

Appendix E

Updated Site-Specific Dive Safety and Work Plan

Site-Specific Dive Safety and Work Plan

Lower Duwamish Waterway, Middle Reach

Seattle, WA

Prepared for: Lower Duwamish Waterway Group

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For Submittal to: The US Environmental Protection Agency

Region 10 (Seattle, WA)

FINAL

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1 – Introduction and Objectives

This document presents the Dive Safety and Work Plan for diver-assisted under-pier observations and sediment sampling in the Middle Reach and Lower Reach of the Lower Duwamish Waterway (LDW). The diving activities support the phased Pre-Design Investigation (PDI) for remedial design in this section of the waterway.

The primary objective of this work is to:

- Conduct sediment probing.
- Perform under-pier reconnaissance.
- Collect sediment samples in areas inaccessible to sampling vessels.

These activities will provide the necessary field data to support the remedial design process.

1.1 Description of Activities

Gravity Consulting and Crux Diving personnel will conduct surface supplied diving operations to:

- Evaluate sediment conditions.
- Determine the depth of soft sediment.
- Collect sediment samples.

The standard four-person dive team configuration includes:

- Primary Diver
- Standby Diver
- Diver Tender
- Dive Supervisor (or designated person-in-charge [DPIC])

This configuration allows rotation of roles to ensure safe operations and minimize diver fatigue.

Work will be coordinated with the project consultant Anchor QEA in accordance with the final project quality assurance project plan (QAPP).

Initial Reconnaissance

Prior to diving activities, a surface reconnaissance inspection will be conducted from the Gravity Research Vessel with the dive supervisor and engineering team.

The inspection will:

- Assess the structural condition of over-water structures.
- Identify submerged debris.
- Identify structural damage that may pose a hazard.

If hazardous conditions are identified, the transect location will be adjusted in consultation with the engineering team.

Transect Surveys

At each dive location:

1. The diver will descend along a down line at the pier face.
2. The diver will monitor the surrounding area for hazards such as:
 - Debris
 - Entanglement risks
 - Structural obstructions

If conditions are unsafe, an alternate transect will be selected.

Sediment Probing

Sediment probing will determine whether soft sediment is present within the interstitial spaces of shoreline armoring or riprap.

A 3/8-inch stainless steel probe will be inserted into the sediment to determine sampling feasibility and depth.

Station control will be determined by position relative to pile bents, as GPS positioning is unreliable beneath structures.

Sediment probing may cause turbidity and low visibility conditions. Divers are trained to operate in blackout conditions and will maintain contact with the transect line during operations.

Sediment Sampling

Sediment samples will be collected per the final QAPP.

Sampling methods include:

10-centimeter samples

- 8-inch-diameter stainless steel hand core

Deeper samples

- 3.75-inch-diameter butyrate core tube
- Inserted manually or with a slide hammer

Procedure:

1. The diver inserts the core tube to the desired depth.
2. The tube is capped and extracted.
3. The diver returns to the surface with the sample.

Samples will be processed according to the final QAPP.

1.2 Known Physical Site Hazards

The LDW has a long history of industrial and municipal use, which introduces several potential hazards:

- Unmarked underwater structures
- Submerged debris
- Entanglement hazards
- Variable currents
- Vessel traffic

These conditions require divers to work slowly and methodically, particularly in areas with limited visibility.

2 – Emergency Response Information

NOTE: In any medical emergency, call 911 first before transporting an injured person to a medical facility.

For dive-related emergencies, contact Divers Alert Network (DAN).

The Emergency Response Plan is in the Health and Safety Plan for the LDW middle reach PDI QAPP (Section 14), available on the ldwg.org website.

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2.1 Emergency Contact Information

EMS Rendezvous Points

Harbor Island Marina – Gate C
1001 SW Klickitat Way
Seattle, WA 98134

Duwamish River Boat Ramp
108 South River Street
Seattle, WA 98108

South Park Marina Boat Ramp
8500 Dallas Avenue South
Seattle, WA 98108

Emergency Phone Numbers

Service	Contact
Emergency	911
U.S. Coast Guard VTS	VHF Channel 14 / (206) 217-6152
Divers Alert Network	(919) 684-9111
Poison Control	(800) 222-1222

Emergency equipment available on the vessel includes:

- First aid kit
- Emergency oxygen kit
- Automated external defibrillator (AED)
- Backboard/litter
- Eyewash kit
- Fire extinguisher
- VHF radio
- Cellular phone

2.2 Nearest Dive Emergency Medical Facility

Virginia Mason Medical Center – Hyperbaric Medicine
1100 Ninth Avenue
Seattle, WA 98104
Phone: (206) 583-6543

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Capabilities:

- Double-lock chamber
 - U.S. Navy Treatment Tables 4, 5, and 6
-

2.3 Nearest Non-Dive Emergency Medical Facility

Harborview Medical Center

325 Ninth Avenue

Seattle, WA 98104

Phone: (206) 744-3000

2.4 Nearest Non-Urgent Care Facility

NeighborCare at Columbia City

4400 37th Street South

Seattle, WA 98118

Phone: (206) 461-6957

Hours: Monday – Friday, 8 AM – 5 PM

3 – Dive Plan Overview

Project:

Lower Duwamish Waterway – Middle Reach Sediment Investigation

Daily Work Window:

0700–1700

Field Manager:

Shawn Hinz – Gravity Consulting

Dive Supervisor:

Sterling Ulrich (or Ryan Chapman)

Estimated Number of Dive Days:

5 days

Dive Locations:

Duwamish River

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Divers / Tenders:

To be determined

Purpose of Work

The purpose of the dive operations is to conduct:

- Under-pier reconnaissance
 - Sediment probing
 - Sediment sampling in areas inaccessible to vessels
-

Dive Parameters

Parameter	Value
Estimated number of dives per day	1–4
Maximum depth	50 feet salt water (fsw)
Typical working depth	45 fsw or shallower
Anticipated dive profile	45 for 120 min
Expected visibility	2–5 feet
Tidal influence	–4 to +13 feet range
Expected current	<1 knot
Water Temperature	49 degrees F

Tidal conditions may reverse river flow depending on river stage.

Diving Mode

Surface supplied diving with contaminated-environment dive gear.

A separate equipment certification package will be provided closer to the start of the project. Dive hoses are tested annually to 1.5 times working pressure.

Breathing Gas

- Compressed air via dive compressor
- Minimum 80 feet³ tank capacity
- CGA Grade E breathing air
- Dive compressor and air quality testing are included in the equipment certification package

Backup air supply:

- 30 feet³ bailout bottle
 - Manifold block connected to second-stage regulators
-

Communications

Hard-wired communications will be used between divers and the dive supervisor. Divers will use diving helmets that will mate directly to the dive suit with latex neck dams.

4 – Pre-Dive Safety Procedures and Notifications

The following procedures will be completed prior to dive operations:

Vessel Traffic Notification

- The U.S. Coast Guard Vessel Traffic System (VTS) will be notified on VHF Channel 14 before diving begins.
 - Notification will also be provided when diving operations conclude.
-

Vessel Communication

Channels monitored:

- VHF Channel 14 – VTS
- VHF Channel 13 – Commercial vessel communication
- VHF Channel 16 – Emergency and hailing channel

AIS – The Vessel AIS will be monitored and transmitted through out each day of activity

Situational Awareness

All personnel will monitor:

- Vessel traffic
- Boat wakes
- Changing weather conditions

Crew members will communicate hazards immediately.

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Safety Briefing

Prior to diving operations:

- This Dive Safety Plan will be reviewed with all personnel.
 - Site-specific conditions will be assessed the day of the dive and discussed as part of the pre-dive safety briefing. This discussion will include potential hazards related to weather conditions (e.g. heat stress, hypothermia, sunburn), water conditions (e.g. waves, currents, visibility), and site conditions (e.g. structures, debris, vessel traffic).
 - Roles and emergency procedures will be confirmed.
-

Equipment Inspection

Before each dive day:

- All dive equipment will be inspected.
 - Oxygen systems will be checked.
 - Communications systems will be tested.
-

EMS Vehicle Staging

At least one vehicle will be staged near the closest emergency rendezvous point for rapid medical transport if required.

5 – General Work Plan

Dive operations will be conducted from the vessel Carolyn Dow, a 36-foot aluminum landing craft.

The vessel will either:

- Anchor near the dive location, or
- Tie off to pilings.

Dive Specific Work Plan

It is anticipated that diving operations shall include the below listed tasks. Divers will be equipped with a helmet mounted underwater color camera which will be displayed on a monitor at the dive control station at all times. All activities will be recorded. The work will be accomplished in the sequence in which it is listed.

- Morning safety meeting and check in

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- Meeting with Anchor QEA field lead to review the day's activities and discuss relevant Data Quality Objectives
 - Meeting with divers, crane operators, deck foreman and others to discuss planned work for the day
 - Diver to collect sediment using a 3/8-inch stainless steel probe
-

Down Line Installation

A weighted down line will be secured to the vessel to:

- Provide descent and ascent guidance.
 - Assist diver navigation in low-visibility conditions.
-

Dive Team Roles

Each dive team will consist of:

- Diving supervisor – qualified person identified in writing as the diving supervisor for each diving operation, who will be in charge of the diving operation, planning, and safety and health of the diving team
- Primary diver – assigned by the supervisor to perform specific tasks in the water and topside; is commercially qualified and capable of the tasks required in this project
- Standby diver – dressed and ready to assist diver in an emergency
- Diver tender – assigned by the diving supervisor to perform various tasks

Diving personnel shall be assigned their duties prior to the start of the dive. Personnel will rotate between roles to maintain safety and reduce fatigue. These duties are to be assigned by the diving supervisor and may be changed from time to time as required.

Standby Diver

A fully suited standby diver will remain on the vessel ready to respond to emergencies.

Communication System

The dive team will use:

- Hard-wire communications
 - 12-volt power supply
 - Battery backup
-

Backup Communication

If communications fail, line-pull signals will be used as described in Section 14.

6 – Compliance with Agency and Industry Standards

Gravity-Crux will conduct all work according to recognized industry standards including:

- U.S. Coast Guard regulations
- Occupational Safety and Health Administration (OSHA) Commercial Diving Standards
- Association of Diving Contractors International (ADCI)
- U.S. Environmental Protection Agency Dive Safety Manual (2022)

All operations will comply with applicable health and safety regulations.

If changes to the dive plan occur involving:

- Personnel
- Equipment
- Mission scope
- Dive depth

The client will be notified and approval obtained before proceeding.

6.1 Diver Certification and Training

All divers involved in this project are qualified commercial or government divers with training in:

- Commercial diving operations
- Hazardous Waste Operations (HAZWOPER)
- First Aid
- CPR
- AED operation

- Emergency oxygen administration

Documentation of diver qualifications is provided in Attachment 1

6.2 Medical Monitoring

Personnel subject to OSHA HAZWOPER regulations (29 Code of Federal Regulations 1910.120) will participate in medical surveillance programs when required.

For this project:

- Expected exposures do not require chemical medical surveillance.
 - Supporting documentation is provided in the attachments.
-

7 – Dive Safety Procedures

Diving operations will follow federal and state regulations for commercial diving.

All diving operations shall be conducted in accordance with the Crux Diving Inc Safe Practices Manual, the job specific Dive Operations Plan, the Association of Diving Contractors International Consensus Standards for Commercial Diving Operations, OSHA Regulations, and the U.S. Army Corps of Engineers Safety Manual EM-385-1-1. These regulations are incorporated by reference into the Crux Diving Safe Practices Manual. Crux's supervisor kit contains the following content and will be available at the dive site location.

The Diving Supervisor (Diving Master) is ultimately responsible for the safety of all personnel and equipment working on the project. They will report directly to the Gravity Captain and Anchor QEA representative on all matters concerning the safety of the operation.

The Diving Supervisor will conduct a pre-dive safety meeting each morning before work begins. Items of discussion will include coordination of the day's activities and a review of pertinent Job Hazard Analysis forms. All dive personnel, and if applicable, other crew members i.e. crane operators, and barge or boat operators are required to attend the daily safety meetings. These will be allowed to progress without the approval of the dive safety inspector.

The site supervisors will conduct frequent safety inspections of the worksite, equipment, and materials. Any deficiencies will be corrected as soon as possible and discussed at the next safety meeting.

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After the completion of each dive, the dive supervisor shall:

- Question each diver as to physical condition.
- Instruct divers to report any physical problems or adverse physiological effects, including symptoms of decompression sickness or gas embolism.
- Advise the diver of the nearest location of an operational decompression chamber with 165 feet salt water (fsw) capability.
- Alert each diver to the potential hazards of flying after diving.
- Ascent to altitude protocol shall be in accordance with Table 9-6 of U.S. Navy Dive Manual Rev. 7

In addition, the dive supervisor shall:

- Instruct divers of the hazards of flying at altitudes more than 8,000 feet within 12 hours after decompression.
- Make sure the appropriate dive flags are in place and visible on site

Dive Log

A dive log will be maintained documenting:

- Dive depth
- Bottom time
- Surface intervals
- Repetitive dive groups

Dive limits will follow U.S. Navy Diving Tables

Dive Flags

The following dive flags will be displayed:

- Blue-and-white Alpha flag
- Red-and-white Diver Down flag

Flags will be minimum 1 m × 1 m for visibility.

Emergency Equipment

The vessel will carry:

- AED
- Emergency oxygen supply (636 liters)

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- Backboard / rescue stretcher
- First aid supplies

At least two crew members will be trained in AED use.

A second manually operated bag valve mask (“ambu bag”) will also be on board for circumstances involving two non-breathing divers. In addition to administration of oxygen to an injured diver, basic first aid and activation of EMS will apply. All staff on board are trained in the administration of oxygen and first aid.

Bailout Gas

Each diver will carry a 30-foot³ bailout cylinder.

Contamination Protection

Divers will wear:

- Dry suit with smooth exterior surface
- Attached dry hood
- Dry gloves
- Full-face mask

Any equipment leakage will result in immediate dive termination.

Diver Recovery

The standby diver will be tethered with a longer line than the primary diver to ensure that the standby diver is capable of reaching the primary diver in the event of an emergency.

Divers will wear lifting harnesses compatible with:

- Vessel davit
 - A-frame recovery system
-

Personal Flotation Devices

All personnel will wear personal flotation devices (PFDs) on vessel.

Post-Dive Rinse

Divers will be rinsed with potable water before removing gear to reduce contaminant exposure.

Hygiene Measures

Handwashing stations and sanitizer will be available on the vessel.

Wheelhouse occupancy will be limited to two people to improve ventilation.

8 – Prevention of Chemical Exposure

Dive operations may involve contact with contaminated sediments in the LDW. Appropriate procedures will be followed to minimize exposure risks to divers and surface personnel.

8.1 Contaminants of Concern

Potential contaminants present in surface water and sediments include:

- Bacteria associated with stormwater runoff
- Surface oils and petroleum products
- Industrial contaminants bound to sediments

Divers are instructed to avoid direct contact with water and sediment whenever possible, and ingestion of river water must be avoided.

Surface personnel operate in an open-air environment, reducing inhalation risks. However, precautions will be taken during diver decontamination to avoid inhalation of mist or aerosols.

The primary exposure routes are:

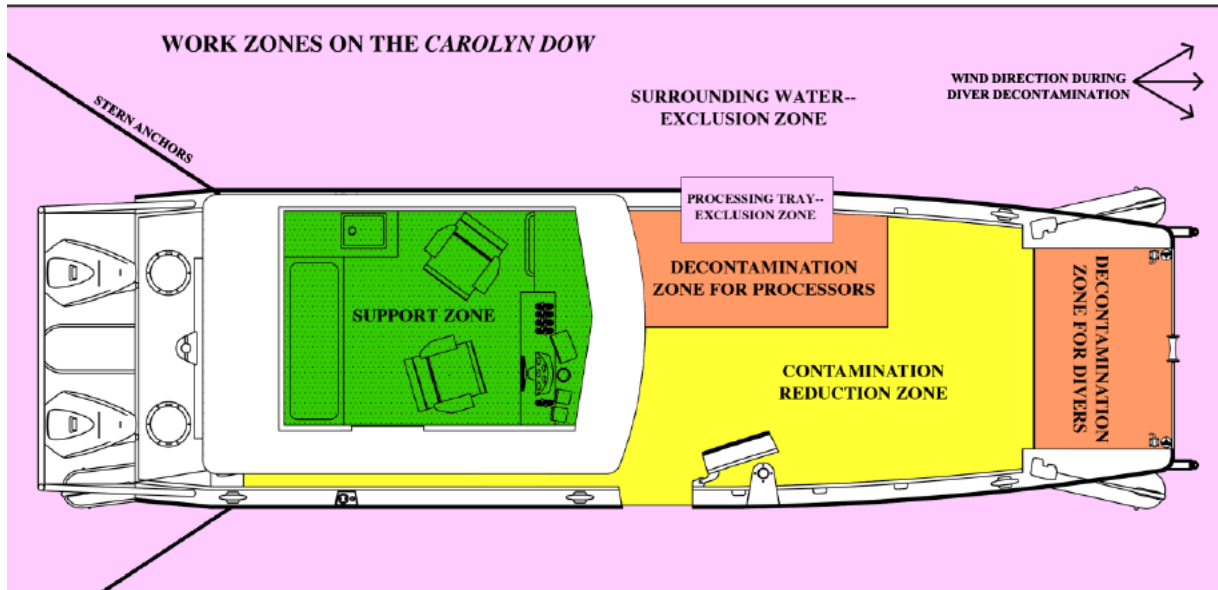
- Dermal contact
- Ingestion of contaminated sediment

Proper PPE and work procedures significantly reduce exposure risks.

A complete list of potential contaminants is provided in Attachment 15.2.

8.2 Work Zones

Due to limited space aboard the Gravity Research Vessel, contamination control zones are simplified but clearly defined. Figure 4 provides the layout of the vessel zones



Four zones will be established:

Zone 1: Exclusion Zone

The surrounding river water and underwater work environment.

Zone 2: Decontamination Zone

Located at the bow door and adjacent deck area where divers exit the water.

Activities include:

- Rinsing divers
- Removing contaminated personal protective equipment (PPE)
- Temporary storage of reusable equipment

This area will be marked with tape.

Zone 3: Contamination Reduction Zone (CRZ)

The remainder of the deck excluding the wheelhouse.

Activities include:

- Equipment storage
- Light decontamination
- Deck rinsing

Sediment accumulation will be minimized through frequent rinsing.

Zone 4: Support Zone

Located in the wheelhouse.

Only personnel who have completed the potable-water rinse process may enter.

Boots must be rinsed before entering this area.

8.3 Personal Protective Equipment (PPE)

Deck Personnel PPE

Level D PPE will be used:

- Work gloves
- Rubber boots
- Eye protection
- Hard hat when overhead hazards exist

During diver decontamination operations, the tender will also wear:

- Rain gear
 - Face shield
-

Diver PPE

Divers will wear contaminated-environment equipment including:

- Dry suit with smooth, easily cleaned exterior
- Attached dry hood
- Dry gloves
- Full-face mask

Any mask, glove, or suit leak will result in termination of the dive.

8.4 Diver Decontamination Procedures

Although dilution in water reduces exposure risks, sediments may remain on dive equipment.

Decontamination procedures will be performed as follows:

1. Diver exits water and sits on the bow door platform.
2. Vessel is positioned so decontamination occurs downwind from crew.
3. Tender sanitizes gloves and hose nozzle before beginning.

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4. Diver's helmet, mask, and gloves are rinsed with potable water.
5. Diver removes mask carefully to avoid contaminated runoff contacting skin.
6. Any exposed skin is washed with soap and water.
7. Diver removes scuba gear and fins while seated.
8. Suit is thoroughly rinsed to remove sediment.
9. Gloves and hood are removed and cleaned if necessary.
10. Diver enters the CRZ.

Reusable gloves may be stored for reuse if uncontaminated.

Equipment will be stored separately from sensitive gear.

9 – Diving Emergency and Problem Management

Emergency supplies will be available on the vessel and maintained in ready condition.

Emergency equipment includes:

- First aid kit
- Medical oxygen
- Backboard
- AED

The primary emergency contact method is cellular telephone, with VHF radio as backup.

Emergency Situations and Recommended Actions Matrix

Emergency Situation	Recommended Action
Entangled diver	Allow diver time to clear entanglement. Deploy standby diver if necessary. Terminate dive if diver is distressed.
Loss of breathing gas	Activate bailout air supply and ascend safely. Standby diver prepares to assist.
Full-face mask malfunction	Switch to secondary regulator and ascend safely.
Suit or glove leak	Abort dive and remove contaminated equipment. Wash exposed skin.
Loss of communication	Use line-pull signals and terminate dive.
Injured diver	Safety diver assists ascent. Provide oxygen and first aid. Activate EMS.
Rapid ascent	Monitor diver for decompression sickness symptoms. Provide oxygen if needed.

Emergency Situation	Recommended Action
Surface crew injury	Abort dive and activate EMS.
Diver unconscious	Deploy standby diver and recover diver to surface immediately. Begin rescue procedures.

10 – Activity Hazard Analysis

The following hazards and controls apply to field activities.

Vessel Operations

Hazard	Control
Vehicle collision	Seat belts required; no phone use while driving
Drowning	PFDs worn when near water
Slips and falls	Vessel safety orientation
Boat wakes	Crew monitors vessel traffic
Windlass injury	Crew trained in safe operation
A-frame pinch points	Hard hats required

Diver Entry and Exit

Divers will enter and exit the water by sitting on the bow door platform, avoiding jumps into shallow or obstructed water.

Anchoring

The vessel will be anchored fore and aft.

If repositioning is required while divers are in the water, windlasses will be used instead of engine propulsion.

High Pressure Cylinders

Hazard	Control
Cylinder failure	Cylinders inspected and hydrostatically tested
Valve freezing	Equipment monitored in cold conditions

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Underwater Operations Hazard Matrix

Hazard	Control
Vessel traffic	Dive flags displayed and vessels contacted
Poor visibility	Dive lights and tethered communications used
Entanglement	Divers remain tethered and maintain line awareness
Hypothermia	Divers monitored and warmed if necessary
Hyperthermia	Wheelhouse cooling available
Equipment leaks	Dive terminated and equipment repaired
Decompression sickness	Follow U.S. Navy dive tables and no-decompression limits (NDLs)

11 – Equipment Considerations

Equipment	Training Required	Inspection
Boats	Boating safety training / USCG Master	Daily inspection
Navigation electronics	Operator familiarization	Functional checks
Sediment samplers	Safe operation training	Visual inspection
Vehicles	Licensed drivers	Department of Transportation inspection
High-pressure cylinders	Cylinder handling training	Hydro test and visual inspection (in accordance with visual inspection procedures)
Dive system	Experienced divers	Annual service
Dry suits	Dry suit training	Leak check
Full-face masks	Communication training	Annual service
Harness and tending lines	Familiarity with system	Visual inspection

12 – U.S. Navy No-Decompression Dive Tables

Dive limits will follow U.S. Navy Diving Manual Version 7.

The Navy tables include:

- NDLs
- Residual Nitrogen Tables for Repetitive Dives

See Tables 6 and 7 below:

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next, read vertically downward to the new repetitive group designation. Continue downward in this same column to the row that represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

* Dives following surface intervals longer than this are not repetitive dives. Use actual bottom times in the Air Decompression Tables to compute decompression for such dives.

Repetitive Group at Beginning of Surface Interval

Repetitive Group at End of the Surface Interval

Dive Depth	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
10	**	**	**	**	**	**	**	**	**	**	**	427	248	159	101	58
15	**	**	**	**	**	**	**	**	450	268	218	164	122	88	61	37
20	**	**	**	**	**	462	331	257	206	166	134	105	83	62	44	27
25	†	†	470	354	286	237	198	157	141	118	98	78	63	48	34	21
30	372	308	261	224	194	168	140	120	108	92	77	63	51	39	28	18
35	245	218	191	169	149	132	118	101	88	75	64	53	43	33	24	15
40	188	169	152	138	122	109	97	85	74	64	55	45	37	29	21	13
45	154	140	127	115	104	93	83	73	64	58	48	40	32	25	18	12
50	131	120	109	99	90	81	73	65	57	49	42	35	28	23	17	11
55	114	105	98	89	80	72	65	58	51	44	38	32	26	20	15	10
60	101	93	86	79	72	65	58	52	46	40	35	29	24	19	14	9
70	83	77	71	65	60	54	49	44	39	34	29	25	20	16	12	8
80	70	65	60	55	51	46	42	38	33	29	25	22	18	14	10	7
90	61	57	52	48	44	41	37	33	29	25	22	19	16	12	9	6
100	54	50	47	43	40	38	33	30	26	23	20	17	14	11	8	5
110	48	45	42	39	36	33	30	27	24	21	18	16	13	10	8	5
120	44	41	38	35	32	30	27	24	22	19	17	14	12	9	7	5
130	40	37	35	32	30	27	25	22	20	18	15	13	11	9	6	4
140	37	34	32	30	27	25	23	21	19	16	14	12	10	8	6	4
150	34	32	30	28	26	23	21	19	17	15	13	11	9	8	6	4
160	32	30	28	26	24	22	20	18	16	14	13	11	9	7	5	4
170	30	28	26	24	22	21	19	17	15	14	12	10	8	7	5	3
180	28	26	25	23	21	19	18	16	14	13	11	10	8	6	5	3
190	26	25	23	22	20	18	17	15	14	12	11	9	8	6	5	3

Residual Nitrogen Times (Minutes)

* Residual Nitrogen Time cannot be determined using this table (see paragraph 9-8.1 subparagraph 8 for instructions).

† Read vertically downward to the 30 fsw repetitive dive depth. Use the corresponding residual nitrogen times to compute the equivalent single dive time. Decompress using the 30 fsw air decompression table.

Table 7. Non-Decompression Limits

No-Decompression Limits and Repetitive Group Designation Table For No-Decompression Air Dives																			
Depth feet / metres	No-Deco Limits (min)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O			
10 3.0		60	120	210	300														
15 4.6		35	70	110	160	225	350												
20 6.1		25	50	75	100	135	180	240	325										
25 7.6		20	35	55	75	100	125	160	195	245	315								
30 9.1		15	30	45	60	75	95	120	145	170	205	250	310						
35 10.7	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310			
40 12.2	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200				
50 15.2	100		10	15	25	30	40	50	60	70	80	90	100						
60 18.2	60		10	15	20	25	30	40	50	55	60								
70 21.3	50		5	10	15	20	30	35	40	45	50								
80 24.4	40		5	10	15	20	25	30	35	40									
90 27.4	30		5	10	12	15	20	25	30										
100 30.5	25		5	7	10	15	20	22	25										
110 33.5	20			5	10	13	15	20											
120 36.6	15			5	10	12	15												
130 39.6	10			5	8	10													
140 42.7	10			5	7	10													
150 45.7	5			5															
160 48.8	5					5													
170 51.8	5					5													
180 54.8	5					5													
190 59.9	5					5													

13 – Line-Pull Signals

Backup communication signals are used if voice communication fails.

Tender to Diver

Pulls	Meaning
1 pull	Are you okay?
2 pulls	Going down
3 pulls	Stand by to come up
4 pulls	Come up

Diver to Tender

Pulls	Meaning
1 pull	I am okay
2 pulls	Give me slack
3 pulls	Take up slack

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Pulls	Meaning
4 pulls	Haul me up

Emergency Signals

Signal	Meaning
2-2-2	Diver is fouled and needs assistance
3-3-3	Diver is fouled but can clear themselves
4-4-4	Immediate recovery required

14 – Attachments

14.1 Diver Credentials

Documentation includes:

- Commercial diving certification
- Medical clearance to dive
- First Aid certification
- CPR certification
- AED training
- Oxygen administration training
- HAZWOPER 40-hour training
- HAZWOPER refresher training

Credentials will be provided prior to project mobilization.

14.2 Potential Contaminants

Contaminants potentially present in the LDW sediments include:

- Polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) and other semivolatile organic compounds (SVOCs)
- Dioxins and furans
- Hydrogen sulfide
- Arsenic
- Barium
- Cadmium

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- Chromium
- Lead
- Mercury
- Selenium
- Silver

Exposure limits and toxicological information are summarized in the Health and Safety Plan for the LDW middle reach PDI QAPP (Appendix A) and QAPP Addendum No. 2 (Attachment D). Both are available on the ldwg.org website.

14.3 Hospital Route Map and Driving Directions

Maps are included showing routes from South Park Marina, Harbor Island and 1st Ave Bridge to the NeighborCare Columbia City with additional routes to Harborview and Virginia Mason.

The NeighborCare address is:

4400 37th Street South

Seattle, WA 98118

(206) 461-6957

Open: Monday – Friday, 8 a.m. – 5 p.m.

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This map shows directions to both hospitals from each emergency rendezvous point.



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14.4 Dive Safety Plan Acknowledgement Form

All dive team members must sign the following acknowledgement prior to operations.

Acknowledgement Statement

As a dive team member, my signature certifies that I have read and understand the policies and procedures described in this Dive Safety and Work Plan.

[illegible]