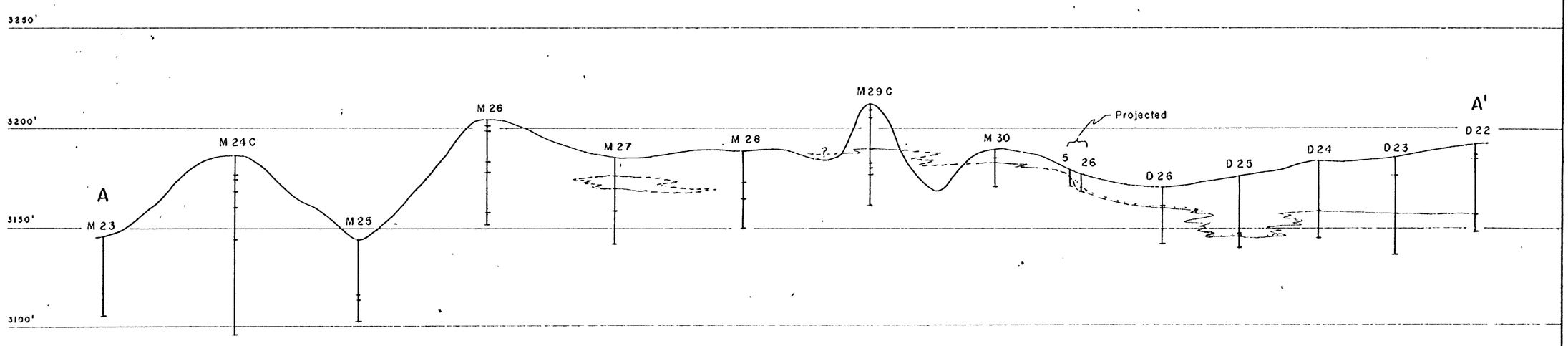
OLLIE PROSPECT TEST HOLES

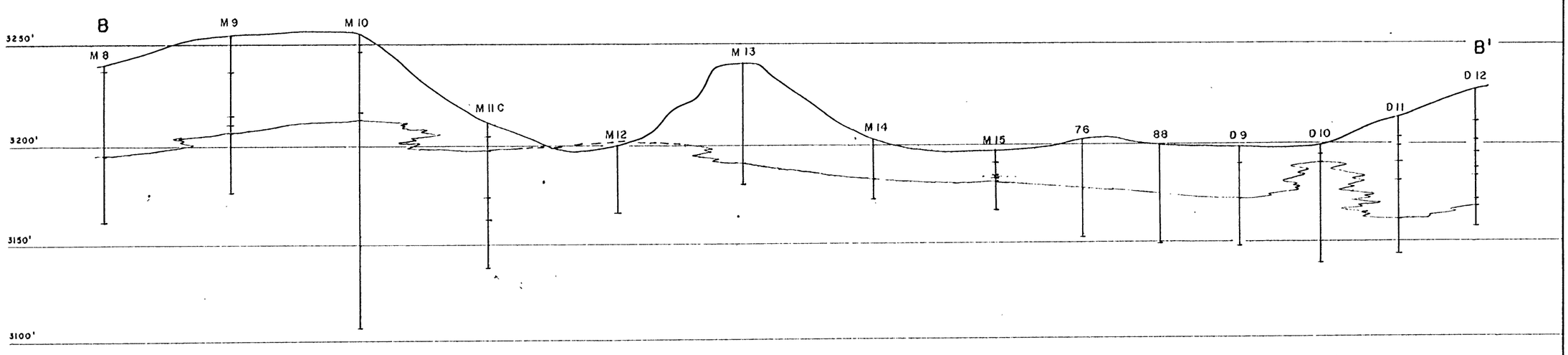
BARREN:o MINERALIZED:●

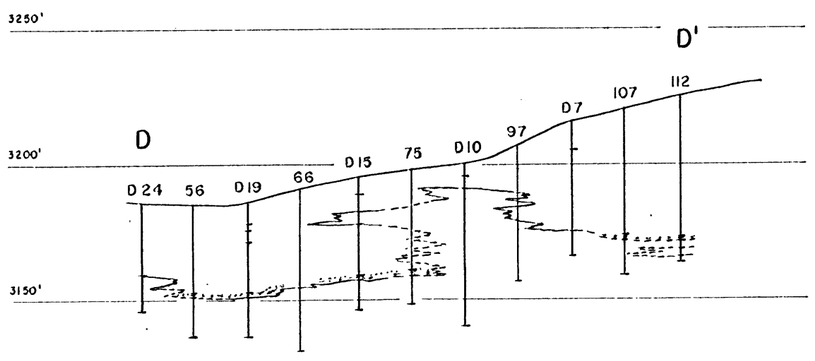
BURMAC EXP. CORP. 10-4-55

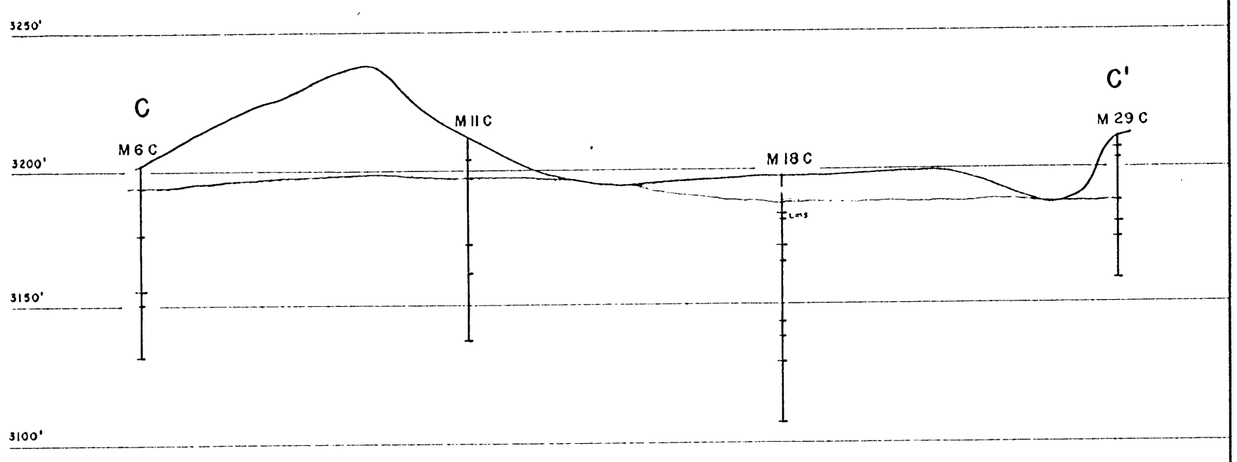












EXPLANATION

Buff Sandstone
(generally the "ore-bearing" unit)

Clay

Gray Sandstone

Tan Sandstone

Light Tan Sandstone

50'
40'
30'
20'
10'
0
500
1000 FEET

NOTES

Datum at mean sea level.

Horizontal control by Brunton and tape.

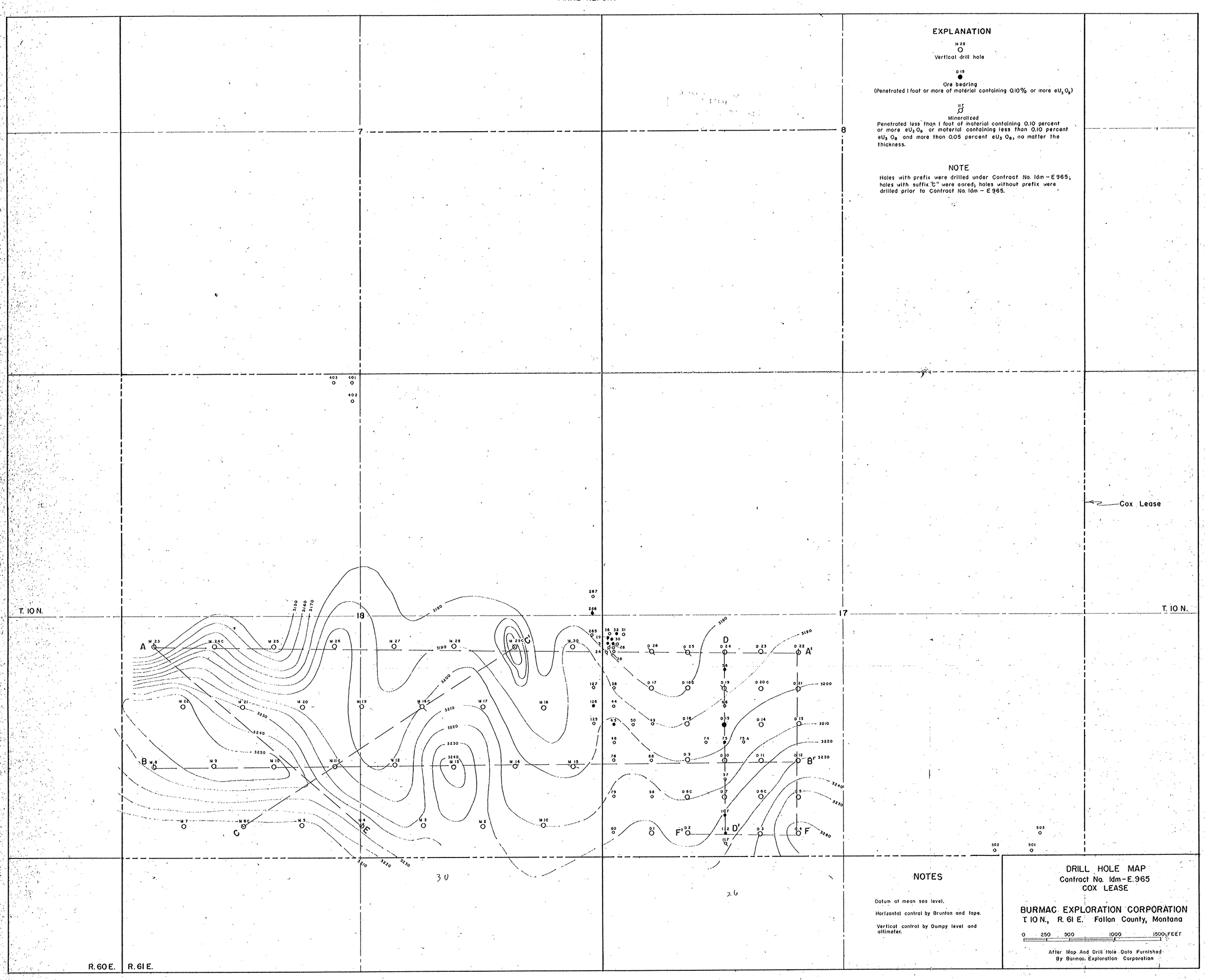
Vertical control by Dumpy level and altimeter.

DRILL HOLE SECTIONS
Contract No. Idm-E.965
COX LEASE

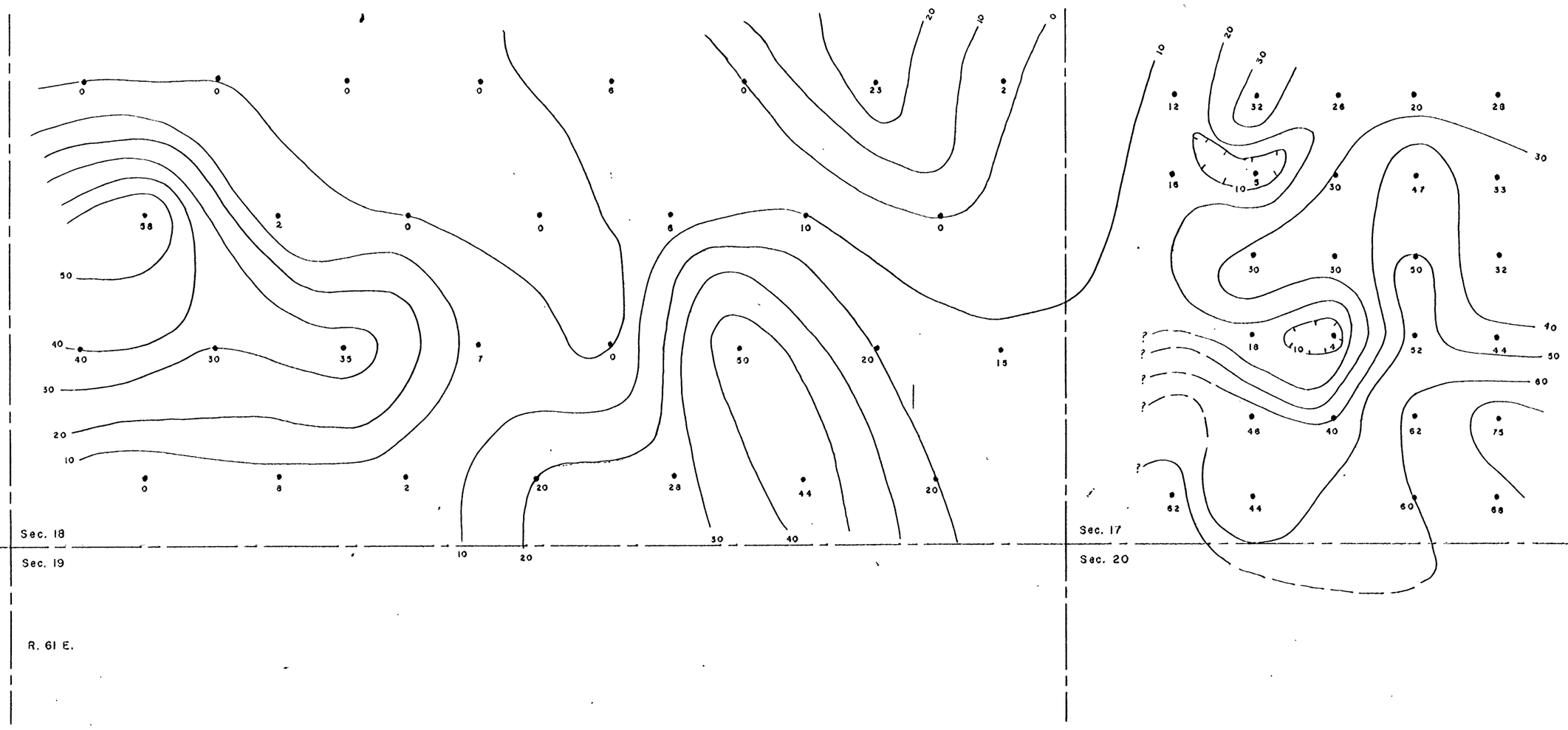
BURMAC EXPLORATION CORPORATION
T. 10 N., R. 61 E. Fallon County, Montana

0 250 300 1000 1500 FEET

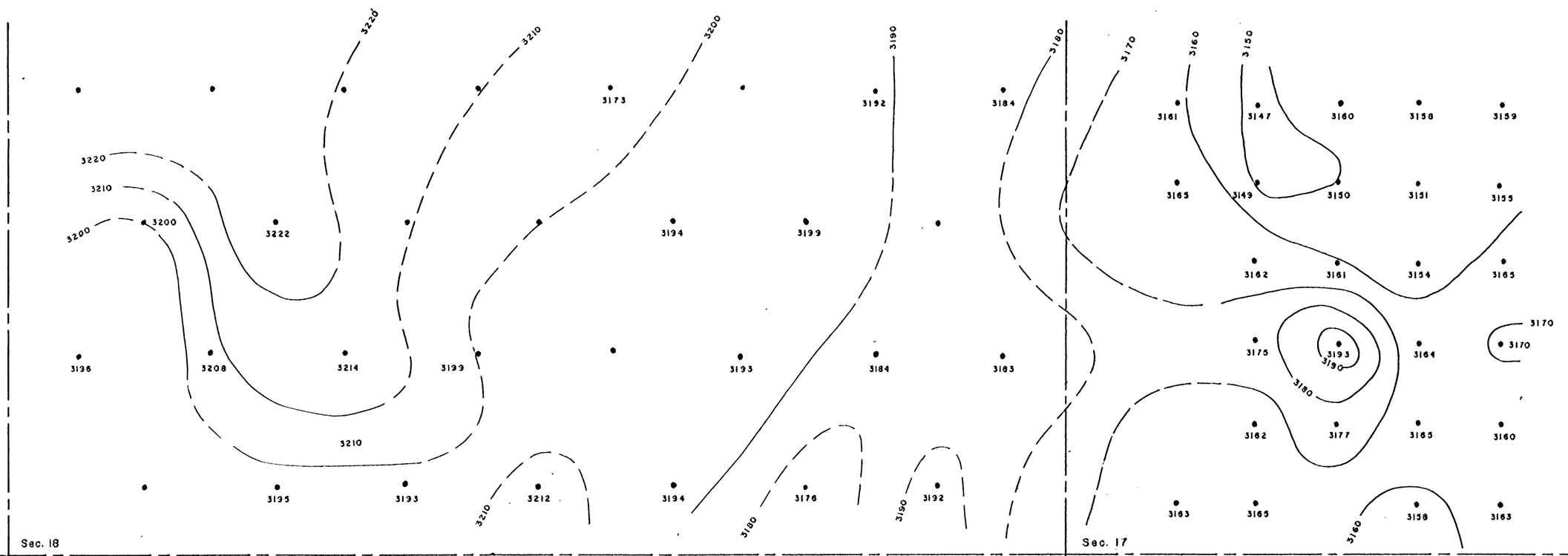
After Map And Drill Hole Data Furnished
By Burmac Exploration Corporation


EXPLANATION
Vertical drill hole
Ore bearing
(Penetrated 1 foot or more of material containing 0.10% or more eU_3O_8)
Mineralized
Penetrated less than 1 foot of material containing 0.10 percent or more eU_3O_8 or material containing less than 0.10 percent eU_3O_8 and more than 0.05 percent eU_3O_8, no matter the thickness.
NOTE
Holes with prefix were drilled under Contract No. Idm – E 965; holes with suffix "C" were cored; holes without prefix were drilled prior to Contract No. Idm – E 965.
Cox Lease
T. 10 N.
T. 10 N.
R. 60 E.
R. 61 E.
NOTES
Datum at mean sea level.
Horizontal control by Brunton and tape.
Vertical control by Dumpy level and altimeter.
DRILL HOLE MAP
Contract No. Idm-E.965
COX LEASE
BURMAC EXPLORATION CORPORATION
T 10 N., R. 61 E. Fallon County, Montana
0 250 500 1000 1500 FEET
After Map And Drill Hole Data Furnished By Burmac Exploration Corporation

Isopach Map Of Ore Bearing Sandstone



Structure Contours Of Underclay Surface



NOTES

Datum at mean sea level

Horizontal control by Brunton and tape

Vertical control by Dumpy level and altimeter.

Datum from drill hole information furnished by the Burmac Corporation.

ISOPACH AND STRUCTURE CONTOUR MAPS
Contract No. Idm-E.965
COX LEASE

BURMAC EXPLORATION CORPORATION
T. 10 N., R 61 E. Fallon County, Montana

0 250 500 1000 1500 FEET

After Map And Drill Hole Data Furnished
By Burmac Exploration Corporation

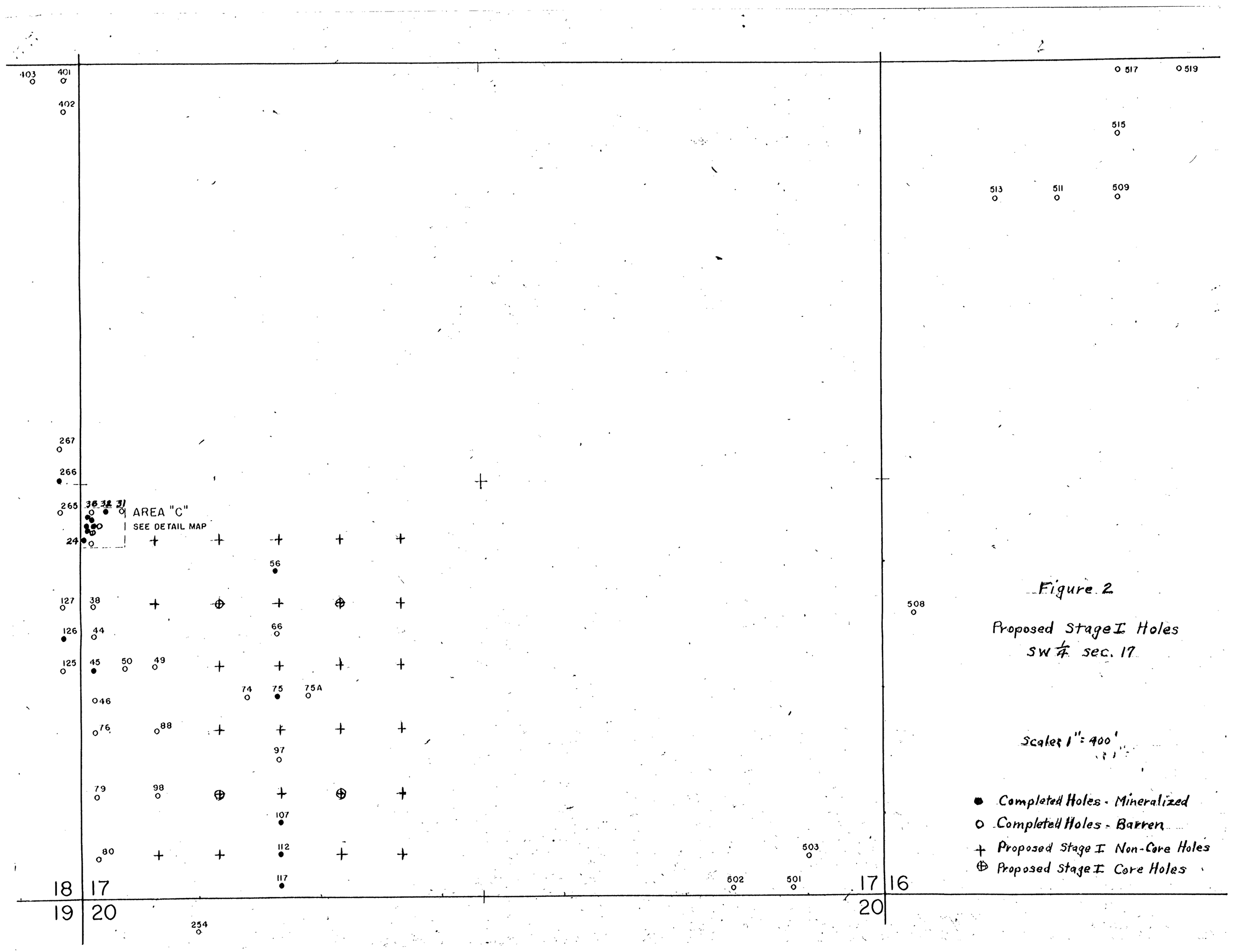
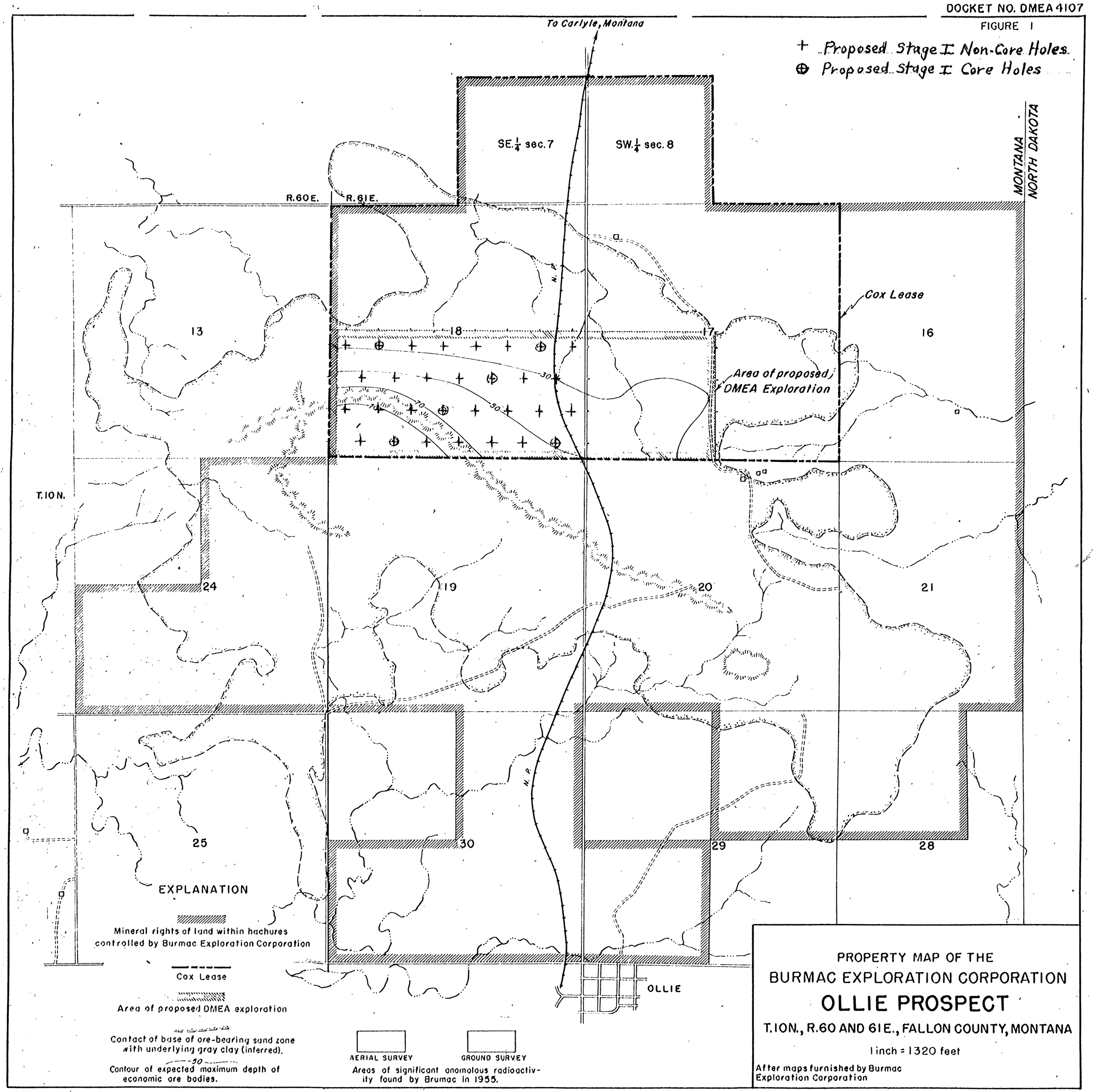


Figure 2

Proposed Stage I Holes
SW ¼ sec. 17

Scale: 1" = 400'

● Completed Holes - Mineralized
○ Completed Holes - Barren
+ Proposed Stage I Non-Core Holes
⊕ Proposed Stage I Core Holes


To Carlyle, Montana
+ Proposed Stage I Non-Core Holes
⊕ Proposed Stage I Core Holes
SE.¼ sec. 7
SW.¼ sec. 8
R.60E.
R.61E.
MONTANA
NORTH DAKOTA
Cox Lease
Area of proposed DMEA Exploration
T.10N.
13
18
17
16
24
19
20
21
25
30
29
28
30
50
70
N.P.
OLLIE
EXPLANATION
Mineral rights of land within hachures controlled by Burmac Exploration Corporation
Cox Lease
Area of proposed DMEA exploration
Contact of base of ore-bearing sand zone with underlying gray clay (inferred).
50
Contour of expected maximum depth of economic ore bodies.
AERIAL SURVEY
GROUND SURVEY
Areas of significant anomolous radioactivity found by Brumac in 1955.
PROPERTY MAP OF THE
BURMAC EXPLORATION CORPORATION
OLLIE PROSPECT
T.10N., R.60 AND 61E., FALLON COUNTY, MONTANA
1 inch = 1320 feet
After maps furnished by Burmac Exploration Corporation