### 3.2 Medical Requirements Overview

#### TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

<table>
<thead>
<tr>
<th>MRID# and Title:</th>
<th>MR054L ISS Potable Water Quality Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsor:</td>
<td>Medical Operations</td>
</tr>
<tr>
<td>Discipline:</td>
<td>Environmental Health System (EHS)</td>
</tr>
<tr>
<td>Category:</td>
<td>Medical Requirements (MR)</td>
</tr>
<tr>
<td>References:</td>
<td>SSP 50260 ISS Medical Operations Requirements Document</td>
</tr>
<tr>
<td>Purpose/Objectives:</td>
<td>Determine and assess crew exposure to chemical contaminants in the potable water supply on the US On-Orbit Segment of ISS based on results from in-flight analyses and ground analysis of archive samples.</td>
</tr>
<tr>
<td>Measurement Parameters:</td>
<td>Concentrations of chemical contaminants and values for other water quality parameters measured in samples.</td>
</tr>
<tr>
<td>Deliverables:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight Duration:</td>
<td>≥ 30 days</td>
</tr>
<tr>
<td>Number of Flights:</td>
<td>Every ISS Increment</td>
</tr>
</tbody>
</table>
| Number and Type of Crew Members Required: | One to two crewmembers (CM) are trained in all EHS activities (US Specialist)
One EHS CM will perform the in-flight activities |
| Other Flight Characteristics: | N/A |
### 3.3 Preflight Training

**TABLE 3.3: PREFLIGHT TRAINING**

<table>
<thead>
<tr>
<th>Preflight Training</th>
<th>Description</th>
<th>Duration</th>
<th>Schedule (L-months):</th>
<th>Flexibility:</th>
<th>Personnel Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inexperienced Crew:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHS Water Collection</td>
<td>45 minutes</td>
<td>L-18/15</td>
<td>N/A</td>
<td>Crewmembers/Instructors</td>
<td></td>
</tr>
<tr>
<td>EHS Water Processing</td>
<td>75 minutes</td>
<td>L-12/9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHS Water Sim</td>
<td>120 minutes</td>
<td>L-9/6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Experienced Crew:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHS Water Experienced</td>
<td>75 minutes</td>
<td>L-15/12</td>
<td>N/A</td>
<td>Crewmembers/Instructors</td>
<td></td>
</tr>
<tr>
<td>EHS Water Sim</td>
<td>120 minutes</td>
<td>L-9/6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ground Support Requirements**

- **Hardware/Software:**
  - Preflight Hardware: EHS Water Kit containing:
    - Water Sample Collection Packet
    - Total Organic Carbon Analyzer (TOCA)
    - Colorimetric Water Quality Monitor Kit (CWQMK)
    - T61p USB to serial adapter
    - T61p Laptop (SSC)
  - Preflight Software: TOCA software
  - CWQMK data transfer spreadsheet
  - Test Location: U.S.

- **Training Facilities:**
  - Minimum Room Dimensions: EHS Water Collection & EHS Water Processing: 8’ x 10’
    - EHS Water Sim: Bldg 9 SSTF
  - Number of Electrical Outlets: 2 110V
  - Temperature Requirements: Ambient
  - Special Lighting: N/A

- **Hot or Cold Running Water:**
  - N/A

- **Privacy Requirements:**
  - Private room free from any distractions

- **Other:**
  - Table & 4-6 chairs
  - 28V Power supply
  - Absorbent towels to collect spillage, if necessary

**Constraints/Special Requirements:**
EHS Water Sim takes place in the Space Station Training Facility (SSTF) in Building 9.

**Launch Delay Requirements:**
Refresher training will be conducted if currency (18 months) expires or at crewmember request.

**Notes:**
- Experienced CM – CMs who have had previous training on EHS activities.
- Inexperienced CM – CMs who have not had previous training on EHS activities.
### 3.4 Preflight Activities – No Crew time

#### TABLE 3.4: PREFLIGHT ACTIVITIES

<table>
<thead>
<tr>
<th>Preflight Activity</th>
<th>Description:</th>
<th>Activity:</th>
<th>Duration:</th>
<th>Schedule:</th>
<th>Flexibility:</th>
<th>Personnel Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Support Requirements Hardware/Software</td>
<td>Preflight Water Sampling</td>
<td>Vehicle Dependent</td>
<td>Vehicle Dependent</td>
<td>N/A</td>
<td>Vehicle Dependent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity:</th>
<th>Duration:</th>
<th>Schedule:</th>
<th>Flexibility:</th>
<th>Personnel Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preflight Water Sampling</td>
<td>Vehicle Dependent</td>
<td>Vehicle Dependent</td>
<td>N/A</td>
<td>Vehicle Dependent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground Support Requirements Hardware/Software</th>
<th>Preflight Hardware:</th>
<th>Preflight Software:</th>
<th>Test Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Servicing Equipment, Approved Sample Containers</td>
<td>None</td>
<td>Vehicle Dependent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Testing Facilities:</th>
<th>Minimum Room Dimensions:</th>
<th>Number of Electrical Outlets:</th>
<th>Temperature Requirements:</th>
<th>Special Lighting:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>Ambient</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hot or Cold Running Water:</th>
<th>Privacy Requirements:</th>
<th>Vibration/Acoustic Isolation:</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

| Constraints/Special Requirements: | Detailed logistics (volume and quantity of samples) will be determined by personnel from the JSC Toxicology and Environmental Chemistry (TEC) Laboratory in coordination with visiting vehicle representatives, hardware providers, and the MMOP Water Quality Subgroup. |

| Launch Delay Requirements: | Preflight sampling will need to be repeated if the potable water system or water resupply hardware is reprocessed due to a launch delay. |

| Notes: | None |

| Data Delivery: | Reports from preflight chemical analyses will be provided to JSC TEC personnel and the MMOP Water Quality Subgroup prior to vehicle launch. |
### 3.5 In-Flight Activities

**TABLE 3.5.1: IN-FLIGHT ACTIVITIES**

<table>
<thead>
<tr>
<th>In-Flight Activity Description:</th>
<th>Activity:</th>
<th>Duration:</th>
<th>Schedule:</th>
<th>Flexibility:</th>
<th>Personnel Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Sample Collection</td>
<td>For PWD:</td>
<td>15 minutes</td>
<td>See Table D-3 in SSP 50260</td>
<td>N/A</td>
<td>1 Crewmember</td>
</tr>
<tr>
<td>Schedule</td>
<td>Unstow:</td>
<td>10 minutes/sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clean Port/Collect Sample:</td>
<td>10 minutes/sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stow:</td>
<td>15 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOCA Analysis</td>
<td>Attended:</td>
<td>10 minutes</td>
<td>See Table D-3 in SSP 50260</td>
<td>N/A</td>
<td>1 Crewmember</td>
</tr>
<tr>
<td></td>
<td>Unattended:</td>
<td>180 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Calldown:</td>
<td>5 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOCA Waste Water Bag Changeout</td>
<td>Replacement</td>
<td>10 minutes</td>
<td>After every 6 analyses</td>
<td>N/A</td>
<td>1 Crewmember</td>
</tr>
<tr>
<td>TOCA Calibration Check</td>
<td>Attended:</td>
<td>10 minutes</td>
<td>Every 90 days</td>
<td>N/A</td>
<td>1 Crewmember</td>
</tr>
<tr>
<td></td>
<td>Unattended:</td>
<td>180 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Calldown:</td>
<td>5 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Procedures:**

Procedures are contained within the System Operation Data File (SODF) Med Ops Book

**Constraints / Special Requirements:**

**Potable Water Sample Collection:**
- Whenever possible, water chemistry sample collections should be coordinated with water microbiology sample collections.
- When chemical samples and microbial samples are collected during the same session, only 15 minutes of unstow time and 15 minutes of stow time is required.
- Real-time changes to the sampling schedule and frequency may be made depending on priorities and water systems performance.
- Schedule on same day and prior to TOCA analysis.

**TOCA Operational Constraints:**
- TOCA analyses should not be scheduled at the same time as T2 exercise.
- TOCA analyses should not be scheduled during N2 Leak Checks.
- TOCA analyses should not be scheduled during water offloads.

Additional water samples may be collected in response to complaints regarding water quality or in contingency situations.
Photo / TV Requirements:

- Photo documentation is required during TOCA deployment. Photos will be taken at a medium distance to give a reasonable perspective of the deployment location. Additional photo documentation may be requested on an as needed basis.

Cold Stowage Requirements: N/A

Mission Extension Requirements: N/A

Landing Wave-Off Requirements: N/A

Notes: N/A

Data Delivery:

- Any data called down during activities will be logged by the BME and distributed to the Crew Surgeon and to JSC TEC personnel. Downlinked data will be made available to JSC TEC personnel and the flight hardware team personnel upon receipt. A data summary from in-flight analyses will be distributed to stakeholders within 1 week of receipt of downlinked data file. See Table 3.6 Post-flight Activities for archive sample data delivery.

---

TABLE 3.5.2: IN-FLIGHT HARDWARE

<table>
<thead>
<tr>
<th>Hardware/Software Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon Analyzer (TOCA)</td>
</tr>
<tr>
<td>Colorimetric Water Quality Monitor Kit</td>
</tr>
<tr>
<td>Water Sample Collection Packet (Shared with MR051L)</td>
</tr>
<tr>
<td>T61p Laptop (SSC)</td>
</tr>
<tr>
<td>TOCA USB</td>
</tr>
<tr>
<td>USB to serial adapter</td>
</tr>
</tbody>
</table>
3.6 Postflight Activities – No Crew time

**TABLE 3.6: POSTFLIGHT ACTIVITIES**

<table>
<thead>
<tr>
<th>Postflight Activity Description:</th>
<th>The archive water samples collected in-flight will be analyzed by the JSC TEC Laboratory.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints/Special Requirements:</td>
<td>Stowage temperatures during transport of the return samples to the TEC Laboratory should be within the range of 2°C to 25°C.</td>
</tr>
<tr>
<td>Early Destow / Early Return:</td>
<td>Archive water samples are approved for early destow from IP, US, and COTS vehicles per OB-14-023.</td>
</tr>
<tr>
<td>Notes:</td>
<td>SF, SD, OC, or MTLO is responsible for the return of samples to JSC depending on the return vehicle.</td>
</tr>
<tr>
<td>Data Delivery:</td>
<td>If the analysis of archive samples indicates an elevation or trend, then JSC TEC will notify the Contingency Action Team, which includes the ISS Increment Lead Crew Surgeon.</td>
</tr>
<tr>
<td></td>
<td>Analytical results from analysis of routine samples will be reported within 30 days of sample receipt.</td>
</tr>
<tr>
<td></td>
<td>A final Increment Toxicology report will be posted to the JSC Toxicology Website no later than 3 months after analysis of all Increment samples is completed.</td>
</tr>
</tbody>
</table>
### 3.7 Summary Schedule

**TABLE 3.7: SUMMARY SCHEDULE**

<table>
<thead>
<tr>
<th>ACTIVITY:</th>
<th>DURATION:</th>
<th>SCHEDULE:</th>
<th>PERSONNEL REQUIRED:</th>
<th>CONSTRAINTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preflight Training:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHS Water Collection</td>
<td>Inexperienced CM: 45 minutes</td>
<td>L-18/15</td>
<td>Crewmember/Instructor</td>
<td></td>
</tr>
<tr>
<td>EHS Water Processing</td>
<td>Inexperienced CM: 75 minutes</td>
<td>L-12/9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHS Water Experienced</td>
<td>Water Sim: 120 minutes</td>
<td>L-9/6</td>
<td>Crewmember/Instructor</td>
<td>EHS Water Sim takes place in the Space Station Training Facility in Building 9.</td>
</tr>
<tr>
<td></td>
<td>Experienced CM: 75 minutes</td>
<td>L-15/12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Sim: 120 minutes</td>
<td>L-9/6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preflight Activity: – No crew time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preflight Water Samples</td>
<td>Vehicle dependent</td>
<td>Vehicle dependent</td>
<td>Vehicle dependent</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Vehicle dependent</td>
<td>Vehicle dependent</td>
<td>Vehicle dependent</td>
<td></td>
</tr>
<tr>
<td><strong>In-Flight Activity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Sample Collection</td>
<td>For PWD: Unstow: 15 minutes</td>
<td>See Table D-3 in SSP 50260</td>
<td>1 Crewmember</td>
<td>Potable Water Collection</td>
</tr>
<tr>
<td></td>
<td>Clean Port/Collect Sample: 10 minutes/sample</td>
<td></td>
<td></td>
<td>Whenever possible, water chemistry sample collections should be coordinated with water microbiology sample collections.</td>
</tr>
<tr>
<td></td>
<td>Stow: 15 minutes</td>
<td></td>
<td></td>
<td>When chemical samples and microbial samples are collected during the same session, only 15 minutes of unstow time and 15 minutes of stow time is required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Real-time changes to the sampling schedule and frequency may be made depending on priorities and water systems performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Schedule on same day and prior to TOCA analysis.</td>
</tr>
<tr>
<td>Activity</td>
<td>Crew time</td>
<td>Unattended:</td>
<td>Data Caldown:</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------</td>
<td>-------------</td>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>TOCA Analysis</td>
<td>10 min</td>
<td>180 min</td>
<td>5 min</td>
<td>See Table D-3 in SSP 50260</td>
</tr>
<tr>
<td>TOCA Waste Water Bag Changeout</td>
<td>10 min</td>
<td></td>
<td></td>
<td>After every 6 analyses</td>
</tr>
<tr>
<td>TOCA Calibration Check</td>
<td>10 min</td>
<td>180 min</td>
<td>5 min</td>
<td>Every 90 days</td>
</tr>
<tr>
<td>Destow and Return of Samples to JSC</td>
<td>Vehicle dependent</td>
<td></td>
<td></td>
<td>JSC Personnel</td>
</tr>
<tr>
<td>Postflight Debrief</td>
<td>Debrief</td>
<td>No extra time</td>
<td>~R+30 days</td>
<td>Crewmembers/ JSC TEC Personnel</td>
</tr>
</tbody>
</table>

- TOCA analyses should not be scheduled at the same time as T2 exercise.
- TOCA analyses should not be scheduled during N2 Leak Checks.
- TOCA analyses should not be scheduled during water offloads.

- Returned water samples should be maintained between 2ºC - 25ºC and temperatures shall be monitored during storage and transport.
- Early destow of water samples and return to JSC is requested.

- Returned water samples should be maintained between 2ºC - 25ºC and temperatures shall be monitored during storage and transport.
- Early destow of water samples and return to JSC is requested.

- Returned water samples should be maintained between 2ºC - 25ºC and temperatures shall be monitored during storage and transport.
- Early destow of water samples and return to JSC is requested.

- Returned water samples should be maintained between 2ºC - 25ºC and temperatures shall be monitored during storage and transport.
- Early destow of water samples and return to JSC is requested.

- Returned water samples should be maintained between 2ºC - 25ºC and temperatures shall be monitored during storage and transport.
- Early destow of water samples and return to JSC is requested.