MORRISON KNUDSEN CORPORATION
MK-FERGUSON GROUP

INTER-OFFICE CORRESPONDENCE

DATE: March 8, 1994

TO: Distribution

FROM: Rebecca Cato-Johnston

SUBJECT: **SOIL SAMPLING CHARACTERIZATION PLAN FOR QUARRY RIM ZONE AND SMALL DRAINAGE WITHIN QUARRY**

Attach for your approval is the subject plan. This plan has been developed to delineate the extent of radiochemical contamination at two areas at the quarry. This plan will include the collection of samples at pre-determined locations and depths and the analysis of these samples by the WSSRAP Radiological Laboratory. The results of this characterization will be used to determine the volume of soil which is impacted and to determine whether removal will occur under the bulk waste remedial activities or will be held for consideration under the quarry residual operable unit.

Please sign below to signify approval of this plan.

Reviewer	Title	Signature	Date
James Meier	Environmental Protection Manager		3/8/94
Gene Valett	Quarry Project Manager		3/9/94
Doug Steffen	Deputy Project Director		3/14/94

If you have any questions or comments regarding this plan, please contact me at extension 3507.

RCJ/pr

Attachment: as stated

Distribution: James Meier
Gene Valett
Doug Steffen

cc: Steve Green
Bill Goldkamp
Gabe Fugate
Walter Anderson

Additional Soil Characterization Sampling Plan
Weldon Spring Quarry
Quarry Rim Zone and Drainage Within Quarry

1 INTRODUCTION

1.1 Purpose

This characterization sampling plan has been developed to delineate the extent of radiochemical contamination at two areas at the Weldon Spring Quarry. Additional analytical data are needed to further define and characterize the vertical and areal extent of radiochemical soil contamination at a location along the western side of the quarry rim and on the northwestern slope within the quarry. The locations where additional soil samples are required have been determined based on limited analytical and visual information obtained during the bulk waste removal activities performed at the quarry.

1.2 Scope

The scope of this effort will include collection of soil samples at pre-determined locations and depths. Sampling will be performed on a 9.2 m by 9.2 m (30 ft by 30 ft) grid spacing which will result in a minimum of 68 sampling locations. Other locations may be sampled based on observations in the field. Sampled will be obtained on 15 cm (6 in) intervals within the boring to a minimum depth of 75 cm (30 in) or to auger refusal, whichever occurs first. Additional samples may be taken if it is determined through the use of field instrumentation that radiochemical contamination still exists. Samples are to be submitted for radiochemical analysis to determine the levels of total uranium and isotopic thorium. Analysis of these samples will be performed at the WSSRAP radiological laboratory.

1.3 Objective

The results of the radiochemical analysis will be used to determine the areal and vertical extent of radiochemical contamination. The data will be evaluated to determine the volume of soil which is radiochemically impacted. This determination of soil volume will be used to determine whether removal will occur under the bulk waste remedial activities or be held for consideration under the quarry residual operable unit.

2 BACKGROUND

2.1 Site Description

The Weldon Spring Quarry is a former 3.6 ha (9 acres) limestone quarry located south-southwest of the chemical plant area. The quarry is essentially a closed basin;

surface water within the rim flows to the quarry floor and into a pond which covers approximately 0.2 ha (0.5 acres). The pond contained approximately 12 million liters (3 million gal) of water and is 6.1 m (20 ft) deep at its deepest point (ANL 1989). The amount of water varies due to pumping activities associated with bulk waste removal activities. The quarry contains radiochemical and chemical contaminants including uranium, thorium, metals, nitrates, PCBs, semivolatile organics, nitroaromatic compounds, and asbestos.

2.2 Investigation Areas

Areas within the quarry which are under investigation are:

- Quarry Rim Zone and adjacent intermittent drainage (Figure 1)
- Drainage located in northwestern portion of quarry depression (Figure 2).

The quarry rim zone is comprised of Vicinity Property #6, the adjacent area within the quarry fence line, and a nearby intermittent drainage. Vicinity property #6 was identified to be a small area of contamination located outside the quarry fence near the upper gate. Concentrations of Ra-226, U-238, Th-230 and Th-232 were detected in soil samples taken from the surface of this area. This contamination is presumed to be the result of surface spillage by trucks placing material over the quarry rim. Oak Ridge Associated Universities initially estimated the areal extent of this contamination was less than one square meter (Boerner, 1986). Later surveys of the area indicated the areal extent of contamination to be much larger. This area was incorporated into the bulk waste removal activities for remediation. An area of approximately 560 sq m (6,000 sq ft) has been excavated to a depth ranging from 0.15 to 1 m (0.5 to 3 ft). Additional sampling indicated elevated levels of radiochemical parameters. The adjacent intermittent drainage has been included in the soil sampling plan to determine if run-off has cause soil contamination down the length of the drainage.

Little information is available regarding the drainage located in the northwestern portion of the quarry. During walk-over surveys associated with bulk waste removal activities, process equipment was observed in this drainageway. Contamination is presumed to be the result of discarding of the materials in this drainage from the side of the quarry. This area has been included in the sampling plan to determine the vertical and areal extent of radiochemical contamination.

3 SAMPLING PLAN

3.1 Sampling Locations

Sampling locations have been selected to better define the extent of contamination for six radiochemical parameters at two areas within the quarry. The depth of the

investigation will be at least 75 cm (30 in). Greater depths may be required if scanning of the soil sample from the bottom of the boring by field instrumentation indicates additional radiochemical contamination. Choice of field instrumentation shall be made by ES&H field representatives in accordance with procedure ES&H 2.5.2s - *In-Situ Radiation Measurements*.

A systematic sampling approach will be utilized to cover the study areas. This method will involve the determination of a grid spacing to be placed over the study areas and samples collected at the grid line intersections. This approach provides a uniform coverage of the area for the construction of a map of the contaminants. Additional sampling locations may be determined in the field based on field observations of soil conditions, such as discoloration, or topographic conditions.

As a result of this systematic sampling approach, the number of sampling locations for each area are as follows:

- Quarry Rim Zone and drainage (Figure 1) 52 locations
- North slope of inner quarry (Figure 2) 16 locations

A grid spacing of 9.2 m by 9.2 m (30 ft by 30 ft) will be used at both areas within the quarry. This spacing was chosen because it provides a adequate number of samples to map the areal extent of the contamination and it also provides a large enough work area for soil removal activities if it is determined that excavation of soils is to occur. These locations will be marked in the field prior to sampling and surveyed upon completion of the project.

3.2 Analysis

All samples will be analyzed for the following radiochemical parameters:

U-238	Ra-228
Ra-226	Th-230

These analyses will be preformed utilizing the on-site radiation laboratory. Total uranium and Th-232 concentrations for each sample will be calculated from the analytical data. On-site analysis is being utilized to determine only the extent of the radiochemical contamination in the soil for bulk waste removal activities. Verification of source removal will be performed at a later date under a separate plan.

3.3 Quality Control

Quality control will be maintained in accordance with procedures ES&H 2.5.8s - *Th-230 Determination in Soils by the UNC Method* and ES&H 2.6.9s - *Instructions for Calibration and Operation of the High Purity Germanium Detector*.

3.4 Sample Location and Identification

Vertical reference of the sampling locations will be surveyed. The sample locations will be staked in the field prior to sampling activities and will then be survey after samples have been collected in the case additional sampling locations will be necessary. Sample identification and numbering will be in accordance with procedure ES&H 4.1.1a - *Numbering System for Environmental Samples and Sampling Locations*.

3.5 Sample Collection

Soil samples will be collected with bucket augers advanced by hand. Representative samples will be collected from the following depth intervals:

Sample Collection Intervals
0 - 15 cm (0 - 6 in)
30 - 45 cm (12 - 18 in)
60 - 75 cm (24 - 30 in)

If additional radiochemical contamination is determined by the scanning of soil samples with field instruments, additional soil samples will be collected on 15 cm (6 in) intervals until the reading of the instrument is at or below background. The samples will be place in sealable plastic bags and place in a cool location for transport to the on-site laboratory. Sample labels will be completed and placed with the sample containers prior to placing the sample containers in the storage area. All sample collection and labelling will be performed in accordance with ES&H procedure 2.5.1s. - *Radiological Soil Sampling*. Chain of custody forms will be completed in accordance with procedure ES&H 4.1.2s - *Chain of Custody*.

3.6 Decontamination

All sampling equipment will be cleaned and decontaminated before sample collection and between each sampling locations. Tools used to transfer soil samples from the sampling tools to the sample containers will also be cleaned and decontaminated before each sample is transferred to the sample container. All decontamination and disposition of spent waters will be performed in accordance with procedure ES&H 4.1.3s - *Sampling Equipment Decontamination*.

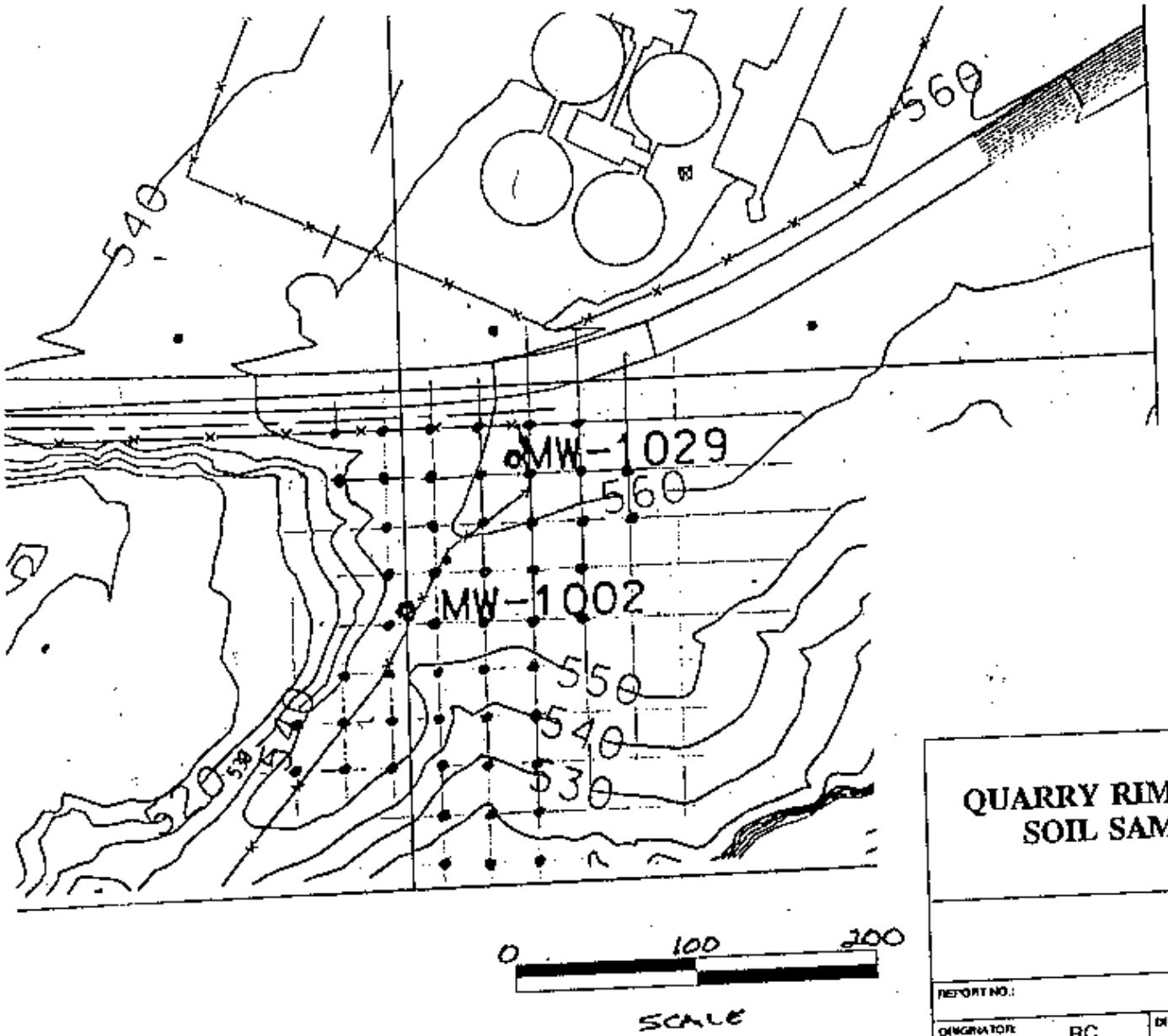
4 HEALTH AND SAFETY

All sampling activities will be conducted according to health and safety practices required for on-site sampling activities. A daily Task-Specific-Safety Assessment

(TaSSA) will be prepared, review, and filed with the Construction Management and Operations Department prior to sample collection, in accordance with procedure CM&O 15a - *Task Specific Safety Assessments*. Sample collection activities may require the use of personal protective equipment and will be determined in accordance with the *Personal Protective Equipment Requirements Manual*. Safety and industrial hygiene personnel may monitor health and safety conditions during sampling activities. Health physics personnel will monitor sample collection activities in areas with radiological contamination.

5 DOCUMENTATION

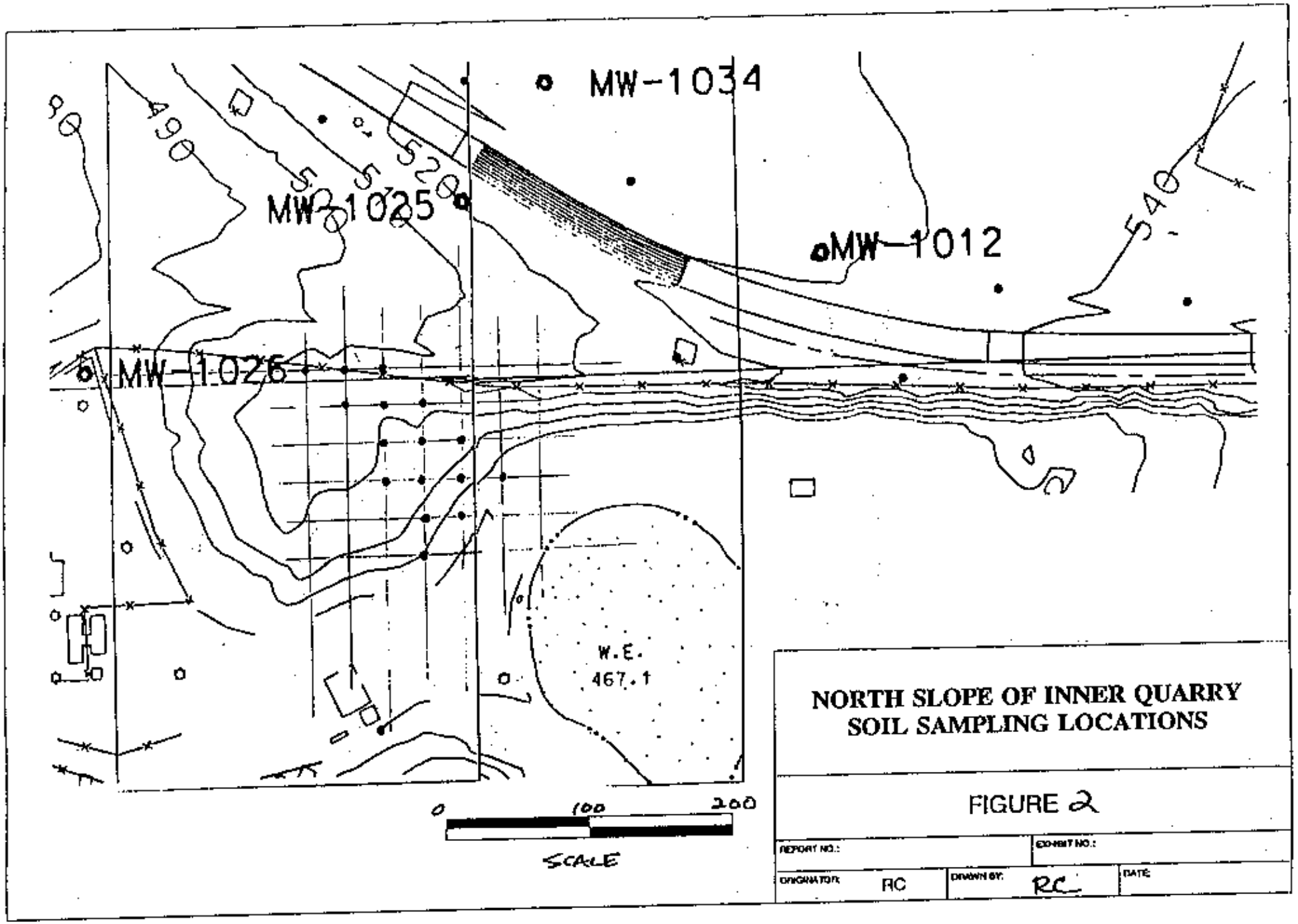
An interpretation of the data will be provided to the appropriate personnel for determination of removal of the contaminated materials. The interpretation will include volume estimates of contaminated materials and maps indicating extent of contamination.



QUARRY RIM ZONE AND DRAINAGE SOIL SAMPLING LOCATIONS

FIGURE 1

REPORT NO.:		EXHIBIT NO.:	
ORIGINATOR: RC	DRAWN BY: RC	DATE: 3/94	



NORTH SLOPE OF INNER QUARRY
SOIL SAMPLING LOCATIONS

FIGURE 2

REPORT NO.:		EXHIBIT NO.:	
ORIGINATOR: RC	DRAWN BY: RC	DATE:	