

Tritium Migration Investigation
Status Report

November 10, 1982

Introduction

As a result of the Agreed Order of February, 1982, a study was undertaken to investigate the tritium migration in groundwater northeast of the Sheffield site. The purpose of the study was to define the source, path, progression, extent and nature of the migration. To this end, the study has progressed through three phases of investigation consisting of a total of 20 well installations, 4 borings, soil temperature surveys, electrical earth resistivity surveys, groundwater elevation monitoring, water and soil sampling and tritium analysis. The study is directed by a steering committee consisting of one technical representative from each of the five federal and state agencies and the company. This includes representatives of the following groups:

- U. S. Nuclear Regulatory Commission Staff
- U. S. Geological Survey
- Illinois Attorney General's Office
- Illinois Department of Nuclear Safety
- Illinois Geological Survey
- US Ecology, Inc.

Although the Agreed Order required a minimum one-year study period, final conclusion of the investigation will require additional time. The Committee has agreed that the tritium plume migration investigation will continue until completion, as determined by the consensus of the Committee members. This report documents the status of the program to date and describes the agreed program (Phase 4) which will be performed over the next several months.

Investigation Status

Path and Extent of Migration

It is the consensus of the Committee that the path and extent of the tritium migration has been satisfactorily defined by the results of the program to date. The migration is limited to a narrow preferential path extending off-site from the northeast corner of Trench 23 generally east-northeast approximately 1000 feet to the stripmine pond on the adjacent property (see attached map). Tritium concentrations of less than 100 nanocuries/liter have been found in water from wells along this path (see attached map). Tritium concentrations of approximately 55 nanocuries/liter have been found in seeps from the shallow groundwater entering the pond. Low concentrations, approximately 1 nanocurie/liter have also been found in 2 samples of the pond water in this area.

Nature and Progression of Migration

It is the consensus of the Committee that the nature and progression of tritium migration have not been satisfactorily defined by the results of the program to date. Several questions remain which need to be addressed.

The information to date is insufficient to differentiate between possible release scenarios. These are: migration from a trench during its open and active operation, migration due to periodic infiltration through existing trench caps, migration due to trench cap failures such as experienced in 1979, or a combination of these mechanisms. Evaluation of the nature of migration is difficult without longer term monitoring of individual wells, since for any well one cannot be sure whether it is located in the middle or on the edge of a plume.

Progression of the migration is also difficult to characterize. Since tritium has been detected at the pond, it is not possible to directly determine the rate of transport from the available data. Accurate velocity

measurements along the migration pathway are essential to the ability to evaluate the progression of the migration.

In order to address these questions and define the nature and progression of migration as well as practicable, two items are being added to the investigative program. First, continued monitoring will be performed to record and evaluate fluctuations in tritium levels. This may lead to better definition of well location in the plume and the nature of the migration. Secondly, velocity measurements will be performed by the borehole dilution method and a tracer travel time method. This will provide two estimates of velocity and may correlate the migration with specific events or trenches on the site. The tracer travel time measurement is expected to take a minimum of six months to complete.

The borehole dilution and tracer test methods were chosen since they will not perturb the groundwater flow system and ongoing monitoring of tritium concentrations. Aquifer pumping tests are planned under an ongoing USGS study, the results of which will be made available to this Committee. The Steering Committee agrees that these pumping tests will be delayed until the borehole dilution tests and continued monitoring can be completed.

A working session has been planned to define the details of the borehole dilution and tracer testing. This session is tentatively scheduled to be held at the Sheffield site on November 19, 1982.

Source of Migration

It is the consensus of the Committee that the source of migration has not been satisfactorily defined by the results of the program to date. Further, the Committee feels this is the question likely to be least well defined at conclusion of the study. Originally it was felt that Trenches 23, 24, 25C and 26 were the likely sources of the tritium, based

on the shape of the potentiometric surface and the trench cap problems in 1979. However, there are a number of items which raise questions with this theory. The tritium concentrations in Well V and the revised groundwater contours suggest that the majority of the trenches may have potentially contributed to this plume. Well V, which is in the middle of the site, has tritium concentrations of approximately 100 nanocuries/liter.

It appears that groundwater from about 2/3 of the site drains to the narrow path of migration identified by this study. It is expected that the results of the program items listed under Nature and Progression of Migration will provide information to better define the source of migration.

Summary

The tritium migration study is continuing under the direction of the Steering Committee. At this point, a conclusion for only one of the study objectives has been reached. This is with respect to path and extent of migration. However, work is continuing toward conclusion on the nature, progression and source objectives. Velocity measurements, and sampling and analysis will be continuing over the next several months. No additional wells are planned at the current time.