March 8, 2016

MEMORANDUM TO: Mark R. Shaffer, Director
Division of Nuclear Materials Safety
Region IV

FROM: John R. Tappert, Director ***/RA/***
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

SUBJECT: RESPONSE TO TECHNICAL ASSISTANCE REQUEST, DATED AUGUST 5, 2015, FOR THE REVIEW OF THE PROTECHNICS DIVISION OF CORE LABORATORIES' REQUEST FOR APPROVAL OF AN ALTERNATE WASTE DISPOSAL METHOD UNDER 10 CFR 20.2002

Region IV submitted a Technical Assistance Request (Agencywide Documents Access and Management System (ADAMS) Accession Number ML15218A608), dated August 5, 2015, requesting a review of the ProTechnics Division of Core Laboratories' (ProTechnics) request for an alternate waste disposal method under 10 CFR 20.2002. The U.S. Nuclear Regulatory Commission (NRC) has previously approved ProTechnics use of two alternate waste disposal methods: 1.) on-site earthen pit burial; and 2.) Class II wells for disposing of well returns containing small concentrations of radioactive tracer material. ProTechnics is now requesting NRC approval for a third option, disposal of the well returns at the Meadowfill Landfill in Bridgeport, West Virginia.

The NRC staff evaluated ProTechnics' request for a third alternate waste disposal method that considers the placement of well returns containing small concentrations of radioactive materials at the Meadowfill landfill. Based on a review of the analyses provided by ProTechnics (ML15211A594), the responses to the request for additional information (ML15292A061), and the independent analyses discussed in the accompanying Technical Evaluation Report (TER), the NRC staff find this disposal option to be acceptable and in compliance with the regulations in 10 CFR 20.2002. The expected doses are a very small fraction of the public dose limit and lower than calculated doses for other alternates already approved for the licensee. The expected dose is less than 0.01 mSv/yr (1 mrem/yr) to the average member of the critical group and doses are maintained as low as reasonably achievable.

Region IV will use the information provided in this TER to issue a license amendment to ProTechnics and an exemption letter to Waste Management, owners of the Meadowfill Landfill,

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granting them permission to dispose of the well returns without an NRC license. The NMSS staff agreed to include an example exemption letter (ML15086A427), Enclosure 2, with this response.

Enclosures: 1. Technical Evaluation Report
2. Example Exemption Letter

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ADAMS Accession No.: ML16041A076 (Pkg.) ML16020A283 (Memo & TER) ML15086A427 (Ex.) *concurred via email

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TECHNICAL EVALUATION REPORT
RESPONSE TO TECHNICAL ASSISTANCE REQUEST REGARDING THE PROTECHNICS DIVISION OF CORE LABORATORIES' REQUEST FOR APPROVAL OF AN ALTERNATE WASTE DISPOSAL METHOD UNDER 10 CFR 20.2002

DOCKET: 030-30429

LICENSEE: Core Laboratories, Inc. dba ProTechnics Division of Core Labs

LICENSE NUMBER: 42-26928-01

BACKGROUND

The ProTechnics Division of Core Laboratories (ProTechnics) is a well-logging licensee (Materials License # 42-26928-01) authorized to use unsealed byproduct material during tracer operations. ProTechnics is currently authorized under conditions of its license to use two alternate waste disposal methods previously approved by the U.S. Nuclear Regulatory Commission (NRC) under 10 CFR 20.2002. On-site earthen pit burial was approved on December 18, 1995 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML12243A217). Disposal into Class II wells was approved as a result of the issuance of license amendment 30 on November 4, 2003 (ML033080194).

SUMMARY OF PREVIOUS EVALUATIONS

The NRC and several Agreement States have already evaluated the impacts associated with the disposal of these well returns containing radioactive materials and have included license conditions authorizing the on-site burial of the material in both shallow pits and Class II disposal wells. In December 1995, the NRC staff concluded a "Finding of No Significant Impact (FONSI)" for the generic disposal of this material in on-site burial pits provided specific restrictions are met. A licensing amendment was added to ProTechnics' license for this generic disposal option. Prior to this point, the NRC staff reviewed and approved these disposals on a case-by-case basis.

In November 2003, the NRC amended ProTechnics' license to allow the disposal of radioactive material associated with well returns in Class II disposal wells that had been previously approved to accept non-hazardous oil and gas waste by State agencies. As discussed in the NRC's response to "Core Laboratories' Request to Inject Well-Logging Waste in Class II Disposal Wells" (ML041200730), acceptance of this second disposal option by the NRC staff was based on a combination of NRC policies and stringent construction, operating, and monitoring requirements for Class II disposal wells. Use of the Class II disposal wells allows for greater control over the waste once it is disposed and limits possible access to the material compared to the previously accepted disposal process of using disposal pits with a soil cover. Additional details related to the use of Class II disposal wells are provided in NUREG/CR-3467, "Environmental Assessment of the Use of Radionuclides as Tracers in the Enhanced Recovery of Oil and Gas."

PROPOSED ACTION

By letter dated June 19, 2015 (ML15211A594), ProTechnics requested approval for a third alternate disposal method, allowing for the disposal of well returns containing small concentrations of radioactive tracer material (less than 120-day half-life) at the Meadowfill Landfill in Bridgeport, West Virginia. Contingent on NRC approval and acceptance by the West Virginia Department of Environmental Protection and the West Virginia Department of Health and Human Resources, Waste Management, Inc., the owner and operator of the Meadowfill Landfill, has already agreed to accept the material in cases when on-site earthen pit burial and injection into Class II disposal wells are determined not to be viable options. The need for a third disposal option is due to the fact that some locations where tracer operations are conducted do not allow shallow disposal pits to be used to hold well returns and costs associated with the construction and maintenance of Class II disposal wells, as well as the transport of the well returns to the well sites can be high. As indicated above and emphasized in the submittal, the NRC staff has already acknowledged the low risks associated with the tracer materials through its review and acceptance of on-site burial in shallow burial pits. The NRC staff agrees that disposal in a landfill, which would occur at greater depths and include a deeper cover, would provide additional shielding as well as greater assurances that the tracers would not be prematurely uncovered or handled. As discussed in the submittal, risk and exposure during the transport of tracer material to the Class II disposal wells, which has already been authorized by the NRC, is minimal. Transporting the tracer material to the Meadowfill Landfill, which is closer in proximity, would further minimize risk and exposure to the public.

NRC STAFF'S REVIEW AND EVALUATION

As part of its tracer operations, ProTechnics injects three radionuclides (Iridium [Ir]-192, Scandium [Sc]-46, and Antimony [Sb]-124) into the wells during hydraulic fracturing activities. The small increase in radioactivity above background assists well operators in optimizing well operations. According to the submittal, no more than 37 Bq/g (1000 pCi/g) of radioactive material is injected into a well at any one time. The submittal does not clearly indicate if this 37 Bq/g (1000 pCi/g) concentration is for a single radionuclide or for a combination of all three radionuclides. As part of its independent analysis the NRC staff considered a combination of all three radionuclides with input concentrations of 37 Bq/g (1000 pCi/g) for each, three times the highest concentration of radioactive material that would be associated with the well returns assuming all of the radionuclides were removed from the well.

The manufacturing process for the radioactive tracer, known as ZeroWash®, embeds the non-water soluble radioactive tracer material inside the matrix of a ceramic particle. As a result, there is minimal to no deleterious effects on the environment from the use of ZeroWash®. According to ProTechnics, internal and external exposure to ZeroWash® will be negligible to the public because the material cannot be absorbed through the skin, will not be inhaled, and ingestion of hundreds of pounds of material would be needed in order to reach an Annual Limit of Intake (ALI). The analysis provided with the submittal consisted of a series of mathematical calculations that considered an individual standing directly over a 7.3 m^2 (78.54 ft^2) shallow pit containing well return waste to a depth of 0.88 m (2.29 ft) with a 0.61 m (2 ft) cover consisting of clean soil on top. The dose, assuming that an individual stood on top of the disposal pit for 24 hours a day for 365 days, was calculated to be 0.056 mSv/yr (5.56 mrem/yr). A similar analysis performed by the NRC staff using RESRAD, Version 6.5, and the same assumptions resulted in

a dose of 0.011 mSv/yr (1.1 mrem/yr). Ultimately the use of realistic parameter values associated with disposal in a landfill, including disposal over larger areas, at greater depths, and with a larger cover, would yield doses that are even less significant.

Considering the characteristics of the ZeroWash® and the short half-lives of the associated radionuclides, the NRC staff performed a second analysis to evaluate the impacts to the dose associated with the disposal of the well returns in a landfill. In this scenario, the waste is assumed to be spread over a larger area and a deeper cover would be installed. The NRC staff assumed that the same volume of well return material considered in the submittal, 6.4 m^3 (227ft^3), was distributed over a larger area within the landfill (10 m^2 or 33 ft^2) to a depth of 0.64 m (2.1 ft) and covered with a 2 meter (6.6 feet) deep cover. The same exposure pathways were considered for the landfill worker. This scenario resulted in a peak dose of 6E-10 mSv/yr (6E-8 mrem/yr). Table 1 compares the RESRAD input parameter values and resulting doses for the two scenarios evaluated by the NRC staff.

Table 1. Comparison of RESRAD parameter values and resulting doses calculated by the NRC staff using RESRAD, Version 6.5[a]

Parameter		Burial Pit Analysis	Landfill Analysis
Exposure Pathways		External Gamma Ingestion Inhalation	External Gamma Ingestion Inhalation
Radionuclides			
	Ir-192	1000 pCi/g	1000 pCi/g
	Sc-46	1000 pCi/g	1000 pCi/g
	Sb-124	1000 pCi/g	1000 pCi/g
Contaminant area (m^2)		7.3 m^2	10 m^2
Contaminant depth (m)		0.9 m	0.64 m
Length parallel to aquifer flow (m)		2.7 m	3.64 m
Cover depth (m)		0.61 m	2 m
Dose[b]		1.1E-02 mSv/yr	6E-10 mSv/yr

[a] Default values were used for the remaining RESRAD parameters
[b] Multiply mSv/yr by 100 to get mrem/yr

FINDINGS

The NRC staff evaluated ProTechnics' request for a third alternate waste disposal method that considers the placement of well returns containing small concentrations of radioactive materials at the Meadowfill Landfill. Based on a review of the analyses provided by ProTechnics and the independent analyses discussed above, the NRC staff finds this disposal option to be acceptable and in compliance with the regulations in 10 CFR 20.2002. The expected doses are a very small fraction of the public dose limit and lower than calculated doses for other alternates already approved for the licensee. The expected dose is less than 0.01 mSv/yr (1 mrem/yr) to

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