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June 30, 1983

Department of Energy
Oak Ridge Operations
Attention: Mr. H. D. Hickman
Post Office Box E
Oak Ridge, Tennessee 37830

Gentlemen:

New Hope Pond

In accordance with the Memorandum of Understanding between the U. S. Department of Energy, Environmental Protection Agency, and the State of Tennessee Department of Health and Environment, we are transmitting an assessment of sources of mercury. The report, entitled "Sources and Discharges of Mercury in Drainage Waters of the Y-12 Plant," describes results of sampling and analysis of the Y-12 Plant drainage system through the outlet of New Hope Pond. Mercury contained in the New Hope Pond Sludge Basin on Chestnut Ridge will be assessed in the Groundwater Study for the Y-12 Facility, for which the contractor's plan of study was transmitted by letter dated June 24, 1983, G. G. Fee to H. D. Hickman, same subject. No sources of mercury have been identified related to the S-3 Ponds or Bear Creek Burial Grounds.

If you require any additional information with regard to the assessment of sources of mercury, please do not hesitate to call us.

Very truly yours,

Original Signed
BY G. G. FEE

Gordon G. Fee, Plant Manager
Oak Ridge Y-12 Plant

GGF:TRB:ipc

* Enclosure: "Sources and Discharges of Mercury in Drainage Waters of the Y-12 Plant"

- cc/enc: T. R. Butz/G. E. Kamp - RC
- G. G. Fee
- R. F. Hibbs
- H. D. Hickman (6)
- M. L. Jones
- ~~R. G. Gordon~~
- J. C. White
- L. F. Willis
- W. J. Yaggi

* The attachment is listed as Enclosure 5 for DOE's convenience. There is no enclosure 1, 2, 3, or 4.

#778

SOURCES AND DISCHARGES OF MERCURY IN DRAINAGE WATERS OF THE
Y-12 PLANT

G. E. Kamp
R. R. Turner

June 30, 1983

Prepared by Union Carbide Corporation
for the U.S. Department of Energy

SOURCES AND DISCHARGES OF MERCURY IN DRAINAGE WATERS OF THE Y-12 PLANT

Recent monitoring data for the NPDES site at New Hope Pond (NHP) reveals mercury concentrations in the discharge which are typically 1 to 2 µg/L (ppb). When multiplied by the typical daily water discharge at this site (8 million gallons/d), these concentrations yield a daily mercury discharge in the range of 30 to 60 g/d (approximately 1 to 2 oz). For example, over the two-year period 1981-1982, the average daily discharge was 39 grams. Prior to studies beginning in October 1982, the locations and strengths of specific sources of mercury within the Y-12 Plant had not been rigorously determined. It was assumed that the recent losses of mercury in drainage waters could be traced to the drainage systems associated with the buildings which formerly (1950 to 1963) contained large quantities of mercury. Specifically, Building 9201-4, which had not been stripped and decontaminated, was suspected to be the main source. Although this building is currently in stand-by status, a small amount of water continues to flow through the sumps and into the headwaters of East Fork Poplar Creek (EFPC). There was also some suspicion that sediments in NHP might be acting as a source of mercury for discharge to EFPC. In order to effectively plan and guide remedial actions to reduce the current losses of mercury in Y-12 drainage waters, the specific buildings and/or areas yielding environmentally significant quantities of mercury must be determined.

In October 1982, a comprehensive investigation was initiated to identify all significant sources of mercury. The approach of this investigation has been to measure both mercury concentration and water flow rate at numerous points within the Y-12 Plant with the goal of developing a detailed mass balance. The product of mercury concentration and water flow rate gives mercury loading rate and thus, the relative contribution of each source can be determined.

The initial efforts focused on establishing the variability in mercury loading rates over a typical 24-hour weekday period. Seven pipes discharging into the industrial ditch, plus the inflow and outflow of NHP were sampled at 4-hour intervals. The inflow and outflow of NHP, and all but one of the pipes sampled, showed only small variations (+25%) in mercury loading over the 24-hour period. Mercury loading for one pipe behind 9201-4 increased from about 3 g/d to about 20 g/d for a brief period (less than 4 hours) apparently when a sump pump was activated. During this period, the mercury loading in the inflow to NHP was 128 ± 16 g/d while the outflow was 67 ± 13 g/d. Thus, about 50% of the mercury carried into NHP in drainage waters was retained by the pond.

About a month later, on December 9 and 10, 1982, a comprehensive sampling of all accessible discharges leading into the industrial ditch, including the underground portion, was conducted. This survey included a total of 47 sampling points upstream of NHP, plus the inflow and outflow of NHP. Results are summarized in the attached figure.

During this sampling period, the input of mercury to NHP was 146 g/d. Upstream discharges (totaling approximately 174 g/d) to the industrial ditch more than accounted for the measured input to NHP, suggesting some temporary accumulation (sedimentation) of mercury in the industrial ditch. The NHP data (based on one grab sample each day) suggest that about 70% of the input mercury was retained by the pond.

Recommendations and Actions Taken

The Drain Line Sampling conducted on December 9 and 10, 1982, provided a "snapshot" picture of the mercury release situation of the drain lines within the Y-12 Plant at the time of the sampling. What was evident from this data was that most of the mercury is coming from the old production buildings. The drainage pipes from Buildings 9204-4 and 9201-5 contribute about 47% (83 g/d), the pipes from 9201-4 contribute about 25% (44 g/d), and 81-10 contribute about 19% (33 g/d), and the pipes from 9201-2 contribute about 8% (13 g/d) of the mercury released through the drainage system at that time. Debris and sediments were observed in some of the drain lines, particularly behind security gratings. In the drainage lines behind the old process buildings, some metallic mercury was observed at the time of sampling, trapped in the bell joints in drain pipes and in junction boxes. Follow-up visual inspections in Buildings 9201-5, 9201-4, 81-10, 9204-4, and 9201-2 showed that in the first three buildings, some metallic mercury was present as well as sludges suspected of being contaminated with mercury. The other two buildings did not show visible evidence of mercury.

As the result of the data obtained in this drain line survey and the subsequent visual observations, several recommendations were made. These recommendations included: installation of temporary dams in the industrial ditch to allow settling of the larger solid particles that may become suspended during cleanup operations, cleanup of the fan rooms and sumps of Buildings 9201-4 and 9201-5, cleanup of the 81-10 area, inspection and cleanup of Building 9201-2, cleanup of major drain lines showing the higher mercury release rates, and investigation of possible rerouting of drain lines in Building 9201-5 to reduce water flows through sumps.

These recommendations were implemented and the lead responsibility assigned to the Metal Preparation Division. The Metal Preparation Division had considerable experience in prior years with other mercury cleanup programs and activities. The follow-up activities commenced in March 1983 with the installation of the temporary dams in the industrial ditch followed by cleanup of the 81-10 area. The feasibility of rerouting drain lines in Building 9201-5 was investigated and it was determined that this would be difficult to accomplish at this time. Cleanup of the fan rooms and sumps in Buildings 9201-4 and 9201-5 is proceeding. Sludges and sediments collected to date have been packaged in lined steel drums and are being stored awaiting disposal.

Upon completion of the cleanup in Buildings 9201-4 and 9201-5, cleanup activities will be started in Buildings 9201-2, as well as in the drain line systems.

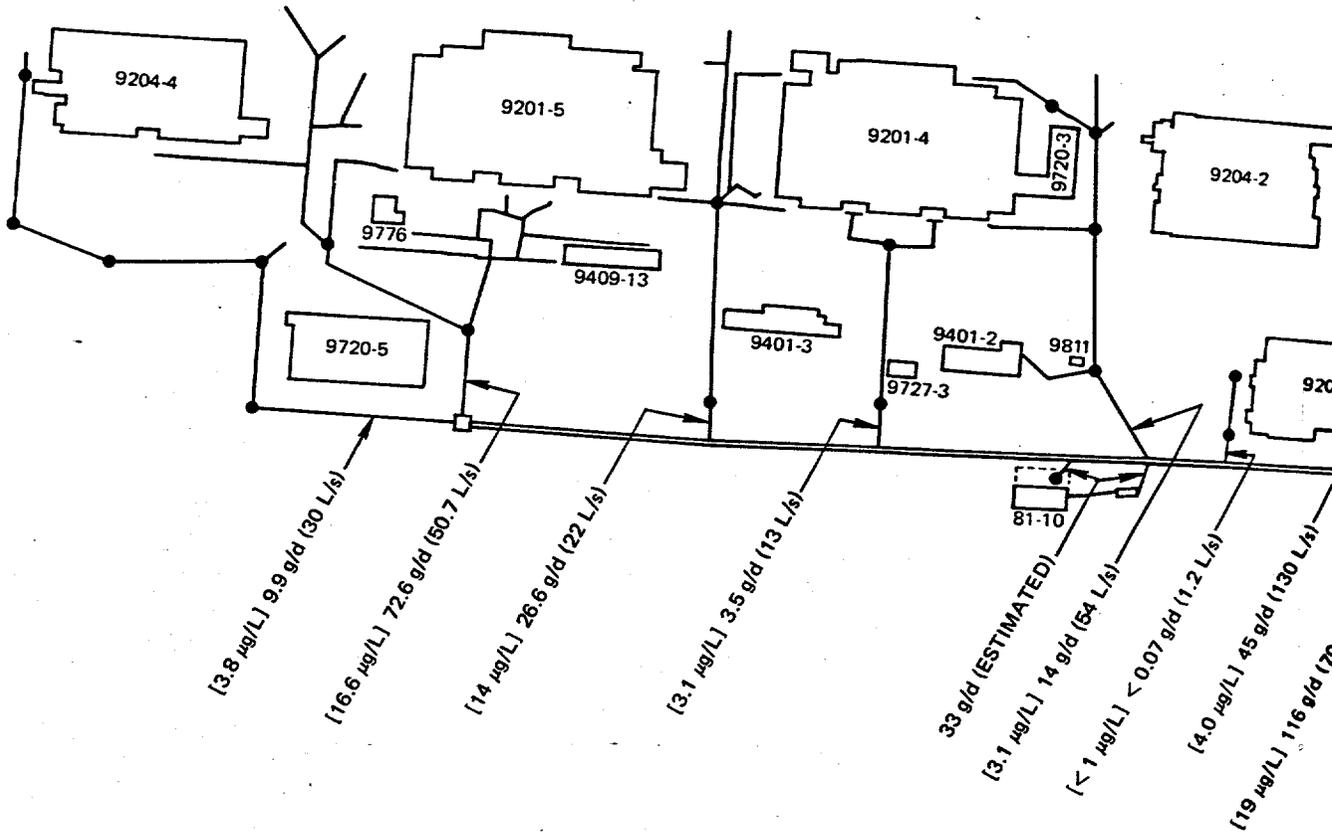
Prior to initiating any cleanup activities, it was recognized that these operations could disturb settled sludges and fine-grained sediments in the drainage system which might temporarily increase the mercury release rate from drainage system in the Y-12 Plant. Cleanup plans were developed and modified in an attempt to minimize the mercury release rate. Since NHP was shown to work fairly effectively as a settling basin in nonstorm periods, it was anticipated that any increase in mercury release from the Y-12 Plant would be no worse than the impact caused by storms.

Further Work

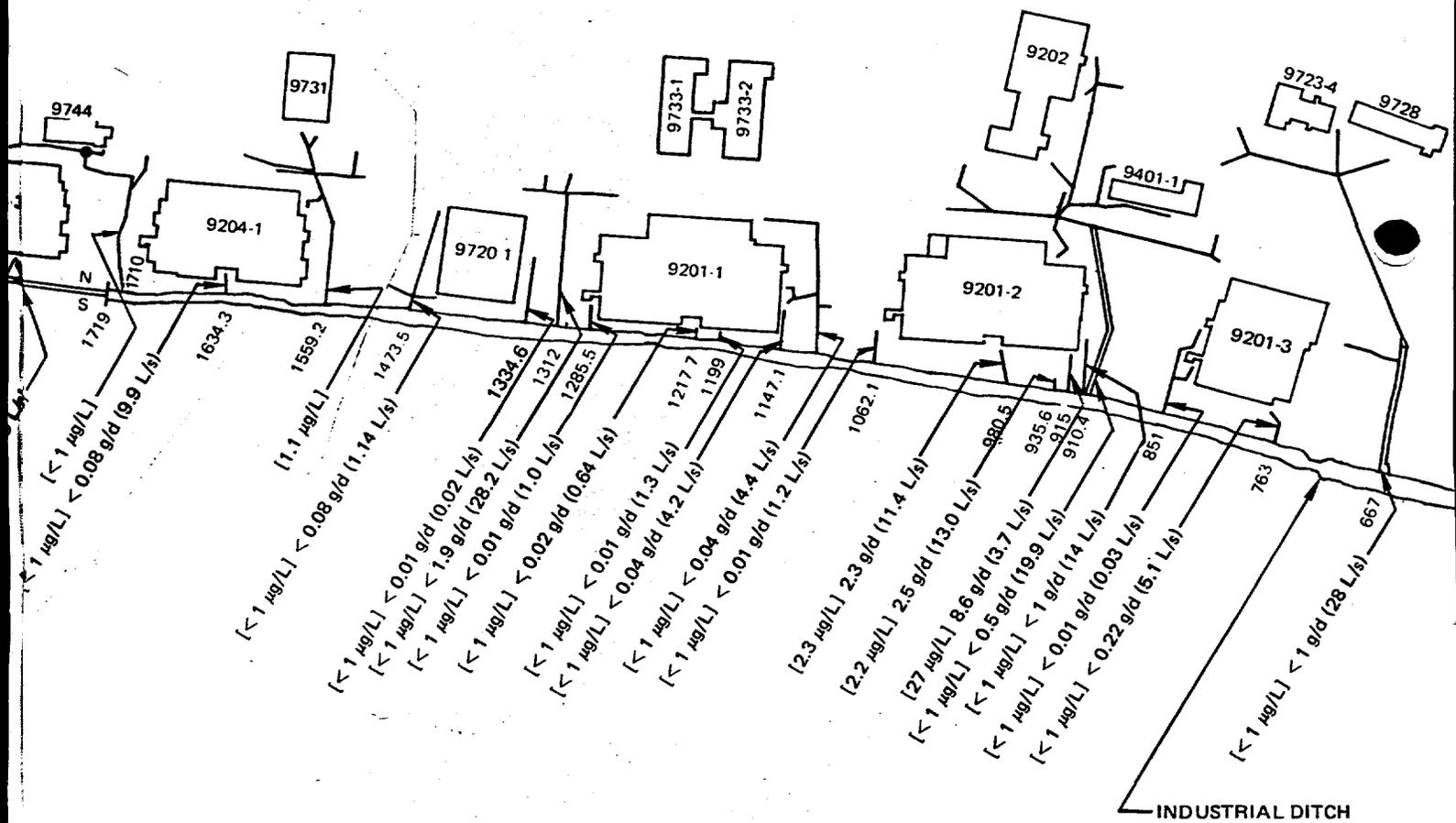
This drain line survey conducted in December 1982 provided the focus for the corrective actions currently underway. It provides one set of data points, i.e., an "instantaneous picture" of the mercury discharges from the Y-12 Plant. This set of data, however, does not provide a complete characterization of mercury releases from the Y-12 Plant drainage system. Additional sampling is needed to better characterize the drainage system and understand current mercury release rates. Since the initial sampling provided a consistent picture of where mercury was being released, it was decided to postpone additional sampling of the drain lines until after this present cleanup activity is completed.

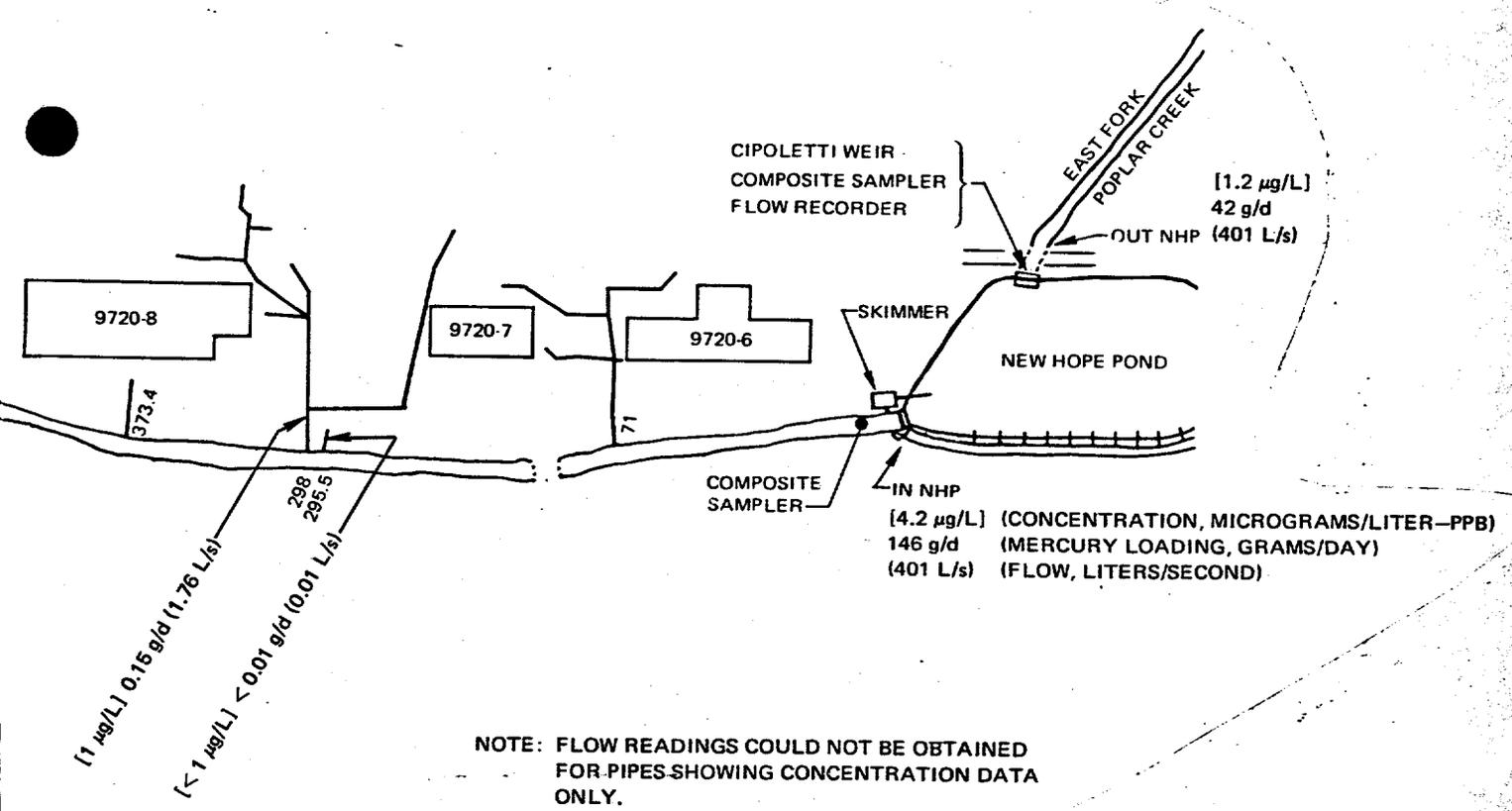
Further sampling will provide a basis for estimating the impact of the cleanup and identify the need for additional corrective action programs. It will also allow for better estimates of mercury release rates from the plant drainage system, as well as NHP. The relative impact of storms on mercury release needs better definition to complete the characterization of mercury release from the Y-12 Plant drainage system. Additional storm data will be collected to characterize this impact. Drain line survey work is expected to continue until it is demonstrated that sources of mercury have been adequately cleaned up or contained. Routine monitoring will then follow.

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Hg DRAIN LINE SAMPLING PROGRAM DECEMBER 9 & 10, 1982





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