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Liquid and Gaseous Waste Operations Department Annual Operating Report CY 1990

March 1991

J. J. Maddox
C. B. Scott

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LIQUID AND GASEOUS WASTE OPERATIONS DEPARTMENT

ANNUAL OPERATING REPORT

CY 1990

Date Published: MARCH 1991

J. J. Maddox
C. B. Scott

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TABLE OF CONTENTS

1.0	**OPERATING SUMMARY**	1
1.1	Process Waste System	1
1.2	Liquid Low-Level Waste System	2
1.3	Gaseous Waste System	2
1.4	Waste Operations Control Center (WOCC) Computer Systems	2
2.0	**UPGRADE ACTIVITIES**	3
2.1	Nonradiological Wastewater Treatment Plant	4
2.2	Process Waste Treatment Plant and the Process Waste (PW) System	6
2.3	Liquid Low-Level Waste System	9
2.4	Gaseous Waste System	9
2.5	Waste Operations Data Management and Analysis System (WODMAS)	9
2.6	WOCC Data Acquisition System	12
2.7	WOCC Distributed Control System	15
2.8	Liquid Waste Solidification Program (LWSP)	17
2.9	Study for Installation of the Spare Evaporator at Building 2531	22
2.10	Equipment Cleaning Facility	24
2.11	Bethel Valley LLLW Line Item	24
3.0	**MAINTENANCE ACTIVITIES**	25
3.1	Nonradiological Wastewater Treatment Plant	25
3.2	Process Waste Treatment Plant and Collection System	28
3.3	Liquid Low-Level Waste System	29
3.4	Gaseous Waste System	32
3.5	Cathodic Protection Survey of LLLW Piping	33

TABLE OF CONTENTS (CONTINUED)

4.0	**MISCELLANEOUS ACTIVITIES**	34
4.1	LLLW System	34
4.2	Federal Facility Agreement (FFA) Implementation – Low-Level Waste System	35
4.3	Training	37
4.4	Trench Grouting Demonstration	37
4.5	OSR Compliance	38
4.6	Access Control	38
4.7	Occurrence Reporting	38
4.8	Procedures	40
5.0	**APPENDIX**	41

WASTE MANAGEMENT OPERATIONS SECTION
LIQUID AND GASEOUS WASTE OPERATIONS DEPARTMENT

Operating Report - Calendar Year (CY) 1990

1.0 OPERATING SUMMARY

1.1 Process Waste System

A total of 6.86×10^7 gal of liquid waste was decontaminated by the Process Waste Treatment Plant (PWTP) ion exchange system during CY 1990. This averaged out to 130 gpm throughout the year. When necessary, a wastewater sidestream of 50-80 gpm was treated through the use of a natural zeolite treatment system. An additional 2.93×10^6 gal (average of 5.6 gpm throughout the year) were treated by the zeolite system. During the year, the regeneration of the cation exchange resins resulted in the generation of 3.76×10^3 gal of liquid low-level waste (LLLW) concentrate and 3.38×10^3 gal of LLLW evaporator feed. The head-end softening process (precipitation/clarification) generated 706 drums of solid low-level waste sludge. This was an increase of 77 drums over the amount generated in 1989. This increase was due to the start-up of the Bethel Valley Storage Tanks. Before these tanks were placed in service, solids in the wastewater settled out in the Equalization Basin; however, since these tanks have been placed in service, these solids are not being removed until they reach the clarifier at the PWTP. See Table 1 for a monthly summary of activities at the PWTP. Figures 1, 2, 3, and 4 show a comparison of operations at the PWTP in 1990 with previous years. Figure 5 shows a comparison of annual rainfall at ORNL since 1986.

A total of 1.39×10^8 gal of liquid waste was treated at the Nonradiological Wastewater Treatment Plant (NRWTP), which was placed in service for testing and/or checkout on February 3, 1991. Of this amount, 5.30×10^6 gal were treated by the precipitation/clarification process for removal of heavy metals. Three boxes of solid sludge generated by the precipitation/clarification process were removed from the filter press room and sampled per the ORGDP Waste Acceptance Criteria. The NRWTP receives wastewater from the PWTP, the metals/nonmetals pumping station, the 190 pumping station, and the Melton Valley (MV) process waste collection tanks. The NRWTP removes particulates, heavy metals, and organics, as well as adjusts the pH of the wastewater, before discharge to White Oak Creek. See Table 2 for a monthly summary of activities at the NRWTP.

When the NRWTP was put into operation, the demineralizer regenerant from the ORNL Steam Plant was redirected from the neutralization facility (Building 3518) to the Coal Yard Runoff Treatment Facility (CYRTF), with Building 3518 maintained for backup in the event of heavy rainfall. In early September, permitting problems relevant to the disposal of the CYRTF sludges forced this wastewater stream to be diverted back to Building 3518 for neutralization, with subsequent treatment at the NRWTP. Due to the extremely high amount of solids in this metals wastewater

feedstream to the NRWTP, sludge generation from the NRWTP clarifiers increased dramatically. This wastestream will be deverted back to the CYRTF when the regulatory concerns are resolved (scheduled for resolution in the first quarter of CY1991).

1.2 Liquid Low-Level Waste System

Both the A2 and 2A2 evaporator systems operated normally during the year. A total of 2.61 x 10^5 gal of LLLW were processed through the A2 evaporator system and 1.58 x 10^5 gal of LLLW were processed through the 2A2 evaporator system. There was 8.41 x 10^3 gal of concentrate transferred from the A2 system and 4.53 x 10^3 gal of concentrate transferred from the 2A2 system to the waste storage tanks. See Table 3 for a monthly summary of activities at the evaporator systems and Fig. 6 for a graphical representation of the amount of concentrate presently stored at ORNL awaiting disposal. See Fig. 7 for a graphical comparison of the generation of LLLW at ORNL and Figures 8 through 29 for a comparison of the generation of LLLW by individual sources over the last six years.

1.3 Gaseous Waste System

On September 7, 1990, a failure of the bearing sensors on the 4500 cell ventilation electric fan caused it to shut down. The backup steam turbine started per design resulting in no system upset. This event was classified as a Non-routine event under the Occurrence Reporting System (see Occurrence Report Number MMES-90-285 X10-90-63).

On October 24, 1990, a defective connection on the 3500 cell ventilation electric fan caused it to shut down. The backup steam turbine started per design resulting in no system upset. This event was classifed as a Non-routine event (see Occurrence Report Number MMES-90-1210 X10-90-193).

On December 1, 1990, a failure of the ORR cell ventilation electric fan occurred. This caused deviations in the ORR cell ventilation but did not violate the OSR for the 3039 Stack Area. This event was classified as an Off-Normal event (see Occurrence Report Number MMES-90-1696 X10-90-252).

1.4 Waste Operations Control Center (WOCC) Computer Systems

In May, the WOCC computer system operation and procedures underwent an internal Quality Assurance (QA) audit by representatives of QA and Computing and Telecommunications Division (C&TD) during the annual Reactor Operations Committee (ROC) review of department operations. No major findings were observed.

2.0 UPGRADE ACTIVITIES

Several new facilities were placed in service during the year. The Nonradiological Wastewater Treatment Plant was officially given approval for operation on March 30, thus meeting the National Pollutant Discharge Elimination Standards (NPDES) permit compliance date of March 31. The NRWTP was completed a year ahead of the original schedule and under budget. The remaining funds were used for Phase I and Phase II improvements at the facility that were identified during checkout and start-up. The NRWTP also received an award from the East Tennessee Project Management Institute by being named their Project Team of the year.

During the year, optimization of the NRWTP has been ongoing; with several modifications to the original metals treatment process being evaluated, including the operation of the metals treatment as a batch process instead of on a continuous basis. During the last quarter of 1990, work was started on the Optimization Report for the NRWTP, which is required by the NPDES permit to be issued after one year of operation.

Another facility placed in service was the Equipment Cleaning Facility (ECF). The ECF is designed to steam clean very slightly contaminated equipment (including monitoring well drilling equipment) and to collect the wastewater for treatment at the designated treatment facility based upon sample results. To date this facility has not been utilized.

An extensive upgrade was initiated at the Process Waste Treatment Plant (PWTP) starting in August. This task included painting of the facility, a new roof for the ion exchange column room, new dikes and floors, and asphalting around the facility. These improvements have resulted in a much improved working environment at the facility.

Computer activities also continued to be a large part of the department's operation. Several additions were required to the Distributed Control System (DCS) as the NRWTP was placed in service. The WOCC control room was refitted as part of the Bethel Valley LLLW Line Item. The Liquid/Gaseous Waste Operations (LGWO) computer systems specialist was also responsible for maintenance and upgrades to the Laboratory Emergency Response Center (LERC) Data Acquisition System (DAS) system, which functions as a backup to the WOCC DAS. He was also given responsibility for setting up and managing the Waste Operations Data Management and Analysis System, which will be used by the entire Waste Management Operations Section for databases and record storage.

Other activities of high interest include the Liquid Waste Solidification Program, which is needed to provide between 50,000 and 100,000 gal of free space for the continued storage of LLLW concentrate; and a study for installation of the spare LLLW evaporator at Building 2531, which is needed due to the failure of three of the seven

steam coils in evaporator 2A2 to date, and the upgrade of the cathodic protection on much of the LLLW system.

2.1 Nonradiological Wastewater Treatment Plant

January

On January 25, the final meeting was held with the ORNL Readiness Review Committee. During the meeting, the Committee gave Waste Management Operations personnel a list of prestart-up items in need of resolution. These items were resolved by January 29, and it was anticipated that the Committee's recommendation to proceed with startup would be received by February 1, with Environmental & Health Protection Division approval to follow by February 3.

On January 29-30, personnel from Engineering-Science (the architect engineering firm that designed the NRWTP) were on-site to give Waste Management Operations a final evaluation of the NRWTP before start-up. They did not identify any problems that should delay start-up. They were asked to evaluate some possible improvements to the NRWTP, and they submitted a report on their visit and the improvements during February.

Chemical testing of the NRWTP was completed on January 26. During testing, the pH control loops were tuned, and the filter press system was tested using a calcium and magnesium sludge. Stability problems with the air stripper acid addition system were resolved by the addition of a metering valve and flow meter. Approximately three weeks of testing were completed using potable water. The water was processed by the plant under various scenarios of plant operation and component failures. The completed test plan and documentation were turned over to Waste Management Operations supervision for submittal into the DMC.

February

On February 3, the testing of the NRWTP with actual wastewater was initiated. This testing allows for fine tuning of the plant and the gathering of operational data so that the compliance date of March 31, 1990 could be met. The regulatory approval for the testing during this period was allowed under the NPDES permit for the NRWTP.

On February 3 and 4, several tie-ins were completed to reroute the discharge of wastewater from interim NPDES monitoring points to the NRWTP. The discharge from MH190, which collects wastewater from the 4500 area, was rerouted from the 190 ponds to the 190 Pump Station, which transfers the wastewater to the NRWTP. The discharge from the PWTP was rerouted from White Oak Creek to the 3544 Wet Well, which then transfers the wastewater to the NRWTP. The discharge from the metals/nonmetals pumping station, which receives flow from the 1505 and 2000 areas, was rerouted to go to the NRWTP instead of being discharged at the 190 ponds'

discharge point. The discharge of the Melton Valley (MV) process waste collection tanks to Melton Branch was discontinued, with the wastewater being transferred to the NRWTP.

In order to minimize the production of metals waste at the NRWTP, the flow at MH190 and in Melton Valley is designed to divert to the Bethey Valley (BV) storage tanks for treatment at the PWTP whenever a pH below 6 is detected. These pH parameters were set by Chemical Technology personnel who have sampled the streams and have only encountered metals wastewater when the pH is below 6. The PWTP uses treatment techniques which remove dissolved metals and it was felt that the addition of these waste streams would have no significant impact on PWTP operations.

Work is in progress to continue evaluating these process settings and adjust them as necessary. The metals/nonmetals pump station will divert between the metals and nonmetals tanks at the NRWTP based on pH less than 6. So far analysis has shown very few metals in the feed waste stream at the NRWTP with all metals parameters well below NPDES limits.

On February 8, a Readiness Review Team from DOE-ORO was established to evaluate the plant during the final phase of testing using wastewater. Several meetings, tours, presentations, etc. with this review team and Martin Marietta Energy Systems, Inc., personnel occurred in February.

March

On March 30, permission to place the NRWTP in full operational service was received from DOE-ORO after they had completed their readiness review of the facility. Their review resulted in several recommendations for improvement at the NRWTP; none of which was considered to have an impact on the start-up of the NRWTP. These recommendations were discussed with Energy Systems personnel, and responsibilities for these items were assigned to the proper organizations.

The official start-up of the NRWTP on March 30 met the compliance date in the NPDES permit for full operation by March 31.

April

The additional features - Phase 1 package was issued for cost estimation by RUST and Engineering. This package included:

- Rerouting of air release valve discharge lines on the GAC columns and the dual-media filters to the trench drain
- installation of a platform for access to the top of the caustic tank
- platform improvements for maintenance in the filter press room
- rerouting the air stripper acid wash discharge to the diked area sump.

August

Work on the Phase I improvements continued during the month.

September

Work on the Phase I improvements continued during the month.

October

Work continued on the first phase of improvements to the NRWTP. The drawing package for the second phase of improvements was issued approved.

November

The preconstruction meeting with M. K. Ferguson concerning Phase II upgrades took place the first week in November. Additional pump supports to eliminate vibration problems were completed for pumps J-1001A and B, J-1002A, and J-1008A. Rerouting of the 3608 roof drains to eliminate collection of roof runoff in the diked area for treatment was started during the month.

December

Phase II of the NRWTP upgrades continued during the month by M. K. Ferguson. Additional pump supports to eliminate vibration problems were completed for pumps J-1002B and J-1008B. Rerouting of the 3608 roof drains to eliminate collection of roof runoff in the diked area for treatment was completed.

2.2 Process Waste Treatment Plant and the Process Waste (PW) System

January

In January, efforts were under way to evaluate the performance of the existing beta-gamma monitors. The WOCC was receiving frequent high radiation alarms which did not reflect the actual stream activities. The problem of false high radiation alarms was believed to result from a "plastic bag" inside the monitor which collects sediment from the sampled water which flows into the bag and then out. The accumulation of sediment over time results in an increasingly high radiation background which eventually causes a high radiation alarm. One possible solution to the problem would be to replace the "plastic bag" frequently enough to prevent the sediment from being accumulated. The shortcoming of this solution is that at present the replacement operation must be performed by I&C technicians. Discussions with Instrumentation and Controls (I&C) personnel who were involved in the development of the beta-gamma monitor are taking place to see if a more reasonable solution can be found.

February

MH229, which had been discharging to the White Oak Creek normally, was diverted back to the Diversion Box (DB) during late February. The overflow line to the Equalization Basin was also plugged. This was done to eliminate a Category III outfall that had to be discontinued by March 31, 1990, to comply with the NPDES permit.

March

The continuing efforts to evaluate the performance of the existing beta-gamma monitors in the PW Collection System resulted in the following findings:

1. Replacement of the plastic bag for the monitors does not require an I&C technician to do it. Operations personnel, with minor training efforts by I&C personnel, can perform that maintenance task. WMO did not consider this finding viable due to union labor policies.

2. The design of the existing beta-gamma monitors which utilizes the plastic bag was prompted by the need for a more sensitive instrument capable of covering wider ranges than allowed by the previous design.

3. It appears that the problem of shorting the high voltage power supply is due to a moisture buildup in the high voltage chamber. Moisture gets into the high voltage chamber from around a thin piece of mylar which covers a window between the chambers.

A meeting between operations personnel and all I&C personnel involved is required to resolve these problems.

June

New identification tags for the valves at the PWTP were installed during the month. These tags provide a description of each valve's function.

July

Efforts were undertaken to determine the overall I&C upgrade requirements for the waste operations. As part of these efforts, a survey of manhole locations was conducted to determine if the existing measurements were sufficiently adequate to provide waste operations personnel with the necessary information needed to enhance the monitoring capabilities of waste streams. The results of the survey were tabulated for each location to indicate the existing measurements, the existing equipment, any additional measurements needed, comments on problems with existing instruments, and comments concerning problems that could be attributed to

improper equipment installation. The collected data are being studied to verify their accuracy and completeness before any conclusions can be made.

August

The control room at the PWTP was painted during the month. Painting of the rest of the facility was scheduled for September.

September

Work continued on improvements at the PWTP. The column room was painted, the replacement of the column room roof was started, and floor and dike repairs were started.

October

Work continued on improvements at the PWTP. The upgrade of the dikes and floors in the makeup area and the column room were completed, installation of the new column room roof was completed, work was started to replace the asbestos insulation around the L-3A and B polishing filters, the area around the plant was asphalted, and work was started on pouring a new diked area for the zeolite system.

A 4.3-kVA uninterruptible power supply system was installed at 3544. The system will allow continuous operation of the PWTP control system during transitions from line power to diesel generator power.

November

Work continued on improvements at the PWTP. The new diked area for the zeolite system was completed during the month and was successfully leak tested. The inlet, outlet, and check valves on the L-2 clarifier at 3544 were replaced during the month with minimal impact on operations. This replacement was accomplished to better facilitate future maintenance on the pumps. The asbestos insulation around the L-3A and B polishing filters was removed, the lines were steam traced, and the new insulation was scheduled to be put on in early December.

December

Work continued on improvements at the PWTP. The installation of new insulation for the L-3A and B polishing filters was started during the month and is scheduled to be completed in January 1991.

2.3 Liquid Low-Level Waste System

April

The new evaporator chemical addition building was placed in service on the first of the month. This building contains chemicals which are pumped to the evaporator cooling towers for pH and biological growth control. This new building is provided with diked areas to contain any spills.

September

The WC-9 pump pit sump discharge was rerouted from WC-8 to WC-9.

2.4 Gaseous Waste System

October

Several unidentified valves were found in the 3039 Stack Area. Valve identification tags were prepared and attached to these valves.

2.5 Waste Operations Data Management and Analysis System (WODMAS)

January

A purchase order for procurement of the system hardware was issued on January 19, 1990. The order was issued in time to include a VAX workstation offered by the vendor at no extra cost.

February

The existing WOCC data acquisition system computer was relocated to accommodate the Data Management and Analysis System. The system consists of a DEC VAX 6310 with VMS operating system, high speed line/graphics printer, 1.2 gigabytes of disc storage, and a nine-track magnetic tape. The WODMAS will provide a platform for support and development of all Waste Operations data bases including HAZWASTE, Asbestos, SWIMS, Documentation Management System, WOCC Data Acquisition System, and WOCC Distributed Control System.

Work began to provide the necessary electrical power for the new equipment.

Hardware and software supplied by Digital Equipment, Inc., arrived February 28. Installation will begin on March 1.

March

Work to provide the necessary electrical power for the new equipment was completed.

Installation and check-out of the new hardware was completed.

Installation of the baseline operating system is approximately 40% complete. This includes installation of the VMS operating system,, DECNET/ethernet, and DECWINDOWS software. An additional VAXCLUSTER license will be purchased to allow the VAS 6310 and VAX 3100 to be configured as a cluster and share disk and print resources as well as distribute batch jobs for execution.

The broadband bridge to access the plant network was ordered by C&TD. Delivery was scheduled for April.

WordPerfect for VAX/VMS software was ordered. Delivery was scheduled for April.

A kickoff meeting was held to identify the goals for the conversion of the HAZWASTE and SWIMS systems. Much concern was expressed over the addition of any new features to either system. A project team was established to identify, define, and review any proposed changes to the design and/or operations of either system.

April

Installation of the baseline operating system was completed. This included installation of the VMS operating system, DECNET/ethernet, DECWINDOWS software, VAX C and FORTRAN programming languages, and WORDPERFECT 5.0 word processing software. The cluster configuration (VAX 6310 and VAX 3100) including cluster-wide sharing of disk drives, batch, and print queues has been completed.

Remote Access Facility (RAF) network software has been ordered. RAF will be used to link the WOCC Local Area Network work stations to the WODMAS cluster VAX nodes to allow users VAX access as well as shared cluster print and disk resources.

Delivery of the broadband bridge to access the plant network was delayed. C&TD network support personnel are to provide a loaner bridge to allow RAF testing if the bridge does not arrive before the RAF software does.

May

Installation and testing of Enterprise:DB the database management system has been completed.

RAF network software was installed. Initial evaluation results have been favorable. The temporary license for product evaluation has been extended to June 15. A decision to purchase the product is expected in June. RAF will be used to link the WOCC Local Area Network work stations to the WODMAS cluster VAX nodes to allow users VAX access as well as shared cluster print and disk resources.

The broadband bridge to access the plant-wide network has been installed and tested.

June

A technical staff meeting was held resulting in a decision to purchase RAF network software and a purchase requisition for one host license and twelve end user licenses was issued. RAF will be used to link the WOCC Local Area Network work stations to the WODMAS cluster VAX nodes to allow users VAX access as well as shared cluster print and disk resources.

July

One host license and twelve end user licenses for RAF network software were purchased. Installation is 50% complete. RAF will be used to link the WOCC Local Area Network work stations to the WODMAS cluster VAX nodes to allow users VAX access as well as shared cluster print and disk resources. The LGWO computer system specialist completed a course in DEC VAX System Architecture and a course in DEC VAX System Management I.

August

The LGWO computer system specialist completed a course in DEC VAX System Performance Management and a course in DEC VAX System Management II.

September

RAF software was installed on the Documentation Management System (DMS) computers allowing file transfers to the VAX disk drives. The VAX is now being used as a backup to the DMS data files. Eight personal accounts and three project directories were added to the system.

November

Conversion and development of WOCC DAS archive data analysis was initiated. The first phase will be to place data tape records in chronological order and compact the data. This will allow more efficient storage of archive data on the optical jukebox due in 45 days. Tape storage space in the WOCC control room is nearing the physical limits.

Chemical Technology Division personnel have requested diversion system data from the past year for optimization analysis. The data for the last 60 days has been provided allowing manual analysis. When functional requirements are established, the data extraction will be automated.

December

One account was added to provide I&C personnel with network access to AVID and I&C maintenance systems. The system now provides network access to seven WOCC Local Area Network users as well as online backup to the Documentation Management System.

Competitive bids for the specified optical storage subsystem were scheduled for receipt by January 15, 1991.

2.6 WOCC Data Acquisition System

February

Construction of the partitioning and shelving for the Waste Operations Control Room refit provided by the Bethel Valley LLLW Line Item was completed. Providing power to the partitions is scheduled for March; however, the work can only be partially completed until additional components arrive.

The system consoles were scheduled to arrive from the vendor in two shipments - one in early March and the other during late March. The shipments were delayed due to problems the vendor had with its supplier.

March

A new channel was added to monitor the level of Bldg. 5505's sump to meet Category III Outfall 312 resolution requirements.

A new channel was added to monitor the water level of the 3001 canal.

A total of 27 updates were made to the database.

The emergency and building contact call lists have been verified and updated.

Work to provide power to the new partitions in the WOCC was 50% complete. The remaining work could not be completed until additional components arrive.

The system consoles were shipped on March 27, 1990. The remaining components were to be shipped by April 15, 1990. The shipments were delayed due to problems the vendor had with its supplier.

April

A new channel was added to monitor the 3001 canal CAM status.

A total of 76 updates were made to the database.

The two system consoles arrived, however installation was delayed while the correct faceplate/bezels could be ordered. A purchase order was issued next month for the faceplates when Bailey Controls provided parts numbers, prices, and availability information.

A vertical-mount telephone and radio were ordered for the new console configuration.

The remaining console components have not yet arrived.

May

Four duct pressure signals and one steam pressure signal were added to provide additional monitoring of the 3039 Stack Area.

A total of 73 updates were made to the database.

Under the scope of the Bethel Valley LLLW Line Item, a purchase order was issued for the correct faceplate/bezels to allow mounting of the WOCC DAS terminals in the new consoles. Arrangements made with Bailey Controls expedited the order and the parts were received allowing the console conversion work to begin May 27.

The remaining console components did not arrive during the month.

June

Two signals were added to provide monitoring of the 3001 and 7500 canal levels.

The spare disk drive was removed for service after a number of read/write errors were experienced.

A total of 72 updates were made to the database.

Under the scope of the Bethel Valley LLLW Line Item, the WOCC DAS terminals were mounted in the new consoles.

The additional parts were received, and the remaining electrical work to provide power to the new control room partitions was completed.

The remaining console components on order did not arrive.

July

The local database of concentrator 6 was modified to provide 12 key selectable channels at the auxiliary displays located in Buildings 7920 and 7930. A cabling error was discovered and corrected in the process.

The spare disk drive was reinstalled after being serviced.

A total of 30 updates were made to the database.

The remaining console components for completing the control room refit, a component of the Bethel Valley LLLW Line Item arrived. Installation was under way at the end of the month.

August

A total of 26 updates were made to the database.

A purchase order for two Colorgraphic 8290XL terminals was issued by the LSS office. The terminals will allow the LERC DAS upgrade to be completed providing 100% compatibility between WOCC DAS and LERC DAS operation.

The installation of the remaining console components for the control room refit, a component of the Bethel Valley LLLW Line Item was 85% complete. The remaining item, a vertical mount telephone, is expected in September.

September

A total of 26 updates were made to the database.

The installation of the remaining console components for the control room refit was completed except for some cable rerouting. The work was scheduled for completion in October.

October

Twenty-three new channels were added to provide full-time monitoring of signals mandated by Operational Safety Requirements. The backup database of concentrator 1 was updated.

A total of 535 updates were made to the database.

The main database of the WOCC DAS and the LERC DAS was verified and validated. The only unexpected discrepancies existed in the auxiliary display assignments and the order of display in the areas. The Rate of Change and High Alarm Latch data were manually updated in the LERC DAS. Automated updating will be added in Phase 2 of the LERC upgrade.

The installation of the remaining console components for the control room refit as part of the Bethel Valley LLLW Line Item was completed.

November

A total of 49 updates were made to the database.

A no-charge purchase order for a main computer CPU upgrade was issued to Quickware Engineering Design, Inc. The unit will be evaluated for 30 days. If the unit meets expectations, it will significantly improve system performance and extend the useful life of the system.

December

A total of 18 updates were made to the database.

The LERC upgrades, which will provide 100% WOCC system compatibility, was 85% complete. Steps completed include conversion of graphics software to support Colorgraphics terminals, system generation to include the RA60 trend data storage disk drive and installation of trend data system software.

2.7 WOCC Distributed Control System

March

Due to the failure of the EMC data storage system at the NRWTP NPDES station, approximately seven days of NPDES compliance data were lost. Data acquired and maintained by the DCS were used as backup data to verify NPDES compliance of the NRWTP. A meeting was held between EMC and LGWO department personnel to discuss procedures to assure the availability of compliance verification data. It was decided that the DCS data will be archived to tape every month and made available to EMC when needed. EMC will evaluate the NPDES station data in a timely manner to ensure the ready availability of backup data if needed.

A new channel was added to monitor the secondary NPDES pH probe at the NRWTP NPDES station.

A total of 11 updates were made to the NRWTP/Collection System database.

A Bailey Network-90 representative was on-site for two weeks to train I&C technicians in DCS maintenance. Two one-week classes were held with five technicians in each class. "Hands on" training was accomplished using the existing DCS hardware.

April

The master Operator Interface Unit (OIU) database was distributed to all OIU locations.

A master set of Process Control Unit (PCU) drawings and function specification listings with a magnetic tape copy was submitted for approval and entry into the Documentation Management System.

May

Inadvertent power outages interrupted the communications system on two occasions (See Section 3.1, May for additional details). Communications returned to normal when power was restored.

June

A total of 24 updates were made to the database. Most of the updates pertained to the replacement acid pumps installed previously at Building 3608.

The OIU terminal at Building 3608 failed due to a hardware malfunction. The terminal was replaced with the OIU terminal from Building 3130. A repaired terminal was ordered from Bailey Controls and will be used as a spare unit while parts to repair the failed terminal are shipped from the vendor.

September

One update was made to the database.

A hard disk failure occurred on the Operator Interface Unit at Building 3130. The failure caused the loss of one day of trend data. The disk was replaced.

October

The area assignments of 500 tag alarm levels were reviewed and corrected as necessary to ensure proper area alarm indicator response.

The NRWTP filter feed tank level control loop was tuned to provide slower response time to system flow perturbations in order to minimize possible pump cavitation.

2.8 Liquid Waste Solidification Program (LWSP)

March

During March 1990, it was decided that Procurement would issue an Expression of Interest to determine what vendors would be potential bidders for the solidification campaign. The strategy is to issue a bid for a Time and Materials contract. ORNL Chemical Technology Division personnel will do the waste form certification including EP-Tox and ANS 16.1 using actual waste from tanks W-29 and W-30. Some of the certification testing will use a surrogate representing a nonradioactive chemical equivalent of the supernatant.

The chemical analysis of samples taken from W-29 and W-30 are comparable to the samples taken of the supernatant before the Emergency Avoidance Solidification Campaign (EASC). The concentration of radioactive constituents is very similar to that of the EASC. Both mercury and lead concentrations are less than the maximum allowable limit for these RCRA metals. This differs from the last campaign where mercury and lead exceeded the RCRA limits in the supernatant but passed the EP-Tox tests performed on the solidified samples. The supernatant is still characteristically hazardous because of the high apparent pH, 12.8.

April

During April, Procurement submitted for review a draft of the letter for Expression of Interest for solidification of ORNL liquid low-level waste. A letter of request was drafted for use of Time and Material price agreement for the LWSP. Discussions concerning the specifics of this type of contract were held.

ORNL Chemical Technology personnel submitted an estimate for doing the waste form certification including EP-Tox and ANS 16.1 using actual and surrogate waste.

After discussions with the Environmental Review and Documentation Section (ERDS), the initial assessment is that the LWSP will not require an Environment Assessment (EA) or an Environmental Impact Statement (EIS) since this is an existing operation. The final decision on what environmental protection or NEPA documentation is needed will occur when the Statement of Work for LWSP is reviewed by the ERDS.

May

ORNL Chemical Technology personnel began procurement of materials needed to do the waste form certification including EP-Tox and ANS 16.1 using actual and surrogate waste.

June

During June, a Statement of Work (SOW) was drafted for internal review. The SOW for this solidification campaign was similar to that which was used for the EASC, the difference being that the cement mix which was developed during the EASC will be provided to the selected vendor. The waste form certification of the mixture with the tank supernatant will be done at ORNL.

Discussions with the Environmental Compliance Department were held to initiate proper permitting for the solidification campaign. It was decided that application for the operating air permit would begin with a review of the application submitted to the Tennessee Department of Health and Environment for the EASC.

Chemical Technology Division personnel were prepared to certify the waste forms using the formula mix from the EASC. Both the Toxicity Characteristic Leaching Procedure and ANS 16.1 will be performed using surrogate and actual samples. Samples were poured to do the compressive strength tests.

July

The Statement of Work was released for comment and sent to Procurement so that bid package preparation could be initiated.

A Project Description Memorandum (PDM) was developed for supporting environmental documentation. This will be approved internally and a Memo-to-File prepared for the NEPA documentation.

ORNL Analytical Chemistry personnel analyzed samples from W-29 and W-30 for cyanide using a colorimetric method (modification of Method 9010), and the results were inconclusive. Using a microdistillation unit and ion chromatography, eliminating the problems inherent in the colorimetric method for these samples, the samples were scheduled to be reanalyzed for cyanide.

August

Comments on the SOW were reviewed, and a new revision will be issued to include amendments resulting from the comments and subsequent discussions.

A Project Description Memorandum (PDM) was developed for supporting environmental documentation. From the PDM, a Memo-to-File was prepared and sent to DOE-ORO so the level of National Environmental Policy Act (NEPA) documentation required could be determined.

Results of initial wasteform performance requirements indicate that the 28-day unconfined compressive strength for the solidification mix and the surrogate waste was an average strength of 2184 psi ($\pm$125 psi) for four sample cubes. The unconfined compressive strength requirement is 50 psi after 28 days of curing. Samples are now soaking in water for the 90-day compressive strength following water immersion.

On August 8, 1990, a presentation was given to the EPA and TDHE at the Waste Management Advisory Committee. A summary of the LWSP was given with focus on the permitting strategy. As a result TDHE had an action item to determine if any changes or issues existed which would affect the proposed permit by rule strategy for the LWSP.

September

During the reporting period, it was decided that the bid package for LWSP should be issued as an evaluated procurement instead of a competitively bid procurement. This necessitated the rewriting of the Statement of Work. The rewritten Statement of Work was distributed for further technical review and a source evaluation team for bidders was chosen.

Utilizing supernate from MVST tanks W-29 and W-30, grout test specimens were prepared and molded using the dry solids blend and mix ratio used during the last immobilization campaign on-site in Melton Valley. Both supernate samples as received were yellow in color and had gamma fields of approximately 250 millirem at the container surface. When mixed with the dry solids, both grout pastes gelled within 5 min, however, supernate W-30 began to gel almost immediately upon contact with the dry solid blend, while W-29 took approximately 3 min to show signs of gelling. All samples appeared to set normally with no observed bleed water after 2 hours and none after 24 hours. The surface dose from the specimens has not been recorded as yet, however this is planned for when they are removed from the molds.

Samples were cast for leach testing using both the EP toxicity test method and the ANS 16.1 test. Additionally, samples were poured in the shape of "pancakes" to facilitate crushing and screening of the grout in case we are required to run the TCLP test.

The following updated work schedule for this project as of September is as follows:

September 15-18	EP toxicity test commence.
September 25	ANS 16.1 leach tests commence.
October 25	Results of the EP toxicity tests are expected.
October 25	Results of the 5-day portion of the ANS 16.1 tests are expected.
October 31	Results of the 90-day immersion/compressive strength tests will be available.
January 31, 1991	Results of the final 90-day ANS 16.1 leach tests should be available.
February 28	Comprehensive report on the project to be delivered.

October

The second draft of the SOW was issued for comment. The SOW was released for comment to a wide range of personnel to cover safety, training, quality assurance, and other areas of expertise. This version of the SOW gives the vendor the option of using the formula which was developed for the EASC or developing a mix formula of their own and conducting the necessary waste form certification requirements.

The procurement of solidification services for LWSP will be an evaluated procurement. The evaluation team consists of five members including a representative from the Procurement Division, Engineering, Central Waste Management, and two representatives from the Office of Waste Management and Remedial Action. The evaluation team has reviewed the comments on the SOW and are developing a Request for Proposal.

The Quality Department reviewed the Quality Assurance Plan written for the EASC and recommended changes so a revised plan could be used for the LWSP. Some of the modifications include the new occurrence reporting requirements.

Waste form certification using actual and surrogate LLLW progressed this month. Grouted specimens of supernatant from tanks W-29 and W-30 were removed from their molds without difficulty. Three samples representing each tank are now in the process of being leached in accordance with the ANS 16.1 leach test. These tests are now entering the third week of testing and will continue for ninety days. Leachate solutions from the first week of leach testing were submitted for the analysis of Sr^{90}, Cs^{137}, Cs^{134}, Co^{60}, and the nitrate ion. When these results are available, calculation of the leach indices for the first week will extrapolate to leach indices for the full test. According to the Toxic Characteristic Leachability Procedure (TCLP), grouted material from the tank samples needs to be crushed and screened through a 9.5 mm screen.

Because the samples are "hot," advanced planning has been implemented to complete the TCLP.

November

During the month of November, the SOW for the LWSP was finalized and transmitted to Procurement for inclusion in the Request for Proposal (RFP). The RFP was reviewed and revised several times. The final version is presently making its way through procurement's internal review.

The operating air permit was revised and finalized this month.

During November, the Waste Management Environmental Advisory Committee was alerted to the possibility that the interim storage of the final waste forms may need to be extended beyond the original five-year period. The strategy for disposing of the waste forms will depend on the final Class L-II limits. These limits have not been finalized in the NUS Corporation Environmental Impact Statement (EIS) which is still ongoing. There is some speculation that the Class L-II limits for Cs^{137} may be of a level that the LWSP waste forms will be less than Class L-II.

Description and inclusion of the LWSP was submitted with the ORNL permit-by-rule application to TDHE.

The NEPA documentation which was originally submitted in August 1990 was lost in transit. New request for NEPA documentation determination is going to be "fast-tracked" through the proper channels.

Discussions were held with Chemical Technology Division personnel concerning alternate technologies for short term management of ORNL's LLLW storage problem. The use of ferrous cyanide and sodium titanate was discussed along with filtration and ion exchange to remove Cs^{137} and Sr^{90}.

December

During December, the Request for Proposal was transmitted to the appropriate vendors. The technical and business proposals (bids) are expected from the vendors in early February. A pre-bid conference will be held on January 8, 1991.

Procedures were written to remove one of the radioactive waste storage liners from an EASC storage cask. The interior of the storage cask, including the protective polyester cask liner, will be examined for radiation or other damage. This visual inspection will determine if the LWSP will reorder the same liners for the next solidification campaign. Engineering is preparing the specifications and SOW for the storage casks and liners for LWSP based on the outcome of this inspection.

Chemical Technical personnel gave a presentation on "LLLW Waste Management Review" on December 7, 1990. As part of this presentation, the ongoing supernatant decontamination studies were summarized. Strontium removal using sodium titanate is optimized at high pH. The removal of cesium works best at pH less than 11. In-situ precipitation of strontium and cesium is questionable because of the pH of the tanks, the short duration of effectiveness in the MVST after treatment, and other concerns which may make this scenario for decontamination invalid.

The waste form certification requirements of 10 CFR 61.56, the Toxic Characteristic Leachability Procedure and ANS 16.1 leach test are nearing completion. The 90-day immersion/compression testing of the 2-in. grout cubes formed from surrogate waste solution was completed. Following immersion in distilled water for 90 days, followed by unconfined compressive strength test, yielded an average strength of 1,705 $\pm$ 248 psi. This exceeds the compressive strength minimum of 60 psi. No cracking or spalling of the grout surfaces after 90 days in water was observed.

2.9 Study for Installation of the Spare Evaporator at Building 2531

January and February

The spare evaporator vessel continued to undergo installation of instrumentation for evaluation testing to start.

March

Testing of the spare vessel started after the instrumentation installation was completed during early March.

April

Evaluation of the evaporator is continuing. All seven coils have been evaluated to detect any significant coil displacement or stresses. As the result of coil No. 1 indicating a high stress, it was decided to reevaluate this coil. Therefore, installation of instrumentation is under way, and testing should be completed early next month. After all testing and evaluation is completed, data analysis will be performed, and a decision will be made on possible rework or disposition.

May

Evaluation of the spare evaporator is continuing. On May 30, a second video taping of the inside of the unused evaporator presently located in Building 2531 was performed. The original taping was performed earlier this year.

The evaporator is provided with a series of stacked coils, each supported by "U" bolts which secure the individual windings to upright supports attached to the

bottom of the vessel by welding. Since the original taping, the evaporator coils have been subjected to a series of tests using slightly superheated steam to simulate operating conditions. Circumferentially oriented strain gauges (1 per coil) were installed at strategic locations to measure strain during pressurization. Also, a number of places on the coils were painted on each side of the "U" bolts with "Dykem" ink. It was expected that the ink would rub off against the "U" bolts or the upright supports if the coil moved appreciably during steam pressurization.

The strain gauges showed that the outermost coil experienced unusually high (on the order of 55,000 psi) stresses during the first steam pressurization. Subsequent testing showed the remaining coils to have experienced the normally expected stresses. After all coils were tested, the strain gauge team decided to recheck the outer coil. During this test, the strain shown for the outer coil was essentially the same as that shown for the other coils. Engineering will analyze the strain gauge data and hopefully find an explanation for this unusual behavior.

The visual inspection and video taping showed only one winding, the top tube, third coil from the outside, had the ink rubbed off. There was 3/16 to 1/4 in. of dye scratch, and this shows quite clearly on the video tape. Other tubes may have also experienced similar movement but did not evince any dye scraping due to adequate clearance between the tubes and "U" bolts. Otherwise, the condition of the vessel and the coils appeared to be essentially the same as was observed during the first video taping.

July

A draft Statement of Work for instructing an outside consultant in the preparation of a study and plan for installation of the spare evaporator in Building 2531 has been distributed for review and comment. Preliminary discussions concerning this work have been held with Procurement.

August

ORNL WMO personnel met with representatives from Ebasco Services, Incorporated (ESI) to discuss the Statement of Work for the Study and Plan for Installation of the Spare Evaporator in Building 2531. This preliminary meeting, on August 20, was to supply ESI with information on the task to ascertain whether the contractor feels they have the expertise and willingness to undertake the contract. A second meeting was held on August 30, at which time ESI voiced their interest in the project and supplied Energy Systems personnel with a package containing a listing of the task team (including resumes, experience, references, and a preliminary task schedule). The awarding of the contract is now dependent upon funding availability for this task.

2.10 Equipment Cleaning Facility

January

In January a portion of the items that the Readiness Review Committee cited as needing attention (e.g., labeling of lines, removal of valve handles, running drain lines from the pressure relief valves, etc.) were completed. Scheduling of the necessary P&E personnel is delaying the completion of the remainder of these items. The Plant and Equipment (P&E) Field Engineer is aware that these items are not completed. The Committee chairman has agreed that if a splash curtain for the open end of the washdown basin electrical receptacles located inside the washdown area is completed then the ECF could start up with the assurance that the remaining action items will be taken care of as soon as possible.

The preparation of a sampling and analysis plan was delayed in January until the necessary information is obtained from the Environmental Sampling and Analysis groups.

February

During the month, the following work was completed by P&E personnel:

1. installation of the ground fault interrupt circuit, and
2. completion of labelling the electrical circuits.

March

On March 27, the ORNL Readiness Review Team for the Equipment Cleaning Facility recommended that the facility is ready for operation. The facility is now available for its intended use.

2.11 Bethel Valley LLLW Line Item

NOTE

> The refit of the WOCC control room provided in this line item is documented in Section 2.6 activities.

In September, the first of weekly meetings between Waste Operations and Engineering was held to draft the System Requirements Document (SRD) for the control system. The LLLW system will be tied into the existing Bailey Distributed Control System. The meetings will address control system operations and instrumentation, manual operations, and the man-machine interface requirements. The SRD will become the basis for control system programming when it is approved. These meetings continued through early December, when comments by Engineering

and WMO personnel on the draft document were returned. These comments are being resolved by Instrumentation Engineering personnel and the document will be sent out for final review and signature in early 1991.

In the last quarter of 1990, WMO personnel participated on the Readiness Review team for the Bethel Valley Liquid Low-level Waste Collection and Transfer System Upgrade (Phase I). This review is scheduled for completion in January 1991 so that the fixed price construction contract can be released.

3.0 MAINTENANCE ACTIVITIES

Maintenance activities continued throughout the year. A couple of recurring problems have occurred during the year. These are:

1. Failure of the PWTP clarifier's agitator occurred twice during the year. Repairs require fabrication of new parts and a shutdown of the PWTP's ion exchange treatment system for over a 24-hour period while the clarifier is emptied of sludge and the repairs are performed. To expedite the repair time, P&E has been requested to prepare additional spare parts so they will be on hand instead of having the specific part fabricated after the broken part is identified.

2. Failure of pump shafts at the NRWTP - several pump shafts have failed at the facility during the year. Shaft failure was initially thought to result from a design flaw in the shafts and a redesigned shaft was procurred. After more failures, these shafts were fabricated at ORNL but failures continued. Additional supports have been added to the pump bases to minimize vibrational damage and WMO and P&E personnel are examining the replacement of the six pumps and motors at the NRWTP with pumps and motors of a different design.

The reuse of zeolite columns was started during the year. Previously the zeolite vessels were transferred over to Solid Waste Operations after the zeolite was exhausted. However, the cost of a vessel is extremely high (over $15K) and requires a long lead time when ordering, so WMO and Chemical Technology personnel developed a method to unload and dewater the zeolite into low-cost boxes. This allows the vessels to be used over and cuts down on operating costs.

3.1 Nonradiological Wastewater Treatment Plant

<u>January</u>

During the week ending January 28, the pump shaft on each of the filter feed pumps (J-1008A and B) failed. After examination, it was determined that a design problem with the shafts led to a high stress point that caused the failure of each shaft.

The vendor was notified of the problem, and he furnished shafts of a revised design that were deemed acceptable by Energy Systems personnel. Additional spare shafts have been ordered in case the problem develops again.

February

Due to problems with the acid metering pump for the air stripper, it was replaced with no adverse impact on operations.

March

On March 17 one of the transformers feeding power to the NRWTP went out. The spare transformer on the other power feed continued to work normally resulting in no adverse impact to the NRWTP. A request for replacement of the transformer has been submitted.

The acid feed pump to the final effluent tank was replaced with no adverse impact on operations.

April

The seal on the nonmetals tank's jet mixer was replaced during the month with no impact on operations.

May

On May 12, due to a scheduled power outage at the 7900 Area, the DCS communications loop went down after its battery system was exhausted. The communications loop was down for approximately 5 hours, during which time the NRWTP was operated manually.

Early on May 13, a fallen tree knocked out power to the NRWTP. Power was rerouted by the electrical personnel, and the plant was restarted. The plant was down for 7 hours.

The seal on the filter feed pump (J-1008A) was replaced during the month with no impact on operations.

The transformer on one of the two power feeds to the NRWTP was replaced with no impact on operations. The transformer had failed in March and was replaced under warranty.

July

In early July, one of the two transformers feeding power to 3608 was damaged by lightning, resulting in a short power loss until the power feed could be switched to the standby transformer. Additional grounding has been installed for one transformer, and the other one is being upgraded. Quality Investigation Report #QIR-X-90-EHP-0002 was written to document the incident.

During early July, the shaft broke on the filter feed pump (J-1008A). The standby pump was placed in service with minimal impact on operations. The shaft was replaced a couple of days later with no impact on operations.

September

Backwashing of the NRWTP dual media filters created abnormal alarms. Investigation revealed that a timer relay had been replaced without being properly adjusted causing premature shutdown of the backwash cycle. The relay was adjusted.

Due to a buildup of sludge in the NRWTP sulfuric acid tank's discharge line, the sulfuric acid pump for the final effluent tank was removed from service until it's line can be cleared. The air stripper acid feed pump is being used for pH adjustment. This has led to increased operator attention on the plant's discharge pH. Investigation of the sludge buildup in the acid storage tank is being carried out by Chemical Technology Division personnel.

The main transformer at 3608, which had additional grounding added due to problems encountered earlier in the year, was returned to service.

October

The shaft on filter feed pump J-1008A at the NRWTP was replaced during the month with no impact on operations. The replacement pump shaft was manufactured on-site. The new design should resolve the problem of shaft failure.

November

The OIU monitor at the NRWTP was removed for repair, and a spare was installed temporarily during maintenance.

The polymer pump was repaired during the month with no adverse impact on operations.

December

The broken pump shafts on the nonmetals feed pumps (J-1002A and B) at the NRWTP were replaced during the month with no adverse impact on operations.

3.2 Process Waste Treatment Plant and Collection System

January

In January an investigation of recurring carryover of large particulates with the clarifier revealed that a coupling was broken on the shaft of the internal agitator, thus preventing its proper rotation. On January 10, the PWTP was shut down and the clarifier was cleaned out to facilitate the replacement of the broken coupling. While the PWTP was shut down for this maintenance, the anthracite and distributors were replaced in filter L-3A. This maintenance had been performed on the other filter, L-3B, during a shutdown in December 1989. During this shutdown the zeolite system was used to treat process waste.

March

On March 7, problems with the power feed to 3544 resulted in the underground cable being replaced. The PWTP was shut down during this work for 8 hours with no adverse impact on operations.

During early March, the spent zeolite was unloaded from one of the zeolite vessels and fresh zeolite was loaded. The zeolite vessel was placed on-stream on March 22 for testing to see if the vessels can be reused successfully.

Electric pumps were installed to transfer water from outfall 302 to the Equalization Basin.

April

The spent zeolite was unloaded from one of the zeolite vessels and fresh zeolite was loaded.

May

The breaker on the power feed to 3544, which had been tripping during December, was replaced after the new breaker was received on-site. This had no impact on operations.

June

The overflow line for L-1 was replaced during early June with no adverse impact on operations.

July

On July 23, the ion exchange treatment system at the PWTP was shut down to drain the clarifier for maintenance. After draining the clarifier, a broken coupling on the clarifier agitator's gear box was replaced. The system was restarted on July 24. During the shutdown, 70 gpm of wastewater was treated by the zeolite column.

The filter feed pump's (L-2P) motor was replaced during the month.

December

The pump end of the P-2 pump/motor was replaced during the month with no adverse impact on operations.

3.3 Liquid Low-Level Waste System

January

The In-Tank Evaporation (ITE) project was shut down in early January due to compressor problems.

February

On February 8, the steam supply valve for the transfer jet from service tank W-22 to evaporator 2A2 failed open. This caused 2A2 to be overfilled before corrective action could be taken. The faulty steam valve was replaced, and the excess waste was transferred back to W-22.

March

The ITE project was restarted on March 6 after repairs were completed on the compressor. The project was shut down on March 31 when a CAM detected airborne contamination in the MVST control room. This airborne contamination apparently resulted when a HEPA filter in the tank off-gas system plugged causing slight pressurization of some of the tanks. No equipment or personnel contamination resulted, and the project will be restarted after the filter is replaced. Closer monitoring of the pressure across the HEPA filters during the project will be scheduled to prevent a recurrence of this event.

April

Monthly sampling of Valve Box 1A showed activity in the valve box sump. Further investigations showed slight leakage due to deterioration of the gaskets. The gaskets at Valve Box 1A were replaced with gaskets of materials more compatible with the wastewater handled at Valve Box 1A.

The ITE project continued to be shut down during the month as repair work continued on the air dryer equipment.

May

The ITE project continued to be shut down during the month as repair work continued on the air dryer equipment.

June

The ITE project continued to be shut down during the month as repair work continued on the air dryer equipment.

The containment tent over Valve Box 1 was removed during the month.

July

On July 3, the mechanical level indicators in W-21 and W-22 were recalibrated using level readings taken during the last sampling of these tanks. The results of this recalibration showed an error in the tank levels. There was actually 4,940 gal more in W-21 and 5,500 gal more in W-22 than previous records indicated.

The repairs on the compressor for the ITE were completed and the project was restarted on July 16 for tanks W-24, -25, -26, and -27. The ITE was shut down on July 20 until an interlock is installed which will shut down the compressor if the cell ventilation duct pressure approaches atmospheric. This will prevent the tanks from being pressurized if the ventilation fans should fail or the filters should plug.

On July 25, a leak in the 4500 canyon from the LLLW line servicing the 4500 Complex (C and D corridors) was discovered by construction workers working on the Chilled Water Upgrade Project. When summoned to the site, WMO personnel also found the process line servicing 4500-N and -S to have been broken by the construction workers. The process line was fixed with temporary repairs, with final repairs being scheduled. Work continued on the LLLW line with repairs to replace a corroded elbow scheduled for completion in early August. All contaminated soil from the LLLW leaks was removed and disposed of per approved procedures. No soil contamination was found due to the PW leaks.

August

During the first week of August, a second leak in the 4500 canyon from the LLLW line servicing the 4500 Complex (R and S corridors), was found and repaired. A third LLLW line, servicing the main header from E, F, G, and H corridors, was found to be leaking. The laboratories serviced by this pipeline shut down LLLW generation until the leak was repaired. This line was repaired after the contractor finished the work. All contaminated soil from the LLLW leaks was removed and disposed of per approved procedures.

The ITE project was restarted on August 19 for tanks W-24, -25, -26, and -27 after an interlock was installed which will shut down the compressor if the cell ventilation duct pressure approaches atmospheric. This will prevent the tanks from being pressurized if the ventilation fans should fail or the filters should plug.

September

The ITE was shut down on September 19 due to the loss of the instrument air compressor and the plugging of the off-gas filters. These filters were also found to have elevated radiation backgrounds. The compressor was repaired during the month and the ITE was awaiting replacement of the off-gas filters at the end of the month.

The A-2 evaporator steam control valve was repaired during the month with minimal impact on operations.

Buildings 7860 and 7877 were decontaminated during the month.

October

The ITE continued to be shut down awaiting replacement of the compressor and installation of new humidity probes. The off-gas filters were replaced during the month.

The steam control station at Building 2531 was upgraded during the month with several valves being replaced.

November

The ITE continued to be shut down awaiting maintenance on the compressor and installation of new humidity probes.

December

Preliminary measurements were taken at Valve Box 3 during the month for fabrication of new piping to be installed. This new piping will give some expansion capability to the system and will eliminate recurring leaks.

The ITE continued to be shut down awaiting installation of new humidity probes. The compressor was repaired during the month.

3.4 Gaseous Waste System

January

In January the north bank of HEPA filters at the 3039 stack were replaced due to a failed DOP test, and the central off-gas demister media was changed out due to plugging. After replacement, the filters DOP tested satisfactorily. The three transformers feeding power to the 3039 stack were replaced due to a breach of containment in one of the casings. The quarterly load test of the emergency diesel system was accomplished during this maintenance. The 4500 cell fan blower developed an electrical problem which was corrected.

April

The off-gas filters at Building 7830 were replaced during the month with no adverse impact on operations.

July

An Engineering Service Order (ESO) was written during the month for periodic vibration analyses on the electric blowers, steam-driven turbines, and caustic pumps in the 3039 Stack Area. This service will generate reports identifying problems with the equipment so that repairs can be made before a malfunction occurs. This service is also being examined for use in the process and nonradiological wastewater systems.

August

During mid-August, the bearing and shaft were replaced on the 3092 scrubber sump pump with no impact on operations.

The filters on the cell ventilation systems at 7830 and 7877 were replaced during the month.

October

The off-gas filters for the ITE were replaced during the month.

November

The roughing filters in the 3608 filter press room were replaced during the month.

The off-gas scrubber heater was replaced and the demister media was changed out during the month with minimal impact on operations.

The belts were replaced on the 4500 cell ventilation blower during the month with no adverse impact on operations.

3.5 Cathodic Protection Survey of LLLW Piping

April

An Engineering Service Order was written for a study to determine what modifications/repairs are needed regarding the ORNL cathodic protection system. The scope of work submitted by Harco Technologies Corp. has been reviewed and found to be acceptable. A discussion has been held with them about the scope of work, schedule, and a plant visit. Electrical Engineering has written a request to have the placement of the purchase order expedited so that the task will be completed by June 15, 1990.

May

Harco Technologies Corp., who was awarded the contract to determine what modifications/repairs are needed regarding the ORNL cathodic protection system, performed the necessary field testing during the month. The report on their findings resulting from the testing is scheduled to be submitted by the end of June. Engineering will then interpret the report and estimate the cost of the modifications//repairs during July and August, and is scheduled to report their estimates in September.

July

Work on this task continued as scheduled. A meeting with Engineering, WMO, and HARCO personnel is scheduled for August 16 to review their final report.

August

A meeting with HARCO, Energy Systems Engineering, and the users of the pipelines at ORNL protected by cathodic protection met on August 16 to discuss the findings of HARCO's survey of the ORNL cathodic protector system. HARCO personnel went over their findings, which consisted of numerous deficiencies in the current cathodic protection system. Out of a total of 26 systems reviewed, 20 need upgrades. Energy Systems will now analyze the HARCO report and supply the users with cost estimates for the cathodic protection upgrades.

September

A meeting was held on September 27 to review the preliminary engineering estimates for upgrading the cathodic protection system. These estimates were based upon the recommendations made in the HARCO survey of the systems. A figure of $3,000K was estimated to upgrade all of the LGWOD systems. This figure was estimated using worst case scenarios and is probably somewhat high. Funding has been added to the ESO to Engineering to refine this estimate using new information from LGWOD and P&E Division personnel.

4.0 MISCELLANEOUS ACTIVITIES

4.1 LLLW System

February

Tank TH-2 was sampled for the Remedial Action Program.

March

Tank WC-4 was sampled.

April

The sampling of W-21 showed a high concentration of chlorides. This, coupled with a low pH in the tank, could lead to chloride corrosion of the tank. On April 30, 5.2×10^3 gal were transferred from W-23 to W-21 to neutralize the low pH waste concentrate in W-21. The resulting liquid mix will be sampled to see if sodium hydroxide will need to be added to further neutralize the contents of W-21. The sample results showed the pH was near 7.0.

May

Tank WC-4 was transferred to W-17 on May 19-20 in preparation for turnover to the Remedial Action Program (RAP).

Tank WC-1 was sampled during the month for the RAP.

June

Tanks W-21 and W-22 were sampled during the month.

Tank WC-15 was sampled during the month for the RAP.

August

Tanks W-29 and W-30 were sampled for the LWSP.

4.2 Federal Facility Agreement (FFA) Implementation - Low-Level Waste System

February

An investigation of the active LLLW system has been underway to determine the exact configuration of the system and how it is actually used by LLLW generators. This information has been put on a site drawing. The LLLW system was divided into subgroups with each subgroup being assigned to a project team member for investigation. The team members have interviewed the users to determine as much information as possible about the usage and condition of the system. That information is being compiled in a data base which will be utilized for impact analysis and contingency planning in anticipation of FFA establishment.

Comments to the Implementation Plan were received from DOE. These comments are being evaluated, and a revised plan will be submitted by March 31, 1990.

April

Continued weekly meetings with implementation team and waste generator divisions.

Issued letter to ORNL management apprising them of the FFA and its impacts.

Completed work on the FFA Implementation Plan and issued to DOE-ORO on April 30, 1990.

Prepared preliminary schedule and cost for FFA implementation.

Resolved differences between the FFA tank list and the overall tank list maintained by EM&C.

Issued letter to request changes in the FFA Appendix F tank list. These requested changes are reflected in the Implementation Plan.

Members of the FFA implementation team attended RAP meeting in Chattanooga, where sampling of Tanks WC-1 and WC-15 was an agenda item.

Members of FFA implementation team toured the West Valley Demonstration Plant where high-level wastes are being removed from tanks and treated.

Met with members of Waste Management Coordination Office with the purpose of utilizing their LGCO organization in implementing required FFA actions.

May

In preparing for the impacts on the LLLW system when the FFA is signed, LLLW generators and Waste Operations personnel are working on contingency plans for the disposal of LLLW. Several options are being evaluated, including trucking, bottling, solidification, and local treatment. WMO personnel have designed, and P&E personnel are in the process of constructing, a bottle dump station to be used at Building 2531. Liquid Generation Certification Officials (LGCOs) are working with WMO personnel and the Laboratory Certification Official (LCO) for liquid waste in their contingency planning.

June

Developed strategy for removing contents from inactive tanks. Continuing efforts include identifying and evaluating alternatives for waste removal and treatment options.

Attended meeting with Tennessee Department of Health and Evironment (TDHE) and Environmental Protection Agency (EPA) to review some proposed definitions and interpretations to be used for FFA implementation. The concept of emptying inactive tanks into another tank or treating the waste without performing assessments on the emptied tanks was presented. The regulators indicated they would be amenable to such a proposal. Efforts are under way to evaluate doing this.

Comments to the FFA Implementation Plan were received from DOE and Lee Wan. A meeting was held to review their comments.

Work continued to effect the transfer of three active tanks to the inactive role.

4.3 Training

April

Access training to Liquid and Gaseous Waste Operations' facilities for support personnel was started this month. The training is scheduled to continue through May, with additional classes scheduled as necessary for new personnel.

May

The two-year requalification tests for the chemical operators and supervisors started during the month. To date half of the personnel have taken their requalification tests. The requalification testing will be completed by mid-June.

Access training to LGWO facilities for support personnel was completed this month, with 287 people from various ORNL organizations attending the training sessions.

June

The two-year requalification tests for the chemical operators and supervisors started during the month. All of the personnel have taken and passed their written requalification tests. The oral requalification testing is on-going and will be completed in July.

July

The two-year requalification tests for the chemical operators and supervisors continued. The oral requalification testing has been completed for 50% of the personnel with the others scheduled for completion in August.

August

The two-year requalification tests were completed by the chemical operators and supervisors.

4.4 Trench Grouting Demonstration

June

During late June, 76,000 lb of cement, fly ash, and bentonite was blended at the New Hydrofracture Facility for the trench grouting demonstration in SWSA 6.

July

The blending of cement, fly ash, and bentonite at the New Hydrofracture Facility for the trench grouting demonstration in SWSA 6 was completed in early July.

4.5 OSR Compliance

In September, a review of the Operational Safety Requirements (OSRs) for the 3039 Stack Ventilation System, ORNL/CF (no number) and the Liquid Low-Level Waste (LLLW) System, ORNL/TM-7562 was performed to evaluate the compliance status. A detailed listing of findings, comments, and observations has been issued for review and corrective actions have been initiated to correct non-compliance items.

4.6 Access Control

During December, badge readers at Buildings 2531, 3544, and 3608 were placed in service to provide better access control to these facilities. All support personnel must complete the LGWO department access training class before they are put on the list of approved personnel on the badge readers.

4.7 Occurrence Reporting

4.7.1 Unusual Occurrence Reports

UOR ORNL-90-017-EHP-90-03
Facility: Electrical feed to pumping stations at Buildings 3544 and 3518
Subject: Unexplained tripping of circuit breaker feeding MCC 35-1A-A

UOR ORNL-90-18-EHP-90-4
Facility: 3039 Stack Ventilation System
Subject: Violation of OSR for the 3039 Stack Ventilation System

UOR ORNL-90-34-EHP-90-06
Facility: 3544 Process Waste Treatment Plant
Subject: Personnel contamination due to opening a pressurized system

4.7.2 Quality Investigation Report

QIR-X-90-EHP-0002
Facility: 3608 Nonradiological Wastewater Treatment Plant
Subject: Transformer Failure

4.7.3 Quality Event Report

QER-X-90-IC-5
Facility: Building 7860
Subject: Improper pressure switches

QER-X-90-EHP-0002
Facility: Building 7830A
Subject: Frozen sprinkler system pipes

QER-X-90-EHP-0007
Facility: Building 7830
Subject: CAM Alarm

QER-X-90-EHP-0008
Facility: Building 3608
Subject: Loss of power to NRWTP

QER-X-90-EHP-0009
Facility: Building 3608
Subject: Power outage at NRWTP

4.7.4 Occurrence Reports (under the new MMES Occurrence Reporting System required by DOE)

Emergency

None.

Unusual Occurrence

None.

Off-Normal

Report No.	Subject	Facility
MMES-90-172 X10-90-43	Personnel Contamination	WC-9 Pump Pit
MMES-90-326 X10-90-74	Personnel Contamination	WC-9 Pump Pit
MMES-90-690 X10-90-126	Personnel Clothing Contamination	Building 3544

MMES-90-1030 X10-90-168	Contaminated Work Boots	Building 3544
MMES-90-1696 X10-90-252	Loss of Cell Ventilation	ORR Cell 3042

Non-Routine

Report No.	Subject	Facility
MMES-90-285 X10-90-63	Loss of 4500 electric cell ventilation blower	4500 Electric Blower
MMES-90-705 X19-90-128	Loss of Building 3130 Operator Interface Unit hard disk	3130 OIU
MMES-90-985 X10-90-163	Overfilling of acid tanker	Building 3608
MMES-90-1210 X10-90-193	Loss of 3500 electric cell ventilation blower	3500 Electric Blower
MMES-90-2058 X10-90-284	Diversion of process waste flow to 190 Ponds	3500, PW System

4.8 Procedures

New and revised procedures and system descriptions have been prepared for operations throughout the LGWO department during the previous year. These documents are listed in Table 4. To summarize:

New and revised procedures approved:	81
New and revised procedures in draft:	27
New system descriptions approved:	23
New system descriptions in draft:	3

5.0 Appendix

5.1 Tables

1. Process waste operations.
2. NRWTP operations.
3. LLLW operations.
4. LGWO procedures.
5. LLLW generation.

5.2 Figures

1. Process waste treated at ORNL. (ORNL-DWG. 91-7674)
2. Sludge generation at the PWTP. (ORNL-DWG. 91-7675)
3. Dilute LLLW from the PWTP. (ORNL-DWG. 91-7676)
4. LLLW concentrate from the PWTP. (ORNL-DWG. 91-7677)
5. Rainfall at ORNL. (ORNL-DWG. 91-7678)
6. Used storage space versus time. (ORNL-DWG. 91-7679)
7. LLLW generation at ORNL. (ORNL-DWG. 91-7680)
8. Building 2026 LLLW generation. (ORNL-DWG. 91-7681)
9. Building 3019 LLLW generation. (ORNL-DWG. 91-7682)
10. Building 3025 LLLW generation. (ORNL-DWG. 91-7683)
11. Building 3026-C LLLW generation. (ORNL-DWG. 91-7684)
12. Building 3026-D LLLW generation. (ORNL-DWG. 91-7685)
13. Building 3028 LLLW generation. (ORNL-DWG. 91-7686)
14. 3039 Stack Area LLLW generation. (ORNL-DWG. 91-7687)
15. Building 3074 LLLW generation. (ORNL-DWG. 91-7688)
16. Building 3504 LLLW generation. (ORNL-DWG. 91-7689)
17. Building 3508 LLLW generation. (ORNL-DWG. 91-7690)
18. Building 3517 LLLW generation. (ORNL-DWG. 91-7691)
19. Building 3525 LLLW generation. (ORNL-DWG. 91-7692)
20. Building 3544 LLLW concentrate generation. (ORNL-DWG. 91-7693)
21. Building 3544 LLLW feed generation. (ORNL-DWG. 91-7694)
22. 4500 Complex LLLW generation. (ORNL-DWG. 91-7695)
23. Isotopes Area LLLW generation. (ORNL-DWG. 91-7696)
24. Reactors in Bethel Valley LLLW generation. (ORNL-DWG. 91-7697)
25. WC-5 Pump Pit (tank WC-8) LLLW generation. (ORNL-DWG. 91-7698)
26. WC-5 Pump Pit (tank WC-9) LLLW generation. (ORNL-DWG. 91-7699)
27. HFIR (Building 7900) LLLW generation. (ORNL-DWG. 91-7700)
28. Building 7920 LLLW generation. (ORNL-DWG. 91-7701)
29. Abandoned tank W-1A LLLW generation. (ORNL-DWG. 91-7702)

TABLE 1 PROCESS WASTE OPERATIONS

	Process waste treated by ion exchange (gal)	Process waste treated by zeolite (gal)	Total process waste generated (gal)	Drums of sludge generated	PWTP generated LLLW concentrate to storage (gal)	PWTP generated LLLW feed (gal)
January	5.03×10^6	1.24×10^6	6.27×10^6	67	295	532
February	5.99×10^6	0.25×10^6	6.24×10^6	62	620	335
March	6.9×10^6	--	6.9×10^6	59	250	350
April	5.42×10^6	--	5.42×10^6	44	250	350
May	6.38×10^6	--	6.38×10^6	56	100	250
June	4.47×10^6	1.31×10^5	4.60×10^6	45	0	0
July	5.94×10^6	5.24×10^5	6.46×10^6	72	180	570
August	6.17×10^6	1.32×10^5	6.30×10^6	53	370	282
September	5.36×10^6	--	5.36×10^6	57	680	130
October	5.64×10^6	--	5.64×10^6	74	780	223
November	5.36×10^6	--	5.36×10^6	62	238	353
December	5.91×10^6	6.48×10^5	6.56×10^6	55	0	0
1990 Totals	68.57×10^6	29.25×10^5	71.49×10^6	706	3,763	3,375

TABLE 2 NRWTP OPERATIONS

	Metals wastewater treated (gal)	Nonmetals wastewater treated (gal)	Total wastewater treated (gal)	Boxes of sludge generated
January				
February		1.06×10^7	1.06×10^7	
March	4.3×10^5	1.30×10^7	1.34×10^7	
April	3.77×10^5	1.08×10^7	1.12×10^7	
May	3.07×10^5	1.25×10^7	1.28×10^7	
June	2.16×10^5	1.15×10^7	1.17×10^7	1
July	2.93×10^5	1.33×10^7	1.36×10^7	
August	3.36×10^5	1.41×10^7	1.44×10^7	
September	6.83×10^5	1.20×10^7	1.27×10^7	
October	8.43×10^5	1.19×10^7	1.27×10^7	2
November	6.81×10^5	1.08×10^7	1.15×10^7	
December	11.2×10^5	1.28×10^7	1.39×10^7	
1990 Totals	52.96×10^5	13.32×10^7	13.85×10^7	3

TABLE 3 LLLW OPERATIONS

	LLLW treated by Evaporator A2 (gal)	LLLW treated by Evaporator 2A2 (gal)	Concentrate transferred from A2 (gal)	Concentrate transferred from 2A2 (gal)
January	7.0×10^3	4.96×10^4	--	3040
February	3.05×10^4	2.78×10^4	--	--
March	1.93×10^4	1.32×10^4	2400	1487
April	--	3.92×10^3	--	--
May	--	3.53×10^4	--	--
June	--	1.04×10^4	--	--
July	4.52×10^4	--	3610	--
August	5.02×10^4	--	--	--
September	2.76×10^4	--	2400	--
October	1.93×10^4	--	--	--
November	1.15×10^4	--	--	--
December	5.08×10^4	1.80×10^4	--	--
1990 Totals	26.14×10^4	15.82×10^4	8410	4527

Table 4 LGWO Procedures

NOTE

The * beside a document or a revision number indicates that that document is a draft only.

OPERATING MANUAL FOR THE PROCESS WASTE TREATMENT PLANT (BUILDING 3544) WM-LGWO-602

SYSTEM DESCRIPTIONS

WM-HRWO-602.1.1	BV Colleciton and PWTP Feed Systems
WM-HRWO-602.1.2	PWTP Precipitator/Clarifier System
WM-HRWO-602.1.3	PWTP Polishing Filters
WM-HRWO-602.1.4	PWTP IX and Regeneration Systems
WM-HRWO-602.1.5	PWTP Evap. System and Evap. Concentrate and Regen. Heel Transfer System
WM-HRWO-602.1.6	PWTP Acid Fume Scrubber
WM-HRWO-602.1.7	PWTP Cation-exchange Water Softener
WM-HRWO-602.1.8	PWTP Nitric Acid Storage and Transfer System
WM-HRWO-602.1.9	Bldg. 3518 Neutralization System
WM-HRWO-602.1.10	PWTP Routine Analytical Procedures and Operations
WM-HRWO-602.1.11	PWTP NaOH Storage and Transfer System
WM-HRWO-602.1.12	PWTP Sulfuric Acid Storage and Transfer System

PROCEDURES

WM-HRWO-602.2.1	BV Colleciton and PWTP Feed Systems
WM-HRWO-602.2.2	PWTP Precipitator/Clarifier System
WM-HRWO-602.2.3	PWTP Polishing Filters
WM-HRWO-602.2.4	PWTP IX and Regeneration Systems
WM-HRWO-602.2.5	PWTP Evap. System and Evap. Concentrate and Regen. Heel Transfer System
WM-HRWO-602.2.6	PWTP Acid Fume Scrubber
WM-HRWO-602.2.7	PWTP Cation-exchange Water Softener
WM-HRWO-602.2.8	PWTP Nitric Acid Storage and Transfer System
WM-HRWO-602.2.9	Bldg. 3518 Neutralization System
WM-HRWO-602.2.10	PWTP Routine Analytical Procedures and Operations
WM-HRWO-602.2.11	PWTP NaOH Storage and Transfer System
WM-HRWO-602.2.12	PWTP Sulfuric Acid Storage and Transfer System

(The following replace procedures WM-HRWO-602.2.1 through WM-HRWO-602.2.12)

WM-LGWO-602.2.1	3544 Feed System
WM-LGWO-602.2.2	Clarifier System
WM-LGWO-602.2.3	Polishing Filters
WM-LGWO-602.2.4	Ion Exchange System and L-5 Clearwell
WM-LGWO-602.2.5	Evaporation System and Transfers to the LLLW Evaporator Facility
WM-LGWO-602.2.6	Acid Fume Scrubber
WM-LGWO-602.2.7	Cation-exchange Water Softener
WM-LGWO-602.2.8	Nitric Acid Storage and Transfer System

Table 4 Continued.

WM-LGWO-602 Continued.

WM-LGWO-602.2.9	Building 3518 Acid Neutralization System
WM-LGWO-602.2.10	Analytical Procedures and Routine Operations
WM-LGWO-602.2.11	Sodium Hydroxide Storage and Transfer System
WM-LGWO-602.2.12	Sulfuric Acid Storage and Transfer System
WM-LGWO-602.3.1*	Radiation Monitors
WM-LGWO-602.5*	Maintenance Procedures

OPERATING PROCEDURES MANUAL FOR THE NONRADIOLOGICAL WASTEWATER TREATMENT FACILITY COLLECTION SYSTEM WM-LGWO-603

WM-LGWO-603.2.2.6	1505 Pumping Station, MH208 DB, and F-4005 Operation	
WM-LGWO-603.2.2.7	Manhole 190 Diversion Box and Pump Station	Rev. 1
WM-LGWO-603.2.2.8	3544 Wet Well	
WM-LGWO-603.2.2.9	Building 3518 Transfer to NRWTP	

OPERATING MANUAL FOR THE NONRADIOLOGICAL WASTEWATER TREATMENT PLANT WM-LGWO-604

SYSTEM DESCRIPTIONS

604.1.1	Caustic Storage and Feed Operations
604.1.2	Sulfuric Acid Storage and Feed Operations
604.1.3	Equalization Tanks
604.1.4	Clarifier
604.1.5	Filter Press
604.1.6	Dual-Media Filters
604.1.7	Air Stripper
604.1.8	Granular Activated Carbon Columns
604.1.9	Ellfuent Holding/Backwash Operation
604.1.10	Plant Sumps

Procedures

604.2.1	Caustic Storage and Feed Operations	Rev. 0, 1, 2*
604.2.2	Sulfuric Acid Storage and Feed Operations	Rev. 0, 1, 2*
604.2.3	Equalization Tanks and Transfer Pumps	Rev. 0, 1
604.2.4	Clarifier System	Rev. 0, 1, 2
604.2.5	Filter Press Operation	Rev. 0, 1, 2*
604.2.6	Dual-Media Filters	Rev. 0, 1
604.2.7	Air Stripper Operation	Rev. 0, 1, 2*
604.2.8	Granular Activated Carbon Columns	Rev. 0, 1, 2*
604.2.9	Effluent Holding/Backwash Operations	Rev. 0, 1, 2*
604.2.10	Plant Sumps	Rev. 0, 1
604.2.11	Analytical Procedures	Rev. 0, 1
604.3.1	Air System	
604.3.2	Process Water System	

Table 4 Continued.

WM-LGWO-604 Continued.

604.3.3	Electrical System	
604.3.4	Ventilation System	
604.3.5	Heat Tracing	
604.3.6	Sewage Lift Station	
604.4.1	Air System Failure	
604.4.2	Process Water System Failure	
604.4.3	Electrical System Failure	Rev. 0, 1*
604.4.4	Ventilation System Failure	
604.5	Maintenance Procedures	Rev. 0, 1
604.6	Record Management and System Documentation	Rev. 0, 1

OPERATING PROCEDURES FOR THE EQUIPMENT CLEANING FACILITY AT BUILDING 7935 WM-LGWO-605

WM-HRWO-605.2	Operating Procedures for the Equipment Cleaning Facility at Building 7935 Rev. 1

LIQUID AND GASEOUS WASTE OPERATIONS DEPARTMENT-WIDE PROCEDURE MANUAL WM-LGWO-606

WM-LGWO-606.1	Logbook Entry Procedure
WM-LGWO-606.2	Shift Turnover Procedure
WM-LGWO-606.3	General Sampling Procedure

OPERATING MANUAL FOR THE PROCESS WASTE SYSTEM - MISCELLANEOUS PROCEDURES WM-LGWO-607

WM-LGWO-607.1	Process Waste Tanker

LIQUID LOW-LEVEL WASTE MANUAL MISCELLANEOUS PROCEDURES WM-LGWO-608

WM-HRWO-608.1	Air System for Melton Valley Storage Tanks In-tank Evaporation System
WM-LGWO-608.1	Air System for Melton Valley Storage Tanks In-tank Evaporation System
WM-LGWO-608.2	Liquid Low-level Waste Dumpster Tank Operating Procedure
WM-LGWO-608.3	LLLW 1,000-gallon Tanker Transporting and Draining Operating Procedure
WM-LGWO-608.4	LLLW 1,000-gallon Tanker Filling Operating Procedure
WM-LGWO-608.5	Bottled Liquid Low-Level Waste Pickup and Transport
WM-LGWO-608.6	Disposal of Bottled Liquid Low-Level Waste
WM-LGWO-608.7.1	General Sampling Procedures for LLLW Tanks

Table 4 Continued.

OPERATING MANUAL FOR THE WASTE OPERATIONS CONTROL CENTER WM-LGWO-609

SYSTEM DESCRIPTION

609.1.1*	WOCC System Description
609.1.2*	WOCC DAS System Description
609.1.3*	Concentrator System Description

PROCEDURES

609.2.1	WOCC Operator Duties Rev. 0, 1, 2*
609.2.2	WOCC DAS Operating Procedures
609.5*	Maintenance Procedures
609.6*	Record Management and System Documentation

OPERATING MANUAL FOR THE LIQUID LOW-LEVEL AND PROCESS WASTE COLLECTION AND TRANSFER SYSTEMS WM-LGWO-610

WM-LGWO-610.2.1	Bethel Valley LLLW System	Rev. 0, 1*
WM-LGWO-610.2.2	Bethel Valley Process Waste System	
WM-LGWO-610.2.3	Melton Valley LLLW System	
WM-LGWO-610.2.4*	Melton Valley Storage Tank Facility	
WM-LGWO-610.2.5	Melton Valley Process Waste System	
WM-LGWO-610.3.1*	Melton Valley Ventilation Systems	
WM-LGWO-610.3.2	Radiation Monitors	
WM-LGWO-610.6*	Record Management and System Documentation	

OPERATING MANUAL FOR THE LIQUID LOW-LEVEL WASTE EVAPORATOR FACILITY WM-LGWO-611

SYSTEM DESCRIPTION

WM-LGWO-611.1	Evaporator Facility System Description

PROCEDURES

WM-LGWO-611.2.1*	Transfers from collection header to tanks W-21, -22, -23, and C-1, -2
WM-LGWO-611.2.2*	Transfers from tanks W-21, -22, -23, to tanks C-1, -2
WM-LGWO-611.2.3*	Transfers from tanks C-1/C-2
WM-LGWO-611.2.5*	Evaporator Facility Operation
WM-LGWO-611.2.6*	Transfers to the MVST Facility
WM-LGWO-611.3.1*	Cell Ventilation
WM-LGWO-611.3.2*	Radiation Monitors

Table 4 Continued.

Operating Manual for the 3039 Stack Ventilation System

WM-LGWO-612.2.1*	ORR Cell Ventilation System Operation
WM-LGWO-612.2.2*	3500 Cell Ventilation System Operation
WM-LGWO-612.2.3*	4500 Cell Ventilation System Operation
WM-LGWO-612.2.4*	3025/3026 Cell Ventilation System Operation
WM-LGWO-612.2.5*	Isotope Area Cell Ventilation System Operation
WM-LGWO-612.3.1*	Diesel Generator Operation

Table 5. LLLW generation.

Bldg./Area Served	Tank	1986 Avg. (Gal/week)	1987 Avg. (Gal/week)	1988 Avg. (Gal/week)	1989 Avg. (Gal/week)	1990 Avg. (Gal/week)
Isotopes Area	WC-10	906	342	376	244	134
3039 Stack	W-22	805	818	778	852	813
Reactors	WC-19	1281	831	329	548	560
Abandoned	W-1A	400	232	295	935	897
2026	2026	31	33	21	21	23
4500 Complex	WC-11	863	204	141	203	68
4500 Complex	WC-12	63	49	42	26	25
4500 Complex	WC-13	212	235	153	51	45
4500 Complex	WC-14	45	34	36	17	16
3517	W-12,W-22	1441	487	709	306	226
Pump Pit	WC-8	87	80	126	315	271
WC-5 Pump Pit	WC-9	35	109	83	88	200
3508	WC-5,WC-6	44	31	39	63	78
3525	W-12	872	422	558	439	395
3544 Concentrate	W-21	226	86	87	69	64
3544 Feed	W-22	485	115	165	112	72
7920	WC-20	370	268	388	236	246
HFIR	HFIR	1238	617	687	711	1419
3028	WC-2	5	20	21	13	8
3504	WC-7	95	14	7	26	11
3026-D	W-16	246	152	91	31	10
3026-C	W-17,W-18	534	375	413	685	605
3019	W-22	469	499	200	23	23
3025	WC-3	NA	89	5	13	0
3074	TRUCK	NA	NA	76	26	24

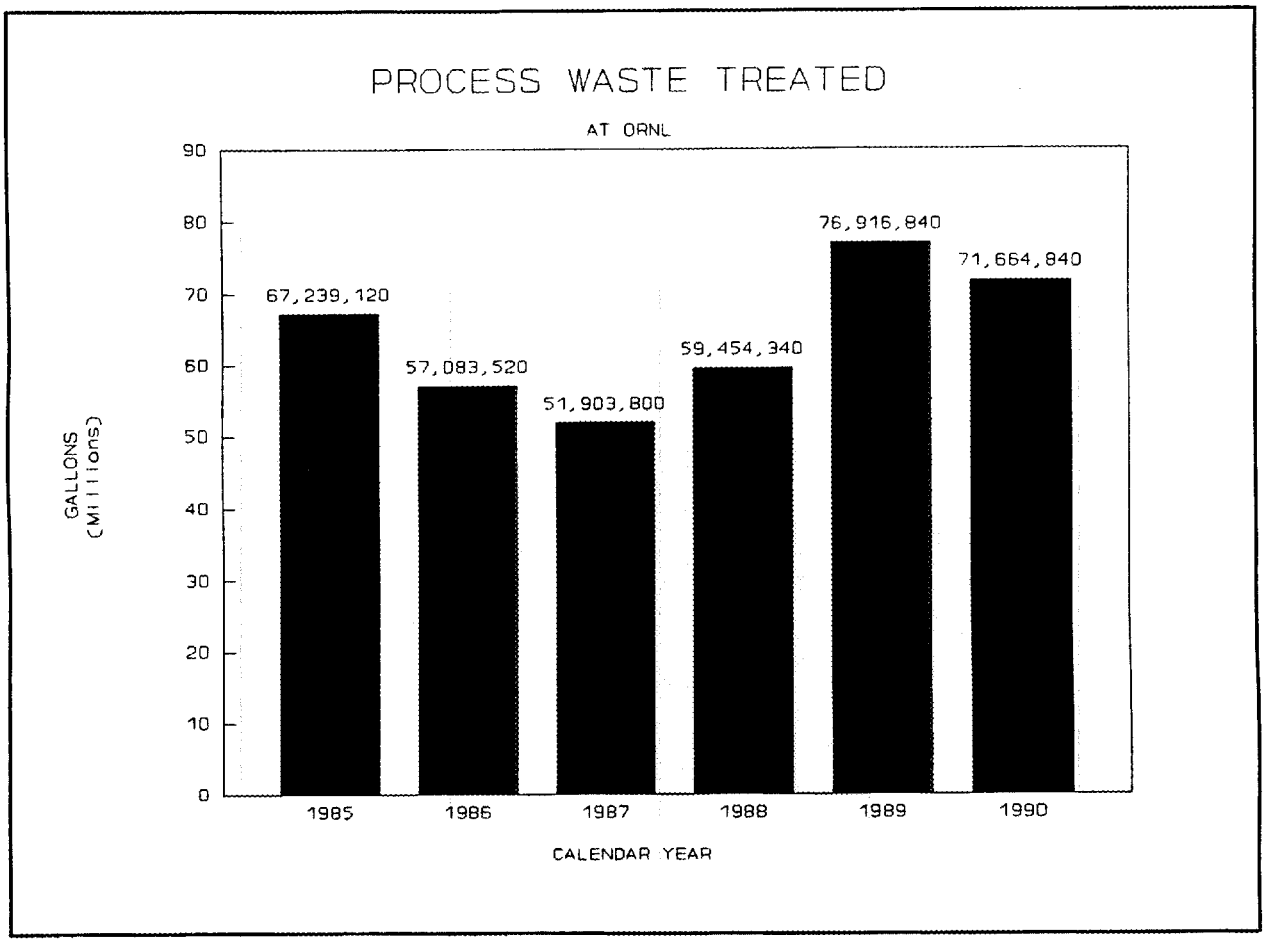

Figure 1. Process waste treated at ORNL. (ORNL-DWG. 91-7674)

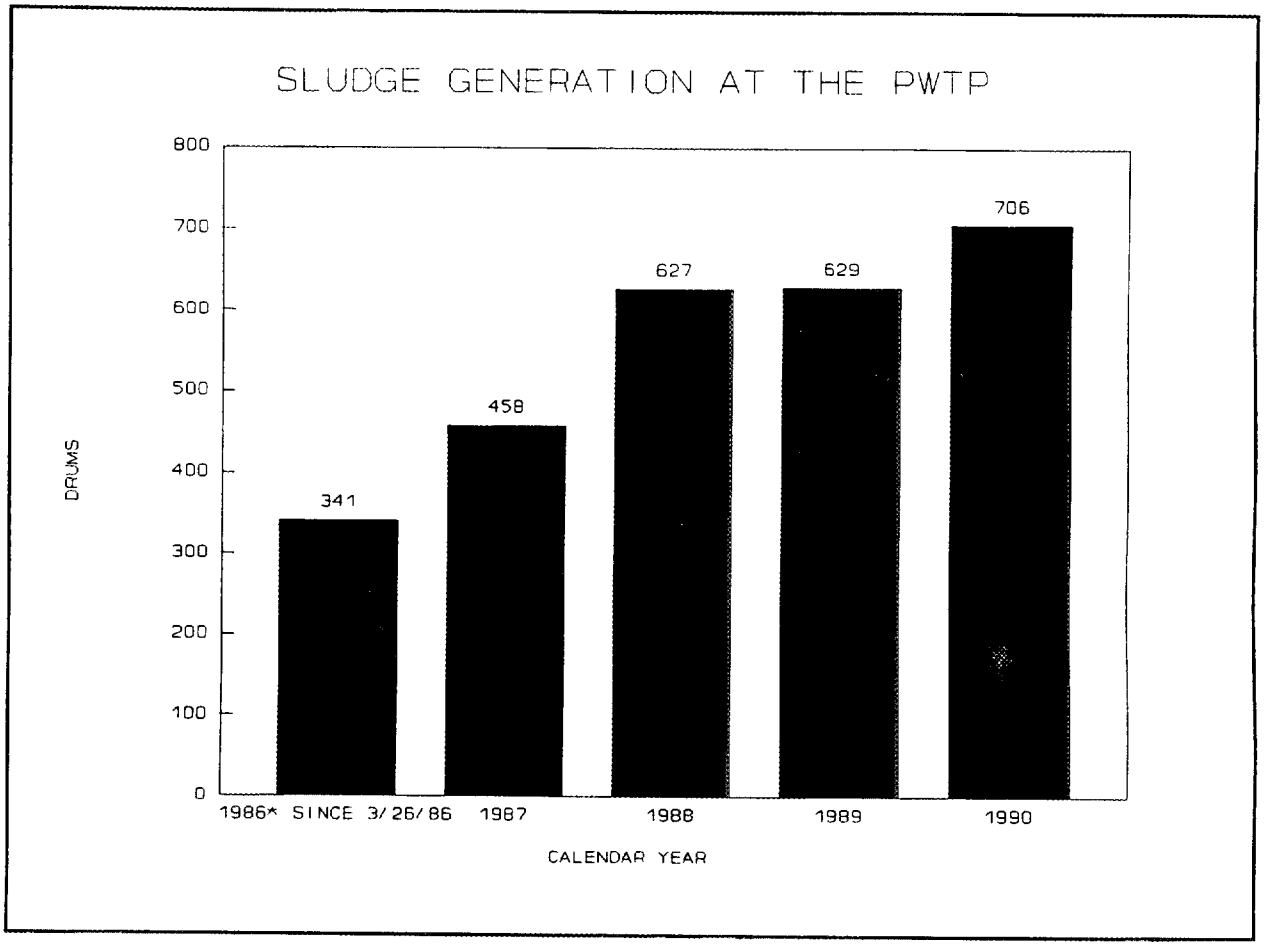

Figure 2. Sludge generation at the PWTP. (ORNL-DWG. 91-7675)

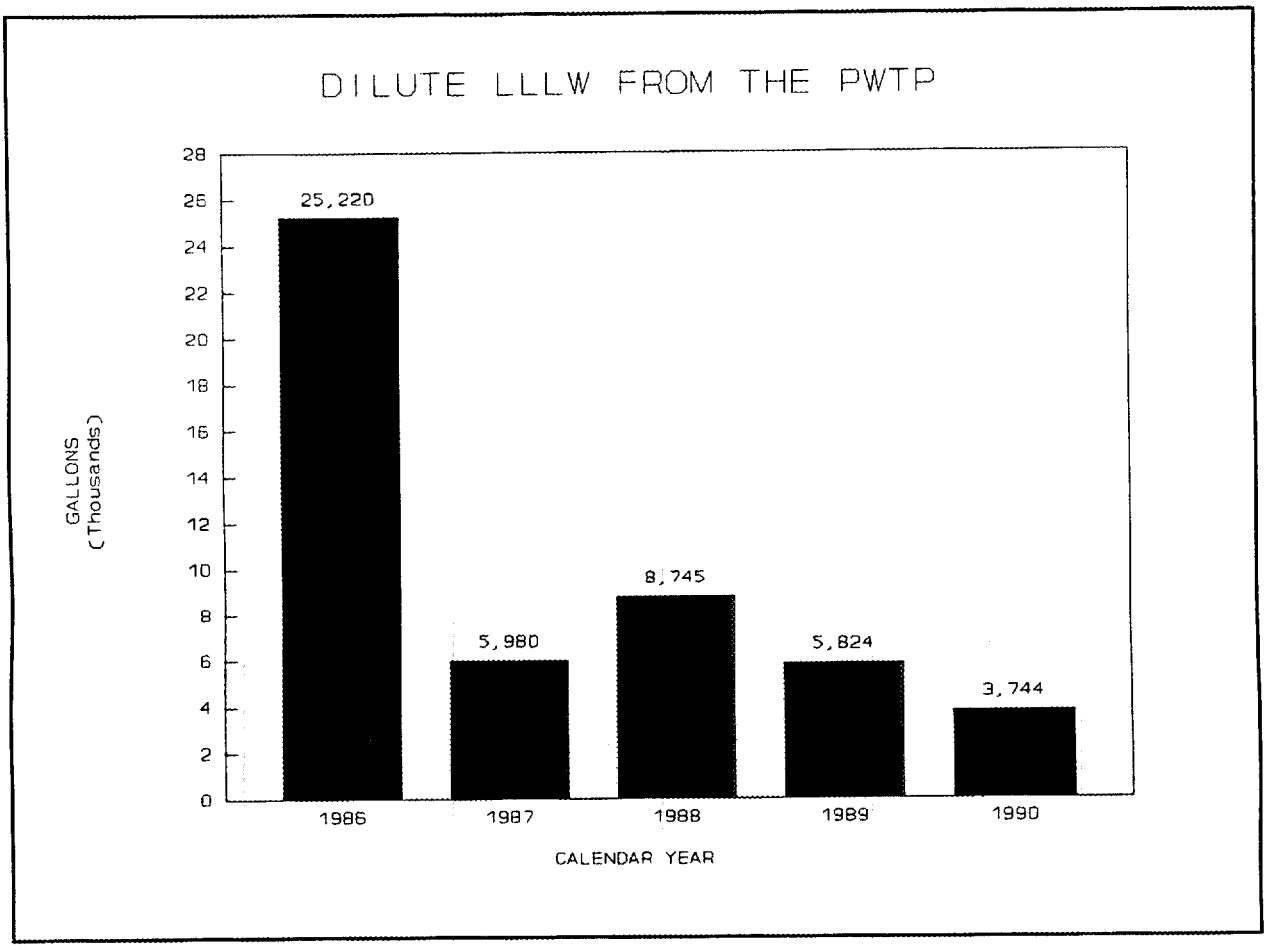

Figure 3. Dilute LLLW from the PWTP. (ORNL-DWG. 91-7676)

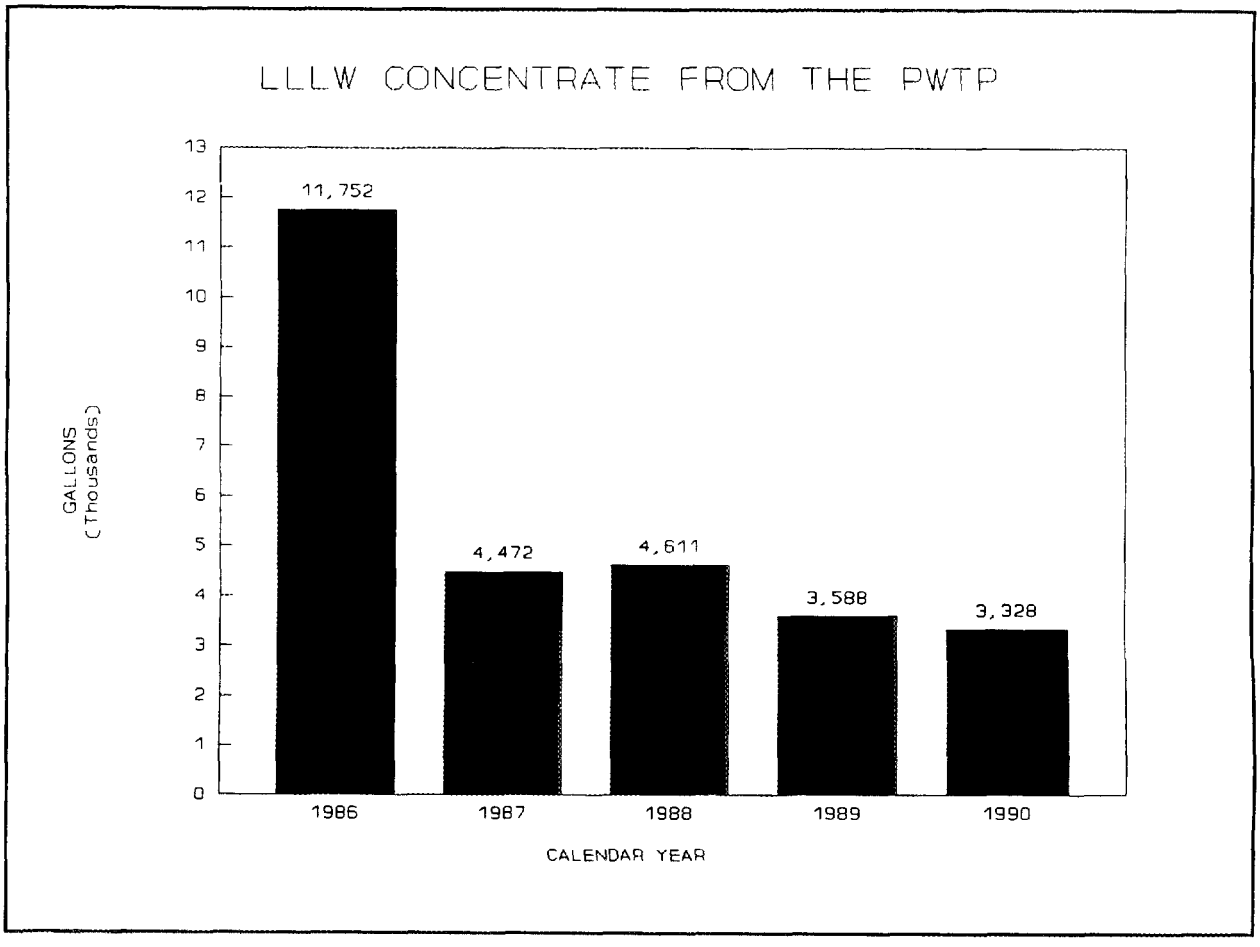

Figure 4. LLLW concentrate from the PWTP. (ORNL-DWG. 91-7677)

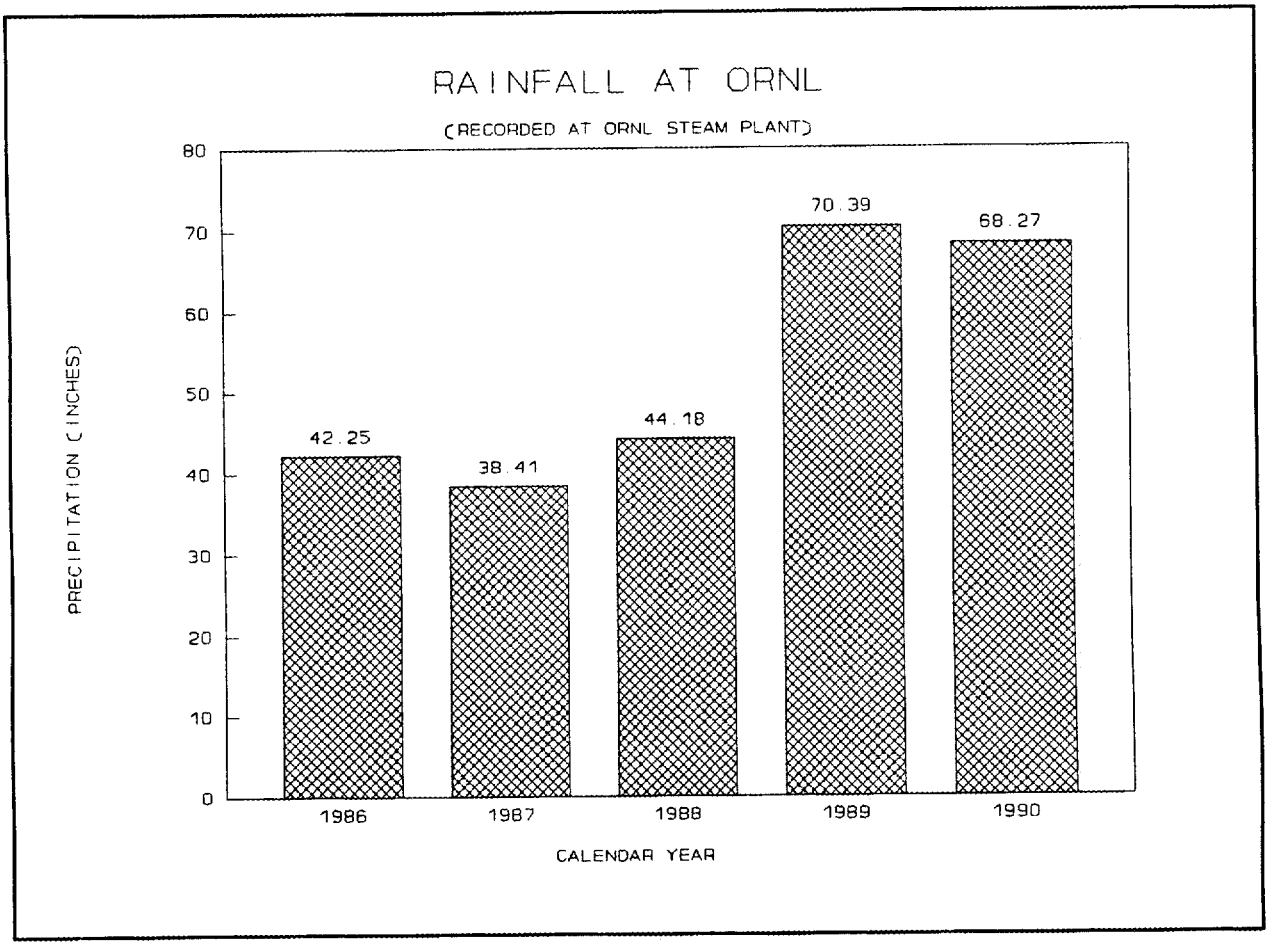

Figure 5. Rainfall at ORNL. (ORNL-DWG. 91-7678)

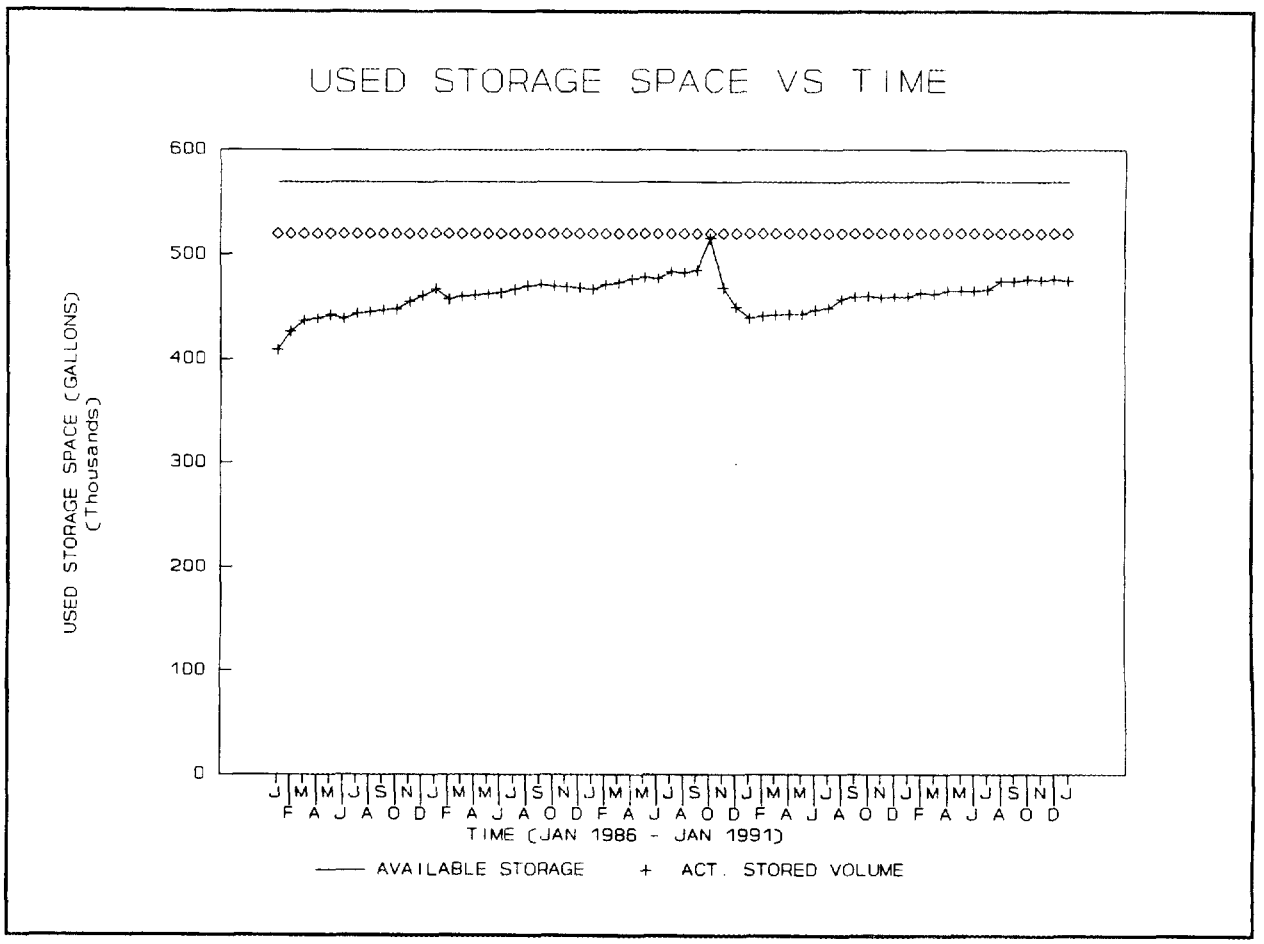

Figure 6. Used storage space versus time. (ORNL-DWG. 91-7679)

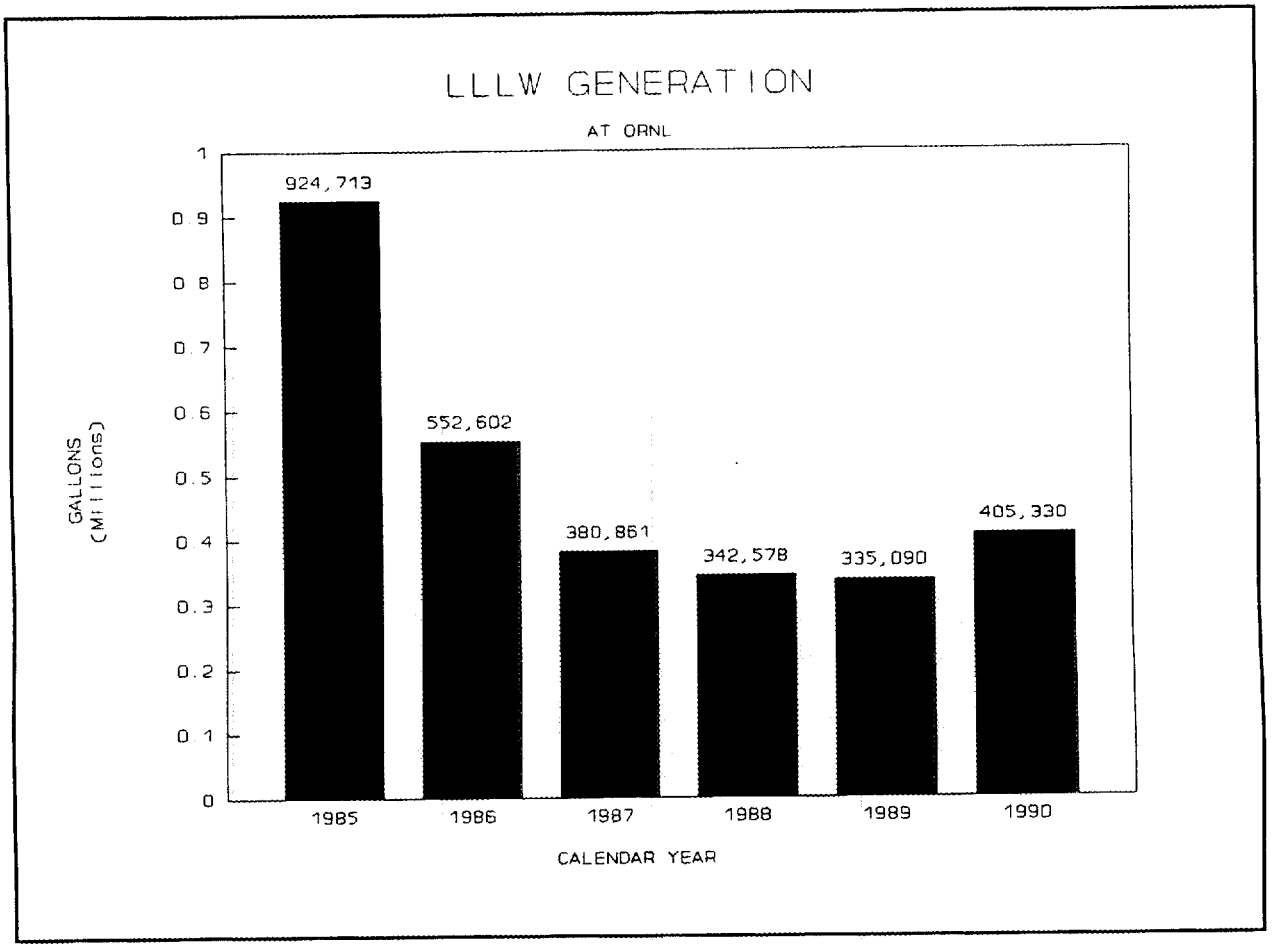

Figure 7. LLLW generation at ORNL. (ORNL-DWG. 91-7680)

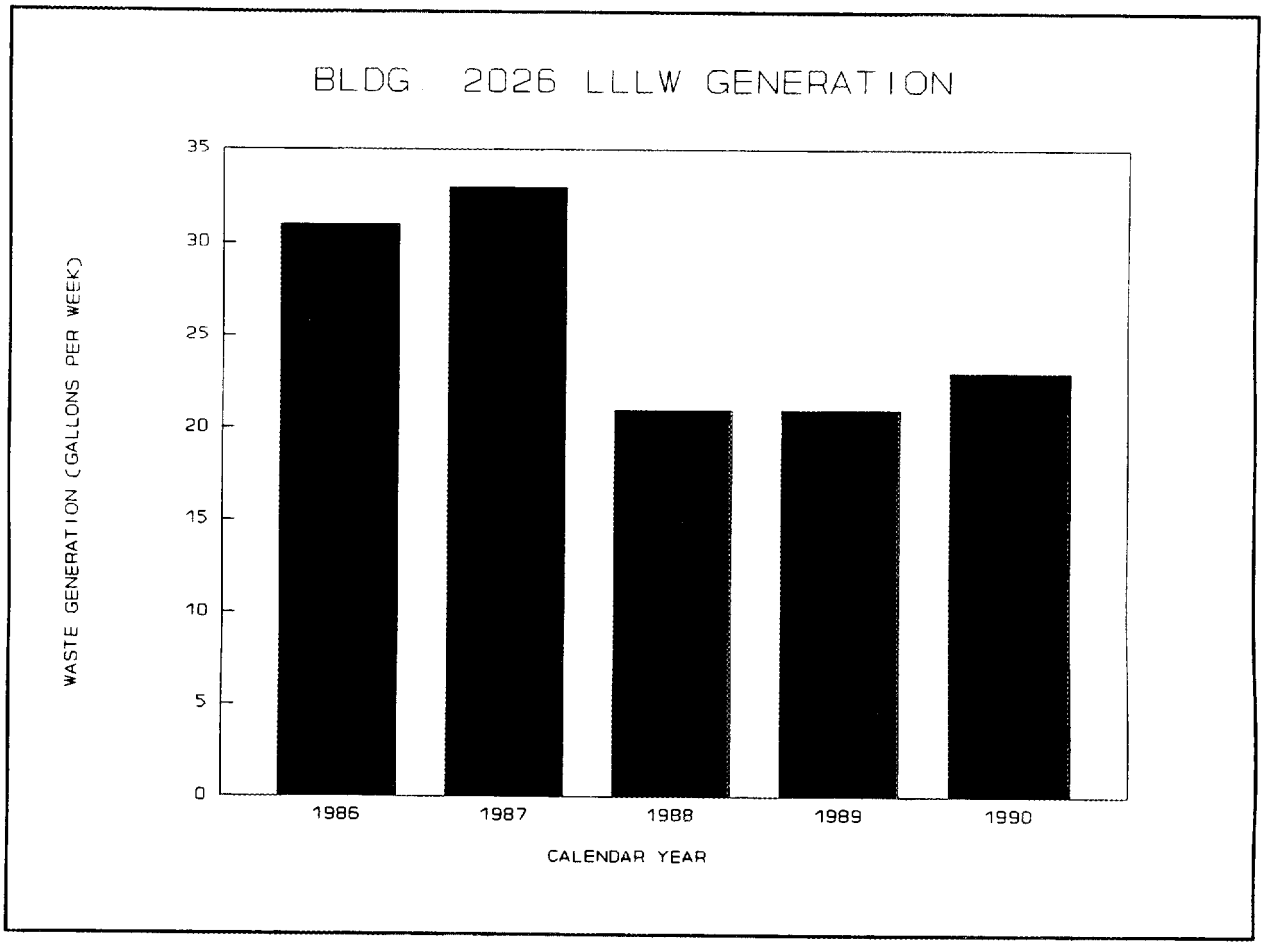

Figure 8. Building 2026 LLLW generation. (ORNL-DWG. 91-7681)

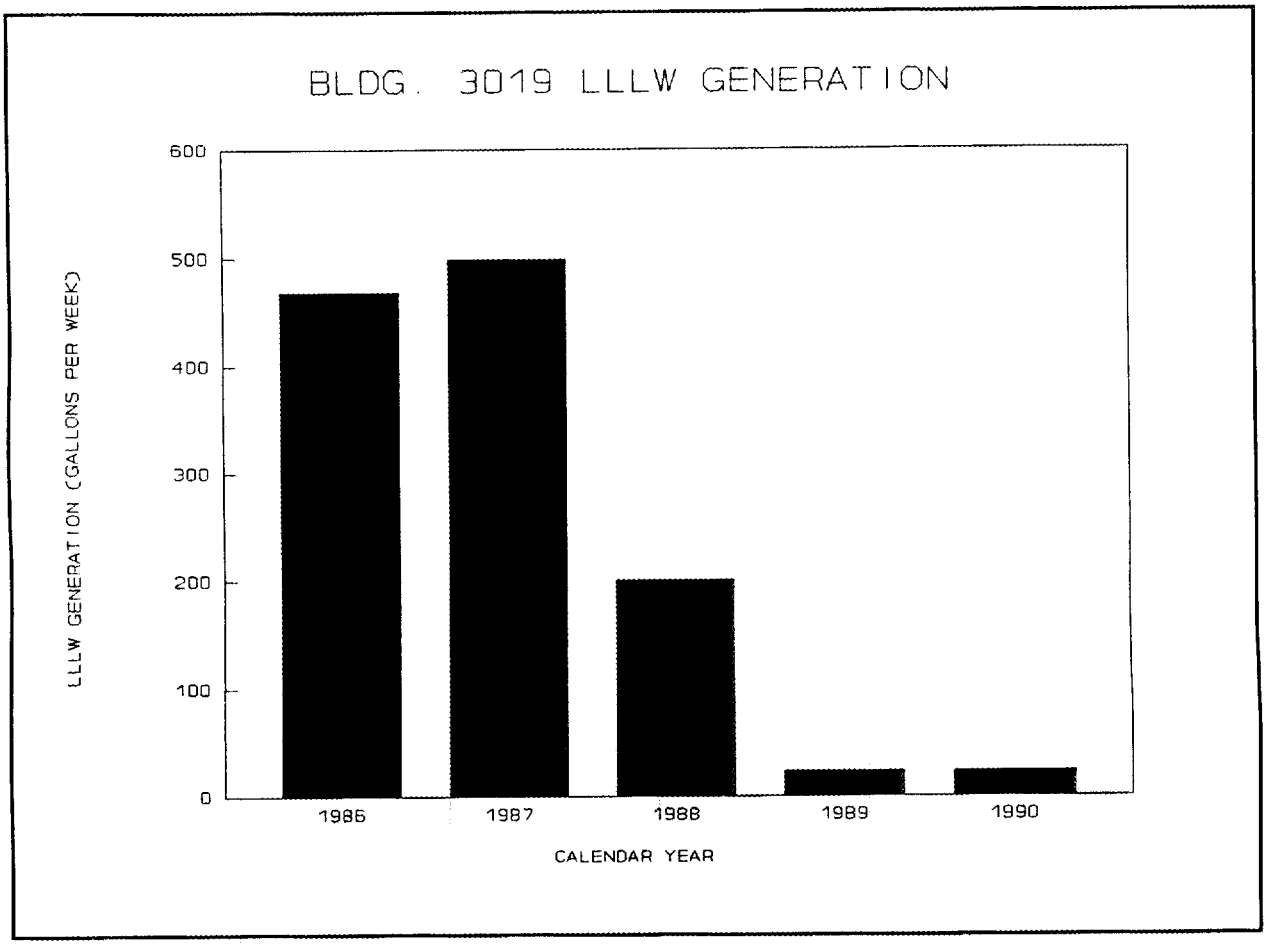

Figure 9. Building 3019 LLLW generation. (ORNL-DWG. 91-7682)

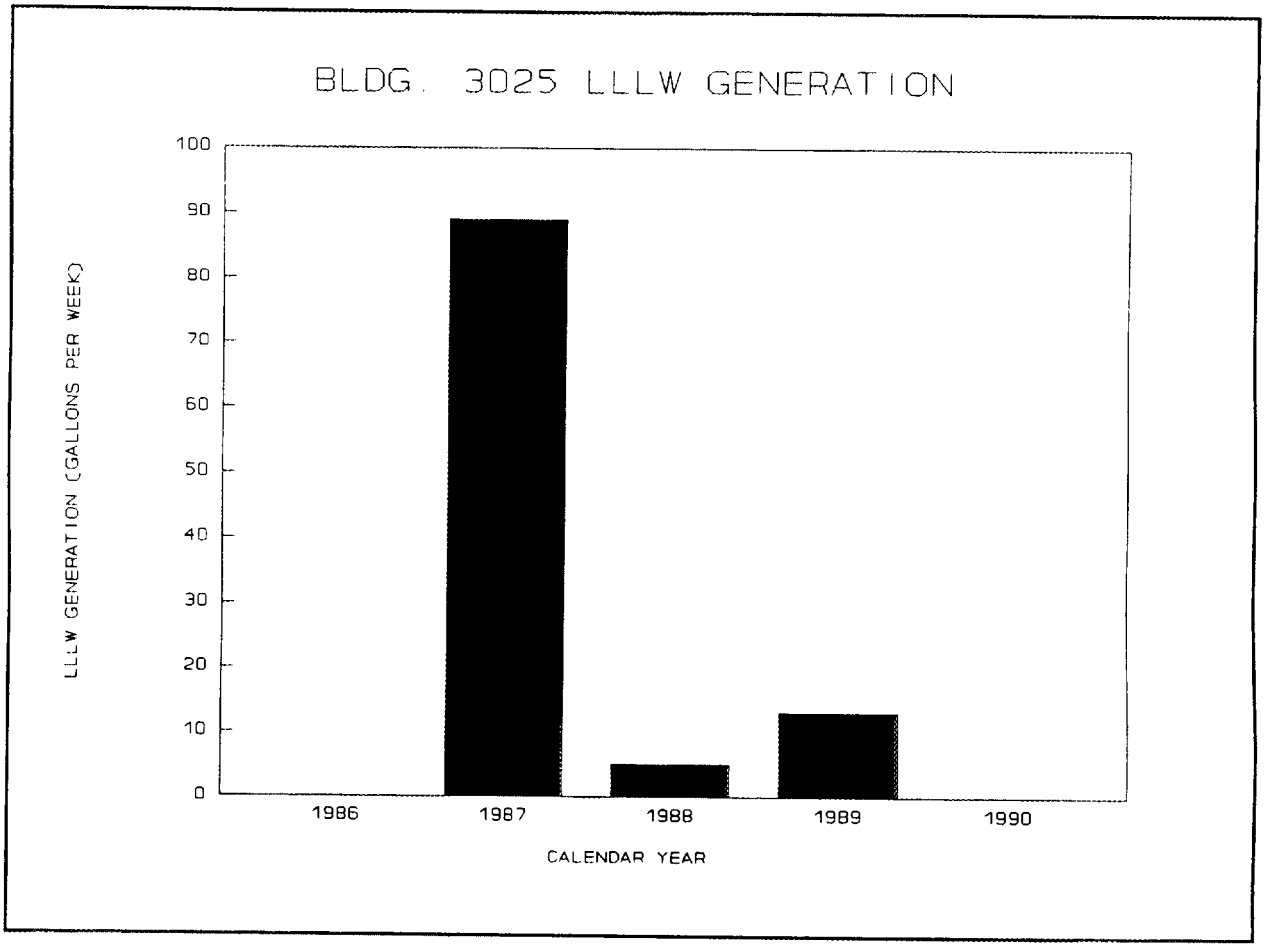

Figure 10. Building 3025 LLLW generation. (ORNL-DWG. 91-7683)

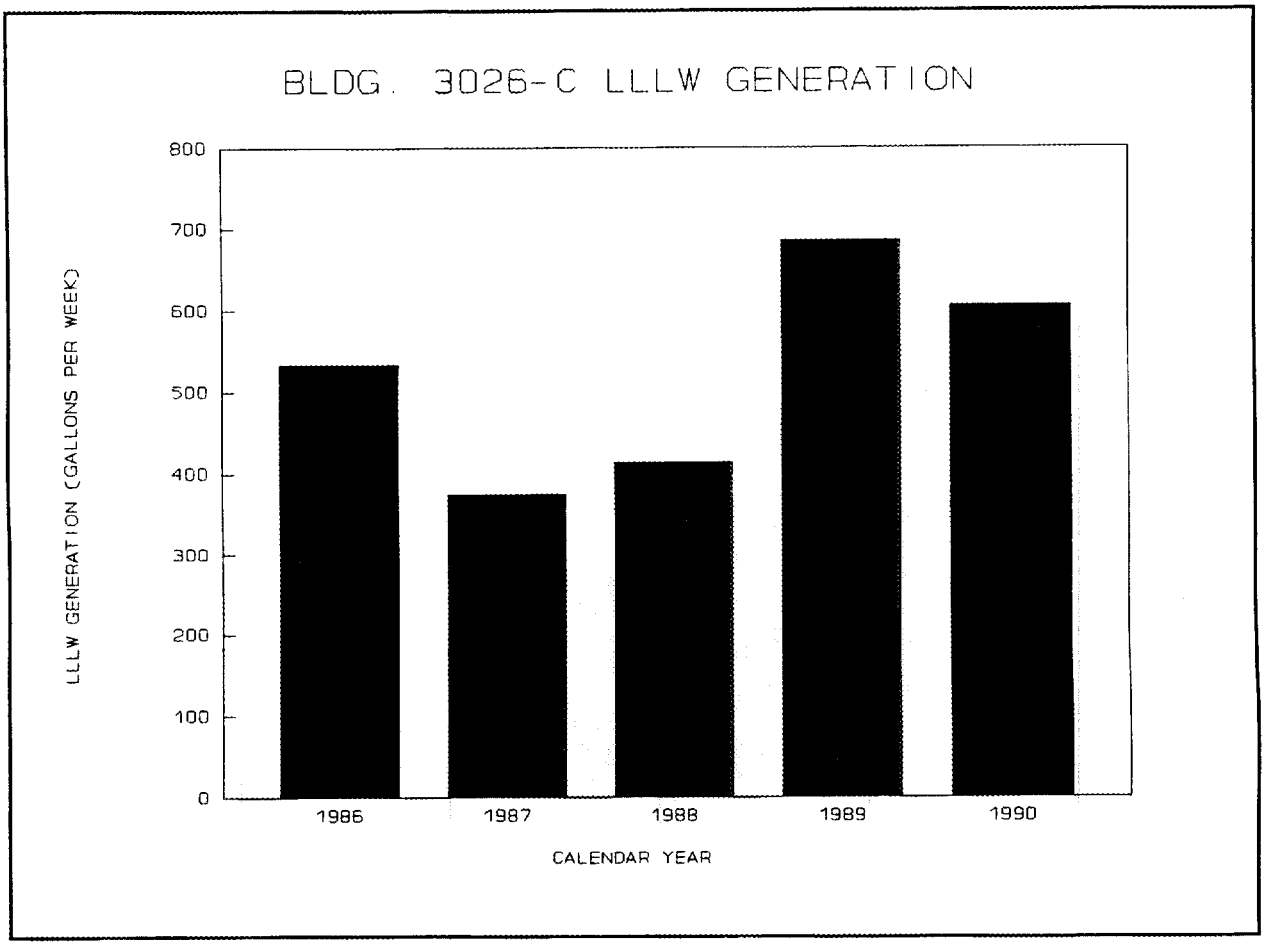

Figure 11. Building 3026-C LLLW generation. (ORNL-DWG. 91-7684)

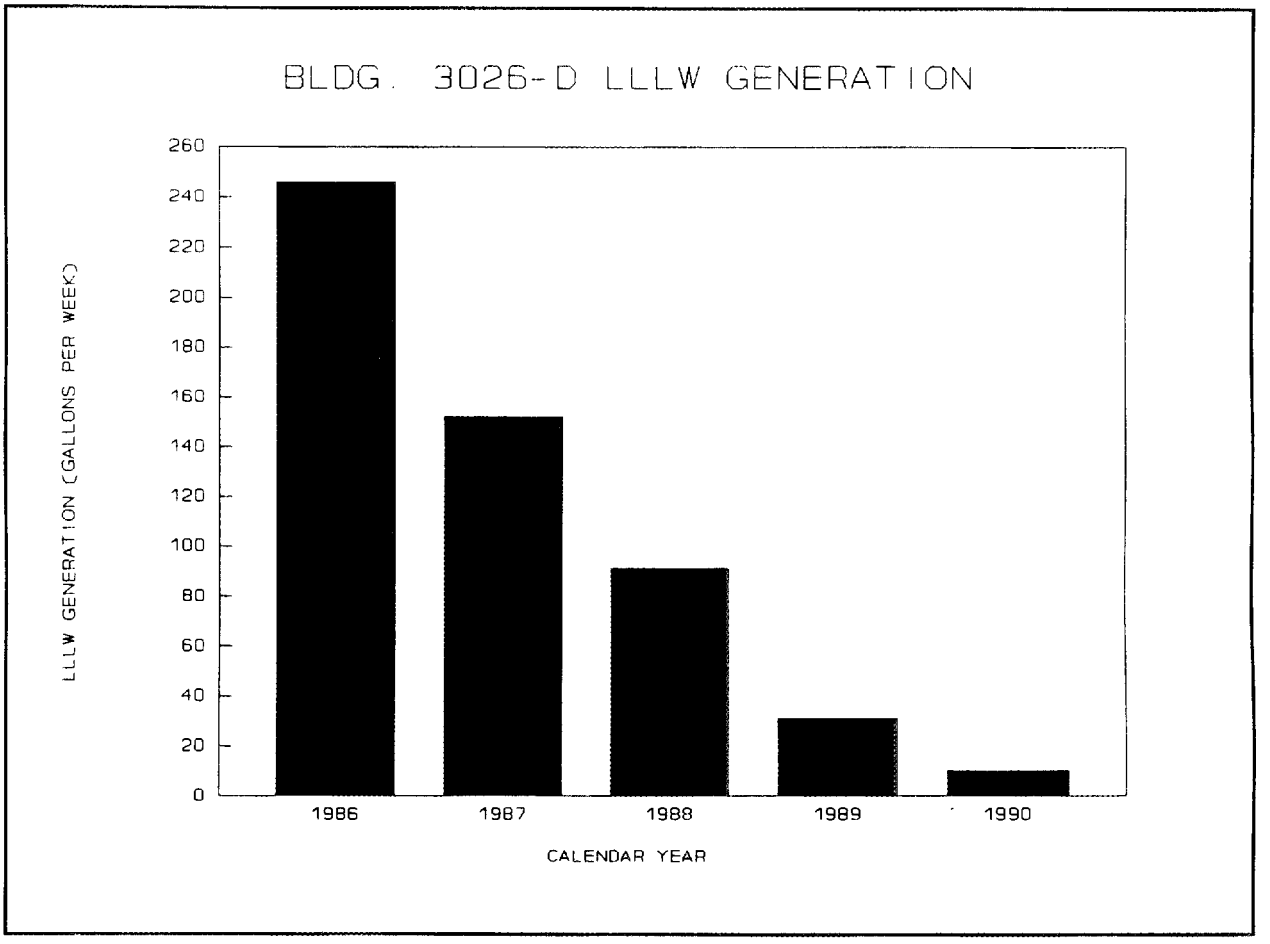

Figure 12. Building 3026-D LLLW generation. (ORNL-DWG. 91-7685)

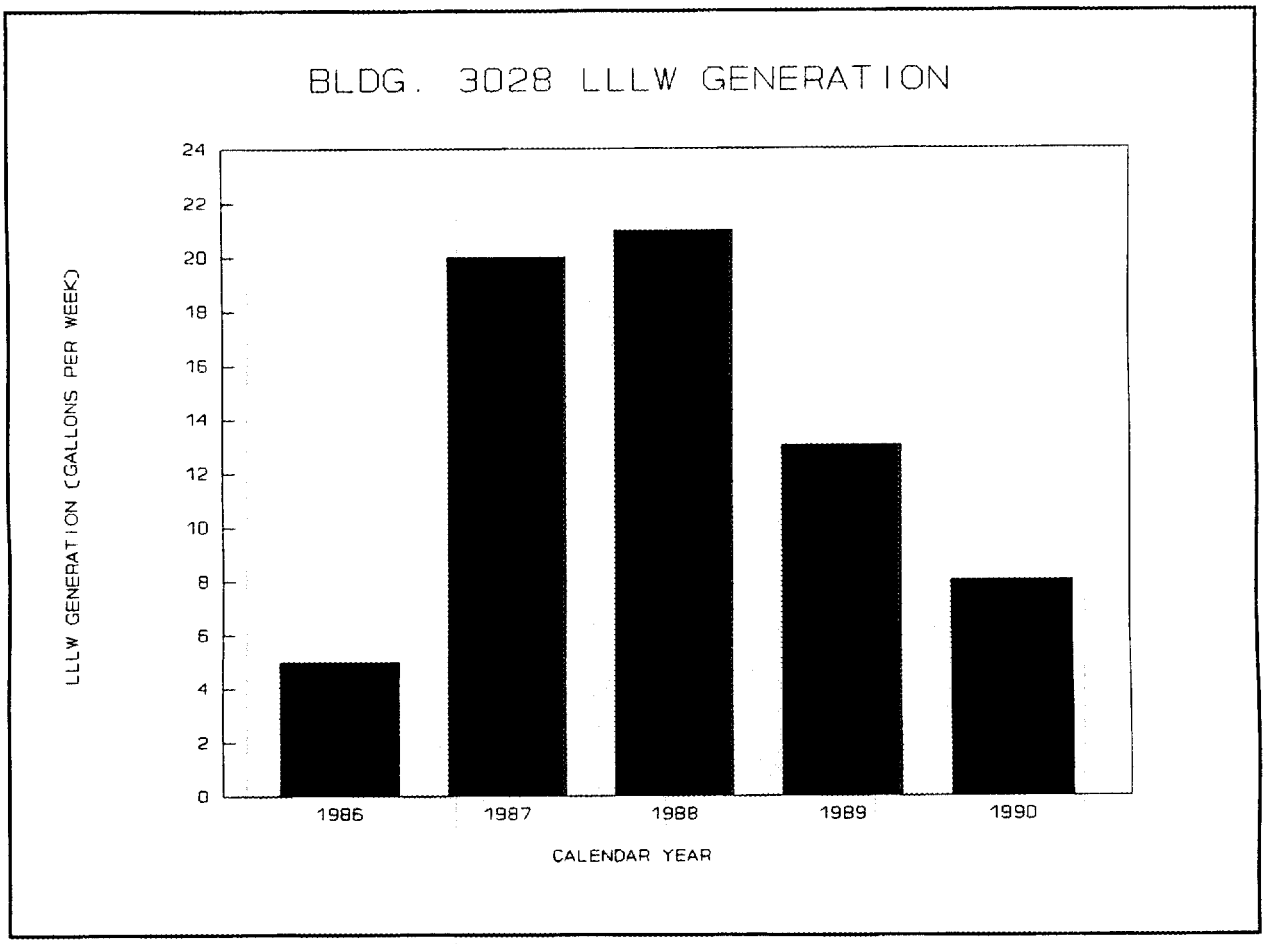

Figure 13. Building 3028 LLLW generation. (ORNL-DWG. 91-7686)

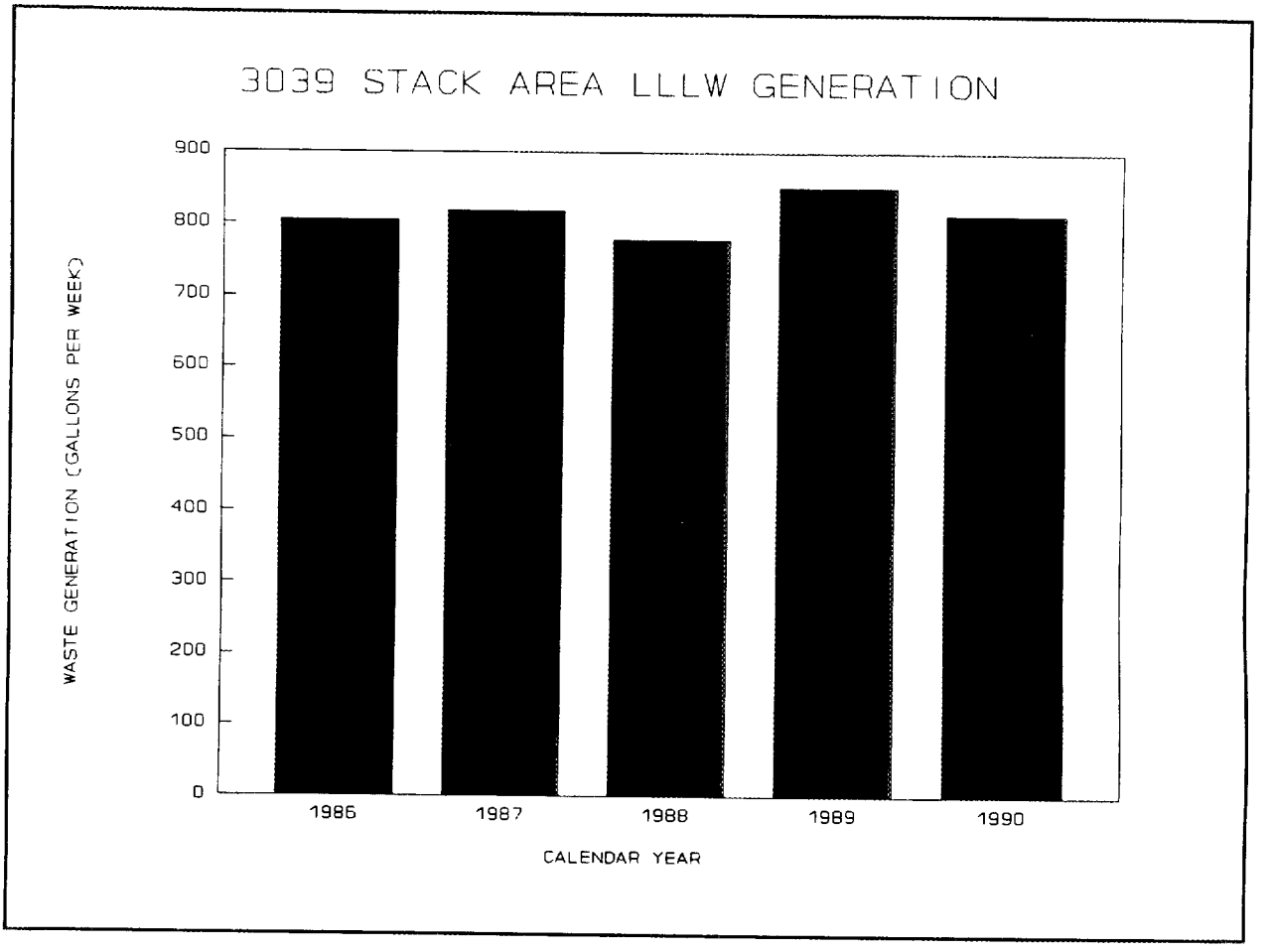

Figure 14. 3039 Stack Area LLLW generation. (ORNL-DWG. 91-7687)

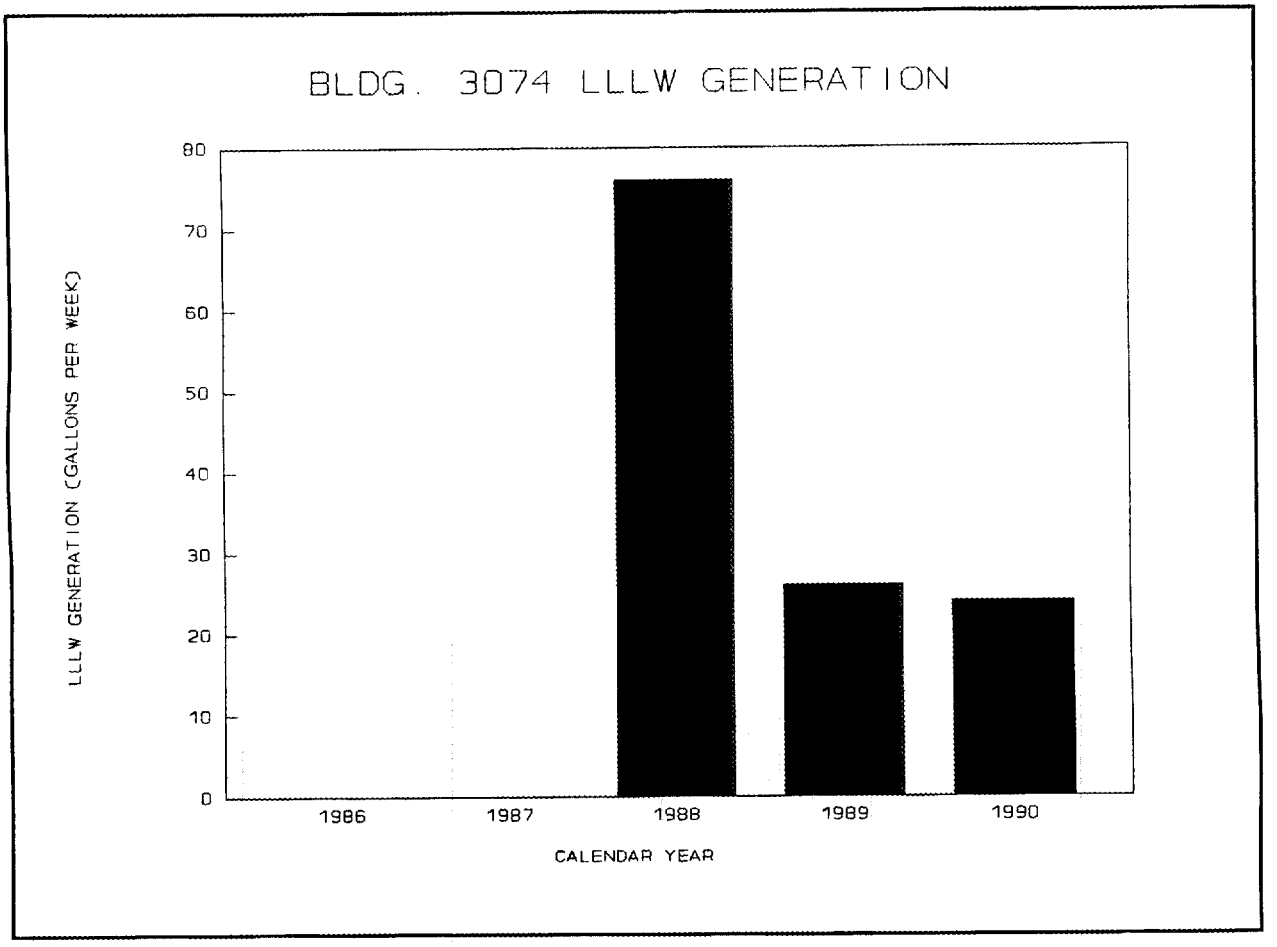

Figure 15. Building 3074 LLLW generation. (ORNL-DWG. 91-7688)

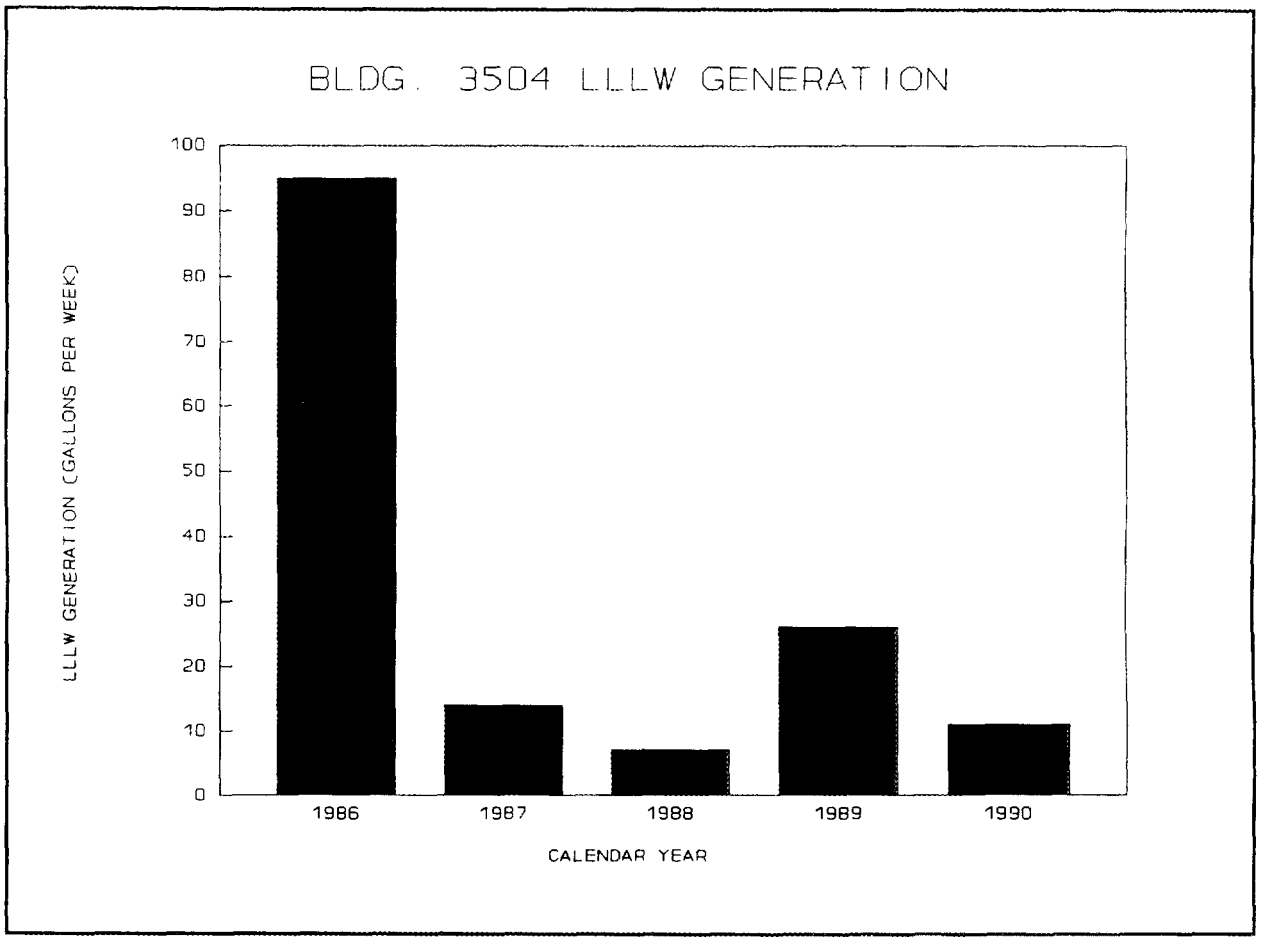

Figure 16. Building 3504 LLLW generation. (ORNL-DWG. 91-7689)

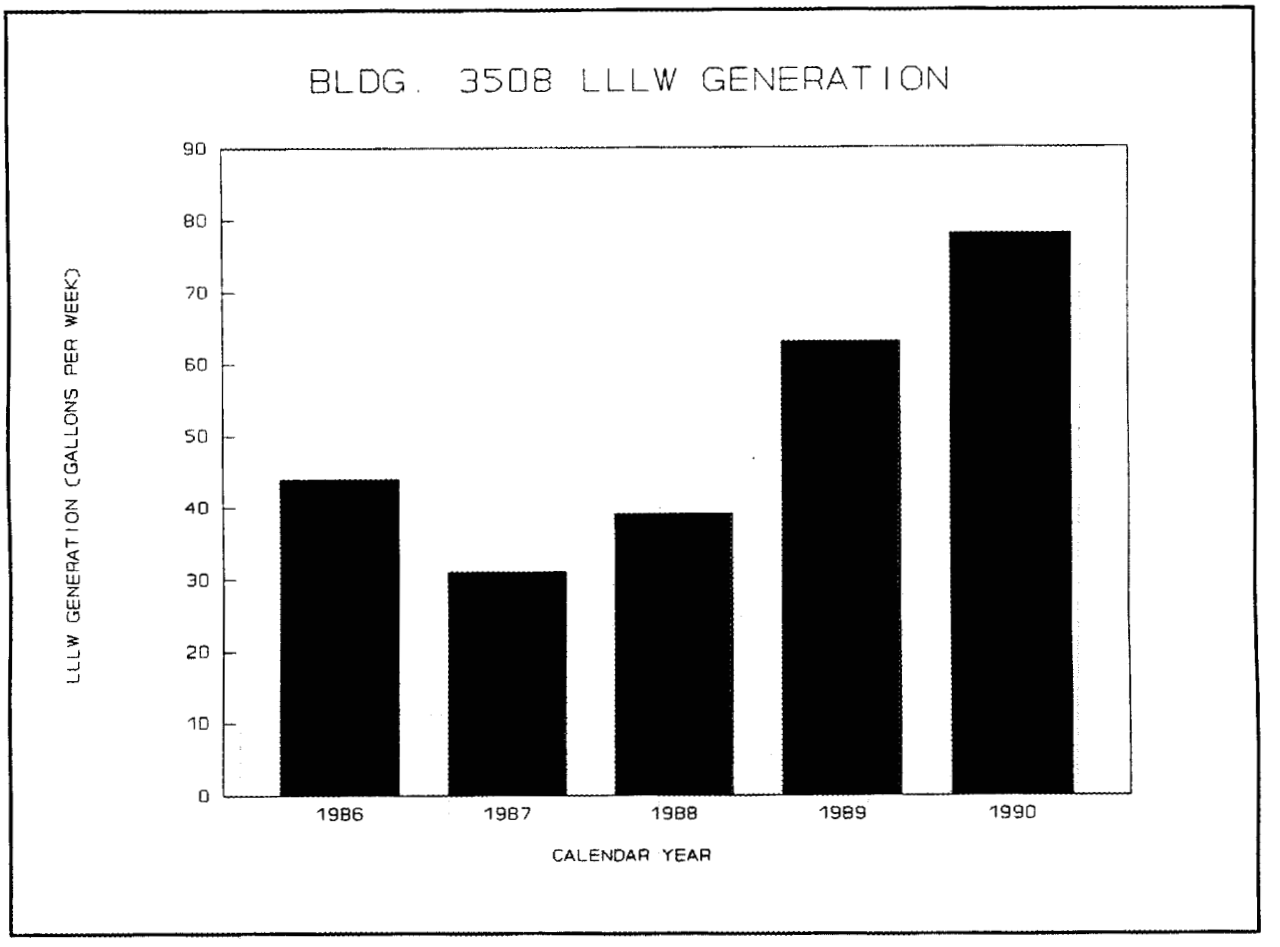

Figure 17. Building 3508 LLLW generation. (ORNL-DWG. 91-7690)

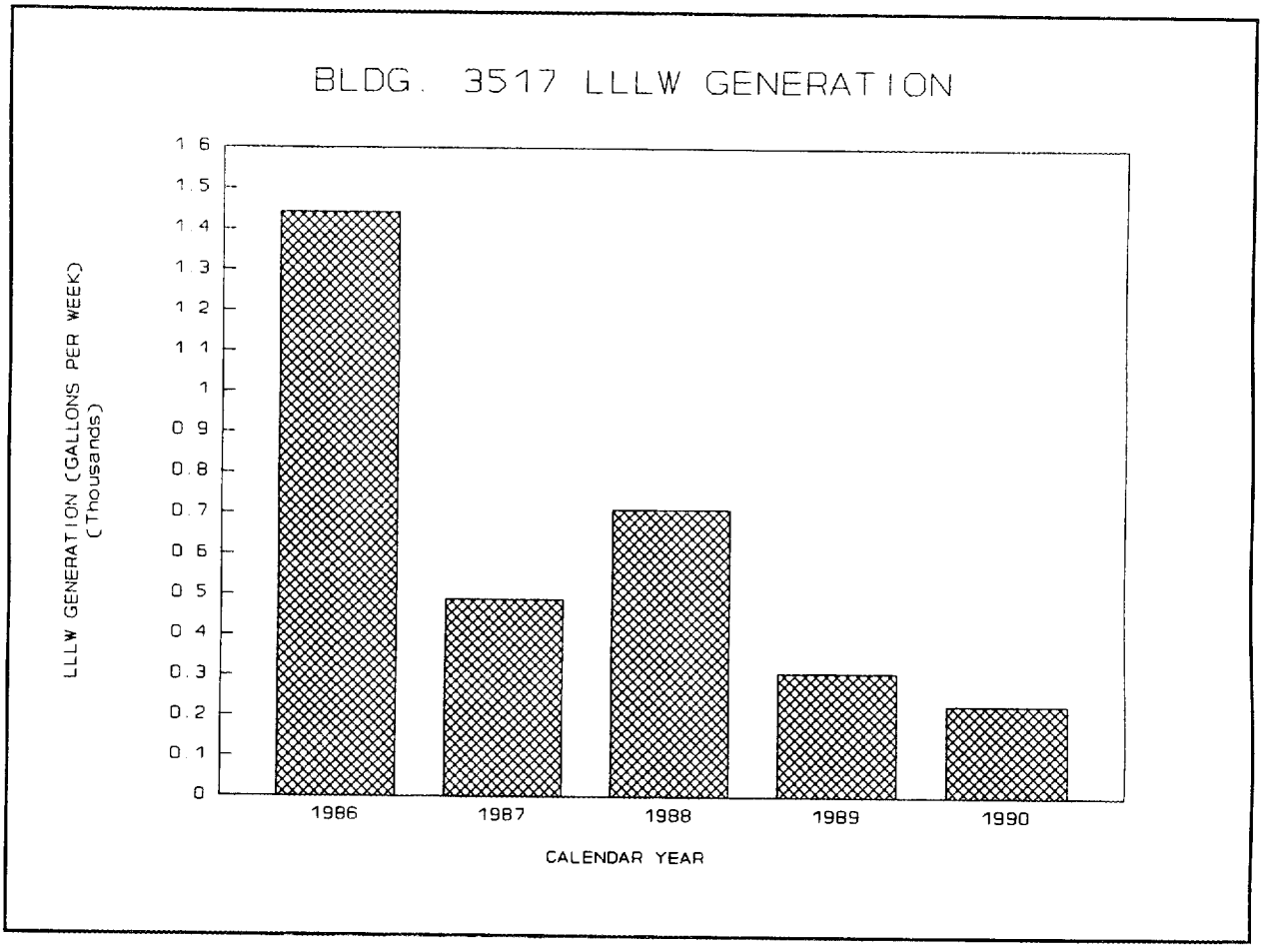

Figure 18. Building 3517 LLLW generation. (ORNL-DWG. 91-7691)

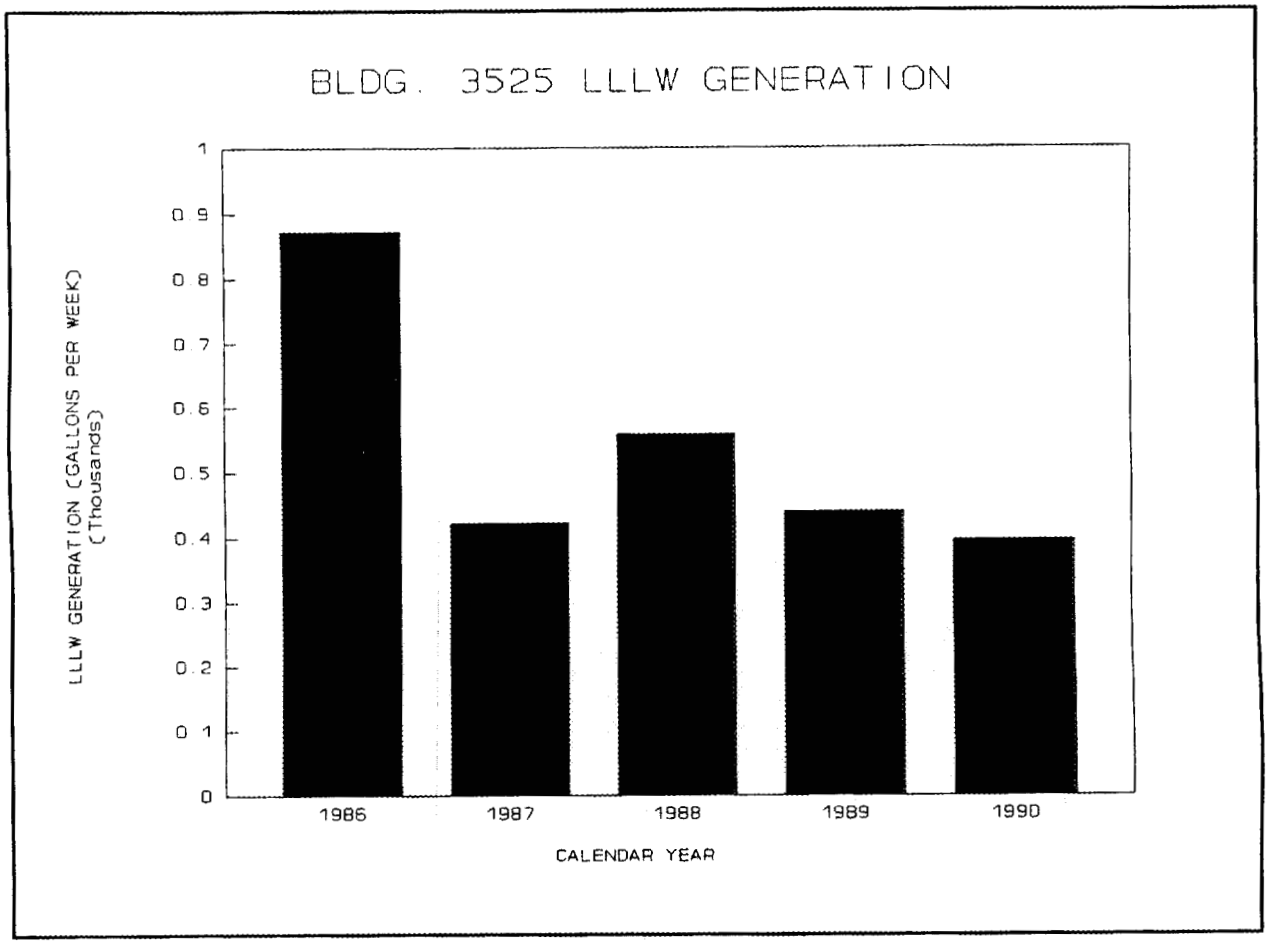

Figure 19. Building 3525 LLLW generation. (ORNL-DWG. 91-7692)

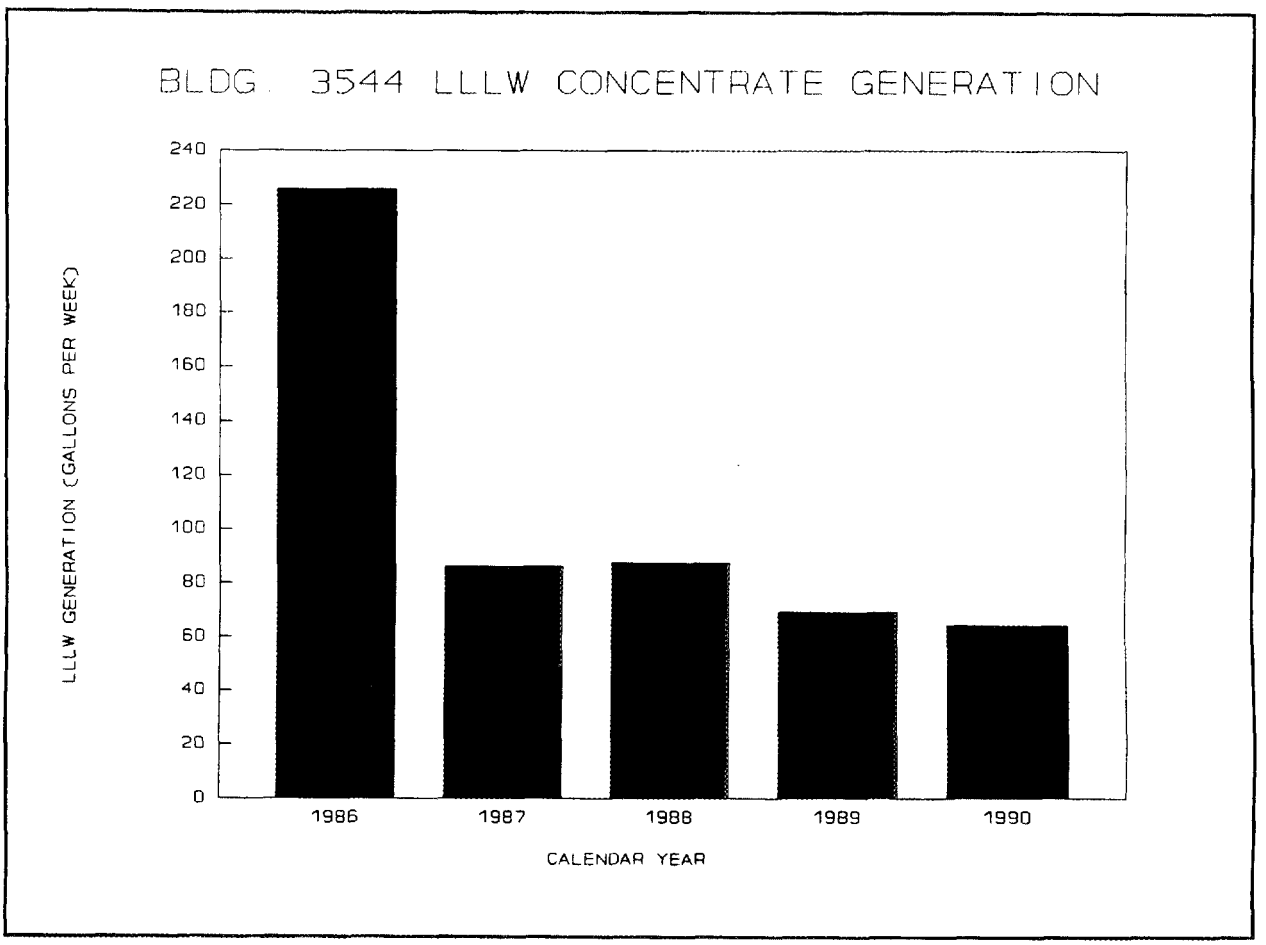

Figure 20. Building 3544 LLLW concentrate generation. (ORNL-DWG. 91-7693)

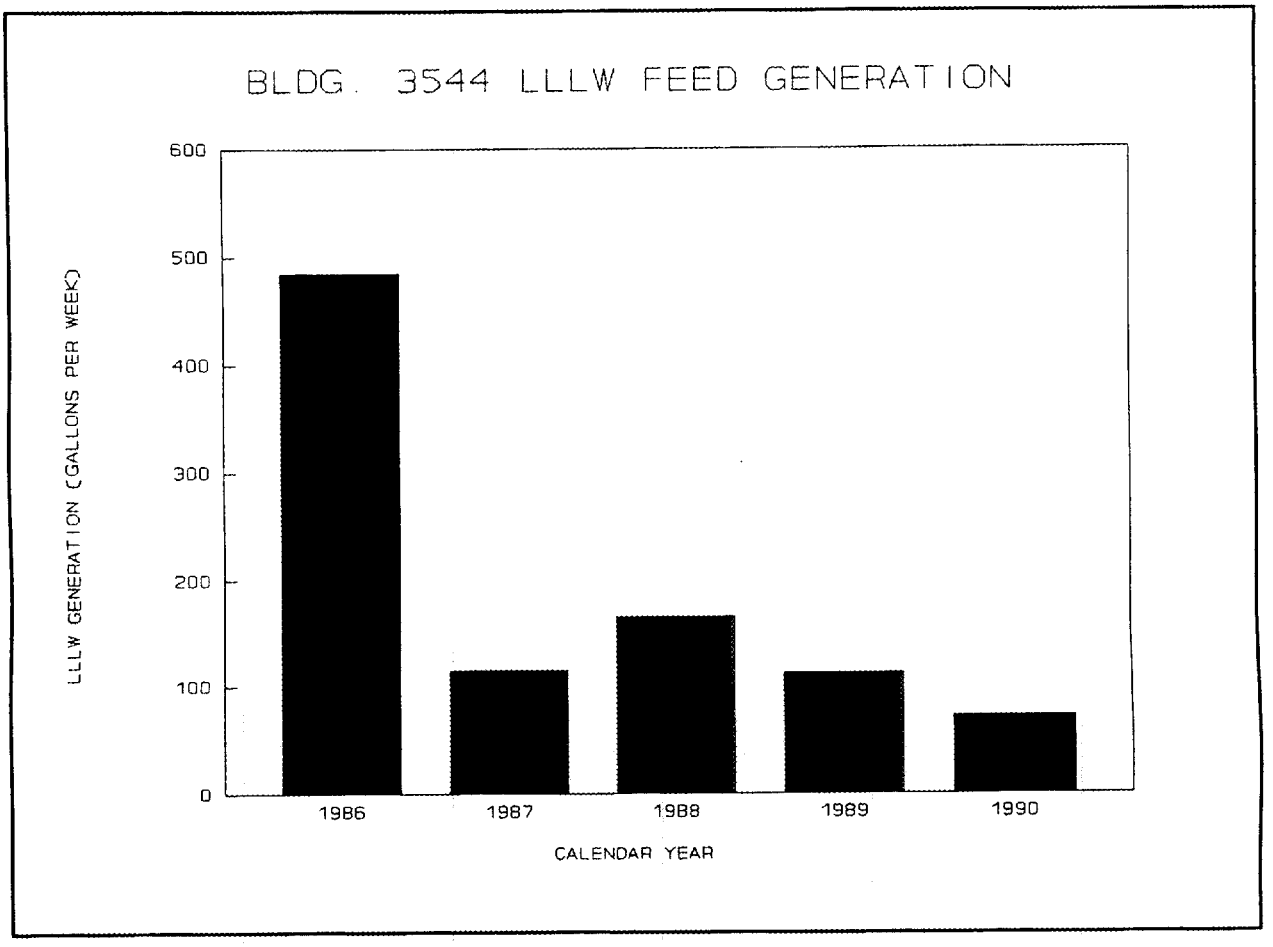

Figure 21. Building 3544 LLLW feed generation. (ORNL-DWG. 91-7694)

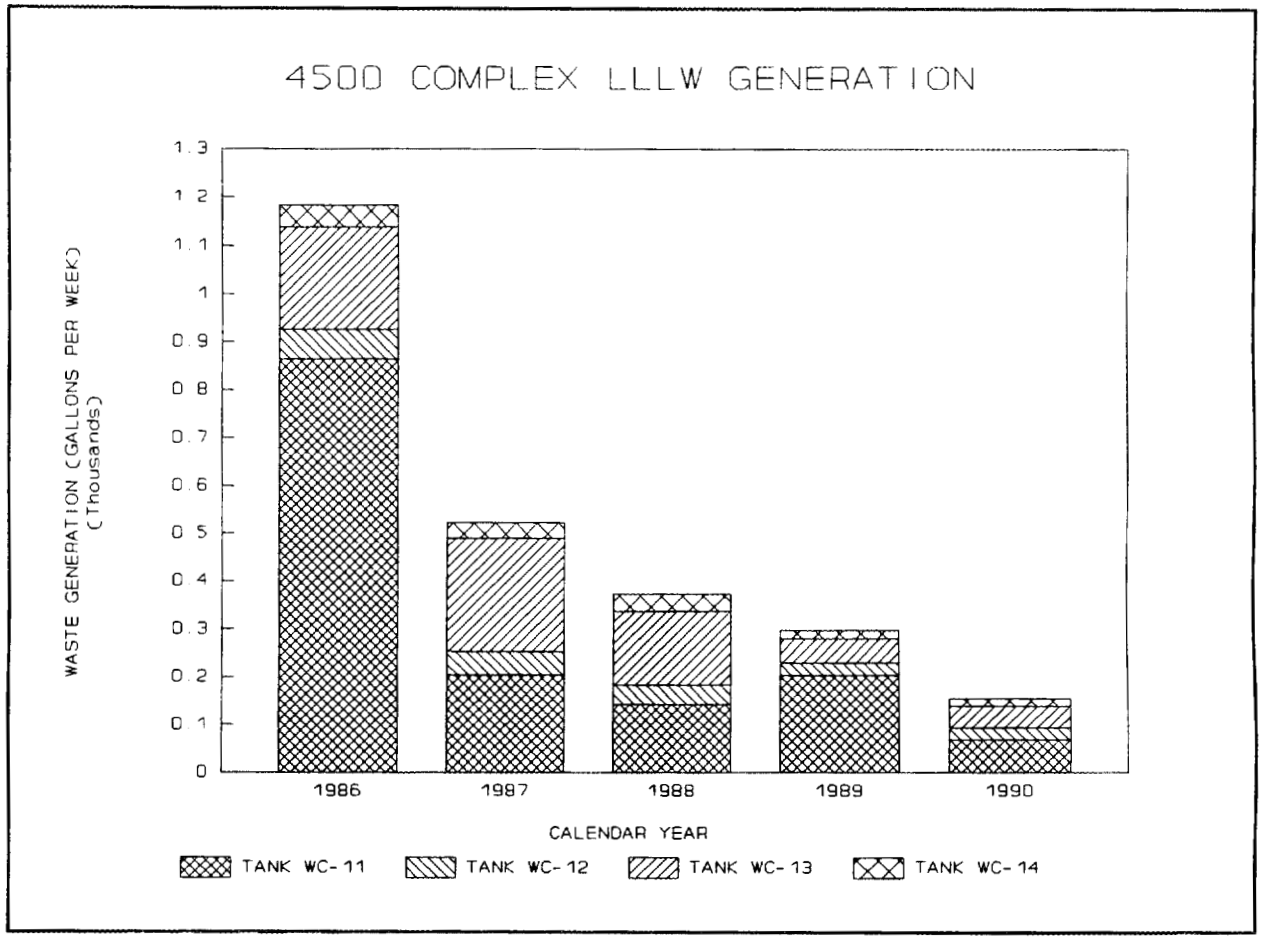

Figure 22. 4500 Complex LLLW generation. (ORNL-DWG. 91-7695)

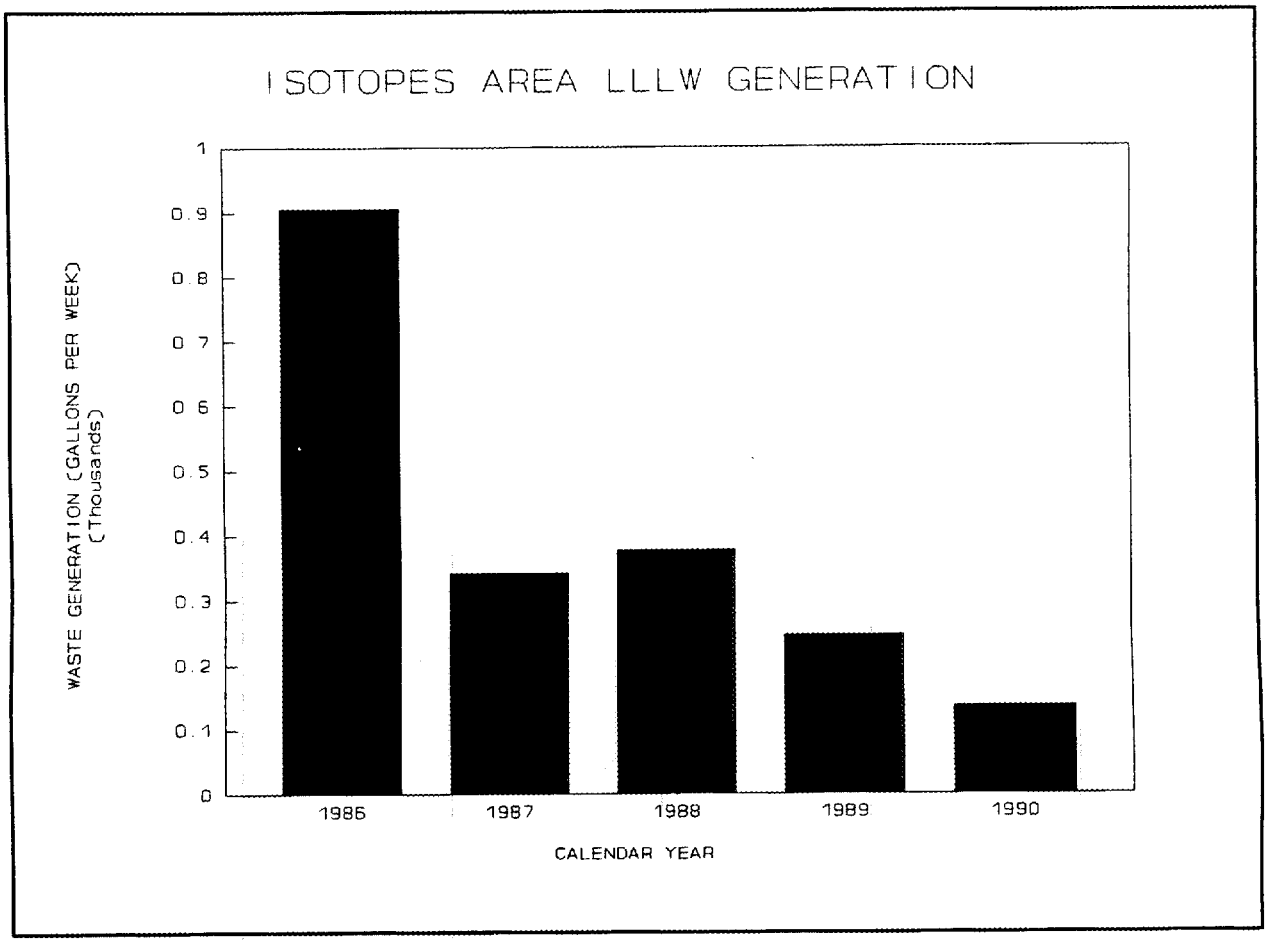

Figure 23. Isotopes Area LLLW generation. (ORNL-DWG. 91-7696)

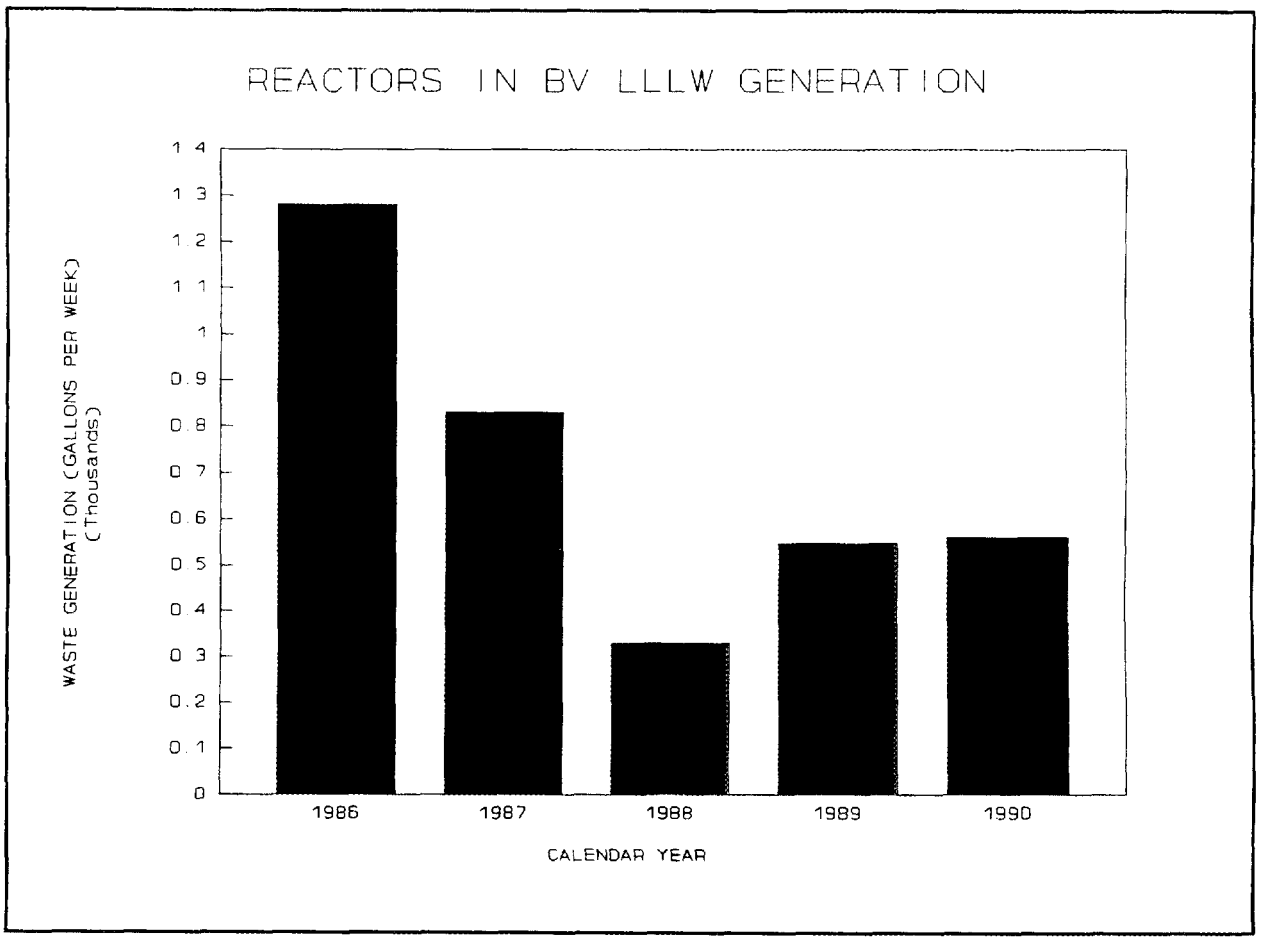

Figure 24. Reactors in Bethel Valley LLLW generation. (ORNL-DWG. 91-7697)

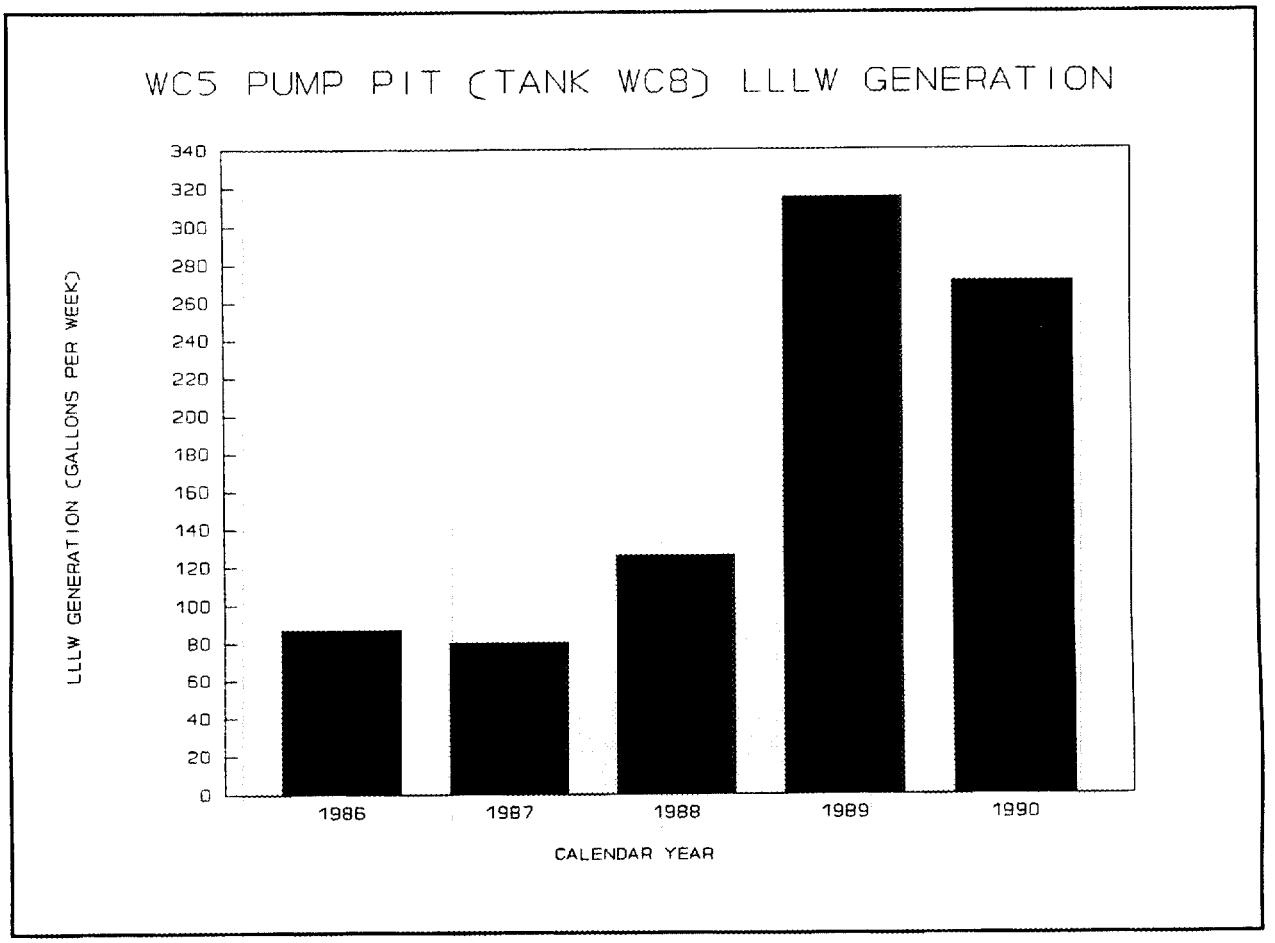

Figure 25. WC-5 Pump Pit (tank WC-8) LLLW generation. (ORNL-DWG. 91-7698)

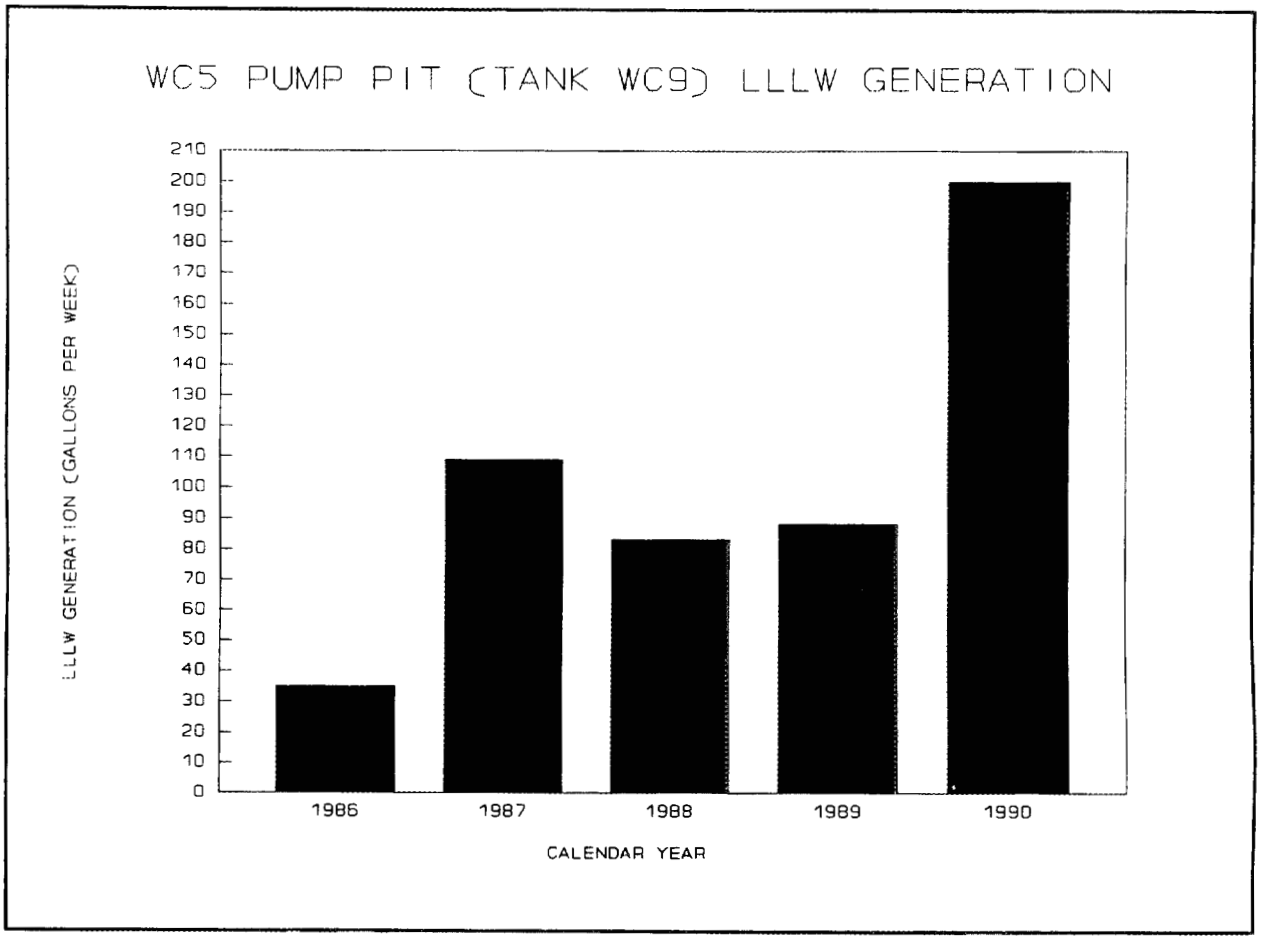

Figure 26. WC-5 Pump Pit (tank WC-9) LLLW generation. (ORNL-DWG. 91-7699)

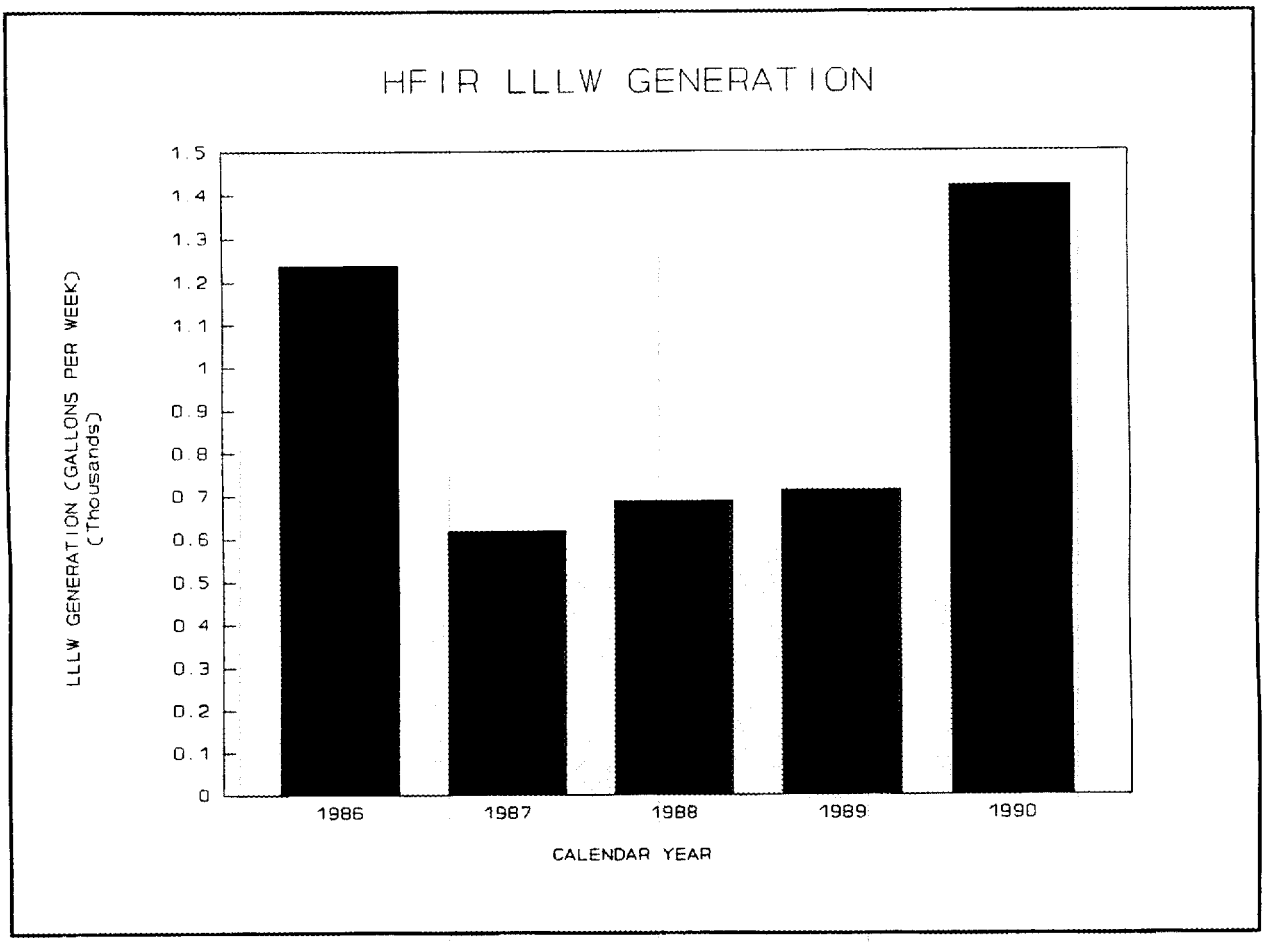

Figure 27. HFIR (Building 7900) LLLW generation. (ORNL-DWG. 91-7700)

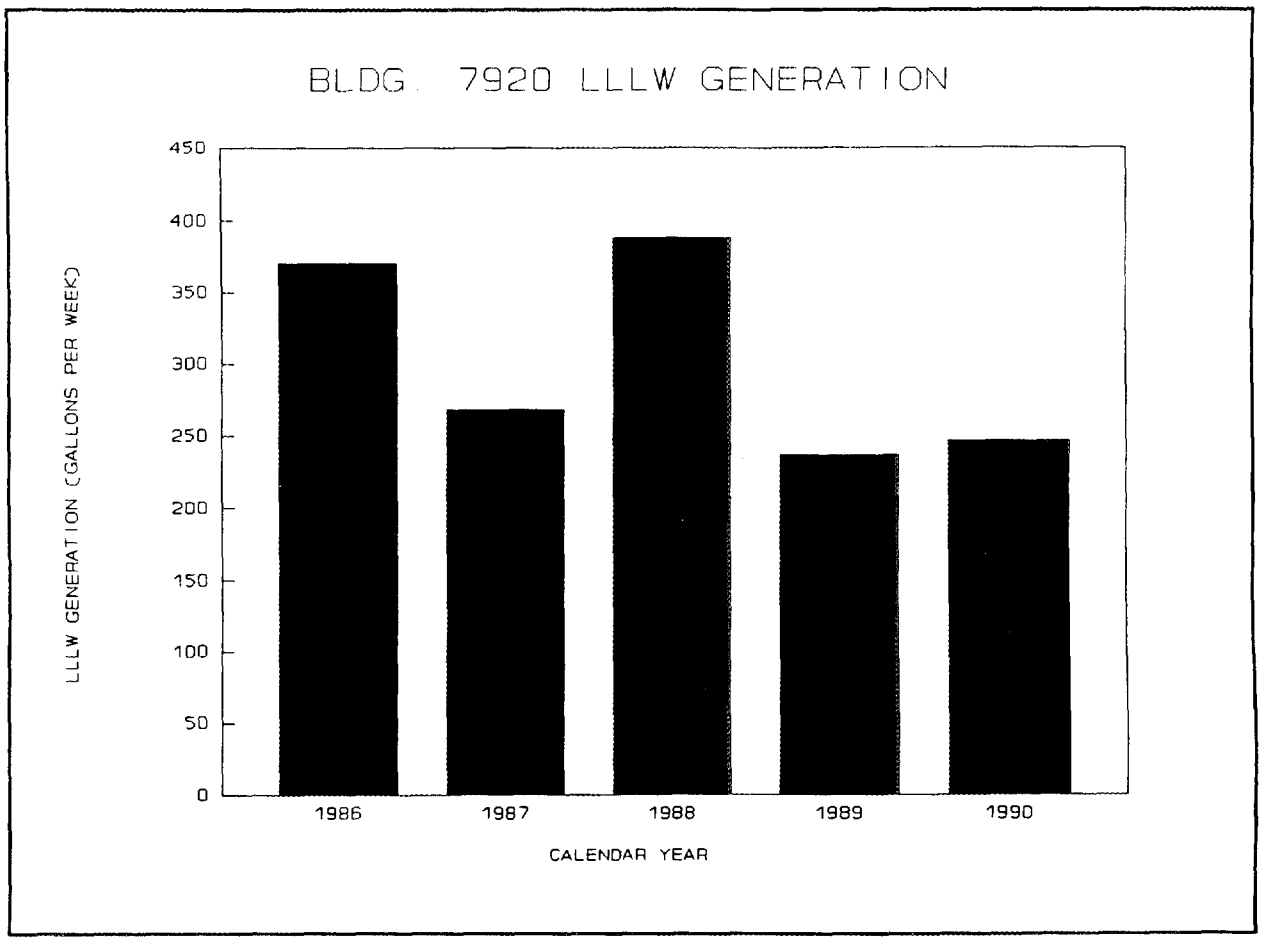

Figure 28. Building 7920 LLLW generation. (ORNL-DWG. 91-7701)

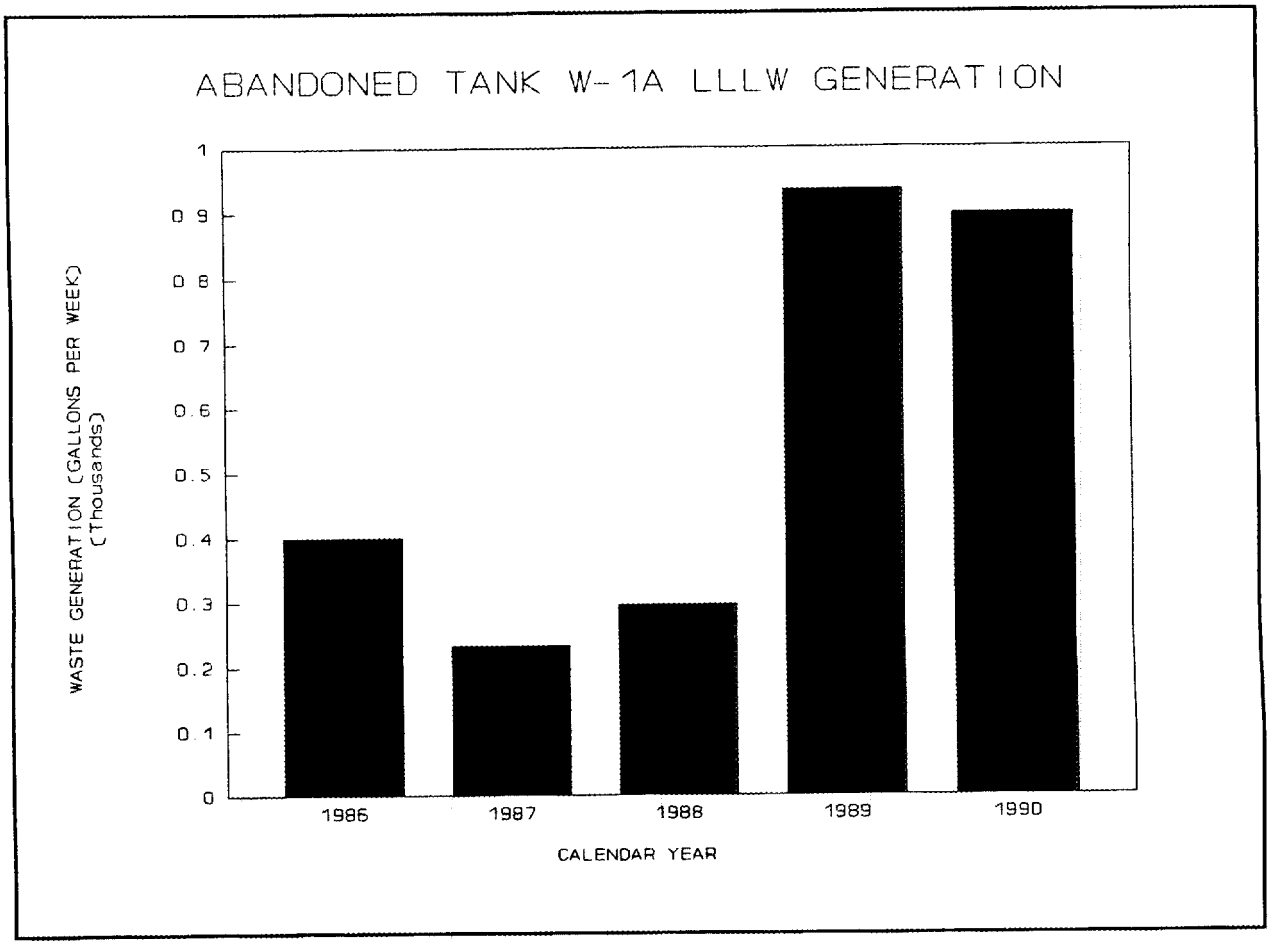

Figure 29. Abandoned tank W-1A LLLW generation. (ORNL-DWG. 91-7702)

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