Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 12, 2005
Plenary Session

Overview of workshop goals and objectives, followed by a series of participant mapping presentations (See workshop archive for related Powerpoints). Session facilitated by Rikk Kvitek (CSUMB). (notes: H. Lopez).

- CA Coastal Conservancy mission
- Strategic plan: Ocean mapping
- What does Ocean Protection Council need in terms of resources to achieve goals and objectives?
- Cost, accomplishing it, proposals to legislature for future funding
- Users of ocean mapping, equipment, utilization, efficiency

Talk: Rikk Kvitek (CSUMB) – Workshop goals and objectives, Mapping technologies

- Ocean – not just big blue area, but composed of complex, diverse habitats
- Need exists for entire state of CA – management issues
- Current data coverage indicate most nearshore habitat mapped <40% mapped, high-resolution
- 75% – state waters, very little mapping attention
- 2000 – Task Force Meeting, Central Coast priority sites
- 2004 – Seafloor habitat data

Goal:

- Develop plan for statewide seafloor mapping (3 nm shore to offshore) with stakeholders

Objectives:

- Provide update on seafloor mapping capabilities and applications
- Identify additions to data coverage
- Identify gaps and needs
- Prioritize areas
- Recommendations for 2006 Central Coast Mapping RFP

Voting

1. Statewide – all statewide waters in CA for identifying priority blocks
2. Central Coast – Mid-Monterey Bay to Pt. Arena

- Identify location(s) you want mapped
- Mapping: broad habitats, seafloor, sub-seafloor structure
- Decide what mapping products are necessary
- Tools, habitat maps, survey techniques: multibeam bathymetry, side-scan sonar, video, grab
- High-resolution, critical habitat
- Hand digitizing methods vs. algorithmic approaches

Synthesis of Workshop Notes

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- Identifying critical habitat, for example, white abalone
- Tools: DEM rugosity analysis, pros and cons
- Counted, measured and identify fish; classified habitat: depth, slope, rugosity, TPI
- Combined parameters, shallow/deep species
- Predicted fish distribution
- Required extensive groundtruthing
- Identify squid egg production
- Repetitive mapping
- Environmental change detection
  - Use base map as reference point to see how landscapes change, for example, Monterey Submarine Canyon
- Identify scarps, terraces, sediment waves, time series, locate changes
  - Monitoring habitat disturbance
  - Quantifying benthic disturbance
- Think about technologies required to fulfill needs
  - Side-scan, multibeam bathymetry
  - They show different things, acoustic reflectance, sediment composition, relief
  - Optical imaging safe and useful for shallow-water areas

[]Talk: Gary Greene (MLML) – Habitat mapping, added value

- A need exists for interpretive [process of] habitat maps [ping]
- A Mapping [as series of] data set[s] can be used to produce a variety of thematic maps [applicable to a variety of fields], not just maps for fisheries
- Substrate is what is best mapped today with present mapping techniques and is a necessary component in evaluating seafloor [plays a major role in] fisheries and ecology
- In Alaska [work], multibeam bathymetry, backscatter, and submersible observations were used to construct interpretive polygons of habitat types for fisheries management purposes
- In Alaska, specific geologic features such as volcanic cones were found to be ideal habitat for Yelloweye rockfish due to relief and types of rocks and boulders present and identification of such structures were useful for MPA evaluations
- Creating a habitat maps, requires multiple tasks such as collection, processing and interpretation of multibeam bathymetry, backscatter, and groundtruth data at a desired resolution or scale from which potential habitat polygons can be constructed [, dependent upon scale]
- For this workshop, participants should [we must] keep in mind scale at which habitat maps should be produced [desired scale]
- In the majority of mapping efforts what is actually produced are *Potential* habitat maps;[,] in order to define [be] *actual* habitats, groundtruthing is required and

Synthesis of Workshop Notes

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distinct associations with a species or community of organisms need to be determined
- The seafloor is a dynamic environment and often multiple surveys need to be undertaken in order to detect changes and develop time-series analyses
- Workshop participants need to think of areas of priority where dynamic conditions are important, processes that may alter habitat associations
- Habitat maps can be too complex/detailed for some users, but can often be simplified if initial interpretations are attributed in a way that they can be easily queried in a GIS; to be successful in this effort the most detailed interpretations need to be done
- Thematic and derivative maps, other than habitat maps, can be produced from a single data set and should be constructed to produce the most comprehensive map series possible in any mapping effort
- In addition, a need exists to fill in gaps along the shoreline where substrate types have been historically interpreted by extending [– continue with] onshore geology offshore, but today the use of air photos or the use of such technologies as Shoals bathymetric LIDAR can image the very shallow nearshore areas and should be considered in any State mapping effort [, for example]
- Thematic maps consist of seafloor [–] morphology, grain size distribution, geology, geohazards, non-living resources and substrate types
- For example, landslides can be easily imaged as a geohazered and also may be a critical habitat to a particular specie of fish
- Time series analyses, if done properly, can provide repeatability in the evaluation of dynamic conditions on the seafloor such as has been done offshore of Santa Cruz to determine seasonal sediment shifts
- The mapping community needs to determine a classification scheme to use in the California mapping efforts because a standard process in habitat typing is critical to comparing and contrasting habitats state-wide
- It is also critical[:] to inventory [of] existing data in order to prevent duplication of effort and to develop a baseline
- Data type and quality maps should be constructed to show area of coverage, type, quality and other information on seafloor data that exists today and can be used to evaluate marine benthic habitats

Talk: Chris Wills (California Geological Survey) – Geologic mapping along CA coast

- History of mapping
- Vintage 1960s maps
- L.A., Ventura, Orange County mapping
- New, detailed geologic maps, for example, onshore grain sizes, useful for active sedimentation, onshore geologic map, added habitat maps from Greene
- Seamless onshore/offshore geologic maps

Synthesis of Workshop Notes

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- When performing habitat classifications, have a geologist at hand
- Incorporate wide range of disciplines
- Current maps: 24:000 scale – preferred standard
- Geologic maps provide: bedrock types, sediment types, landslides, faults

Talk: Doug Lockhart (Fugro Pelagos, Inc) – data acquisition and processing considerations

- Variety of resolution (sub-meter to meters depending on depth)
- Surveys require extensive manpower
- Clients' needs vary
- Topographic data collection (red laser)
- Hydrographic LIDAR (green laser used for bathymetry)
- Why do they collect topographic data? To detect tidal changes in beach profiles
- Small launches to big boats
- East Coast LIDAR survey
- Select a consistent, repeatable datum
- Consider datum: Tide; ellipsoid
- Error budget
- NOAA has specs for hydrographic surveys

Talk: Guy Cochrane (USGS Coastal and Marine Geology) – Seafloor mapping in Santa Barbara Channel

- The Seafloor mapping project of the Coastal and Marine Geology Program is presently mapping in Southern and Central California.
- One task headed by Curt Storlazzi is doing repeated surveys to identify geologic change in Northern Monterey Bay
- We use a towed sidescan which can operate in deep water, and a pole mounted interferrometric side-scan for nearshore mapping out to 75 m
- Estuarine and open ocean areas are being mapped.
- We follow up sonar mapping with video groundtruthing with a collaborating biologist who logs Epifauna, bottomfish identified
- We log primary and secondary substrate, slope, complexity, and bio-coverage along with microhabitat features, key species, and anthropogenic features.
- Deep-water multibeam is contracted out.
- California Mapping Consortium – idea was to get large group together who are mapping for various reasons and coordinate.
- Create forum for data voids, needs and availabilities
- Produce quad-based maps
- Maintain online source of maps and metadata including data sources.
- Produce GIS including topo-bathy, geologic unit, hazards and resources, surficial seafloor substrate, habitats, physical processes, and legal boundaries

Synthesis of Workshop Notes

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- Prototype map that can be used as example is being produced now
- A variety of State and Federal organizations are involved

Talk: Dirk Rosen (Marine Applied Research and Exploration) – Baseline monitoring

- ROV work – Establishing quantitative baseline in Santa Barbara
- Cooperation between ROV pilot and captain
- Preplanning is critical
- Using Guy's and Rikk's maps in Channel Islands
- Data collection phase:
  - Select comparable sites based upon existing mapping
  - Plan ROV transects
  - Fly planned ROV transects using acoustic tracking
- Post-processing phase:
  - Determine fish quantities
- Sand, rock, cobble, boulder
- Processed ROV trackline with habitat and fish
- Depth range: 20 m – 100 m
- Compare site inside and outside MPA
- ROV surveys – 18 sites, 213 km
- To get quantitative baseline, repeated surveys are necessary
- Want to add fish size to density estimates

Talk: Kirsten Gilardi (UC Davis, SeaDoc Society) – Removing derelict fishing gear

- Lots of abandoned commercial and recreational fishing gear
- Synthetic materials
- Potential to entangle marine life, poses navigational threat, endangers divers, etc.
- Significant decline of Hawaiian monk seal
- Removal program began in 2002 in Puget Sound – NW Straits, >1,000 nets, pots and traps removed
- Is derelict fishing gear an issue in CA? If so, we need to find locations in need of removal
- Assessment of reports complaining of presence of gear
- State Coastal Conservancy funding
- Gather data showing where gear exists; gathering people to do removal work
- Pilot year: chose four study sites
- Gear locations identified by divers, side-scan sonar, reports from individuals, prioritize gear for removal
- Gear removal: GIS software to locate sites, divers, winch
- Data collected: gear type, legal/illegal, biological impacts, owner identification, status (removed)
- Gear disposal: landfill

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Talk: Brian Edwards (USGS) – Mapping benthic shelf habitats

- Study area: San Pedro Shelf, 18 km wide
- Cooperative project between USGS, UCSC, LA County Sanitations Districts
- Approach: using pixel-scale classification of seafloor composition and sediment texture
- 4 m pixel data, can identify wrecks, dredge spoils, outfalls, pipelines, etc.
- Pete Dartnell looked at multibeam data
- Generated two roughness categories and integrated with backscatter density
- Created rule-based hierarchical decision tree
- Preliminary classification scheme – pixel by pixel
- Assessing accuracy – two methods – medium sized sled, 1) two digital video cameras, lasers, digital still camera, 2) grab sampler
- Still images taken every 30 seconds
- 180 samples were taken
- Video observation and data entry – recording on tape and creating log on programmable key pad
- Lat/long and time stamps recorded
- Plot observations in GIS
- Allows subsequent observations – time efficient
- New Hampshire developed video mosaic strip at pixel level resolution
- Time consuming, but very compelling
- Interfaces – very important for biological reasons
- Adding biological component
- Species-specific habitat maps
- Data products – several maps

Talk: Dave Caress (MBARI) – Mapping using an AUV

- Working with engineers and operational people at MBARI
- Motivation: map deep ocean (6,000 m)
- Developing technology that will impact the concerns of the people present at workshop
- Monterey Canyon – axis 1,400 m depth
- Components – side-scan sonar (Edgetech 110/410 kHz chirp), multibeam (Reson 7100 multibeam sonar), sub-bottom profiler, CTD, antenna, etc.
- 3 knot speed, 21” diameter, torpedo shaped with no fins, 17.2’ length
- AUV can be attached to ROV *Ventana*
- Goal: keep consistent height off bottom

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Operations to date: sub-bottom profiles, repeated surveys in Monterey Canyon to monitor changes in sediment transport, upper Smooth Ridge for MARS cable route
- 100 m, 300 m, 520 m, 1000 m, and 1400 m depth range
- Ex. MARS cable route – 1 m lateral resolution
- Bedforms identified, repeated mapping efforts
- Current status : achieved operational status
- Future : scheduled for 50 days at sea

– Davidson Seamount, Axial Seamount (Juan de Fuca spreading ridge), Santa Monica Basin, Barclay Canyon (British Columbia), Monterey Canyon repeat mapping, Smooth Ridge (Monterey Bay), Offshore San Andreas Fault (proposed)

Talk: Neal Driscoll (Scripps Institute of Oceanography – Sub-bottom profiling)

- Sub-surface data importance
- Need to know third dimension
- Faults and interaction
- Left lateral faults – compression
- Right lateral faults – extension
- Habitat changes correlating with presence of faults
- Need of high-resolution maps and cores to data changing horizons
- AUV work – future for recurring surveys
- Determine future movements on seafloor
- Fiber optic cable strain sensors
- Accuracy (mm) to detect change
- Identify seafloor change

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 12, 2005
Central Coast RFP Area- Data needs lunchtime group discussion

Focal region: mid-Monterey Bay to Point Arena. Data needs identified by participants and compiled from notes taken during group discussion. Facilitated by Rikk Kvitek (CSUMB). (notes: M. Young , S. Zurita, K. Wong).

Mark Johnsson (California Coastal Commission)

- Information on habitat: indicate rugosity/relief in addition to sediment classification
- Sediment movement for management purposes
- Sufficient detailed sub-bottom bathymetry for landslide and seismic purposes
- Beach nourishment, offshore sediment resources/nourishment management especially important in Southern California

Mary Yoklavich (NOAA/NMFS-SWFSC)

- Fish stock assessment (characterizing habitat)
- Locating and monitoring MPA sites
- Deeper water, 50 – 400m (i.e.: heads of sub-canyons) along central coast
- Future MLPA sites in state waters

Tom Albo (Greeninfo)

- Data availability/access

Dirk Rosen (Marine Applied Research and Exploration)

- Habitat classification for use with fisheries and biodiversity
- Potential MPA sites

[]Gary Greene (Moss Landing Marine Labs)

- Anything that hasn't been mapped yet [is important and needs to be considered, although we cannot map everything at this time and need to prioritize]

Michael Reichle (California Geological Survey)

- Geologic, Tsunamis and Seismic Hazards (Any bathymetric and subbottom data that shows recent landslides and faultings)
- Any geologic info would be of great interest.

Arthur Shak (US Army Corps of Engineers)

- Navigation
- Nearshore coastal

Synthesis of Workshop Notes

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Jerry Wilson (Fugro Pelagos, Inc)

- Throughout State
- Santa Monica Bay

Cliff Davenport (Coastal Sediment Management Workgroup)

- Critically eroding coastal areas
- Areas of excess sedimentation
- Nearshore over entire state
- Offshore in areas with high erosion
- Show the difference between low and high relief areas
- Potential economic sources of sand (sand traps)

Dick Seymour (Scripps Institute of Oceanography)

- Directional properties of waves
- Accurate Bathymetric data from 300m to shallows

Dave Caress (Monterey Bay Aquarium Research Institute)

- Physical and biological oceanography studies associated with upwelling.
- Need bathy for rest of continental shelf from Moss Landing north to Santa Cruz

Larry Espinosa (California Department of Fish & Game)

- Data for nearshore shallows where greatest impact of oil spills are likely to occur
- Biological component
- Shipwrecks that could cause oil leaks (holdings of shipwrecks available)

Paul Veisze (California Department of Fish & Game)

- MPA sites
- Filling data gaps in current coverages for state waters

Dan Specht (US Army Corps of Engineers)

- Nearshore data
- Habitat classification
- Areas of erosion, scouring and deposition
- Areas requiring or involved in beach nourishment
- Hydrographic surveys of ship channels

Keith Jones (CalTrans)

- ASBS data
- SF Bay area to Año Nuevo (especially Año Nuevo and James Fitzgerald Marine Reserve)

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Ben Becker (NPS Point Reyes National Seashore)

- Habitat Data
- MPA sites

Mary Elaine Dunway (Minerals Management Service)

- Block 456 – Beach nourishment
- Offshore areas for high wind and waves

Dale Roberts (NOAA, Cordell Bank NMS)

- Around Marin County
- Farallones

Holly Lopez (Center for Habitat Studies, MLML)

Canyons
Bedforms in San Francisco Bay

[]Irina Kogan (NOAA, Gulf of the Farallones NMS)

- MLPA process
- Oil Spill Response [and Damage assessment]
- Sediment transport/ processes
- Nearshore and deep, some federal waters
- Farallones, Cordell Bank, Fitzgerald Marine Reserve
- Estuaries – Tomales Bay and Bolinas Lagoon
- Año Nuevo – Pescadero Point (rocky area)
- Submarine canyons and Shelf/slope break to find biological hotspots
  Farallones escarpment
- Pioneer canyon
- Dynamic processes of canyons

John Butler (NOAA/NMFS-SWFSC)

- High resolution data of the rocky intertidal out to 10m in South California (for black abalone)

Neal Driscoll (Scripps Institute of Oceanography)

- Tectonic deformation
  - Subsurface data with high spatial density
- Areas that subside
- Deeper cores in the shallow areas

John Orcutt (Scripps Institute of Oceanography)

- Behavior of California coastline

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Coastal Bathymetry especially southern California

Chris Wills (California Geological Survey)

- Geologic processes (offshore)
- Offshore and onshore sediment tracking (relate to watersheds)
- Pt. Reyes and Point Half Moon Bay

Chuck Katz (SPAWAR Systems Center San Diego, Navy)

- Bays, estuaries, nearshore
- Cover current data gaps
- Focus on "data user areas" versus "data gatherer areas"

Brian Edwards (USGS Coastal and Marine Geology)

- Shelf Break areas
- High resolution 3D subbottom data for benthic habitat conservation

Pete Dartnell (USGS Coastal and Marine Geology)

- Computer techniques, grid products from base maps
- Southern California

[]Sam Johnson (USGS Coastal and Marine Geology)

- [Mapping along shoreline and within 3-mile limit has lots of importance for understanding] Coastal Erosion/ Sediment Transport, [needed for sediment management]
- [Sub-bottom data can be important for habitat and resource issues]
- [Mapping of] offshore faults [is important for earthquake hazard assessments]
- [Mapping of faults and potential landslide areas can aid] Tsunami hazards [assessment]

[]Heather Kerkering (CenCOOS)

- Pt. Conception to Oregon [with habitat mapping specifically needed in northern California regions]
- San Francisco Bay (for navigation and sediment transport)
- Placement of MPAs
- End user driven mapping

Sophie DeBeukelaer (Monterey Bay National Marine Sanctuary)

- MPA process – need good habitat information
- Año Nuevo
- Mapping in already designated MPAs
- MLPA site designations in progress

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Paulo Serpa (California Department of Fish & Game)

- MLPA mapping
- Pigeon Point to Año Nuevo- priority
- Above Pigeon Point to San Francisco
- Groundfish habitat
- Nearshore LIDAR for entire coast

Chad King (Monterey Bay National Marine Sanctuary)

- Monitoring information
- Data gaps
- Current and future reserves
- Santa Cruz and San Mateo Counties
- Shelf break in the south

Dave Lott (Monterey Bay National Marine Sanctuary)

- Support the MLPA process – mapping MPAs

Steve Watt (Sea Engineering, Inc)

- Habitat Change – repetitive mapping
- Sediment transport modeling

Greg Benoit (CA Coastal Commission)

- Habitat Classification
- Sediment transport
- Entire state waters

Rick Hanks (Bureau of Land Management)

- San Mateo Coast
- Point Reyes to Point Arena
- Offshore mapping
- Blue strip along coast (LIDAR)

Gerry Wheaton (NOAA Ocean Service)

- Updates nautical charts for:
    - Monterey
    - Moss Landing
    - Santa Cruz
    - Half Moon Bay (sediment)
    - Bodega Bay
    - Nearshore (especially near Ft. Ord), beach erosion areas

Synthesis of Workshop Notes

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- MLLW to legal boundary

Kirsten Gilardi (UC Davis, SeaDoc Society)

- Moss Landing to Point Lobos (sidescan for derelict fishing gear)
- Areas of intensive fishing especially Dungeness fleets
- Areas accessible by divers
- Fairly shallow waters
- San Mateo County
- North of San Francisco

Mary Gleason (The Nature Conservancy)

- MLPA process
- Biodiversity hot spots
- Potential MPA sites
- Pigeon Point to Point Arena

Unidentified participant

- Near Sewage outfalls,
- Near large municipalities
- Around larger developed areas
    - Nearshore around storm runoff/outfalls
- Areas of Biological Significance
- Around Marin County

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 12, 2005
Statewide Data Needs- lunchtime group discussion

Statewide data needs identified by participants and compiled from notes taken during group discussion. Facilitated by Rikk Kvitek (CSUMB). (notes: M. Young , S. Zurita).

(California Coastal Conservancy)

- Funded near shore mapping from Camp Pendleton, Oceanside to San Diego
- Complete maps Santa Barbara, Ventura, LA counties
- Complete map of the California Bight

Jerry Wilson (Fugro Pelagos, Inc)

- Entire southern region south of Point Conception especially Santa Monica Bay
- Decide on what is priority bathy or sss?
- Holdings: LIDAR data from Dana Point south to the Mexican border
- IHO standards for navigation safety (non-habitat mapping)

Mary Elaine Dunway (Minerals Management Services)

- Point Conception south to Ventura in the Santa Barbara Channel
- Scouring/sediment transport areas
- Are changes needed for pipelines?

[]Sam Johnson (USGS Coastal and Marine Geology)

- [Proposed LNG facilities off] Ventura
- ~~Bathy data of shoals~~ [SHOALS bathymetric lidar data]
- ~~Faults related to Northridge quake~~
- [Trace] Transverse ranges [structures into the] offshore ~~to better understand tectonics~~ [for better earthquake hazards assessments, including tracing the fault zone that generated the Northridge earthquake]

Art Shak (US Army Corps of Engineers)

- Gap in near shore around LAX
- Coastal zone habitat mapping to better understand erosion, dredging, shore protection, sedimentation

Michael Reichle (California Geological Survey)

- Complete bathy and sub-bottom data extending out to federal waters
- Areas around Morro Bay and Cambria for faulting in line scarps

Mary Yoklavich (NOAA/NMFS-SWFSC)

- Offshore banks in federal waters

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Southern California: San Nicholas Island (blocks # 813, 814 for groundfish species stock assessments)
- Inside and outside comparisons of MPA sites

Cliff Davenport (Coastal Sediment Management Workgroup)

- Bathy data of canyons and wetlands

Mark Johnsson (California Coastal Commission)

- Potential sand deposit areas
- Location of current habitats (Oceanside to San Diego, Encinitas to Solana Beach)
- Accurate bathy data off LA ports, Long Beach, and Sand Diego coast)
- Past events (landslides) repeat intervals
- Cabrillo deep water ports
- Oxnard – liquefy natural gasline (one of first major gaslines to be placed in decades)
- Characterize needs for MPA's

Kirsten Gilardi (UC Davis, SeaDoc Society)

- Morro Bay
- Fine scale mapping around Catalina Island (backside of Catalina)
- Rocky habitats off Point Loma and Palos Verdes

Dominic Gregorio (State Water Resource Control Board)

- Near shore gaps where storm water runoff occurs
- Mouth of Mugu Lagoon (possibly block # 682, not sure)
- Julia Pfeiffer Burns near shore where landslide occurred, severe sediment scour
- Orange County mouths: Laguna Beach and Crystal Cove
- San Nicholas and San Clemente Islands
- Catalina Island (2 harbors area)
- Quarry on Catalina Island
- Data gaps of Channel Islands MPA network
- Proposed MLPA sites from Big Creek to Cambria

Paulo Serpa (California Department of Fish & Game)

- Julia Pfeiffer Burns
- Multibeam and sss for Big Creek
- Data gaps of Point Sal
- Cambria very important (block 601)
- Data gaps in current Channel Island MPA's

Pete Dartnell (USGS, Coastal and Marine Geology)

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Santa Barbara Channel regions
- Fill data gaps from Dana Point to La Jolla Canyon
- Offshore: geologic habitat maps in deeper waters

Brian Edwards (USGS, Coastal and Marine Geology)

- SSS – detailed (pixel by pixel) work and extend this approach to deeper water
- Multibeam of the coastline (…to Huntington Beach) to better understand sediment pathways (material from Bolsa Chica being placed offshore)

Don Cadien (LA County Sanitation District)

- High priority habitat areas: unmapped areas of Northern Channel Islands

Dick Seymour (SIO)

- Should near shore areas be mapped more than once (blueline coast)?
- SIO taking monthly surveys of blocks: 738,802, 842 (back beach to 8m depth) using ATV's, jet skis every 100m
- Want to do seasonal shoal type investigation

John Orcutt (SIO)

- Extend map into Baja
- LIDAR data (Newport/Inglewood fault): tectonics offshore have large impact on sediment
- Deconstruction of Matilija Dam in Ventura. Large quantities of sediment released into ocean (Blocks: 662, 664, 654)

Jeff Babcock (SIO)

- Bathymetry and sub-bottom high resolution maps from Huntington Beach south to the border (Huntington Beach to San Diego especially important)
- Near shore LIDAR combined with sub-bottom
- Repetitive mapping along with bathy data
- Sediment thickness (what happens when certain events occur?)
- Relate sub-bottom to tectonics and biological habitat

Dave Caress (MBARI)

- Question: "What frequency is needed by SIO to determine near shore sediment thickness?"

Jeff Babcock (SIO)

- Answer: "…from past experiments (Neil Driscoll) the Edgetech uses a lower frequency for sediment (approx.1 to 6 khz) and a higher frequency is used for bathymetry"

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

John Butler (NOAA/NMFS SWFSC)

- Black abalone (0 – 10m)
- Crescent City to Punta Abreojos
- San Nicholas Island
- Catalina
- Northern Channel Islands
- Point Conception south to Point Loma (rocky habitat)
- Offshore banks located in federal waters (300 – 500m)

Dan Specht (USACE)

- Sand sources and sinks
- Question: "What would be the consequences of not getting the data needs?"

Jerry Wilson (Fugro Pelagos, Inc.)

- Discussions by federal agencies about "noise" affects on specific species in ocean

Mark Johnsson (California Coastal Commission)

- Increasing concerns about "noise"

Chuck Katz (SPAWAR Systems Center San Diego, Navy)

- List of products that will be produced from mapping

Don Cadien (LA County Sanitation District)

- Prioritizing
- Question of stability over time

Mary Gleason (The Nature Conservancy)

- Looking for biodiversity hot spots along central coast
- Potential MPA sites need better habitat maps
- Pigeon Point to Point Arena

Marina Cazorla (California Coastal Conservancy)

- Focus on Monterey Peninsula and north
- Want as much done as possible between Monterey Bay and Bodega Bay and possibly north of Point Arena

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 12, 2005
Northern California – Data needs group discussion

Mapping priorities for Northern California (Monterey canyon to northern California border) discussed during breakout session. Discussion facilitated by Gary Greene (Moss Landing Marine Labs). *Asterisks indicate areas identified by the group as priority areas. (Notes: J. Sampey, K. Wong.) *Post-workshop comments ([ ]) were by G. Greene, unless otherwise noted*.

Objectives:

1) Identify areas of data needs
2) Identify important products (from end users)
3) Prioritize the above

Discussion topics: 1) target areas 2) data types

Areas of interest (what are the areas that are important and why?)

- Farallone Islands within state waters, should concentrate on the south east Farallones [because of data gaps and potential good habitats for fisheries]
- Focus on the geological features extending from the Farallone Islands out to Cordell Banks- as this is a potential biological hotspot.
- *Proposed and agreed by many individuals in the discussion, [that] the area extending from just south of the Golden Gate to [the] west of the Farallones and north to Pt. Reyes should be an area of high priority- as there is potential for MPAs in this area. Include [in any mapping effort] previously collected data ([ranging from] 30-100+m [water depth])

Gary Green- MLML: This is a large area and we have to keep in mind the time it takes to survey and the ability to survey it [given the potential funding].

After this comment by Greene, discussion ensued as to the reasons that this area is very critical and in need of priority mapping.

- While the area is large, it is an important fishery area and [contains] biological hotspot[s] that should be mapped with high[-resolution systems in as much] detail [as possible].
- This area is critical due to MPA considerations, navigation, sediment transport, tectonic activity, and contaminants/water quality [issues].
- Area from shelf to Gualala River under consideration for inclusion into [a National Marine Sanctuary] ~~sanctuary~~.
- Area north of the Golden Gate out to the shelf should be mapped due to important bird rookeries, potential oil spill and oil drilling impacts and emergency response [planning].

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Areas were identified within the state waters boundary that may require different mapping technologies.

- Deep areas that are within the 3-mile state boundary. These areas best suited for multibeam [bathymetric and backscatter mapping]
- Shallow area inaccessible by boat best suited to [bathymetric] LiDAR [digital photographic mapping].
- Offshore areas should be done with backscatter [along with multibeam bathymetry collection].

Near shore areas are the most important areas to map, due to the interaction with land and sea. However, this interface is the hardest to map.

Greg Benoit- CA Coastal Commission: The data gap from 0-10 meters needs to be addressed. This is an area in which habitat greatly affects policy decisions. It is critical that a habitat map be created for this zone for all near shore California.

- Question: Would [bathymetric] LiDAR be able to be used in the surf zone?
- Answer: (*Fugro Pelagos, Inc*): LiDAR will not penetrate white water, the reflectivity is too high. For LiDAR to be utilized a low surf day would be advisable [for the data collection time].
- LiDAR being flown in the near shore area should consider [for] surveys of coastal wetlands, and possibly conducted at the same time where possible.
- The estuaries most in need of mapping are those from San Francisco to Santa Cruz.

It was realized by the group that much of the North Coast has not been mapped and some method/ criteria needed to be in place to decide priority areas.

- Question: Could we conduct a low-resolution survey for the coast to get a sense of the habitat along the north coast.
- Answer (*Gary Greene- MLML*): The nature of [most seafloor mapping] systems does not really permit a low-resolution survey to be conducted.
- *Fugro Pelagos, Inc*: Another option is to look at original NOAA data, which is presented on mylar sheets ~~in~~ [at] higher sounding densities and use ~~that~~ [these] to aid in identifying key areas.
- *Green & others*: Also could use terrestrial geologic maps and [small scale offshore geologic maps to] interpret what may be [the substrate types] in the water and [plan a mapping exercise] ~~map~~ based on those sorts of interpretations.

The discussion then focused on identifying critical areas along the coast that individuals or groups thought would be most critical

- Estuaries (Bolinas, two Esteros [Bay] lagoons) in general should be mapped due to their biological significance. Also, repetitive surveys would be desired.
- Santa Cruz and Davenport area habitat[s need to be better delineated].

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Año Nuevo and Pescadaro Points are of interest due to the[existence of rocky] ~~rock~~ habitat. There is MPA consideration within this area.
- Fitzgerald Marine Reserve would be important due to habitat, hazards, MPA, and geology.
- Devil's Slide – CalTrans plans to build a tunnel [to bypass this area], [the activity] could cause hazards to the local nearshore area
- *Cuddy Cove- geologic interest, subbottom and habitat [all appear critical to this area].
- Areas along the north coast which are hotspots for recreational abalone diving.
- Areas such as river mouths and fishing grounds [need investigating]. River mouths may be candidates for repetitive future mapping [because of sediment input and constant seafloor alterations].

[]Cliff Davenport (Coastal Sediment Management Workgroup)
[clarity on my comment regarding the need to repetitively map offshore of river mouths: Our current paradigm expects that sediment that exits a river mouth either ends up on a downcoast beach or nearshore (coarser sediment) or gets widely dispersed in the oceanic offshore environment (fine-grained sediment). Efforts are underway looking at tearing down dams that trap sediment as a means to get more coarse sediment to our eroding coastlines. However, recent studies are implying that during high volume river flows (which is when most of the coarse sediment is moving) associated with storm events, the sediment may actually be moving offshore as a turbidity flow (aka hyperpycnal). If this is in fact the case, then costly efforts to take out dams, etc. may not produce the desired result of getting all the coarse sediment to the coastline. Repetitive mapping can shed some light on this by analyzing post storm conditions to see whether significant changes in the offshore seafloor took place.]

- *Van Damme (area south of Mendocino [where dam removal is being considered]), this is a shallow habitat area. The USGS would be very interested in this site [because of future sediment input].
- *Ft. Bragg area [is another area that was considered important to map because of the existence of fisheries habitats]
- * Trinidad to Patrick's Pt. (blocks 132-133)- This area is important for several reasons, [such as:]
    - Biologically significant
    - Water quality [issues]
    - Large [commercial and sport] fisheries, especially groundfish, salmon, and crab fisheries
    - The rocky habitat is not impacted by sediment [cover, but could be in the future]
    - Shoreline erosion [is occurring].
    - Fisheries management [for the region needs good habitat maps]

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

  - Important habitat for marine mammals/haul outs and many marine birds [another reason for good habitat maps]
- * Mad River to Trinidad.
  - Razor clams (Clam Beach) [an important fisheries that needs to be protected]
  - Shifting Mad River Mouth [is altering sediment seafloor]
  - The area is a multiple use area with public recreation, shipping and active fishing [that may be in conflict and good data need to be available for proper management practices to occur].
  - Mapping would facilitate the understanding of rip currents-which are prevalent in the area.
  - Many thrust faults exist in the area [and need to be mapped as they are a geological hazard].
- * Rest of Humboldt Bay, outside the jetties and around the outfall (possible LiDAR usage) [because of the areas sensitive wetlands habitats].
- *Crescent City- Hazards study following the tsunami [of the]1960's, sediment dispersal [in need of evaluation for growth management]
- * Klamath River to Crescent City [is in need of mapping because of:]
  - Navigation [concerns]
  - Sediment Transport [concerns]
  - Fishery [concerns]
- *St George Reef [because of:]
  - Smith river mouth – potential fish habitat and seal haul out [aeras that are in need of characterization]
- *Smith River (largest undammed river in CA) [because of:]
  - Water quality, fisheries [and other concerns]

The North Coast was arbitrarily divided into 4 geographical zones

A – Santa Cruz to Ocean Beach
B – Ocean Beach to lower Mendocino Coast
C – Mendocino Coast to South of Humboldt
D – Humboldt to Oregon

Suggestion: we should have some sort of preliminary surveys, such as low-resolution swath mapping [or a desktop study], to figure out what should be prioritized. This would be beneficial in areas that have not yet been mapped.

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 12, 2005
Southern California – Data needs group discussion

Mapping priorities for Southern California (South of Pt Conception) discussed during breakout session. Discussion facilitated by Rikk Kvitek (CSUMB). (Notes: M. Young, S. Zurita)

Jerry Wilson (Fugro Pelagos, Inc)

- San Juan Bay
- South of Point Conception

Mary Elaine Dunway (Minerals Management Service)

- Santa Barbara Channel
- South of Point Conception
- Areas of seeps and scouring

[]Sam Johnson (USGS Coastal and Marine Geology)

- [Santa Barbara-Ventura areas has big sediment management and coastal erosion issues]
- SHOALS bathymetric [LIDAR] data [could be very important]
- Faults (continuation of faults)
    - Understanding tectonic ring
- Offshore Ventura
- [Potential Earthquake and Tsunami sources in very active Santa Barbara channel area should be documented]

Art Shak (US Army Corps of Engineers)

- Habitat Mapping in Coastal zone (shore protection, beach erosion, dredging, and disposal of dredge spoils)
- Shoal in Ventura and Santa Barbara Counties
- Littoral Zone

Michael Reichle (California Geological Survey)

- Complete Bathymetric and Sidescan
- Morro Bay to Cambria – Faulting line scarps

Mary Yoklavich (NOAA/NMFS-SWFSC)

- State waters blocks 814 and 813
    - Stock assessment of groundfish
- Point Conception to North to Vandenburg
- Julia Pfeiffer Burns

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- North of Big Creek and adjacent areas

Unidentified participant (US Army Corps of Engineers)

- Critically eroding areas (still in the process of prioritizing)
- Some Federal sites
- San Clemente
- Surfside
- Offshore
- Wetlands
- Bathy and sediment deposition areas

Mark Johnsson (California Coastal Commission)

- Current habitat
- Sand deposits
- Oceanside
- San Diego
- Tsunami modeling
- Accurate bathy for the ports of LA and Long Beach
- Off the coast of San Diego

Unidentified participant

- Identify landslide risks
    - Santa Monica Bay
- Hazards
    - Cabrillo water port (off Malibu)
    - Natural gas pipeline off Oxnard
- MLPA
    - Characterize protected areas

Kirsten Gilardi (UC Davis, SeaDoc Society)

- Morro Bay
- Backside of Catalina
- Fine scale resolution around Channel Islands
- Rockier points
    - Pt. Loma
    - Palos Verdes
- Derelict fishing gear
- Fill in unmapped areas

Unidentified participant

- Nearshore – storm water runoff

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Mouth of Mugu Lagoon
    - Block 682
- Julia Pfeiffer Burns area
    - Landslides
    - Sediment scour effects
    - Filled cove
    - Time series data
- Creek mouths in Orange County
- San Nicolas and San Clemente Islands
- Catalina Island
    - 2 Harbors – marine activity
    - road sediment
    - quarry – localized impacts

Unidentified participant

- Channel Islands – unmapped areas
- Big Sur South to Cambria for MLPA

Paulo Serpa (CDFG)

- Julia Pfeiffer Burns
- Big Creek sidescan and additional multibeam (for MLPA process)
- Filling in data gaps to Pt. Sal
- Cambria (Block 601)
- Data gaps in the Channel Islands
- Pt. Loma
- La Jolla Coast
- Torrence to LA Breakwater

Pete Dartnell (USGS, Coastal and Marine Geology)

- Santa Barbara Channel
- Gap between Dana Point and La Jolla Canyon
    - Habitats and Geologic Maps
- Deeper water habitats

Brian Edwards (USGS, Coastal and Marine Geology)

- Single, multibeam, and backscatter
- Detailed backscatter maps
    - Extend to deeper water habitats off San Diego
- Coastline (sediment transport)
- LA margin (beach nourishment)
    - Point-source dispersal of sediment

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Chuck Katz (SPAWAR Systems Center San Diego, Navy)

- Environmental impacts
- Baseline monitoring

Don Cadien (LA County Sanitation District)

- Complete North Channel Islands
- North of Point Conception
- Between Pt. Reyes and Pt. Sal
    - Geology

Dick Seymour (SIO)

- Blue Line Along Coast
- Blocks 738, 802, 842
    - Monthly surveys
    - Beach to 8m depth (ATVs)
    - Every 100 meters
- Conduct seasonal shoals investigations
- Map seasonal changes to find out how often to survey coast

John Orcutt (SIO)

- Understanding of environment South of Border
- High resolution data for faults
    - Change in offshore sediments
    - Coincidental data
- Matilija Dam – dumping of sediment
    - Behavior of sediment
- Blocks 654, 682, 653, 664

Jeff Babcock (SIO)

- High resolution (<1 meter) 500 meters to 100 meters water depth
- Huntington Beach to San Diego
- LIDAR data in the nearshore
- Sub bottom data collected with multibeam
    - Baseline of sediments
    - Repetitive studies
    - Decadal change
    - El Nino change
    - Thickness of sediments
    - Resources
    - Erosion – Offshore

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Tectonics
- Habitat areas
- Sands versus hard substrate
- Faulting and seismic in high accuracy

Dave Caress (MBARI)

- Frequency range of sub bottom for nearshore sand forms
- Shallow water sandy environment

John Butler (NOAA/NMFS SWFSC)

- 0-10 meters Crescent City to Punto Abrejos (abalone)
- San Nicholas Island
- Catalina
- Northern Channel Islands
- Point Conception to Point Loma – shallow rocky habitat
- Offshore banks

Dan Specht (US Army Corps of Engineers)

- Characterization of Sediments
  - Sand sources and sinks

Mary Elaine Dunway (Minerals Management Service)

- Start Broader (use tiered approach)
- Work on problem areas

Art Shak (US Army Corps of Engineers)

- Intertidal areas
  - Topo and bathy
- Morro Bay

Jerry Wilson (Fugro Pelagos, Inc)

- Bathy for navigation safety
- Optimize Bathy or backscatter
- Biological impacts of acoustical noise
  - Eco-sounders

Mark Johnsson (California Coastal Commission)

- Response to above
  - Higher frequencies cause less problems
  - Biological ramifications

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Chuck Katz (SPAWAR Systems Center San Diego, Navy)

- Maps and data products

Don Cadien (LA County Sanitation District)

- Stability over time
- Frequency with regard for stability

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 13, 2005
Recommendations for Minimum Requirements of Final Products

Morning roundtable of recommendations for baseline mapping effort based on current information needs for State waters. Discussion led by Rikk Kvitek (CSUMB). (Notes: M. Young, S. Zurita, K. Wong)

Dick Seymour (SIO)

- Current state of the art SHOALS (surf zone to extinction level)
- Classified database broadly available (backscatter, xyz's)
- Data interpretation

Keith Jones (CalTrans)

- Purpose for products produced, regulatory/ policy decisions
- Keep track of water quality (to what extent will multibeam help)

Cliff Davenport (Coastal Sediment Management Workgroup)

- Valuable products from substrate maps = geologic maps (identify location, volume, and depth)
- Sub-bottom profiles of substrate maps to determine where mud belts are located
- Repetitive mapping of river mouths
- Begin with backscatter data to determine critical locations (ie: erosion)
- Identify general locations w/o knowing critters
- Core for representative grain size analyses

John Butler (NOAA/NMFS SWFSC)

- Habitat maps (more backscatter)
- Better classification maps that would be more useful for MPA selection and fishery management
- Standards for different types of relief (low & high) ad substrate type (sand & rock), costs will vary greatly with resolution required, equipment varies

Dale Roberts (Cordell Bank National Marine Sanctuary)

- Resolution of habitat maps should be dependent on site, depth, and species of interest

Paul Veisze (CDFG)

- Time factor rates
- Use productivity measures to meet timelines for legislative demands, work backwards from 2011 timeline

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

[]Gary Greene (MLML)

- [There is a need to] Determine what data is available (~~do we need to~~ [can we] build upon that [data]?) [and the move ahead to design a survey
- [We should determine] Specific needs of management, policies, and objectives before specifications like resolution [and scale] are determined
- Reconnaissance: [surveys can be done at] low resolution, [while] Critical areas [can be surveyed at] high[er] resolution

Guy Cochrane (USGS, Coastal and Marine Geology)

- 3 tiered structure - xyz & backscatter grids --> numerical derivative such as topographic index grid --> attributed GIS polygons (may increase costs by approximately 50%)

Irina Kogan (Gulf of the Farallones National Marine Sanctuary)

- Backscatter useful in near shore, shallow, areas with habitat
- Backscatter useful for MLPA process
- Images of substrate data done first then detailed habitat maps and groundtruthing

Art Shak (USACE)

- Baseline map of current shoreline with MLLW lines
- Good basemap from shore out to navigational depths

Rikk Kvitek (CSUMB)

- Shoreline important boundary for legal purposes
- Shoreline is moving so important to have the shoreline mapped

Gerry Wheaton (NOAA Ocean Service)

- Data all uniform
- Define data acquisition

Mary Elaine Dunway (Minerals Management Service)

- Tiered approach is cost effective and has been very useful to biologists
- Multibeam and backscatter groundtruthing, use AUV's, towed cameras, manned submersibles

[]Gary Greene (MLML)

- Knowledge of geologic processes that lead to educated guesses about substrate [types is a powerful tool in habitat characterization and mapping]
- Changes in grain size [is] key [to understanding the dynamic processes of the seafloor]

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

Rikk Kvitek (CSUMB)

- Groundtruthing should be included as a minimum requirement

[]Guy Cochrane (USGS, Coastal and Marine Geology)

- Groundtruthing increase costs by approximately 25%
- ~~There is a biological need for groundtruthing~~ [Sonar is useful for classifying macro-habitat and bottom induration but there is a need for groundtruthing using video and sampling for micro-habitat classification]

John Butler (NOAA/NMFS SWFS)

- Groundtruthing needs to be a focus if species are dependent on area mapped (i.e.: slopes)- rockfish habitat
- 25% of data should be groundtruthed

Chris Wills (California Geological Survey)

- Habitat mapping: polygons of substrate important for policy makers
- Evaluate fault processes, sediment processes (sub-bottom profiles)
- Hazards interpretation in baseline data, slope and potential slides

Mary Elaine Dunway (Minerals Management Service)

- Need for groundtruthing to move forward

Gerry Wheaton (NOAA Ocean Service)

- RFP's have potential outcomes (What is RFP going to accomplish?)

Dick Seymour (SIO)

- Clarification on groundtruthing
- We need to be concentrating on making specifications of minimum requirements

Doug Lockhart (Fugro Pelagos, Inc.)

- Deliverables of data is easy to determine quality total propagated processes
- Total propagated error, how good data is

John Butler (NOAA/NMFS SWFS)

- Columns in voting block determine what type of data is needed

SUMMARY

Levels of Interpretation:

- 1^{o}-Basic Data- backscatter & bathy images (rough vs smooth & texture mosaics)- require groundtruthing (e.g. towed camera)
- 2^{o}-GIS computer analyses [such as slope analyses and complexity evaluations]

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- 3^{o}-Geologic/Habitat [maps in a] GIS
- 4^{o}-Hazards & Faults/Slides [maps in a GIS]
- 5^{o}-Sediment sources [types and direction of transport maps in a GIS]

[]Cliff Davenport (Coastal Sediment Management Workgroup)
[I feel that it is extremely important that the "Statewide Mapping" effort be geared towards getting as much coverage (100%?) as possible of the seafloor under State waters, even if we have to accept a lower resolution of coverage. Information obtained during this first phase would be more appropriate for regional planning anyway, so resolution needs should be less. We don't always know going in what we'll find or where, we don't know where all the problem/opportunity areas are, and trying to obtain initial coverage with high resolution will be expensive and possibly wasteful.

The first phase can then serve as a platform to focus more site-specific studies in the future that would need a higher resolution (ie specific attributes of habitat, offshore sources of sand for beach restoration, active fault delineation for hazard analyses, etc.). These studies could be done as part of the seafloor mapping, but I also expect that the information obtained will springboard into studies funded by other organizations as well. Its important to have Sub-bottom Profiling conducted in selected (not all) areas, especially in Geologic Areas of Significance (e.g., where economically viable deposits and geologic hazards exist).

The Phase 1 studies need to be groundtruthed after the inital data has been processed (25% was recommended in the workshop). The Phase 2 assessments can be done with cameras/grab sampling, and provides a fortuitous occasion to mount the deep profiling equipment and collect additional information at the higher resolutions needed for more site-specific investigations of current need.]

Clarification of terms “hi and low resolution”.

[… should try to get complete coverage in as economical manner as possible, and that would involve "high resolution multibeam bathymetric profiling with backscatter". Subsequent studies to gather more detailed information on a specific location(s) would constitute Phase 2 assessments.]

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 13, 2005
Recommendations for Data Acquisition and Processing

Breakout discussion of general mapping guidelines and standards for data acquisition and processing. Facilitated by Rikk Kvitek (CSUMB). (Notes: M. Young, S. Zurita)

***Objective:** To create a strategic plan for California state waters by defining the minimum standards for data acquisition.

- Base map of existing datasets, a good step to work from, synthesis of existing datasets & data gaps/what type of analyses have been done for each site map
- In addition to remote sensing data (bathy & backscatter) provide other information that exists with that data, and on data collected in strategically located places
- Include sub-bottom profiling with surveys so extra vessel time is eliminated
- Survey time is doubled if it includes a towfish survey while running multibeam, unless the sub-bottom is hull mounted
- It is more efficient to run 2 vessels: Use multibeam image to guide sub-bottom instrument

SUB-BOTTOM IN STATE WATERS:

- Sand bodies hard to image (need low frequency which would reduce resolution)
- Sub-bottom and video groundtruthing should be post bathy and backscatter
- Not many devices to image sand, faults, etc.
- Tiered studies allow you to determine where and when sub-bottom and groundtruthing should occur
- Frequency versus resolution changes due to species of interest, sediment, and processes
- USGS study: Camera tows on a continuous trackline using a sled. Coverage is less than that of a ROV
- Sled with a camera gives sediment grain size
- Data acquisition tier (shoreline out to 3 mile limit)
    - Multibeam and backscatter, XYZ
    - Sub-bottom profiles and video camera: sand & tectonics (groundtruth)
    - Physical samples, cores
- Narrow strip of hard to reach areas – GeoSwath used by *Fugr*o (shore to water in flat areas)/ Need to run a tideline
- *Ocean Imaging* – multispectral dependent on cloud cover
- Specify needs first then determined instruments used
- Multispectral displays data differently than acoustic
- LIDAR better to use for 0 – 10m depths

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Running separate systems may lose capabilities for co-registration
- Datasets co-registered wherever possible
- Biological data important- need to specify level to collect
- Include water column along with Acoustic Doppler Current Profiler (ADCP) for temperature, current, salinity (what's in the water?)
- ADCP would require another person to manage and not as easy to use on smaller vessels
- Consider local sediment transport
- Collaboration- include entities
- IHO standards: possible modifications and implications
    - Does the order of 1 standard decrease data if changed?
    - IHO = 10% at 40m mainly for navigable reasons/change to 5% at 40m for habitat analyses would work better
- Must maintain manufacturers specs to meet IHO standards
- New Reson system (7000 series) has 0.5 degree beams (512 beams across 150 degree swath)
    - 6 terabytes of data collected each day
- Verify acoustic compliance with regards to marine mammal regulations
- Shallow water mapping based on IHO order 1 standard (most cost efficient)
- Share cost of equipment
- AUV increase resolution and cost
- High resolution data using hull mounted system of 0.5 degree beams
- LIDAR best if 2x2m @ 400m altitude (IHO standard requires two flights of 2x2m data)
- Habitat surveying versus navigation surveys dependent on processing possibility
- *Fugro* surveys based on ellipsoid and calculate back to tide (found data fits better), total propagated error is reduced by RTK use

DATA ACQUISITION SUMMARY

- Towed sled with continuous video (if needed use ROV for more intense studies)
- IHO order 1 standards provides appropriate resolution for habitat, deeper water IHO may change
- Exceed IHO standards (0.5 degree beam, higher resolution for habitat in deeper water)
- Additional instruments such as an ADCP would be better if collaboration with other agencies is good
- Marine mammal regulatory compliances
- Sub-bottom and other instruments power outputs are well below regulatory levels
- Use of ROV instead of towing a sled in hard to reach areas like Big Sur

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 13, 2005
Recommendations for Data Analysis, Interpretation, and Classification

Breakout discussion of guidelines and standards for data analysis, interpretation, and classification. Facilitated by Gary Greene (MLML). (Notes: K. Wong). *Post-workshop comments ([ ]) were by G. Greene, unless otherwise noted.*

Gary Greene (MLML): People want [two] (2) things, raw data, and/or some analyses/interpretation such as [habitat] ~~locations~~ or substrates [types]

What types of interpretations are minimally required for the many different purposes [of mapping the seafloor]?

Dale Roberts (NOAA Cordell Bank NMS): Contour map[s],[with] bathymetric contours (isobaths) [is at least the minimum map type needed]

What [contour] intervals [are needed]?
Dependent on the use and depth of the data: [one] (1)m contours would be desired for tsunami research [and modeling].

Pat Iampietro (CSUMB): contour lines are easily generated in GIS, rather than focusing on what intervals, we should focus on other levels of interpretation.

General request for data [type, at a minimum]:

- Gridded xyz data
- Geologic/habitat polygons
- Rugosity maps, Roughness maps, Lithologic maps.

Interpret [bathymetric and backscatter data] at greatest detail possible. Habitat maps would be species-dependent or species-specific. First, make fine scale maps (high-resolution), then back ~~out~~ [off] to using to low-resolution [(simplification of data to meet objectives of mapping effort)] data where needed.

[Consider] Employing new technologies-[such as] synthetic aperture sonar

What resolution of data do we want?

- *Gary Greene (MLML):* acquire at the highest resolution possible

- *Irina Kogan (GFNMS):* We should get as much detail as possible in the interpretation. Do a good job interpreting before giving the data to regulators.

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

- Accuracy assessment (confidence level of data) ~~that is~~ [should be] polygon based. This will help policy makers.

- Require interpretations [to be] done without bias, done by a credible organization [or person without an agenda]

- Groundtruthing needed ([for a] portion of survey footprint) at the time [the survey] data is collected

- Need baseline or general interpretations that everyone can use for the entire site [surveyed]. These ~~would~~ [may] not be specific to the needs of everyone.

- Make use of current data sets, background information [to plan and execute new survey and if possible use in interpretation for the construction of maps]

- We should do overall [general] background interpretations first for the whole area [surveyed]- then come back later (to the data) to do more specific interpretations.

GENERAL AGREEMENT OF MINIMUM REQUIREMENTS

- Contours/isobaths [maps]
- Grids at the highest resolution possible [– artificial sun-shaded images and backscatter mosaics]
- Vector and polygon maps
- Potential habitats, geology, hazards [maps]
- Confidence levels stated [in a data quality map]
- Quality assessment, such as groundtruthing [to be undertaken for a fraction of the survey area]
- Credible source[s] doing the analysis
- Background data [to be compiled prior to surveying to prevent duplication of data] ~~with no duplicate information~~
- [Survey at a] 100% coverage [when possible]

Synthesis of Workshop Notes

Participants were given a further opportunity to provide comments to those recorded during the workshop. Post-workshop contributions are shown in brackets[ ].

December 13, 2005
Strategies for Metadata, Archiving and Dissemination of Data and Products

Breakout discussion of metadata, archiving, and dissemination of data and products. Facilitated by Guy Cochrane (USGS). (Notes: J. Sampey)

- Discussion started with agreement that metadata inclusion should be a requirement of the data acquisition contract
- Agreement that FGDC standards should be followed for metadata creation
- Data should be collected in one reference plane (NAVD88 etc.), any re-projection of the data should be documented.
- Suggested use of SANDDAG project (nearshore profile) as a model for the creation of metadata and its integration into data products. This project added extra information to metadata for shallow water surveys. The new information added elements addressing project specific data collection- followed FGDC standards

ARCHIVING

Data needs to be archived for future reference and also formatted to allow useful distribution to end-users. Due to the large data volume, a suitable location capable of storing extensive data sets and allowing user downloads has to be identified.

- *Becky Pollock (CA Coastal Conservancy):* The data has to be non-proprietary and available to the public.
- Possible archiving location- NOAA's National Oceanographic Data Center (NODC). This location has "unlimited storage", however the usability of directly obtaining data from this site was in question. The user interface is limited and data searching is rudimentary. (Further information www.nodc.noaa.gov)
- Since data collected would be limited to California, a question was posed as to the suitability of CA Department of Fish and Game (CDFG) to act as the data repository. The benefits being an already in-place data retrieval system. (Further information: http://imaps.dfg.ca.gov/)
- California Spatial Information Library was another possible archival location. (Further Information: http://gis.ca.gov/)
- No matter what location is selected for data archiving, a user-friendly interface is a must. Possible solution proposed was be the creation of an IMS webpage or other data search page that would link to archiving location such as NODC or CDFG archives.
- *Greene* [Another process is to work cooperatively with the new California Seafloor Mapping Consortium to display and publish maps that could be placed on the joint California Geological Survey/USGS web site that is presently being considered for development.]

Synthesis of Workshop Notes

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ORGANIZATION

Collected data more than likely would be compiled by numerous agencies. Due to the formats required for successful data archiving, a single contact should define the appropriate organizational and archiving format. i.e. possible scenario- data collectors provide data files to a central organizing body to populated the archive (e.g. NODC, CDFG). A common data format is required for this process.

- Separate funds would need to be appropriated to allow for a single contact for formatting and archiving all data.
- A metadata service would need to be identified

Cost of implementing above approach

- Creating links to the repository site would be minimal especially if existing data site such as CSUMB's Seafloor Mapping Labs IMS server and CDFG's IMAPS were used.
- Some potential software applications that could be used to access data would require license fees which would drive cost up. May be of benefit to research free open source software which will provide data access.
- Assessment of maintenance cost would be needed.

Inclusion in RFP

- If RFP does not specifically include dissemination (but it should at a limited level), then look at adding it to individual contracts (archiving subcontract?).
- What about old/existing data? Should this be considered in the RFP?
- Specifications should be in place for including metadata descriptions of "before and during" data collection, included processing steps.

Target audience

- The method of data delivery will depend on the target audience, there is a distinct difference in presentation if the audience are scientist, policy makers, or the general public.
- Data querying and manipulations on an IMS server would not be much use to the majority of scientist. More useful is a simple data display/visualization (via IMS or map gallery) and click to download.
- If data manipulation on IMS type program is desired it would take a full time staff to maintain, thus adding considerable cost to the project
- *Carrie Bretz (CSUMB)*: IMS is not capable of out-of-the-box complex data manipulation/query. Higher-level manipulation capabilities require some programming and would necessitate extensive time on the part of the administrator.

GENERAL AGREEMENT

A tiered approach for distribution of data and derivatives might be most effective- FTP, HTTP on web site, IMS (as viewer only). Data displayed as footprints and clicking

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links to downloadable files would be adequate and relatively inexpensive. This method of data distribution along with keyword searches and spatial box search would be the advisable methods (e.g. CERES, Geography Network).

Synthesis of Workshop Notes

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December 13, 2005
Summary Recommendation for Final Products

Summary of breakout discussions (Notes: S. Zurita)

DATA MINIMUM REQUIREMENTS

- XYZ and backscatter (LIDAR, hyperspectral, multibeam, multispectral)
- Data available
- DEM bathy contour map (resolution based on usage of map)
- Bathy for IHO specs- safe navigation
- Rugosity and substrate type (gridded xyz data used for geology habitat)
- Vectors showing faults and other structures
- Highest resolution possible within limits
- Data interpreted to greatest detail at specific resolution
- Confidence of interpretation indicated, total propagated error, QAQC
- Gather background data in two ways:
    - 100% coverage
    - Existing data incorporated into interpretive process
- Analysis of collected data to determine future data acquisition
- Groundtruthing should be included and at least should be obtained at least once during actual data acquisition

METADATA, ARCHIVING, DISSEMINATION

- FGDC standards
- Basic descriptions of data processing steps
    - Navigation precision
    - Acquisition methods
    - Sonar data processing and mosaicking
    - Resolution changes and reprojections.
- Description of files (i.e. original projections, datums)
- Consider new FGDC standard developed by SANDDAG
- Dissemination of tiered system for database (FTP with links, website images of data that link to data sources, IMS)
- Register with Geographic search engines and web search engines such as CERES, Geography Network
- Video data archiving to DVD, since video tape does not last
- Existing IMSs' available, but no one has volunteered, (the RFP may need to request a contractor to oversee and maintain website and IMS)