



Project Title: Benthic Rover

Sanctuary: Monterey Bay Aquarium Research Institute

Project Coordinator:

Dr. Ken Smith, Senior Scientist
MBARI
7700 Sandholdt Road
Moss Landing, CA 95039

Project Abstract: MBARI is currently requesting permission to deploy an instrument called the Benthic Rover on MARS. The Rover provides an autonomous platform from which to conduct a diverse series of measurements at the deep-sea, sediment-water interface for extended periods of time, months to years. These measurements include sediment community oxygen consumption (by using a benthic respirometer system similar to those which have already been deployed in the Sanctuary in the past), megafauna density and movements, and bottom current flow. In addition, sensors from other investigators can be accommodated on the Rover platform to increase the diversity of concurrent measurements of bottom water and sediment properties along a time-series, transect of stations. Autonomous deployments of the Rover have been conducted previously in the Sanctuary with minimal impacts.

Project Rationale: Coupling between a pelagically-derived food supply and sediment community utilization of organic matter is critical to an understanding of biogeochemical cycling in the ocean. To resolve the coupling between pelagic and benthic systems, it is important to monitor the arrival and residence of organic matter on the sea floor using instrumentation capable of making measurements with appropriate spatial and temporal resolution. It is also imperative to measure the structural heterogeneity such as burrows in the surface sediments to interpret spatial and temporal variability of fluxes across the sediment-water interface. Critical questions which must be addressed to ultimately resolve pelagic-benthic coupling in the context of biogeochemical cycling are: 1) what is the quality and quantity of phytodetritus reaching the sea floor, 2) how important is irrigation (non-diffusive transport) in measuring mineralization in sediments and 3) what responses are elicited in the sediment community by the arrival of fresh detritus on the sea floor?

To address such critical questions, the project team has developed a bottom-transecting instrument referred to as the Benthic Rover to make long time-series estimates of fresh phytodetritus arriving on the sea floor.

The Rover will be capable of conducting non-invasive time-series measurements of phytopigment fluorescence as an indicator of fresh phytodetritus on the sediment surface, while imaging the same sediments acoustically to provide 3-dimensional profiles of structural features (e.g. burrows and animals). Sediment community metabolism



measurements (e.g. sediment community oxygen consumption) coupled with 2-dimensional oxygen imaging studies will be conducted.

To understand carbon cycling in the deep ocean, scientists need rovers that work on their own in much deeper, more remote waters than at MARS. As MBARI engineers tackle these stiff design requirements, MARS lets them work on one problem at a time.

With a constant data link to shore, engineers can test the drive mechanisms before they have perfected the automatic steering programs. They can also test sensor accuracy before the instrument goes down on a year-long stay in an autonomous mode at a more remote location. If problems crop up, the R/V *Point Lobos* and ROV *Ventana* can be on site to fix things in less than two hours. This deployment will also allow us to provide real-time data and video of the benthic ecology at the MARS site.

Objectives: To develop and deploy an instrument to address critical research questions, which will ultimately resolve pelagic-benthic coupling in the context of biogeochemical cycling in the deep sea.

Intended Use of Results: Results will be published in appropriate scientific literature.

Methods: The Rover is a mobile physiology lab. In a series of 3-day experiments, the Rover measures how much oxygen seafloor animals are using. Precise motors lower two 30-cm-wide (12-inch) sample chambers into the sediment, where probes record oxygen levels. Two acoustic scanners use ultrasound (in 4-MHz pulses) to look 10 cm (4 inches) deep into the sediment for large animals like worms.

Measuring oxygen consumption helps scientists calculate the seafloor's demand for carbon. To measure the supply, the Rover uses fluorescent scanners. The scanners detect still-active chlorophyll in plant cells, a sign that the cells have only recently settled out from sunlit surface waters.

For each experiment, the Rover camps out at a single location for 3 days, then moves about 5 m (15 feet) to begin another sample. Before moving, the Rover consults a current meter and waits until the current shifts so that its next pre-decided study location lies upstream. This patient approach allows the Rover to keep from stirring up sediment into the area it is about to measure. Currently, the team hopes to deploy the Rover on MARS in spring 2008 for a period of one year. In this time, the Rover will have taken approximately 50 measurements and moved a total distance of about one and a half football fields. The ROV *Ventana* will make three scheduled trips (once every four months) to observe the Rover throughout the one-year planned deployment.

Publications and Reports: We will continue to publish our data generated from Rover in internationally recognized, refereed journals.



Collections: Sediment and bottom water samples will be analyzed at MBARI and the data made available on the MBARI website.

Data and Other Materials: Digital photographs and video taken during the Rover deployment will be archived at MBARI for use by any interested party.

Qualifications: Dr. Smith came to MBARI in 2006 from Scripps Institution of Oceanography in San Diego, CA. Deployments of an earlier version of the Rover off central California resulted in the following publications:

Smith, K.L., Jr., R.C. Glatts, R.J. Baldwin, A.H. Uhlman, R.C. Horn, C.E. Reimers and S.E. Beaulieu (1997) An autonomous bottom-transecting vehicle for making long time-series measurements of sediment community oxygen consumption to abyssal depths. *Limnol. Oceanogr.* 42: 1601-1612.

Smith, K.L. Jr. and R.S. Kaufmann (1999) Long-term discrepancy between food supply and demand in the deep Eastern North Pacific. *Science* 284: 1174-1177.

Smith, K.L., Jr., R.S. Kaufmann, R.J. Baldwin and A.F. Carlucci (2001) Pelagic-benthic coupling in the abyssal eastern North Pacific: an eight-year time-series study of food supply and demand. *Limnol. Oceanogr.* 46: 543-556.

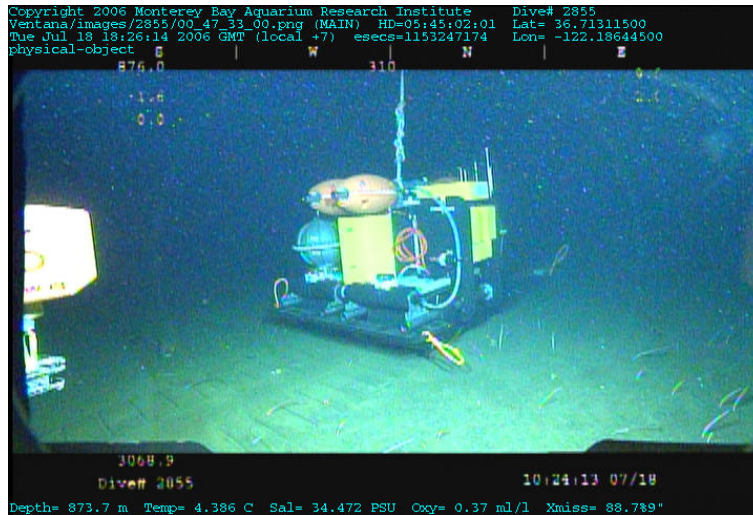
Smith, K.L., Jr., R.J. Baldwin, H.A. Ruhl, M. Kahru, B.,G. Mitchell and R.S. Kaufmann (2006) Climate effect on food supply to depths greater than 4000 meters in the northeast Pacific. *Limnol. Oceanogr.* 51: 166-176.

Autonomous deployments of the Rover have occurred as part of a time series at a location know as Station M. Preliminary results of these studies can be found at <http://www.mbari.org/pelagic-benthic/deepsea.htm>.

Environmental Impacts: The dimensions of the Rover are approx 8' x 6'. The Rover runs on tracks, not wheels (see images below). It travels at a very slow rate, approximately 0.5m/hour (slower than a land tortoise). The Rover only weighs about 150 pounds in water with the drop weight. The weight is distributed across a large footprint, so it leaves a very slight impression on the seafloor. Any trace would likely be rapidly covered by natural sediment movement across the seafloor. The Rover can only move on flat surfaces, and it will only be deployed on sand/mud substrate. It cannot operate on rocky, hard bottom substrate and will not be deployed in such a location. Therefore, impacts should be minimal. Because the instrument will be recovered at the end of the deployment, the seafloor should rapidly return to its previous condition.

Copies of other permits: The Rover has been deployed previously in the Sanctuary under permit numbers MBNMS-2006-020, MBNMS-2006-022, MBNMS-2006-028, and CDP E-05-007/Consistency Certification CC-076-05 (copies attached, along with a report submitted after the first two deployments). These previous deployments of the Rover

have been autonomous. Because a different (tethered) version of the Rover was planned for deployment on MARS, the California Coastal Commission required that we obtain authorization from them for the previous autonomous deployments. Attached are copies of CCC authorizations for the previous deployments. California State Lands Commission did not require authorization be given by their agency as the deployments did not occur in state waters.



Rover on the seafloor.



Drop weight recovery. Rover tracks can be seen on either side of the weight. These minimal tracks are expected to disappear quickly due to bottom currents.



Pelagic-Benthic Coupling

Abyssal Time-Series Studies at Station M



Research Group: [Ken Smith](#) (Senior Scientist) , [Henry Ruhl](#), [Jake Ellena](#), [Mike Vardaro](#)

The most recent and extensive study in the lab was conducted over a period of 16 years from 1989 to 2004 at "Station M" (34deg 50'N, 123deg 00'W; 4,100 m depth) 220 km west of the central California coast. Another recent study examined the benthic community dynamics at the Hawaii Ocean Time-series station ALOHA between Dec 1997 and Jan 1999.

The Sta. M study represents the most detailed investigation of any abyssal area in the world ocean. Over this time period, we monitored continuously the flux of sinking particulate matter through the benthic boundary layer (bottom 600 m of the water column and sea floor) and employed time-lapse photography to record dynamic benthic processes. We and our colleagues have made seasonal measurements of particulate, suspended, and dissolved organic and inorganic fractions through the water column and in the sediments as an estimate of potential food supply to the benthos. We have also monitored sediment community oxygen consumption as an estimate of food consumption by the benthic community.



Camera Sled



Sea cucumber (*Scotoplanes globosa*)

The sea floor at Sta. M is characterized by silty-clay sediments with little topographic relief (<100 m over 1600 square km). Surface waters of the California Current overlying this site have well-developed spring plumes of chlorophyll that persist into summer and exhibit interannual variability. This temporal signal in surface production is observed throughout the water column and into the sediments.

Measurements at Station M were made with a variety of instruments. Sinking particulate matter (mostly dead phytoplankton and detritus) was measured with sediment traps at 50 and 600 meters above bottom. Current flow measurements were made using current meters at 2, 50, and 600 meters above bottom. The activities of mobile sea floor-dwelling animals (e.g. brittle stars, sea cucumbers, sea urchins) and the periodic occurrence of detrital aggregates (food for the animals) on the sea floor were observed using a time-lapse camera tripod. Photographic transects of the study site were taken using a sled equipped with a camera that was towed behind a research ship. Oxygen consumption (a

measure of biological activity) of the organisms living in the sediment was measured using a Free Vehicle Grab Respirometer (FVGR) with grabs that retrieve the sediments for faunal examination and chemical analyses. Core samples of the sea floor were also collected using the submersible Alvin with specially designed core respirometers. Oxygen consumption measurements were also taken using the [ROVER](#), an autonomous underwater vehicle.

The most significant findings of these studies at Sta. M are listed below:

1. Sinking particulate organic matter fluxes through the benthic boundary layer showed seasonal peaks in summer and fall with considerable interannual variability.
2. Sinking particulate organic matter fluxes at 600 m above bottom were correlated with the Bakun upwelling index, revealing a time lag of approximately 50 days between these climatically mediated events at the surface and the fluxes at 3500 m depth.
3. Phytodetritus reaching the sea floor and collected with Alvin in 1994 varied temporally in composition from a dominance of chain-forming diatoms in August to phaeodarians in September.
4. This phytodetritus formed a "carpet" over the sea floor from July through November 1994 in contrast to previous years when the detrital cover was less pronounced.
5. There was a lack of consistent correlation between the distribution and abundance of epibenthic megafauna (i.e. echinoderms) and the presence of detrital material on the sea floor.
6. Concentrations of total and organic carbon, total nitrogen, chlorophyll and phaeopigments in detrital aggregates collected on the sea floor were similar to those concentrations in the sinking particulate matter collected 50 m above bottom in sediment traps but higher than those in the surface sediments.
7. Annual oxygen consumption associated with detrital aggregates represented a minor contribution (0.34%) to the annual sediment community oxygen consumption estimated at Sta. M in 1994-1995.
8. A 7-year study of food supply [sinking particulate organic carbon (POC)] and food demand [sediment community oxygen consumption (SCOC)] at Sta. M revealed a long-term deficit in food supply. The POC:SCOC ratio decreased by 52 to 59% between 1989 and 1996. A possible explanation for this trend is the documented sea surface temperature increase and concomitant plankton biomass decrease in the eastern North Pacific, resulting in an apparent reduction in POC export from surface waters to the deep ocean.
9. New results have linked climate fluctuation, food supply, and shifts community structure at an abyssal time-series station in the NE Pacific (Ruhl H. A., & Smith K. L., *Science*, **305**: 513 (2004)).

Last updated: Oct. 16, 2006

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, CA 93340

**MONTEREY BAY NATIONAL MARINE SANCTUARY
RESEARCH PERMIT**

Permittee:

Dr. Marcia McNutt
Monterey Bay Aquarium Research Institute
(MBARI)
7700 Sandholdt Road
Moss Landing, CA 95039

Permit Number: MBNMS-2006-028

Effective Date: October 16, 2006

Expiration Date: November 30, 2007

Project Title: To deploy a piece of equipment known as the benthic rover within the MBNMS

This permit is issued for activities in accordance with the National Marine Sanctuaries Act (NMSA), 16 USC §1431 *et seq.*, and regulations thereunder (15 CFR Part 922). All activities must be conducted in accordance with those regulations and law. No activity prohibited in 15 CFR Part 922 is allowed except as specified in the activity description below.

Subject to the terms and conditions of this permit, the National Oceanic and Atmospheric Administration (NOAA) National Marine Sanctuary Program hereby authorizes the permittee listed above to conduct research activities within Monterey Bay National Marine Sanctuary (MBNMS or sanctuary). All activities are to be conducted in accordance with this permit and the permit application received September 20, 2006 and supplemental information received on September 29, 2006. The permit application is incorporated into this permit by reference; provided, however, that if there are any conflicts between the permit application and the terms and conditions of this permit, the terms and conditions of this permit shall be controlling.

PERMITTED ACTIVITY DESCRIPTION:

The following activities are authorized by this permit:

This permit is for the deployment of a 8-foot by 6-foot vehicle known as the "Benthic Rover". The Benthic Rover will measure fresh phytodetritus arriving on the sea floor while concurrently monitoring the structural features of the sediment. These tests will be non-invasive measurements.

No further disturbance of the cultural or natural resources of the sanctuary is allowed.

PERMITTED ACTIVITY LOCATION:

The permitted activity is allowed only in the following location(s):

The approximate location for the test deployments is in the vicinity of 36.71136, -122.18681.

In addition to the terms above, the following terms and conditions apply to this permit:



SPECIAL CONDITIONS:

1. Approximately six deployments of this equipment may be conducted within the MBNMS. Deployments will generally last approximately 2 days, with a maximum length of approximately six weeks. This authorized activity may be conducted from October 16, 2006 through November 30, 2007.
2. Permitted activities shall include the temporary deployment and recovery of a piece of equipment known as the Benthic Rover upon the seafloor of the MBNMS. All equipment shall be removed no later than the expiration date of this permit.
3. The equipment authorized by this permit shall be used in accordance with the methods and objectives identified in the permit application dated September 20, 2006. Any connection to the proposed MARS cable will need to be evaluated and permitted separately. Disturbance of any other sanctuary resources is prohibited.
4. No activity authorized by this permit shall disturb or impact any historical or marine archaeological resources of the sanctuary. If historical or marine archaeological resources are encountered at any time, the permittee shall cease all further activities under this permit and immediately contact the MBNMS Superintendent.
5. All equipment authorized for installation under this permit shall be removed when such equipment is no longer in use, or sooner if directed by the MBNMS Superintendent if such equipment is causing or may cause unacceptable harm to sanctuary resources or qualities. Intentional abandonment of equipment or any item is prohibited. In the event that any equipment is damaged or dislocated due to weather or any other cause, the permittee shall use all available means to locate and recover the affected item(s).
6. The permittee shall submit a report of all activities conducted under this permit to the MBNMS Permit Coordinator no later than December 30, 2007. The report should include information regarding daily activities such as location (latitude and longitude) of deployment, discovery or disturbance of historical artifacts, problems encountered, equipment lost, etc.

GENERAL CONDITIONS:

1. Within 30 (thirty) days of the date signed by the sanctuary official the permittee must sign and date on the appropriate line below for this permit to be considered valid. Once signed and dated, the permittee must ensure that the persons listed below each receive a signed original within 35 (thirty-five) days of the date signed by the sanctuary official:

Deirdre Hall
Permit Coordinator
Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, CA 39340

David Bizot
National Permit Coordinator
NOAA National Marine Sanctuary Program
1305 East-West Highway (N/ORM6)
Silver Spring, MD 20910

11. This permit does not relieve the permittee of responsibility to comply with all other federal, state and local laws and regulations, and this permit is not valid until all other necessary permits and/or authorizations are obtained. Particularly, this permit does not allow disturbance of marine mammals or seabirds protected under provisions of the Endangered Species Act, Marine Mammal Protection Act, or Migratory Bird Treaty Act. Authorization for incidental or direct harassment of species protected by these acts must be secured from the U.S. Fish and Wildlife Service and/or NOAA Fisheries, depending upon the species affected.
12. The permittee shall indemnify and hold harmless the National Marine Sanctuary Program, NOAA, the Department of Commerce and the United States for and against any claims arising from the conduct of any permitted activities.
13. Any question of interpretation of any term or condition of this permit will be resolved by NOAA.

Your signature below, as permittee, indicates that you accept and agree to comply with all terms and conditions of this permit. This permit becomes valid when you, the permittee, countersign and date below. Please note that the expiration date on this permit is already set and will not be extended by a delay in your signing below.

Marcia McNutt 10/9/06
Dr. Marcia McNutt Date
Monterey Bay Aquarium Research Institute (MBARI)

Holly Price 10/15/06
Holly Price Date
Acting Superintendent
Monterey Bay National Marine Sanctuary



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, CA 93940

MONTEREY BAY NATIONAL MARINE SANCTUARY
RESEARCH PERMIT

Permittee:

Dr. Marcia McNutt
Monterey Bay Aquarium Research Institute
(MBARI)
7700 Sandholdt Road
Moss Landing, CA 95039

Permit Number: MBNMS-2006-022

Effective Date: July 18, 2006

Expiration Date: July 18, 2006

Project Title: To Deploy a Piece of Equipment Known as the Benthic Rover Within the MBNMS

This permit is issued for activities in accordance with the National Marine Sanctuaries Act (NMSA), 16 USC §1431 *et seq.*, and regulations thereunder (15 CFR Part 922). All activities must be conducted in accordance with those regulations and law. No activity prohibited in 15 CFR Part 922 is allowed except as specified in the activity description below.

Subject to the terms and conditions of this permit, the National Oceanic and Atmospheric Administration (NOAA) National Marine Sanctuary Program hereby authorizes the permittee listed above to conduct research activities within Monterey Bay National Marine Sanctuary (MBNMS or sanctuary). All activities are to be conducted in accordance with this permit and the permit application received July 13, 2006. The permit application is incorporated into this permit and made a part hereof; provided, however, that if there are any conflicts between the permit application and the terms and conditions of this permit, the terms and conditions of this permit shall be controlling.

PERMITTED ACTIVITY DESCRIPTION:

The following activities are authorized by this permit:

This permit is for the one-day deployment of an 8-foot by 6-foot vehicle known as the "Benthic Rover". The Benthic Rover will be deployed simply to verify vehicle launch and recovery operation capabilities. No associated scientific tests will be conducted. No further disturbance of the cultural or natural resources of the sanctuary is allowed.

PERMITTED ACTIVITY LOCATION:

The permitted activity is allowed only in the following location(s):

The permitted activity is allowed in the area of the Monterey Bay Canyon upon mud or sand habitats in the vicinity of 36.71136; 122.18681

In addition to the terms above, the following terms and conditions apply to this permit:



SPECIAL CONDITIONS:

1. All authorized activities may be conducted on July 18, 2006.
2. Permitted activities shall include the temporary deployment and recovery of a piece of equipment known as the Benthic Rover upon the seafloor of the MBNMS. All equipment shall be removed no later than the expiration date of this permit.
3. The equipment authorized by this permit shall be used in accordance with the methods and objectives identified in the permit application dated July 7, 2006, and Special Condition 2, cited above. Disturbance of any other sanctuary resources is prohibited.
4. No activity authorized by this permit shall disturb or impact any historical or marine archaeological resources of the sanctuary. If historical or marine archaeological resources are encountered at any time, the permittee shall cease all further activities under this permit and immediately contact the MBNMS Superintendent.
5. All equipment authorized for installation under this permit shall be removed when such equipment is no longer in use, or sooner if directed by the MBNMS Superintendent if such equipment is causing or may cause unacceptable harm to sanctuary resources or qualities. Intentional abandonment of equipment or any item is prohibited. In the event that any equipment is damaged or dislocated due to weather or any other cause, the permittee shall use all available means to locate and recover the affected item(s).
6. The permittee shall submit a report of all activities conducted under this permit to the MBNMS Permit Coordinator no later than August 11, 2006. The report should include information regarding daily activities such as location (latitude and longitude) of deployment, discovery or disturbance of historical artifacts, problems encountered, equipment lost, etc.
7. This activity may also require permission from other State and Federal agencies. The enclosed permit is not valid until all other necessary permits and/or authorizations are obtained.

GENERAL CONDITIONS:

1. Within 30 (thirty) days of the date signed by the sanctuary official the permittee must sign and date on the appropriate line below for this permit to be considered valid. Once signed and dated, the permittee must ensure that the persons listed below each receive a signed original within 35 (thirty-five) days of the date signed by the sanctuary official:

Deirdre Hall
Permit Coordinator
Monterey Bay National Marine Sanctuary

David Bizot
National Permit Coordinator
NOAA National Marine Sanctuary Program

299 Foam Street
Monterey, CA 39340

1305 East-West Highway (N/ORM6)
Silver Spring, MD 20910

2. It is a violation of this permit to conduct any activity authorized by this permit prior to the sanctuary official having received a permit with the permittee's original signature on the appropriate line below. The permittee must contact the sanctuary office to ensure the requisite documentation has been received before conducting any activity authorized by this permit.
3. This permit may only be amended by the National Marine Sanctuary Program. The permittee may not change or amend any part of this permit at any time. The terms of the permit must be accepted in full, without revision; otherwise, the permittee must return the permit to the sanctuary office unsigned with a written explanation for its rejection. Amendments to this permit must be requested in the same manner the original request was made.
4. All persons participating in the permitted activity must be under the supervision of the permittee, and the permittee is responsible for any violation of this permit, the NMSA, and sanctuary regulations for activities conducted under, or in junction with, this permit. The permittee must assure that all persons performing activities under this permit are fully aware of the conditions herein.
5. This permit is non-transferable and must be carried by the permittee at all times while engaging in any activity authorized by this permit.
6. This permit may be suspended, revoked, or modified for violation of the terms and conditions of this permit, the regulations at 15 CFR Part 922, the NMSA, or for other good cause. Such action will be communicated in writing to the applicant or permittee, and will set forth the reason(s) for the action taken.
7. This permit may be suspended, revoked or modified if requirements from previous National Marine Sanctuary Program permits or authorizations issued to the permittee are not fulfilled by their due date.
8. Permit applications for any future activities in the sanctuary or any other sanctuary in the system by the permittee might not be considered until all requirements from this permit are fulfilled.
9. This permit does not authorize the conduct of any activity prohibited by 15 CFR § 922, other than those specifically described in the "Permitted Activity Description" section of this permit. If the permittee or any person acting under the permittee's supervision conducts, or causes to be conducted, any activity in the sanctuary not in accordance with the terms and conditions set forth in this permit, or who otherwise violates such terms and conditions, the permittee may be subject to civil penalties, forfeiture, costs, and all other remedies under the NMSA and its implementing regulations at 15 CFR Part 922.

10. Any publications and/or reports resulting from activities conducted under the authority of this permit must include the notation that the activity was conducted under National Marine Sanctuary Permit MBNMS-2006-022 and be sent to the sanctuary official listed in general condition number 1.
11. This permit does not relieve the permittee of responsibility to comply with all other federal, state and local laws and regulations, and this permit is not valid until all other necessary permits and/or authorizations are obtained. Particularly, this permit does not allow disturbance of marine mammals or seabirds protected under provisions of the Endangered Species Act, Marine Mammal Protection Act, or Migratory Bird Treaty Act. Authorization for incidental or direct harassment of species protected by these acts must be secured from the U.S. Fish and Wildlife Service and/or NOAA Fisheries, depending upon the species affected.
12. The permittee shall indemnify and hold harmless the National Marine Sanctuary Program, NOAA, the Department of Commerce and the United States for and against any claims arising from the conduct of any permitted activities.
13. Any question of interpretation of any term or condition of this permit will be resolved by NOAA.

Your signature below, as permittee, indicates that you accept and agree to comply with all terms and conditions of this permit. This permit becomes valid when you, the permittee, countersign and date below. Please note that the expiration date on this permit is already set and will not be extended by a delay in your signing below.

K. Marcia McNutt (for M McNutt) 7/17/06
Dr. Marcia McNutt Date
Monterey Bay Aquarium Research Institute (MBARI)

Holly Price 7/13/06
Holly Price Date
Acting Superintendent
Monterey Bay National Marine Sanctuary

0 document(s) attached.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, CA 93940

MONTEREY BAY NATIONAL MARINE SANCTUARY RESEARCH PERMIT

Permittee:

Dr. Marcia McNutt
Monterey Bay Aquarium Research Institute
(MBARI)
7700 Sandholdt Road
Moss Landing, CA 95039

Permit Number: MBNMS-2006-020

Effective Date: July 11, 2006

Expiration Date: July 12, 2006

Project Title: To Deploy a Piece of Equipment Known as the Benthic Rover within the MBNMS

This permit is issued for activities in accordance with the National Marine Sanctuaries Act (NMSA), 16 USC §1431 *et seq.*, and regulations thereunder (15 CFR Part 922). All activities must be conducted in accordance with those regulations and law. No activity prohibited in 15 CFR Part 922 is allowed except as specified in the activity description below.

Subject to the terms and conditions of this permit, the National Oceanic and Atmospheric Administration (NOAA) National Marine Sanctuary Program hereby authorizes the permittee listed above to conduct research activities within Monterey Bay National Marine Sanctuary (MBNMS or sanctuary). All activities are to be conducted in accordance with this permit and the permit application received July 07, 2006. The permit application is incorporated into this permit and made a part hereof; provided, however, that if there are any conflicts between the permit application and the terms and conditions of this permit, the terms and conditions of this permit shall be controlling.

PERMITTED ACTIVITY DESCRIPTION:

The following activities are authorized by this permit:

This permit is valid for the one-day deployment of an 8-foot by 6-foot vehicle known as the "Benthic Rover". The Benthic Rover will be deployed simply to verify vehicle launch and recovery operation capabilities. No associated scientific tests will be conducted.

No further disturbance of the cultural or natural resources of the sanctuary is allowed.



PERMITTED ACTIVITY LOCATION:

The permitted activity is allowed in the area of the Monterey Bay Canyon upon mud or sand habitats in the vicinity of 36.71136; 122.18681

In addition to the terms above, the following terms and conditions apply to this permit:

SPECIAL CONDITIONS:

1. All authorized activities may be conducted on July 11, 2006.
2. Permitted activities shall include the temporary deployment and recovery of a piece of equipment known as the Benthic Rover upon the seafloor of the MBNMS. All equipment shall be removed no later than the expiration date of this permit.
3. The equipment authorized by this permit shall be used in accordance with the methods and objectives identified in the permit application dated July 7, 2006, and Special Condition 2, cited above. Disturbance of any other sanctuary resources is prohibited.
4. No activity authorized by this permit shall disturb or impact any historical or marine archaeological resources of the sanctuary. If historical or marine archaeological resources are encountered at any time, the permittee shall cease all further activities under this permit and immediately contact the MBNMS Superintendent.
5. All equipment authorized for installation under this permit shall be removed when such equipment is no longer in use, or sooner if directed by the MBNMS Superintendent if such equipment is causing or may cause unacceptable harm to sanctuary resources or qualities. Intentional abandonment of equipment or any item is prohibited. In the event that any equipment is damaged or dislocated due to weather or any other cause, the permittee shall use all available means to locate and recover the affected item(s).
6. The permittee shall submit a report of all activities conducted under this permit to the MBNMS Permit Coordinator no later than August 11, 2006. The report should include information regarding daily activities such as location (latitude and longitude) of deployment, discovery or disturbance of historical artifacts, problems encountered, equipment lost, etc.
7. This activity may also require permission from other State and Federal agencies. The enclosed permit is not valid until all other necessary permits and/or authorizations are obtained.

GENERAL CONDITIONS:

1. Within 30 (thirty) days of the date signed by the sanctuary official the permittee must sign and date on the appropriate line below for this permit to be considered valid. Once

signed and dated, the permittee must ensure that the persons listed below each receive a signed original within 35 (thirty-five) days of the date signed by the sanctuary official:

Deirdre Hall
Permit Coordinator
Monterey Bay National Marine Sanctuary
299 Foam Street
Monterey, CA 39340

David Bizot
National Permit Coordinator
NOAA National Marine Sanctuary Program
1305 East-West Highway (N/ORM6)
Silver Spring, MD 20910

2. It is a violation of this permit to conduct any activity authorized by this permit prior to the sanctuary official having received a permit with the permittee's original signature on the appropriate line below. The permittee must contact the sanctuary office to ensure the requisite documentation has been received before conducting any activity authorized by this permit.
3. This permit may only be amended by the National Marine Sanctuary Program. The permittee may not change or amend any part of this permit at any time. The terms of the permit must be accepted in full, without revision; otherwise, the permittee must return the permit to the sanctuary office unsigned with a written explanation for its rejection. Amendments to this permit must be requested in the same manner the original request was made.
4. All persons participating in the permitted activity must be under the supervision of the permittee, and the permittee is responsible for any violation of this permit, the NMSA, and sanctuary regulations for activities conducted under, or in junction with, this permit. The permittee must assure that all persons performing activities under this permit are fully aware of the conditions herein.
5. This permit is non-transferable and must be carried by the permittee at all times while engaging in any activity authorized by this permit.
6. This permit may be suspended, revoked, or modified for violation of the terms and conditions of this permit, the regulations at 15 CFR Part 922, the NMSA, or for other good cause. Such action will be communicated in writing to the applicant or permittee, and will set forth the reason(s) for the action taken.
7. This permit may be suspended, revoked or modified if requirements from previous National Marine Sanctuary Program permits or authorizations issued to the permittee are not fulfilled by their due date.
8. Permit applications for any future activities in the sanctuary or any other sanctuary in the system by the permittee might not be considered until all requirements from this permit are fulfilled.
9. This permit does not authorize the conduct of any activity prohibited by 15 CFR § 922, other than those specifically described in the "Permitted Activity Description" section of this permit. If the permittee or any person acting under the permittee's supervision

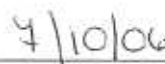
conducts, or causes to be conducted, any activity in the sanctuary not in accordance with the terms and conditions set forth in this permit, or who otherwise violates such terms and conditions, the permittee may be subject to civil penalties, forfeiture, costs, and all other remedies under the NMSA and its implementing regulations at 15 CFR Part 922.

10. Any publications and/or reports resulting from activities conducted under the authority of this permit must include the notation that the activity was conducted under National Marine Sanctuary Permit MBNMS-2006-020 and be sent to the sanctuary official listed in general condition number 1.
11. This permit does not relieve the permittee of responsibility to comply with all other federal, state and local laws and regulations, and this permit is not valid until all other necessary permits and/or authorizations are obtained. Particularly, this permit does not allow disturbance of marine mammals or seabirds protected under provisions of the Endangered Species Act, Marine Mammal Protection Act, or Migratory Bird Treaty Act. Authorization for incidental or direct harassment of species protected by these acts must be secured from the U.S. Fish and Wildlife Service and/or NOAA Fisheries, depending upon the species affected.
12. The permittee shall indemnify and hold harmless the National Marine Sanctuary Program, NOAA, the Department of Commerce and the United States for and against any claims arising from the conduct of any permitted activities.
13. Any question of interpretation of any term or condition of this permit will be resolved by NOAA.

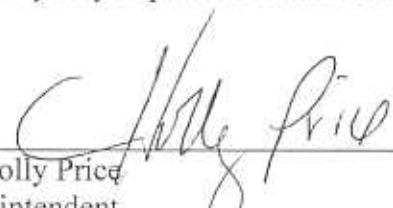
Your signature below, as permittee, indicates that you accept and agree to comply with all terms and conditions of this permit. This permit becomes valid when you, the permittee, countersign and date below. Please note that the expiration date on this permit is already set and will not be extended by a delay in your signing below.



Dr. Marcia McNutt
Monterey Bay Aquarium Research Institute (MBARI)



Date



Dr. Holly Price
Superintendent
Monterey Bay National Marine Sanctuary



Date

Allen, Mandy

From: Diane Livia [dlivia@coastal.ca.gov]
Sent: Tuesday, April 24, 2007 1:34 PM
To: Allen, Mandy
Cc: Alison Dettmer; Mark Delaplaine
Subject: Benthic Rover Deployment
Attachments: Mandys letter re deployment of Rover_CCC_4_11_07.pdf; Alisons letter to Mandy re Benthic Rover approval.pdf

Dear Mandy,

Please consider this email to constitute approval of the four benthic rover deployments you described in your letter of April 11, 2007 (attached), for the reasons stated in Alison Dettmer's letter of July 10, 2006 (attached) which approved your first benthic rover deployments. This approval includes the deployments you described for May 21 – 29, 2007; August 27 – September 10, 2007; November 7 – November 26, 2007; and early January 2008.

This approval does not include the deployment you have planned for Winter-Spring 2008 where the rover will be connected to the MARS center. Please include that deployment in the regular approval submission for all MARS projects.

If, as you suggest in your letter, the dates change on any of these approved deployments, please let me know.

Best,

Diane

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Diane Livia

Analyst

Energy and Ocean Resources

Federal Consistency

4/24/2007

Allen, Mandy

From: Diane Livia [dlivia@coastal.ca.gov]
Sent: Thursday, September 21, 2006 1:59 PM
To: Allen, Mandy
Cc: Alison Dettmer
Subject: RE: Application for another Rover deployment

Mandy,

Please consider this e-mail to constitute approval of the third rover deployment in federal waters as described below, for the reasons stated in Alison Dettmer's letter of July 10, 2006 approving the first rover deployment.

Diane Livia

Analyst

Energy and Ocean Resources

Federal Consistency

California Coastal Commission

45 Fremont St. #2000

San Francisco, CA 94105

415-904-5250

-----Original Message-----

From: Allen, Mandy [mailto:mandy@mbari.org]
Sent: Wednesday, September 20, 2006 11:36 AM
To: Deirdre Hall; Diane Livia; plummed@slc.ca.gov
Subject: Application for another Rover deployment

Hello all,

9/21/2006

CALIFORNIA COASTAL COMMISSION

45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200



July 10, 2006

Mandy Allen
Operations Administrator
Monterey Bay Aquarium Research Institute
7700 Sandholdt Road
Moss Landing, CA 95039

Re: Monterey Bay Aquarium Research Institute (MBARI) Benthic Rover Test Deployment
Modification to MARS project (CDP E-05-007/Consistency Certification CC-076-05)

Dear Ms. Allen :

On September 15, 2005, the Commission authorized the above-referenced MBARI proposal to install and operate a 31.7-mile long marine research fiber optic cable offshore of Moss Landing and within the Monterey Bay National Marine Sanctuary. One of the conditions of approval provided

1. **Scope of Project Approval.** This permit authorizes those project activities specifically described in MBARI's June 6, 2005 coastal development permit application, as amended by letters and submittals dated July 7, 2005, July 11, 2005, August 22, 2005, and August 29, 2005, except as otherwise modified by the conditions of this permit. Any future modifications of or additions to the project, as described in the referenced documentation, shall require an amendment to this permit.

MBARI has submitted a letter dated July 7, 2006, describing short term Benthic Rover testing, seaward of the coastal zone boundary. Under the federal consistency procedures (15 CFR Section 930.65), the Commission reviews project modifications and any changed circumstances to determine whether a previously-concurred activity remains consistent with the Coastal Act, or whether the modifications/changes render the project: (1) substantially different than originally described; and (2) no longer consistent with the applicable Coastal Act policies. Based on the information included in your letter, combined with the understanding that the additional commitment contained in the email communication from you to NOAA Sanctuaries-MBNMS, is also incorporated into the test (particularly, contingency plans for removal of any non-functioning equipment), the Coastal Commission staff agrees with MBARI that the test would not affect the coastal zone, and that, as modified, the originally concurred-with activity remains consistent with the applicable Coastal Act policies.

If you have any questions, feel free to contact me at (415) 904-5205.

Sincerely,

A handwritten signature in cursive script, appearing to read "Alison Dettmer".

Alison Dettmer
Manager, Energy and Ocean Resources Unit

cc: Santa Cruz District Office
State Land Commission (Dwight Sanders)
MBNMS (Dierdre Hall)

Report on Benthic Rover Deployments: 7/11/06 and 7/18/06
Permit numbers: MBNMS-2006-020 and MBNMS-2006-022

On July 11, 2006, the Benthic Rover was deployed from the R/V *Point Lobos* on Smooth Ridge in Monterey Bay, at location N 36.71136, W 122.18681 in 890 meters of water. The Rover entered the water at 1258 PDT and was back on deck at 1700 PDT, spending just over 5 hours in the water.

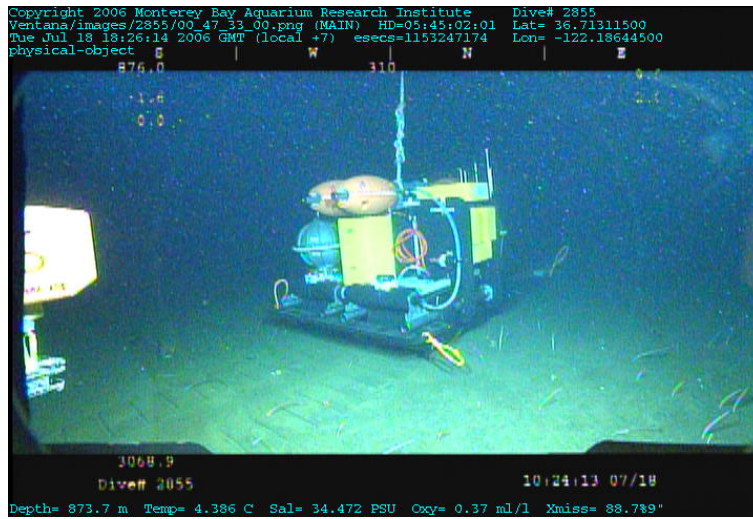
The Rover was programmed to move a total of 20 meters on the bottom. Mechanical problems with the Rover propulsion system limited movement to less than 10 meters. Impact to the bottom sediment was minimal, in the form of barely visible tracks. No flora or fauna were observed to be harmed in any way.

An acoustic link with the Rover's recovery system could not be established from the ship, and so the release of the drop-weight could not be commanded remotely. The ROV *Ventana* released the weight manually, but the drop weight disappeared from sight in a cloud of sediment. After searching for 50 minutes without success, the pilots concluded that the drop weight was obscured beneath the soft sediment. The ROV was forced by worsening weather to return to the surface without the weight.

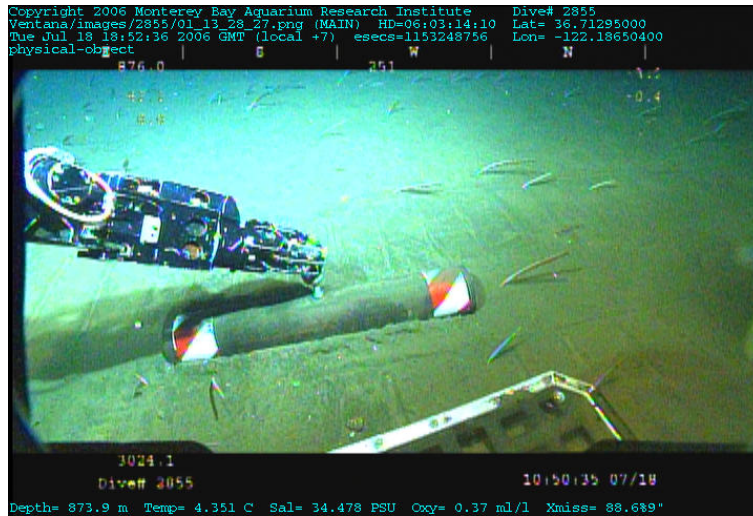
On July 18, 2006, the Benthic Rover was redeployed in the same location after receiving numerous mechanical modifications based on the earlier test results. The Rover entered the water at 0940 PDT and was back on deck at 1300 PDT, spending 3 hours and 20 minutes in the water.

The Rover was again programmed to move a total of 20 meters on the bottom. This time all moves executed successfully. Again, impact to the bottom sediment was minimal. Sea pens in the Rover's path were observed to stand up again after the vehicle had passed.

The drop weight was released via acoustic link. The drop weight was then recovered successfully by the ROV *Ventana*.



Rover on the seafloor.



Drop weight recovery. Rover tracks can be seen on either side of the weight. These minimal tracks are expected to disappear quickly due to bottom currents.