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Project Information (Check Applicable Box)

- ☐ Balance of Facilities
- ☐ Pretreatment
- ☐ HLW Vitrification
- ☐ LAW Vitrification
- ☐ Analytical
- ☐ External Interfaces
- ☒ Across all areas

Document is applicable to ALARA? ☐ Yes ☒ No

In general, any record that deals with Radiation, Radioactive Material, Occupational Dose, Dose Reduction, or Dose Rate are considered ALARA Records. (See 24590-WTP-GPP-SRAD-002, *Application of ALARA in the Design Process*, section 4.8 for additional guidance)

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Contents

1 **Introduction** 2

2 **Applicable Documents** 2

2.1 40 CFR 264.1101, (c)(1)(iv), Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities, Design and Operating Standards 2

2.2 WAC 173-303-695, Containment Buildings 2

3 **Description** 2

3.1 **WTP Confinement Zones** 2

3.2 **Fugitive Dust Control Description** 4

Figures

Figure 1 **WTP Confinement Systems** 5

Acronyms

CFR	Code of Federal Regulations
DWPA	Dangerous Waste Permit Application
HEPA	High Efficiency Particulate Air Filter
HLW	High Level Waste Vitrification Plant
HVAC	Heating, Ventilation and Air Conditioning
LAW	Low Activity Waste Vitrification Plant
ORP	Office of River Protection
PTF	Pretreatment Facility
RCW	Revised Code of Washington
WTP	River Protection Project-Waste Treatment Plant
SSCs	Systems, Structures, and Components
WAC	Washington Administrative Code

1 Introduction

In compliance with the Washington Administrative Code, WAC 173-303-695, WTP facilities have been designed to prevent fugitive emissions of contaminants from containment buildings within PTF, HLW and LAW through pathways other than HEPA-filtered and monitored discharge points to the environment. WTP HVAC systems, in conjunction with the building structures provide the confinement system needed to prevent exit of contaminants from WTP facilities through doors, windows, building cracks or other unmonitored and unfiltered exit paths directly to the environment.

This narrative describes the mitigative features of the WTP facilities which prevent fugitive emissions of contaminants from the various containment buildings directly to the environment and ensures that no visible emissions are emitted from containment buildings.

2 Applicable Documents

The description supports the DWPA submittal in compliance with the following Federal and State of Washington Administrative Codes.

2.1 40 CFR 264.1101, (c)(1)(iv), Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities, Design and Operating Standards

2.2 WAC 173-303-695, Containment Buildings

3 Description

3.1 WTP Confinement Zones

The WTP facilities are designed such that they are segregated into confinement zones for ventilation control purposes. WTP confinement zones consist of barriers or barrier systems, which includes walls, floors and roofs, and the associated HVAC systems.

WTP facilities' ventilation confinement zones shown in Figure 1 consist of the following:

Confinement Zone	Contamination Classification	Ventilation Design Philosophy Definitions
Primary	C5	Plant areas and associated ventilation ductwork that are in direct contact with airborne contaminants and which prevent the spread of airborne contaminants to adjacent zones under both normal and abnormal operating conditions. Maintained at approximately (-) 1.0 to (-) 1.4 inches of water relative to C3 areas.
Secondary	C3	Contaminated areas where work requires protective clothing. Maintained at maximum negative pressure of (-) 0.4-inches of water relative

Confinement Zone	Contamination Classification	Ventilation Design Philosophy Definitions
		to surrounding C2 areas.
Tertiary	C2	Controlled Area. Operating areas of the process building that have direct interfaces with contaminated areas and have the potential to be contaminated. Maintained at a slight negative pressure with respect to atmosphere.

Confinement will be achieved by maintaining the greatest negative pressure in areas with greatest contamination potential. Air will be cascaded from areas with the least potential for contamination to areas with the greatest potential for contaminated areas (i.e., C2 to C3 to C5).

Airborne contaminants in C2 areas will cascade to C3 areas or be removed by C2 exhaust system HEPA filters prior to discharge to the environment. Airborne contaminants in C3 areas will cascade to C5 areas or be removed by C3 exhaust system HEPA filters prior to discharge to the environment, including releases from containment buildings within C3 areas. Airborne contaminant in C5 areas will be removed by C5 exhaust system HEPA filters prior to discharge to the environment, including releases from containment buildings within C5 areas.

To minimize fugitive emissions, contaminants are confined in the building by maintaining pressure differentials and proper air flow directions from areas of lesser contamination potential to areas of greater contamination potential. The facilities are kept at a negative pressure relative to outdoors by exhausting more air than supplied to the WTP Process Facilities resulting in net inleakage to the building from outdoor environment to inside C2 areas.

WTP cascade system will pass air through more than one area thus reducing the number of separate ventilation streams, the amount of exhaust air requiring treatment, and the number of monitored discharge points to atmosphere.

Except for certain C2 areas, exhaust from WTP process buildings is HEPA filtered prior to discharge to atmosphere precluding fugitive dust releases through the normal exhaust paths.

During routine operating and maintenance activities, cascade ventilation is maintained. When starting up, WTP HVAC systems are started in the following sequence to maintain proper cascaded air flow.

1. C5 exhaust fans
2. C3 exhaust fans
3. C2 exhaust fans
4. C2 supply units

The systems are interlocked such that the exhaust systems serving areas of lesser contamination potential can not operate without the exhaust systems serving areas of higher contamination potential operating. This precludes pressurization of WTP areas and possible fugitive dust emissions from the facility through doors, windows, building cracks, or other unmonitored and unfiltered exit paths.

3.2 Fugitive Dust Control Description

The following design features and operational measures will be used to prevent fugitive dust from escaping from containment buildings resulting in unfiltered and unmonitored releases to the environment, and control fugitive emissions such that openings will not exhibit visible emissions:

3.2.1 Cascading air flow from areas of least potential contamination to areas of greatest potential contamination (i.e., C2 to C3 to C5 areas).

3.2.2 Greater negative pressure in confinement areas compared to outside environment pulls air into the area preventing backflow.

3.2.3 Intake from one confinement zone to another through air in-bleed units, with isolation and backflow control type features.

3.2.4 HEPA filtration of exhaust air is monitored prior to atmosphere discharge through an exhaust stack. C2 and C3 exhaust systems have one stage of HEPA filters. C5 exhaust systems have two stages of HEPA filters.

3.2.5 Redundant exhaust fans maintain negative pressure and cascading airflow during normal operation, routine fan maintenance and repair conditions.

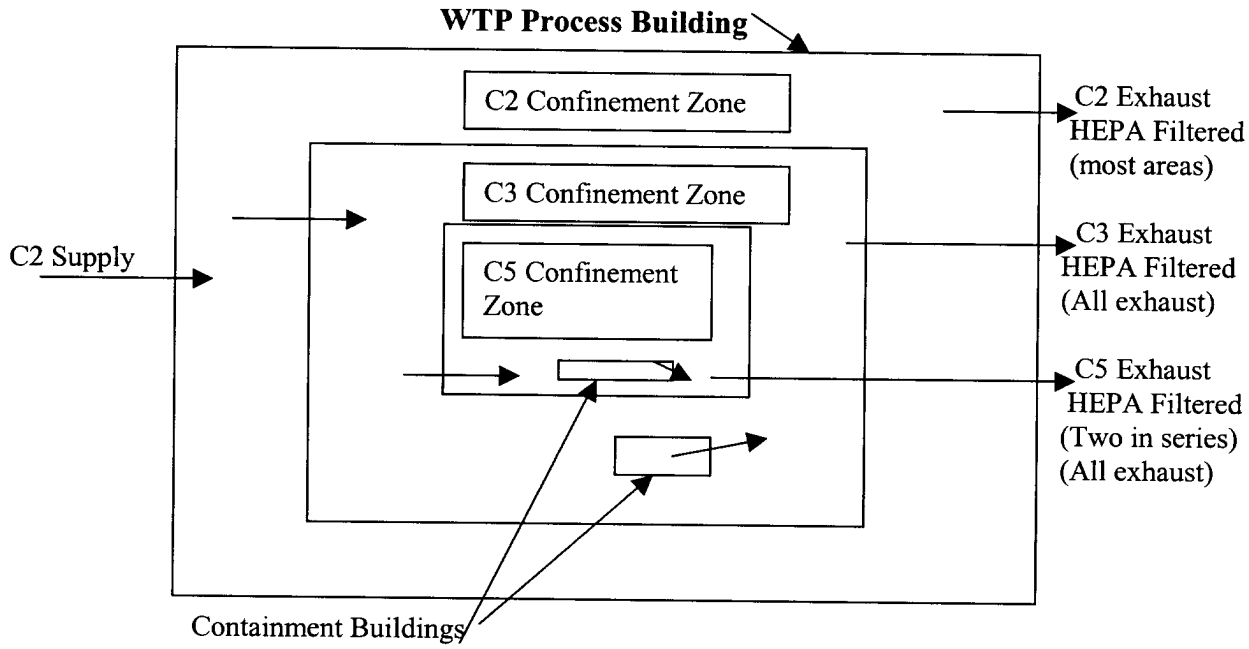
3.2.6 Personnel ingress and egress through airlocks and subchange rooms.

3.2.7 Dedicated HEPA-filter systems will be provided for each maintenance area, workshop, and decontamination room where local process-generated airborne contaminants will be collected to prevent spread outside of the area.

3.2.8 Containment buildings (i.e., cells or areas) are typically located within C3 or C5 areas for control of airborne contamination.

3.2.9 Containment buildings are located within ventilation-controlled process facilities.

Figure 1 WTP Confinement Systems



Notes:

1. Confinement zone barriers (i.e., walls, floors, and roofs) are made of material meeting requirements of Statutes and Codes applicable to confinement structures.
2. Containment buildings are located in C3 and C5 confinement zones.
3. Supply to facilities are distributed to C2 areas, then cascaded to C3 areas and eventually to C5 areas. The facilities are kept at a negative pressure relative to outdoors by exhausting more air than supplied to the confinement building resulting in net inleakage to the building.
4. Exhaust air from the facilities are HEPA filtered prior to release to atmosphere at an elevated release point. C5 exhaust passes through two HEPA filtration system in series.
5. During normal operation and routine maintenance conditions, this cascade type ventilation is maintained.

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