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AN ANALYSIS OF THE SOUTH TANK FARM AND THE POTENTIAL HAZARDS ASSOCIATED WITH CONTINUED USE OF THE TANKS AS PART OF THE INTERMEDIATE-LEVEL LIQUID WASTE DISPOSAL SYSTEM

F. R. Mynatt
C. C. Webster

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ORNL-TM-604

OPERATIONS DIVISION

AN ANALYSIS OF THE SOUTH TANK FARM AND THE POTENTIAL HAZARDS ASSOCIATED WITH CONTINUED USE OF THE TANKS AS PART OF THE INTERMEDIATE-LEVEL LIQUID WASTE DISPOSAL SYSTEM

F. R. Mynatt

C. C. Webster

Date Issued

AUG 21 1963

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee
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ABSTRACT

The available information about the tanks, originally constructed in 1943, is presented with design drawings either presented or referenced. Similar tanks located at other sites are discussed. The present use of the tanks is discussed along with information to show how they fit into the ORNL waste disposal system. The potential problems associated with use of these tanks is discussed and recommendations are made.

I. LOCATION AND DESCRIPTION

The south tank farm is a lot approximately 120 ft by 180 ft located in ORNL area 3507. There are six underground tanks on the lot spaced on a 60-ft center-to-center square matrix. The tanks are recorded as equipment pieces numbered 206-111, 206-112, 206-113, 206-114, 206-115, and 206-116. The waste disposal identification numbers in corresponding order are W-5, W-7, W-9, W-10, W-8, and W-6. Figure 1 shows the location of the tanks in the Laboratory area.

The tanks are 50 ft in diameter by 12 ft deep with a dome top having no central support. The tank bottoms are 3 in. thick, and the sides are 6 in. thick at the bottom and 5 in. thick at the top. Each tank has a water capacity of approximately 1,470,000 lb or 170,000 gal.[1]

Very little information is available on the construction of the tanks. Most of the information presented herein was obtained from construction drawings. The tank bottoms rest on a concrete saucer which was placed on bedrock approximately 18 ft below the surface at an elevation of 781 ft above sea level. The tops of tanks W-5, W-6, W-7, and W-8 are covered uniformly with 6 ft of earth; and the tops of tanks W-9 and W-10 are covered with 5 ft 6 in. of earth.

The saucers on which the tanks sit have a slightly larger diameter than the tanks. The saucers are designed with troughs to channel the drainage from the tank sides into 6-in. terra cotta drain pipes which lead to dry wells.[2] Pertinent drawings of the tanks and the associated drainage system are included at the end of this report. The following description of a saucer was found in a July, 1943, Clinton Laboratory Progress Report:

> "Each tank is built on a concrete pad covered with a mat. This mat consists of two plies of all cotton rag, asphalt impregnated, water proofing fabric and a surface cover of Orange Label sisalkraft paper all cemented together with asphalt. The outer edges of each pad are equipped with a raised rim to collect any seepage on the pad and conduct it through a 6-in. terra cotta line to the dry wells."[1]

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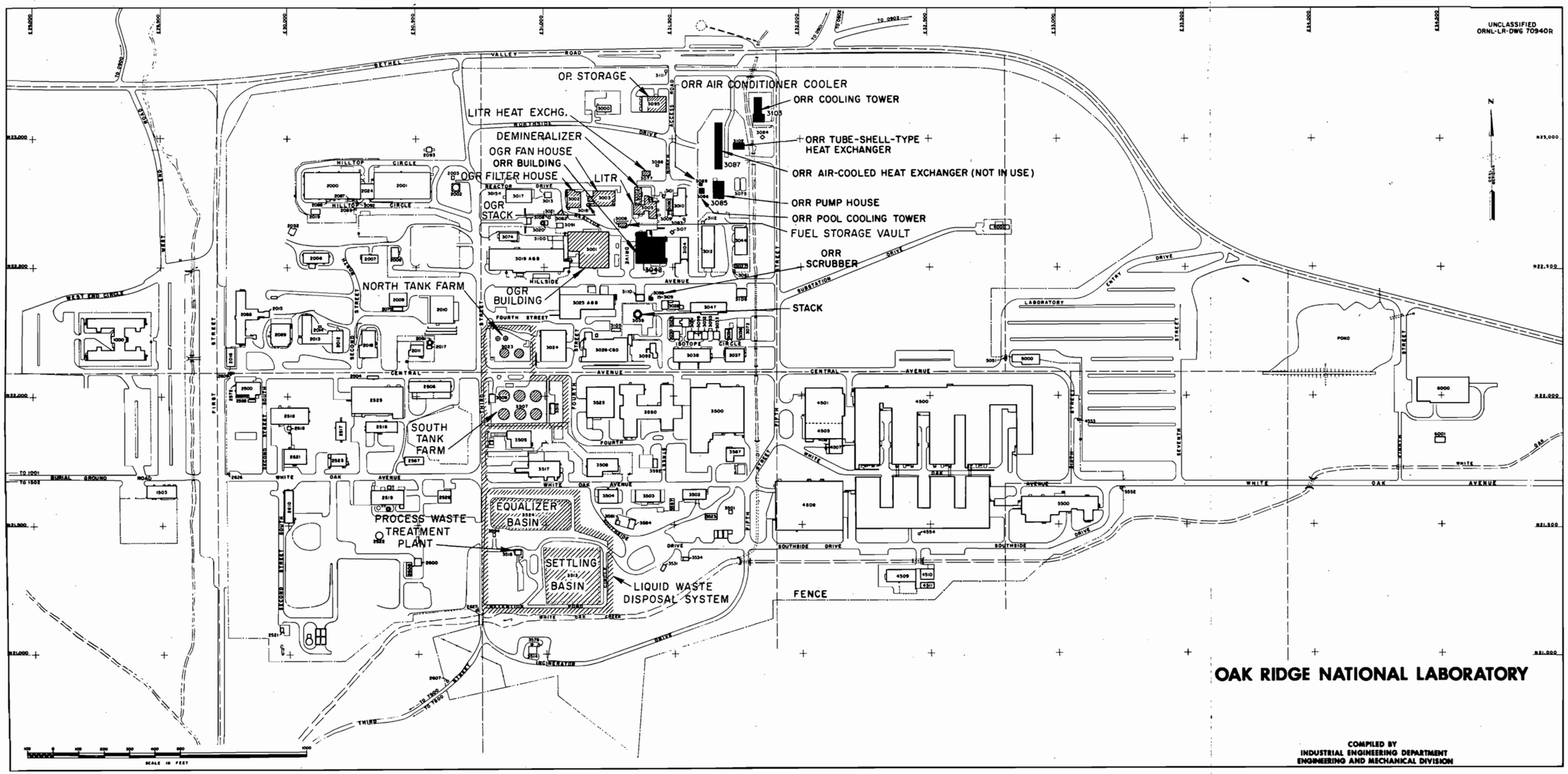


Fig. 1. Oak Ridge National Laboratory

Figure 2 shows a cut-away view through tanks W-7 and W-8.

The tanks were constructed by the Gunite process which is comparable to a current process known as shotcrete. The tanks' bottoms, sides, and dome-shaped tops are reinforced with wire mesh and reinforcing rods. The 3/4-in. diameter and 1 1/8-in. diameter rods in the sides were formed into hoops by using turnbuckles and were held in position by attaching them to vertical 1/2-in. diameter rods. Each tank has approximately 8,000 sq ft of 4-in. by 4-in. (#8 x #8) wire mesh and over 6 tons of reinforcing rods within the concrete.[3] The following description of Gunite is found in Kent's Mechanical Engineers' Handbook (1950):

> "Gunite. This is the trade name of a portland-cement-sand mixture combined with water when discharged in the form of mortar from the nozzle of a cement gun. The process has a broad application for remedial treatments applied over deteriorated concrete or masonry surfaces, but it may be used advantageously as a means of constructing thin walls and partitions. The thickness of the solid section usually varies from 1 1/2 in. to 2 in., but may be made thicker when desired. The finish surface is of uniform, slightly rough texture."[4]

Gunite is a good process for tank construction because, if applied in layers, cracks do not tend to propagate from one layer to another. The strength of the concrete wall produced by the Gunite process is highly dependent upon the proportion of mixture components and the thoroughness of mixing. The drawing specification for the tank facilities calls for a minimum concrete strength of 2,500 psi after 28 days.[2]

The sides of the tanks are surrounded by a 3-ft radial layer of 2-in. (average size) crushed stone. The height of this 3-ft layer of crushed stone is approximately 12 ft and extends from the saucer to the top of the tank. The main purpose of the stone is to provide a passage for drainage, and possible leakage, to the saucer and thereafter to the dry well where such leakage can be detected.[1]

Many changes have been made in the piping directly associated with the tanks. As originally designed, the tanks were arranged in three groups of two tanks each. The three tanks on the north side were receiver

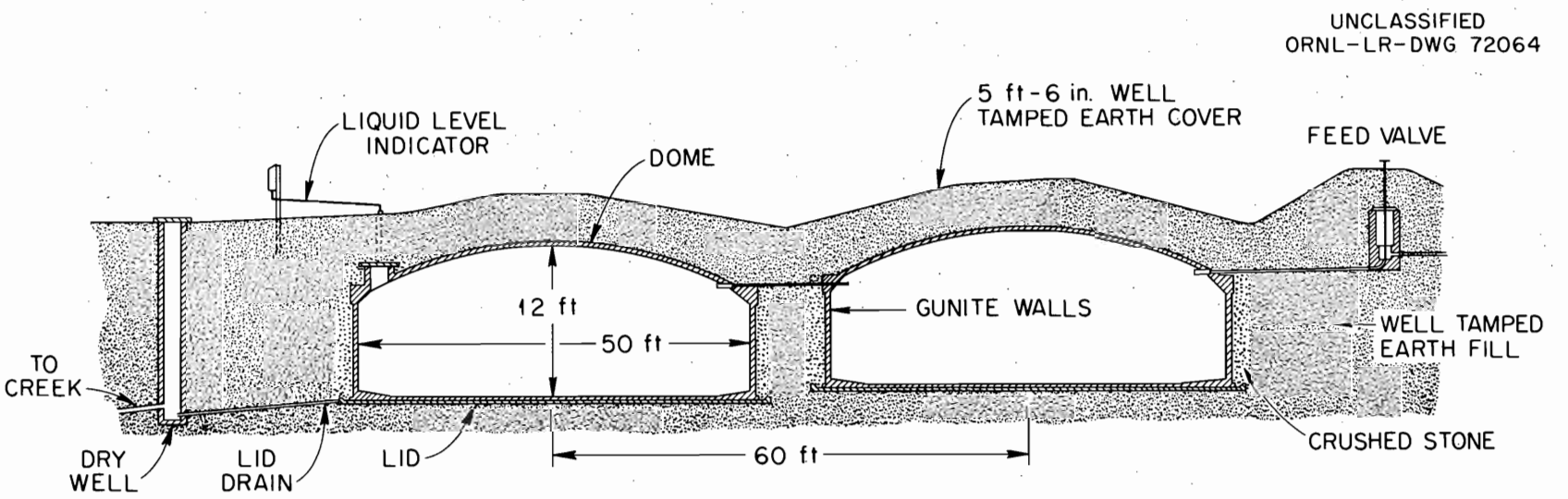
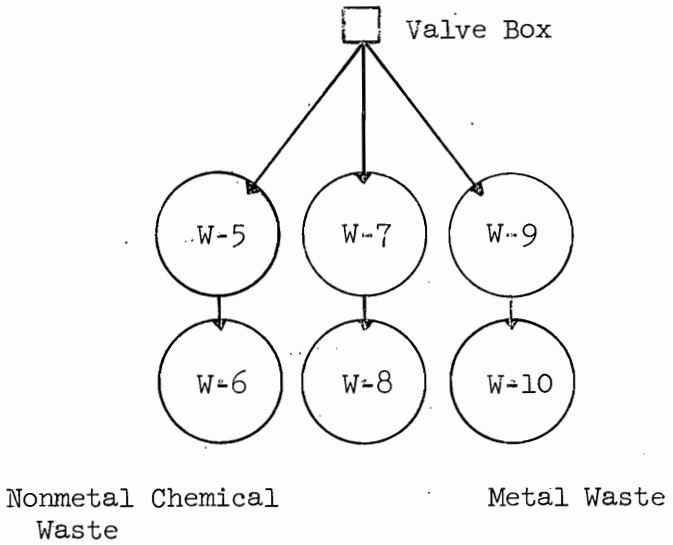


Fig. 2. Gunite Liquid-Waste Storage Tanks

tanks which overflowed into the three tanks on the south side. Tanks W-5 and W-6 were for storage of nonmetal chemical waste. Tanks W-7 and 8 and W-9 and 10 were for storage of metal (uranium) waste. The original flow diagram is shown below.



Original Flow Distribution

The most significant addition since the original piping installation is the pumping station and underground transfer lines which provide a way for pumping waste from any tank to any other tank or to the liquid waste pits. Other additions include the installation of a ventilation system for tanks W-5, W-6, W-8, and W-10. Tanks W-5, W-6, and W-8 have been equipped with volume gauges and samplers.

II. WASTE STORAGE TANKS AT OTHER SITES

Concrete liquid-waste storage tanks resembling these at ORNL are used at the Hanford and the Savannah River operations. The important difference between the tanks at ORNL and those built at Hanford during 1943-44 is that the Hanford tanks use a mild steel inner liner for containment, whereas the ORNL tanks' interior surfaces were painted with a

bitumastic or asphaltic paint. The tanks built more recently at Hanford are larger, and some are capable of containing concentrated self-boiling waste. All concrete tanks at Hanford use welded mild steel liners for leak-proof containment.[5]

In 1960, four large (1,300,000 gal) reinforced concrete tanks were built for the Savannah River operations storage of intermediate level nonboiling waste. The domes and bottoms of these tanks are constructed of poured reinforced concrete. The walls, however, are constructed of reinforced shotcrete. Containment and leak protection are provided by welded mild steel liners. Leak detection is provided by drainage channels directly below the steel liner. Such drainage is collected in a reservoir where it may be detected.[6]

III. USE OF THE WASTE STORAGE TANKS

The flow of radioactive waste at ORNL can be divided into four systems: (1) gaseous, (2) intermediate-level liquid, (3) process liquid, and (4) solid. Figure 3 is a schematic flowsheet of the waste disposal system and shows the major components of each system. Our attention is focused on the three 170,000-gal central storage tanks of the highly radioactive liquid-chemical waste system and the three 170,000-gal central storage tanks of the liquid-uranium waste system; both are encircled on the flowsheet.

The highly radioactive liquid waste system on the flowsheet is so named because it has the highest level of any liquid waste at ORNL. Actually the level of activity varies between 0.001 and 0.02 curie per gal as compared with 80.0 to 5200.0 curies per gal in waste from production sites.[7] By comparison the liquid waste at ORNL should be classed as intermediate-level waste as it is often designated in this report.

The tanks were originally constructed to be used for permanent storage of radioactive liquid waste produced by the plutonium pilot plant and related facilities. The system was arranged in three units of two tanks each as described on pages 3 through 5. Two pairs of tanks (W-7 and W-8, W-9 and W-10) were used for storage and recovery of uranium waste. Between

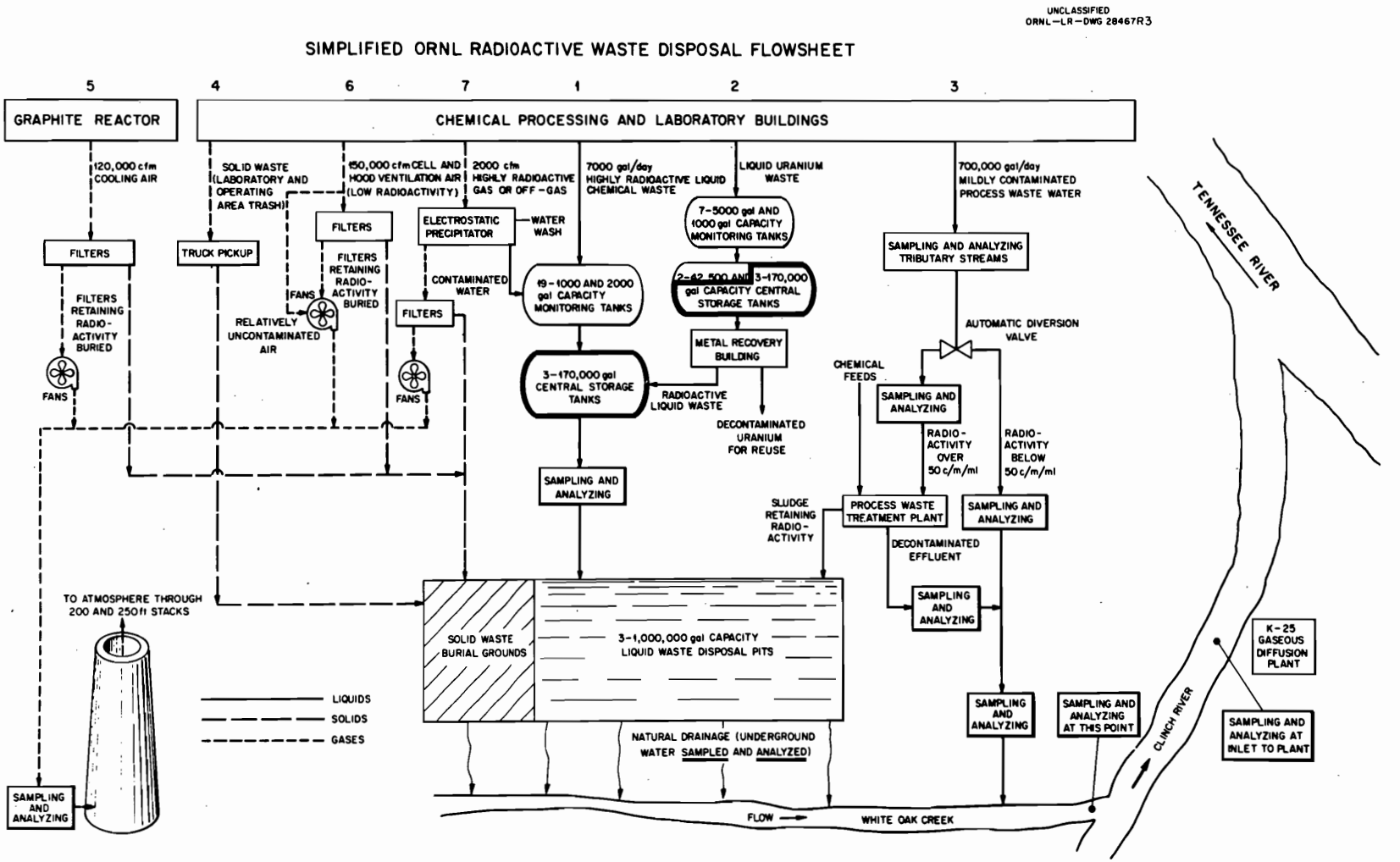


Fig. 3. Simplified ORNL Radioactive Waste Disposal Flowsheet

1952 and 1957 a metal recovery process was used to reclaim approximately 130 tons of uranium from the liquid uranium waste collected over the years in these four waste storage tanks.[7] One pair of tanks was originally used for permanent storage of radioactive liquid waste which did not contain uranium. All the waste is neutralized before being transferred to the tanks, usually by the addition of a 50% solution of NaOH. The original procedure called for a pH of 7.0-7.5, and precipitation and sedimentation were observed.[1] This sedimentation did not prove to be detrimental in filling the tanks, and at the Hanford site this settling process has been found to decontaminate the liquid substantially.[8]

Due to the expanding needs of the Laboratory, the capacity of the tanks proved to be inadequate for the permanent storage of the intermediate-level waste. At the present time none of these tanks are used for permanent storage, and only three of the six concrete tanks are used as hold-up containers for liquid waste (chemical). Figure 4 is a schematic flow sheet of the liquid waste disposal system used at the present time.

The three tanks presently used are represented as concrete surge tanks. These are tanks W-5, W-6, and W-8. Tanks W-7, W-9, and W-10 are not now being used but contain a solution of water, caustic (NaOH), and some radioactive material. Table 1 is representative of the radioactivity of the solution contained in these tanks. By maintaining the solution in a basic condition, the rate of deterioration of the tanks is kept at a low value.

Table 1. Activity in Tanks W-7 and W-9

	Tank W-7	Tank W-9
Gross β (counts/min/ml)	1.82×10^5	5.59×10^6
Gross γ (counts/min/ml)	1.13×10^5	6.17×10^6
Gross α (counts/min/ml)	4.38×10^3	---
Sr (dpm/ml)	2.98×10^4	5.48×10^6
Ru^{106} (dpm/ml)	---	2.46×10^7
Cs^{137} (dpm/ml)	6.31×10^5	1.50×10^7
Co^{60} (dpm/ml)	---	2.46×10^7
Liquid volume (gal)	126,000	143,000

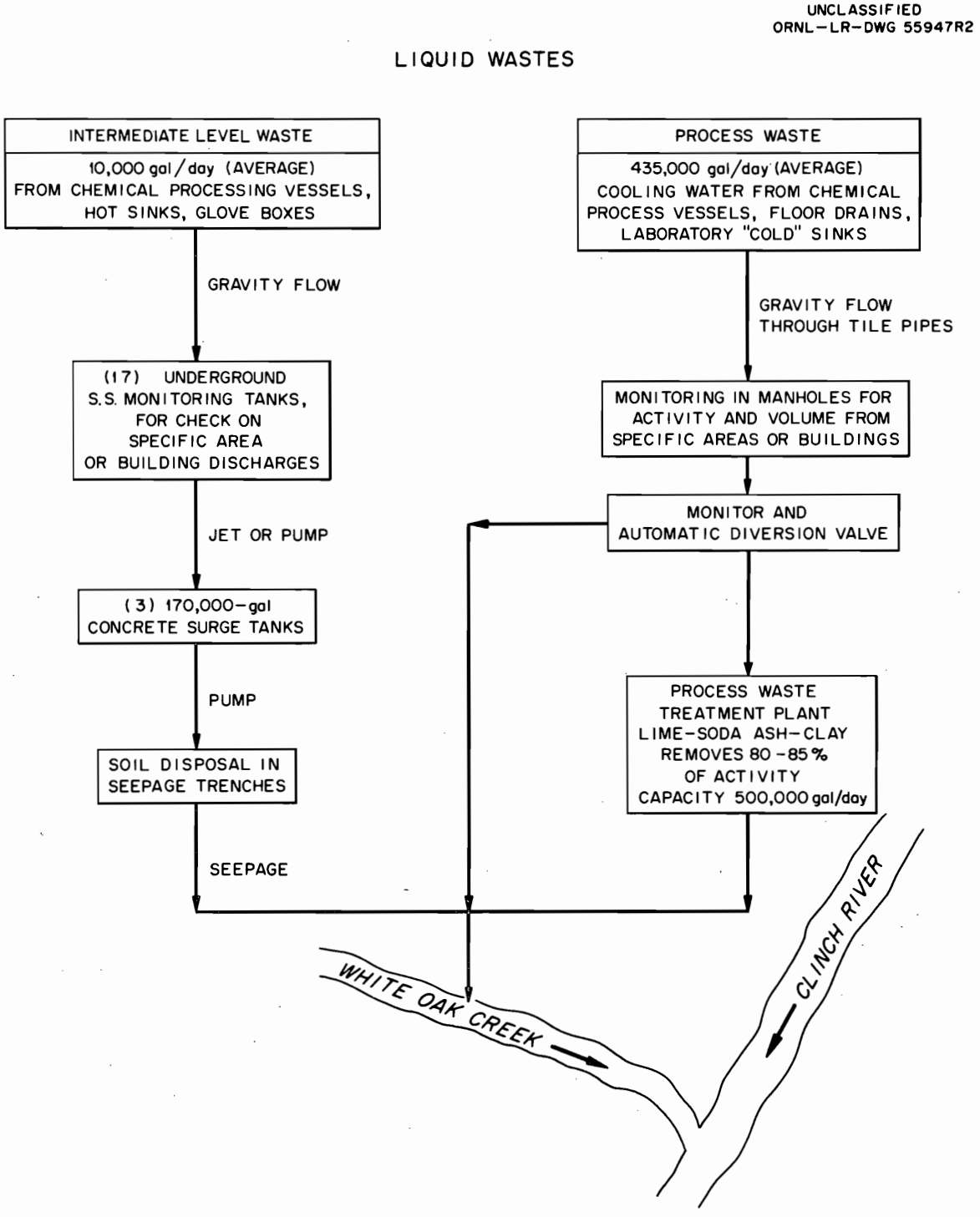


Fig. 4. ORNL Liquid-Waste Disposal Flowsheet

The average monthly rate of liquid pumped through the three tanks used for temporary storage of chemical waste is 336,000 gal. The tanks serve as a surge facility and also hold up the waste allowing for decay of short-lived radioisotopes before discharging to the waste pits. Current operating procedure calls for a pH of 10 or more for the liquid waste discharged to the tanks. This high pH level can be expected to effect significant precipitation and sedimentation with an accompanying decontamination factor. The resultant sludge is more highly radioactive than the liquid which is routinely pumped to the waste trenches.

Table 2 below shows the available storage space resulting from the deposition of material in the tanks.

Table 2. Sludge Volume and Capacity of ORNL Intermediate-Level Waste Storage Tanks[11]

Tank	Sludge Volume (Gal)	Available Capacity (Gal)	Current Use
W-5	60,000	100,000	Chemical waste
W-6	86,000	79,000	Chemical waste
W-8	86,000	79,000	Chemical waste
W-7*	30,000	135,000	Chemical waste
W-9*	12,000	153,000	Metal waste
W-10*	10,000	155,000	Metal waste

*Not currently in use

The Waste Disposal Group of the Operations Division is responsible for the operation of the tank farm. To assure that the structural aspects of the concrete tanks are not altered, based on analysis made on the Hanford and Savannah River liquid waste tanks,[5, 6] the following limitations should be considered for tank-farm operation:

(1) Specific gravity of the liquid should be less than 1.25.

(2) The waste should not be allowed to boil.

(3) Vapor pressure in the tanks should not differ significantly from atmospheric pressure.

Due to the volatility and combustibility of many organic solvents, users of the system are requested to follow a special procedure when discharging organics into the system. The organic material is to be discharged only in small quantities and then flushed with water. In addition, special precautions are taken to assure safe conditions within tank W-5 which is the hold-up tank receiving the organic waste. A blanket of nitrogen is maintained, and the gases above the liquid are sampled routinely to assure that the gases above the liquid are not accumulating in such proportions as to develop into a hazardous condition. All other tanks through which the organics pass are maintained with sufficient ventilation.

IV. ACCIDENT ANALYSIS

In order to make assumptions concerning the maximum credible accident for the tank farm, we need information concerning a multitude of variables. Most of the variables have compensating effects (i.e., both beneficial and detrimental) such that quantitative knowledge of the variable would not predict its effect on the accident. Thus, only by experiencing an accident can we begin to appreciate the effect of many of the variables.

The quantity and activity of the contents of the tanks are of prime importance. First, we can assume that three of the tanks presently contain no appreciable amount of activity. These tanks, W-7, W-9, and W-10, contain mostly caustic and very little uranium waste. Liquid samples were removed from tanks W-7 and W-9 in February, 1963, and analyzed for various types of activity as well as sources. The results are shown in Table 1. Next, we assume that three tanks, W-5, W-6, and W-7, are full and have an activity concentration in the liquid equal to that of the effluent or that which may be indicated by sampling.

Figure 5 is a sketch of a liquid sampler developed for use in the tank farm. The sampler is 14 ft long and would be suspended by a rope passed over a pulley hanging from a 20-ft tripod. The sampler is lowered into the tank until the liquid level indicator is activated. The liquid sample is then pulled into the container by the hand pump (syringe and two valves). By using this pump, the release of gaseous activity is

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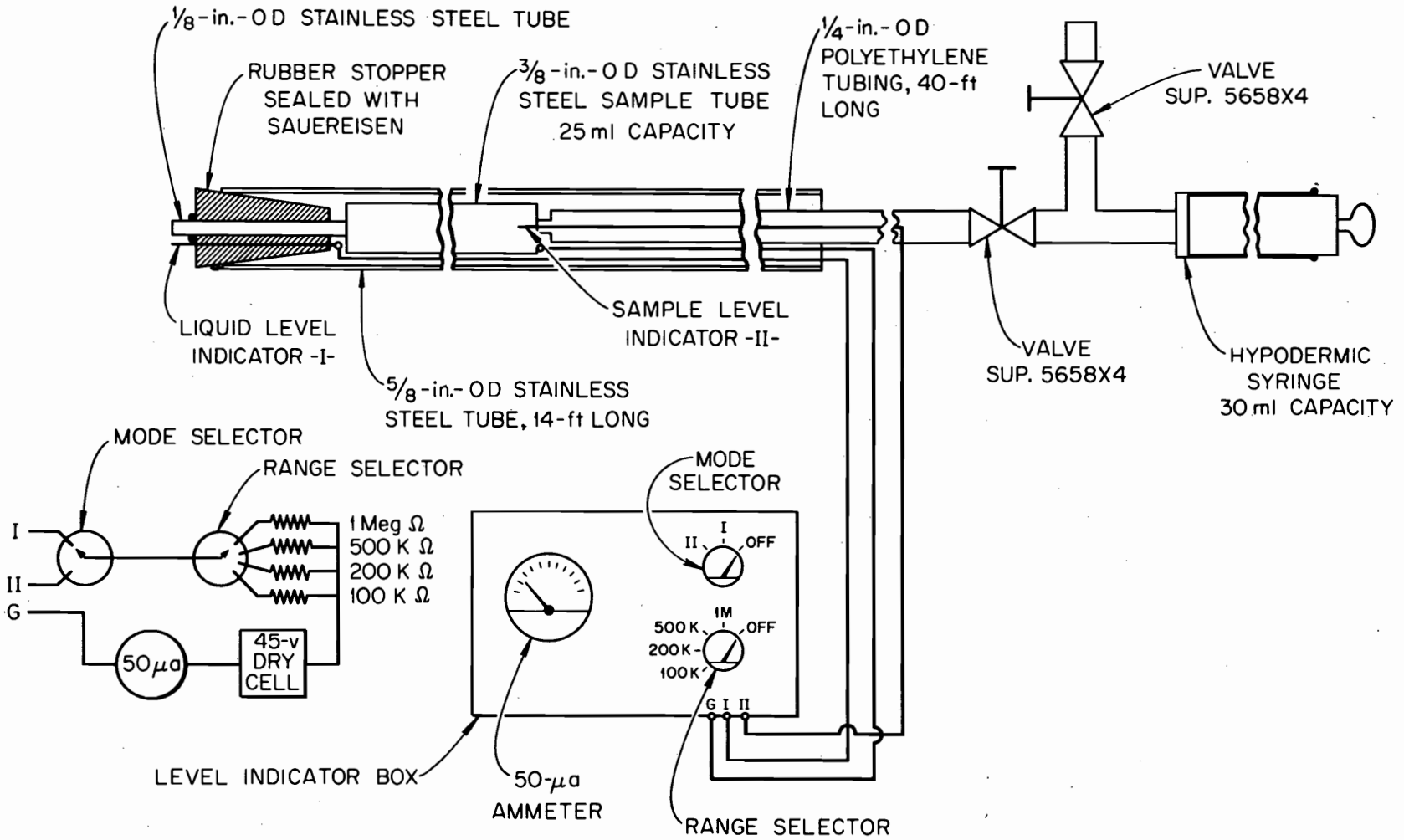

Fig. 5. Liquid Sampler

minimized. When the sample level indicator is activated, the valves are closed and the sampler is raised from the tank. During this procedure, adequate precautions are taken to prevent the spread of contamination and overexposure. By use of the pump the sample is transferred to a bottle. The sample size is limited to 25 ml to permit the handling of the sample containers with 15-in. tongs. The sludge level may be obtained by placing a protective cap on the sampler intake and lowering the sampler until it stops. The sampler level may be compared with known tank depth, thus giving the sludge (more probably a cake) thickness. Once the depth of the liquid is determined, liquid samples could be taken at different depths.

It is highly improbable that a sample would be representative of the liquid contained in any one of three tanks being used even at the time the sample is taken; moreover, due to the semicontinuous filling and removal of waste from the tanks, a representative sample of one time would not be likely to be representative at another time. For these reasons the regular sampling of the tank effluent, which is pumped to the waste pits, is as indicative of the tank contents as most other practical means of sampling would be. Table 3 gives an average calculation of the activity concentration for the period from April, 1958, to March, 1959, and compares it to the average for 1961.

Table 3. Sampling of Effluent from Tank Farm

Date	No. of Curies Discharged	Volume Discharged (Gal)	Concentration (Curies/Gal)
April - June, 1958	19,020	735,000	0.0258
July - September, 1958	11,560	941,000	0.0123
October - December, 1958	10,540	845,000	0.0125
January - March, 1959	12,053	914,000	0.0132
Total	53,173	3,435,000	Ave. 0.0160

In 1961, 32,329 curies were discharged.

Volume discharged = 3,000,000 gal.

Average concentration = $\frac{32,329}{3,000,000}$ = .0108 curies/gal.

Table 4 gives a list of the activity transferred per nuclide, the average activity concentration, and the maximum permissible concentration (nonoccupational) calculation for the liquid waste transferred in 1962.

Table 4. Total Volume of Liquid and Activity Pumped through Tank Farm in 1962

Nuclide	Activity Transferred (Curies)
Sr^{90}	1,513
Ru^{106}	741
Cs^{137}	17,561
Co^{60}	111
TRE	1,141
Total	21,067

Volume discharged = 4,030,000 gal.

Concentration = $\frac{21,067}{4,030,000}$ = .0052 curies/gal = 11.5 μc/ml.

MPC (Nonoccupational) for Mixture Transferred in 1962.

$$MPC = \frac{1}{\frac{\frac{1,513}{21,067}}{1 \times 10^{-7}} + \frac{\frac{741}{21,067}}{1 \times 10^{-5}} + \frac{\frac{17,561}{21,067}}{2 \times 10^{-5}} + \frac{\frac{111}{21,067}}{5 \times 10^{-5}} + \frac{\frac{1,141}{21,067}}{1 \times 10^{-5}}}$$

$$MPC = \frac{1}{\frac{.0718}{1 \times 10^{-7}} + \frac{.0352}{1 \times 10^{-5}} + \frac{.834}{2 \times 10^{-5}} + \frac{.00527}{5 \times 10^{-5}} + \frac{.0542}{1 \times 10^{-5}}}$$

$$MPC = \frac{1}{7.704 \times 10^{5}} = 1.23 \times 10^{-6} \ \mu c/ml$$

From these tables we can estimate that the total activity now in the tanks in liquid form is less than 1,500 curies; thus, in the worst accident, release of all the liquid contents would not be disastrous. The effects of the accident would be minimized by the relatively slow movement of the waste through the soil, the ability of the soil to retain radionuclides as demonstrated by the waste-pit operation, and the use of the emergency pond. While the sludge in the tanks is much more active than the liquid (perhaps by a factor of 10), it will not contribute to the accident due to its stationary nature. Only if such conditions exist that the sludge is leached away would it be of concern; and, as long as a caustic environment is provided, leaching is improbable. The great improbability of a major release from the tank farm and the fact that the release would be relatively slow, thus allowing time for extensive emergency procedure, tend to relieve us from concern.

A more probable, but less extensive, accident involving the tank farm would be in the form of leakage of waste from the tanks. Such leakage could take place through cracks in the concrete or seepage through the concrete. This is possible because the tanks do not have a leakproof liner and depend only on the concrete for containment. This could be a hazardous situation if it were not for the leak-detection and drainage system.

Each of the tanks is surrounded on the sides by crushed rock. In the event of a leak, the liquid would flow down through the rock, would be caught by the "saucer" on which the tank sits, and would be channeled through the 6-in. drain pipes into the dry wells. All six dry wells discharge into a single drain. This discharge is monitored for activity at the pump. The waste then is discharged to the equalization basin through the diversion box where it is again monitored for activity.

At this point it is pertinent to discuss the geologic considerations affecting leak detection and accident conditions. Figure 6 is a section of a TVA geologic map of the Oak Ridge area. On this we can note the positions of ORNL, Bethel Valley, and various tributaries. A depth-to-water map was developed during a study of the area around Melton Branch for a proposed burial ground. From this map it was found that the water table varied between the 775-ft and the 812-ft elevation. Depth of

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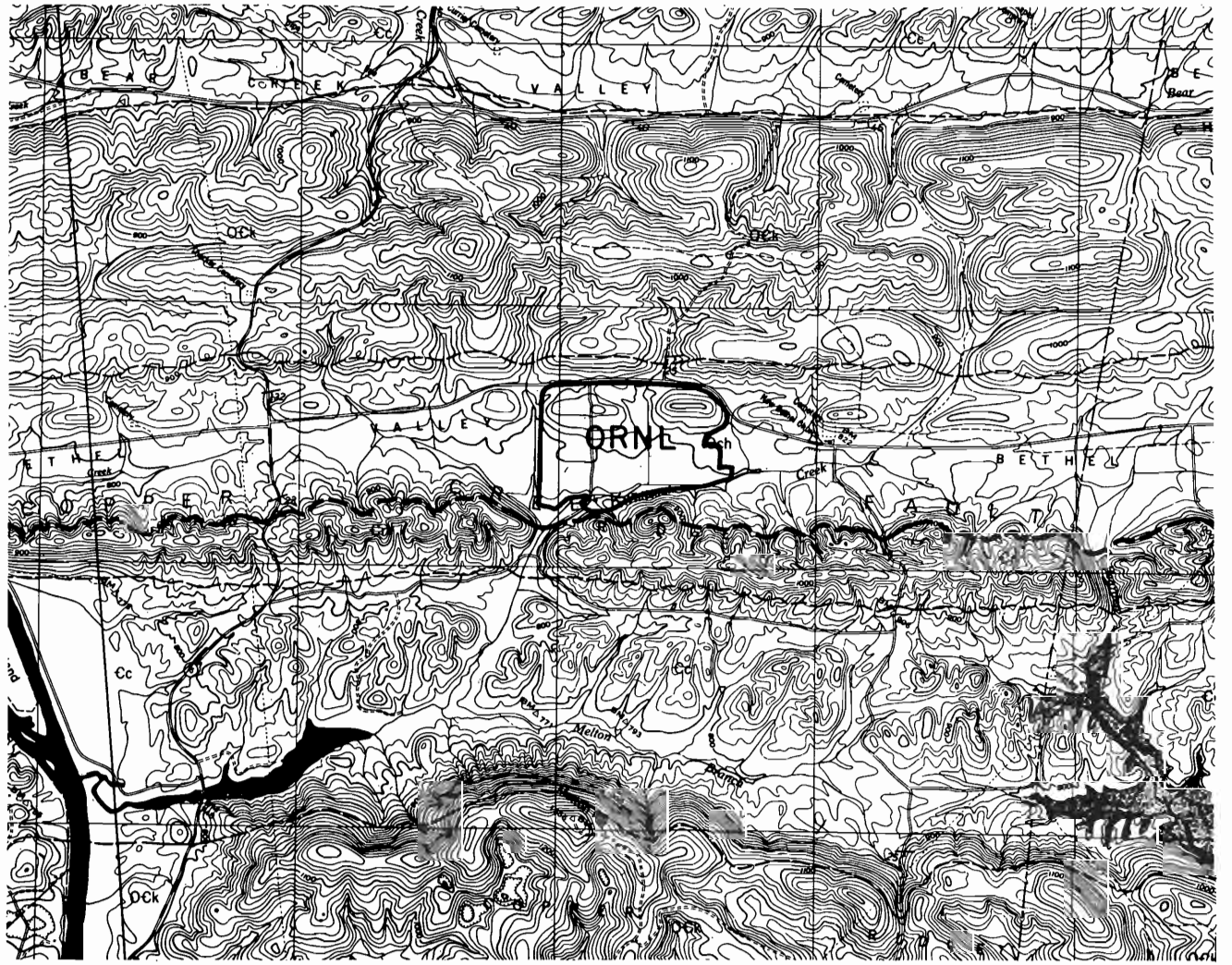

Fig. 6. Topological Map of ORNL Area Including Waste Disposal Area

burial in the new burial ground was limited to 1 ft above the maximum recorded water table for the specific area in question. The area near White Oak Creek is similar in many respects to the area around Melton Branch. This indicated that the water table around the tank farm might be as high as, or higher than, that near Melton Branch. The elevation of the tank saucers for W-5, W-7, and W-9 is 782.5 ft and for W-6, W-8, and W-10 is 781.0 ft. The facts led to the assumption that the maximum water table in the tank farm was above the level of the tank saucers. Indeed, this is substantiated by the high average flow from the tank drains; i.e., 26,500 gal per day.[9]

A high water table around a tank farm could be very detrimental in that the water table provides a means for transporting the waste rapidly from the upper soil to another strata where it may find its way to some unexpected location. In our case the liquid waste in the soil probably would move south in the direction of the gradient; while in the Chickamauga limestone below the tanks, it would probably move southwest or northeast in the direction of the strike.

In the ORNL tank farm the high water table is also beneficial in that the high drainage from the leak-detection system gives continual proof that the system is in good condition; effectively, the tanks are situated in a basin which drains through this leak-detection system where all the leakage from the tanks would be removed through the drain to the equalization basin. There are two activity monitors capable of detecting a leak. One is at the sump pump for the drain, and one is at the diversion box. As evidence of operating ability, a leak of waste from a pipeline near the tanks was detected by the activity monitors.[10]

In case of a very large break or maximum release, the dry-well-drainage system could be expected to remove the waste at a high rate and thus minimize release to the water table. The activity in the equalization basin, would, in case of maximum release, rise above the current limit of 20 curies. If this occurs the liquid from the equalization basin could be pumped to the emergency pond. Also, liquid still in the tanks could be pumped to an unharmed tank, to the waste pits, or to the emergency pond, or simultaneously to all three. The most important consideration affecting the results of a tank release is that the slow movement of waste through the soil would allow time for emergency action.

V. CONCLUSIONS

1. As the tanks are currently operated, their use as a hold-and-surge facility may be considered safe.

2. Slight leakage from the tanks could be tolerated as long as the leak-detection and drainage systems are fully operative.

3. The maximum credible accident could be serious, but proper emergency procedures could make the additional activity release to the environment tolerable.

4. The primary hazard is the unknown strength of the tanks. Because of the age of the tanks and the lack of stress analysis information, this must be considered as an unknown variable. For this reason the transfer of explosive mixtures (or components which could make up an explosive mixture) should be prohibited. The ground loading above the tanks should be kept to an absolute minimum.

VI. RECOMMENDATIONS

While the tanks cannot be tested, it appears to be reasonably probable that they will remain intact. In case of a minor fracture of a tank, the liquid waste can be transferred quickly to the trenches leaving only solid waste in the tanks. When the evaporator is put into operation within about a year, the radioactivity of the liquid in the tanks will increase significantly. If some other process for disposing of the waste is not developed, it will eventually be necessary to build additional storage facilities. It is recommended that enough new storage capacity of a higher quality[5,6] be built to permit transfer of the liquid from a large fraction of the existing tanks to one of the new tanks in the event that a leak should occur. This margin of spare storage capacity should always be maintained.

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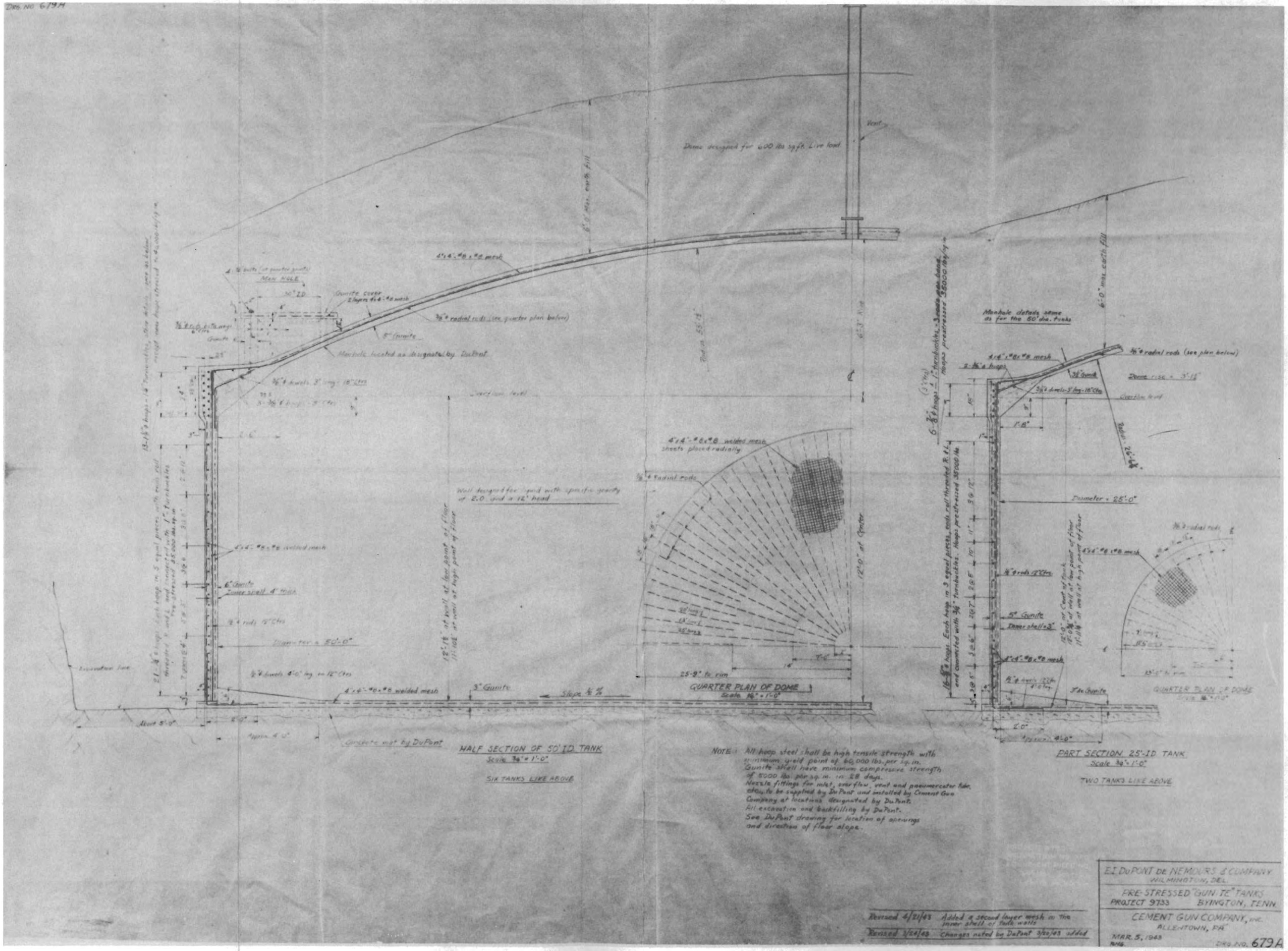
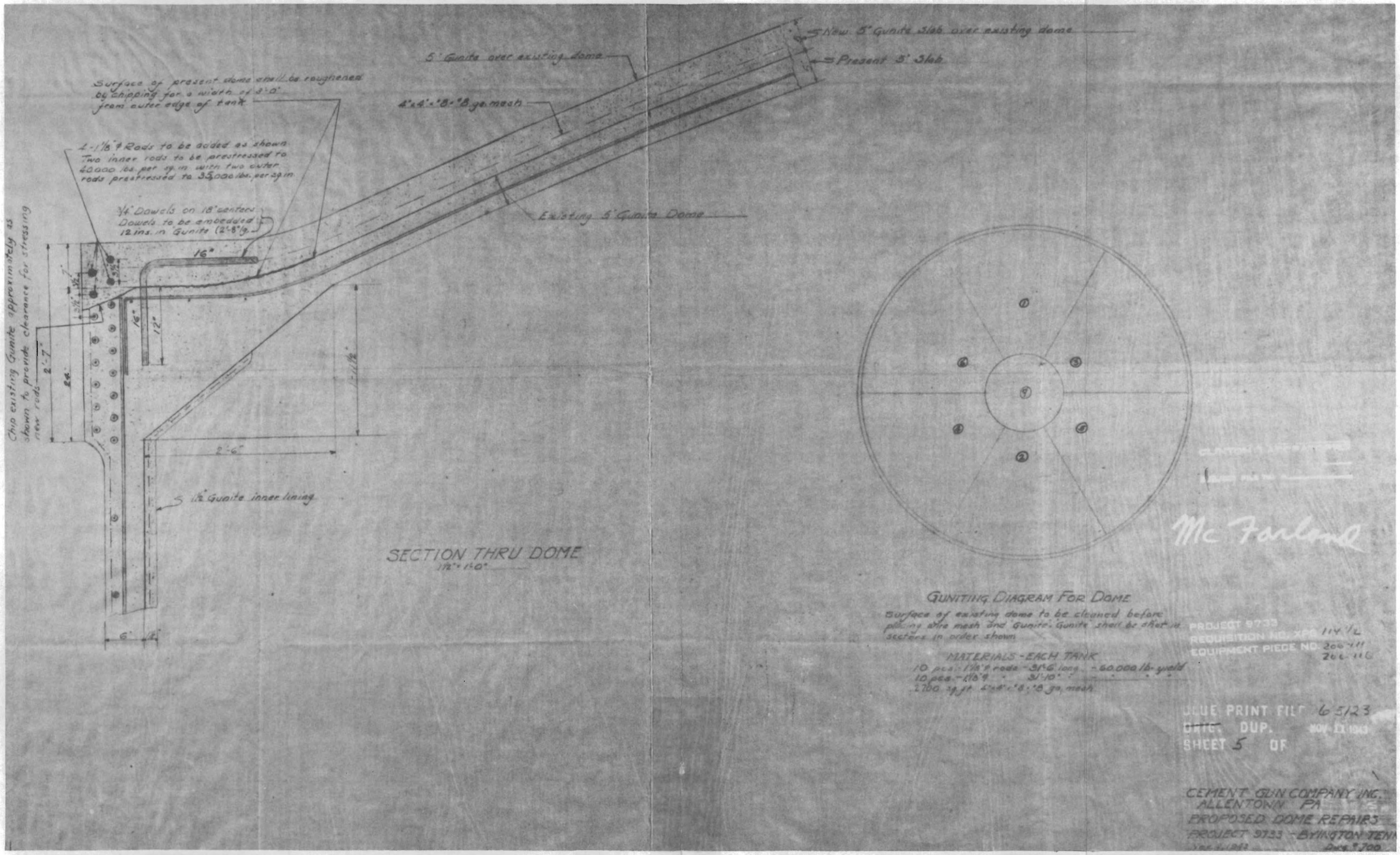
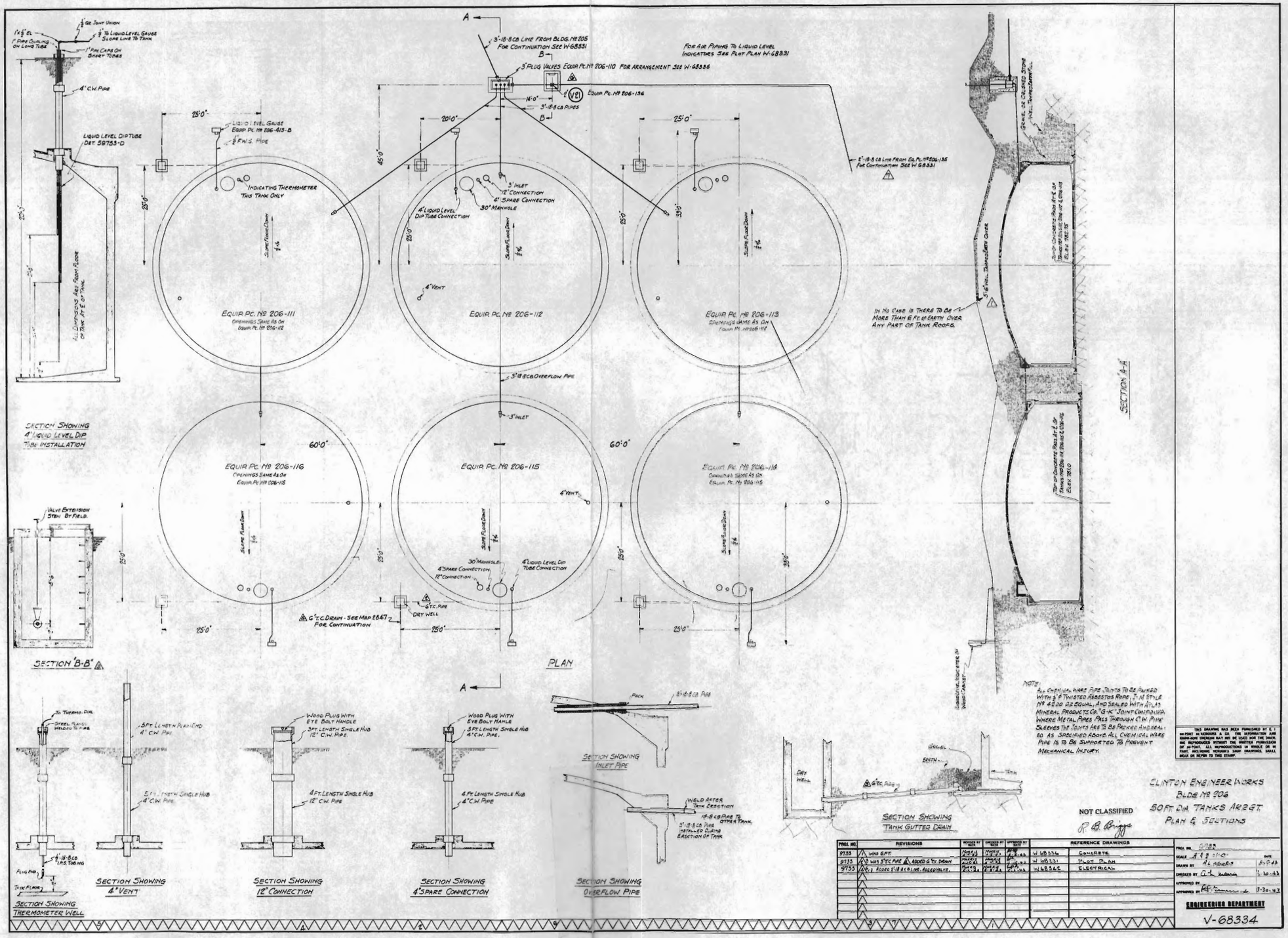

DRG. NO 679A
Vent
Dome designed for 600 lbs sq ft. Live load
6'-0" max. earth fill
4"x4"-#8x#8 mesh
Manhole
30" I.D.
Gunite cover
2 layers 4"x4"-#8 mesh
3/8" radial rods (see quarter plan below)
5" Gunite
Manhole located as designated by DuPont
3/8" ϕ dowels 3' long - 18" ctrs
Wall designed for liquid with specific gravity of 2.0 and a 12' head
4"x4"-#8x#8 welded mesh
6" Gunite
Inner shell 4" thick
3/4" rods 12" ctrs
Diameter = 50'-0"
3/8" dowels 4'-0" long on 12" ctrs
4"x4"-#8x#8 welded mesh
3" Gunite
Slope 1/2 %
Concrete mat by DuPont
Elevation line
Elevation level
4"x4"-#8x#8 welded mesh sheets placed radially
3/8" radial rods
25'-9" to rim
QUARTER PLAN OF DOME
Scale 1/4" = 1'-0"
Manhole details same as for the 50' dia. tanks
3/8" radial rods (see plan below)
2-3/8" ϕ hoops
3/8" Gunite
3/8" ϕ dowels - 3' long - 18" ctrs
Diameter = 25'-0"
3/8" rods 12" ctrs
5" Gunite
Inner shell = 3"
4"x4"-#8x#8 mesh
3" Gunite
Diameter = 50'-0"
Slope 1/2 %
Approx. 4'-0"
HALF SECTION OF 50' ID TANK
Scale 1/4" = 1'-0"
SIX TANKS LIKE ABOVE
PART SECTION 25'-ID TANK
Scale 1/4" = 1'-0"
TWO TANKS LIKE ABOVE
QUARTER PLAN OF DOME
Scale 1/4" = 1'-0"
NOTE: All hoop steel shall be high tensile strength with a minimum yield point of 60,000 lbs. per sq. in.
Gunite shall have minimum compressive strength of 5000 lbs. per sq. in. in 28 days.
Nozzle fittings for inlet, overflow, vent and pneumercator tube, etc., to be supplied by DuPont and installed by Cement Gun Company at locations designated by DuPont.
All excavation and backfilling by DuPont.
See DuPont drawing for location of openings and direction of floor slope.
Revised 4/21/43 Added a second layer mesh in the inner shell of tank walls
Revised 3/24/43 Changes noted by DuPont 3/20/43 added
E.I. DuPONT DE NEMOURS & COMPANY
WILMINGTON, DEL.
PRE-STRESSED "GUNITE" TANKS
PROJECT 9733 BYINGTON, TENN.
CEMENT GUN COMPANY, INC.
ALLENTOWN, PA.
MAR. 5, 1943
DRG. NO. 679A

A. APPENDIX

Several drawings are included at the end of this report for reference information. In the case of Drawing 679A and 700, clear copies are not currently available.

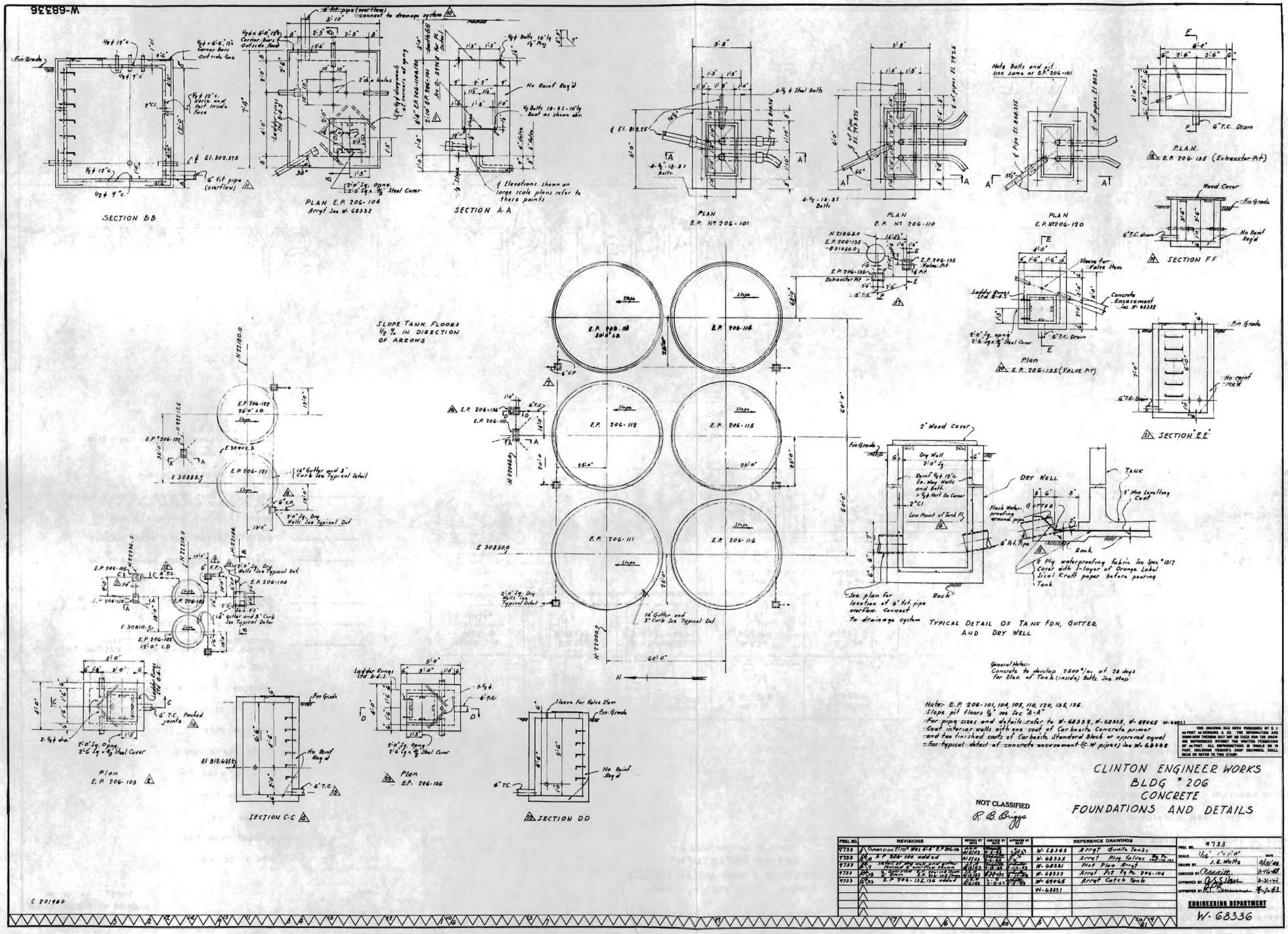
	Page
Drawing No. 679A	22
Drawing No. 700	23
Drawing No. W-68334	24
Drawing No. W-68336	25
Drawing No. D-12201	26
Drawing No. D-12205	27


New 5" Gunite Slab over existing dome
Present 5" Slab
5" Gunite over existing dome
Surface of present dome shall be roughened by chipping for a width of 3'-0" from outer edge of tank
4"x4"x#8-#8 ga. mesh
4-1 1/8" ϕ Rods to be added as shown. Two inner rods to be prestressed to 40,000 lbs. per sq. in. with two outer rods prestressed to 35,000 lbs. per sq. in.
3/4" Dowels on 18" centers. Dowels to be embedded 12 ins. in Gunite (2'-8" lg.)
Existing 5" Gunite Dome
Chip existing Gunite approximately as shown to provide clearance for stressing new rods
16"
12"
2'-7"
24"
2'-6"
1 1/2" Gunite inner lining
6"
SECTION THRU DOME
1 1/2" = 1'-0"
GUNITING DIAGRAM FOR DOME
Surface of existing dome to be cleaned before placing wire mesh and Gunite. Gunite shall be shot in sectors in order shown
MATERIALS - EACH TANK
10 pcs. - 1 1/8" ϕ rods - 31'-6" long - 60,000 lb. yield
10 pcs. - 1 1/8" ϕ " 31'-10" " " "
2700 sq. ft. 4"x4"x#8-#8 ga. mesh
Mc Farland
PROJECT 9733
REQUISITION NO. XPG 114 1/2
EQUIPMENT PIECE NO. 206-111
206-116
DUE PRINT FILE 6 5123
DATE DUP. NOV. 22 1943
SHEET 5 OF
CEMENT GUN COMPANY INC.
ALLENTOWN PA
PROPOSED DOME REPAIRS
PROJECT 9733 - BYINGTON TENN
Dwg. #700



SECTION SHOWING 4" LIQUID LEVEL DIP TUBE INSTALLATION
SECTION 'B-B'
PLAN
SECTION 'A-A'
SECTION SHOWING THERMOMETER WELL
SECTION SHOWING 4" VENT
SECTION SHOWING 12" CONNECTION
SECTION SHOWING 4" SPARE CONNECTION
SECTION SHOWING INLET PIPE
SECTION SHOWING OVERFLOW PIPE
SECTION SHOWING TANK GUTTER DRAIN
EQUIP. PC. No 206-111
EQUIP. PC. No 206-112
EQUIP. PC. No 206-113
EQUIP. PC. No 206-116
EQUIP. PC. No 206-115
EQUIP. PC. No 206-114
FOR AIR PIPING TO LIQUID LEVEL INDICATORS SEE PLOT PLAN W-68331
IN NO CASE IS THERE TO BE MORE THAN 6 FT. OF EARTH OVER ANY PART OF TANK ROOFS.
NOTE: ALL CHEMICAL WARE PIPE JOINTS TO BE PACKED WITH 1/2" Ø TWISTED ASBESTOS ROPE, J-M STYLE No 4200 AZ EQUAL, AND SEALED WITH ATLAS MINERAL PRODUCTS CO. "G-K" JOINT COMPOUND. WHERE METAL PIPES PASS THROUGH C.W. PIPE SLEEVES THE JOINTS ARE TO BE PACKED AND SEALED AS SPECIFIED ABOVE. ALL CHEMICAL WARE PIPE IS TO BE SUPPORTED TO PREVENT MECHANICAL INJURY.
NOT CLASSIFIED
R. B. Briggs
CLINTON ENGINEER WORKS
BLDG No 206
50 FT. DIA. TANKS AR2 GT.
PLAN & SECTIONS
REVISIONS
REFERENCE DRAWINGS
CONCRETE
PLOT PLAN
ELECTRICAL
ENGINEERING DEPARTMENT
V-68334

W-68336



General Notes:-
Concrete to develop 2500#/□" at 28 days
For Elev. of Tank (inside) Bott. See Map

Note:- E.P. 206-101, 104, 105, 110, 120, 135, 136.
Slope pit floors 1/2" see Sec A-A
For pipe sizes and details refer to W-68339, W-68335, W-68068 W-68331
Coat interior walls with one coat of Carbozite Concrete primer and two finished coats of Carbozite, Standard Black or approved equal
For typical detail of concrete encasement (C.W. pipes) see W-68332

THIS DRAWING HAS BEEN FURNISHED BY S. I. M. PORT M. HERSHEY & CO. THE INFORMATION AND DESIGN HERE THEREON MAY NOT BE USED NOR THE DRAWING REPRODUCED WITHOUT THE WRITTEN PERMISSION OF M. PORT. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING VENDOR'S SHOP DRAWINGS, SHALL BEAR OR REFER TO THIS STAMP.

CLINTON ENGINEER WORKS
BLDG "206
CONCRETE
FOUNDATIONS AND DETAILS

NOT CLASSIFIED
R. B. Briggs

PROJ. NO.	REVISIONS	MADE BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
9733	Dimension "D" for Wall and E.P. 206-116 added	J.E. Waltz	3-16-43	[illegible]	3-16-43	[illegible]	3-16-43
9733	8" Pipe 206-105 added	M. Ziles	3-16-43	[illegible]	3-16-43	[illegible]	3-16-43
9733	Detail of pipe and pipe gutter revised & another added	M. Ziles	3-17-43	[illegible]	3-17-43	[illegible]	3-17-43
9733	Dimensions E.P. 206-116 changed & E.P. 206-135 added	M. Ziles	3-18-43	[illegible]	3-18-43	[illegible]	3-18-43
9733	E.P. 206-135, 136 added	M. Ziles	3-26-43	[illegible]	3-26-43	[illegible]	3-26-43

REFERENCE DRAWINGS

W-68343	Arrgt Quonset Tanks
W-68335	Arrgt Pipe Valves No. 206-101, 104, 105, 110, 135
W-68331	Plot Plan Arrgt
W-68332	Arrgt Pit & Pc. 206-104
W-68068	Arrgt Catch Tank
W-68351	

PROJ. NO. 9733
SCALE 1/16" = 1'-0"
DRAWN BY J. E. Waltz 3/26/43
CHECKED BY [illegible] 3-16-43
APPROVED BY [illegible] 3-31-43
APPROVED BY [illegible] 4-5-43

ENGINEERING DEPARTMENT
W-68336

C 201660

OAK RIDGE NATIONAL LABORATORY

PROCESS WASTE

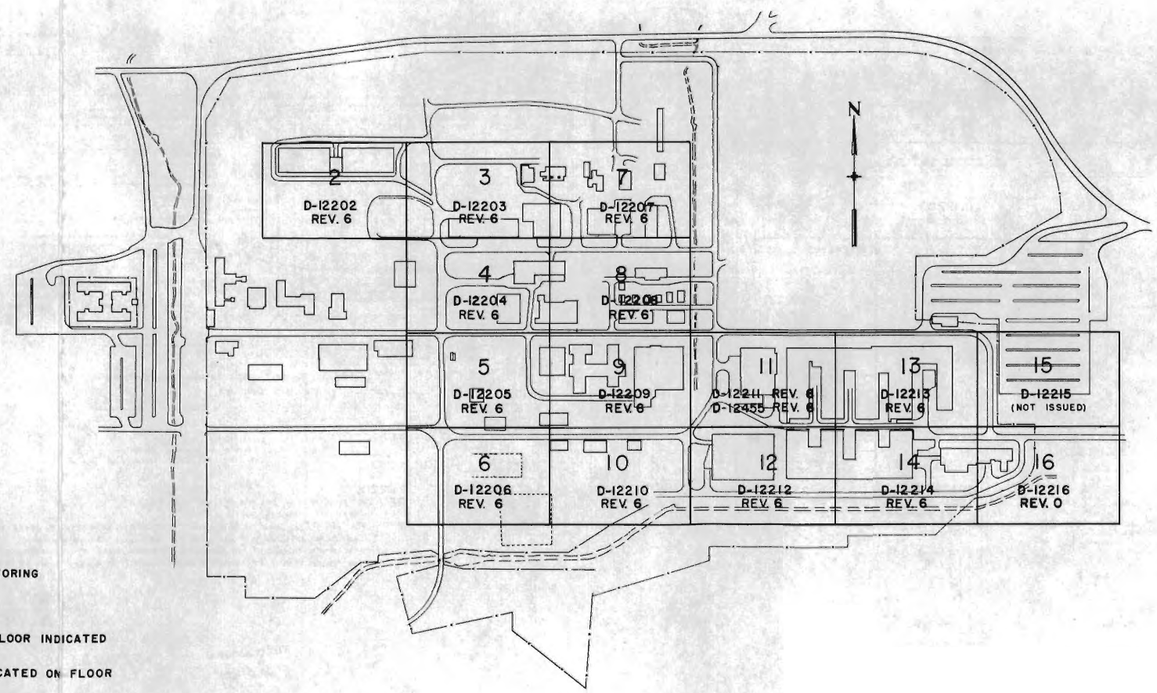
COLLECTION, RETENTION AND DISPOSAL SYSTEMS

LEGEND

- ● FLOOR DRAIN
- ○ SINK, TABLE OR HOOD DRAIN
- ⊗ DRINKING FOUNTAIN
- ▲ ROOF OR CONDENSATE DRAIN
- H HEATER
- V VENTILATION EQUIPMENT
- ▽ OVERFLOW DRAIN
- ● SUMP
- ⊚18 MANHOLE OR DRY WELL AND NUMBER
- ▬ JET PIT
- ▭ VALVE BOX
- ▥ CATCH BASIN
- ↑ VALVE
- ⊕ PUMP
- ⊗ MANHOLE WITH FLOW AND ACTIVITY MONITORING FACILITIES
- —o— TRAP
- o1, 1, 2, OR 3 OR ●1, 1, 2, OR 3 — FIXTURE LOCATED IN BASEMENT OR ON FLOOR INDICATED BY NUMBER
- oH OR ●H — FIXTURE FOR WASTE TO TANK FARM (LOCATED ON FLOOR INDICATED)
- oP OR ●P — FIXTURE FOR WASTE TO EQUALIZATION BASIN OR SETTLING BASIN (LOCATED ON FLOOR INDICATED)

NOTE:

THIS ATLAS IS COMPLETE ONLY INSOFAR AS AVAILABLE INFORMATION PERMITS.



COMPILED AND PREPARED BY
DESIGN DEPARTMENT
ENGINEERING & MECHANICAL DIVISION

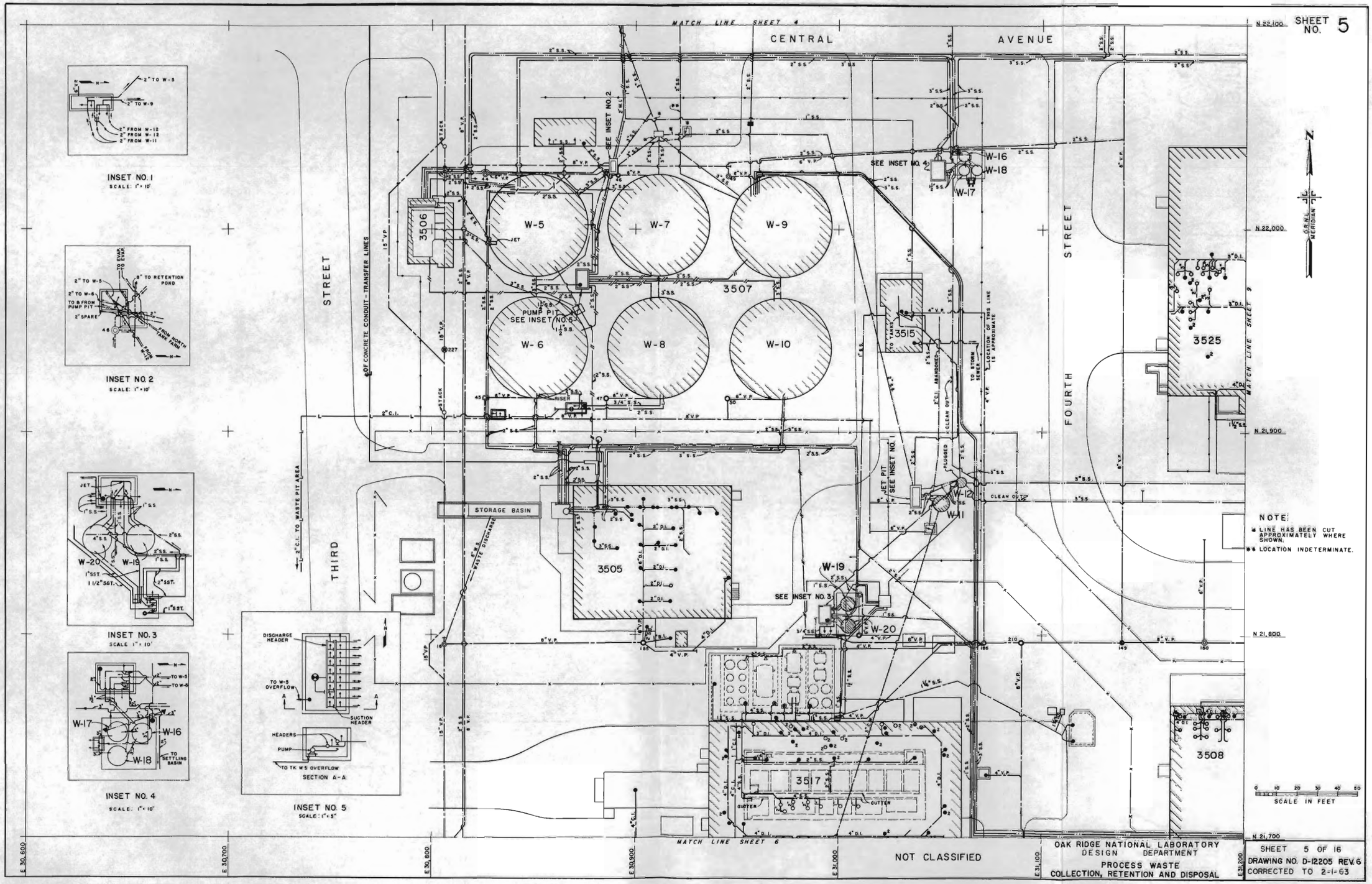
SUBMITTED ACCEPTED APPROVED

LEGEND

- —c— WASTE TRANSFER LINES BETWEEN 3019 & 3505
- — — — WASTE TO TANK W-1
- ——— WASTE TO TANKS W-3 & W-4
- ——— WASTE TO TANKS W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-12, W-16, W-17, W-18, W-19 & W-20
- —o— —o— WASTE TO TANKS W-13, W-14 & W-15
- ——/—— WASTE TRANSFER LINES ABOVE GROUND
- ——— WASTE TO EQUALIZATION BASIN AND / OR SETTLING BASIN
- ——·—— WASTE TO TANKS W-5, W-6, W-7, W-8, W-9, W-10, W-16, W-17, W-18, W-19, W-20, EQUALIZATION BASIN OR SETTLING BASIN
- ——=—— WASTE TO BUILDING 3505
- ——//—— WASTE TRANSFER LINES BETWEEN TANKS W-3, W-5, W-6, W-7, W-8, W-9, W-10 & BUILDING 3517
- L. LEAD PIPE
- S. S. STAINLESS STEEL PIPE
- W. S. WROUGHT STEEL PIPE
- V. P. VITRIFIED PIPE
- T. C. TERRA COTTA PIPE
- C. W. CHEMICAL WARE PIPE
- C. I. CAST IRON PIPE
- D. I. DURIRON PIPE
- W. I. WROUGHT IRON PIPE
- A. C. PIPE AT CEILING

NOT CLASSIFIED

SHEET 1 OF 16
DRAWING NO. D-12201 REV. 6
CORRECTED TO 2-1-63


SHEET NO. 5
MATCH LINE SHEET 4
CENTRAL AVENUE
FOURTH STREET
THIRD STREET
MATCH LINE SHEET 9
MATCH LINE SHEET 6
INSET NO. 1
SCALE: 1" = 10'
INSET NO. 2
SCALE: 1" = 10'
INSET NO. 3
SCALE 1" = 10'
INSET NO. 4
SCALE: 1" = 10'
INSET NO. 5
SCALE: 1" = 5'
W-5
W-6
W-7
W-8
W-9
W-10
W-11
W-12
W-16
W-17
W-18
W-19
W-20
3506
3507
3505
3515
3517
3525
3508
STORAGE BASIN
PUMP PIT SEE INSET NO. 5
SEE INSET NO. 2
SEE INSET NO. 3
SEE INSET NO. 4
JET PIT SEE INSET NO. 1
SECTION A-A
NOTE:
* LINE HAS BEEN CUT APPROXIMATELY WHERE SHOWN.
** LOCATION INDETERMINATE.
SCALE IN FEET
NOT CLASSIFIED
OAK RIDGE NATIONAL LABORATORY
DESIGN DEPARTMENT
PROCESS WASTE
COLLECTION, RETENTION AND DISPOSAL
SHEET 5 OF 16
DRAWING NO. D-12205 REV. 6
CORRECTED TO 2-1-63