The OAEL has 11 different rate structures (as of 3/2014). This document summarizes what is included in each of these.

1. DIC – Self Service
2. DIC – Full Service
3. TA – Self Service
4. TA – Full Service
5. pH – Self Service
6. pH – Full Service
7. Cooler Usage – Full Service
8. Cooler Usage – Self service
9. CRM supply
10. Mercury Waste Handling
11. Lab Training

**Rate 1: DIC – Self Service**

This rate is per sample for use of the total carbon instrument. The rate includes all reagents (N\textsubscript{2} gas, phosphoric acid, magnesium perchlorate, Sodium Carbonate standard material) as well as general lab use such as DI water, Kimwipes, and glassware. The rate is charged only on data samples; replicate samples of the same material and samples of calibration standards and CRMs are not charged. Users are expected to troubleshoot their own operation, as outlined in the user manuals, and to contact OAEL staff if maintenance is needed, though trained users may perform their own maintenance. Users should plan on 3 hours of setup time before running samples. In general, users can expect to process 12 samples in a standard day, though well practiced teams can often work through 16-20 in a long day.

*This rate does not include certified reference materials, (CRM). These should be purchased under rate 9.*

*This rate is only available to users who have been trained on this instrument at FHL. Training can be conducted as priced in Rate 11 depending on user’s skill level and chemistry familiarity.*

**Rate 2: DIC – Full Service**

This rate is per sample for use of the total carbon instrument. The rate includes everything included in the self-service rate. It also includes the labor to set up, calibrate, and clean up the instrument, as well as the time required to run samples. The rate is charged only on data samples; replicate samples of the
same material and samples of calibration standards and CRMs are not charged. In general, staff can process 12 samples in a standard day, though higher throughput may be possible.

This rate does not include certified reference materials, (CRM). These should be purchased under rate 9.

Note that a salinity measurement is required for this assay. If this information is available, please write it on the sample bottle or on an accompanying worksheet. It is also possible to measure this parameter in the lab, if needed.

Rate 3: TA – Self Service

This rate is per sample for use of the total alkalinity instrument. The rate includes all reagents (calibrated HCl) as well as general lab use such as DI water, Kimwipes, and glassware. The rate is charged only on data samples; replicates of the same material are not charged separately, and junk samples or CRMs are not charged. Users are expected to troubleshoot their own operation and to contact OAEL staff if maintenance is needed, though trained users may perform their own maintenance. In either circumstance, users should be aware that instrument problems may arise and may take substantial time to troubleshoot; any samples considered unreliable due to instrument errors are not charged. Users should plan on 2 hours of setup time before running samples. In general, users can expect to process 12 samples in a standard day, though well practiced teams can often work through 16-20 in a long day.

This rate does not include certified reference materials, (CRM). These should be purchased under rate 9.

Instruments will be verified by OAEL staff with Dickson’s certified reference acid. User may need to provide their own acid for additional procedures.

This rate is only available to users who have been trained on this instrument at FHL. Training can be conducted as priced in Rate 11 depending on user's skill level and chemistry familiarity.

Rate 4: TA – Full Service

This rate is per sample for use of the total alkalinity instrument. The rate includes everything included in the self-service rate. It also includes the labor to set up, calibrate, and clean up the instrument and sample vials, as well as the time required to run samples. The rate is charged only on data samples; replicates of the same material are not charged separately, and calibration standards and CRMs are not charged. In general, staff can process 12 samples in a standard day, though higher throughput may be possible.

This rate does not include certified reference materials, (CRM). These should be purchased under rate 9.

Note that a salinity measurement is required for this assay. If this information is available, please write it on the sample bottle or on an accompanying worksheet. It is possible to measure this parameter in the lab.
Rate 5: pH – Self Service

This rate is per sample for use of the pH spectrophotometer. This rate includes all reagents (m-cresol purple dye, EtOH for cleaning) as well as general lab use such as DI water, Kimwipes, and glassware. The rate is charged only on data samples; replicates of the same material are not charged separately, and junk samples or CRMs are not charged. Users are expected to troubleshoot their own operation and to contact OAEL staff if maintenance is needed, though trained users may perform their own maintenance. Users should plan on 30 minutes of setup time before running samples. In general, users can expect to process 6 samples per hour.

This rate is only available to users who have been trained on this instrument at FHL. Training can be conducted as priced in Rate 11 depending on user’s skill level and chemistry familiarity.

Rate 6: pH – Full Service

This rate is per sample for use of the pH spectrophotometer. The rate includes everything included in the self-service rate. It also includes the labor to set up and clean up the instrument, as well as the time required to run samples. The rate is charged only on data samples; replicates of the same material are not charged separately, and calibration standards and CRMs are not charged. In general, staff can process 6 samples per hour.

Please note that spectrophotometric pH is generally only run on samples within hours of collection.

Rate 7: Cooler Usage - Full Service

This rate includes one cooler on a weekly basis. The rate includes all the supplies and labor to supply the lab with filtered, flowing seawater (at a flow rate determined on a per case basis, CO₂-free air, and pure CO₂ gas. Each cooler includes a Durafet pH probe and the ability to control pH to a setpoint by adding pure CO₂. The OAEL staff will set up communications to log these data. Each cooler also includes a chiller unit, heater, and temperature controller capable of maintaining temperature within the range of 10-20°C. Also available are 3.5 L polycarbonate containers for isolating animals (each cooler can hold 8 of these), as well as small 12V pumps to circulate water within these chambers. Additionally, a peristaltic pump is plumbed to each cooler for the delivery of liquid algal food. The rate includes a general assortment of racks, tubing, fittings, and irrigation drippers to supply pH controlled water to the individual chambers. More specialized setups are the responsibility of the user. At startup, OAEL staff will completely clean seawater lines up to the coolers. As needed, OAEL staff will perform pressure testing of lines to verify integrity of cooling coils. Supply of necessary replacement parts such as pumps and probes are provided as well.

Additional Services provided in the full service rate (but not the self service rate) include:
A) Bleach-sterilization of coolers (since certain organisms have different tolerances for cleaning products, users should be sure to discuss their requirements with staff).
B) Establishment of treatment conditions and 24-hours hold time to stabilize on set point.
C) Set up of feeding lines from the peristaltic pumps if required.
D) Calibration of Durafet electrodes against spectrophotometric pH and reference temperature, before experiment start and weekly thereafter.
E) Daily inspection of the laboratory, verifying delivery of CO₂ and Air, verification of probe performance, verification of pump function.
F) Post-experiment cleanup of cooler internals. Users are expected to leave the coolers free of all biological material and any user-supplied equipment.

Notes and Caveats:

Several services are not included in the full service rate and remain the responsibility of the user. Chemical conditions in the chambers are not monitored, and should form part of the experimental protocol. Users should plan to devote 15 minutes / cooler every day to verify the temperature and salinity of the chambers. Users must also plan to record the pH and temperature in the coolers; a computer logging system exists to help staff troubleshoot the equipment, and these data will be given to users to the extent that they are available, but this function is not guaranteed and data may experience gaps. Users must monitor the logging capability and inform the OAEL staff when adjustments are needed. The water flow rate from the mixing reservoirs to the experimental chambers is normally set by irrigation drippers. These do a reasonable, and very cost-effective job of regulating flow (up to 50 ml/min). They are prone to clogging, however, and some variability is likely. Users are responsible for monitoring the flow rate to experimental chambers on a regular basis and may need to adjust protocols (e.g., regularly shifting drippers) to achieve desired experimental conditions.

Users must be aware that pH conditions in the coolers will fluctuate throughout the experiment; short-term (15 minute – 1 hour) variability of +/- 0.2 pH units is normal. Additional excursions as much as +/- 2 pH units are possible due to equipment failure, etc. These will be stabilized as quickly as possible, and users should be alert to such deviations to inform staff of needed service. Additionally, while temperatures can generally be maintained within a tight range of 10-20°C, abnormally hot ambient conditions may overwhelm the chillers, leading to temperatures as high as 12-14°C. Users requiring very low temperature conditions are advised to work at other times than July – August.

In designing experiments, it is important to note that no “Ambient” pH condition exists in the lab. All the water entering the lab has a pH of >8.0 due to CO₂ scrubbing. The pH of the seawater in Puget Sound (and in the FHL seawater system) is approximately 7.7. Users must specify the pH for each treatment condition. Additionally, note that the experimental aquaria are regulated to a fixed pH. As the total alkalinity of the incoming seawater varies, the pCO₂ of the treatment conditions will vary accordingly.

For full service users, the start time of the experiment (and billing) will be approximately (depending on the number of coolers involved) 1 week before the aquaria are considered ready to house experimental organisms. Additionally, billing will continue for an additional 3 days for cleanup.
Rate 8: Cooler Usage - Self Service

This rate is only available to users who have extensive experience working in the OAEL, including experience with maintaining the cooler systems. Because users of this rate are expected to modify the internal workings of lab equipment, access to this rate is solely at the discretion of the laboratory manager.

This rate includes one cooler on a weekly basis. The rate includes all the supplies and labor to supply the lab with filtered, flowing seawater (at a flow rate determined on a per case basis, CO₂-free air, and pure CO₂ gas. Each cooler includes a Durafet pH probe and the ability to control pH to a setpoint by adding pure CO₂. Each cooler also includes a chiller unit, heater, and temperature controller capable of maintaining temperature within the range of 10-20°C. Also available are 3.5 L polycarbonate containers for isolating animals (each cooler can hold 8 of these), as well as small 12V pumps to circulate water within these chambers. Additionally, a peristaltic pump is plumbed to each cooler for the delivery of liquid algal food. The rate includes a general assortment of racks, tubing, fittings, and irrigation drippers to supply pH controlled water to the individual chambers. More specialized setups are the responsibility of the user. At startup, OAEL staff will completely clean seawater lines up to the coolers. Supply of necessary replacement parts such as pumps and probes are provided as well.

Additional Services listed A-F in the full service rate are NOT provided. They are the responsibility of the self service user.

All the notes and caveats mentioned for full service users apply to self-service users as well.

For self-service users, the start time for billing purposes is when the experimental conditions are reached and the chambers are prepared for holding organisms. Users are not billed for cleaning and prep time. The amount of time available for self-service users to prep equipment is dependent on other uses occurring at the same time.

Rate 9: CRM

This rate includes a 500 mL bottle of Certified Reference Material, prepared by Andrew Dickson’s lab at the Scripps Institution of Oceanography. The rate includes all shipping costs, processing of mercury waste, cleaning of bottles and return shipping. In general, one bottle is needed for each day in which the DIC or Total Alkalinity instruments are used. The certified values are not necessarily stable once the bottle is opened, and new standards should be purchased fresh daily.

Rate 10: Mercury Waste Handling

This rate includes processing and disposal of 500 mL of seawater contaminated with mercuric chloride. It also includes return shipping of a glass bottle to Andrew Dickson’s lab at the Scripps Institution of Oceanography. This rate is intended to defer costs incurred by users who bring their own CRMs to the lab, leaving behind contaminated waste and empty bottles.
Rate 11: Laboratory Training

This rate covers 1 hour of training on the use of the various equipment in the OAEL. Users should expect to need 6-8 hours to learn each of the main chemistry instruments depending on previous experience and chemistry knowledge.