DEPARTMENT OF ECOLOGY
State of Washington

State of Washington Department of Ecology

Cruise Ship Memorandum of Understanding, Cruise Operations in Washington State Inspection Report

Northwest Regional Office

P.O. Box 330316
Shoreline, WA 98133

Phone: (425) 213-4230

Inspection Date	Permit Number	County	Receiving Waters	Ecology Inspector
October 1, 2023	NA	King	Marine Waters	Evan Dobrowski

Entry Time 9:00 am Exit Time 1:15 pm	Photos Taken	Samples Taken	Inspection Announced	Discharges to: ☒ Surface Water
	☒ Yes ☐ No	☐ Yes ☒ No	☒ Yes ☐ No	☐ Ground Water ☐ Dewater ☐ POTW

Name and Location of Site Inspected:
RADIANCE OF THE SEAS, Royal Caribbean Cruises Ltd.
Pier 91, Seattle, Washington

Additional Participants/Inspectors:

On-Site Representative(s): ***Name/Title/Phone/e-mail***
Stela Vela, Environmental Officer
e: RD_EnvironmentalOfficer@rccl.com

Responsible Official(s): ***Name/Title/Address/Phone/e-mail***
John Hanley, Manager, Environmental Regulatory Compliance & Sustainability
Royal Caribbean Cruises Ltd.
1050 Caribbean Way, Miami, FL 33132
e: jhanley@rccl.com

Other Facility Data:
Notification made to Elizabeth Hackley and John Hanley on September 13, 2023

Flag: Bahamas

Section A: Areas Evaluated

☒ Black/Gray Wastewater System	☒ Residual Solids	☒ Records/Reports	☒ Hazardous Waste/ Solid Waste	☐ Sampling/Monitoring
☒ Discharge Locations	☒ Operation & Maintenance	☒ Sludge Handling/ Disposal	☒ Oily Bilge Water	☒ Other

Section B: For Vessels Discharging ≥ 1nm from Berth and ≥ 6 Knots Only [2.1.3(A)]

☐	Schematics Match Black/Gray Wastewater System	
☐	Operations as Described in Submitted Documentation	
☐	Daily 24-hour Continuous Monitoring for Turbidity or Equivalent Monitoring	
☐	Turbidimeter or Equivalent Monitoring Equipment Functioning Properly	
☐	Auto Shut Down or Operational Controls to Insure System Shut Down if High Turbidity Occurs	
	Turbidity or Equivalent: Last Calibration: Trigger Level for Early Alarm: Trigger Level for Shutdown: Recorded Turbidity/Equivalent Levels Above Triggers:	
☐	Daily 24-hour Continuous Monitoring for Disinfection Effectiveness	
☐	Disinfection Effectiveness Monitoring Equipment Functioning Properly	
	Disinfection Effectiveness Monitoring:	
☐	Auto Shut Down or Operational Controls to Insure System Shut Down if Disinfection System Upset Occurs	
☐	Disinfection System Operated and Maintained Properly	
	Disinfection System:	

NOT APPLICABLE

Section C: For Vessels Discharging Continuously [2.1.3(B)]		
☐	Schematics Match Black/Gray Wastewater System	
☐	Operations as Described in Submitted Documentation	
☐	Daily 24-hour Continuous Monitoring for Turbidity or Equivalent Monitoring	
☐	Turbidimeter or Equivalent Monitoring Equipment Functioning Properly	
☐	Auto Shut Down or Operational Controls to Insure System Shut Down if High Turbidity Occurs	
	Turbidity or Equivalent: Last Calibration: Trigger Level for Early Alarm: Trigger Level for Shutdown: Recorded Turbidity/Equivalent Levels Above Triggers:	
☐	Daily 24-hour Continuous Monitoring for Disinfection Effectiveness	
☐	Disinfection Effectiveness Monitoring Equipment Functioning Properly	
	Disinfection Effectiveness Monitoring: NOT APPLICABLE	
☐	Auto Shut Down or Operational Controls to Insure System Shut Down if Disinfection System Upset Occurs	
☐	Disinfection System Operated and Maintained Properly	
	Disinfection System:	
	Section D: General (Approved to Discharge)	
☐	No Discharges Within ½ Miles From Shellfish Beds/ Protocol (President's Point, Apple Tree Cove, Tyee Shoal, Middle Point (near Pt Townsend))	
☐	Discharges Immediately Stopped When High Turbidity Occurs	
☐	Discharges Immediately Stopped When Disinfection System Upset Occurs	
☐	Immediate Notifications Made to WA Department of Health for Disinfection System Upset	
☐	Sampling Conducted 2/month, 1/month in Seattle (BOD, TSS, Fecal Coliform, pH, Chlorine Residual)	
☐	Whole Effluent Toxicity Testing 1 per 2 Years (homeported) or 1/40 Calls for Continuous	
	Section E: General	
☒	Wastewater Discharge Records Review	Discharge records were reviewed (blackwater/graywater/residual solids) and are maintained properly. No discharges found to be in the OCNMS, MOU waters or Washington state waters (MOU related waters). Further review will be done following the end of the season.
☒	Wastewater Discharges protocol per MOU and managed properly	The discharge protocols are consistent with MOU requirements to not occur in MOU related waters.
☒	Residual Solids Managed Properly/Disposal Protocol per MOU	Residual solids protocols are consistent with MOU requirements.
☒	Hazardous Waste Managed Properly	Hazardous protocols are consistent with MOU requirements.
☒	WA Hazardous Waste Guidelines Followed (Appendix vii)	Hazardous waste protocols are consistent with MOU requirements.
☒	Solid Waste Managed Properly (zero garbage discharge)	Solid waste protocols are consistent with MOU requirements. Solid waste discharge records were reviewed and are maintained properly. No

		discharges or releases of solid wastes were found to be inconsistent with MOU requirements.
☒	Photo/X-Ray Waste Managed Properly (fluids, cartridges,…) and landed ashore	Photo and x-ray waste protocols are consistent with MOU requirements.
☒	Dry-Cleaning Wastes and Byproducts (fluids, sludge, filter materials…) Managed Properly (PERC – haz waste – landed ashore)	Dry cleaning waste products are managed per MOU requirements.
☒	Unused/Outdated Pharmaceuticals Managed Properly (safely disposed of)	Unused or outdated pharmaceuticals are disposed of either by incineration via red medical bag wastes and witnessed by lead nurse or are brought ashore as hazardous waste when necessary. Expired IV fluids, saline solutions, and injectables are discarded down medical center drains.
☒	Fluorescent and Mercury Vapor Lamp Bulbs Managed Properly (prevent release of mercury)	Fluorescent and mercury vapor lamp bulbs protocols for management are consistent with MOU requirements.
☒	Waste Reduction/Reuse/Recycling Opportunities Maximized (glass, cardboard, aluminum & steel cans)	Waste reduction/reuse/recycling opportunities appear to be maximized per MOU requirements.
☒	Batteries Managed Properly (recycled, reclaimed, disposed of properly)	Batteries management protocols are consistent with MOU requirements.
☒	Incinerator Ash Managed Properly and minimized volume (haz waste segregation and annual testing)	Incinerator ash management is consistent with MOU requirements.
☒	Oily Bilge Water Managed Properly (<15 ppm, no visible sheen and underway)	Oily bilge water protocols are consistent with MOU requirements.
☒	Ballast Water Managed Properly (per Wash regs –reporting, treated or if open sea exchange >200 nm from outside EEZ, 50nm if not EEZ)	Ballast water is managed with graywater and blackwater holding and no exchanges are necessary.
☒	OCNMS rules and regs followed	The discharge protocols are consistent with MOU requirements and are to not occur in OCNMS waters.
Additional General Questions		
☒	How is deck runoff and hull cleaning handled (scuppers…) (non-toxic/phosphate free cleaners, biodegradable)	Deck runoff and hull cleaning protocols are consistent with MOU requirements.
☒	How is maintenance performed on the outside of the vessel (paint chipping, painting, etc)	Outside vessel maintenance protocols are consistent with MOU requirements.
☒	Sculleries and Galleys – type of detergents and degreasers used (phosphate free and non-toxic)?	Restaurants and galleys use detergents and degreasers that are non-toxic and phosphate free.
☒	How are food waste discharges handled (prevention of erroneous materials)?	Food waste discharge protocols are consistent with MOU requirements and records reviewed show no discharges in MOU related waters.
☒	Medical sinks/floor drains, chem. stor areas wastes go where (plugged, blackwater, bilge)?	Medical sinks/floor drains are reported as connected to blackwater.
☒	Where is pool and spa water discharged? Dechlorinated/debrominated and underway?	Pool and spa water protocols are consistent with MOU requirements.
☒	What type of fuel is used and percent sulfur content?	Ship uses HFO with 2% sulfur content with EGCS to achieve 1% sulfur content. Inside OCNMS ship uses MGO with <0.1% sulfur content.

Other:

Section F: Sampling Results

Parameter	Results
Biochemical Oxygen Demand 5-Day (BOD_5)	
Total Suspended Solids (TSS)	
Fecal Coliform	
Residual Chlorine	
pH	
Ammonia, Nitrogen	

Section G: Summary of Findings/Comments

Introduction

Evan Dobrowski, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program (NWRO-WQ) conducted the inspection of the Royal Caribbean Cruise Ltd, RADIANCE OF THE SEAS on October 1, 2023. The main contact on board the RADIANCE OF THE SEAS was Stela Vela, Environmental Officer (EO) for the vessel. Prior notification of the visit was given on September 13, 2023, for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State* (MOU), as amended. The RADIANCE OF THE SEAS is not approved to discharge wastewater in MOU waters.

The RADIANCE OF THE SEAS was put into service in March of 2001 and is 961 feet long with 13 decks. Passenger capacity is currently about 2700, with about 850 crew.

The RADIANCE OF THE SEAS is scheduled for 2 calls in Seattle between May 9, 2023, and October 1, 2023. The vessel visits Victoria on its way into Seattle.

Inspection

We arrived and boarded the ship (photo #01) at 9:00 am and began with introductions and a plan for the day with Stela Vela, EO. We started the inspection at the EO's office reviewing discharge logs and other documents. After this we headed to the Engine Control Room (ECR) and discussed various waste streams and discharge protocols as well as fuel transfer protocols. We then toured the blackwater marine sanitation devices, the oily bilge treatment, and the Exhaust Gas Cleaning Systems with the engineering staff. We then headed to the incinerator room and then to the garbage and hazardous waste storage areas. The inspection was then finalized with a brief debriefing and we disembarked the vessel at 1:00 pm.

Photo #01 10/1/23 Image: IMG_E0818
By: Dobrowski
Description: RADIANCE OF THE SEAS vessel

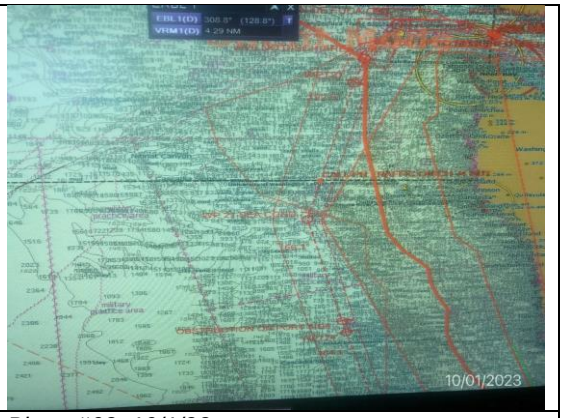

Photo #02 10/1/23
Image: IMG_E0817
By: Dobrowski
Description: Fuel switchover and stop discharge location on navigational charts.

Discharge Types and Protocols in MOU waters, Washington State waters or the Olympic Coast National Marine Sanctuary (OCNMS) (MOU related waters):

The discharge protocols start with voyage plans for each itinerary prior to that route. A matrix is developed for each route upon a detailed review of locations for allowed discharges. The matrix for the Seattle/Santa Barbara route details no discharges in MOU related waters, for

- bilge water;
- blackwater;
- graywater;
- food waste;
- ballast water; and
- pool and spa water.

The matrix also shows that Puget Sound is a designated No Discharge Zone for sewage with a link to our website. The matrix is overlaid onto the navigational screen (Photo #02) to show the location where fuel switch overs and discharges stop just before the OCNMS.

The protocol for discharges is a closed-loop process. There is communication between the ECR Officer on Watch and the Bridge staff for approval from the Bridge that the vessel is in an area authorized for discharge. The overboard valves have a push pin which must be pushed in to open the valve and pushed out to close the valve. This is followed by activating the overboard valve on the Damatic Control System in the ECR. Both these processes together are required to open or close overboard valves. All discharges are electronically logged in the spreadsheet kept on the vessel as well as in paper records, this vessel is not using a NAPA system. Any change to the logs shows who made the change by staff signature in the spreadsheet. Any changes are reviewed by the Bridge. The GPS coordinates are documented in both paper and electronic records in order to log the discharge location. The discharges all to occur outside of MOU related waters (Washington State waters, the Strait of Juan de Fuca up to the border with Canada and the OCNMS). For black water and gray water, the latitude and longitude coordinates are recorded in the spreadsheet system along with all other logs. The date, time and location of both the start and the stop of the discharges are recorded, along with port location, effluent type, speed, tank name and volume, valve name, and status of valve. The maker of the entry and reviewer/signer is also included, along with any notes. The vessel protocol is to not discharge blackwater or graywater in Canadian waters on this route. Navigation on the bridge shows clearly marked electronic maps indicating discharges to stop 13 miles outside the OCNMS (12 miles from shore and a one mile buffer).

Discharge Types:

Blackwater includes toilet waste and medical drains and is sent by vacuum/jet to one of Scanship Hydroxyl marine sanitation devices (photo #03). Description paraphrased from the schematic on the MSD system: Black water enters from the inlet into the aeration tank where the bacteria present in this section decomposes the blackwater in the presence of oxygen which is supplied by the aeration nozzles. A continuous supply of oxygen is necessary. The blackwater then enters into the settling section where settling takes place and flocs of activated sludge settles down along with other settleable matter. Sludge is returned back to the aeration section. The settled blackwater then enters into the disinfection section where chlorine is added (photo #03). Flow then goes to UV treatment and dedicated holding tanks if not in an area of discharge (photo #04). Blackwater is not discharged in MOU related waters and all blackwater is treated. Settleable solids are monitored periodically and chlorine availability checked. Once per year, each MSD is taken off-line for a full maintenance cleaning. Solids are removed at this time, drummed and sent ashore in Seattle on this route.

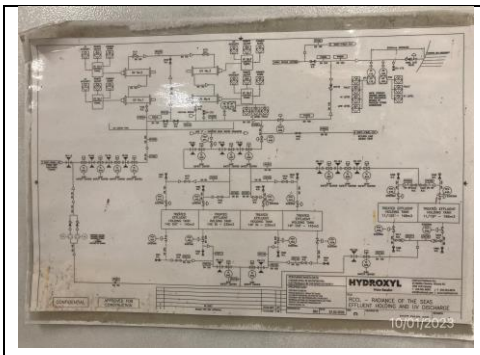

Photo #03 10/1/23 Image: IMG_E0773
By: Dobrowski
Description: MSD Schematic

Photo #04 10/1/23
Image: IMG_E0769
By: Dobrowski
Description: MSD overboard

Graywater, which includes accommodation and crew sink and shower water, galley water, laundry and possibly spa water is held untreated and discharged outside of MOU related waters.

Dirty bilge water is collected and sent to one of two oily bilge tanks. Liquid moves to one of the centrifugal oily water separators (OWS). The system includes two stages of filtration and recirculates at >5 parts per million (ppm) oil content with the oily content meter (photo # 05). Oily sludge is collected from the system and sent ashore by truck. Maintenance on the OWS's includes regular cleaning of the filters and other regular checks and maintenance. Prior to discharge, the liquid is sent through a white box which only allows discharges <15 ppm. The discharge protocol for this route is outside the MOU related waters. The white box (photo #06). The Chief Engineer and the EO have the two separate keys and both need to be present to open the white box. There is a record each time the white box door is opened and a video camera on OWS equipment. The chief Engineer and the EO have the ability to review camera recordings. All portable pumps are logged and only used for certain equipment. The EO confirmed that she is not aware of any rerouting of oily bilge. The OWS was off and recirculating during the inspection and not discharging. If graywater tanks overflow or come in contact with oily bilge, the content is considered as oily bilge and treated through the OWS and the Captain and Chief Engineer are notified.

The RADIANCE OF THE SEAS uses graywater in various tanks for ballast and therefore does not do ballast water exchanges. Stability has not been an issue.

The RADIANCE OF THE SEAS has 3 fresh water Jacuzzis and 3 saltwater pools. The pools are discharged >12nm and outside of MOU related waters and the Jacuzzi water can be sent to the graywater collection tanks for discharge outside of MOU related waters.

Food waste is segregated into soft and hard foods. Soft foods are fed into food waste pulper. The effluent from the food waste pulper is deposited into the grey water tanks and is discharged outside of MOU related waters. Hard foods are either incinerated or landed ashore as USDA waste in Seattle. Used cooking oil is sent ashore for recycling. The EO and Food Operations staff inspect the pulpers typically daily. There is no food chute on board.

Photo #05 10/1/23 Image: IMG_E0786 By: Dobrowski
Description: OWS oil content meter

Photo #06 10/1/23 Image: IMG_E0788 By: Dobrowski
Description: OWS White Box

Photo #07 10/1/23 Image: IMG_E0795 By: Dobrowski
Description: Recycling Station

Photo #08 10/1/23 Image: IMG_E0800 By: Dobrowski
Description: Hazardous Waste Storage

Photo #09 10/1/23 Image: IMG_E0804 By: Dobrowski
Description: Silver Recovery Unit

Deck runoff goes directly overboard. The VGP requirements are followed for prevention of any materials off the deck. Only non-toxic, phosphate free cleaners are used. Outside vessel maintenance such as paint chipping and painting is sometimes done at the Port of Seattle. Work does not occur if too windy and is done with permission of the Port.

Laundry water is sent to the graywater collection tanks and discharged outside MOU related waters. Dry cleaning is not done on the vessel. Therefore, no chemical such as perchloroethylene (Perc) are used on the vessel.

Photo waste is offloaded in Victoria. X-rays are done digitally without any waste. Fluorescent bulbs are crushed on board and held for offloading ashore as hazardous waste. Hazardous waste materials are stored separately in various dedicated locations throughout the vessel and include items such as paints, thinners, oily rags and debris, incinerator ash, chemicals, aerosols photo waste, and some batteries. Bio-medical waste is incinerated with sharps being offloaded as biomedical waste ashore.

Unused or outdated pharmaceuticals and narcotics are either destroyed onboard through incineration or are landed ashore via red medical bag waste. When medical waste is incinerated the Lead Nurse is required to transport the medical waste and witness incineration. Expired IV fluids, saline solution, and injectables are discarded down medical drains.

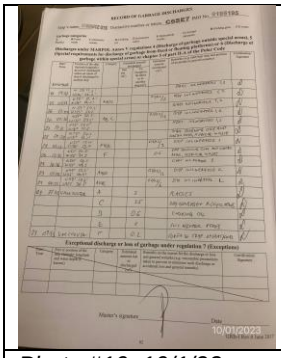

Photo #10 10/1/23
Image: IMG_E0755 By: Dobrowski
Description: Garbage/Hazardous Waste Record Example Log

Garbage such as domestic and operational waste is offloaded in Seattle. Some USDA wastes, some food waste, biomedical bagged waste, some plastics, food contaminated cardboard, and some paper is incinerated with one incinerator. Ash is tested annually and offloaded as hazardous waste. The garbage record book was reviewed (photo # 10) and showed consistency with requirements.

Glass, heavier plastics, most cardboard, aluminum, tin and steel cans, batteries, used cooking oil and other items are recycled.

A wet scrubber for exhaust is installed on the RADIANCE OF THE SEAS. In use on this trip is one diesel engine utilizing a scrubber and HGO; there are 2 additional gas turbines onboard. While in MOU waters the vessel is switching over to MGO fuel < 0.1% sulfur. The vessel is not equipped for shore power. The wet scrubbers uses filters (photo #13) and discharges are diluted and monitored before discharge.

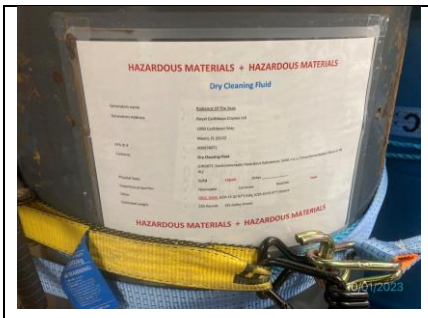

Photo #11 10/1/23 Image: IMG_E0813 By: Dobrowski
Description: Dry Cleaning Fluid

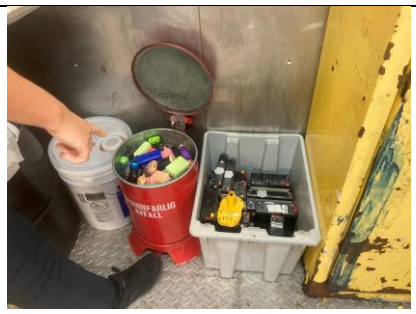

Photo #12 10/1/23
Image: IMG_E0799 By: Dobrowski
Description: Hazardous Waste Storage room/Flammables

Photo #13 10/1/23
Image: IMG_E0791 By: Dobrowski
Description: Wet Scrubber Filters

The vessel has a clear process for notifications for any non-compliance incident.

Conclusions and Recommendations

The protocols for discharges are clear. Records were orderly and appeared consistent with the MOU.

Copies to:
Stela Vela, Environmental Officer, RADIANCE OF THE SEAS
Alex Adams, Port of Seattle
Amy Jankowiak, Ecology
Central Files: Royal Caribbean Cruises Ltd – RADIANCE OF THE SEAS; WQ 6.1

Section H: Signatures		
Name and Signature of Inspector: Evan Dobrowski, Compliance Specialist *Evan Dobrowski*	Agency/Office/Telephone: Department of Ecology Northwest Regional Office Water Quality Program 206-594-0175	Date November 6, 2023