



REPLY TO
ATTENTION OF

10 JUN 1985

HSHB-EW-M

SUBJECT: Water Quality Information Paper No. 26

PRIORITY POLLUTANT SAMPLING AND ANALYSIS FROM GROUND-WATER MONITORING WELLS
AND DOMESTIC AND INDUSTRIAL SEWAGE TREATMENT PLANTS

I. PURPOSE. The purpose of this information paper is to:

A. Establish a standard procedure for the sampling from ground-water monitoring wells for priority pollutants.

B. Prescribe a protocol for collecting priority pollutant samples in accordance with US Environmental Protection Agency (EPA)-approved methodology.

C. Provide information concerning priority pollutant analyses by this Agency's laboratories.

II. REFERENCES. See Enclosure 1 for a listing of references.

III. GENERAL.

A. With the advent of the Federal Water Pollution Control Act (PL 92-500), as amended (reference 1), the basic regulations governing the discharge of toxic pollutants to surface streams were formulated. With these regulations, 129 original toxic pollutants were identified and established as being potentially harmful to human health and the environment. The list was later modified to 126 contaminants. These 126 elements and compounds now make up what is commonly referred to as the "priority pollutants list" (see Enclosure 2).

B. In recent years, state and Federal concern has increased with regard to the existence of ground-water pollution. This has been promulgated from the ever-increasing number of confirmed incidences of ground-water pollution. The investigations, methodologies, and practices now employed to ascertain these contaminant levels in ground water have been in effect only for a short time; therefore, a great deal of disparity exists on the actual methodology used to sample for these priority pollutants with regard to ground water.

C. On 3 November 1983, this Agency prepared a Memorandum for Record (MFR) (reference 6) delineating procedures for the sampling and analysis for priority pollutants. However, the MFR was established mainly for the sampling for priority pollutants from surface waters or from effluents generated by a wastewater treatment plant. It did not cover those procedures that would have to be utilized in sampling from a ground-water monitoring well. In fact, due to the unique nature of monitoring well sampling, the methodology to be utilized would

have to be significantly different than that stated in the MFR. Therefore, the MFR was expanded in this information paper to include priority pollutant sampling from ground-water monitoring wells.

D. The remainder of this information paper is divided into two parts. The first part covers the data contained in the original document pertaining to the priority pollutant sampling within domestic and industrial sewage treatment plants, and the second part covers the priority pollutant sampling of ground-water monitoring wells.

IV. PRIORITY POLLUTANT SAMPLING WITHIN DOMESTIC AND INDUSTRIAL SEWAGE TREATMENT PLANTS.

A. Background. Army installations with industrial operations must provide information concerning the presence of any priority pollutants in wastewater discharges when applying for a National Pollutant Discharge Elimination System (NPDES) permit. Those facilities with operations in 1 or more of 34 primary industrial categories contributing to a discharge must report quantitative data for cyanide, total phenols, certain fractions of the organic priority pollutants, and all of the priority pollutant metals. Facilities with industrial operations not listed in the 34 primary industrial categories must indicate which of the priority pollutants may be present in wastewater discharges and must report quantitative data for those pollutants. The list of the 34 primary industrial categories and specific sampling guidelines are contained in the EPA's Application Form 2C, which is provided as Enclosure 3.

B. Sampling Protocol.

1. Equipment.

a. Automatic Samplers. Use the ISCO® 2100 for discrete sampling because the distribution tray funnel on the ISCO 1680 cannot be adequately cleaned for organics sampling. In the composite mode, use the ISCO 2100 when available or modify the ISCO 1680 to exclude the metal tubing.

b. Tubing. Use only new Dow Corning® medical-grade silicon tubing in the pump and new Teflon® tubing (minimum 1/4-inch inside diameter) in the sampling train. Be certain to bring along the Teflon line-flaring tool when using the 1/4-inch tubing. Rubber-coated Teflon tubing is available for difficult sample point setups where kinking of the regular tubing would be a problem.

c. Buckets and Funnels. Use only Teflon-lined buckets and glass or Teflon-lined funnels when transferring samples.

2. Cleaning Procedures.

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a. Tubing. For each sample point, cut an approximate length of Teflon tubing prior to departure. Flush each length with petroleum ether, air dry, then cap with aluminum foil prior to shipment to site. Rinse the silicon tubing with hot water for 5 minutes, then rinse with distilled water for 1 minute, install in the sampler, and cap both ends with aluminum foil prior to shipment.

b. Strainers. Use either stainless steel (preferred) or polypropylene strainers precleaned as follows:

- (1) Wash with hot detergent.
- (2) Rinse with hot tap water.
- (3) Rinse with acetone.
- (4) Rinse with distilled water.
- (5) Air dry.
- (6) Rinse with petroleum ether.
- (7) Air dry.
- (8) Wrap with aluminum foil prior to shipment.

c. Sampler Bottles (discrete and composite). Use only glass bottles for organic priority pollutant sampling.

- (1) Before study.
 - (a) Wash with hot detergent.
 - (b) Rinse with hot tap water.
 - (c) Rinse with 20-percent nitric acid.
 - (d) Rinse thoroughly with tap water.
 - (e) Rinse with distilled water.
 - (f) Rinse with acetone.
 - (g) Air dry.
 - (h) Rinse with petroleum ether.
 - (i) Air dry overnight.

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- (j) Cover with Teflon-lined cap or aluminum foil.

(2) Onsite. Because of time and space limitations it may be difficult to clean sampler bottles thoroughly. Try to keep the same bottles for each sample point. The petroleum ether step may be omitted to save time, but ensure that all of the acetone has evaporated prior to use.

- d. Buckets and Funnels. Prior to study, preclean the same as the strainers. Onsite, omit the petroleum ether step.

3. Sample Volumes, Containers, Preservation, and Holding Times. See Enclosure 4 for a summary of sample handling information. Note the short (7-day) holding time for the extractable organics. Project officers should ensure that samples are extracted and analyzed within prescribed times.

4. Blanks. The use of field blanks is recommended when sampling/analyzing for trace levels of the organic priority pollutants. Deionized water should be used as blank water.

- a. Sampler Blanks. At each sample point, pump 2 liters of blank water through the sampling train (including sampler bottle) and discard. Then pump 3 liters of blank water through the sampling train, collect, and submit as a sample (one per sample point) for nonvolatile organics analysis.

- b. Container Blanks. For each study, fill one 40 mL glass vial and one amber glass jug with blank water onsite, preserve the same as the real samples, and submit for organic analysis.

5. Sampling Procedures.

- a. Sample Number and Type. The NPDES permit application form (see Enclosure 3) requires only one analysis per parameter. However, the greater the number of analyses, the more representative are the data. In general, to obtain meaningful data while minimizing the laboratory workload, 3 days of sampling (spaced as far apart as possible) are recommended. Flow composites (24-hour) are required for nonvolatile organics and metals. Grab samples are required for volatile organics, cyanide, and total phenols. The following EPA guidelines must be followed:

- (1) Composite Sample. A composite must contain at least eight sample aliquots of a least 100 mL each over a 24-hour period. A maximum time interval of 30 minutes (or 48 samples/24 hours) is recommended between samplings.

- (2) Grab Sample. A grab must be a minimum of 100 mL collected at a randomly selected time over a period not exceeding 15 minutes. For reporting of data in the application form, at least four grab samples per day must be collected. To reduce the number of volatile organic analyses, the grab aliquots collected over a 24-hour period can be combined into one sample in the laboratory just prior to analysis.

- b. Sample Collection. The following procedures should be followed during sample collection.

(1) When possible, grab samples should be collected directly into the appropriate sample containers. Intermediate collection devices should be either Teflon-lined or glass and should be cleaned between sample collections in accordance with procedures outlined in paragraph IVB2c.

(2) When collecting volatile organic samples, a glass beaker should be used as an intermediate collection device. The vials should be filled completely to prevent volatilization. Gently pour the last few drops into each vial so that surface tension holds the water in a reverse meniscus. The cap should then be applied and some overflow lost; air space in the vial is thus eliminated. After capping, turn each vial over and tap it to check for air bubbles; if any are present, repeat the procedure.

(3) If necessary, filter gross suspended matter to ensure sample homogeneity through a 5- to 6-inch-diameter glass funnel with a prewashed, silanized, glass-wool plug (see reference 8).

C. Priority Pollutants Analysis.

1. Selection of Parameters. Two of the priority pollutants, asbestos and dioxin, are not routinely analyzed for. Due to the lack of a suitable test method for asbestos, NPDES permit applications are required only to indicate whether asbestos is expected to be discharged and, if so, to describe the source of the discharge and to submit any available data. Because the routine shipping and use of analytical standards of dioxin would endanger the public, the EPA requires that only applicants who use or produce certain dioxin-related compounds (see Enclosure 3) screen for it.

2. Detection Limits. The minimum detection limits for chemical analyses will depend upon the character of a sample. In general, the less interferences in a sample, the lower the achievable detection limit. While there are EPA-approved methods for priority pollutant analysis (with associated detection levels), there are no minimum levels prescribed by law. Regulatory officials should be contacted prior to a study to determine what levels of detection are required. The following detection limit ranges are achievable in common laboratory practice.

a. Volatile Organics: 1 to 10 parts per billion (ppb)

b. Base/Neutral Extractables: 10 to 25 ppb

c. Acid Extractables: 10 to 25 ppb

d. Pesticides/Polychlorinated Biphenyls (PCBs).

(1) Normally: 20 to 50 ppb (500 for toxaphene)

(2) With special equipment: 0.04 to 3.8 ppb

e. Metals.

(1) Antimony: 0.10 parts per million (ppm)

(2) Arsenic: 0.010 ppm

- (3) Beryllium: 0.050 ppm
- (4) Cadmium: 0.001 ppm
- (5) Chromium: 0.025 ppm
- (6) Copper: 0.025 ppm
- (7) Lead: 0.005 ppm
- (8) Mercury: 0.002 ppm
- (9) Nickel: 0.010 ppm
- (10) Selenium: 0.005 ppm
- (11) Silver: 0.025 ppm
- (12) Thallium: 0.050 ppm
- (13) Zinc: 0.015 ppm
- (14) Total Cyanide: 0.01 ppm
- (15) Total Phenols: 0.01 ppm

V. PRIORITY POLLUTANT SAMPLING PROCEDURES FOR GROUND-WATER MONITORING WELLS.

A. Background.

1. It is important to remember that, in sampling ground water, the primary goal is to obtain, as accurately as possible, a true picture of the chemical composition of the water within the aquifer (i.e., ground-water quality of the aquifer itself and not the quality of the water as it comes out of the tap, as it were). Therefore, the procedures to attain this goal have to be strictly adhered to so that this result can be achieved.

2. One of the major difficulties in assessing ground water for its priority pollutant content is that the analytical method used to determine concentration gives results in ppb. This is a very small fraction of the total volume of liquid sampled. Therefore, due to the fact that very low concentrations are being measured, a potential contaminant can be introduced at almost any point in the sampling process unless precautions and very stringent guidelines are followed. In fact, cross contamination between monitoring wells via the sampling equipment is a major area of concern. The following procedures are established so that a sample can be obtained which reflects, as accurately as possible, actual aquifer conditions.

B. Purging the Well of Existing Contaminants.

1. A well, whether it be a drinking water well or a monitoring well, is an effective trap for contaminants and/or existing elements when not in use. When any well has not been used for a period of time, the cavity created by

the well forms a void within the aquifer which has a tendency to trap and concentrate existing elements and compounds within the confines of the well casing. Therefore, sampling and analysis of this water will generally result in obtaining concentrations of elements and/or compounds higher than those which actually exist within the aquifer. Consequently, this water must be evacuated (purged) from the well before sampling can begin.

2. The pumping process is, perhaps, as important in obtaining a good ground-water sample as any of the other phases of the sampling program. The basic concept of the purging process is to collect a representative sample of the water within the aquifer. This can be accomplished by evacuating a minimum of five well volumes from the well or by pumping water from the well until conductivity, pH, and temperature of the aquifer water have stabilized.

a. A well volume is defined as the amount of water in the well, in gallons, as measured from the static water level to the bottom of the well. Pumping at a rate equal to the recharge rate of the well ensures that the stagnant water within the well will be evacuated and that "fresh" water from the aquifer will replace the water evacuated. This concept, i.e., pumping at a rate equal to the recharge rate, is relatively easy to attain with large-diameter wells (>4 inch inside diameter) but can be a problem with small-diameter wells (<4 inch inside diameter).

b. In small-diameter shallow wells and/or tight aquifers, the wells may be pumped dry. Pumping a well dry is not actually a true statement. Depending upon the type of pump used for purging, there will be some stagnant water left in the bottom of the well once water levels decrease below the level at which the pump can efficiently pump the remaining water to the surface. Therefore, depending on the type of device used for purging, it may be necessary to pump the well dry two or three times before a sample can be safely taken.

3. There are basically four methods by which the purging process can be accomplished. The methods are defined by the type of pump used for purging. The four types of pumps are the submersible pump, the centrifugal or peristaltic pump, the air-lift mechanism, or the bailer.

a. Submersible Pump. Submersible pumps are normally relegated to the evacuation of large-diameter wells and/or deep wells. A deep well in this document refers to a well in which the static water level is greater than 25 feet below the surface of the earth. These pumps are extremely effective in evacuating large-diameter wells because their pumping rates are relatively high and their setup and breakdown times are relatively short. The main constraint in evacuating wells with this type of device is to select a pump size which roughly approximates the specific yield of the well.

b. Centrifugal or Peristaltic Pumps. These pumps are not "down-the-hole" types of pumps. They are above the surface and rely on the fact that the static water level is closer than 25 feet from the surface. The intake line extends down the well casing, evacuates the well through suction, and discharges the water through a discharge line on the surface. These types of

pumps are extremely versatile when the aforementioned ground-water conditions prevail. For the shallower wells, the pumping rates can be varied to match the specific yield of the aquifer whether they are to be used on large- or small-diameter wells.

c. Air-lift Mechanism. Air-lift systems are usually relegated to small-diameter deep wells. Their basic constraint is that they exhibit a very low pumping rate. Usually, this is less than 0.5 gallon per minute. Therefore, the time required to evacuate a small-diameter deep well may be substantial. An air-lift system which uses air or some inert gas to bring water to the surface and has an expandable reservoir as an intermediate step is referred to as a bladder pump. Another method to evacuate water from a well is to inject air through a discharge line which is placed into the well so the outlet is near the bottom. The air is supplied from an air compressor or bottle of gas. The injection of this air will cause the water within the well to rise to the surface and overflow the top of the standpipe. This process is not quite as preferable as some of the other methods because the process of injecting air directly from an air compressor may introduce contaminants into the well.

d. Bailer. Bailers come in all different forms and materials. As a general rule, all are acceptable. The only requirement is that the bailer be constructed of material that will not react with the chemical parameters in the well. The bailer most utilized by this Agency is described as follows: A bailer is a collection tube of specific volume which, when lowered into a well, is triggered to close by the release of a messenger sent from the surface, thereby capturing a portion of the water contained within the casing. The captured sample is then hoisted to the surface for discharge. This is the least desirable of all the purging methods because of its labor-intensive nature and its unusually long time requirement. Although, under special conditions, this method could be as effective as any of the other methods, i.e., small-diameter well and very shallow ground-water conditions where a well volume is relatively small (less than 3 gallons).

C. Sampling.

1. The priority pollutant list contains basically six general categories of elements and/or compounds. They are the volatile organics (28), base/neutral extractable organics (46), acid extractable organics (11), pesticides/PCBs (25), metals (13), and miscellaneous (3). For an itemized listing of these categories, see Enclosure 2.

2. Once the well has been purged of all stagnant water and five well volumes have been removed from the well, sampling can begin.

3. Because of the unique nature of the elements and/or compounds to be analyzed for, the type of device to be used for sampling is extremely important in order to obtain a fair assessment of actual ground-water conditions.

a. Any vigorous agitation of the sampled water must be avoided. This is a requirement since agitation will volatilize the volatile organics in the sample, resulting in a lower-than-actual concentration of these parameters.

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b. The sampling device and sample containers must be constructed of materials that will not react with the sample and change the sample chemistry. Therefore, use of devices or containers made of iron (or like metal) or polyvinyl chloride (or like plastic) may, in actuality, increase certain parameters to be measured due to leaching. Consequently, the sampling device and sample containers should be made of stainless steel, Teflon, and/or glass. The sample containers, if glass, should be appropriately cleaned and the lids should have Teflon liners. All of these steps are required to eliminate the amount of introduced pollutants via the sampling device.

4. The recommended method of sampling for priority pollutants from ground-water monitoring wells is with a stainless steel bailer with Teflon end caps or an all-Teflon bailer. These devices are commercially available and are absolutely required for volatile organics sampling. However, for the other classes of parameters, a bailer is not the only instrument that can be used. Any of the other sampling devices (i.e., bladder pump, submersible pump, centrifugal pump, or peristaltic pump) can be used for sampling. If only one of these devices is used for sampling during a survey, it must be cleaned thoroughly, as outlined in 6 below, before it can be used to sample other wells. This must be accomplished to reduce the potential for cross contamination. However, these other types of pumps would require much more labor-intensive cleaning than a bailer. Ideally, the best situation would be to have a bailer or pump dedicated to each sampling point.

5. The sample containers used for volatile and organic sampling should be glass with Teflon-lined lids. These sample containers should be cleaned thoroughly, utilizing the following procedures:

- a. Wash with hot detergent.
- b. Rinse with hot tap water.
- c. Rinse with 20-percent nitric acid.
- d. Rinse thoroughly with tap water.
- e. Rinse with distilled water.
- f. Rinse with acetone.
- g. Rinse with petroleum ether.
- h. Air dry overnight.
- i. Cover with Teflon-lined cap.

6. Before each sample is taken, the sampling device must also be thoroughly cleaned of all contaminants. If the samples must be filtered, the filtering device must also be subjected to the same cleaning process. The following procedures should be followed:

- a. Wash with mild detergent.
- b. Rinse with tap water.
- c. Rinse with distilled water.
- d. Rinse with acetone.
- e. Rinse with petroleum ether.
- f. Air dry or dry with nitrogen gas.

The petroleum ether step should be eliminated if sampling is for known quantities of petroleum hydrocarbons. Since the bailer must be lowered into the well via some form of line, care should be taken to ensure that no cross contamination is introduced into successive sampled wells via this line. A safeguard to prevent this from happening is to dedicate the line used for each well to that particular well. The type of material to be used for this purpose can vary. The requirements are that it be a material that will not react with elements and compounds which may be in the ground water and that each line segment be used only for the bailing of one well. What has been used at this Agency in the past is the common cotton line, which is commercially available.

7. Once all of the above conditions have been satisfied, sampling can begin. As each sample is retrieved from the well, the containers used to store and transport the sample should be flushed with water from the well. This water is then discarded and the container filled. Each container should be completely filled with sample. With respect to sampling for volatile organics, the 40 mL vials should be filled to the top such that a reverse meniscus is formed at the top of the vial. The Teflon-lined cap is then secured and the vial turned over to determine if any air bubbles have been included in the sample. Tapping the side of the vial will aid in the detection of air bubbles by releasing them from the sides and bottom of the vial to rise to the top. If so, the filling procedure must be repeated.

8. In addition to the samples for the six categories within the priority pollutants, two field blanks should also be taken.

- a. Sampler Blank.

(1) After following the procedures listed previously for cleaning the bailer, and prior to down-hole sampling, fill the bailer with distilled (deionized) water. Agitate the bailer. Repeat several times so that at least 3 liters of deionized water are used for this rinsing process. Pour a fourth liter of deionized water through the bailer and collect in a sample container. This will be the sampler blank which will be used to determine any background levels of organics remaining in the bailer prior to sampling.

(2) If a bladder pump, submersible pump, or centrifugal pump is used for sampling, the same procedure as described above is used except the 3 liters of deionized water are pumped through the system prior to collecting the fourth liter as the sampler blank.

b. Container Blank. There is only one container blank per survey. The container blank is used to determine any background levels of organics that may be in the deionized water and/or the containers used during the survey. If the deionized water and containers are brought with the survey team from USAEHA, this blank can be made up prior to departure. However, if the deionized water is purchased or provided by the installation, a container blank will have to be made up at the survey site.

9. As a general rule of thumb, this entire procedure for sampling and purging (for wells less than 50 feet deep) takes approximately 2.5 hours per well. After the samples have been taken, some of them may have to be preserved and filtered. The following Table describes the sample quantity required, amount of sample, preservation methodology, and whether filtration is required. If filtration is required, the final product must be filtered through a 0.45-micron filter. This Agency utilizes a nitrogen over-pressure filtering system for filtering ground water. This device has several distinct advantages: it is capable of filtering large volumes of water in a short period of time, it is constructed of stainless steel, and all surface areas where ground water would have contact are Teflon lined.

TABLE. SAMPLING SCHEME

Sample Category	Amount of Sample	Preservation Methodology	Filtration Requirements
Volatile Organics	3 40-mL vials	None	None
Base/Neutral Ext.	1 liter	None	None
Acid Extractables	1 liter	None	None
Pesticides	1 liter	None	None
Phenols	1 liter	2 mL Sulphuric Acid	Yes
Cyanide	2 liters	4 pellets of NaOH	Yes
Metals	1 liter	2 mL Nitric Acid	Yes
Mercury	240 mL	5 mL Nitric Acid/ Potassium Dichromate	Yes

VI. TECHNICAL ASSISTANCE. Additional information/assistance with the above methodology may be obtained from Mr. Mark D. Nickelson, AUTOVON 584-3554/3816.



MARK D. NICKELSON
Geologist
Water Quality Engineering Division

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8. Container Blank. There is only one container blank per survey. The container blank is used to determine any background levels of organic that may be in the deionized water and/or the container used during the survey. If the deionized water and container are brought with the survey team, the container blank can be made up prior to departure. However, if the deionized water is purchased or provided by the installation, a container blank will have to be made up at the survey site.

9. As a general rule of thumb, this entire procedure for sampling and purging for wells less than 50 feet deep takes approximately 2.5 hours per well. After the samples have been taken, some of them may have to be preserved and filtered. The following table describes the sample quantity required, amount of sample, preservation methodology, and whether filtration is required. If filtration is required, the final product must be filtered through a 0.45 micron filter. This Agency utilizes a nitrogen over-pressure filtering system for filtering ground water. This device has several distinct advantages: it is capable of filtering large volumes of water in a short period of time; it is constructed of stainless steel, and all surface areas where ground water would have contact are helium lined.

TABLE 1. SAMPLING SCHEME

Sample Category	Amount of Sample	Preservation Methodology	Filtration Requirements
Volatiles Organics	3-40-ml vials	None	None
Bacteriological	1 liter	None	None
Acid Extractables	1 liter	None	None
Pesticides	1 liter	None	None
Phenols	1 liter	5 ml Sulphuric Acid	Yes
Cyanide	2 liters	4 bottles of NaOH	Yes
Metals	1 liter	5 ml Nitric Acid	Yes
Mercury	500 ml	5 ml Nitric Acid	Yes
		Potassium Dichromate	

10. TECHNICAL ASSISTANCE. Additional information assistance with the above methodology may be obtained from Mr. Mark D. Rickerson, AUTUMN 554-3524/3515.

Mark D. Rickerson
 MARK D. RICKERSON
 Geologist
 Water Quality Engineering Division

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3. Procedures Manual for Ground-Water Monitoring at Solid Waste Disposal Facilities, EPA, Office of Solid Waste, August 1977.
4. Standard Operating Procedures and Quality Assurance Manual, EPA, Region III, Water Surveillance Branch, 29 August 1980.
5. Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants, EPA, Environmental Monitoring and Support Laboratory.
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8. Procedures, HSE-LE, Organic Environmental Chemistry Division, this Agency, Sample Collection Procedure for Analysis of Organic and Inorganic Toxic Pollutants, 1 June 1980.

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6. Memorandum for Record, USACHA, WSP-EM-2, 3 November 1983, subject: Priority Pollutants, Sampling and Analysis.
7. Water Quality Information Paper No. 6, USACHA, WSP-EM-2, 15 November 1983, subject: Priority Pollutants and Toxic Substances.
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PRIORITY POLLUTANTS

VOLATILE ORGANICS

Acrolein	1,2-Dichloropropane
Acrylonitrile	1,2-Dichloropropylene
Benzene	Methylene chloride
Toluene	Methyl chloride
Ethylbenzene	Methyl bromide
Carbon tetrachloride	Bromoform
Chlorobenzene	Dichlorobromomethane
1,2-Dichloroethane	Chlorodibromomethane
1,1,1-Trichloroethane	Tetrachloroethylene
1,1-Dichloroethane	Trichloroethylene
1,1-Dichloroethylene	Vinyl chloride
1,1,2-Trichloroethane	1,2-trans-Dichloroethylene
1,1,2,2-Tetrachloroethane	Chloroethane
2-Chloroethyl vinyl ether	Chloroform

BASE/NEUTRAL EXTRACTABLE ORGANICS

1,2-Dichlorobenzene	Fluorene
1,3-Dichlorobenzene	Fluoranthene
1,4-Dichlorobenzene	Chrysene
Hexachloroethane	Pyrene
Hexachlorobutadiene	Phenanthrene
Hexachlorobenzene	Anthracene
1,2,4-Trichlorobenzene	Benzo(a)anthracene
bis(2-Chloroethoxy)methane	Benzo(b)fluoranthene
Naphthalene	Benzo(k)fluoranthene
2-Chloronaphthalene	Benzo(a)pyrene
Isophorone	Idenol(1,2,3-c,d)pyrene
Nitrobenzene	Dibenzo(a,h)anthracene
2,4-Dinitrotoluene	Benzo(g,h,i)perylene
2,6-Dinitrotoluene	4-Chlorophenyl phenyl ether
4-Bromophenyl phenyl ether	3,3'-Dichlorobenzidine
bis(2-Ethylhexyl)phthalate	Benzidine
Di-n-octyl phthalate	bis(2-Chloroethyl)ether
Dimethyl phthalate	1,2-Diphenylhydrazine
Diethyl phthalate	Hexachlorocyclopentadiene
Di-n-butyl phthalate	N-Nitrosodiphenylamine
Acenaphthylene	N-Nitrosodimethylamine
Acenaphthene	N-Nitrosodi-n-propylamine
Butyl benzyl phthalate	bis(2-Chloroisopropyl)ether

ACID EXTRACTABLE ORGANICS

Phenol	p-Chloro-m-cresol
2-Nitrophenol	2-Chlorophenol
4-Nitrophenol	2,4-Dichlorophenol
2,4-Dinitrophenol	2,4,6-Trichlorophenol
4,6-Dinitro-o-cresol	2,4-Dimethylphenol
Pentachlorophenol	

PESTICIDES/PCBs

α-Endosulfan	Heptachlor
β-Endosulfan	Heptachlor epoxide
Endosulfan sulfate	Chlordane
α-BHC	Toxaphene
β-BHC	Aroclor® 1016
γ-BHC	Aroclor 1221
γ-BHC (Lindane)	Aroclor 1232
Aldrin	Aroclor 1242
Dieldrin	Aroclor 1248
4,4'-DDE	Aroclor 1254
4,4'-DDD	Aroclor 1260
4,4'-DDT	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
Endrin	Endrin aldehyde

METALS

Antimony	Mercury
Arsenic	Nickel
Beryllium	Selenium
Cadmium	Silver
Chromium	Thallium
Copper	Zinc
Lead	

MISCELLANEOUS

Asbestos (fibrous)	Total Phenols
Total Cyanides	

* Aroclor is a registered tradename of the Monsanto Company, St. Louis, Missouri



Permits Division

Application Form 2C - Wastewater Discharge Information

Consolidated Permits Program

This form must be completed by all persons applying for an EPA permit to discharge wastewater (*existing manufacturing, commercial, mining, and silvicultural operations*).

Encl 3



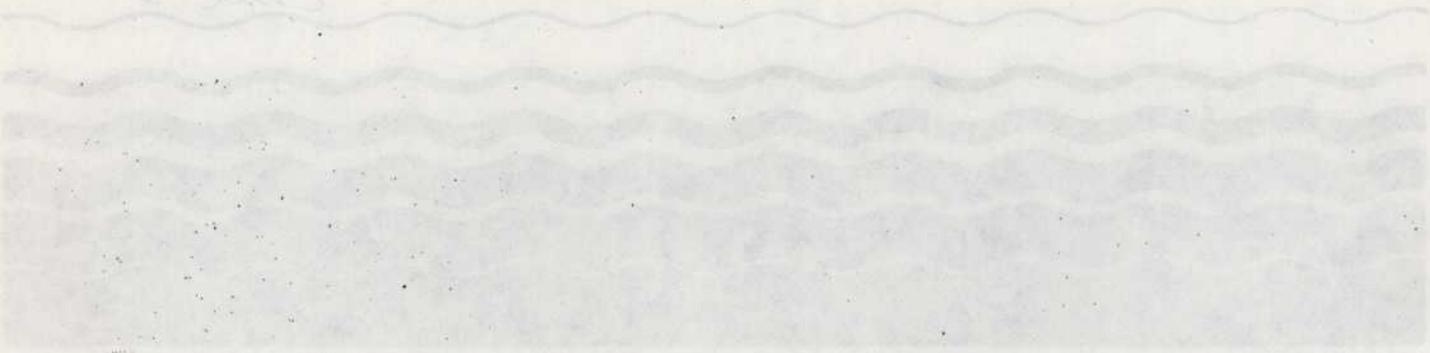
Application Form 3300 -
Wastewater Discharge
Information

EPA

Consolidated Permits Program

This form must be completed by all permittees for
the 1992 permit cycle. For more information, contact
the EPA Regional Office or the EPA National Office.
EPA Form 3300-2 (Rev. 11/81)

Vol 3



FORM 2C - INSTRUCTIONS

This form must be completed by all applicants who check "yes" to Item II-C in Form 1.

Public Availability of Submitted Information

Your application will not be considered complete unless you answer every question on this form and on Form 1. If an item does not apply to you, enter "NA" (for not applicable) to show that you considered the question.

You may not claim as confidential any information required by this form or Form 1, whether the information is reported on the forms or in an attachment. This information will be made available to the public upon request.

Any information you submit to EPA which goes beyond that required by this form and Form 1 you may claim as confidential, but claims for information which is effluent data will be denied. If you do not assert a claim of confidentiality at the time of submitting the information, EPA may make the information public without further notice to you. Claims of confidentiality will be handled in accordance with EPA's business confidentiality regulations at 40 CFR Part 2.

Definitions

All significant terms used in these instructions and in the form are defined in the glossary found in the General Instructions which accompany Form 1.

EPA I.D. Number

Fill in your EPA Identification Number at the top of each page of Form 2C. You may copy this number directly from Item I of Form 1.

Item I

You may use the map you provided for Item XI of Form 1 to determine the latitude and longitude of each of your outfalls and the name of the receiving water.

Item II-A

The line drawing should show generally the route taken by water in your facility from intake to discharge. Show all operations contributing wastewater, including process and production areas, sanitary flows, cooling water, and stormwater runoff. You may group similar operations into a single unit, labeled to correspond to the more detailed listing in Item II-B. The water balance should show average flows. Show all significant losses of water to products, atmosphere, and discharge. You should use actual measurements whenever available; otherwise use your best estimate. An example of any acceptable line drawing appears in Figure 2C-1 to these instructions.

Item II-B

List all sources of wastewater to each outfall. Operations may be described in general terms (for example, "dye-making reactor" or a "distillation tower"). You may estimate the flow contributed by each source if no data is available, and for stormwater, you may use any reasonable measure of duration, volume, or frequency. For each treatment unit, indicate its size, flow rate, and retention time, and describe the ultimate disposal of any solid or liquid wastes not discharged. Treatment units should be listed in order and you should select the proper code from Table 2C-1 to fill in column 3-b for each treatment unit. Insert "XX" into column 3-b if no code corresponds to a treatment unit you list.

If you are applying for a permit for a privately owned treatment works, you must also identify all of your contributors in an attached listing.

Item II-C

A discharge is intermittent unless it occurs without interruption during the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities. A discharge is seasonal if it occurs only during certain parts of the year. Fill in every applicable column in this item for each source of intermittent or seasonal discharges. Base your answers on actual data whenever available; otherwise, provide your best estimate. Report the highest daily value for flow rate and total volume in the "Maximum Daily" columns (columns 4-a-2 and 4-b-2). Report the average of all daily values measured during days when discharge occurred within the last year in the "Long Term Average" columns (columns 4-a-1 and 4-b-1).

Item III-A

All effluent guidelines promulgated by EPA appear in the Federal Register and are published annually in 40 CFR Subchapter N. A guideline applies to you if you have any operations contributing process wastewater in any subcategory covered by a BPT, BCT, or BAT guideline. If you are unsure whether you are covered by a promulgated effluent guideline, check with your EPA Regional office (Table 1 in the Form 1 instructions). You must check "yes" if an applicable effluent guideline has been promulgated, even if the guideline limitations are being contested in court. If you believe that a promulgated effluent guideline has been remanded for reconsideration by a court and does not apply to your operations, you may check "no."

Item III-B

An effluent guideline is expressed in terms of production (or other measure of operation) if the limitations are expressed as mass of pollutant per operational parameter, for example, "pounds of BOD per cubic foot of logs from which bark is removed," or "pounds of TSS per megawatt hour of electrical energy consumed by smelting furnace." An example of a guideline not expressed in terms of a measure of operation is one which limits the concentration of pollutants.

Item III-C

This item must be completed only if you checked "yes" to Item III-B. The production information requested here is necessary to apply effluent guidelines to your facility and you may not claim it as confidential. However, you do not have to indicate how the reported information was calculated.

Report quantities in the units of measurement used in the applicable effluent guideline. The figures provided must be a measure of actual operation over a one month period, such as the production for the highest month during the last twelve months, or the monthly average production for the highest year of the last five years, or other reasonable measure of actual operation, but may not be based on design capacity or on predictions of future increases in operation.

Item IV-A

If you check "yes" to this question, complete all parts of the chart, or attach a copy of any previous submission you have made to EPA containing the same information.

Item IV-B

You are not required to submit a description of future pollution control projects if you do not wish to or if none is planned.

Item V-A, B, C, and D

These items require you to collect and report data on the pollutants discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and must be completed in accordance with the specific instructions for that part. The following general instructions apply to the entire item.

ITEM V-A,B,C, and D (continued)

GENERAL INSTRUCTIONS. Part A requires you to report at least one analysis for each pollutant listed. Parts B and C require you to report analytical data in two ways. For some pollutants, you may be required to mark "X" in the "Testing Required" column (column 2-a, Part C), and test (sample and analyze) and report the levels of the pollutants in your discharge whether or not you expect them to be present in your discharge. For all others, you must mark "X" in either the "Believe Present" column or the "Believe Absent" column (column 2-a or 2-b, Part B, and column 2-b or 2-c, Part C) based on your best estimate, and test for those which you believe to be present. Part D requires you to list any of a group of pollutants which you believe to be present, with a brief explanation of why you believe it to be present. (See specific instructions on the form and below for Parts A through D.)

Base your determination that a pollutant is present in or absent from your discharge on your knowledge of your raw materials, maintenance chemicals, intermediate and final products and byproducts, and any previous analyses known to you of your effluent or of any similar effluent. (For example, if you manufacture pesticides, you should expect those pesticides to be present in contaminated stormwater runoff.) If you would expect a pollutant to be present solely as a result of its presence in your intake water, you must mark "Believe Present" but you are not required to analyze for that pollutant. Instead, mark an "X" in the "Intake" column.

A. REPORTING. All levels must be reported as concentration and as total mass. You may report some or all of the required data by attaching separate sheets of paper instead of filling out pages V-1 thru V-9 if the separate sheets contain all the required information in a format which is consistent with pages V-1 thru V-9 in spacing and in identification of pollutants and columns. (For example, the data system used in your GC/MS analysis may be able to print data in the proper format.) Use the following abbreviations in the columns headed "Units" (column 3, Part A, and column 4, Parts B and C).

CONCENTRATION		MASS	
ppm	parts per million	lbs.	pounds
mg/l	milligrams per liter	ton	tons (English tons)
ppb	parts per billion	mg	milligrams
µg/l	micrograms per liter	g	grams
		kg	kilograms
		T	tonnes (metric tons)

If you measure only one daily value, complete only the "Maximum Daily Values" columns and insert "1" into the "Number of Analyses" columns (columns 2-a and 2-d, Part A, and columns 3-a and 3-d, Parts B and C). The permitting authority may require you to conduct additional analyses to further characterize your discharges.

For composite samples, the daily value is the total mass or average concentration found in a composite sample taken over the operating hours of the facility during a 24 hour period; for grab samples, the daily value is the arithmetic or flow-weighted total mass or average concentration found in a series of at least four grab samples taken over the operating hours of the facility during a 24 hour period.

If you measure more than one daily value for a pollutant, determine the average of all values within the last year and report the concentration and mass under the "Long Term Average Values" columns (column 2-c, Part A, and column 3-c, Parts B and C), and the total number of daily values under the "Number of Analyses" columns (column 2-d, Part A, and column 3-d, Parts B and C). Also, determine the average of all daily values taken during each calendar month, and report the highest average under the "Maximum 30 Day Values" columns (column 2-b, Part A, and column 3-b, Parts B and C).

B. SAMPLING. The collection of the samples for the reported analyses should be supervised by a person experienced in performing sampling of industrial wastewater. You may contact your EPA or State permitting authority for detailed guidance on sampling techniques and for answers to specific questions. Any specific requirements contained in the applicable analytical methods should be followed for sample containers, sample preservation, holding times, the collection of duplicate samples, etc. The time when you sample should be representative of your normal operation, to the extent feasible, with all processes which contribute wastewater in normal operation, and with your treatment system operating properly with no system upsets. Samples should be collected from the center of the flow channel, where turbulence is at a maximum, at a site specified in your present permit, or at any site adequate for the collection of a representative sample.

ITEM V-A,B,C, and D (continued)

Grab and composite samples are defined as follows:

1. GRAB SAMPLE. An individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.
2. COMPOSITE SAMPLE. A combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24 hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.

C. ANALYSIS. You must use test methods promulgated in 40 CFR Part 136; however, if none has been promulgated for a particular pollutant, you may use any suitable method for measuring the level of the pollutant in your discharge provided that you submit a description of the method or a reference to a published method. Your description should include the sample holding times, preservation techniques, and the quality control measures which you used.

If you have two or more substantially identical outfalls, you may request permission from your permitting authority to sample and analyze only one outfall and submit the results of the analysis for other substantially identical outfalls. If your request is granted by the permitting authority, on a separate sheet attached to the application form identify which outfall you did test, and describe why the outfalls which you did not test are substantially identical to the outfall which you did test.

D. REPORTING OF INTAKE DATA. You are not required to report data under the "Intake" columns unless you wish to demonstrate your eligibility for a "net" effluent limitation for one or more pollutants, that is, an effluent limitation adjusted by subtracting the average level of the pollutant(s) present in your intake water. NPDES regulations allow net limitations only in certain circumstances. To demonstrate your eligibility, under the "Intake" columns report the average of the results of analyses on your intake water (if your water is treated before use, test the water after it is treated), and attach a separate sheet containing the following for each pollutant:

1. A statement that the intake water is drawn from the body of water into which the discharge is made. (Otherwise, you are not eligible for net limitations.)
2. A statement of the extent to which the level of the pollutant is reduced by treatment of your wastewater. (Your limitations will be adjusted only to the extent that the pollutant is not removed.)
3. When applicable (for example, when the pollutant represents a class of compounds), a demonstration of the extent to which the pollutants in the intake vary physically, chemically, or biologically from the pollutants contained in your discharge. (Your limitations will be adjusted only to the extent that the intake pollutants do not vary from the discharged pollutants.)

PART V-A. Part V-A must be completed by all applicants for all outfalls, including outfalls containing only noncontact cooling water or storm runoff. However, at your request, the permitting authority may waive the requirements to test for one or more of these pollutants, upon a determination that testing for the pollutant(s) is not appropriate for your effluents.

Use composite samples for all pollutants in this Part, except use grab samples for pH and temperature. See discussion in General Instructions to Item V for definitions of the columns in Part A. The "Long Term Average Values" column (column 2-c) and "Maximum 30 Day Values" column (column 2-b) are not compulsory but should be filled out if data is available.

PART V-B. Part V-B must be completed by all applicants for all outfalls, including outfalls containing only noncontact cooling water or storm runoff.

Use composite samples for all pollutants you analyze for in this Part, except use grab samples for residual chlorine, oil and grease, and fecal coliform. The "Long Term Average Values" column (column 3-c) and "Maximum 30 Day Values" column (column 3-b) are not compulsory but should be filled out if data is available.

ITEM V-A,B,C, and D (continued)

PART V-C. Table 2c-2 lists the 34 "primary" industry categories in the left-hand column. For each outfall, if any of your processes which contribute wastewater falls into one of those categories, you must mark "X" in "Testing Required" column (column 2-a) and test for: (A) All of the toxic metals, cyanide, and total phenols; and (B) The organic toxic pollutants contained in the gas chromatography/mass spectrometry (GC/MS) fractions indicated in Table 2c-2 as applicable to your category, unless you qualify as a small business (see below). The organic toxic pollutants are listed by GC/MS fractions on pages V-4 through V-9 in Part V-C. For example, the Organic Chemicals industry has an "X" in all four fractions; therefore, applicants in this category must test for all organic toxic pollutants in Part V-C. If you are applying for a permit for a privately owned treatment works, determine your testing requirements on the basis of the industry categories of your contributors. When you determine which industry category you are in to find your testing requirements, you are not determining your category for any other purpose and you are not giving up your right to challenge your inclusion in that category (for example, for deciding whether an effluent guideline is applicable) before your permit is issued.

For all other cases (secondary industries, non-process wastewater outfalls, and non-required GC/MS fractions), you must mark "X" in either the "Believed Present" column (column 2-b) or the "Believed Absent" column (column 2-c) for each pollutant, and test for those you believe present (those marked "X" in column 2-b). If you qualify as a small business (see below) you are exempt from testing for the organic toxic pollutants, listed on pages V-4 through V-9 in Part C. For pollutants in intake water, see discussion in General Instructions to this item. The "Long Term Average Values" column (column 3-c) and "Maximum 30 Day Values" column (column 3-b) are not compulsory but should be filled out if data is available.

Use composite samples for all pollutants in this Part, except use grab samples for total phenols and cyanide.

You are required to mark "Testing Required" for dioxin if you use or manufacture one of the following compounds:

- A. 2,4,5-trichlorophenoxy acetic acid (2,4,5-T);
- B. 2-(2,4,5-trichlorophenoxy) propanoic acid (Silvex, 2,4,5-TP);
- C. 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate (Erbon);
- D. O,O-dimethyl O-(2,4,5-trichlorophenyl) phosphorothioate (Ronnel);
- E. 2,4,5-trichlorophenol (TCP); or
- F. Hexachlorophene (HCP).

If you mark "Testing Required" or "Believe Present," you must perform a screening analysis for dioxins, using gas chromatography with an electron capture detector. A TCDD standard for quantitation is not required. Describe the results of this analysis in the space provided; for example, "no measurable baseline deflection at the retention time of TCDD" or "a measurable peak within the tolerances of the retention time of TCDD." The permitting authority may require you to perform a quantitative analysis if you report a positive result.

The Effluent Guidelines Division of EPA has collected and analyzed samples from some plants for the pollutants listed in Part C in the course of its BAT guidelines development program. If your effluents were sampled and analyzed as part of this program in the last three years, you may use this data to answer Part C provided that the permitting authority approves, and provided that no process change or change in raw materials or operating practices has occurred since the samples were taken that would make the analyses unrepresentative of your current discharge.

SMALL BUSINESS EXEMPTION. If you qualify as a "small business," you are exempt from the reporting requirements for the organic toxic pollutants, listed on pages V-4 through V-9 in Part C. If your facility is a coal mine, and if your probable total annual production is less than 100,000 tons per year, you may submit past production data or estimated future production (such as a schedule of estimated total production under 30 CFR Section 795.14(c)) instead of conducting analyses for the organic toxic pollutants. If your facility is not a coal mine, and if your gross total annual sales for the most recent three years average less than \$100,000 per year (in second quarter 1980 dollars), you may submit sales data for those years instead of conducting analyses for the organic toxic pollutants.

ITEM V-A,B,C, and D (continued)

The production or sales data must be for the facility which is the source of the discharge. The data should not be limited to production or sales for the process or processes which contribute to the discharge, unless those are the only processes at your facility. For sales data, in situations involving intra-corporate transfers of goods and services, the transfer price per unit should approximate market prices for those goods and services as closely as possible. Sales figures for years after 1980 should be indexed to the second quarter of 1980 by using the gross national product price deflator (second quarter of 1980 = 100). This index is available in "National Income and Product Accounts of the United States" (Department of Commerce, Bureau of Economic Analysis).

PART V-D. List any pollutants in Table 2c-3 that you believe to be present and explain why you believe them to be present. No analysis is required, but if you have analytical data, you must report it.

NOTE: Under 40 CFR 117.12(e)(2), certain discharges of hazardous substances (listed in Table 2c-4 of these instructions) may be exempted from the requirements of Section 311 of CWA, which establishes reporting requirements, civil penalties, and liability for clean-up costs for spills of oil and hazardous substances. A discharge of a particular substance may be exempted if the origin, source, and amount of the discharged substance are identified in the NPDES permit application or in the permit, if the permit contains a requirement for treatment of the discharge, and if the treatment is in place. To apply for an exclusion of the discharge of any hazardous substance from the requirements of Section 311, attach additional sheets of paper to your form, setting forth the following information:

- A. The substance and the amount of each substance which may be discharged;
- B. The origin and source of the discharge of the substance;
- C. The treatment which is to be provided for the discharge by:
 1. An on-site treatment system separate from any treatment system treating your normal discharge,
 2. A treatment system designed to treat your normal discharge and which is additionally capable of treating the amount of the substance identified under paragraph 1 above, or
 3. Any combination of the above.

See 40 CFR Section 117.12(a)(2) and (c), published on August 29, 1979, in 44 FR 50766, or contact your Regional office (Table 1 in the Form 1 instructions), for further information on exclusions from Section 311.

Item VI-A

You may not claim this information as confidential; however, you do not have to distinguish between use or production of the pollutants or list the amounts. Under NPDES regulations your permit will contain limits to control all pollutants you report in answer to this question, as well as all pollutants reported in Item V or VI-B at levels exceeding the technology-based limits appropriate to your facility. Your permit will also require you to report to EPA if you in the future begin or expect that you will begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which you did not report here, and your permit may be modified at that time if necessary to control that pollutant.

Item VI-B

For this item, consider only those variations which may result in concentrations of pollutants in effluents which may exceed two times the maximum values you reported in Item V. These variations may be part of your routine operations, or part of your regular cleaning cycles.

Under NPDES regulations your permit will contain limits to control any pollutant you report in answer to this question at levels exceeding the technology-based limits appropriate to your facility. Your permit will also require you to report to EPA if you know or have reason to believe that any activity has occurred or will occur which would make your discharge of any toxic pollutant five times the maximum values reported in Item V-C or in this item, and your permit may be modified at that time if necessary to control the pollutant.

Do not consider variations which are the result of bypasses or upsets. Increased levels of pollutants which are discharged as a result of bypasses or upsets are regulated separately under NPDES regulations.

Item VI-C

Examples of the types of variations to be described here include: Changes in raw or intermediate materials; Changes in process equipment or materials; Changes in product lines; Significant chemical reactions between pollutants in waste streams; and Significant variation in removal efficiencies of pollution control equipment.

You may indicate other types of variations as well, except those which are the result of bypasses or upsets. The permitting authority may require you to further investigate or document variations you report here.

Base your prediction of expected levels of these pollutants upon your knowledge of your processes, raw materials, past and projected product ranges, etc., or upon any testing conducted upon your effluents which indicates the range of variability that can be expected in your effluent over the next five years.

EXAMPLE. Outfall 001 discharges water used to clean six 500 gallon tanks. These tanks are used for formulation of dispersions of synthetic resins in water (adhesives). Use of toxic pollutants which can be expected in the next 5 years is:

- 1. Copper acetate inhibitor, 1/2 lb. per tank;
2. Dibutyl phthalate, 50 lbs. per tank;
3. Toluene, 5 lbs. per tank; and
4. Antimony oxide, 1 lb. per tank.

Based on normal cleaning an average of 1% and a maximum of 3% of the contents of each tank is collected and discharged once every two weeks in the 150 gallons of water used for cleaning. Treatment (pH adjustment, flocculation, filtration) removes 85% of metals and 50% of organic compounds.

Item VII

Self explanatory. The permitting authority may ask you to provide additional details after your application is received.

Item VIII

Self explanatory.

Item IX

The Clean Water Act provides for severe penalties for submitting false information on this application form.

Section 309(c)(2) of the Clean Water Act provides that "Any person who knowingly makes any false statement, representation, or certification in any application, . . . shall upon conviction, be punished by a fine of no more than \$10,000 or by imprisonment for not more than six months, or both."

FEDERAL REGULATIONS REQUIRE THE CERTIFICATION TO BE SIGNED AS FOLLOWS:

- A. For a corporation, by a principal executive officer of at least the level of vice president;
B. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
C. For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.

CODES FOR TREATMENT UNITS

PHYSICAL TREATMENT PROCESSES

1-A	Ammonia Stripping	1-M	Grit Removal
1-B	Dialysis	1-N	Microstraining
1-C	Diatomaceous Earth Filtration	1-O	Mixing
1-D	Distillation	1-P	Moving Bed Filters
1-E	Electrodialysis	1-Q	Multimedia Filtration
1-F	Evaporation	1-R	Rapid Sand Filtration
1-G	Flocculation	1-S	Reverse Osmosis (<i>Hyperfiltration</i>)
1-H	Flotation	1-T	Screening
1-I	Foam Fractionation	1-U	Sedimentation (<i>Settling</i>)
1-J	Freezing	1-V	Slow Sand Filtration
1-K	Gas-Phase Separation	1-W	Solvent Extraction
1-L	Grinding (<i>Comminutors</i>)	1-X	Sorption

CHEMICAL TREATMENT PROCESSES

2-A	Carbon Adsorption	2-G	Disinfection (<i>Ozone</i>)
2-B	Chemical Oxidation	2-H	Disinfection (<i>Other</i>)
2-C	Chemical Precipitation	2-I	Electrochemical Treatment
2-D	Coagulation	2-J	Ion Exchange
2-E	Dechlorination	2-K	Neutralization
2-F	Disinfection (<i>Chlorine</i>)	2-L	Reduction

BIOLOGICAL TREATMENT PROCESSES

3-A	Activated Sludge	3-E	Pre-Aeration
3-B	Aerated Lagoons	3-F	Spray Irrigation/Land Application
3-C	Anaerobic Treatment	3-G	Stabilization Ponds
3-D	Nitrification-Denitrification	3-H	Trickling Filtration

OTHER PROCESSES

4-A	Discharge to Surface Water	4-C	Reuse/Recycle of Treated Effluent
4-B	Ocean Discharge Through Outfall	4-D	Underground Injection

SLUDGE TREATMENT AND DISPOSAL PROCESSES

5-A	Aerobic Digestion	5-M	Heat Drying
5-B	Anaerobic Digestion	5-N	Heat Treatment
5-C	Belt Filtration	5-O	Incineration
5-D	Centrifugation	5-P	Land Application
5-E	Chemical Conditioning	5-Q	Landfill
5-F	Chlorine Treatment	5-R	Pressure Filtration
5-G	Composting	5-S	Pyrolysis
5-H	Drying Beds	5-T	Sludge Lagoons
5-I	Elutriation	5-U	Vacuum Filtration
5-J	Flotation Thickening	5-V	Vibration
5-K	Freezing	5-W	Wet Oxidation
5-L	Gravity Thickening		

TESTING REQUIREMENTS FOR ORGANIC TOXIC POLLUTANTS INDUSTRY CATEGORY

INDUSTRY CATEGORY	GC/MS FRACTION ¹			
	Volatile	Acid	Base/Neutral	Pesticide
Adhesives and sealants	X	X	X	-
Aluminum forming	X	X	X	-
Auto and other laundries	X	X	X	X
Battery manufacturing	X	-	X	-
Coal mining	X	X	X	X
Coil coating	X	X	X	-
Copper forming	X	X	X	-
Electric and electronic compounds	X	X	X	X
Electroplating	X	X	X	-
Explosives manufacturing	X	X	X	-
Foundries	X	X	X	-
Gum and wood chemicals	X	X	X	X
Inorganic chemicals manufacturing	X	X	X	-
Iron and steel manufacturing	X	X	X	-
Leather tanning and finishing	X	X	X	X
Mechanical products manufacturing	X	X	X	-
Nonferrous metals manufacturing	X	X	X	X
Ore mining	X	X	X	X
Organic chemicals manufacturing	X	X	X	X
Paint and ink formulation	X	X	X	X
Pesticides	X	X	X	X
Petroleum refining	X	X	X	X
Pharmaceutical preparations	X	X	X	-
Photographic equipment and supplies	X	X	X	X
Plastic and synthetic materials manufacturing	X	X	X	X
Plastic processing	X	-	-	-
Porcelain enameling	X	-	X	X
Printing and publishing	X	X	X	X
Pulp and paperboard mills	X	X	X	X
Rubber processing	X	X	X	-
Soap and detergent manufacturing	X	X	X	-
Steam electric power plants	X	X	X	-
Textile mills	X	X	X	X
Timber products processing	X	X	X	X

¹ The pollutants in each fraction are listed in Item V-C.

X = Testing required.

- = Testing not required.

**TOXIC POLLUTANTS AND HAZARDOUS SUBSTANCES REQUIRED TO
BE IDENTIFIED BY APPLICANTS IF EXPECTED TO BE PRESENT**

TOXIC POLLUTANT

Asbestos

HAZARDOUS SUBSTANCES

Acetaldehyde
 Allyl alcohol
 Allyl chloride
 Amyl acetate
 Aniline
 Benzotrile
 Benzyl chloride
 Butyl acetate
 Butylamine
 Captan
 Carbaryl
 Carbofuran
 Carbon disulfide
 Chlorpyrifos
 Coumaphos
 Cresol
 Crotonaldehyde
 Cyclohexane
 2,4-D (2,4-Dichlorophenoxyacetic acid)
 Diazinon
 Dicamba
 Dichlobenil
 Dichlone
 2,2-Dichloropropionic acid

HAZARDOUS SUBSTANCES

Dichlorvos
 Diethyl amine
 Dimethyl amine
 Dintrobenzene
 Diquat
 Disulfoton
 Diuron
 Epichlorohydrin
 Ethion
 Ethylene diamine
 Ethylene dibromide
 Formaldehyde
 Furfural
 Guthion
 Isoprene
 Isopropanolamine
 Kelthane
 Kepone
 Malathion
 Mercaptodimethur
 Methoxychlor
 Methyl mercaptan
 Methyl methacrylate
 Methyl parathion
 Mevinphos
 Mexacarbate
 Monoethyl amine
 Monomethyl amine

HAZARDOUS SUBSTANCES

Naled
 Napthenic acid
 Nitrotoluene
 Parathion
 Phenolsulfonate
 Phosgene
 Propargite
 Propylene oxide
 Pyrethrins
 Quinoline
 Resorcinol
 Strontium
 Strychnine
 Styrene
 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)
 TDE (Tetrachlorodiphenyl ethane)
 2,4,5-TP [2-(2,4,5-Trichlorophenoxy)
 propanoic acid]
 Trichlorofon
 Triethanolamine
 Triethylamine
 Trimethylamine
 Uranium
 Vanadium
 Vinyl acetate
 Xylene
 Xylenol
 Zirconium

HAZARDOUS SUBSTANCES

1. Acetaldehyde	70. Calcium cyanide	136. Ferric ammonium citrate
2. Acetic acid	71. Calcium dodecylbenzenesulfonate	137. Ferric ammonium oxalate
3. Acetic anhydride	72. Calcium hypochlorite	138. Ferric chloride
4. Acetone cyanohydrin	73. Captan	139. Ferric fluoride
5. Acetyl bromide	74. Carbaryl	140. Ferric nitrate
6. Acetyl chloride	75. Carbofuran	141. Ferric sulfate
7. Acrolein	76. Carbon disulfide	142. Ferrous ammonium sulfate
8. Acrylonitrile	77. Carbon tetrachloride	143. Ferrous chloride
9. Adipic acid	78. Chlordane	144. Ferrous sulfate
10. Aldrin	79. Chlorine	145. Formaldehyde
11. Allyl alcohol	80. Chlorobenzene	146. Formic acid
12. Allyl chloride	81. Chloroform	147. Fumaric acid
13. Aluminum sulfate	82. Chloropyrifos.	148. Furfural
14. Ammonia	83. Chlorosulfonic acid	149. Guthion
15. Ammonium acetate	84. Chromic acetate	150. Heptachlor
16. Ammonium benzoate	85. Chromic acid	151. Hexachlorocyclopentadiene
17. Ammonium bicarbonate	86. Chromic sulfate	152. Hydrochloric acid
18. Ammonium bichromate	87. Chromous chloride	153. Hydrofluoric acid
19. Ammonium bifluoride	88. Cobaltous bromide	154. Hydrogen cyanide
20. Ammonium bisulfite	89. Cobaltous formate	155. Hydrogen sulfite
21. Ammonium carbamate	90. Cobaltous sulfamate	156. Isoprene
22. Ammonium carbonate	91. Coumaphos	157. Isopropanolamine
23. Ammonium chloride	92. Cresol	dodecylbenzenesulfonate
24. Ammonium chromate	93. Crotonaldehyde	158. Kelthane
25. Ammonium citrate	94. Cupric acetate	159. Kepone
26. Ammonium fluoroborate	95. Cupric acetoarsenite	160. Lead acetate
27. Ammonium fluoride	96. Cupric chloride	161. Lead arsenate
28. Ammonium hydroxide	97. Cupric nitrate	162. Lead chloride
29. Ammonium oxalate	98. Cupric oxalate	163. Lead fluoborate
30. Ammonium silicofluoride	99. Cupric sulfate	164. Lead flouride
31. Ammonium sulfamate	100. Cupric sulfate ammoniated	165. Lead iodide
32. Ammonium sulfide	101. Cupric tartrate	166. Lead nitrate
33. Ammonium sulfite	102. Cyanogen chloride	167. Lead stearate
34. Ammonium tartrate	103. Cyclohexane	168. Lead sulfate
35. Ammonium thiocyanate	104. 2,4-D acid (2,4-Dichlorophenoxyacetic acid)	169. Lead sulfide
36. Ammonium thiosulfate	105. 2,4-D esters (2,4-Dichlorophenoxyacetic acid esters)	170. Lead thiocyanate
37. Amyl acetate	106. DDT	171. Lindane
38. Aniline	107. Diazinon	172. Lithium chromate
39. Antimony pentachloride	108. Dicamba	173. Malathion
40. Antimony potassium tartrate	109. Dichlobenil	174. Maleic acid
41. Antimony tribromide	110. Dichlone	175. Maleic anhydride
42. Antimony trichloride	111. Dichlorobenzene	176. Mercaptodimethur
43. Antimony trifluoride	112. Dichloropropane	177. Mercuric cyanide
44. Antimony trioxide	113. Dichloropropene	178. Mercuric nitrate
45. Arsenic disulfide	114. Dichloropropene-dichloropropane mix	179. Mercuric sulfate
46. Arsenic pentoxide	115. 2,2-Dichloropropionic acid	180. Mercuric thiocyanate
47. Arsenic trichloride	116. Dichlorvos	181. Mercurous nitrate
48. Arsenic trioxide	117. Dieldrin	182. Methoxychlor
49. Arsenic trisulfide	118. Diethylamine	183. Methyl mercaptan
50. Barium cyanide	119. Dimethylamine	184. Methyl methacrylate
51. Benzene	120. Dinitrobenzene	185. Methyl parathion
52. Benzoic acid	121. Dinitrophenol	186. Mevinphos
53. Benzotrile	122. Dinitrotoluene	187. Mexacarbate
54. Benzoyl chloride	123. Diquat	188. Monoethylamine
55. Benzyl chloride	124. Disulfoton	189. Monomethylamine
56. Beryllium chloride	125. Diuron	190. Naled
57. Beryllium fluoride	126. Dodecylbenzenesulfonic acid	191. Napthalene
58. Beryllium nitrate	127. Endosulfan	192. Napthenic acid
59. Butylacetate	128. Endrin	193. Nickel ammonium sulfate
60. n-Butylphthalate	129. Epichlorohydrin	194. Nickel chloride
61. Butylamine	130. Ethion	195. Nickel hydroxide
62. Butyric acid	131. Ethylbenzene	196. Nickel nitrate
63. Cadmium acetate	132. Ethylenediamine	197. Nickel sulfate
64. Cadmium bromide	133. Ethylene dibromide	198. Nitric acid
65. Cadmium chloride	134. Ethylene dichloride	199. Nitrobenzene
66. Calcium arsenate	135. Ethylene diaminetetracetic acid (EDTA)	200. Nitrogen dioxide
67. Calcium arsenite		201. Nitrophenol
68. Calcium carbide		202. Nitrotoluene
69. Calcium chromate		203. Paraformaldehyde

TABLE 2C-4

HAZARDOUS SUBSTANCES (continued)

204. Parathion	238. Sodium dodecylbenzenesulfonate	266. Trichloroethylene
205. Pentachlorophenol	239. Sodium fluoride	267. Trichlorophenol
206. Phenol	240. Sodium hydrosulfide	268. Triethanolamine dodecylbenzenesulfonate
207. Phosgene	241. Sodium hydroxide	269. Triethylamine
208. Phosphoric acid	242. Sodium hypochlorite	270. Trimethylamine
209. Phosphorus	243. Sodium methylate	271. Uranyl acetate
210. Phosphorus oxychloride	244. Sodium nitrite	272. Uranyl nitrate
211. Phosphorus pentasulfide	245. Sodium phosphate (dibasic)	273. Vanadium pentoxide
212. Phosphorus trichloride	246. Sodium phosphate (tribasic)	274. Vanadyl sulfate
213. Polychlorinated biphenyls (PCB)	247. Sodium selenite	275. Vinyl acetate
214. Potassium arsenate	248. Strontium chromate	276. Vinylidene chloride
215. Potassium arsenite	249. Strychnine	277. Xylene
216. Potassium bichromate	250. Styrene	278. Xylenol
217. Potassium chromate	251. Sulfuric acid	279. Zinc acetate
218. Potassium cyanide	252. Sulfur monochloride	280. Zinc ammonium chloride
219. Potassium hydroxide	253. 2,4,5-T acid (2,4,5- Trichlorophenoxyacetic acid)	281. Zinc borate
220. Potassium permanganate	254. 2,4,5-T amines (2,4,5-Trichlorophenoxy acetic acid amines)	282. Zinc bromide
221. Propargite	255. 2,4,5-T esters (2,4,5-Trichlorophenoxy acetic acid esters)	283. Zinc carbonate
222. Propionic acid	256. 2,4,5-T salts (2,4,5-Trichlorophenoxy acetic acid salts)	284. Zinc chloride
223. Propionic anhydride	257. 2,4,5-TP acid (2,4,5-Trichlorophenoxy propanoic acid)	285. Zinc cyanide
224. Propylene oxide	258. 2,4,5-TP acid esters (2,4,5- Trichlorophenoxy propanoic acid esters)	286. Zinc fluoride
225. Pyrethrins	259. TDE (Tetrachlorodiphenyl ethane)	287. Zinc formate
226. Quinoline	260. Tetraethyl lead	288. Zinc hydrosulfonate
227. Resorcinol	261. Tetraethyl pyrophosphate	289. Zinc nitrate
228. Selenium oxide	262. Thallium sulfate	290. Zinc phenolsulfonate
229. Silver nitrate	263. Toluene	291. Zinc phosphide
230. Sodium	264. Toxaphene	292. Zinc silicofluoride
231. Sodium arsenate	265. Trichlorofon	293. Zinc sulfate
232. Sodium arsenite		294. Zirconium nitrate
233. Sodium bichromate		295. Zirconium potassium fluoride
234. Sodium bifluoride		296. Zirconium sulfate
235. Sodium bisulfite		297. Zirconium tetrachloride
236. Sodium chromate		
237. Sodium cyanide		

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LINE DRAWING

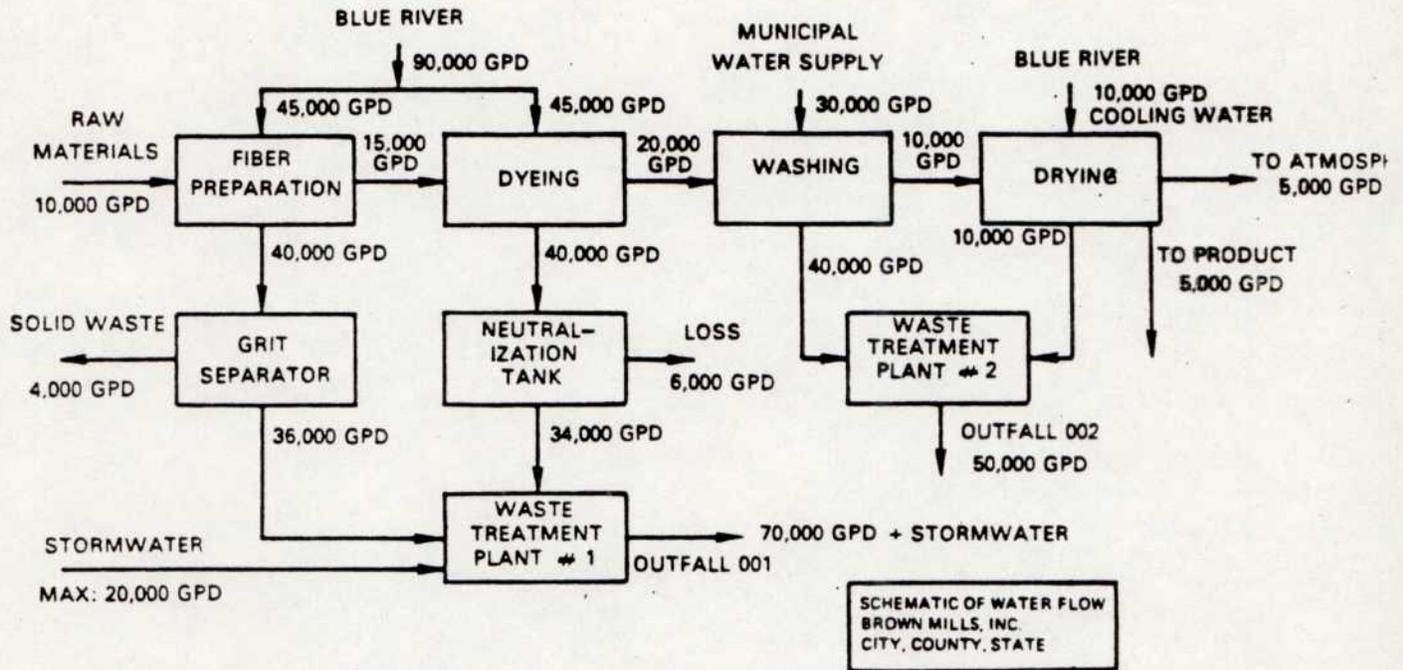


FIGURE 2C-1

