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**Contents: Liquid Effluents**

Effective Date: **March 1999**

Point of Contact: [Environmental Compliance Representative](#)

**Section**

**Overview of Content  
(see section for full process)**

[Introduction](#)

[1. Planning for Liquid Effluents](#)

- Characterize all liquid effluents before discharge.
- Determine whether the release of the effluent is authorized or prohibited.
- If authorized, determine if monitoring is required.
- If prohibited, dispose of as industrial/hazardous waste.

[2. Monitoring Liquid Effluents](#)

- Measure the volume and rate of discharge.
- Establish a sampling and analysis program.
- Routinely review analytical data.

[Definitions](#)

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[Authorization Criteria for Radiological Liquid Effluents Flowchart](#)

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[Hazardous Waste Management](#) Subject Area

[Mixed Waste Management](#) Subject Area

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## Standards of Performance

All staff and guests shall comply with applicable Laboratory policies, standards, and procedures, unless a formal variance is obtained.

All staff and guests shall promptly report accidents, injuries, ES&H deficiencies, emergencies, and off-normal events in accordance with procedures.

Managers shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers shall ensure that work is planned to prevent pollution, minimize waste, and conserve resources, and that work is conducted in a cost-effective manner that eliminates or minimizes environmental impact.

Before waste is generated, managers shall ensure that it has a funded and available disposition pathway. Managers shall ensure that all hazardous materials and waste have an identified owner who is accountable for its proper disposition.

All staff and users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that protects the environment and the public.

All staff and users shall ensure that environmental effluents, emissions, and wastes associated with their work are as low as reasonably achievable (also referred to as "E-ALARA").

## Management System

This subject area belongs to the management system.

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### Introduction: Liquid Effluents

Effective Date: **May 2001**

Point of Contact: [Environmental Subject Matter Expert](#)

Wastewater effluents generated by Laboratory operations are regulated under the federal Clean Water Act (CWA), as implemented by the New York State Department of Environmental Conservation and Department of Energy (DOE) Order 5400.5. This subject area describes the minimum requirements necessary to comply with these regulations, as well as guidance on how to comply with Laboratory administrative limits.

Wastewater effluents discharged from BNL operations have the potential to affect fresh surface water and groundwater resources. Groundwater on Long Island is the predominant source of potable water and has been designated as a sole source aquifer under the Safe Drinking Water Act (SDWA). The Peconic River both recharges to, and receives water from, the sole source aquifer system. Therefore, BNL's wastewater discharge criteria at the point source and outfall are based on the drinking water quality standard. In New York, the State maintains enforcement authority for the CWA. The NYS State Pollutant Discharge Elimination System (SPDES) permit provides the basis for regulating wastewater effluents at BNL. The SPDES permit establishes release concentration limits and monitoring requirements.

Also, DOE Order 5400.5, in addition to limiting dose to the members of the public, has standards for liquid effluents driven by the As Low As Reasonably Achievable (ALARA) policy and Pollution Prevention (P2) Objectives. These objectives adopt the "Best Available Technology" implementation, with technical feasibility and economical viability considerations during the authorization criteria. Therefore, the Environmental Service Division has developed the E-ALARA (Environmental Effluents are As Low As Reasonably Achievable) authorization criteria for liquid effluents. See the [Authorization Criteria for Radiological Liquid Effluents Flowchart](#).

BNL staff and visitors who generate or manage wastewater streams must evaluate their operations through process assessments to implement technically feasible and economically viable pollution prevention technologies before authorization.

The following are exempt from this subject area:

- Domestic water used in a once-through, noncontact cooling water system that is discharged to the BNL sanitary sewer or other permitted point source. For assistance in determining whether or not a discharge is routed to a permitted point source, contact the [Environmental Subject Matter Expert](#).
- Storm water run-off permitted under the BNL SPDES permit.
- Storm water run-off from areas not affected by Laboratory operations. These include parking areas for office buildings and personnel walkways.
- Small quantities of nonhazardous chemicals and dilute liquid solutions that are sink-disposable. A list of these is included in the exhibit [Sink-Releasable Chemical List](#).
- Liquid effluent sources that have been previously reviewed and found acceptable for release and whose characteristics remain consistent with the original review.

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## 1. Planning for Liquid Effluents

Effective Date: **May 2001**

Point of Contact: [Environmental Subject Matter Expert](#)

## Applicability

This information applies to staff who generate or manage liquid effluents that are discharged to the BNL Sewage Treatment Plant or storm sewer.

## Required Procedure

Staff members identify liquid effluents or modifications to existing processes that generate liquid effluents by completing the following steps. See the [Liquid Effluent Evaluation Process Flow Diagram](#) for an overview of this procedure.

**Note:** To prevent accidental, unauthorized liquid releases to the sanitary system, post the [Sink-Releasable Chemical List](#) at sinks vulnerable to chemical discharges, such as laboratory sinks.

<b>Step 1</b>	<p>Characterize all liquid effluents before they are discharged to the BNL sanitary sewer to prevent unauthorized release. Refer to the exhibit <a href="#">Liquid Effluent Release Limits</a> and the <a href="#">Authorization Criteria for Radiological Liquid Effluents Flowchart</a> for more information.</p> <p><b>Note:</b> The <a href="#">Environmental Subject Matter Expert (SME)</a> must approve all discharges.</p>
<b>Step 2</b>	<p>If the liquid waste contains unknown chemical and/or radionuclide constituents, characterize it by submitting a sample for analysis through the BNL Analytical Services Laboratory or a contractor laboratory. The <a href="#">Environmental Compliance Representative (ECR)</a> can assist in determining the appropriate analyses.</p> <p>If available, process knowledge may be used to describe chemical and radiological contaminants and their concentrations.</p>
<b>Step 3</b>	<p>Submit the following information to the ECR:</p> <ul style="list-style-type: none"> <li>• Description of the process generating the liquid effluent;</li> <li>• Identity of contaminant(s), if known;</li> <li>• Concentration of contaminant(s);</li> <li>• pH.</li> </ul> <p>Use the <a href="#">Liquid Effluent Evaluation Form</a> as a guide for documenting this information.</p>
<b>Step 4</b>	<p>If the proposed effluent is a one-time release, go to Step 5. If it is a continuous or routine release, go to Step 6.</p>

<b>Step 5</b>	The Environmental SME, using the <a href="#">Liquid Effluent Release Limits</a> exhibit, evaluates the supplied information and determines whether the release of the effluent is authorized or prohibited. Go to Step 7.
<b>Step 6</b>	If the proposed liquid effluent will be continuously discharged, the Environmental SME determines if the discharge is acceptable and the level of monitoring that may be required. If monitoring is required, see the <a href="#">Monitoring Liquid Effluents</a> section.
<b>Step 7</b>	The Environmental SME documents the evaluation and forwards a copy to the release requestor and any other parties who are affected by the decision, e.g., Plant Engineering, ES&H Coordinators. Maintain this evaluation in a permanent file.
<b>Step 8</b>	If the liquid effluent discharge is not approved by the Environmental SME or the Environmental Services Division Manager, the generator may refer the matter to the Operations Council and/or the Management Council OR dispose of the liquid effluent as industrial/hazardous waste (see the <a href="#">Hazardous Waste Management</a> , <a href="#">Mixed Waste Management</a> , and <a href="#">Radioactive Waste Management</a> Subject Areas).

## Guidelines

Maintain a list of all liquid effluent streams that routinely discharge to either the BNL sanitary system or to recharge basins.

The department should have knowledge of where all floor drains lead (either to the sanitary system or the storm system) for buildings under its control. This information will allow for a quick evaluation of environmental impacts in the case of a liquid spill to a floor.

To support the Laboratory's waste minimization objectives, staff should minimize liquid effluents by examining constituents and replacing hazardous ones with less hazardous or nonhazardous ones. Where possible, implement the following steps:

- Design projects and experiments to use minimum volumes;
- Use closed-loop systems;
- Recycle chemicals and reagents;
- Consider pretreatment options.

For more information, see the [Pollution Prevention and Waste Minimization](#) or [Hazardous Waste Management](#) Subject Areas.

## References

[Hazardous Waste Management](#) Subject Area

[Mixed Waste Management](#) Subject Area

[Pollution Prevention and Waste Minimization](#) Subject Area

[Radioactive Waste Management](#) Subject Area

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## 2. Monitoring Liquid Effluents

Effective Date: **May 2001**

Point of Contact: [Environmental Subject Matter Expert](#)

## Applicability

This information applies to all Line Managers who are responsible for operations that produce liquid effluents that are routinely discharged to the environment.

## Required Procedure

If the Environmental Services Division has determined that an environmental liquid effluent source requires monitoring (see the [Planning for Liquid Effluents](#) section), line management implements the following procedure.

<b>Step 1</b>	Measure the volume and rate of discharge. In some circumstances these values are measured at the environmental outfall, in others they are recorded at the generation point of the facility. The <a href="#">Environmental Subject Matter Expert (SME)</a> will specify which applies.
<b>Step 2</b>	Establish a sampling and analysis program that will provide data to demonstrate compliance with the <a href="#">BNL SPDES-Permitted Outfalls and Discharge Points</a> . As with Step 1, where the monitoring occurs, i.e., at the facility or at the environmental outfall, is determined on a case-by-case basis. The SME will specify which applies.
<b>Step 3</b>	If real-time monitoring is used, place all monitor alarms in areas that are under routine surveillance.
<b>Step 4</b>	Routinely review analytical data. The Environmental Services Division conducts a parallel review and maintains permanent records.

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**Authorization Criteria for Radiological Liquid Effluents (a)(f)**

E-ALARA (b)

Implement economically viable and technically feasible waste minimization, treatment, and pollution prevention opportunities (c)(d).

Waste minimization, treatment, and pollution prevention opportunities exhausted.

**Request Discharge Authorization from ESD.**

**NOTES:**  
 a. Criteria apply to anthropogenic radionuclides only.  
 b. Environmental Effluents are As Low As Reasonably Achievable.  
 c. Economically Viable = Cost of waste minimization, treatment, risk management, and pollution prevention opportunities are recovered in three years.  
 d. Technically Feasible = Available technology exists for waste minimization, treatment, and Pollution Prevention (e.g., ion exchange, evaporation, and other separation methods).  
 e. MDL = Minimum Detection Limit using standard analytical methods, counting time, and volume: i.e., the propagated analytical error would be less than 50% at 2 standard deviations.  
 f. These criteria are applicable unless other criteria are negotiated with regulatory agencies (e.g., under the CERCLA process).

**Sewage Treatment Plant (STP)**

Radionuclide <drinking water standard at source.

Yes

Tritium <50% of the drinking water standard at Outfall 001.

Yes

Tritium < 25% of the drinking water standard at Outfall 001.

No

Generator conducts written critique of the wastewater source to reduce future releases and institutes corrective action.

Unless otherwise noted - If **NO** at any step, the generator must refer the release to the Operations Council for review, considering technical, institutional, and social risk. The Operations Council may refer to the Integration Council for final decision.

**Recharge Basins**

**Plume Management**  
Including well installation, development, and sampling and groundwater treatment.

Yes

All radionuclides < drinking water standards.

**Other Locations (at Outfall)**

Yes

Tritium < 25% of the drinking water standard at outfall.

Yes

All other radionuclide concentrations <10% of the drinking water standard.

No measurable change in Cs-137, Sr-90, concentrations at both the STP influent and at Outfall 1, as compared with levels from 1997 - 1999.\*

Yes

No transuranics or other long-lived radionuclides measurable at the source without evaluation of cumulative effects on the Peconic River sediments and/or STP sludge.

All other radionuclides < MDL (e) at Outfall 1.

Yes

**Discharge Approved by the ESD Manager or designee.**

**Drinking Water Standards for Common Nuclides**

Tritium	20,000 pCi/L
Be-7	6,000 pCi/L
Na-22	400 pCi/L
Mn-54	300 pCi/L
Co-57	1,000 pCi/L
Co-58	9,000 pCi/L
Co-60	100 pCi/L
Sr-90	8 pCi/L
Cs-137	200 pCi/L
Zn-65	300 pCi/L

\*Maximum influent and effluent Sr-90 concentrations were 2.8 and 1.4 pCi/L, respectively. Maximum Cs-137 influent and effluent concentrations were 0.7 and 2.2 pCi/L, respectively. No radionuclides would be released which could result in the dose from Peconic River sediments exceeding 15 mrem per year.

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### BNL SPDES-Permitted Outfalls and Discharge Points

Effective Date: **March 1999**

Point of Contact: [Environmental Compliance Representative](#)

Recharge Basins		
Outfall ID	BNL ID	Description
002	HN	AGS noncontact cooling water, STAR detector and PHENIX experiment cooling tower blow-down.
02A		BRAHMS, PHOBOS experiment cooling tower blow-down.
02B		Bldg. 1004 RF cooling tower blow-down.
003	HO	HFBR, AGS non-contact cooling water.
004	HP	BMRR non-contact cooling water.
005	HS	NSLS cooling tower blow-down, parking lot water run-off.
006A	HTw	LINAC non-contact cooling water, floor drains, storm water.
006B	HTe	Bldg. 919 cooling tower blow-down.
007	HX	Water Treatment Plant backwash.
008	HW	Warehouse area storm water run-off.
010		Central Steam Facility

Discharges to Site Sanitary System	
Outfall ID	Description
001A	Bldg. 535, printed circuit board plating/etching cleaning water.
001B	Bldg. 498, degreasing facility.
001C	Bldg. 118, photoprocessing waste water.
001D	Bldg. 197B, photoprocessing waste water
001E	Bldgs. 244, 405, 422, 423, 96, boiler blow-down.
001F	Bldg. 902, cooling tower blow-down.

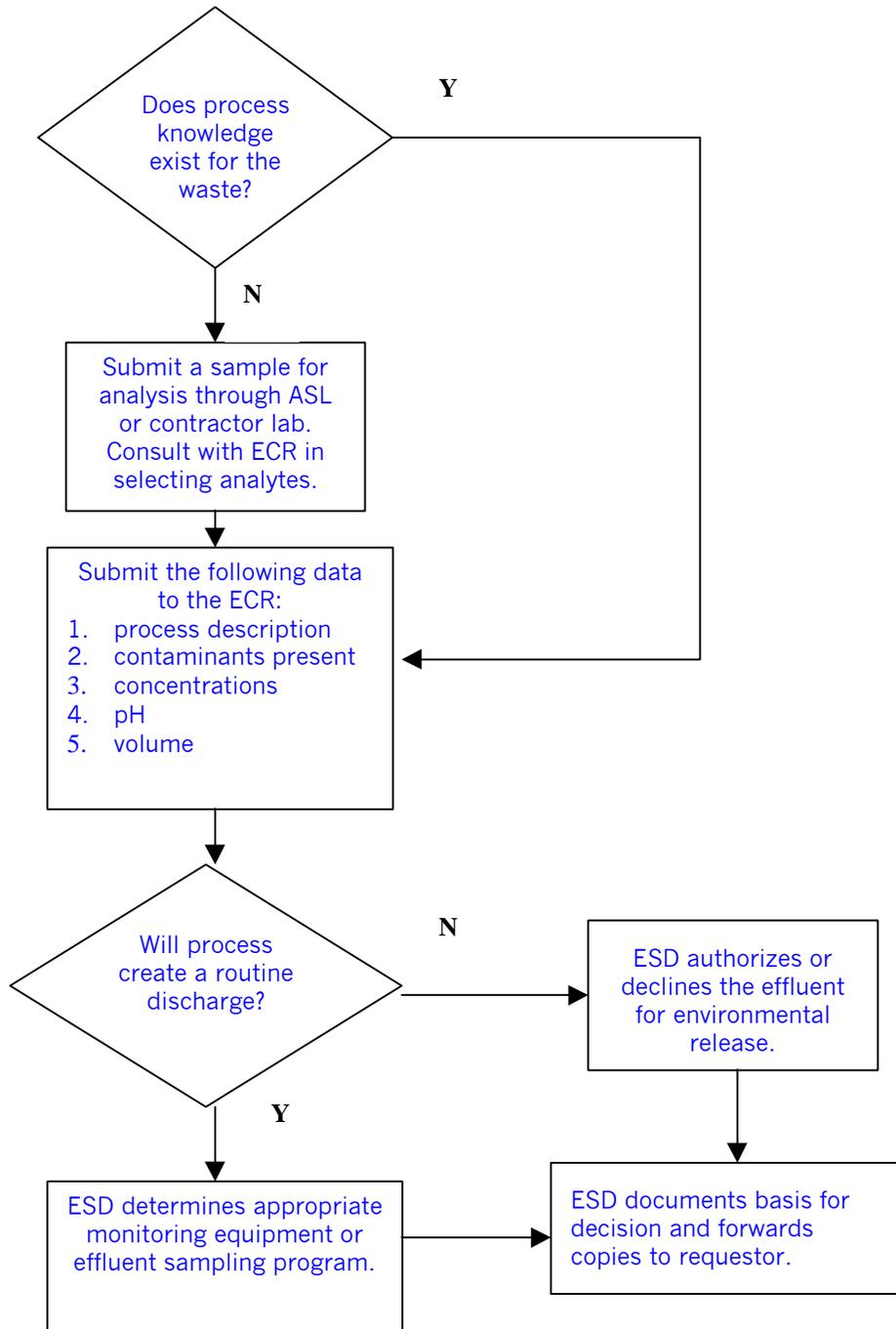
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# Liquid Effluent Evaluation Process Flow Diagram





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The Environmental Service Division developed the E-ALARA (Environmental Effluents are As Low As Reasonably Achievable) authorization criteria for liquid effluents. See the [Authorization Criteria for Radiological Liquid Effluents Flowchart](#).

Liquid Effluent Release Limits		
Analytical Parameter	SPDES Effluent Limitation (mg/L)	NYSDEC Ambient Water Quality Standard (mg/L)
Aluminum	NA	0.1 (Ionic)
Antimony	NA	0.003
Arsenic	NA	0.15
Barium	NA	1.0
Beryllium	NA	0.011
Cadmium	NA	0.0005
Chromium	NA	0.034 (Dissolved)
Cobalt	NA	0.005
Copper	0.15	0.004 (Dissolved)
Iron	0.37	0.3
Lead	0.019	0.001 (Dissolved)
Magnesium	NA	35
Manganese	NA	0.3
Mercury	0.0008	0.000007
Nickel	0.11	0.024 (Dissolved)
Selenium	NA	0.005 (Dissolved)
Silver	0.015	0.0001 (Ionic)
Thallium	NA	0.008
Vanadium	NA	0.014
Zinc	0.1	0.03
Volatile Organic Compounds (EPA Method 624)	5 ppb (per compound)	
Cyanide	0.1	0.0052 (free)
Ammonia as N	2.0	2.0
Total N	10	10

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### Sink-Releasable Chemical List

Effective Date: **May 2001**

Point of Contact: [Environmental Subject Matter Expert](#)

The following are examples of nonhazardous chemicals. Small quantities of dilute solutions can be released to the sink with water running. Unless explicitly identified below, the Environmental Services Division must evaluate all other liquid effluents for appropriate disposal.

Organic Chemicals	Inorganic Chemicals
Acetates: Ca, Na, NH <sub>4</sub> , and K	Bicarbonates: Na, K, Mg, Ca
Amino acids and their salts	Borates: Na, K, Mg, Ca
Citric acid and salts of Na, K, Mg, Ca, and NH <sub>4</sub>	Bromides: Na, K
Lactic acid and salts of Na, K, Mg, Ca, and NH <sub>4</sub>	Carbonates: Na, K, Mg, Ca
Sugars and sugar alcohol (ethanol)	Fluorides: Ca
Acetic acid	Iodides: Na, K
Boric acid	Oxides: Mg, Ca, Al, Si, Fe
Oxalic acid	Phosphates: Na, K, Mg, Ca, and NH <sub>4</sub>
Effluent pH should be between 6-9	

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## Liquid Effluent Evaluation Form

This form is designed to serve as guide for evaluating the acceptability of waste water discharges to the BNL Sanitary Sewage Treatment Plant or other permitted point source discharge. Without the explicit approval of the New York State Department of Environmental Conservation, discharges to a non-permitted point source or direct discharge of waste to the ground is strictly prohibited. Your Environmental Compliance Representative can assist in the completion of this form, after which, it may be submitted to the Environmental Subject Matter Expert for review.

<p>1. Describe the wastewater and the process generating this wastewater. Include any chemical additives.</p>	
<p>2. Indicate total volume of liquid or flow rate: _____ gal. or _____ gal./day.</p>	
<p>2. Have radiological and chemical analyses been performed? If yes, indicate COC # _____.</p>	<p>___ Yes ___ No</p>
<p>3. If not, are historical analyses available for this waste stream?</p> <p>If chemical analyses or radiological analyses are not available, wastewater may not be discharged until such analyses are performed.</p>	<p>___ Yes ___ No</p>
<p>4. Indicate pH: _____. Note: must be between 6.0 and 9.0 SU for discharge to the BNL Sewage Treatment Plant (STP).</p>	
<p>5. Discharge is ___ Continuous ___ Intermittent or ___ One time release</p> <p>For continuous or intermittent releases: If compounds are identified that are not already included in the BNL STP SPDES permit monitoring requirements, a SPDES permit modification may be required.</p>	

<p>The wastewater stream identified above has been reviewed for compliance with the Laboratory SPDES permit and administrative requirements and has been:</p>	<p>_____ Approved _____ Disapproved</p>
<p>Reason:</p>	
<p>The following monitoring requirements are applicable to this waste stream:</p> <p>Analytical Parameters:</p> <p>Monitoring Frequency: _____ Per _____</p> <p>Outfall Designation: _____</p>	

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Person Authorizing Discharge: \_\_\_\_\_ Date: \_\_\_\_\_



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### Definitions: Liquid Effluents

Effective Date: **May 2001**

Point of Contact: [Environmental Subject Matter Expert](#)

Term	Definition
derived concentration guide	The concentration of radionuclides in air or water that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem. (See effluent limits for radionuclides in the <a href="#">Liquid Effluent Release Limits</a> exhibit).
discharge	The addition of any pollutant to the waters of the state, waters of a contiguous zone, or the ocean, through an outlet or point source.
liquid effluent	Any treated or untreated waste liquid that is discharged to the environment.
outfall	A discrete point of wastewater discharge to the environment. Outfalls may consist of point source and nonpoint source discharges. Outfalls include cesspools, septic tanks, leaching pools, stormwater recharge basins, discharges onto the ground surface, discharges into the Peconic River, or any other discharge that is conveyed through a pipe, ditch, or channel and is discharged to the environment for the purpose of disposal.
point source	Any discernible, confined, and discrete conveyance for pollutant discharge, including any pipe, ditch, channel, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel.

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Revision History: Liquid Effluents

Point of Contact: [Environmental Subject Matter Expert](#)

## Revision History of this Subject Area

Date	Description	Management System
May 2001	This subject area was revised to include the E-ALARA (Environmental Effluents are As Low As Reasonably Achievable) authorization criteria for radiological liquid effluents, which are used to implement economically viable and technically feasible waste minimization, treatment, and pollution prevention opportunities before discharging liquid effluents. The Authorization Criteria for Radiological Liquid Effluents Flowchart, which shows this implementation, was added to the subject area. The Introduction, the section on Planning for the Liquid Effluents, the exhibit Liquid Effluent Release Limits, and the Liquid Effluent Evaluation Process Diagram were revised to describe this implementation.	Environmental Management System
March 1999	This subject area replaces ES&H Standard/SEAPPM 6.1.2 and 6.1.3.	Environmental Management System

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