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DRAFT FINAL REPORT FIREFIGHTER TRAINING AREA, LIGHTER AMPHIBIOUS
RESUPPLY CARGO (LARC) 60 MAINTENANCE AREA, AND AUTO CRAFT AREA FORT
STORY VA
9/1/1994
INTERNATIONAL TECHNOLOGICAL CORPORATION



INTERNATIONAL
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CORPORATION

August 24, 1994

Project No. 519029

U.S. Army Corps of Engineers
CEMRO-ED-ER (Hubbard)
215 North 17th Street
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Fire Training Area No. 4 and LARC Area
Fort Story, Virginia
Contract No. DACW45-90-D-9002
Delivery Order No. 55

Dear Mr. Hubbard:

IT Corporation (IT) is pleased to submit three (3) copies of the draft final report for the Fort Story project, Contract No. DACW45-90-D-9002 and Delivery Order No. 55.

Should you have any questions or comments regarding this report, please contact me at (412) 858-3987.

Sincerely,

Thomas P. Mathison
Project Manager

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**FINAL REPORT
FIRE TRAINING AREA NO. 4 AND LARC AREA
FORT STORY, VIRGINIA**

**CONTRACT NO. DACW45-90-D-9002
DELIVERY ORDER NO. 55
IT PROJECT NO. 519029**

PREPARED BY:

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AUGUST 1994

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1.0 Executive Summary

This final report has been prepared by IT Corporation (IT) for the U.S. Army Corps of Engineers (USACE), Omaha District, and presents a summary of the remediation activities which have taken place at the Fire Training Area No. 4 and at the Lighter Amphibious Resupply Cargo (LARC) Area at the Fort Story Military Reservation in Fort Story, Virginia. This project was performed in response to Rapid Response Contract No. DACW45-90-D-9002 and Delivery Order No. 55. Project Activities were performed during the period of April, 1993 through May, 1994 and consisted of the following tasks:

- Prepare the site for remedial activity including the construction of an equipment decontamination pad.
- Remove and containerize the Fire Training Pit (FTP) materials, including water, concrete, and debris
- Excavate the contaminated soils beneath the concrete pad down to the water table and transport to the LARC area for treatment
- Remove a monitoring well at the edge of the FTP
- Backfilling of the FTP excavation including the installation of a gravel recovery trench
- Disposal of approximately 110 tons of soil previously stockpiled adjacent to the LARC area which had been generated during an underground storage tank (UST) removal action.
- Design and install an in-situ bioremediation program for the treatment of total petroleum hydrocarbons (TPH) contaminated soils at the LARC Area.
- Bioremediate the soils within the Larc Area a target level of 50 parts per million (ppm) TPH.
- Conduct a comprehensive sampling and analytical program to confirm the result of the bioremediation effort.
- Transportation and disposal of all wastes generated during the removal of the FTP and the treatment of the soils within the LARC Area.

The remainder of Chapter 1.0 of this report discusses a brief background of the sites to be addressed during this Delivery Order. Chapter 2.0 summarizes the field activities which took

place at each site and the current condition in which each was left. Chapter 3.0 provides the conclusion to this document.

1.1 Site Background

Fort Story is located near Virginia Beach, Virginia on the Cape Henry Peninsula and the Atlantic Ocean. The Fire Training Area No. 4 is located in the southwestern section of Fort Story, along Hospital Road and adjacent to the fuel farm. Prior to 1980, the area was utilized for fire training exercises which consisted of extinguishing JP-4 aviation fuel which was released directly on the surface soils. The releases were extinguished by a mixture of firefighting foam and water. In 1980, the concrete fire pit was constructed to be utilized for the training exercises. Approximately once per month the pit was filled with several inches of water and a mixture of JP-4 fuel, contaminated fuels, and hydraulic fluid. The mixture was set on fire and extinguished using fire fighting foam. Once the fire was extinguished, the residues were left for natural evaporation.

The LARC Maintenance Area is located off Atlantic Avenue and ^FLingyan Gulf Road and is adjacent to Buildings 1088 and 1089. The Larc Area is the maintenance and wash rack area for the ^ALighter Amphibious Resupply Vehicles. The wash rack area is approximately 200 feet by 400 feet and has been used to park the LARC vehicles during maintenance periods. ^R

2.0 Project Summary

2.1 Advance Sampling

^DPrior to the on-site remedial activities commencing, an advance sampling trip was conducted on January 21, 1993. A sample of the FTP water was collected and analyzed for semivolatiles, total metals, volatile organics, pesticides/polychlorinated biphenyls (PCBs), flashpoint, and total cyanide. The purpose of this sampling effort was to determine the parameters of concern in order to dispose of the water. The FTP water exhibited non-detect levels for most parameters tested, however elevated levels of calcium, iron, magnesium, sodium and potassium were detected.

Three soil samples were collected in the vicinity surrounding SB-117 in the LARC area and analyzed for toxicity characteristic leaching procedure (TCLP) lead. The results of this

analysis showed concentrations of 0.765, 0.138, and 2.54 ppm for these samples. This analysis was requested to ensure that hazardous levels of lead did not exist at the site and would not present a problem during soil treatment.

On April 3, 1993, one composite soil sample was collected from the existing stockpile of soil which required disposal and was analyzed for volatile organics, TCLP metals, reactive cyanide, reactive sulfide, pH, ignitability, paint filter test, TCLP volatile compounds, TCLP semivolatile compounds and PCB's. The purpose of this sampling effort was to determine the contaminants present in order to arrange disposal of these soils.

The detected parameters observed for these samples are detailed in Table 3. The Certificates of Analysis are included in Appendix H.

2.2 Site Preparation

The initial site preparation activities included the receiving of five 30 cubic yard rollofs for concrete debris and the acceptance of the heavy equipment which was required for the demolition of the FTP. Due to the short duration anticipated for the removal of the FTP, a fully functional support zone was not prepared.

2.3 Fire Training Pit (FTP) Removal

The concrete FTP was approximately 40 feet by 40 feet with a 20-foot square gravel pit on the interior (Figure 1). The interior pit was estimated to be 4 feet deep with approximately 2 feet of 2-inch gravel at the surface of the pit. The thickness of the concrete varied from approximately 18 inches at the edge to 8 inches at the interior.

2.3.1 Removal of FTP Water and Gravel

The FTP contained water which was determine to be non-hazardous through the advance sampling effort. This water required disposal prior to removal of the concrete and the underlying soils. In order to begin pumping the water, several tree branches and debris was removed from the pit. A vacuum truck from PetroChem, Inc. was utilized to remove the water and dispose of it off site.

The gravel within the pit was removed and placed on the concrete apron. The gravel was then pressure washed using a high pressure washer to remove any remaining fuel or

petroleum contamination. The wash water was collected with a vac truck by Petrochem and disposed of off site. The gravel was placed in a rolloff container for proper off-site disposal.

The concrete apron and pit walls were pressure washed in a similar manner prior to beginning demolition. A total of approximately 6,800 gallons of water was removed from the fire pit during the remedial action.

2.3.2 Demolition of the FTP Concrete

The concrete fire pit was demolished using a 580 Case backhoe equipped with a hoe ram. The concrete was broken into manageable pieces and loaded into rolloffs for off-site disposal. A total of five rolloffs were loaded with concrete from the FTP.

2.3.3 Removal of the TPH-Contaminated Soils

After removal of the concrete apron, the underlying soils were excavated and temporarily stockpiled. Three holding cells measuring approximately 40 feet by 40 feet were constructed on the east, north and west side of the fire training pit. These cells were lined with double 6 mil polyethylene and bermed to contain the soils. Approximately 550 tons of soil was excavated from the FTP and placed in the cells to be transported later to the LARC area for treatment. The excavation measured approximately 43 feet by 43 feet by 6 feet deep upon completion.

2.3.4 Sampling and Analytical Testing

2.3.4.1 Field Screening

After the completion of the contaminated soil removal from the FTP, field screening of the remaining soils was conducted. A HNU/Hanby field test kit was utilized to check for the presence of TPH contamination. A total of 12 tests were run within the excavation of the pit and the results ranged between 10 to 1,000 ppm TPH. The high result was found in the southwest corner of the excavation.

2.3.4.2 Confirmation Sampling

Confirmation samples within the FTP were collected prior to backfilling. A sample was collected from each sidewall of the excavation and sent off site for analysis. The samples were analyzed for TPH, metals, volatile organics and semivolatiles. The detected parameters

for these samples are detailed in Table 4. The Certificates of Analysis for these confirmation samples are found in Appendix H.

2.3.4.3 Additional Sampling

Due to the discovery during the excavation of the FTP of some old electrical parts, several samples were collected and sent to a local laboratory, Solutions Laboratory in Chesapeake, Virginia, to be analyzed for PCBs. The analysis showed no presence of PCBs and no special handling of the soils was required. The Certificates of Analysis for these samples are included in Appendix H.

2.3.5 Backfilling and Regrading

After the collection of the confirmation samples, the excavated area was backfilled using 3/4-inch stone. The purpose of this was to provide a recovery trench in which to recover any free product which may show up in the future. A total of 547 tons of stone was placed as backfill in the excavated pit. The area surrounding the FTP was regraded to its original condition. The stockpiled soils were covered with 6 mil polyethylene and secured.

2.3.6 Additional Excavation

After receipt of the confirmation results, it was discovered that additional contamination may be present outside the limits of the original excavation. Six additional soil samples were collected and analyzed for TPH. Figure 1 shows the location where these samples (A-F) were collected. Based on the results of this sampling effort, the decision was made to excavate additional material along the east edge of the pit and transport this soil to the LARC area for treatment. An area approximately 40 feet long by 5 feet wide was removed. This area was then backfilled with gravel in a similar manner as before. No further action was undertaken at the FTP site.

2.3.7 Site Teardown and Equipment Decontamination

The soils stockpiled in the holding cells were transported to the LARC area utilizing tri-axle dump trucks. Once the soil was removed, the polyethylene liner within the cells were removed and placed in a rolloff for disposal. The earthen berms were leveled and graded to match the surrounding contours. No revegetation of this area was required.

All equipment utilized during the FTP demolition was cleaned prior to removal from the site. The buckets and tracks were cleaned of the heavy soils utilizing shovels and brushes. All equipment was then inspected by the USACE on-site representative and the IT site supervisor prior to release.

2.4 UST Soil Disposal

The stockpiled soils which were generated during a previous UST removal project were disposed of as part of this Delivery Order. These soils were staged adjacent to the LARC area to the north of the wash rack. The soils were thought to be considered F-listed wastes based on the contents of the tanks which were previously removed.

One composite sample was collected from the stockpile and analyzed for volatile organic compounds, TCLP volatiles, TCLP semivolatiles, benzene, toluene, ethylbenzene, and xylene (BTEX), PCB,s, reactive cyanide, reactive sulfide, pH, ignitability, and paint filter test. The results of this analytical were utilized to arrange disposal of these soils.

The soils were manifested, loaded and hauled to Laidlaw Environmental Services Inc. in Pinewood, South Carolina. A total of 110.74 tons of soil was disposed of on October 21 and 27, 1993.

The Certificates of Analysis are included in Appendix H of this report and the profiles and manifests are included in Appendix D.

2.5 LARC Area Bioremediation

2.5.1 Site Preparation

The initial activities conducted in preparation of the bioremediation activities included the installation of the site support facilities, the installation of construction fencing to isolate the site, the installation of several wells, the erection of a large pool to contain the inoculants required for the project, and to mobilize all the necessary heavy equipment and pumps required.

2.5.1.1 Well Installation and Pump Test

In order to conduct an analysis of the groundwater characteristics in the area of concern, six wells were installed within the boundaries of the LARC area. Five 2-inch monitoring wells were installed and one 4-inch well was installed. These wells were utilized to obtain the necessary data required in order to design a pumping system for the project.

The optimum number of recovery wells and pumping rates needed to be determined to provide hydraulic isolation of the site. This would ensure that the biological treatment which was conducted on the site would be maintained within the boundaries of the LARC area.

The Shallow Aquifer Analysis report which details this investigation is included as Appendix G of this report.

2.5.1.2 Pool Installation

A portable holding pool was erected on the site in order to contain the inoculants which were specifically bred for this bioremediation effort. The area required to place the pool was leveled with a bulldozer prior to erection. The 40-foot by 100-foot pool consisted of a steel frame and a plastic liner which was erected in several days. The pool was about four feet deep and could contain approximately 120,000 gallons of water.

An air supply system consisting of perforated piping and pumps was installed in the pool in order to provide oxygen to the inoculants which would be placed in the pool.

2.5.2 Bioremediation of LARC Area Soils

The initial work at the site consisted of the transfer of approximately 38,000 gallons of the biological inoculant from the Solutions Laboratory where it was prepared to the on-site pool. The concentrated solution was transferred utilizing tanker trucks and pumped into the pool. Additional water was also placed into the pool from Monitoring Well No. 5. This solution would be utilized as the primary biological treatment for the site.

Excavators, bulldozers, pumps, generators and light plants were mobilized to the site to be used in the treatment process.

The original remediation program was to consist of hydraulic isolation of the site and to create a cone of depression. The solution containing the microorganisms and inoculants would be placed over the site and would migrate to the depressed groundwater. This would then be pumped out through an oil-water separator to remove the oil. The water would then be placed in holding tanks to adjust the pH, aeration, and nutrient and microorganism enrichment. The water would then be placed back onto the site for another cycle of capturing, consuming and moving the contaminants within the site. Another important part of the remediation process is the physical movement of the soils to break up pockets of heavy contamination and to completely expose the soils to the inoculated solution.

During the initial investigation of the site, several pits were excavated to locate pockets of heavy contamination and to examine the soil characteristics of the site. During this investigation, the pits exhibited very unstable conditions and the appearance of "running" sand in the base of the excavation. Due to this condition, Solutions Environmental technical staff thought this condition would not provide sufficient holding time for the inoculant to sufficiently work on the soils. The decision was made to erect the pool to use as the inoculating and mixing tank in order to accomplish thorough contact of the soils.

Prior to placement of the soils in the pool, the debris present was required to be removed. This was initially attempted to be done manually and with the equipment but the quantity of debris was excessive. Two large steel screens (with 3/4-inch and 1-1/2-inch openings) and containers were fabricated and delivered to the site. The soil was placed through the screens to remove the debris. The debris was segregated on the site for later disposal. These screens were utilized for only the initial soil processing phase.

The soil from the initial screening operation was placed in the pool with the inoculation solution. This mixture was then mixed and aerated using a slurry pump. After sufficient agitation and holding time, the slurry was pumped from the pool into holding pits. This scenario was followed for the first few batches of soil to be treated. As the work progressed, the mixing and pumping of the soil in the pool became very difficult due to the debris passing the screening operation and the heavy slurry which was produced. Another change in the process was attempted.

The decision was made to excavate pits throughout the LARC area and use them as the mixing ponds. The pool would be used to contain the inoculant, and a series of trenches would be dug to transport the solution to the various pits. The contaminated soils would be placed in the pits and would mixed using the excavator and the slurry pumps. The slurry would then be pumped from the pit to a stockpile area to drain. The clean soil was transported to another stockpile to be analyzed prior to being placed in an excavated area.

A total of six pits were excavated for the treatment of the soil. Pit #2 was lined with a high density polyethelene (HDPE) liner and used to handle the heavily contaminated soils. As the soils were processed in the pits, the oils and floating greases would float to the surface. This oil was then removed using a local oil recycling company vacuum truck and transported off site for proper disposal. A total of 2,800 gallons of oil, grease and oily water was disposed of in this manner. The sludge which accumulated in pit #2 was also collected and disposed by a local waste oil recycler. A total of 5,800 gallons of sludge was removed from the site during the remediation of the site.

2.5.3 Problems Encountered

Several problems arose during the bioremediation of the LARC area. A major problem was the presence of the debris found beneath the surface. This debris consisted of railroad ties, coal particles, roadbed materials, ballast stone, metal piping, concrete slab sections and other miscellaneous materials. The handling and separation of this material from the soils required additional steps which added to the cost and duration of the bioremediation effort.

The other major problem encountered was the presence of the a considerable amount of heavily contaminated soil which was not anticipated. This soil contained heavy oils and grease compounds which were very difficult to treat with the process designed.

During the remediation effort, a 2-inch pipe was discovered in zone 6-D/E/F which was abandoned. During interim sampling in this area, kerosene was thought to be present in the soils. This was thought to have come from the previous maintenance operations at the site. Later confirmation sampling in this area determined that the kerosene was no longer present and was probably consumed by the microorganisms which were placed in this area. Further discussion of this sampling effort is included in Section 2.5.5.

A phone cable was found to intersect the LARC area in the eastern portion. This cable was carefully exposed to determine its exact location and then relocated by the Base utility company. This caused a slight delay in the activities planned for this area of the site.

2.5.4 Bioremediation Results

The efforts of Solutions Environmental in the bioremediation of the LARC area resulted in a significant reduction in the contamination levels present. During the course of the work, Solutions collected and analyzed soil samples to check the progress of the bioremediation. Upon completion of the work, Solutions was required to collect 60 confirmation samples selected randomly.

The results of Solutions sampling indicated that the majority of the site was below the target level of 50 ppm TPH. Of the 60 samples, only four samples were above the stipulated target level. The results are detailed in the Solutions letter to IT dated August 30, 1993 and included in Appendix A of this report.

During this confirmation effort, duplicate samples were collected and shipped to IT Analytical Services (ITAS) in Austin, Texas. The results obtained from these duplicate samples varied significantly from the results reported by Solutions Laboratory. Table 5 summarizes the results obtained from each lab for the duplicate samples. Of the results reported by ITAS, only two samples indicated that the target level of 50 ppm had been achieved. Solution's results showed that all of the samples were below the required action level.

This discrepancy in the analytical results presented a major problem with the verification of the actual contamination left at the site. The methods and procedures of Solutions Laboratory were questioned and reviewed. During the review process, the decision was made to collect additional samples and send to a third party lab for analysis. The lab chosen, EA Laboratories of Sparks, Maryland is a USACE Missouri River Division (MRD) approved laboratory. Three samples were collected from previously sampled locations and sent to EA Laboratories for analysis. The results of these analysis (Table 6) indicated that the ITAS results were more representative of the contamination levels remaining at the site.

2.5.5 Confirmation Sampling

In order to fully evaluate the extent of contamination which remained after the bioremediation effort was concluded, a full scale confirmation sampling effort was conducted. A total of 120 sample points were chosen, 30 points from each of four levels; the surface, 2-foot, 3-foot, and 4-foot levels. Each sample was analyzed for TPH using three methods; 418.1, method 8015 - diesel, and Method 8015 - gasoline. The results of these samples are detailed in Figures 3 to 14.

The results of the confirmation samples show that the TPH contamination for the LARC area vary from nondetect to a high concentration of 4800 ppm. The results vary significantly based on the analytical method and the depth of the sample. Overall, the average TPH concentration of the site based on the confirmation samples is approximately 751 ppm using the 418.1 method and 229 ppm for the 8015 - diesel method. The 8015 - gasoline method showed non-detect readings for the entire site.

2.5.6 LARC Area Current Status

Based on the results of the confirmation sampling, the TPH contamination levels of the LARC have been significantly reduced by the bioremediation effort. Although the results of the work did not meet the target action level of 50 ppm, the source of the contamination has been removed from the area. The fact that significant amounts of oil and grease were removed during the project, as well as the confirmation results which indicate that the lighter-end hydrocarbons are no longer present, show that the bioremediation effort was quite successful. The heavier hydrocarbon compounds which remain at the site (as indicated by the confirmation sampling) could be from the coal or grease constituents which were found during the bioremediation work.

The site has been regraded back to its original condition to be utilized by the Base. The overall visual appearance of the area is significantly improved as a result of this work.

2.5.7 Transportation and Disposal

During the course of this project, several waste streams were generated that required off-site disposal. The wastes consisted of the following:

Fire Training Pit. The concrete and rock which was removed from the FTP was loaded into five rollofs (approximately 100 cubic yards) and transported to the BFI, Inc. landfill in Chesapeake, Virginia.

The water which was removed from the FTP was disposed of by PetroChem, Inc. of Norfolk, Virginia. A total of approximately 6,800 gallons were removed and disposed of as oil contaminated water.

UST Soils. Approximately 110.74 tons of soils were profiled, manifested, and transported to the Laidlaw Environmental Services, Inc. facility in Pinewood, South Carolina.

LARC Area. During the bioremediation work, approximately 2,800 gallons of oil, grease, and oily water was disposed of by PetroChem, Inc. An additional 5,800 gallons of sludge was removed and disposed by C & M Waste Oil of Chesapeake, Virginia.

The manifests and disposal records for each of these waste streams are included in Appendix D of this report.

3.0 Conclusions and Recommendations

The demolition of Fire Training pit No. 4, the disposal of the UST soils, and the bioremediation of the LARC area at Fort Story was conducted by IT from April 13, 1993 through March 28, 1994. The purpose of this project was to demolish the FTP including disposal of wastes and backfilling, the off-site disposal of soils generated during a previous UST removal project, and the bioremediation of the LARC area soils for TPH to a target level of 50 ppm. To this end, the remedial activities included the following:

- Advanced sampling of the anticipated waste streams at the FTP and the UST soils. Also sampling of the LARC area to confirm lead levels were not considered to be hazardous.
- The preparation of the site for remedial activities by mobilizing the necessary equipment and personnel.
- Disposal of the water within the FTP, demolition and disposal of the concrete apron, excavation of soils and transportation to the LARC area, confirmation sampling and analysis, and backfilling of the site with gravel.

- Profiling, manifesting, loading and transporting of approximately 110.74 tons of the UST soils to an approved disposal facility.
- The bioremediation of approximately 15,000 cubic yards of soil at the LARC area utilizing inoculants, aeration and heavy equipment.
- The collection and analysis of confirmation samples at the LARC area to adequately characterize the current condition of the site.
- The regrading of the LARC area to preremedial conditions.

The intent of this project was to remove the sources of TPH contamination from the FTP and the LARC areas at Fort Story. The FTP concrete was demolished and hauled off-site for proper disposal while the soils from the FTP were excavated and hauled to the LARC area for treatment. The soils within the LARC area were treated using bioremediation techniques from the surface down to the groundwater table which was approximately four feet.

The bioremediation effort did not reduce the TPH concentrations in the soil to the 50 ppm target level, however, the contamination was significantly reduced. Several factors may have led to the higher readings after biological treatment including the presence of constituents which were not anticipated to be present. These included heavy grease and oil compounds, coal particles and possibly kerosene. As was demonstrated through the confirmation sampling, the lighter end compounds were remediated from the site and these are the constituents which would tend to move and spread contamination. The heavier compounds which remain at the site and the concentrations present do not pose a significant threat to human health. Based on the intended use of the site and the fact that this area is relatively isolated from the general public, IT recommends that no further remediation take place at the site.

In conclusion, this project accomplished the intended goals which were established in the original scope of services. Although the effort did not meet the target levels set for the site, the contamination was significantly reduced and the site has been left in a more stable condition.

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TABLES

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**Table 1
Project Points of Contact
Fire Training Area No. 4
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**Table 2
Summary of Samples Collected and
Parameters Analyzed**

Location	Quantity	Matrix	Parameters Analyzed
Advance Samples			
LARC Area	3	Soil	TCLP Lead
Fire Training Pit	1	Water	PCB/pesticides, BNA, cyanide, total metals, mercury, volatile organics, semivolatile organics
Stockpile Composite	1	Soil	General chemistry: reactive cyanide, reactive sulfide, pH, ignitability, paint filter liquids test, TCLP metals, volatile organic compounds, TCLP volatile compounds, TCLP semivolatile compounds, selected volatile organic compounds: benzene, toluene, ethylbenzene, total xylenes, PCB.
Project Samples			
Fire Training Pit	4	Soil/Sand	TPH, volatile organic compounds, semivolatile organic compounds, total metals.
Kerosene related	21	Sand/Soil	TPH-D
LARC Area Confirmation Samples	135	Soil	TPH, TPH-D, TPH-G

D

Table 3
Summary of Detected Parameters for Advanced Sampling

Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
Fire Training Pit	519029-W001	Q30109901	Arsenic	58.7 µg/L
	519029-W001	Q30109901	Barium	50.3 µg/L
	519029-W001	Q30109901	Calcium	7,000 µg/L
	519029-W001	Q30109901	Iron	1,480 µg/L
	519029-W001	Q30109901	Magnesium	823 µg/L
	519029-W001	Q30109901	Manganese	12.3 µg/L
	519029-W001	Q30109901	Potassium	5,560 µg/L
	519029-W001	Q30109901	Sodium	4,590 µg/L
	519029-W001	Q30109901	Heptachlor	0.03 µg/L
LARC Area Soil Sample	519029-5001	Q30109701	TCLP Lead	0.765 µg/L
	519029-5002	Q30109702	TCLP Lead	0.138 µg/L
	519029-5003	Q30403503	TCLP Lead	2.54 µg/L
Stockpiled Soils Soil Sample	SPC-01	Q30403501	TCLP Cadmium	0.006 mg/L
	SPC-01	Q30403501	TCLP Lead	0.15 mg/L
	SPC-01	Q30403401	Toluene	18 µg/L
	SPC-01	Q30403401	Methylene chloride	73 µg/L
	D	Q30403401 (Reanalysis)	Methylene chloride	46 µg/L

Table 4
Summary of Detected Parameters for Confirmation Samples for Fire Training Pit

Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
Fire Training Pit Soil Sample	1-13	B3-06-297-01	TPH	11 µg/L
	519029502	Q30416702	Xylenes (total)	2600 µg/L
	519029502	Q30416702	Napthalene	1600 µg/L
	519029502	Q30416702	2-Methylnapthalene	5700 µg/L
	519029502	Q30416702	Fluorene	1200 µg/L
	519029502	Q30416702	Phenanthrene	2300 µg/L
	519029502	Q30416702	Anthracene	2300 µg/L
	519029501	Q30416701	Total Barium	7.7 mg/L
	519029501	Q30416701	Total Chromium	2.2 mg/L
	519029501	Q30416701	Total Lead	10.9 mg/L
	519029502	Q30416702	Total Barium	5.6 mg/L
	519029502	Q30416702	Total Chromium	1.7 mg/L
	519029502	Q30416702	Total Lead	22.5 mg/L
	519029503	Q30416703	Total Barium	3.0 mg/L
	519029503	Q30416703	Total Chromium	1.2 mg/L
	519029504	Q30416704	Total Arsenic	1.1 mg/L
	519029504	Q30416704	Total Barium	8.1 mg/L
	519029504	Q30416704	Total Chromium	2.9 mg/L
	519029504	Q30416704	Total Lead	30.0 mg/L
	519029501	Q30416701	TPH	31 mg/L
	519029502	Q30416702	TPH	4000 mg/L
	519029507	Q30416704	TPH (analyzed in triplicate)	210//72/71 mg/L
	519029501	Q304-192-01	TPH	85 mg/L
	519029502	B3-04-192-02	TPH	1300 mg/L
519029504	B3-04-192-04	TPH	66 mg/L	

**Table 5
Confirmation Sample Results Comparison**

Grid Location	Solutions Sample ID	Solutions Result mg/kg	ITAS Sample ID	ITAS Result/mg/kg	
20-A-24"	01A1	3.58	20-A-24	ND 310	TPH-G TPH-D
19-E-48"	02A1	1.52	19-E-48	ND ND	TPH-G TPH-D
16-B-48"	03A1	<0.10	531-16-B-48	ND 780	TPH-D TPH-G
15-F-12"	04A1	<0.10	238-15-F-12	ND 240	TPH-G TPH-D
15-A-36"	05A1	31.9	393-15-A-36	ND 690	TPH-G TPH-D
14-A-48"	06A1	<0.10	518-14-A-48	ND 750	TPH-G TPH-D
13-E-12"	07A1	<0.10	223-13-E-12	ND 170	TPH-G TPH-D
238	08A1	37.6	238	ND 150	TPH-G TPH-D
18-D-5	09A1	<0.10	18-D-5	ND 150	TPH-G TPH-D
1-A-S	01A1	<0.10	1-A-S0101	ND 45	TPH-G TPH-D
3-F-S	02A1	<0.10	3F-S12402	ND 400	TPH-G TPH-D
4-A-S	03A1	<0.10	4-A-S0403	ND 120	TPH-G TPH-D
8-D-12"	04A1	<0.10	8-D-1220304	ND 65	TPH-G TPH-D
9-E-36"	05A1	3.99	9-E-3647105	ND 790	TPH-G TPH-D
11-B-24"	06A1	12.7	11-13-24-284	ND 380	TPH-G TPH-D

Table 6
Summary of Confirmation Sample Results from EA Laboratories

Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
Soil Sample Low Level Extraction	E-15-477	13369	TPH as motor oil	3700 mg/kg
	E-7-469	13370	TPH as motor oil	760 mg/kg
	C-10-304	13371	TPH as motor oil	320 mg/kg
	C-10-304 DUP	13371 DUP	TPH as motor oil	290 mg/kg
Soil Sample High Level Extraction	E-15-477	13360	TPH a motor oil	950 mg/kg
	E-15-477 DUP	13369 DUP	TPH as motor oil	940 mg/kg
	E-7-469	13370	TPH as motor oil	390 mg/kg
	C-10-304	13371	TPH as motor oil	240 mg/kg

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D R A F T

FIGURES

DRAWING NUMBER 519029-B1
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 APPROVED BY [Signature]
 NAM 19AUG94
 DRAWN BY [Signature]

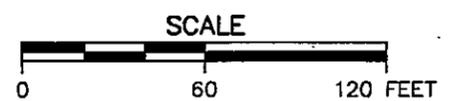
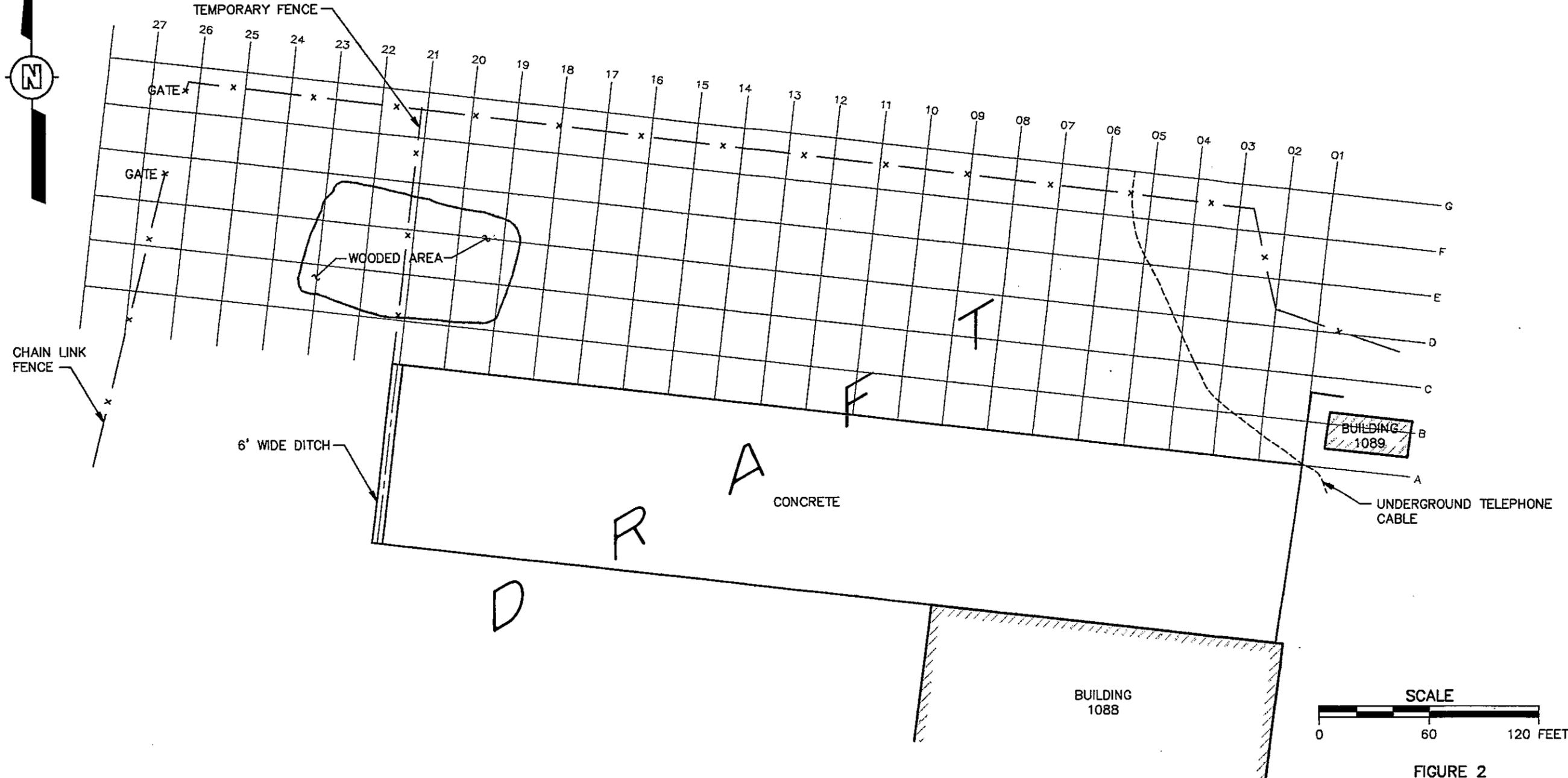


FIGURE 2
 LARC AREA PLAN
 FORT STORY
 VIRGINIA BEACH, VIRGINIA
 PREPARED FOR
 U.S. ARMY CORPS OF ENGINEERS
 OMAHA, NEBRASKA

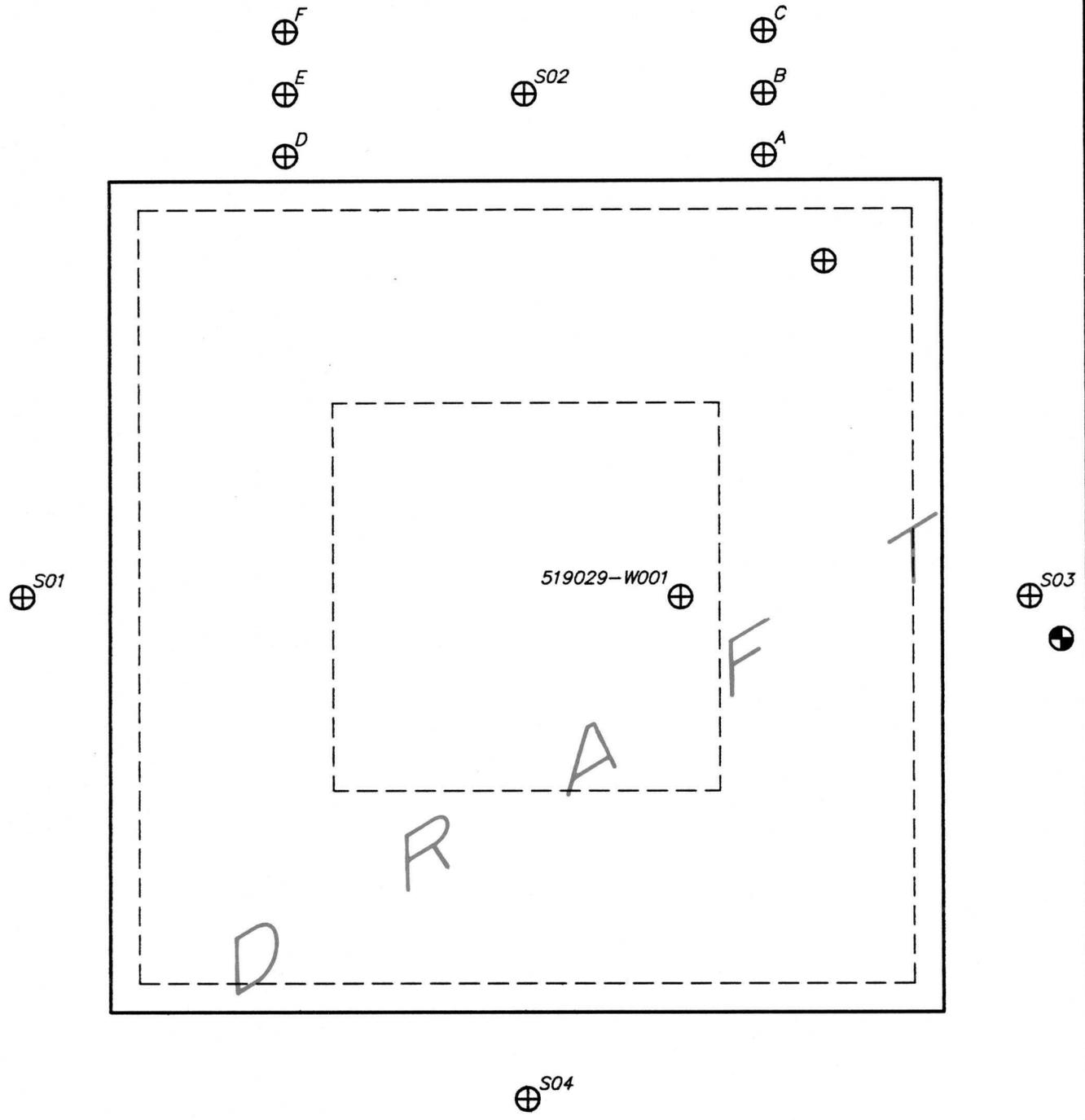


23 AUG 94
 2:56 PM

DF L

NAM	CHECKED BY	DATE
19AUG94	JPM	8/24/94
APPROVED BY		

DRAWING NUMBER 519029-A2



FIRE TRAINING PIT EXCAVATION

SCALE: 1/8" = 1'-0"

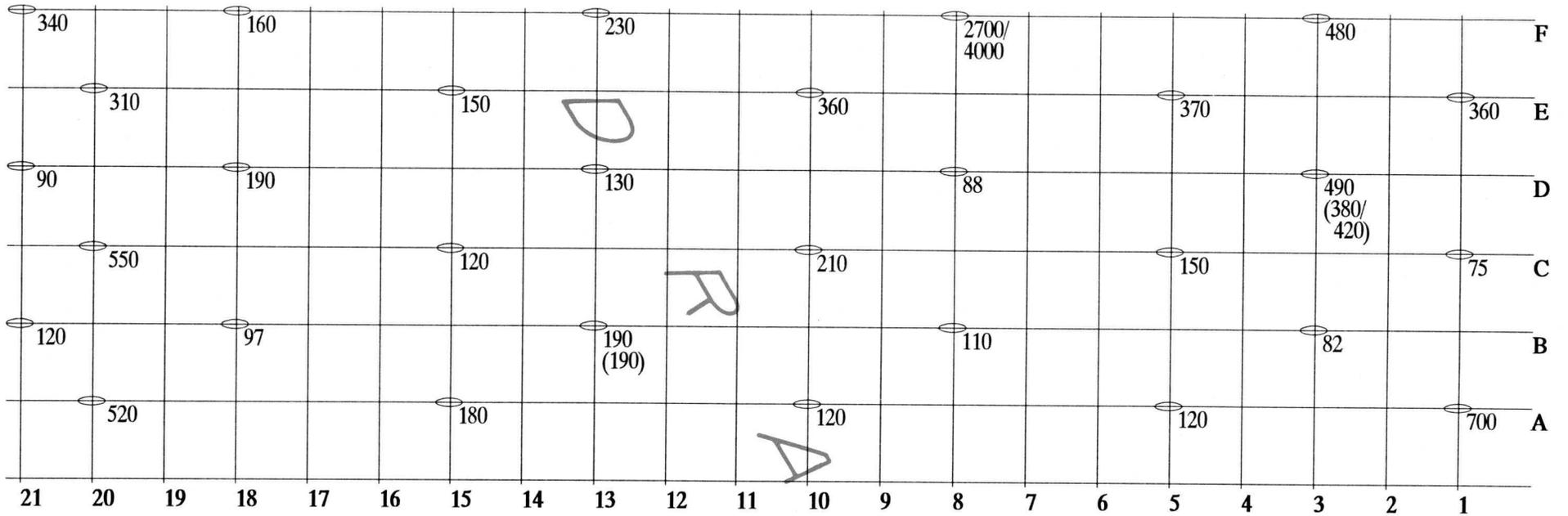
LEGEND:

- ⊕ SAMPLE POINT
- ⊕ MONITORING WELL
- BOUNDRY OF EXCAVATION (43' x 43')
- - - FORMER FIRE TRAINING PIT (40' x 40')

FIGURE 1
 FIRE TRAINING PIT EXCAVATION
 FORT STORY
 VIRGINIA BEACH, VIRGINIA
 PREPARED FOR
 U. S. CORPS OF ENGINEERS
 OMAHA, NEBRASKA



**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



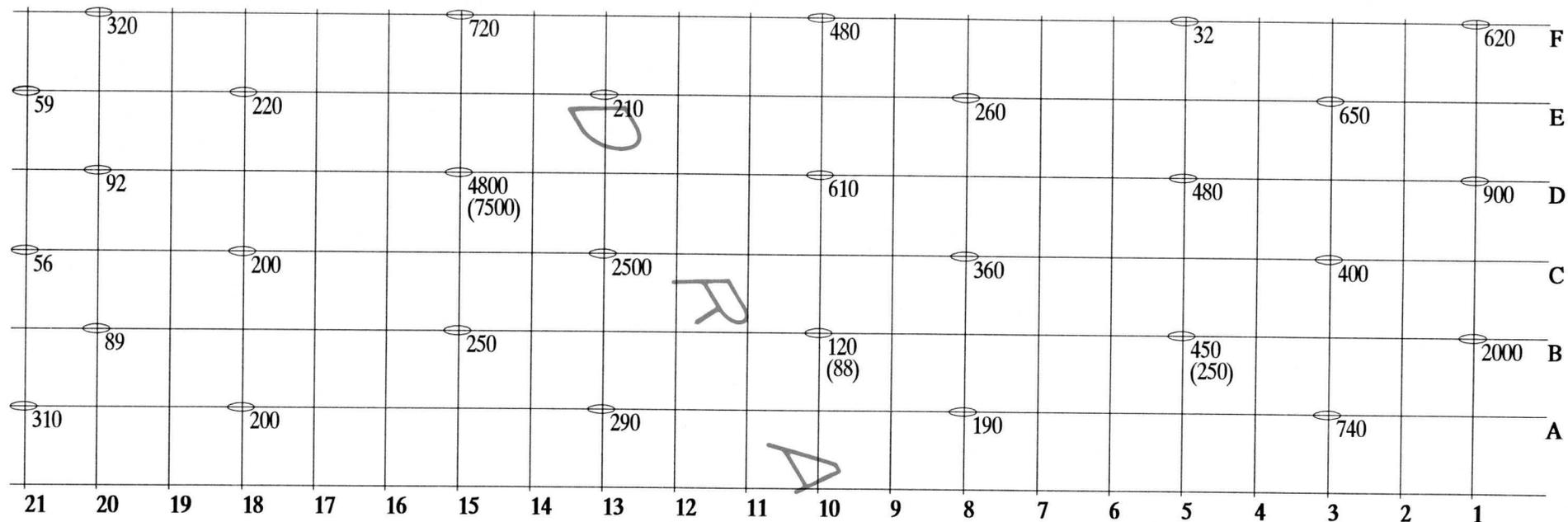
SUR_418.WK1\4-28-94

DEPTH: SURFACE
ANALYSIS METHOD: TPH 418.1

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 3

LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results



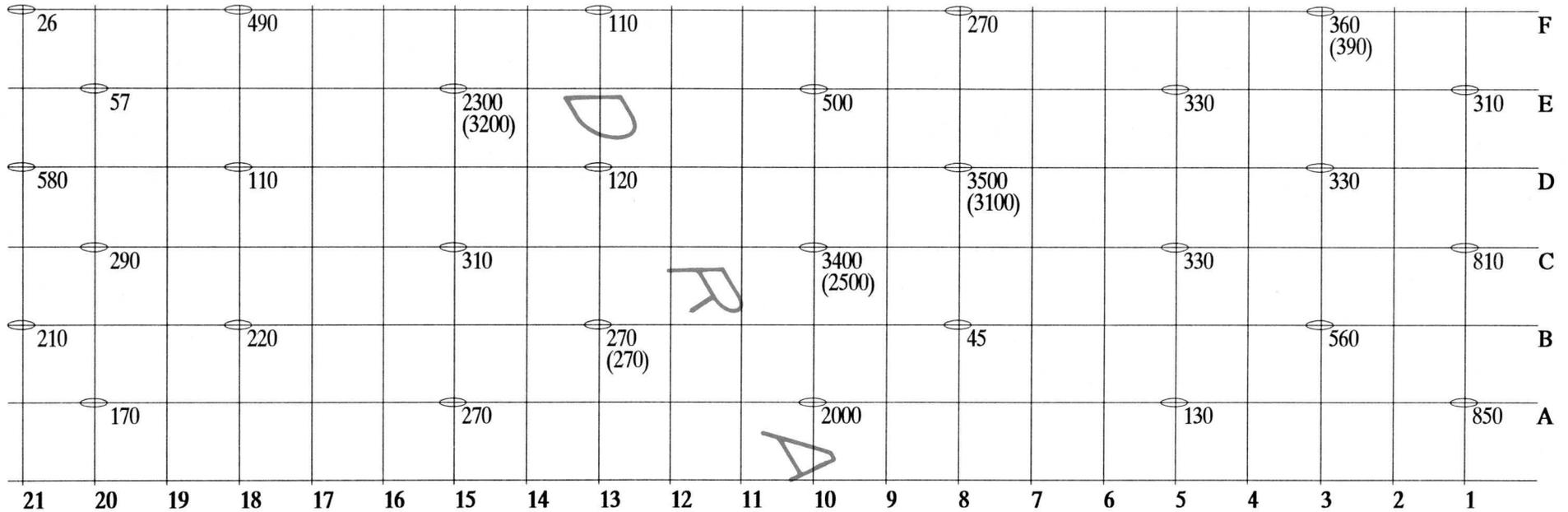
S24_418.WK1\4-28-94

DEPTH: 24" BELOW SURFACE
ANALYSIS METHOD: TPH 418.1

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 4

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



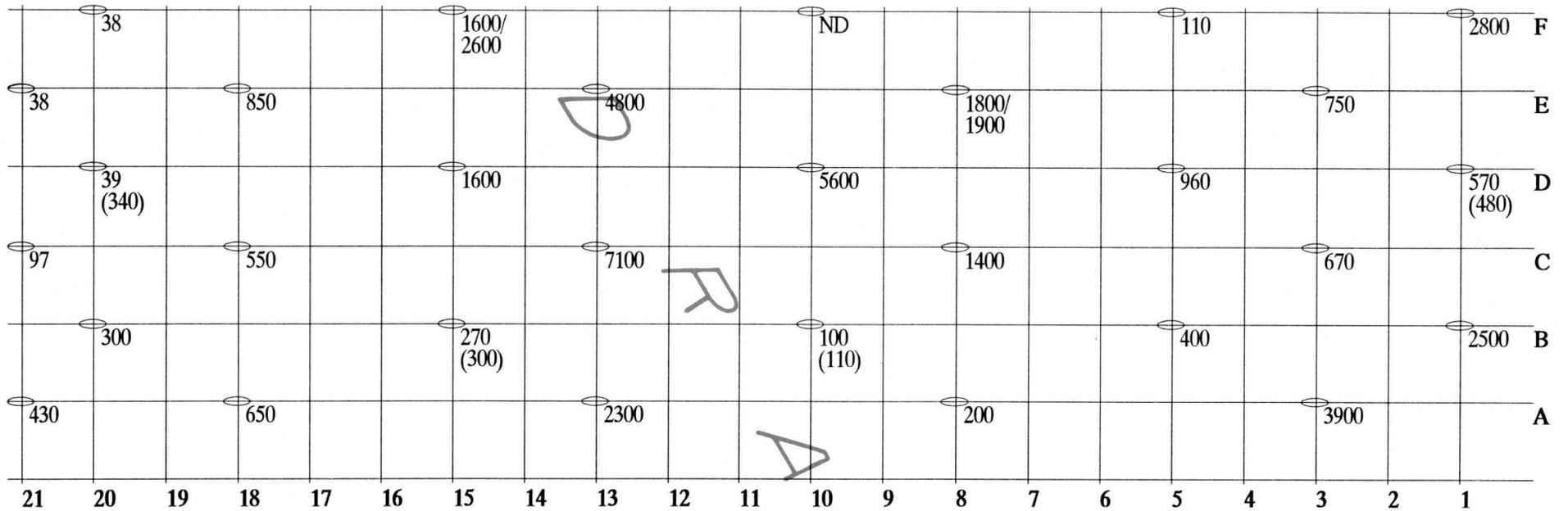
S36_418.WK1/4-28-94

DEPTH: 36" BELOW SURFACE
ANALYSIS METHOD: TPH 418.1

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 5

LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results



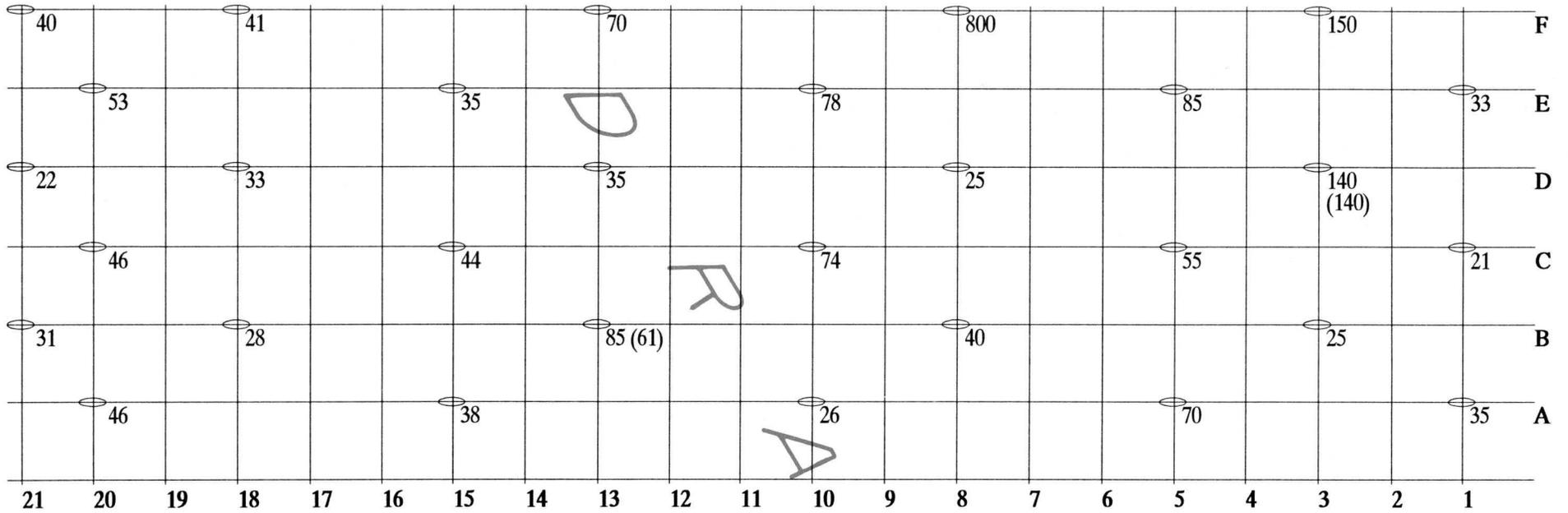
S48_418.WK1\4-28-94

DEPTH: 48" BELOW SURFACE
ANALYSIS METHOD: TPH 418.1

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 6

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



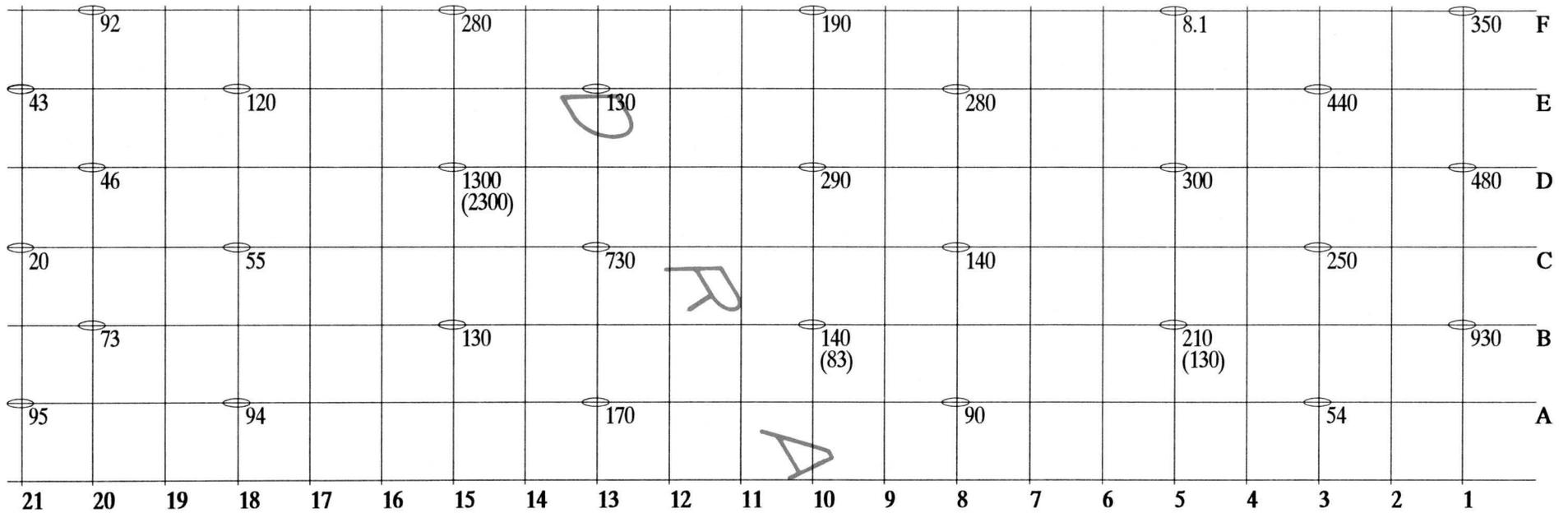
SUR_D.WK14-28-94

DEPTH: SURFACE
ANALYSIS METHOD: TPH 8015-D

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 7

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



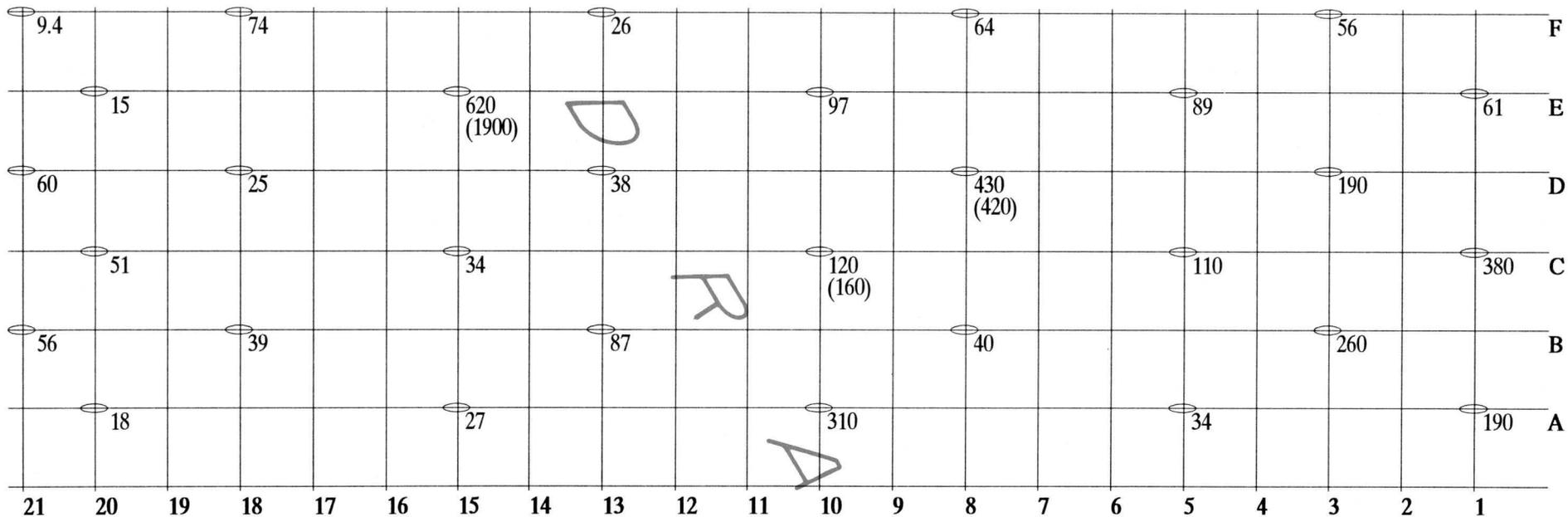
S24_D.WK14-28-94

DEPTH: 24" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-D

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 8

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



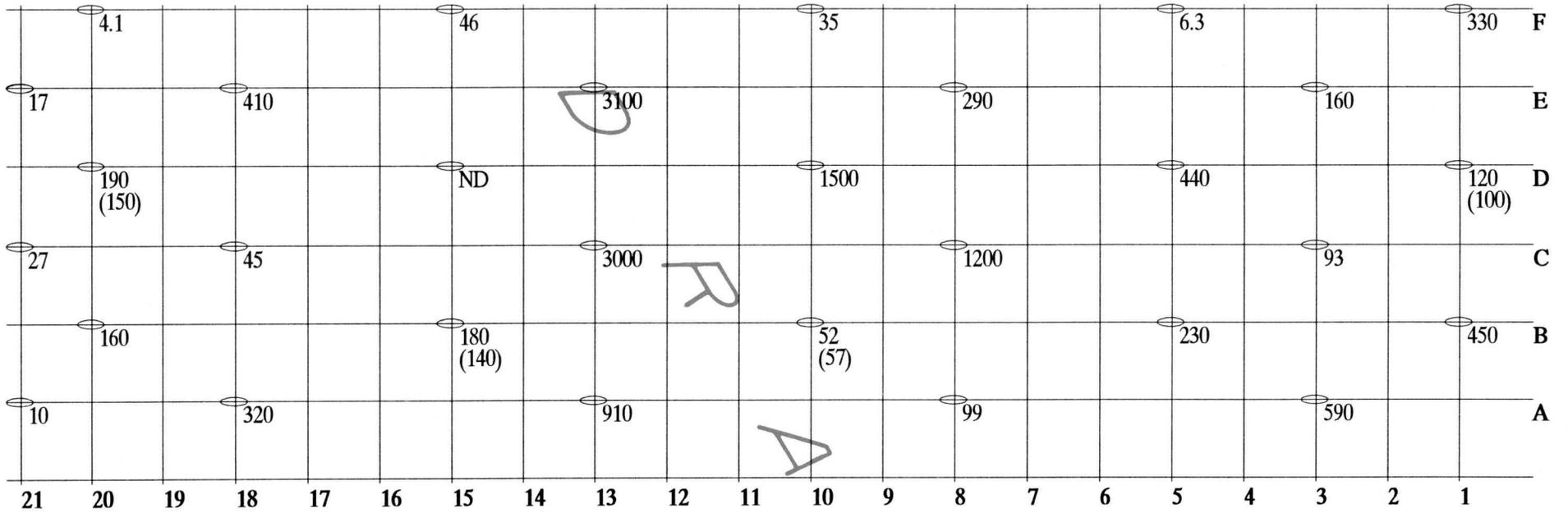
S36_D.WK1\4-28-94

DEPTH: 36" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-D

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 9

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



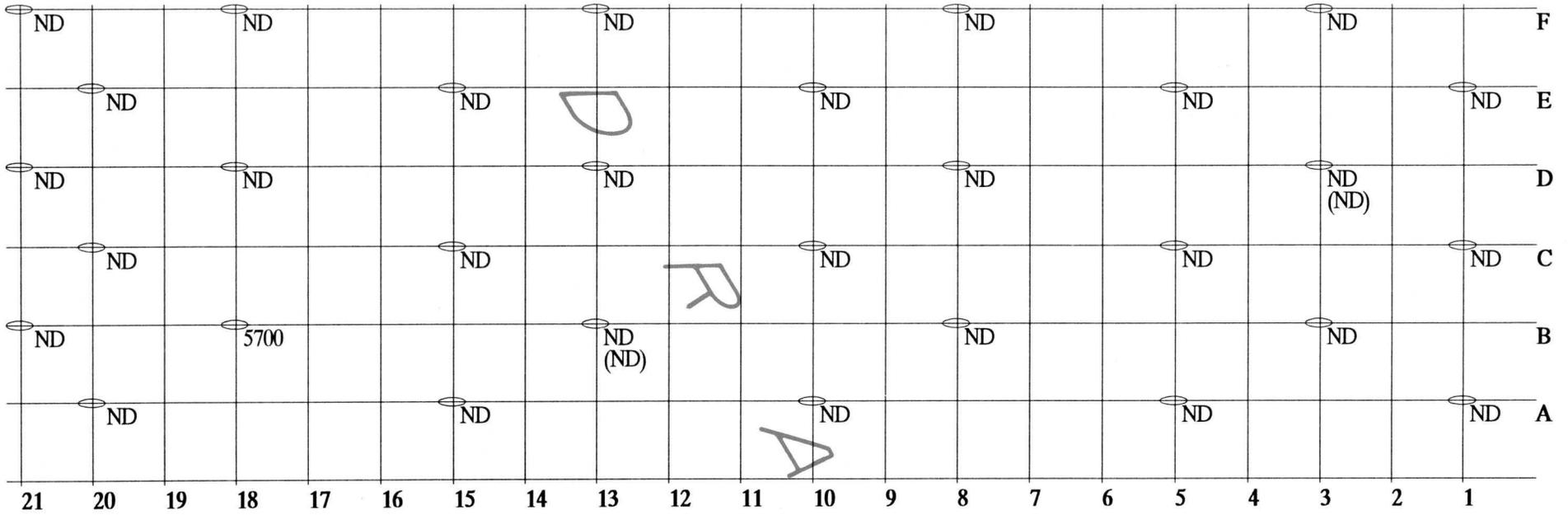
S48_D.WK14-28-94

DEPTH: 48" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-D

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 10

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



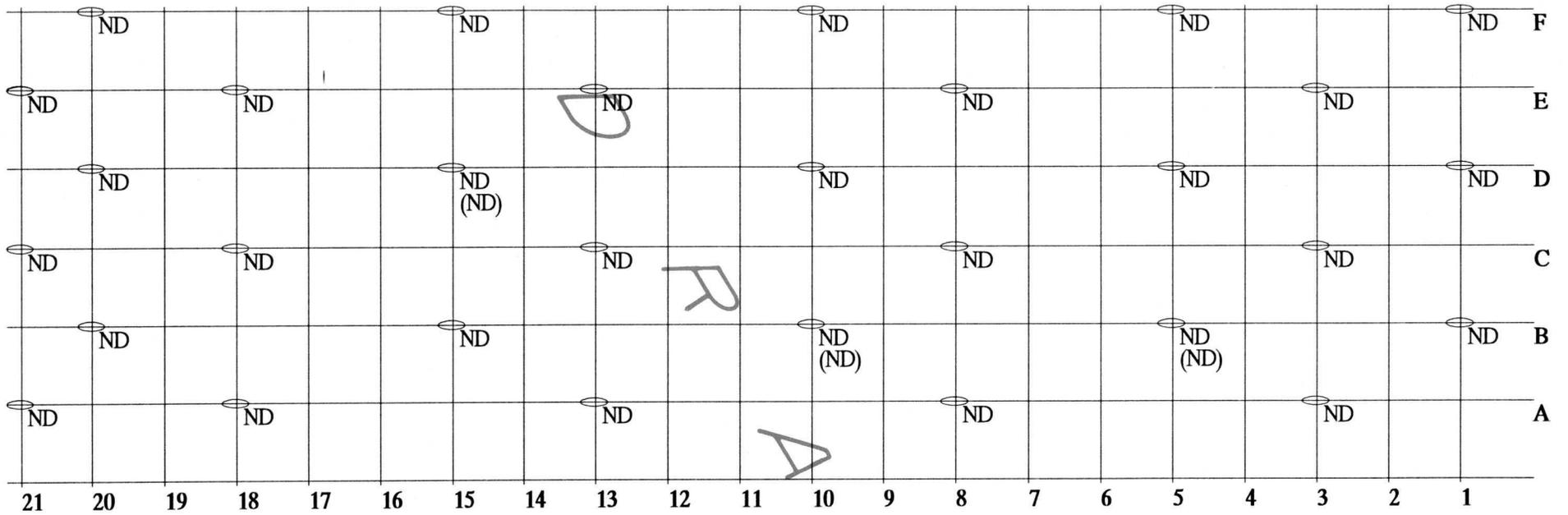
SUR_G.WK14-28-94

DEPTH: SURFACE
ANALYSIS METHOD: TPH 8015-G

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 11

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



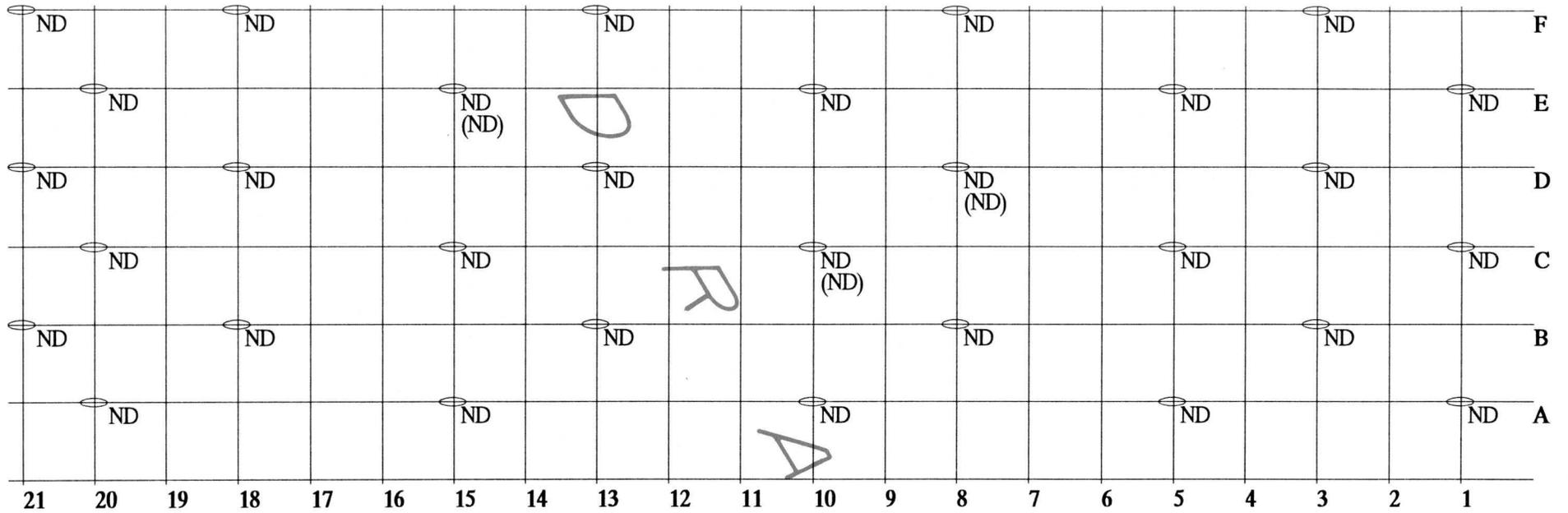
S24_G.WK14-28-94

DEPTH: 24" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-G

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 12

**LARC AREA BIOREMEDIATION
FORT STORY, VIRGINIA
Confirmation Sample Results**



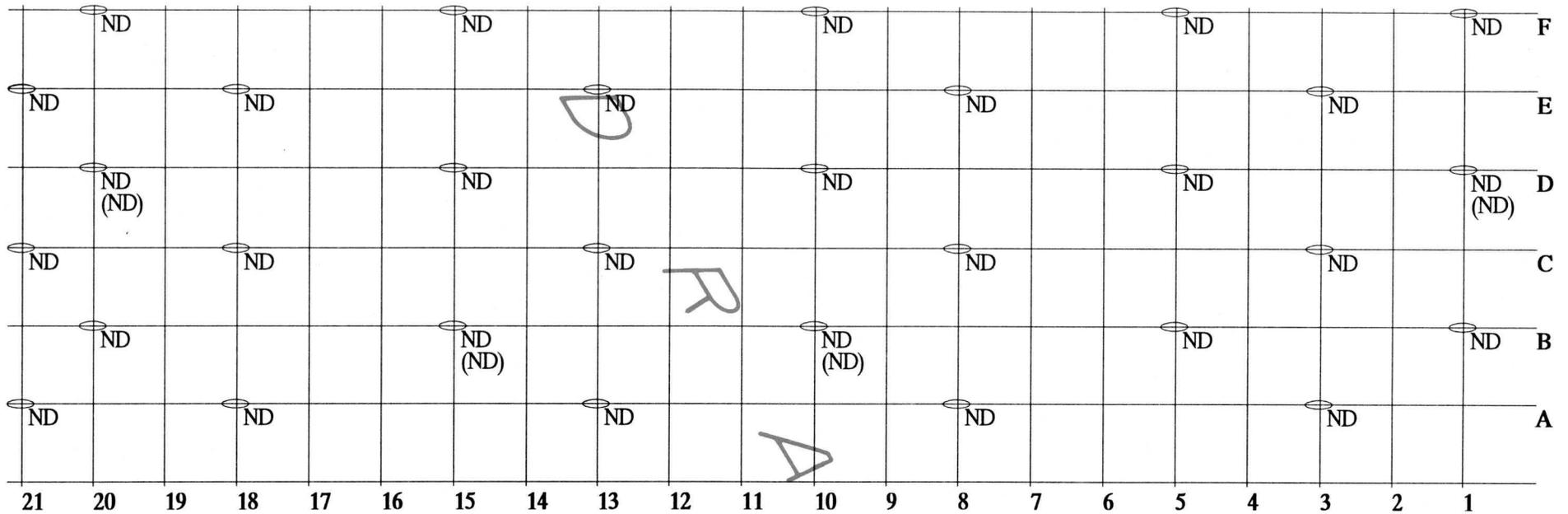
S36_G.WK14-28-94

DEPTH: 36" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-G

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 13

LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

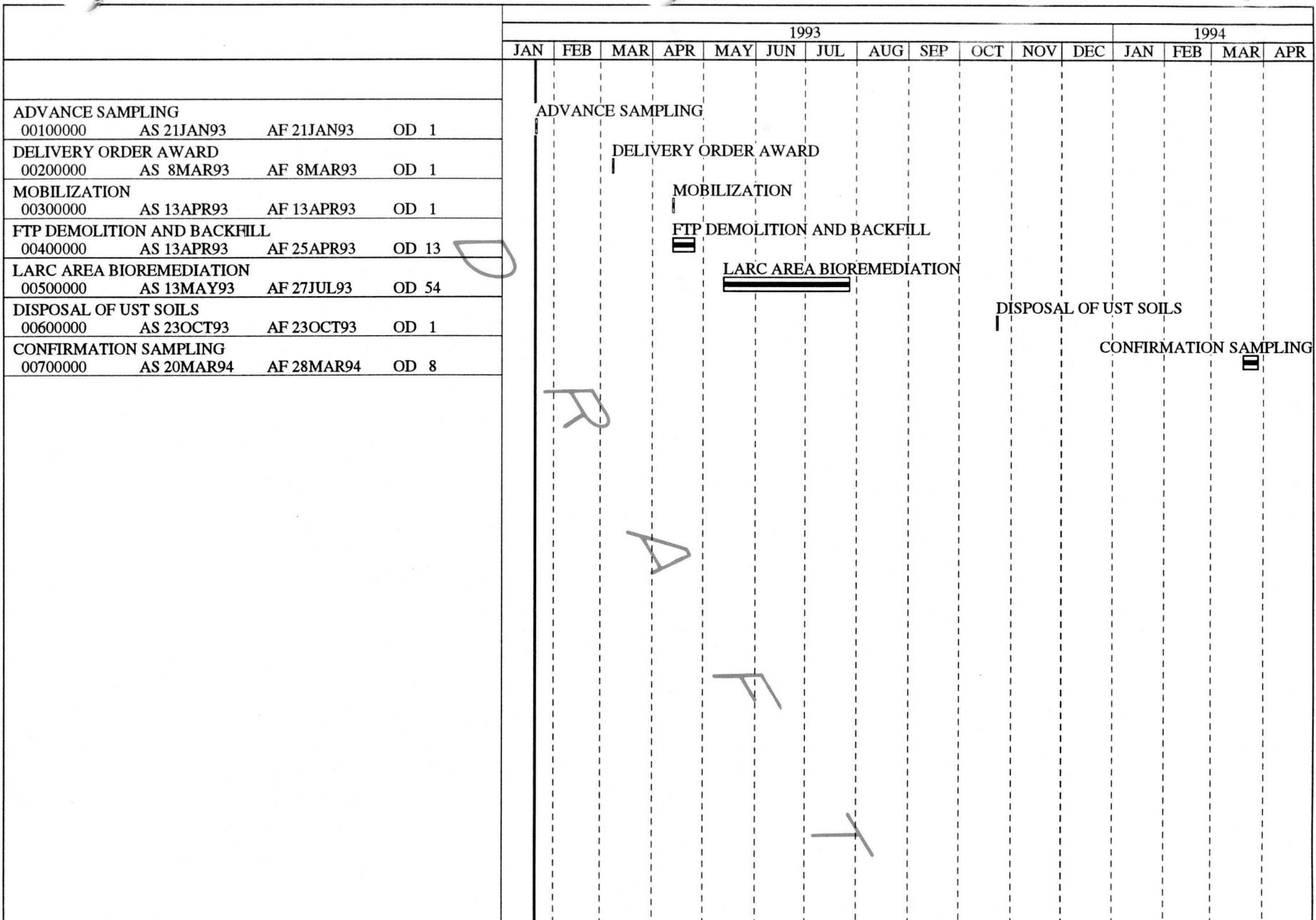


S48_G.WK1\4-28-94

DEPTH: 48" BELOW SURFACE
ANALYSIS METHOD: TPH 8015-G

○ SAMPLE LOCATION AND RESULT (PPM)

Figure 14



Plot Date 23AUG94
 Data Date 21JAN93
 Project Start 21JAN93
 Project Finish 20JAN93

Activity Bar/Early Dates
 Critical Activity
 Progress Bar
 Milestone/Flag Activity

LARC

FIGURE 15
 SCHEDULE OF REMEDIAL ACTIVITIES
 FORT STORY, VIRGINIA

Sheet 1 of 1

----- PREPARED BY IT CORPORATION -----

Date	Revision	Checked	Approved