

ROCKY FLATS PLANT
EMD OPERATING
PROCEDURES MANUAL
VOLUME III: GEOTECHNICAL

Manual No.: 5-21000-OPS-GT
Procedure No.: Table of Contents, Rev 59
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Organization: Environmental Management

THIS IS ONE VOLUME OF A SIX VOLUME SET
WHICH INCLUDES:

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94-DMR-000418	Advanced Notification to the State of Colorado	2	04/22/94

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SUPERSEDED
DOCUMENT

DOCUMENT CLASSIFICATION REVIEW WAIVER
PER R.B. HOFFMAN, CLASSIFICATION OFFICE
JUNE 11, 1991

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GT.04	Rotary Drilling and Rock Coring	2	05/12/92
93-DMR-000957	FORM GT.4A Modification	2	01/10/94
94-DMR-000419	Advanced Notification to the State of Colorado	2	04/22/94
•94-DMR-000935	Procedure Modification to Allow Sonic Drilling Technique Usage	2	06/01/94
GT.05	Plugging and Abandonment of Boreholes	2	05/12/92
93-DMR-000961	Form GT.5A Modification	2	01/10/94
GT.06	Monitoring Wells and Piezometer Installation	2	05/12/92
DCN 93.10	SVE Bentonite Chips	2	08/20/93
DCN 93.11	SVE Well Specifications	2	08/20/93
DCN 93.12	Riser Installation	2	09/02/93
DCN 93.13	Cancel DCN 93.11, Item #1 for OU 2 SVE Study	2	10/06/93
DCN 93.14	Revision of Figure GT.6-3	2	10/06/93
GT.07	Logging and Sampling of Test Pits and Trenches	2	05/12/92
94-DMR-000276	Section GT.07 and form Modifications	2	02/28/94
GT.08	4-E42-ER-OPS-GT.08 Surface Soil Sampling	3	01/25/94
94-DMR-000133	Sampling Modifications	3	02/04/94
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GT.09	Soil Gas Sampling and Field Analysis	2	05/12/92
94-DMR-000431	Calibration Occurrence Clarification	2	04/11/94
GT.10	Borehole Clearing	2	05/12/92
GT.11	Plugging and Abandonment of Wells	2	05/12/92
93-DMR-000962	Form GT.11A Modification	2	01/10/94
94-DMR-000561	Section 11 Modification	2	05/06/94

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GT.15	Geophysical Borehole Logging	2	05/12/92
GT.17	Land Surveying	2	05/12/92
DCN 93.01	Land Surveying Clarification	2	09/02/93
94-DMR-000560	Text Modification	2	05/06/94
GT.18	Surface Geophysical Surveys	2	05/12/92
DCN 93.02	5.5 Time Domain Electromagnetic Metal Detection	2	11/22/93
GT.19	Field Gas Chromatographs	2	05/12/92
GT.20	Procedures for Soil Interstitial Water Sampling and Sampler Installation	2	05/12/92
94-DMR-000297	Section GT.20 and form Modifications	2	02/28/94
GT.21	Cone Penetrometer Testing	1	05/12/92
GT.24	Approval Process for Construction Activities on or Near Individual Hazardous Substance Sites (IHSSs)	0	05/12/92

DOCUMENT MODIFICATION REQUEST (DMR)

Refer to 1-A01-PPG-001 for Processing Instructions.
Print or Type All Information (Except Signatures)

1. Date 5/2/94	25. DMR. No. 94-DMR-000935 <i>5/6/94</i>
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2. Existing Document Number/Revision 5-21000-OPS-GT.4/Rev 2	3. New Document Number or Document Number if it is to be changed with this Revision NA
4. Originator's Name/Phone/Page/Location Kelly O'Neill/8665/5473/080-293	5. Document Title Rotary Drilling and Rock Coring
6. Document Type <input checked="" type="checkbox"/> Procedure <input type="checkbox"/> Other _____	7. Document Modification Type (Check only one) <input type="checkbox"/> New <input type="checkbox"/> Revision <input checked="" type="checkbox"/> Intent Change <input type="checkbox"/> Nonintent Change <input type="checkbox"/> Editorial Correction <input type="checkbox"/> Cancellation

8. Item	9. Page	10. Step	11. Proposed Modifications
1	2	2.0	<p>Add the following sentence after the first sentence of the first paragraph in Section 2.0:</p> <p>"These procedures also are applicable for the use of sonic drilling methods where little or no water, air, or mud is required for circulation during penetration."</p> <p>Also add the words "sonic drilling", as indicated, into the same paragraph.</p>
2	2	3.0	<p>Change Section 3.0 to read:</p> <p>"Personnel overseeing rotary drilling, <i>sonic drilling</i>, and rock coring will..."</p>
3	4	5.1	<p>Insert the following sentence in the last paragraph before the last sentence:</p> <p>Sonic drilling methods require little or no water, air, mud, or other circulation medium for penetration.</p>
4	8	5.3.3	<p>Add the following as a new section:</p> <p>5.3.3 Sonic Drilling Techniques</p> <p>Sonic drilling is achieved by a drill head that transmits high-frequency pressure waves through steel drilling pipe to create a cutting action at the tip of the drill bit. Pressure waves are created by center-rotating, offset balanced roller-weights. The frequency of the drill string causes the column to vibrate elastically along its longitudinal axis. In the resonant condition, the drill string acts as a fly-wheel, transmitting maximum power to the drill bit. This power, combined with slow rotation to expose fresh material to the bit and slight downward pressure advances the drill string through soil and rock without the addition of a drilling medium.</p> <p>Because the drilling action and thin-wall design of the drill string either forces the displaced material into the wall of the borehole or into the core barrel, very little waste cuttings are generated.</p> <p>Samples will be obtained by vibrating the drill bit and rotating the core barrel to the desired depth, advancing the outer drill pipe, and then pulling the sample to the surface via the wireline. Once at the surface, the sample will be vibrated or hydraulically extracted from the core barrel into a plastic sleeve or clean sample tray. After a sample is collected, the core barrel will be decontaminated and readied to retrieve the next sample.</p>

12. Justification (Reason for Modification, EJO#, TP#, etc.)

1-4. Change procedure to allow for use of sonic drilling technique.

If modification is for a new procedure or a revision, list occurring disciplines in Block 13, and enter N/A in Blocks 14 and 15. If modification is for any type of change or a cancellation, organizations are listed in Block 13, then Concurror prints, and signs in Block 14, and dates in Block 15.

13. Organization	14. Print and Sign (if applicable)	15. Date (if applicable)
SME	Tim Lovseth <i>[Signature]</i>	5/6/94
EQS	Mark Brooks (RR) <i>[Signature]</i>	5/13/94
RPM	Wanda Busby <i>[Signature]</i>	5/9/94

16. Originator's Supervisor (print/sign/date)
Tim O'Rourke *[Signature]* 2-Min-124

17. Assigned SME/Phone/Page/Location Tim Lovseth/8706/5134/080	18. Cost Center 0202	19. Charge Number ENV-GT 98965500 <i>(enc)</i>	20. Requested Completion Date 05/17/94	21. Effective Date 6-1-94 <i>(enc)</i>
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22. Accelerated Review? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	23. ORC Review Not required; this nonintent change was processed as an intent change to expedite the DMR process.
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24. Responsible Manager (print, sign, date)
Steve Singer *[Signature]* Stephen H. Singer 5/6/94

REVIEWED FOR CLASSIFICATION/UCNI

BY _____ NA
DATE _____ NA

DOCUMENT CLASSIFICATION REVIEW WAIVER
PER R.B. HOFFMAN, CLASSIFICATION OFFICE

ROTARY DRILLING AND ROCK CORING

EG&G ROCKY FLATS PLANT
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TITLE:
ROTARY DRILLING AND ROCK
CORING

Approved:

/s/ J.E. Evered

05/12/92

(Name of Approver)

(Date)

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2.0 PURPOSE AND SCOPE

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This standard operating procedure (SOP) describes procedures that will be used at the Rocky Flats Plant (RFP) for rotary drilling and rock coring, using air and water as drilling media. These procedures also are applicable for the use of sonic drilling methods where little or no water, air, or mud is required for circulation during penetration. It addresses equipment, field procedures, decontamination, and documentation that will be used for rotary drilling, sonic drilling, and rock coring, and describes documentation of these procedures in order to attain acceptable standards of accuracy, precision, comparability, representativeness, and completeness.

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If the end-purpose of the drilling is to install and complete a monitoring well, not a piezometer, the Project Manager should refer to SOP GT.6 and other contained related SOPs for further instructions. These procedures specify pre-installation approval for monitoring wells from Environmental Sciences and Engineering, Geosciences Division. Advanced notification of monitoring well installation is necessary for the state of Colorado, Division of Water Resources. Prior to invasive activities, SOP GT.24 requirements should be reviewed and followed to acquire soil disturbance approval from RFP Construction Management.

3.0 PERSONNEL QUALIFICATIONS

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Personnel overseeing rotary drilling, sonic drilling, and rock coring will be geologists, geotechnical engineers, or field technicians with an appropriate amount of applicable field experience or on-the-job training under the supervision of another qualified person.

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them away (in the case of water). Using water when drilling can also alter the groundwater chemistry in the vicinity of the borehole, and needs to be accounted for during development of wells. Rotary drilling and rock coring may be used for advancing boreholes with or without environmental sampling in zones of hard material which cannot be penetrated with augers.

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Samples obtained for analytical chemistry testing will be prepared and contained in general accordance with SOP GT.2, Drilling and Sampling Using Hollow-Stem Auger Techniques. In general, air will be the drilling medium used when it is necessary to penetrate cemented zones of rock in auger borings drilled for environmental sampling. Water will typically be used as the drilling medium when drilling relatively deep bedrock wells and when obtaining rock core exclusively for geologic logging. Alternatively, dual-tube air percussion or ODEX drilling methods using water or air may be appropriate for some conditions. Sonic drilling methods require little or no water, air, mud, or other circulation medium for penetration. The appropriate work plan will outline drilling requirements for each project.

5.2 EQUIPMENT AND MATERIALS

5.2.1 General Rotary Drilling Equipment

The following is a list of equipment and materials for rotary drilling:

- Drill rig with appropriately-sized drill bits and rods
- Portable recirculation tanks for water rotary
- Preapproved water for water rotary
- Conveyance equipment (pumps and hoses)
- Air compressor with appropriate air filter(s)
- High pressure steamer/sprayer
- Wash/rinse tubs
- Weighted tape measure

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Dust control measures may also be required according to the Field Operations Plan (FOP) and Health and Safety Plan (HSP). The airborne dispersion of cuttings can be controlled to some extent by circulating the return air through a vortex or cyclone. See SOP FO.1, Air Monitoring and Dust Control for more information.

5.3.2 Rock Coring

Continuous core samples collected using rock coring methods can be used to obtain relatively undisturbed samples of rock for stratigraphic, lithologic, hydrogeologic, and environmental data. Conventional rock coring methods use a diamond coring bit instead of a conventional tricone or granular rotary bit.

Continuous core samples will be extracted from the core barrel, placed on core racks, and logged by appropriate personnel according to SOP GT.1, Logging Alluvial and Bedrock Material. Rock core to be saved for geotechnical testing or further geologic observations will be placed in plastic core wrap and then placed in core boxes with appropriately-sized dividers to protect and preserve the orientation of the core during movement and storage. Coring equipment will also be decontaminated according to SOP FO.3, General Equipment Decontamination.

Air or water drilling media used for coring must be contaminant-free. Therefore, the provisions required in Subsections 5.3.1.1 and 5.3.1.2 for drilling fluids also apply to rock coring procedures.

5.3.3 Sonic Drilling Techniques

Sonic drilling is achieved by a drill head that transmits high-frequency pressure waves through steel drilling pipe to create a cutting action at the tip of the drill bit. Pressure waves are created by center-rotating, offset balanced roller-weights. The frequency of the drill string causes the column to vibrate elastically along its longitudinal axis. In the resonant condition, the drill string acts as a

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fly-wheel, transmitting maximum power to the drill bit. This power, combined with slow rotation to expose fresh material to the bit and slight downward pressure advances the drill string through soil and rock without the addition of a drilling medium.

Because the drilling action and thin-wall design of the drill string either forces the displaced material into the wall of the borehole or into the core barrel, very little waste cuttings are generated.

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6.0 DECONTAMINATION

Generalized equipment decontamination procedures will include:

- Sampling equipment. Decontamination will be conducted between individual sampling points to minimize potential cross-contamination. Sampling equipment will be decontaminated according to SOP FO.3, General Equipment Decontamination. During drilling and sampling, decontaminated equipment will be placed on new plastic sheeting or racks until it is used. At least two sets of samplers will be available so that one set can be used while the other is being decontaminated. When coring bedrock using water as a circulating medium, no decontamination of core barrels or measuring tapes is necessary between coring