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DEPARTMENT OF THE NAVY

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From: Commanding Officer, Navy Environmental Health Center
To: Commander, Atlantic Division, Naval Facilities
Engineering Command

Subj: MEDICAL REVIEW OF INSTALLATION RESTORATION PROGRAM
DOCUMENTS FOR MARINE CORPS BASE, CAMP LEJEUNE, NC

Ref: (a) Baker Environmental transmittal letter of 13 Oct 93

Encl: (1) Medical Review of Draft Final Remedial Investigation/
Feasibility Study Work Plan and Sampling and Analysis
Plan for Sites 41, 69 and 74 (Operable Unit No. 4)
Marine Corps Base, Camp Lejeune, NC

1. As requested by reference (a), we completed a medical review of the "Draft Final Remedial Investigation/Feasibility Study Work Plan and Sampling and Analysis Plan for Sites 41, 69 and 74 (Operable Unit No. 4) Marine Corps Base, Camp Lejeune, North Carolina." Our comments are provided in enclosure (1).

2. The technical point of contact for comments is noted in the enclosure. We are available to discuss the enclosed information by telephone with you and, if necessary, with you and your contractor. If you require additional assistance, please call Ms. Sheila Berglund, P.E., Head, Installation Restoration Program Support Department at (804) 444-7575 or DSN 564-7575, extension 430.

W P Thomas
W. P. THOMAS
By direction

**MEDICAL REVIEW OF
DRAFT FINAL REMEDIAL INVESTIGATION/
FEASIBILITY STUDY WORK PLAN AND SAMPLING AND ANALYSIS PLAN
FOR SITES 41, 69 AND 74 (OPERABLE UNIT NO. 4)
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

Attachment: (1) *Procedural Guidance for Chemical Defense
Equipment Kits* (October 1990), Defense
Reutilization Marketing Office

General Comments:

1. The draft documents entitled "Draft Final Remedial Investigation/Feasibility Study Work Plan, Marine Corps Base Camp Lejeune, North Carolina," dated October 8, 1993 and "Draft Final Remedial Investigation/Feasibility Study Sampling and Analysis Plan, Marine Corps Base, Camp Lejeune, North Carolina," dated October 13, 1993 were provided to the Navy Environmental Health Center (NAVENVIRHLTHCEN) for review on 13 and 15 October 1993, respectively. The reports were prepared for Atlantic Division Naval Facilities Engineering Command by Baker Environmental, Inc.
2. The information presented in the work plan (WP) and sampling and analysis plan (SAAP) is generally in accordance with guidance provided in pertinent Environmental Protection Agency (EPA) guidance documents such as *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final* (October 1988). Few inaccuracies/discrepancies were noted in the documents. Our comments are primarily related to the WP, and address the need for more specific information to be included.
3. The primary concern is that the WP does not include a risk assessment section. Specific review comments and recommendations provided below address the need for additional and more specific health information to be included in the WP.
4. The technical point of contact for this review of the remedial investigation WP and SAAP is Ms. Andrea Lunsford, Head, Health Risk Assessment Department, Environmental Programs Directorate, NAVENVIRHLTHCEN, who may be contacted at 444-7575, extension 402.

Enclosure (1)

Review Comments and Recommendations:

Work Plan

1. Page 2-36, section 2.2.5 (Previous Investigations and Findings), subsection 2.2.5.5 (Tissue Sampling)

Comments:

a. The first paragraph states that chloromethane and acetone were detected in fish tissue samples collected in January 1991 in the New River estuary. Sampling results are addressed. Although not specifically stated, these chemicals may be laboratory related contaminants. It should be specifically stated whether or not either of these results may be attributed to laboratory contamination.

b. The text lists a number of inorganics that were detected in the four shellfish (oyster or mussel) samples collected. Specific sampling results are not presented. Section 1.2.3 of the SAAP states that the detected inorganics were at low levels; however, sampling results are not provided in the sampling plan either.

c. The text further states that "aquatic organism" samples were collected along the New River, Everett Creek and an unnamed tributary to the river, as part of the Ecological Risk Assessment. Technical analysis of the results is in progress. Section 1.2.3 of the SAAP states that "further evaluation of aquatic life in the New River has been conducted, along with an evaluation of present day surface water and sediment conditions... Therefore, no additional studies are required to evaluate aquatic life." Until the additional (1992) aquatic sampling data is evaluated, it cannot be determined that additional studies are not needed.

Recommendations:

a. Specifically state whether the chloromethane and acetone levels detected in fish tissue samples can be attributed to laboratory contamination.

b. Provide sampling results for oyster and mussel tissue.

c. Until 1992 aquatic sampling data is evaluated do not make the determination that additional aquatic life studies are not necessary.

2. Page 3-1, Section 3.0 (Evaluation of Existing Information), subsection 3.1.2 ([Site 69 - Rifle Range] Potential Migration and Exposure Pathways) and Page 5-40, section 5.6.1 (Human Health Evaluation Process), subsection 5.6.1.4 (Exposure Assessment: Identification of Potential Exposure Scenarios Under Current and Future Land Uses)

Comments:

a. The Section 3.1.2 list of exposure pathways includes "wildlife (deer and other mammals)." Hunting activities at Marine Corps Base (MCB), Camp Lejeune are not addressed in this work plan. Exposure pathways presented in section 5.6.1 do not include human exposures resulting from consumption of wildlife.

b. Bob White Quail, deer, and turkey are hunted on base. Hunting activities may or may not extend into the sites. Evaluation of this pathway may not significantly impact the risk assessment; however, risks should be calculated for all completed pathways. If hunting activities are impacted by the sites under investigation, risks from the consumption of wild animals should be assessed for all individuals who hunt at MCB, Camp Lejeune.

Recommendation: Discuss hunting activities on or around this site. If appropriate, assess risks related to the consumption of wild animals.

3. Page 3-2, section 3.0 (Evaluation of Existing Information), subsection 3.1.2 (Potential Migration and Exposure Pathways)

Comments:

a. The first bullet in the section entitled "Exposure Pathways" states "Military personnel trespassing through the area could be exposed to surface soil and standing water." The fourth bullet states that currently, access to the area is restricted (this statement is not included with bullet 1). Since the fence surrounds Site 69, it is not clear which military personnel are being referred to by the term **trespassers**. The fence restricts trespasser access to Site 69. Personnel involved with the remedial investigation (RI) program have access to Site 69 (i.e., they possess a key); however, they should not be considered trespassers.

b. Trespassers may be more readily exposed to contaminants outside of the fence as a result of runoff from Site 69. A past trespassing scenario was likely at Site 69 prior to the installation of the fence; however, it is currently unlikely inside the fenced area. The text should discuss these issues.

Recommendation: State the specific military personnel that are considered trespassers and whether the exposure is expected to occur inside or outside of the fenced area.

4. Page 4-7, Section 4.0 (Remedial Investigation/Feasibility Study Objectives), subsection 4.2.2 ([Site-74 Mess Hall Grease Pit Disposal Area] Soil Investigation Objectives)

Comments:

a. Paragraph two states that the contaminants of greatest concern are most likely those that are buried, vice those released to the surface. It further states that the "surface of the site has apparently been disturbed several times. These conditions limit the importance of surface disposal of contaminants." The intention of these statements is not clear. It appears that the text is providing justification for only collecting sub-surface soil samples. However, the SAAP addresses surface soil sampling.

b. The way in which the soil has been disturbed is not addressed. If clean fill material was placed on top of Site 74 after disposal of all materials ceased, then surface soil samples would not be representative of the site contaminants. However, if the soil was minimally disturbed, it may still be representative of on-site contamination.

c. Regardless of the degree of disturbance, surface soil concentrations still must be determined to assess surface soil exposure pathways.

Recommendations:

a. Clarify the intention of the statements made with regard to surface soil exposure pathways.

b. Discuss the nature and degree of surface soil disturbance that has occurred at Site 74.

5. Page 5-12, section 5.0 (Remedial Investigation/Feasibility Study Tasks), section 5.3.1.4 (Groundwater Investigation), paragraph 4 and page 5-16, section 5.3.2.3 (Soil Investigation), bullet 1

Comments:

a. Section 5.0 repeatedly (e.g., sections 5.3.1.4 and 5.3.2.3, etc.) refers to surface soil samples as those collected at depths of 0 to 6 inches. Although this is consistent with EPA guidance as presented in documents such as the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A*, December 1989 (RAGS manual) which

defines surface soil samples as samples taken from depths of 0 to 6 inches, it is inconsistent with the Agency for Toxic Substances and Disease Registry (ATSDR) *Public Health Assessment Guidance Manual* (1992) which defines surface soil samples as soil samples taken from depths of 0 to 3 inches.

b. The guidance reflects ATSDR's position that depths greater than three inches do not accurately reflect surface soil conditions. Under the Comprehensive Environmental Response, Compensation and Liability Act, ATSDR is mandated to perform a public health assessment (PHA) of any site which is placed on the National Priorities List. In developing PHAs at Department of Defense facilities, ATSDR uses environmental data collected during IR investigations. ATSDR summaries may reflect "no samples" taken for surface soil based on the fact that samples were taken at depth intervals greater than three inches.

c. To facilitate correlation between PHAs and health risk assessments, and in order to minimize costs associated with redundant sample collection and analysis, we encourage the adoption of "0 to 3 inches" as the norm for surface soil sample collection for future site investigations. Adoption of this sampling protocol will not be in controversy with current EPA guidance, since the RAGS manual does direct that surface soil samples be collected at the "shallowest depth practical" in order to accurately reflect the potential surface soil exposure pathway.

Recommendation: Collect surface soil samples at 0 to 3 inch depths wherever this is achievable.

6. Page 5-38, section 5.6.1 (Human Health Evaluation Process), subsection 5.6.1.2 (Data Summary)

Comments:

a. Paragraph two states that in the calculation of the mean, concentrations presented as "ND" (non-detect) will be incorporated at one-half of the **sample detection limit**. The term "sample detection limit" is not a common term used in the RAGS manual. It is also not defined in this work plan.

b. The RAGS manual recommends one-half the **sample quantitation limit (SQL)** as a proxy concentration for non-detects, if there is reason to believe that the chemical is present at a concentration that is below the SQL.

(1) SQLs are preferred over the method detection limits (MDLs), instrument detection limits (IDLs) and contract required quantitation limits (CRQLs) because they represent sample specific characteristics.

(2) Use of one-half the SQL, MDL or IDL is recommended because statistical studies indicate that this value would not unduly bias the results upward or downward, provided the data are not highly skewed, and provided the number of non-detects is not greater than 10 to 15 percent (%) of the data. This recommendation, and in-depth discussion of the rationale for using one-half (1/2) SQL values, is provided in the final exposure guidelines published in 57 FR No. 104, Friday, May 29, 1992.

Recommendations:

a. When it is appropriate to use substitute values for non-detects, use one-half the SQL. If SQLs cannot be obtained, then consider using one-half the CRQL, MDL or IDL, in that order, with caution.

b. Clearly designate substitute values on data summary tables. One way to designate substitute values is to enclose the values in parentheses and then to explain the symbol in the table legend.

7. Page 5-40, section 5.6.1 (Human Health Evaluation Process), subsection 5.6.1.4 (Exposure Assessment: Identification of Potential Exposure Scenarios Under Current and Future Land Uses)

Comments:

a. Preliminary (generic) exposure pathways are listed in bullet form. The only pathway in which air contaminants are included is the soil pathway; only dust is mentioned to be of concern. Surface soil sampling has not yet been conducted for Site 69; therefore, the presence of volatile organic hydrocarbons (VOCs) cannot be ruled out. The text contains many references to VOC contamination:

(1) Section 2.2.5.2 states that various VOCs were detected in the ground water at Site 69.

(2) Section 2.2.5.3 states that surface water samples indicated that one of the sampling stations (69SW1) was highly contaminated with VOCs and sampling station 69SW2 was also contaminated with VOCs, but to a lesser degree.

(3) VOCs were detected in ground water monitoring wells at Site 41. Section 2.4.5.1 states that low levels of phenols were detected in all five ground water wells and dichlorodifluoromethane and vinyl chloride were detected just above state standards in well 41GW2.

b. During remediation efforts, air concentrations of VOCs and semivolatile organic hydrocarbons (SVOCs) may be of concern.

Table 7-1 of the SAAP summarizes environmental sampling that is planned for Sites 41, 69 and 74. This table does not include sampling for air contaminants (e.g., particulates, VOCs or SVOCs) at any of the sites. Information to substantiate the omission of air sampling is not provided.

Recommendation: Include air sampling in the sampling plan or provide appropriate justification for its exclusion.

8. Page 5-40, section 5.6.1 (Human Health Evaluation Process), subsection 5.6.1.4 (Exposure Assessment: Identification of Potential Exposure Scenarios Under Current and Future Land Uses) and pages 2-13 through 2-19, section 2.1.9 (Land Use and Demographics)

Comments:

a. Preliminary (generic) exposure pathways are listed in bullet form. The exposure scenarios listed do not distinguish between current and potential future exposures. Since exposure pathways for these two scenarios (i.e., current and future) are not separated, we cannot conclusively agree with their existence. For example, a residential scenario is listed for soil pathways. This scenario may be of concern only for future potential residents since the three sites addressed in this WP are not currently used as a residential area. Current and future scenario pathway models should be presented separately, based on information currently known about the sites.

b. Section 2.1.9 presents information concerning current land use; however, information regarding future land use is not provided. Although the title of Section 5.6.1.4 ("Exposure Assessment: Identification of Potential Exposure Scenarios Under Current and Future Land Uses") implies a future land use, it is not known whether one is being considered for this risk assessment.

c. This and other sections of the WP address exposed populations as "worker, resident and recreational users." Section 2.1.9 addresses land use demographics for Camp Lejeune; however, not in terms of the sites under investigation. Site-specific information to characterize potentially exposed populations with regard to size and characteristics is not provided. Sensitive populations (e.g., infants and children, elderly people, hospitals, etc.) and their locations in reference to the specific sites are not addressed (e.g., nursing homes and child care facilities).

Recommendations:

a. Separately list the exposure pathways applicable to current and future exposure scenarios.

b. Address future land uses for each of the sites.

c. Provide site-specific information to characterize exposed populations with respect to location relative to the sites, activity patterns, and the presence of sensitive populations. Also identify any distant exposed populations, such as public water supply consumers and consumers of fish, shellfish or agricultural products impacted by the site.

9. Pages 5-35 to 5-37, section 5.6 (Task 6-Risk Assessment) and pages 5-37 to 5-44, section 5.6.1 (Human Health Evaluation Process)

Comments:

a. Section 5.6 provides short, generic discussions addressing exposure assessment, toxicity assessment, and risk characterization. The text basically states that risk assessments will be performed in accordance with EPA guidelines as presented in risk assessment documents such as the RAGS manual. However, site-specific information is lacking.

b. Work plans should contain a separate human health risk assessment section which specifically describes the type of information that will be included in the risk assessment. Some of the types of information that should be included are:

(1) Identification of all potentially exposed populations; site-specific descriptions of tasks related to exposure pathways; present and potential future land use; media that are or may be contaminated; locations of actual and potential exposure and present concentrations at appropriate exposure points.

(2) The equations, calculations, and default assumptions used to determine exposures for all exposure scenarios (e.g., off-base, on-base, children, adults, current land use, future land use, etc.).

(3) Parameters used to estimate exposure point concentrations (e.g., arithmetic mean, geometric mean, 95th percentile, etc.).

(4) The reference doses (RFDs) and cancer slope factors (CSFs) used to determine exposures.

(5) A discussion concerning the selection of data to be used for the risk assessment (e.g., the use and nonuse of "U", "J", and "UJ" qualified data).

(6) The selection criteria to be used to determine "compounds of concern" (e.g., comparison to background and frequency of detection statistics).

(7) An "uncertainty" section that addresses significant differences between actual site conditions and required default assumptions to determine risk. (For example, to discuss the risk associated with a potential shallow ground water ingestion scenario, or the risk associated with proxy values being used for non-detection data.)

Recommendation: Discuss and/or present the information addressed above.

10. Pages 5-37 to 5-44, section 5.6.1 (Human Health Evaluation Process)

Comment: In addition to the information discussed above, the risk assessment section of the WP should provide specific information on the presentation of results. Section 5.6.1.2 ("Data Summary") states that tables will be developed for each medium sampled and will indicate the frequency of detection, observed range of concentration, the means and upper 95th percent confidence limits for each chemical detected in each medium. The following data table types should also be addressed.

(a) The format of the data summary tables should be specified in advance (e.g., the summary tables should list sampling numbers on the horizontal axis and provide the analytical result of all detections on the vertical axis); this section could reference an appendix which provides the specific format of the tables.

(b) The method by which proxy values will be annotated on the data summary tables should be described (e.g., the use of 1/2 the SQL is generally adopted as the proxy value for non-detects). These data should be specifically annotated. Parentheses may be used to indicate substitute values, i.e., in addition to a "U" validation qualifier.

(c) The methodology and the specific sampling results used to "group" data (e.g., to derive average and upper-limit concentration values) should be clearly identified and/or shown on individual tables in the RI report; this section should state that this information will be provided.

(d) The text should specify that all equations used to derive intermediate parameters of the risk equations will be provided; and that all default assumptions used in the individual risk equations will be provided/listed.

(e) The text should state that the risk summary tables will be presented in the format recommended in the RAGS manual (e.g., see Exhibits 8-3 and 8-4 on pages 8-8 and 8-9 of the RAGS manual.

Recommendation: Expand this section to include the specific information suggested in (a) through (e), above.

Sampling and Analysis Plan

11. Page 1-19, section 1.1.4 (Site 41-Camp Geiger Dump Near Former Trailer Park), subsection 1.1.4.3 (Site History)

Comment: The text states that chemical agent training kits, which may contain small quantities of blister agents, were disposed of at Site 69. Instructions to one of the "Chemical Agent Detector Kits" were uncovered at Site 69. Although it is not specifically stated in the instructions, it appears that this kit is a "M256 Chemical Agent Detector Kit." The M256 kit does not contain blistering agents itself but is designed to determine the presence of mustards, arsenicals and phosgene with detector tube methodology. Information regarding the chemical contents of the M256 kit is provided as Attachment (1).

Recommendation: Review attachment (1). Modify the text, as appropriate.

Code: 342

PROCEDURAL GUIDANCE FOR CHEMICAL DEFENSE EQUIPMENT KITS

DRMO

OCTOBER 1990

Attachment 1.



This kit contains 93 milliliters of ethanol, and has an EPA Waste Code of D001. This kit contains glass and may cause some furnace slagging problems. The hazardous constituent of this kit is 1-Hydroxyethane or ethanol.

The entire kit may be disposed of using class 2301 or 2324. No removal or breakdown is required.

Shipping Label: Corrosive and Flammable
 Shipping Name: Chemical Kit
 Hazardous Waste Number and Item: D001, Ethanol
 DOT Shipping Code: UN 1170

4. Decontaminating Kit, SKIN, M258A1 NSN 4230-01-101-3984.

Disposal Instructions:

This kit contains all chemicals listed in item three (3) above. Disposal instructions are the same.

5. Detector Kit, Carbon Monoxide, Colorimetric, M23.

<u>Form</u>	<u>Content/Unit</u>	<u>Total Quantity/Kit</u>
Indicator Tube Carbon Monoxide	Indicating Gel, Palladium sulfate (0.00123 gm/tube) Ammonium Molybdate (0.00122 gm/tube), Guard gel pure silica gel 12 tubes/box, 1 box kit	0.01478 gm 0.013464 gm

Disposal Instructions:

This kit contains no RCRA waste, and can be disposed of as an entire kit using a single non-RCRA class.

6. Detector Kit, Chemical Agent, M255, NSN 6805-01-010-8399.

<u>Form</u>	<u>Content/Unit</u>	<u>Total Quantity/Kit</u>
Ampoule No. 5 (clear liquid, Position #1)	Potassium carbonate (0.24 gm/ampoule) Water (0.4 ml/ampoule) 1 ampoule/sampler	2.88 gm 4.80 ml
Ampoule No. 3 (clear liquid, Position #2)	4-(4'-nitrobenzyl) pyridine (0.0025 gm/ampoule) and Mercuric Cyanide (0.0024 gm/ampoule) 3A	0.027 gm 0.032 gm





	Methanol (0.2 ml/ampoule) 1 ampoule per sampler	2.4 ml
Ampoule No. 3 (clear liquid with green pellets, Position #3)	4 parts of 4 benzyl pyridine in 396 parts of 2-methoxy ethanol (0.4 ml/ampoule) 1 ampoule/sampler	4.8 ml
Ampoule No. 3 (clear liquid, Position #4)	Sodium hypochlorite (0.792) in water (0.15 ml/ampoule) 1 ampoule/sampler	1.8 ml
Ampoule No. 3 (clear liquid with orange pellet, Position #5)	Buffer pH8: Tris-(hydroxymethyl)-amino- methane (0.00303 gm/ampoule) Hydrochloric acid, 0.1M (0.143 ml/ampoule) Aerosol OT (0.15 mg/ampoule) 1 ampoule/sampler	0.0363 gm 1.70 ml 1.56 mg
Ampoule No. 5 (orange liquid, Position #6)	2,6-Dichloroindophenyl acetate (0.195 mg/ampoule) Ligroine (0.3 ml/ampoule) 1 ampoule/sampler	0.00234 gm 3.5 ml
Pellet (tab 1, Position #7)	4,4-Bis (dimethylamino)-thio- benzophenone (0.088 gm/tablet) Amorphous silica (0.088 gm/tablet) Ball clay (0.0202 gm/tablet) Amioca starch (0.0044 gm/tablet) Microcrystalline cellulose (Avicel) (0.1162 gm/tablet) Stearic acid (0.132 gm/tablet) 1 tablet/sampler	0.264 gm 1.056 gm 0.242 gm 0.0528 gm 1.393 gm 0.158
Detector spot (star shape, Position #8)	Horse serum cholinesterase (0.2 mg/disk) Gelatin (0.5 mg/spot) impregnated on filter paper disk 1 spot/sampler	2.4 mg 6 mg
Detector spot (circular shape, Position #9)	Barbituric acid (1 wt %) impregnated on glass fiber disk 1 spot/sampler	0.48 mg
Ampoule No. 4 (double, green liquid, Position # 11)	Cupric chloride (0.4 gm/ampoule) Ethylene glycol (0.2 gm/ampoule) Distilled water (0.4 ml/ampoule) 2 ampoules/sampler	9.6 gm 4.8 gm 9.6 ml
Heater (under Ampoule No. 4)	Aluminum powder (0.285 gm/pad) Paper pulp (0.189 gm/pad) 1 Pad/sampler	3.42 gm 2.27 gm





*Whole Kit is
 mercuric cyanide*

Disposal Instructions:

The M256 Detector kit contains two hazardous waste streams which must be separated prior to turn-in.
 Ampoule No. 3 contains 0.032 gm of Mercuric Cyanide. Mercuric Cyanide has an EPA Waste Code of D008, and may be cleaned by the DRMO as class 2007.

~~The remainder of the kit should be disposed of as Methanol. Methanol has an EPA Waste Code of U154 and may be cleaned by the DRMO as class 1518 or 1530.~~

	<u>Mercuric Cyanide</u>	<u>Methanol</u>
Shipping Label:	Poison	Flammable Liquid/Poison
Shipping Name:	Poisonous Solid, n.o.s.	Flammable, n.o.s.
Waste Number/Item:	D008, Mercuric Cmpds.	D001, Methanol
DOT Shipping Code:	UN 1638	UN 1230

7. Detector Kit, M256EL, BSN 0655-01-133-4954.

<u>Form</u>	<u>Content/Unit</u>	<u>Total Quantity/Kit</u>
Ampoule No. 5 (clear liquid, Position #1)	Potassium carbonate (0.24 gm/ampoule) Water (0.4 ml/ampoule) 1 ampoule/sampler	2.89 gm 4.88 ml
Ampoule No. 3 (clear liquid, Position #2)	4-(4-nitrobenzyl) pyridine -- (2.25 mg/ampoule) Mercuric cyanide (2.64 mg/ampoule) Methanol (0.2 ml/ampoule) 1 ampoule/sampler	0.027 gm 0.032 gm 2.4 ml
Ampoule No. 3 (clear liquid, Position #2)	4 parts of 4-benzyl pyridine in (2.25 mg/ampoule) Mercuric cyanide (2.64 mg/ampoule) Methanol (0.2 ml/ampoule) 1 ampoule/sampler	4.8 ml 0.032 gm 2.4 ml
Ampoule No. 3 (clear liquid with green pellet, Position #3)	4 parts of 4-benzyl pyridine in 398 parts of 2-methoxy ethanol (0.4 ml/ampoule) 1 ampoule/sampler	4.8 ml
Ampoule No. 3 (clear liquid, Position #4)	Sodium hypochlorite (0.78%) Water (0.15 ml/ampoule) 1 ampoule/sampler	1.8 ml
Ampoule No. 3 (clear liquid with orange pellet)	Buffer pH8: Tris-(hydroxymethyl)-amino- methane (0.00303 gm/ampoule)	0.0303 gm