APPENDICES

APPENDIX A. 2004 ROUNDTABLE AGENDA

Monday, March 15

- 1st Annual Meeting of the Pacific Communications and Dissemination Steering Committee

Tuesday, March 16 – DAY ONE

- Registration and Continental Breakfast 8:00–8:30am
- Gathering, Welcome, Introduction of Participants 8:30–9:00am
  - *Oli - Kumu John Lake*
  - *Welcome by John Marra, Introduction of MAPping Change*
  - *Welcome by MAPping Change*
  - *Self-Intro by All Participants*
  - *Welcome by Bill Thomas, Introduction of Keynote Speakers*
- Opening and Keynote Presentations 9:00–9:30am
  - Margaret Davidson, Director, NOAA Coastal Services Center
  - Kaniela Akaka, Cultural Advisor at Mauna Lani and Kalahuipua`a
- Overview of Agenda and Desired Outcomes 9:30–9:45am
- Connecting with the Needs of End Users: Lessons Learned 9:45–11:30am
  - Chip Guard, NOAA NWS Guam Forecast Office
  - Andra Samoa, American Samoa Government DELTA Consortium
  - Eddie Bernard, NOAA Pacific Marine Environmental Laboratory
  - Larry Kanda and Brian Yanagi, Hawai`i State Civil Defense

BREAK ~10:30am

- Regional Programs and Initiatives: Reports from Federal Agencies 11:30am–2:15pm
  - Mary Glackin, Assistant Administrator, NOAA Office of Program Planning and Integration
  - Sally Ziolkowski, Director of Federal Insurance and Mitigation Division, FEMA Region IX
  - Ed Young, Deputy Director, NOAA NWS Pacific Region Headquarters
  - Jill Meyer for David Kennedy, Director, NOAA Office of Response and Restoration
  - John McCarroll, Manager, Pacific Islands Office EPA
  - John Gambel, National Hurricane Program Manager, FEMA
  - Alan Mikuni, Regional Geographer, Western Region USGS
  - Stan Boc, Engineering Research and Development Center USACOE

LUNCH **NOON**

- Regional Programs and Initiatives: Reports from Regional Organizations 2:15–4:15pm
  - Atu Kaloumaira, South Pacific Applied Geoscience Commission (SOPAC)
  - Laura Kong, International Tsunami Information Center
  - Laura Kong, for Circum-Pacific Council
  - Jackie Burniske, Pacific Resources for Education and Learning (PREL)
  - Paula Carroll, US Coast Guard, Regional Response Team
  - Glenn Lockwood, Red Cross
  - Carolyn Imamura, Pacific Basin Development Council (PBDC)

BREAK ~3:00pm

- Wrap-Up and Feedback 4:15–4:30pm

EVENING: Pau Hana Sunset Sail 5:00 pm

Wednesday, March 17 – DAY TWO

- Recap and Review of Agenda 8:30–8:45am
- Establishing the *Hui O Hana*: INTRODUCTION TO CANOES/PADDLES 8:45–9:15am
  - ◊ John Marra, NOAA PSC, and MAPping Change
- Establishing the *Hui O Hana*: CANOES 9:15–11:30am

  NAVIGATORS: Cheryl Anderson, Eddie Bernard, Pene Lefale, David Kennedy, John McCarroll, James Weyman, Ed Young, Sally Ziolkowski

BREAK as needed

- Posting of Projects and Activities into the Themes/Tools Framework

  (during preceding session)
- Featured Projects and Activities 11:30am–2:15pm
  - ◊ Pene Lefale, NIWA Pacific Climate Analyst

    Traditional Knowledge and Practices

    (Local indigenous knowledge of the climate and weather of Pacific Islands)
  - ◊ Peter Hacker, IPRC

    Coastal and Ocean Observations

    (The Asia-Pacific Data-Research Center (APDRC) Web-based access to atmospheric and oceanic products)
  - ◊ Stan Boc, ACOE

    Coastal and Ocean Observations, Decision-Support Tools and Training

    (PILOT, surge and runup modeling, HURREVAC/MMT-MMS)

LUNCH **NOON**

  - ◊ David Kennard, FEMA

    Data Management, Decision-Support Tools and Training

    (Map Modernization, HAZUS-MH, HMPs, and HMP guidebooks)
  - ◊ Henry Wolter and Ed Harp, USGS

    Data Management, Post-Disaster Evaluation

    (National Map, seamless DEMs)
  - ◊ Russell Jackson, NOAA CSC

    Data Management, Decision-Support Tools and Training

    (Hurricane Tracks Tool, Hazards Locator Tool, CRA Demographic Assessment Extension, etc.)
  - ◊ Kelly Sponberg, NOAA OGP

    Communications Infrastructure

    (RANET)
  - ◊ Chris Chiesa, EWC/PDC

    Data Management, Decision-Support Tools and Training

    (Natural Hazards Atlas, Distributed Information Network)
  - ◊ Mike Devany, NOAA ORR

    Decision-Support Tools and Training, Post-Disaster Evaluation

    (CAMEO, ALOHA, ESI Maps)
- Establishing the *Hui O Hana*: PADDLES I 2:15–4:15pm

  STEERSMEN: Coastal Ocean Observing Systems- Roger Lukas, Mark Merrifield; Data Management - Henry Wolter; Decision-Support Tools and Training - Russell Jackson; Communications Infrastructure and Information Dissemination - Kelly Sponberg; Post-Disaster Evaluation and Performance Indicators -

David Kennard; Traditional Knowledge and Practices - Chris Chung; Education and Outreach- Laura Kong

BREAK — as needed

- Wrap-Up and Feedback — 4:15–4:30pm

EVENING: Pau Hana Sunset Reception — 6:00–8:00pm

Thursday, March 18 – DAY THREE

- Recap and Review of Agenda — 8:30–8:45am
- Establishing the *Hui O Hana*: PADDLES II — 8:45–10:00am

BREAK — 10:00 am

- Reaching for Higher Ground/Defining Pacific Partnerships — 10:15am–12:00pm

LUNCH — **NOON**

- Revising and Refining the Action Plan: CHARTING A COURSE — 1:00–2:30pm
- Establishing a Regional Coordinating Body: ASSEMBLING THE CREW — 2:30–3:15pm

BREAK — 3:15 pm

- Immediate Next Steps — 3:30–4:00pm
- Closing and Evaluation — 4:00–4:30pm
- Convening of the Coordinating Body: LAUNCHING THE CANOE — 4:30–5:30pm

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Roger Lukas	UH Oceanography: ocean and atmosphere physics; observing systems
Carla Manuel	NOAA Pacific Services Center, strategic and financial planning
John Marra	NOAA Pacific Services Center, Coastal Hazards Specialist
John McCarroll	US EPA, Pacific Islands Office, San Francisco
Kris McElwee	Training and Outreach Coordinator, traditional knowledge
Robert McLeod	NWS Dissemination Services, outreach, Warning Coordination Meteorologist Program
Mark Merrifield	UH Department of Oceanography
Jill Meyer	Coastal Resource Specialist – Office of Response and Restoration – Pacific Island Coordinator – NOAA
Alan Mikuni	U.S. Geological Survey
Lucas Moxey	NOAA National Marine Fisheries Service
Peter Nicholson	Assoc. Professor, Civil and Environmental Engineering, University of Hawai`i
Ann Ogata-Deal	Coastal Hazards Lead, Hawai`i Coastal Zone Management Program
Wilson W. Orr	Integrated urban growth; disaster modeling for planners and elected officials
Marina Piscolish	Facilitator
Gingerlei Porter	American Samoa Projects/Program Coordinator for Telecommunication Information Policy Group (TIP-G)//PEACESAT/State Telehealth Access Network (STAN)
Karen Rosa	U.S. Fish and Wildlife Service, Environmental Contaminants Program, Honolulu
Andra Samoa	Chief Coordinator of ASG DELTA Consortium/ASG PEACESAT Director, ASPA Telecommunication and Policy Specialist
Colin Schulz	Telecommunications Consultant, Pacific Islands Meteorological Project
Eileen Shea	East-West Center
Nori Shoji	NOAA Detailee to the Office of Senator Daniel K. Inouye
Kalani Souza	Facilitator
Kelly Sponberg	UCAR-JOSS at NOAA Office of Global Programs in collaboration with the USAID Office of Foreign Disaster Assistance; primary activity is RANET
Adam Stein	NOAA Pacific Services Center, Geospatial Technician, Honolulu
Craig Tasaka	State GIS Program Manager/Coordinator, Office of Planning, State of Hawai`i
Bill Thomas	NOAA Pacific Services Center, Kahuna iki
Donald Thomas	Center for Study of Active Volcanoes, University of Hawai`i Training in Volcano Hazard Monitoring and Assessment; All-hazards Public Outreach Program
Sam Thomas	NOAA Pacific Services Center, Program Analyst
Ken Waters	NOAA National Weather Service
Jim Weyman	NWS Central Pacific Hurricane Center/WFO Honolulu
Gerald E. Wheaton	Pacific Islands Navigation Manager, Nautical chart, Coast Pilot
Edwina Williams	Project Manager, Civil and Public Works Branch, COE
Henry Wolter	U.S. Geological Survey National Mapping Liaison for Hawaii and Pacific Basin!
Debra Woodard	Department of Homeland Security, Emergency Preparedness & Response Directorate
Bryce Wyble	National Geospatial-intelligence Agency (formerly NIMA) representative to USARPAC
Eric Yamashita	GIS Research/Planning Analyst, University of Hawai`i Social Science Research Institute
Brian Yanagi	Hawai`i State Civil Defense
Sterling Yong	State of Hawai`i DLNR, Engineering Division
Edward H. Young, Jr.	Deputy Director, NWS Pacific Region
Sally Ziolkowski	Dept. of Homeland Security/FEMA Region IX, Federal Insurance and Mitigation Division

APPENDIX D. RISK MANAGEMENT–RELATED INTERNET RESOURCES

Agency, Institution, Organization	Web Site	Description
Federal Agencies		
DisasterHelp.Gov	disasterhelp.gov	Provides information and services relating to disaster preparedness, response, recovery, and mitigation. Later phases will incorporate delivery of cross-agency processes and services to citizens, governments, and NGOs.
Army Corps of Engineers (ACOE)	www.usace.army.mil	ACOE home page. Includes general information on ACOE's mission and links to internal departments.
ACOE: Honolulu District Office	www.poh.usace.army.mil	Honolulu District Office home page. Includes general information and links to past, present, and future projects across the Pacific.
US Coast Guard (USCG): Marine Safety and Environmental Protection Web site	www.uscg.mil/hq/g-m/gmhome.htm	Daily updated site including information on merchant mariner licensing, navigation rules, regulatory information, waterways management, vessel documentation, and marine safety.
USCG: National Response Center (NRC)	www.nrc.uscg.mil	The sole federal point of contact for reporting oil and chemical spills. Highlights include incident summaries, extensive links page, and a portal for downloading historic spill data and reporting any type of spill.
Environmental Protection Agency (EPA): Environmental Monitoring and Assessment Program (EMAP)	www.epa.gov/emap/	EMAP develops tools necessary to monitor and assess the status and trends of national ecological resources. Links to EMAP publications, projects, and data.
EPA: Global Warming Site	yosemite.epa.gov/oar/globalwarming.nsf	Summarizes the nationwide impact of emission effects and what is being done, and includes an extensive resource center for outreach and publications.
EPA Publication: The Probability of Sea-Level Rise	www.gcrio.org/EPA/sealevel/	An EPA report that develops probability-based projections that can be added to local tide-gauge trends to estimate future sea level at particular locations.
Federal Emergency Management Agency (FEMA)	www.fema.gov	Homepage for the US Department of Homeland Security's Federal Emergency Management Agency

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
FEMA Publication: Are You Ready? A Guide to Citizen Preparedness	www.fema.com/areyouready/	This document brings together facts on disaster survival techniques, disaster-specific information, and how to prepare for and respond to both natural and man-made disasters.
FEMA: Flood Hazard Mapping	www.fema.gov/mit/tsd/dl_cgs.htm	Includes guidelines and specifications for flood hazard mapping partners. Highlights include FAQs, tutorials, e-mail list registration, and map modernization updates.
FEMA: Region 9 Homepage	www.fema.gov/regions/ix/	Serves AZ, CA, HI, NV, American Samoa, Guam, CNMI, Marshall Islands, and the Federated States of Micronesia. Includes general information about organization, disasters, partners, and updated news.
FEMA: Global Emergency Management System (GEMS)	www.app1.fema.gov/gems/	An on-line, searchable database containing links to Web sites related to emergency management.
FEMA: HAZUS MH Model (Multi-Hazards US)	www.fema.gov/hazus/	Home page for FEMA modeling suite for estimating potential losses from earthquakes, floods, and hurricanes. This site contains links to user groups, related literature, and extensive lists of resources.
Non-profit HAZUS Site	www.hazus.org	Operated and maintained by the Western Disaster Center (WDC). Resource for HAZUS users with information on guidelines, best management practices, user groups, and extensive HAZUS links.
National Aeronautical and Space Agency (NASA): Earth Observing System (EOS)	eospso.gsfc.nasa.gov	EOS home page contains details on all EOS missions and links to EOS-related sites for data and resources. Excellent source for education materials for all education levels.
NASA: Ocean Surface Topography from Space	sealevel.jpl.nasa.gov	Excellent source for global oceanic data and technology information. Contains resources for educators and researchers.
NASA: Sea-viewing Wide Field-of-view Sensor (SeaWiFS)	seawifs.gsfc.nasa.gov/SEAWIFS.html	Provides quantitative data on global ocean bio-optical properties to the Earth science community. Web site includes general information and links to data sets.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NASA: Seawinds – Measuring Ocean Winds from Space	winds.jpl.nasa.gov	NASA Jet Propulsion Lab Web site for programs measuring ocean winds from space. Includes data platform descriptions, data sets, publications, and educational resources.
National Oceanic and Atmospheric Administration (NOAA): Center for Costal Monitoring and Assessment (CCMA)	ccmaserver.nos.noaa.gov	CCMA conducts research monitoring, surveys, and assessments of coastal environmental quality. Home page contains links to the three program divisions: remote sensing development, bioeffects data, and biogeographic assessment.
NOAA: TOPEX/POSEIDON Analysis	ibis.grdl.noaa.gov/SAT/hist/	NASA/CNES satellite altimeter, Topex/Poseidon, collects sea level observations. Analyses based on these data are available in three different forms.
NOAA: Climate Diagnostic Center (CDC)	www.cdc.noaa.gov	CDC develops national capabilities to analyze, interpret, and forecast important climate variations. Includes focus information, data availability, research, and an excellent links page for finding weather-related data.
NOAA: Climate Monitoring and Diagnostic Laboratory (CMDL)	www.cmdl.noaa.gov	CMDL research links related to carbon cycling, climate change, ozone depletion, and air quality. Includes links to products and research stations in Hawai`i and Samoa.
NOAA: Climate Prediction Center (CPC)	www.cpc.ncep.noaa.gov	Includes extensive links to national hazard-related data and forecasts and a link to the Tropical Pacific Climate Information and Prediction Center (TPCIPC).
NOAA: CPC Tropical Pacific Climate Information and Prediction Center (TPCIPC)	www.cpc.ncep.noaa.gov/pacdir/	Includes tropical Pacific rainfall forecasts, sea level rise data, and forecasts. Also contains links to outreach materials and excellent links page for Pacific-related Web sites.
NOAA: CPC Monitoring and Data Index	www.cpc.ncep.noaa.gov/products/MD_index.html	Provides global oceanic and atmospheric data, precipitation, and temperature data and graphics. Also includes specific links to Pacific Island climate data and graphics.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: Office of Ocean and Coastal Resource Management (CZM)	www.ocrm.nos.noaa.gov	OCRM is responsible for implementing the Coastal Zone Management Act of 1972. The organization has two major programs: The Coastal Zone Management Program (CZM) and the National Estuarine Research Reserve System (NERRS).
NOAA: OCRM Coastal Zone Management Program (CZM)	www.ocrm.nos.noaa.gov/czm/resource.html	CZM home page with links to state affiliates, details on the Coastal Zone Management Act, publications, and other resources.
NOAA: National Centers for Coastal Ocean Science (NCCOS)	coastalscience.noaa.gov	NCCOS conducts and supports research, monitoring, assessment, and technical assistance for managing coastal ecosystems. Web site has links to products, outreach, news, etc.
NOAA: National Climatic Data Center	lwf.ncdc.noaa.gov/oa/ncdc.html	NCDC supports a three-tier national climate services support program: NCDC, Regional Climate Centers, and State Climatologists. Web site has links to data and center products and information.
NOAA: National Environmental Satellite, Data, and Information Service (NESDIS)	www.nesdis.noaa.gov	NESDIS provides access to global environmental data from satellites and other sources to promote, protect, and enhance economy, security, environment, and quality of life.
NOAA: NESDIS Hazards Support Activities	www.ngdc.noaa.gov/seg/hazard/activity/	Links to data products and resources for hazards data, assessment, and response.
NOAA: NESDIS National Geophysical Data Center (NGDC)	www.ngdc.noaa.gov	NGDC provides scientific stewardship, products, and services for geophysical data describing the solid earth, marine, and solar-terrestrial environment, as well as earth observations from space.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: NESDIS NGDC Marine Geology and Geophysics (MGG)	www.ngdc.noaa.gov/mgg/	MGG compiles, maintains, archives, and distributes data in both coastal and open ocean areas including bathymetry and gridded relief, trackline geophysics, sediment thickness, data from ocean drilling and seafloor sediment and rock samples, and digital coastlines.
NOAA: NESDIS International and Interagency Affairs Office	nedi.gov	Web site currently under construction.
NOAA: NESDIS NGDC Natural Hazards Data	www.ngdc.noaa.gov/seg/hazard/	Includes NGDC historical hazards data and outreach materials, including excellent photos of potential hazards.
NOAA: NESDIS NGDC Natural Hazards Data Resources Directory	www.ngdc.noaa.gov/seg/hazard/resource/	An excellent resource for the disaster and hazard management community. Includes 1) data resources organized by natural hazard topic; and 2) lists of hazard-related organizations.
NOAA: National Weather Service (NWS) National Hurricane Center (NHC)	www.nhc.noaa.gov	Links to Atlantic and Eastern Pacific storm data and information. Good source for links to other tropical weather–related sites including the Joint Typhoon Warning Center.
NOAA: NWS Automated Weather Information Processing System	www.nws.noaa.gov/geodata/	This catalog assembles and promulgates spatial geographic information issued by the NWS for use by the user community.
US Department of Defense (DOD): Joint Typhoon Warning Center (JTWC)	metoc.npmoc.navy.mil/jtwc.html	JTWC is the agency responsible for issuing tropical cyclone warnings for the Pacific and Indian Oceans.
NOAA: NGDC Coastline Extractor	rimmer.ngdc.noaa.gov/coast/	Web site for downloading international coastlines by lat/long coordinates.
NOAA: National Geodetic Survey (NGS) Shoreline Data Explorer Web site.	www.ngs.noaa.gov/RSD/shoredata/NGS_Shoreline_Products.htm	NGS compiles shoreline data for application to the nautical charts produced by NOAA Office of Coast Survey. Download data here.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: National Ocean Service (NOS)	www.nos.noaa.gov	NOS is a scientific and technical organization whose mission is to preserve and enhance the nation's coastal resources and ecosystems. Great place to begin any search for U.S. coastal information and data.
NOAA: NOS Center for Operational Oceanographic Products and Services (CO-OPS)	www.co-ops.nos.noaa.gov	CO-OPS collects, analyzes, and distributes historical and real-time observations and predictions of water levels, coastal currents, and other meteorological and oceanographic data.
NOAA: NOS Office of Coast Survey (OCS)	chartmaker.ncd.noaa.gov	The Office of Coast Survey's Historical Map & Chart Collection contains over 20,000 maps and charts from the late 1700s to present day. Get digital maps and data here.
NOAA: NOS Coastal Services Center (CSC) Coastal Hazards	www.csc.noaa.gov/themes/coasthaz/	Excellent source of information on Coastal Services Center coastal hazards–related projects, products, and partnerships. Includes an excellent set of links to other hazard-related Web sites.
NOAA: Coastal Services Center Funding Opportunities Information	www.csc.noaa.gov/text/grant.html	Links to federal, state, and community Web sites that provide information on funding opportunities for natural resource protection issues.
NOAA: Coastal Services Center Coastal Zone Information Center (CZIC)	unicorn.csc.noaa.gov/docs/czic/	Library of documents submitted by state coastal zone management programs in accordance with the Coastal Zone Management Act of 1972.
NOAA: OCRM and NOS Coastal Hazards and Information System (COHIS)	www.ocrm.nos.noaa.gov/czm/cohis/ProjectSummary.html	A joint initiative of NOAA, FEMA, and the coastal management programs in GA and AL to advance the ability to respond to a hurricane disaster through application of a GIS and GPS.
NOAA: Coastal Services Center Historical Hurricane Tracks Tool	hurricane.csc.noaa.gov/hurricanes/	The Historical Hurricane Tracks tool is an interactive mapping application that allows you to easily search and display 150 years of Atlantic Basin tropical cyclone data.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: Coastal Services Center Community Vulnerability Assessment Tool (CVAT)	www.csc.noaa.gov/products/nchaz/startup.htm	An informational aid designed to assist communities in their efforts to reduce hazard vulnerability. Site contains a methodology that helps local and state governments determine and prioritize their localities' vulnerability to coastal hazards.
NOAA: Coastal Services Center Vulnerability Assessment Techniques and Applications (VATA)	www.csc.noaa.gov/vata/	An on-line resource for information on vulnerability assessment techniques and networking. Includes an extensive list of related links.
NOAA: Coastal Services Center Damage Assessment Tool	www.csc.noaa.gov/products/nchaz/htm/dassess2.htm	Coastal Services Center GIS tool for utilizing a vulnerability assessment database for rapid, accurate assessment of post-event hazard damage.
NOAA: Coastal Hazards Information Management System (COHIS)	www.ocrm.nos.noaa.gov/czm/cohis/ProjectSummary.html	COHIS is an ArcView-based system modeled after South Carolina's Office of Ocean and Coastal Resource Management's "Post Hurricane Recovery Project."
NOAA: Coastal Services Center Topographic Change Mapping	www.csc.noaa.gov/crs/tcm/	Resource for coastal topographic data and related information and tools. Includes LIDAR, InSAR, and IfSAR information and links.
NOAA: Coastal Services Center Dune Hazard Assessment Tool (DHAT)	www.csc.noaa.gov/beachmap/html/dune_model.html	DHAT is a GIS tool that allows coastal planners to predict the impact of erosion on oceanfront properties and developments.
NOAA: Coastal Services Center Shoreline Data	www.csc.noaa.gov/shoreline/	Provides the ocean and coastal resource management community with data and information related to shoreline mapping.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: NOS Pacific Services Center (PSC)	www.csc.noaa.gov/psc/	PSC develops and delivers coastal management information and services to the State of Hawai`i, Territories of American Samoa and Guam, and CNMI.
NOAA: PSC Pacific Island Partners	www.csc.noaa.gov/psc/partners.html	A complete list of links to PSC partners in U.S. Pacific Islands.
NOAA: NOS Mapfinder	oceanservice.noaa.gov/mapfinder/	The NOS MapFinder service provides “one stop shopping” for images and data from a number of National Ocean Service (NOS) offices.
NOAA: OCS NOWCOAST	chartmaker.ncd.noaa.gov/csdl/op/nowcoast.htm	An on-line, real-time physical meteorological, oceanographic, river, and air/water quality information Web portal. In addition to this observation data, the portal provides NOAA forecasts for major estuaries, seaports, and adjacent coastal regions.
NOAA: NESDIS National Oceanographic Data Center (NODC)	www.nodc.noaa.gov	NODC archives & provides public access to global oceanographic and coastal data, products, and information.
NOAA: National Severe Storms Laboratory (NSSL)	www.nssl.noaa.gov	NSSL leads the way in investigations of all aspects of severe weather. A partnership with the National Weather Service dedicated to improving severe weather warnings and forecasts in order to save lives and reduce property damage.
NOAA: NESDIS Tropical Events	www.osei.noaa.gov/Events/Tropical/	Includes multichannel color composite imagery and animations of tropical cyclones at different stages of development from polar and geostationary satellites.
NOAA: National Weather Service (NWS)	www.nws.noaa.gov	NWS homepage. NWS provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters, and ocean areas.
NOAA: NWS Pacific Region Headquarters (PRH)	www.prh.noaa.gov	PRH homepage with links to all Pacific region offices. Also contains links to all current forecasts and observations in the Pacific region.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: Hurricane Homepage	hurricanes.noaa.gov/	Includes extensive resources for preparedness, and outreach. Complete set of links for tropical cyclones and hurricanes including the Central Pacific Hurricane Center.
NOAA: Office of Global Programs (OGP)	www.ogp.noaa.gov	OGP leads the Climate and Global Change (C&GC) Program. OGP sponsors scientific research aimed at understanding climate variability and its predictability.
NOAA: Office of Response and Restoration (OR&R)	response.restoration.noaa.gov	OR&R homepage has links to tools and information for emergency responders and planners, and others working to understand and mitigate the effects of oil and hazardous materials in our waters and along our coasts.
NOAA: Office of Oceanic and Atmospheric Research (OAR)	www.oar.noaa.gov	NOAA research is conducted through OAR. It is the driving force behind environmental products and services that protect life and property and promote sustainable economic growth. Includes links to all NOAA-affiliated research partners.
NOAA: Pacific Marine Environmental Laboratory (PMEL)	www.pmel.noaa.gov	PMEL carries out interdisciplinary scientific investigations in oceanography and atmospheric science. Programs focus on open ocean observations in support of long-term monitoring and prediction of the ocean environment. Links to specific programs and products.
NOAA: PMEL El Niño Page	www.pmel.noaa.gov/tao/elnino/other-buoys.html	El Niño theme page providing links to El Niño resources across the Internet.
NOAA: PMEL Tsunami Research Program	www.pmel.noaa.gov/tsunami/	The PMEL Tsunami Program seeks to mitigate tsunami hazards to Hawaii, California, Oregon, Washington, and Alaska. Research and development activities focus on an integrated approach to improving tsunami warning and mitigation.
NOAA: PMEL Impacts of El Niño and Benefits of El Niño Prediction	www.pmel.noaa.gov/tao/elnino/impacts.html	Discusses the impacts of El Niño and provides extensive links to sites that research global societal impacts.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: NCDDC Coastal Risk Atlas (CRA)	www.ncddc.noaa.gov/cra/	The CRA is a project of the National Coastal Data Development Center (NCDDC) undertaken jointly with the NOAA Coastal Services Center (CSC). The purpose of the project is to deliver an online risk/vulnerability atlas for the coastal U.S.
NOAA: Coastal Storms Initiative (CSI)	www.ndbc.noaa.gov/csi.shtml	CSI is a crosscutting multi-line office initiative designed to achieve an enhanced, seamless observation-to-user capability across NOAA. CSI will provide accessible data and information, forecasts, value-added tools, and training for users regarding coastal storm impacts within coastal watersheds.
NOAA: Climate and Societal Interactions Division (CSI) and Environment, Science and Development (ESD) in the South Pacific	www.ogp.noaa.gov/mpe/csi/appdev/spac/	The CSI/ESD South Pacific Web page includes information and links to previous and current projects in the South Pacific.
NOAA: NWS National Data Buoy Center (NDBC)	www.ndbc.noaa.gov	Provides real-time and archived data from moored buoys, C-man stations, and ship observations.
NOAA: NWS About Tsunamis Page	wcatwc.gov/subpage1.htm	Information from the West Coast and Alaska Warning Center.
NOAA: NWS Latest Satellite Imagery	www.nhc.noaa.gov/satellite.shtml	Provides latest imagery from the National Environmental Satellite, Data, and Information Service (NESDIS).
NOAA: FAQs about Hurricanes, Typhoons, and Tropical Cyclones	www.aoml.noaa.gov/hrd/weather_sub/faq.html	Provides definitions, information on cyclone names, records, winds, historical data, and more.
NOAA: Near-Real-Time Sea Level Data	ibis.grdl.noaa.gov/SAT/near_rt	Provides altimeter, ocean current, and global oceanic modeling data from multiple NOAA sources.
NOAA: Photo Library	www.photolib.noaa.gov	Contains over 20,000 images of weather, space, shores, coastal seas, and marine species.
NOAA: NGDC Tsunami Event Database	www.ngdc.noaa.gov/seg/hazard/tsevsrch.shtml	Consists of an event database with information on cause, source location, magnitude, and intensity and a runup database with locations where tsunami effects occurred.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
NOAA: PMEL Tsunami Research Program	www.pmel.noaa.gov/tsunami/	The PMEL Tsunami Program seeks to mitigate tsunami hazards to Hawai`i, California, Oregon, Washington, and Alaska. Site contains links to data and products.
NOAA: NODC World Ocean Database 2001	www.nodc.noaa.gov/OC5/WOD01/pr_wod01.html	Extensive database providing global ocean basin and surface data from multiple platforms in many formats.
NOAA: La Niña Page	www.elnino.noaa.gov/lanina.html	Provides links to general information, data, forecasting, and impacts of La Niña.
NOAA: 1998 Year of the Ocean: Mitigation the Impacts of Coastal Hazards	www.yoto98.noaa.gov/yoto/meeting/hazard_316.html	This document discusses background issues related to planning for coastal hazards.
NOAA: NOS Tides Online	tidesonline.nos.noaa.gov	Presents current and historical data from active stations in the National Water Level Observation Network.
United States Geological Survey (USGS): Atlas of Natural Hazards in the Hawaiian Coastal Zone	geopubs.wr.usgs.gov/i-map/i2761/	The purpose of this report is to communicate to citizens and regulatory authorities the history and relative intensity of coastal hazards in Hawai`i.
USGS: Coastal and Marine Geology Program	marine.usgs.gov	Home page for USGS marine geology data, products, information, and news.
USGS: Hawaiian Volcano Observatory	wwwhvo.wr.usgs.gov	This USGS page contains updated information on Hawaii's volcanoes including eruption and seismic activity. Also includes a link to CNMI volcanic activity.
USGS: Northern Mariana Islands Volcanic Activity	hvo.wr.usgs.gov/cnmi/	Information on Anatahan, including daily updated eruption and seismic activities.
USGS: National Research Program (NRP)	water.usgs.gov/nrp/	NRP conducts basic and problem-oriented hydrologic research in support of the mission of the USGS. Web site includes links to supported models, research projects, and research institutes.

Agency, Institution, Organization	Web Site	Description
Federal Agencies (cont.)		
USGS: National Earthquake Information Center (NEIC)	neic.usgs.gov	NEIC rapidly determines location and size of all destructive earthquakes worldwide and immediately disseminates this information. This is an excellent resource for maps, outreach materials, news, and data.
USGS: Hurricane and Extreme Storm Impact Studies	coastal.er.usgs.gov/hurricanes/	Provides an overview of hurricanes, impact studies of selected storms, and information on three investigative components: Scanning Airborne Laser (Lidar), Oblique Aerial Video and Still Photography, and Ground Surveys.
USGS: Hazards Home Page	www.usgs.gov/themes/hazard.html	Homepage for all USGS hazards work. Links to long-term monitoring and forecasting, short-term prediction, real-time monitoring, and communication capabilities.
USGS: Center for Science Policy	wgsc.wr.usgs.gov/csp/	Responsible for integrating science and stakeholders in natural hazards decision making. Provides links to the three research agendas.
USGS: Tsunamis & Earthquakes	walrus.wr.usgs.gov/tsunami/	General information on how local tsunamis are generated by earthquakes as well as animations, virtual reality models of tsunamis, and summaries of past research studies.
USGS: Geology Homepage	geology.usgs.gov/	The home page for the USGS geology discipline. Contains links to real-time hazards data and active research programs.
USGS: Coastal Storms and Tsunamis	www.usgs.gov/themes/coast.html	One of several hazards theme pages with links to related USGS work on coastal storms.
USGS: Coastal and Nearshore Erosion	walrus.wr.usgs.gov/hazards/erosion.html	Links to USGS coastal and nearshore erosion studies and research.
Nonprofit and Academic Institutes		
Duke University: Program for the Study of Developed Shorelines	www.env.duke.edu/psds/	Includes information on coastal hazards, erosion, advocacy, preservation, and stabilization of the shoreline.

Agency, Institution, Organization	Web Site	Description
Nonprofit and Academic Institutes (cont.)		
H. John Heinz III Center for Science, Economics and the Environment	www.heinzctr.org	A nonprofit institution dedicated to improving the scientific and economic foundation for environmental policy.
Florida International University: International Hurricane Center (IHC)	www.ihc.fiu.edu	An interdisciplinary research center focused on the mitigation of hurricane damage to people, the economy, and the built and natural environments.
University of Colorado: Natural Hazards Center (NHC)	www.colorado.edu/hazards/	A clearinghouse concerning the social science and policy aspects of disasters. The Center collects and shares research and experience related to preparedness, response, recovery, and mitigation.
World Meteorological Organization: World Climate Research Programme (WCRP)	www.wmo.ch/web/wcrp/	Objectives of the program are to develop the scientific understanding of the physical climate and climate processes needed to determine to what extent climate can be predicted and the extent of human influence on climate.
Florida State University: Annotated List of El Niño Resources	www.coaps.fsu.edu/lib/enso_sites.html	A compilation of Web resources maintained by DOC, NOAA, PMEL, and TAO.
CLIVAR: An International Research Programme on Climate Variability and Predictability	www.clivar.org	An international research program addressing many issues of natural climate variability and anthropogenic climate change.
U.S. Global Change Research Information Office	www.gcrio.org	Data and information on climate change research, adaptation and mitigation strategies, and related educational resources.
Coastal Hazards Information Clearinghouse	coastalhazards.wcu.edu	Provides detailed discussions of hazards, images of property damage, and state coastal hazards maps. Hosted by Western Carolina University.
Coastal Management	www.coastalmanagement.com	Extensive source of interesting and informative Web sites to assist you to manage, use, and research the world's coasts.

Agency, Institution, Organization	Web Site	Description
Nonprofit and Academic Institutes (cont.)		
Organization of American States: Natural Hazards Project (NHP)	www.oas.org/nhp/	NHP supports member states to assess their vulnerability to natural hazards and mitigate the effects of disasters through technical assistance and training and technology transfer.
HAZNET	www.haznet.org	The site to find out how Sea Grant programs are working together to better understand coastal natural hazards and develop ways to reduce their impacts on lives, property, and coastal economies.
East-West Center	www.eastwestcenter.org	An education and research organization established by the U.S. Congress in 1960 to strengthen understanding and relations between the United States and the countries of the Asia Pacific region.
Pacific Disaster Center (PDC)	www.pdc.org/iweb/	PDC is an information technology-based applications center designed to provide world-class information products and services to federal, state, local, and regional emergency managers.
HazardsMap.gov: The Multi-Hazard Mapping Initiative	www.hazardmaps.gov	A FEMA living atlas of hazards data and map services for advisory purposes supplied from a network of hazard and base map providers.
University of Hawaii: Social Science Research Institute	www.ssri.hawaii.edu	SSRI facilitates and supports interdisciplinary, applied research that addresses critical, social, environmental, and economic problems primarily in Hawai'i and the Asia Pacific region.
Pacific ENSO Applications Center	lumahai.soest.hawaii.edu/Enso/index.html	A multi-institutional partnership to conduct research and produce information products on climate variability related to the El Niño - Southern Oscillation (ENSO) climate cycle in the US Pacific Islands.
Shore and Beach	www.asbpa.org/shore_beach.html	The American Shore and Beach Preservation Association professional on-line journal.
Intergovernmental Oceanographic Commission (IOC) of UNESCO	ioc.unesco.org/iocweb/	The IOC provides member nations of the United Nations with a mechanism to enhance research and technology transfer to address individual and global marine resource issues.

Agency, Institution, Organization	Web Site	Description
Nonprofit and Academic Institutes (cont.)		
Ocean Portal	ioc.unesco.org/oceanportal	A high-level Web portal of ocean data and related information.
HazPac from Crowdingtherim.org	www.crowdingtherim.org/docs/ctr/online.html	HazPac is an on-line map and database that allows you to explore and learn about natural hazards of the Pacific Rim.
United Nations Ocean Atlas	www.oceansatlas.org	An information system designed for use by policy makers who need to become familiar with ocean issues and by scientists, students, and resource managers who need access to underlying databases and approaches to sustainability.
SOPAC	www.sopac.org.fj	SOPAC is mandated to contribute to sustainable development, reduced poverty, and enhanced resilience for the people of the Pacific by supporting the development of natural resources, investigating natural systems, and reducing vulnerability through applied environmental geosciences, appropriate technologies, knowledge management, technical and policy advice, human resource development, and advocacy of Pacific issues.
South Pacific Regional Environment Program (SPREP)	www.sprep.org.ws	SPREP's mandate is to promote cooperation in the Pacific islands region and to provide assistance in order to protect and improve the environment and to ensure sustainable development for present and future generations.
HURREVAC	www.hurrevac.com	The support site for users of the HURREVAC program. HURREVAC stands for HURRicane EVACuation program on a computer. The program was developed to meet a need for computer-based management of data produced by various federal hurricane evacuation studies.

APPENDIX E. AGENCY, INSTITUTION, AND ORGANIZATION ACRONYMS

NOAA National Oceanic and Atmospheric Administration
- **PPI** Office of Program Planning and Integration
- **NOS** National Ocean Service
  - **CSC** Coastal Services Center
    - **PSC** Pacific Services Center
  - **CO-OPS** Center for Oceanographic Operational Products and Services
  - **NCCOS** National Centers for Coastal Ocean Science
  - **NGS** National Geodetic Survey
  - **NMS** National Marine Sanctuaries
  - **OCRM** Office of Ocean and Coastal Resource Management
  - **OCS** Office of Coast Survey
  - **ORR** Office of Response and Restoration
    - **USAICRC** United States All Islands Coral Reef Committee
- **NWS** National Weather Service
  - **GFO** Guam Forecast Office
  - **HFO** Honolulu Forecast Office
  - **PEAC** Pacific ENSO Applications Center
  - **PRH** Pacific Region Headquarters
- **OAR** Office of Oceanic and Atmospheric Research
  - **OGP** Office of Global Programs
  - **PMEL** Pacific Marine Environmental Laboratory
- **NESDIS** National Environmental Satellite, Data, and Information Service
  - **NCDDC** National Coastal Data Development Center
- **NMFS** National Marine Fisheries Service

DHS Department of Homeland Security
- **FEMA** Federal Emergency Management Agency

EPA Environmental Protection Agency
NGA National Geospatial-Intelligence Agency
USACOE United States Army Corps of Engineers
- **ERDC** Engineer Research and Development Center

USGS United States Geologic Survey
USFW United States Fish and Wildlife Service
USN United States Navy
- **JTWC** Joint Typhoon Warning Center

EWC East-West Center
- **PDC** Pacific Disaster Center

PBDC Pacific Basin Development Council
PREL Pacific Resources for Education and Learning
SOPAC South Pacific Applied Geoscience Commission
SPREP South Pacific Regional Environment Programme
UNDESA United Nations Department of Economic and Social Affairs
UNESCO United Nations Educational, Scientific, and Cultural Organization
- **ITIC** International Tsunami Information Center

ABOM Australian Bureau of Meteorology
NIWA National Institute of Water and Atmospheric Research (of New Zealand)

HCD State of Hawai`i Civil Defense
- **HSHMF** Hawai`i State Hazard Mitigation Forum

HSOP Hawai`i State Office of Planning
- **HCZM** Hawai`i Coastal Zone Management Program

HDLNR Hawai`i Department of Land and Natural Resources

OCCL Office of Conservation and Coastal Lands
UH University of Hawai`i
CSAV Center for Study of Active Volcanoes
SLC Sea Level Center
SOEST School of Ocean and Earth Science and Technology
IPRC International Pacific Research Center
APDRC Asia-Pacific Data Research Center
SSRI Social Sciences Research Institute

ASG American Samoa Government
DELTA Consortium Distance Education, Learning and Telehealth Applications
DOC Department of Commerce
ASCMP American Samoa Coastal Management Program

SGCP Sustainability and Global Change Program (of Prescott College)
SSI Scientific Solutions, Incorporated

APPENDIX F. 2004 ROUNDTABLE OF FEDERAL HAZARD MITIGATION PARTNERS IN THE PACIFIC ISLANDS ORGANIZING COMMITTEE

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APPENDIX G. DRAFT RESOLUTION OF THE 2004 ROUNDTABLE

Resolution of the 2004 Roundtable of Federal Hazard Mitigation Partners in the Pacific Islands

RECALLING THAT
representatives from federal government and Pacific Island local, national, and regional agencies, institutions, and organizations involved in risk management–related programs and activities met for two days in Honolulu, Hawai`i, during March of 2003 and made recommendations to enhance communication, coordination, and collaboration related to the delivery and development of risk management–related programs and activities, and

RECOGNIZING THAT
significant progress was made in the implementation of these recommendations, and

WHEREAS,
1. the Pacific Islands constitute a region of great geographical, social, economic, environmental, political, and cultural diversity, and possess a diverse range of needs and capabilities that, in turn, presents unique challenges and opportunities; and

2. the Pacific Islands are exposed to a diverse range of hazards including those that are climate- and weather-related in nature, such as tropical cyclones and hurricanes, storm surges, heavy rains and flooding, landslides, drought, and sea-level changes; those associated with seismic or volcanic activity including tsunami; and those that are human-induced, such as oil spills and discharges of hazardous materials; and

3. these hazards present significant immediate and long-term threats to the lives and livelihoods of the people of the Pacific Islands, and a concerted integrated approach is required to reduce vulnerability and increase resiliency as a means of sustaining the viability of Pacific Island economies and ecosystems; and

4. *hazard mitigation* is generally defined as any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards, and *risk management* is not limited to longer-term actions that reduce risks to life and property; risk management encompasses more immediate actions pertaining to disaster preparedness, response, and recovery, encompasses the full spectrum of a community's social, economic, and environmental assets, and encompasses the full spectrum of risk management measures, including education and outreach; and

5. representatives from federal government and Pacific Island local, national, and regional agencies, institutions, and organizations involved in risk management–related programs and activities met for three days in Honolulu, Hawai`i, in March of 2004 to explore opportunities to enhance communication, coordination, and collaboration; and

6. deliberations during the meeting have identified opportunities for and recognized the mutual benefits of enhancing communication, coordination, and collaboration—among federal partners as well as other agencies, institutions, and organizations—as a means to address issues of local, national, and regional concern and more specifically to improve the efficiency in and the cost-effectiveness of the development and delivery of risk management–related information products and services.

NOW, BE IT THEREFORE RESOLVED, that the 2004 Roundtable of Federal Hazard Mitigation Partners in the Pacific Islands calls for

1. The formation of a regional coordinating body for the Pacific Islands Hazards `*Ohana*. Its mission will be to enhance communication, coordination, and collaboration among the network of partners and stakeholders in the Pacific Islands, and to cultivate a sense of community and an appreciation for the unique physical and cultural characteristics of the Pacific Islands. Its specific role will be to
   - ◊ support ongoing dialogue between the providers and users of risk management–related products and services;
   - ◊ support capacity-building by serving as a conduit for technical expertise, assistance, and training;
   - ◊ evaluate and prioritize risk management–related products and services needs so as to leverage financial, technical, scientific, and other resources;
   - ◊ promote collaboration and cooperation among local, national, and regional agencies, institutions, and organizations designed to address the risk management needs of Pacific Island communities;
   - ◊ enhance the coordination of federally and non-federally funded risk management programs and activities;
   - ◊ promote the integration of traditional and cultural knowledge and practices in all risk-management programs and activities; and
   - ◊ oversee the development and implementation of a joint regional action plan.

2. As a preliminary step toward meeting this first objective, the formation of an interim coordinating council to develop proposed operating policies and procedures of the coordinating council and working groups and to prepare a draft of the joint regional action plan for consideration at the 2005 Roundtable of Federal Hazard Mitigation Partners in the Pacific Islands (FHMPPI). The interim council is to be composed of pairs of representatives selected by consensus from each of the working groups, one from a federal agency and the other from the broader risk management community operating in the Pacific Islands. Service on the interim council is voluntary; however, each member or his or her designated alternate is expected to participate actively in the formulation of the operating policies and procedures and development of the draft joint regional action plan. To the maximum extent possible, members will bear the costs of their own participation, including the costs of travel to and attendance at the 2005 FHMPPI. Between now and the convening of the 2005 FHMPPI, the NOAA Pacific Services Center will serve as the lead in coordinating the efforts of the interim council.

3. The formation of the following set of interim working groups or, *hui o hana*: Climate Risk Management; Seismic, Volcanic, and Tsunami Risk Management; Human-Induced Risk Management; Coastal, Ocean, and Atmospheric Processes and Observations; Data Management; Data Analysis and Decision-Support Tools and Training; Communications Infrastructure and Information Dissemination; Post-Disaster Evaluation and Performance Indicators; Education and Outreach; and Traditional Knowledge and Practices. These working groups will provide guidance to the regional coordinating body in its efforts to evaluate and prioritize regional hazards-related products and services needs.

4. The convening of a 2005 Roundtable of Federal Hazard Mitigation Partners in the Pacific Islands. The primary purpose of this meeting will be to establish the formal operating policies and procedures of the coordinating body and to adopt a joint regional action plan.

Approved, this eighteenth day of March, two thousand and four, in Honolulu, Hawai`i.

E lauhoe mai na wa`a, pae aku i ka`aina.
If everyone paddles the canoe, the shore is reached.

HAZUS MH

PRELIMINARY SUMMARY OF ISSUES AND COMMENTS RELATING TO APPLICATIONS IN THE PACIFIC REGION FOR EARTHQUAKE, FLOOD AND HURRICANE LOSS ESTIMATION AND RELATED INFORMATION PRODUCTS

Comments from the Hawaii HAZUS Training and Proposed Users Group Attendees (January 5 to 8, 2004) and Members of the following State Civil Defense groups: Hawaii State Hazard Mitigation Forum, Multi-Hazard Science Advisory Committee, Hawaii State Earthquake Advisory Committee, Hawaii Hurricane Advisory Committee, and Tsunami Technical Review Committee

Draft Comments including local data requirements

Compiled by the

Hawaii State Earthquake Advisory Committee Planning Sub-Committee

March 11, 2004

Gary Chock editor's note: This preliminary summary is subject to revision based on additional input, further review of technical material, and case study investigation that may be performed using a beta version (Build 30) of the software.
(Version 1.0 of this white paper is anticipated March 31, 2004)

General Discussion:

1. **The HAZUS MH Build 30a did not contain a complete building dataset file for Hawaii**, in that all occupancy mapping schemes for assignment of specific building types were missing for the earthquake module. *This data should be provided to allow further evaluation. Also, a further description of the differences in regional data files between HAZUS 99 and MH should be provided for those communities that need to migrate Level 2 or 3 data to MH in the future (such as Hawaii).*

2. **Data for Guam has been discontinued in HAZUS MH.** The U.S. Territory of Guam has a high frequency of damaging earthquakes and typhoons. *Level 1 data in MH file formats should be restored for at least the earthquake module.*

3. **HAZUS MH should allow for expert user created regions outside of the 50 States.** *Development of the necessary data layers for many other application areas would be encouraged by adding this option to HAZUS.*

4. **Shelter needs are based on resident populations, and would not include the large visitor and military populations in military housing in Hawaii**. Shelter needs are based on the post-event scenario as a function of the level of damage to residential structures, not the pre-event needs (such as for hurricanes*). It would be helpful if the program would allow customized assignment of "transient" or "short-term" population sectors to user-specified occupancies within census tracts.*

5. **The ground-truthing option of recalculation of losses to account for actual damage reports does not exist in the Hurricane and Flood modules.** Ground truth input of damage data for updating loss calculations is one of the more valuable (and flexible) features that HAZIS MH could have. *It is highly recommended to FEMA that ground truthing feature be implemented across all modules. Use of HAZUS could then be integrated into exercises, and could help gain significantly greater acceptance by county officials in post-disaster response.*

6. **On-base military facilities are not included.** This will require additional data collection and modeling work for these areas, which are significant in Hawaii and Guam.

7. The building stock definition in HAZUS-MH is the same as the earthquake building stock definition in HAZUS-MH with regard to general occupancy (e.g., RES, COM, ...), specific occupancy (e.g., RES1, RES2, ...), and general building type (Wood, Masonry, Steel Frame, Concrete Frame, or Manufactured Home). However, **note that the RES3 occupancy class (multi-unit housing) has been subdivided into 6 sub-classes in HAZUS-MH: Duplex, 3-4 units, 5-9 units, 10-19 units, 20-49 units, 50 or more units.** The Hawaii Building Inventory Database will need to be parsed to produce these new subdivision proportions in each Hawaii and Maui census tract.

8. **The *specific building types* and construction characteristics used in the Hurricane and Flood models are different from the *specific building types* used in the Earthquake Model**. Therefore, separate "Level 2"building inventory customizations need to be developed in Hawaii for these two new modules.

9. INCAST inventory database collection tool for individual building information is now set up for data for all three modules. **Much of the INCAST data menu is not used by the current version of HAZUS MH. Therefore, the user of INCAST must have sufficiency of knowledge of HAZUS building parameters in order to efficiently collect the necessary data.** It is recommended that the INCAST menus identify the data fields associated with each hazard module, and also identify those that have no current (but perhaps future) relevance.

10. **Losses of storm flooding and wind are combined based on an assumption of correlation at the coastline (additive probability of loss) and independence at a certain buffer distance away from the coastline (additive loss).** Within the buffer, interpolation of the sum of losses is used. This empirical method has not been validated with actual storms, and so it may be discontinued at a future date.

11. **HAZUS 99 and HAZUS MH cannot be installed on the same computer. This would cause the HAZUS 99 output to be deactivated. Users should be advised of this limitation.** Therefore, comparative analyses between the two versions must be conducted on separate computers.

12. **There is considerable interest in exploring the possibility of integrating tsunami modeling in the future, if it could be done with input and methodology approval of the Tsunami Technical Review Committee.**

13. **HAZUS MH has some capability to utilize plume modeling layers produced by ALOHA.**

14. **State Civil Defense has stated that the default Level 1 dataset of HAZUS MH is only to be used for evaluation and training purposes**. No default HAZUS runs are to be used for public information products in Hawaii. (The SCD HAZUS 99 Earthquake Module is deemed to be at Level 3.)

Earthquake Module

The following discussion of the Earthquake Module includes some discussion of prior bugs in HAZUS 99 SR-1 and SR-2 as well as representations of the (unverified) status of the MH version:

1. **The earthquake module does not allow other specific building types to be input by the user**. This impacts the ability to model single wall construction and other building types used in the Pacific region. Currently, single-wall construction is implemented in the Hawaii model by a combination of customized fragilities of the wood-frame residential and mobile home categories.

   NIBS has indicated in mid-2003 that future released may have the capability for dynamic addition of custom building types. This is recommended as a high priority for the Pacific region. HAZUS MH does not have this capability for any of the three modules.

2. **The AAL analysis did not run for Hawaii on HAZUS MH.** *Will this be addressed in the next Build?*

3. **Hospitals could not be mapped for Hawaii in HAZUS MH**. *Will this be addressed in the next Build?*

4. **The PGA contour PESH analysis option did not run on HAZUS MH.** *Will this be addressed in the next Build***?**

5. **Once an AAL analysis is run for a region in HAZUS 99, it does not allow any further customization of parameters**. This is awkward, since a new duplicate region needs to be created for each AAL run. *The AAL option should be coded so that it can be run successively on a region to model the effects of parameter changes, such as code upgrades or mitigation, etc.*

6. **State Civil Defense (September 17, 2003) requested data synchronization and distribution of the improved HAZUS building inventory for Hawaii and Maui Counties produced by HSEAC to FEMA and the HAZUS software developers.**

   FEMA has stated that it "will replace the default building inventory in HAZUS <u>if a complete state set</u> is available, such as the replacement that was made for South Carolina. Currently the Hawaii data set is incomplete and cannot replace the HAZUS default. It is important to note that the database contained in the HAZUS methodology uses publicly available national datasets, with the exception of the South Carolina data which has been entirely replaced with local data."

7. **The treatment of damage costs parameters have been revised in HAZUS MH**. The Hawaii-customized specific cost files for HAZUS 99 will need to be modified in order to achieve the equivalent loss modeling result in MH. *Also, a further guide to the*

differences in regional data files between HAZUS 99 and MH should be provided for those communities that need to migrate Level 2 or 3 data to MH file structure in the future (such as Hawaii). All User Groups and local user agencies should be queried about future major changes in file structure, so that the net cost of ownership and maintenance of HAZUS can be considered by State and Counties.

8. **It is also important to note that customized data files developed for HAZUS 99 will not be directly transferable to MH without modification**, **due to GIS version and HAZUS coding changes.** *A further guide to the differences in regional data files between HAZUS 99 and MH should be provided for those communities that need to migrate Level 2 or 3 data to MH in the future (such as Hawaii).*

9. **The ground-truthing and "advanced engineering" options have not been case-studied in the Hawaii model**. This should be utilized in future work in Hawaii.

10. **An original (new) scenario must <u>always</u> be created in HAZUS 99 SR-1 and SR-2 or else results are not repeatable later:**

    Program does *not* clear the results from a previous analysis, and thus, does not output results reflecting the most recent run if a *pre-defined* scenario is re-run (software developer was notified in August, 2001 but problem was not fixed in the SR-2 version released in December 2001). As a result, identical scenario runs do not yield repeatable results if there is a different scenario that is run in between the first scenario and the repeated run of the pre-defined first scenario. Therefore, there is an unacceptable probability of spurious loss reporting by HAZUS.
    To avoid the problem, the work-around consists of always creating a new scenario name each time an analysis is needed, even if there have been no changes made in any manner to earthquake scenario parameters. A scenario must always be run as a new one; however, this greatly eliminates many of the options that HAZUS is supposed to have relating to more detailed analysis of a scenario where the PESH analysis is already performed, or of ground-truthing runs.

    The response of NIBS suggests that they did not believe this issue exists in HAZUS 99. However, this bug has been independently corroborated by the Pacific Disaster Center and the HAZUS Training instructor. The HAZUS MH beta should be checked for this occurrence. (A preliminary trial with a San Diego region appears to confirm this, but the incomplete Hawaii dataset did not allow verification for Hawaii.) Technical review and case studies will be required to verify solutions for previously known bugs.

    FEMA/NIBS should place resources towards issuing technical notes on all reported bugs in the future and issue software patches as required. At present, there is no technical support component that addresses dissemination and timely correction of bugs.

11. **Crystal Report files are not always cleared when a new scenario is initiated in HAZUS 99 SR-1 and SR-2**, leading to spurious reports generated from a mixture with the past scenarios run on the same region of study.

    The response of NIBS suggests that they did not believe this issue exists in HAZUS 99. However, this bug has been corroborated by the Pacific Disaster Center and the HAZUS Training instructor. *The HAZUS MH beta should be checked for this occurrence prior to public release.*

12. **The Munson & Thurber attenuation function for Hawaii events implemented in HAZUS 99 SR-2 does <u>not</u> report results for those census tracts that physically touch a defined high magnitude (>M7)fault from an earthquake event**. The losses from such near-field tracts are omitted (zero losses), and consequently all reports are misleadingly low.

    To avoid the problem in HAZUS 99, one must manually calculate the PGA and spectral values for the specific omitted tract by using the Munson & Thurber attenuation function, and reassign the values to the ground motion result database prior to estimating damage. Unfortunately, this means that user intervention and intimate knowledge of the Munson & Thurber attenuation calculation method is required.

    NIBS states that this has been solved in HAZUS MH. The method now used for estimating ground motion is to read from pre-populated tables of ground motion magnitudes of 5 to 8.5 in 0.1 increments and distances from events from 0 to 100 km in increments of 1 km.

    Beta testing of all attenuation functions should be implemented by FEMA as part of development. Independent technical review and case studies will be required to verify solutions for previously known bugs prior to operational MH use in Hawaii.

13. **The Munson & Thurber attenuation function implemented in HAZUS 99 does not place the near-field limit on PGA, contrary to the description in the manual**. This was supposed to be a modification of the original relationship described in the user manual. This was discovered when a large magnitude earthquake was run and PGA values above the limit value was observed.

    NIBS states that this has been solved in HAZUS MH. (A trial run using a San Diego region appears to confirm this.) Independent technical review and case studies will be required to verify solutions for previously known bugs prior to operational MH use in Hawaii.

14. **The Project Hawaii 97 attenuation function indicated in the GUI drop-down attenuation menu of HAZUS SR-2 is actually Sadigh, et al, 1993.** This was discovered by noticing the same results occur for both attenuation functions. (PGVs, spec velocities,

spec displ, losses, and spec acc are the same). The PGA results are slightly different. Each method selected from the GUI attenuation menu in HAZUS gives identical results from a scenario. Unfortunately, this means that it is impossible to perform runs using the weighted average attenuation consistent with the USGS seismic hazard mapping of Hawaii that is the basis for the NEHRP provisions.

NIBS states that a new attenuation function menu with a Hawaii 2000 function is included in the GUI of HAZUS MH and addresses this issue. *Beta testing of all attenuation functions should be implemented as part of development.*

Independent technical review and case studies will be required to verify solutions for previously known bugs prior to operational MH use in Hawaii.

15. **Method for changing soil types (on screen w/ info tool) per the users manual *corrupts* the region and does not work in HAZUS 99**. Soil types can only be changed by editing the soil database file manually.

    To avoid problem, the work-around consists of changing soil types in the database file and importing it as a soil data map. **The HAZUS GUI cannot be used for this purpose, contrary to the manual**. This makes input much more time-consuming.

    NIBS states that HAZUS MH has a new GUI to allow this.

    Technical review and case studies will be required to verify solutions for previously known bugs.

16. **HAZUS 99 casualties estimates are less than those estimated using SR1 and SR-2 for an earthquake scenario that yields nearly identical PGAs.**

    NIBS states that a new casualties model was incorporated into SR1 and SR2, and is also in MH. This new model accounts for outdoor casualties, among other things, and will produce different results. NIBS indicates that a discussion of the changes are included in the MH Technical Manual. *Is there a point of contact at the developer's office for further detail than that?*

17. Considering the operational issues relating to the bugs and required work-arounds, **it is difficult to place adequate confidence in the reliability on results run on HAZUS 99 for an actual event for emergency response purposes**, unless a calibration check control scenario is first run on the region created for the actual event as part of the operational procedure.

18. **It is important to note that the current version of the HAZUS-MH Earthquake Model is substantially slower than HAZUS 99 SR-2** due to the changes in the software architecture, among other things.

This issues is now being addressed through code optimization that will result in a faster running model in the 2004 Service Release 1 of HAZUS-MH. *What is the schedule for first public release and MH SR-1 (the current best estimate)?*

19. **Using the HAZUS earthquake module to estimate and interpret losses for use by governmental agencies requires expert skills in seismology and earthquake engineering.** Therefore, only qualified personnel should run HAZUS. GIS knowledge alone is not sufficient.

Hurricane Module:

It is our understanding that the Hurricane Module is programmed to continue in development through 2005. Hurricane loss estimation in the Pacific requires regionally-validated storm windfield modeling and tracking, topographic speedup modeling, terrain category and building inventory databases defined with detailed spatial resolution, and regional building damage and loss functions.

1. **The general building stock representation for Hawaii in the wind module is based on county-wide aggregations, not census tracts.** Therefore, census tracts differ only by the quantity of structures, but not by economic cost profile, age, type of construction, or urban or rural land use. *This is less than equivalent to a "Level 1" building stock model.*

2. **The hurricane module does not allow for other specific building types to be created by the user.** *This impacts the ability to model losses in the Pacific region where a variety of non-CONUS construction systems are used*. Also, some tropical residential construction does not utilize full enclosure by glazed fenestrations in the completed building.

3. **User input of custom fragility and loss functions is not allowed**. Parametric fragility and loss functions of loss ratio vs. wind speed are used. Damage and fragility functions for buildings are not editable. This differs from the earthquake and flood modules, which do allow customization by expert users. *User customization should be allowed if there is an expectation of HAZUS use beyond Level 1 default modeling by local governments.*

4. **The structural types of essential facilities are not modeled in accordance with the information for that structure.** The developer indicated that the essential facilities are assumed to be a composite reflecting the distribution of structural types in the general building stock throughout the census tract, rather than as individual structures of a discrete type. *This does not appear to be consistent with how essential facilities are modeled in the earthquake module and would lead to misleading and inaccurate results.*

5. **The Hawaii model in SR-1 will contain the topographic speed-up model developed by ARA for the Hawaii Hurricane Relief Fund (HHRF) mitigation study** (This particular model has a coefficient of determination R^2 of about 0.38). **However, the program will not display these wind speeds nor output them in any map or table. It will only output the flat land speeds.** *Mapping products for Hawaii and the Pacific need to present the wind speed with topographic effects; the flat land speeds are not entirely useful.*

6. **The Hurricane module does not currently include surge and wave set-up inundation damage**. According to the developer's representative, it is anticipated that the SR-1 MH release will include storm surge only (but not wave set-up, the predominant contributor to coastal flooding during hurricanes in Hawaii and other Pacific islands). *Storm induced coastal flooding in Hawaii and other Pacific islands is characterized by steep nearshore bathymetry. Consequently, modeling requires treatment of wave setup and a surf-zone process and inundation runup that includes wave swashing. Wave setup is a build-up of the water level due to wave breaking and the associated surf-zone process. Wave swashing refers*

to the surf-zone process that results in a time-variable waterline that interactively affects subsequent waves. Wave swashing has been demonstrated to be the most important component of coastal flooding during Hurricane Iniki. Both wave setup and wave swashing have been found to be the principal phenomena influencing storm induced coastal overwash flooding in Hawaii. It would appear that the parametric models of HAZUS need to be subjected to comparative case studies in Hawaii.

7. **The single-family residential building stock model for Hawaii in SR-1 will be based on the simplified residential building stock model developed by ARA for the HHRF study**, which includes parameters for single-wall construction, metal roofs, and "tofu" foundations. **The single wall residence does not exist as a separate specific building type, so it is not possible to isolate loss results for this category of structure.** *It would be desired that custom specific building types were available, so that this structural type could be de-aggregated from the conventional type.*

8. The loss functions allow menu button selection of mitigation options for single family and manufactured (mobile) homes, but the resistance level of these options is not defined in the GUI. *Therefore, it is not clear what is physically required to achieve the level of mitigation selected. Conversely, it is not clear what the assumption of effectiveness is for varying levels of windspeed. Can this be further clarified in the User and Technical Manuals?*

9. The hurricane module will not output windpeeds at any particular point in time, only the maximum for the storm. *In future development, a time series of windspeeds should be made available for user-defined site locations.*

10. There is a standardized upper level to surface wind relationship.. This may impact the ability to study the effect of modeling various alternative representations of the turbulent windspeed vertical profile specific to hurricanes.

11. No mesoscale effects are included, as affecting the windfields of the islands of Maui and Hawaii. *The topographic scale effects may be an insufficient estimator of wind speed-up on these islands.*

12. The topographic effects are averaged over time and spatially over the entire census tract distribution of buildings to a average value at the centroid of the census tract, and then this average value is used with a lognormal distribution scheme to all structures aggregated in the census tract. **The scheme is subject to question in areas where topography varies very significantly within a census tract as it is in many parts of Hawaii, and where the census tracts are larger.**

13. **Topographic effects are treated as a hidden internal modifier to the building stock loss calculation.** *This should be made a part of the explicit output.*

14. **In urban Honolulu, the model may be (parametrically) double counting the effect of surface roughness.** *The original wind tunnel data for this region already included urban roughness elements.*

15. **Because the Hawaii parameters were created at the end of the HHRF study as modifications to an engineered building prototype, there is no published validation with Hawaii hurricane losses for these specific construction attributes.** The HHRF study scope did not include validation of the loss characteristics of these parameters with Hawaii storm losses. (There is a very detailed property-geocoded database of losses for the entire island of Kauai that could be used for a local validation study of damage, losses, and storm run-up.)

16. **Windborne debris modeling for Hawaii does not include the contribution of vegetation blow-down, due to lack of specific data in the format used for the CONUS.** *Is there a procedure by which Hawaii users could create the data files needed by the program? (A discussion of tropical Pacific vegetation blow-down is given in Guard and Lander, 1999, "A Scale Relating Tropical Cyclone Wind Speed to Potential Damage for the Tropical Pacific Ocean Region", WERI Technical Report 86, University of Guam.)*

17. Specific building types and construction characteristics used in the Hurricane and Flood models are different from the specific building types used in the Earthquake Model. Many of the building features that control building damage due to wind, debris, and rain (e.g., roof shape, roof deck attachment, opening protection, etc.) have little or no influence on the earthquake performance of buildings.

18. **Terrain roughness in Hawaii was estimated for census tract areas using the four major State Land Use (zoning -based) GIS layers, but more detailed digital Land Cover layers (9 categories) based on Landsat images are available from the NOAA Coastal Services Center** (*http://www.csc.noaa.gov/crs/lca/hawaii.html*) **for all the Hawaiian islands**. This project was accomplished through the assistance of the Hawaii Department of Land and Natural Resources, the Hawaii Coastal Zone Management Program, other agencies (U.S. Geological Survey, U.S. Fish and Wildlife Service, U.S. Department of Agriculture, University of Hawaii, Bernice Pauahi Bishop Museum, The Nature Conservancy of Hawaii, Hawaii Natural Heritage Program), and the U.S. Geological Survey EROS Data Center. The Honolulu-based Pacific Services Center can provide further information.

19. **The model includes filling after landfall.** This is not considered a significant effect in Hawaii and Pacific insular state islands.

20. **Debris calculations (for recovery clean-up) include only structural material tonnage and not the nonstructural materials** such as roofing, cladding and glazing, wall and floor finishes, gypboard, electrical and plumbing fixtures, furnishings, appliances, and personal contents. *These are major components of total debris volume and should be included in the model.* Debris management has been documented to be a major post-storm problem in Pacific islands.

21. Value of contents is based on a ratio of content value to building replacement value.
This is editable. Contents valuation will tend to be different in the Pacific insular states.

Flood Module:

1. **Crystal reports does not report the same economic losses as shown in the GUI results.** *Will this problem be addressed in the next Build***?**

2. **The developers stated that there is no discharge frequency regression analysis of stream flow available for Hawaii, and that there is no hydrologic analyses available in HAZUS MH for the State of Hawaii.** *See USGS Water Resources Investigations Report 94-4052, "Estimation of Magnitude and Frequency of Floods for Streams on the Island of Oahu". Could this information be incorporated for the County of Honolulu?*

3. **Precipitation data is not used. Discharge-return interval statistics from gage stations are needed to compute flood surfaces. HAZUS MH does not have this analysis for Hawaii. Only specific discharge analysis can be done in Hawaii.**

4. **Hawaii stream channel delineation in the 10-meter DEM is not considered sufficiently precise for cross sectional definition.** *This may affect the accuracy of specific discharge analysis.*

5. **It is not clear whether the riverine flood model is applicable to the smaller watershed basin conditions in Pacific islands, where flash flooding due to intense rainfall (often within a short response time) is a predominant mode.** Riverine flood loss calculations are based on floodway depth vs. the DEM. (digital elevation model). *Most drainage basins in Hawaii and American Samoa are less than 10 sq. miles and many are less than 5 sq. miles. They are commonly characterized by amphitheater-shaped valley heads and very steep walls. Most have rapid runoff response to rainfall with a time to peak discharge of less than one hour. High intensity rainfall of tropical storms, steep basin and relatively steep stream slopes, and little channel storage tend to produce flash floods with large discharge rates that peak and then diminish rapidly.*

6. **HAZUS MH does not consider velocity and obstruction related bank-jumping.**

7. Hydraulically isolated pools of flooding may be graphically depicted in mapping that are not physically possible and are therefore neglected in loss calculations. These areas may need to be edited out through GIS before being used in public information products.

8. **The riverine model apparently does not include subsurface flow as a parameter.** The subgrade may apparently be considered implicitly impermeable, which may not be valid on the island of Hawaii.

9. **The flood module is the only module that utilized census block aggregation profile representations of buildings.** Therefore, this inventory representation is unique to this module and should be verified up to Level 2 in Hawaii, since it is still a constructed profile based on some assumptions rather than reflecting an actual county survey. For example, the foundation types and prototypical first floor height is based on a regional assumption. *These assumptions will need to be validated; will the developer indicate what data was used to*

develop the Hawaii profile of the building characteristics pertinent to flood damage? How are the single wall, tofu block foundation homes treated (or not)?

10. **The coastal flooding model uses a smoothed coastline subdivided by the user into segments assumed to be of a homogenous shoreline type**. (rocky, sandy, sandy with small dunes, sandy with large dunes, and coastal wetland). The coastline profile length is specified along regional parameters, in which each transect is considered to be a regime of uniform material. For the sandy shoreline type, the highest elevation along the 2D transect is assumed to be a sand dune peak (this is editable). *Sandy shorelines are assumed to be erodable inland, i.e., there is no modeling of a transition of a sandy beach to a non-erodable inland condition, which is typical in Hawaii and American Samoa. Very few Hawaiian, Guam, or American Samoa beaches are infinitely erodable; most have rocky substrates and are relatively sand-starved.*

11. **The shoreline slope used by HAZUS for wave runup is <u>not</u> derived from the DEM.** Instead, the shoreline type classification is used to assign a default local slope for wave runup calculations. The calculations follow simplified empirical equations from the USACE Coastal Engineering Manual. These equations are based on empirical data derived from continental U.S. conditions, and are suitable for gently sloping seabeds along relatively straight coastlines. According to an October, 2003 briefing given at Fort Shafter, Oahu, it is our understanding that the USACE has begun new research towards developing engineering methodologies more appropriate to the tropical Pacific. Since wave runup is a important phenomena in the Pacific, accurate flood surfaces will need to determine the flood surface outside of HAZUS MH and import the surface into HAZUS for loss calculation using the Flood Information Tool. *HAZUS MH may not be appropriate as a primary coastal flooding estimator for hurricanes.*

12. **The coastal flooding model does <u>not</u> use local bathymetry.** HAZUS determines the extent of flooding along two-dimensional coastline transects using a DEM, which are then interpolated to create a contour of the V and A zones subject to flooding (FEMA "Guidelines and Specification for Wave Elevation Mapping & V-Zone Determination"). *Storm induced coastal flooding in Hawaii and other Pacific islands is characterized by steep nearshore bathymetry. Consequently, modeling requires treatment of wave setup and a surf-zone process and inundation by wave runup that includes wave swashing. Wave setup is a build-up of the water level due to wave breaking and the associated surf-zone process. Wave swashing refers to the surf-zone process that results in a time-variable waterline that interactively affects subsequent waves. Wave swashing has been demonstrated to be the most important component of coastal flooding during Hurricane Iniki. Both wave setup and wave swashing have been found to be the principal phenomena influencing storm induced coastal overwash flooding in Hawaii. It would appear that the parametric models of HAZUS need to be subjected to comparative case studies in Hawaii.*

13. *It would appear that the parametric models of HAZUS need to be subjected to comparative case studies in Hawaii.*

14. **The 2D transects are spaced at about 1000–ft intervals, which would be inadequate for Pacific island shorelines, where short beaches are interspersed with headland features.** *Can the program input be customized by the user to start with a default closer spacing***?** However, a series of independent two-dimensional cross-shore analyses may not be a generally correct phenomenological assumption.

15. **Wave height and period characteristics and surge and setup (Stillwater) height are specified by the user parametrically along with the return period these values represent.** In later MH releases, a surge (not wave) height is anticipated to be ported from the Hurricane Module when combined hazard analysis is used. *However, the storm surge component alone would be insufficient to model coastal overwash in Hawaii and Pacific Islands. Since the HAZUS MH Flood Module is primarily parametric and simplified (rather than modeling physical relationships requiring greater input detail), it would appear that separate simulation models utilizing actual offshore morphology are required to define wave setup and wave heights and wave runup, if not the flood surface itself.*

16. **A Flood Information Tool utility is available to compute economic losses given a user specified flood layer, such as a DFIRM.** *This will probably be very useful as a loss estimator post-processor for other coastal flooding models. (Note: It would be useful to have a similar concept available in the Hurricane Module with a user-specified wind field which may be a result of field data or some other windfield representation.)*

17. **Agricultural crop losses are based on a default regional assumption.** This is editable, but tropical crops are excluded and custom crop types cannot be input. *It would be helpful to allow custom crop types to be user defined, otherwise agricultural losses cannot be calculated for Pacific islands.*

18. **The types of structures are assumed to follow one of four regional schemes.** (Riverine, Coastal V and coastal A FIRM zones, Great Lakes, and Inland). Such assumptions would include the percentage of homes with basements, for example. It is possible to create customized occupancy to building type mapping schemes to replace the default assumptions.

19. **The Flood Module can apparently accept user-defined structures, unlike the restricted earthquake and hurricane modules.**

20. **There are options to specify long-term coastal erosion rates and shoreline protection along the segments.**

21. **Damage functions are specific to V and A zone conditions using depth vs. damage curves per occupancy type (not structural type).** These damage curves are editable.

22. **Damage is estimated by an area-weighted flood height for each census block.** The aggregated building inventory is assumed to have default first floor elevation ratios and a certain amount of basements with respect to the flood elevation. This is editable.

23. **All Structures by default are assumed to be pre-FIRM**. This is editable.

24. **The flood module has options for reporting replacement value losses or estimated depreciated value**. (based on the census block percentage of age by decade and RS Means depreciation). *Would it be possible to have this option in the other modules as well?*

25. **The Flood Module classifies essential facilities consistently with the Earthquake Module.** Essential facilities are individually evaluated for the flood height at their specified locations.

26. **The number of vehicles is based on a default inventory assumption, but can be edited**.

27. **The model includes overland waves, in which wind on flooded inland areas are allowed to generate additional waves overland**. This is not a significant effect in Pacific islands.

28. **Analysis is conducted by a two-stage process.** First, the hazard is run on the user-input study case area, then damage is analyzed for the modeled flood heights.

29. **Careful attention to datum of digital elevation models is necessary to avoid input error.**

30. **In the Technical Manual, it is suggested that Table 3.2 be replaced with Table 5.1, Model Building Types.**

WORKSHOP SUMMARY – JULY 8-10, 2003
HONOLULU HAWAII USA

1.0 Workshop Summary.

As a part of an effort to review the status of EMWIN in Pacific Island countries, to introduce RANET concepts and methods, and to generally examine meteorological communication needs in the Pacific region, an "*Exploratory Workshop on Pacific Collection and Dissemination of Environmental and Related Information for Development of Remote Communities"* was organized jointly in Honolulu, Hawaii by the US NOAA/National Weather Service Pacific Region, the NOAA/Office of Global Programs' Climate Information Access Program (CIP), and the NOAA/NESDIS GCOS Secretariat. The NOAA/NESDIS/Office of Satellite Operations, and the NOAA Pacific Services Center, which offered two of its employees as facilitators, also provided assistance to the workshop. The University of Hawai'i's PEACESAT Project was also a co-sponsor.

Forty-two participants attended the workshop from a wide cross section of agencies interested in promoting cooperation and development of remote communities in the Pacific region. As a pre-workshop focus, several participants attended the RANET-Global: 2003 Partnerships Workshop, which was held in Niger in late March. The goal of their trip was to assess aspects of the RANET process that are appropriate to the Pacific Islands.

During the course of the Pacific workshop, many useful ideas were exchanged on ways to promote information dissemination and sharing between different agencies with a common goal of improving the safety and quality of life of Pacific Islands communities. Early in the workshop, it was noted that while meteorological and emergency information is available in the region at the capital city level, very little in fact reaches remote communities in a timely manner. By not servicing remote areas, the meteorological community misses opportunities for its information to improve livelihoods through day-to-day activities and save lives and property in times of emergency. While the regional and national dissemination structures are working to some extent and need further strengthening, much needs to be done at the village level where a significant information gap exists.

A working group was set up to further promote and encourage cooperation among the various parties and to develop appropriate ways of improving the flow of communication to Pacific Island village communities. The working group was also formed to guide implementation of the specific recommendations of the workshop. The group is also to report on ways to move forward and improve information dissemination at the 9th Regional Meteorological Service Directors Meeting to be held in Tonga on August 19-23, 2003.

2.0 Participants.

A wide range of agencies including meteorology, disaster management, education, telecommunications and climate research were represented and all expressed the need for close cooperation between the various entities to maximize resource use.

It was recognized that to provide effective assistance to rural communities a global approach is necessary, and that the more cooperation there is between agencies, the more cost effective any effort to improve communications will be.

3.0 Existing Systems.

The workshop agreed that it was important to establish a number of levels of effective communications. This includes at the regional, national and local Levels.

It was recognized that there are a number of communications systems already in existence that can be used to communicate information between the various levels. These need to be identified and enhanced so that they can serve the broad needs of the community.

3.1 EMWIN EMWIN, a satellite broadcast of meteorological and emergency management information on GOES-7 and 10, can handle large amounts of data effectively at the regional and national level. Developing a specific data stream for the Pacific will further enhance the network. (Currently the system also carries information for North America.) Present limitations of the platform include one-way transmission, a lack of space for Pacific data, and relatively high complexity and costs for most remote communities and villages. However, it is being utilized at national meteorological and national disaster management offices in 22 Pacific Island countries and territories. For the most part EMWIN remains a significant and stable source of meteorological information in the Pacific. Next steps for improving EMWIN in the Pacific region include: 1) expanding bandwidth capacity by limiting broadcast content in the region to only that with Pacific relevance, 2) examining and determining the use of current and future GOES, 3) enhancing existing EMWIN sites while planning for potential satellite transitions, and 4) expanding ground stations where appropriate and sustainable.

3.2 RANET Provided capacity on the WorldSpace network by First Voice International (formerly WorldSpace Foundation), RANET can provide a cheap solution to one-way data dissemination to rural communities in areas that the service covers. Further work should be carried out to determine its actual coverage area and then adding appropriate content for Pacific Island communities, however the methods utilized by RANET may also serve as a technique for development of future platforms and systems. The overall RANET system is a one-way broadcast, but the network has potential to disseminate

educational, climate, and other non-urgent data to island communities at a low cost. The receivers and associated antennae are small, have low power consumption, and are generally reliable. Currently the satellite platform of RANET reaches only the Western Pacific.

3.3 FM COMMUNITY RADIO FM community radio represents a cheap and reliable method for rural dissemination. Moreover, information broadcast over community FM radio is likely to be of local interest and in local languages. The RANET program has identified low-cost and sustainable FM community radio stations and receivers (currently used in Africa activities), but existing FM radio stations can also be utilized to further disseminate information in a timely manner. Connecting to FM stations, however, requires training and education programs on the use of various early warning and routine meteorological or seasonal products. Partnership building is integral to merging meteorological information with community programming on FM broadcast stations.

3.4 INTERNET The Internet, while supposedly presenting the ultimate solution as a cheap and reliable communications system accessible to all, has yet to fulfill this ideal. In most Pacific Island countries, the costs to access the Internet are high and service is slow, where it is available. Furthermore, at the very time when information is required, during natural disasters Internet service is likely to be overloaded or out of service. For routine day-to-day use in the more developed areas, it has its uses but should not be regarded as a reliable link in times of natural disasters.

3.5 HF RADIO High Frequency (HF) radio was the main backbone of communications to remote areas in the past, but now is looked on as out of date and unreliable. With new technologies and satellite communications, HF is looked on as a poor relation as far as communications are concerned, but time and again it has been proven that when all else fails, HF radio is still the simple technology that gets messages through.

It may not be a fast means of delivering large amounts of data, but it still has a vital role to play in two-way access to remote areas. It should be retained as a backup network even where better and more sophisticated solutions exist as many of these will fail during severe weather and natural disasters. By adding relatively inexpensive digital modems, a reasonable quality digital data communications system can be implemented, and for the more remote areas, HF radio should still be regarded as the prime affordable transmission medium available at this time.

3.6 SATELLITE COMMUNICATIONS SYSTEMS Satellite communications systems like Inmarsat and other services are useful as emergency links, but operational and call charges levied at this time restrict its use for routine communications. VSAT systems likewise have a part to play especially at the

regional and national levels, but the costs are often too high for use in remote areas and to rural communities.

PEACESAT (Pan-Pacific Education and Communication Experiments by Satellite) has filled an important place in the Western and Central Pacific and continues to do so. With the development of smaller, lower- cost receive-only terminals it will continue and perhaps expand its role of providing an affordable link with the remote areas. However, for the small and remote islands PEACESAT'S role in two-way communications is limited.

The ISCS (International Satellite Communications System) provides an important link in the regional dissemination of aeronautical meteorological information and with the upgrade of terminal equipment throughout the region and the possibility of two way communications on this service it is set to play an increasingly important role throughout the Pacific.

3.7 WORD-OF-MOUTH/EXTENSION NETWORKS While often overlooked in technical discussions, word-of-mouth networks and extension agents are often critical to ensuring information is received, not in the last mile, but the last meter. Utilizing such networks, which exist through NGO projects and other community activities, requires partnership development at the regional and local level, as well as significant educational campaigns to make products and services understandable and useful.

3.8 RESEARCH COMMUNITY The research community represents a well-integrated social network, which can be utilized to bring attention to specific issues in the Pacific related to meteorological services. However, participants noted that the research community is often unaware, or does not stress, the link between sustainable observations and the health of meteorological services. Specifically, by enabling meteorological and related national services to disseminate and communicate with their public, the institution is made stronger and more sustainable. This in turn increases the likely ability of a national service to maintain and expand its observation network, as the benefit is better perceived by the public and policy makers. Additionally, a community that values the meteorological products and warnings provided by its meteorological service is more likely to support and accept placement of observation equipment. Participants felt that such a link and process should be made more apparent to the research community so that projects are done in support of and in collaboration with National Hydro-Meteorological Services (NHMSs). 'Bridging programs' such as GCOS may serve as a natural entry point to develop a dialogue between the research community and meteorological services.

3.9 NON-GOVERNMENTAL ORGANIZATIONS NGOs represent another well-established social network, which is likely to prove vital to the development of a sustainable dissemination network. Often NGOs have their own communication systems and word-of-mouth networks that can be utilized to

further disseminate basic warnings and meteorological information. Training and partnership development will be necessary to build and improve interaction between the NGOs and NHMSs. Additionally, by providing and producing additional information related to health, education, agriculture, etc., NGOs are likely to make any communication system more sustainable by encouraging multipurpose use.

4.0 Future Possibilities.

The meeting considered possibilities in the present, near future, and further ahead. There are a number of short-term opportunities, mostly to enhance existing networks and improve reliability. These include digitalization of existing HF networks, expanding the EMWIN network, and installation of small PEACESAT stations. Included within the short-term action items, EMWIN, RANET, PEACESAT, SIDSnet, and regional partners will begin integration of existing networks and content.

It was also recognized that attention must be paid to better maintain and support existing systems.

In the longer term, steps should be taken to identify new and appropriate services that can enhance communications to the rural areas. In particular, various satellite service providers may have spare capacity using appropriate technologies like DVB (Digital Video Broadcast) and DAB (Digital Audio Broadcast), which could be utilized in the Pacific region.

At this time most, if not all, use spot beam technology, which limits coverage to specific areas, which usually are the high population density areas rather than the sparsely populated regions where efforts should be re-directed toward improving.

There is a need to build partnerships with other organizations, both governmental and non-governmental, to provide cheaper solutions brought about by multiple uses of existing communications links. For instance, there are real opportunities for meteorology, education, and disaster managers to pool resources and deliver products that will not only warn communities of possible disasters but also educate them in steps that can be taken to minimize the effects of these events.

Finally, but perhaps most importantly, a long-term goal of the regional partnership will be to improve the dialogue with local communities in order to better assess what information is useful, how it should be delivered, and other ways in which community access and use of content can be improved.

5.0 Funding.

As always is the case, all these exciting possibilities require financial support and at an initial look, it seems that there are not many possibilities for adequate finances to develop these ideas.

However by partnering with other organizations and development projects, it appears that there may be quite a large pool of untapped potential funding that can assist in rural development.

An important step in the further development of ideas and proposals put forward at the workshop will be to actively seek out these partners and develop links with them to actively promote shared goals.

In the near term, participants at the Workshop committed to pooling resources, expertise, and current efforts in order to demonstrate aspects of an integrated regional communications system. The collaboration will have both short-term and tangible benefits, as well as suggest how resources might be pooled in the future to develop a stronger backbone and platform.

6.0 Key Points.

A list of key points that came from the meeting follows:

Key Points from July 8th and 9th Presenter and Panel Discussions

6.1 There is a need to have a dialogue with users in remote communities, as well as other use sectors. This will improve the understanding of user needs, and also improve user understanding of available products and services.

Perhaps there should be community workshops to assess user needs.

6.2 Every nation and community has different requirements and different challenges. There is no single solution, but all solutions must work together.

A sustainable communications system that can serve remote communities' information needs should be:

- layered and built from the ground up and the top down
- from the local out to the regional
- a hub and spoke system

6.3 There are many geographic and economic scales, so solutions will need to be tailored.

‘Large Ocean States’ with relatively extensive telecom resources and more concentrated urban populations (e.g., Hawaii, NZ, Australia, Guam, Fiji, American Samoa’s) versus others with more remote communities and limited telecom resources (e.g., Kiribati, Vanuatu, Niue, Tokelau, Federated States of Micronesia, etc.)

Pacific Island communities encompass a broad range of technical and financial resources and capabilities.

Different users need different types and levels of information at different time frames.

A list of Pacific Region, and perhaps Pacific Island data requirements is needed. A working group should be formed to address this topic.

6.4 Remote community technology should be easy to use, durable, appropriate and affordable. Two-way communication is desirable. Commercial providers of Internet and phone service are not affordable.

There is limited Internet capacity, even in ‘urban’ centers in most Pacific Island countries, and there is little or no access in rural communities and even when available, it is extremely expensive

6.5 Partnerships are essential to success.

There is a need to be opportunistic and take advantage of existing projects and partnerships.

There is a need to form new partnerships and increase cooperation.

Pacific is the primary place in the world for assessing **climate change**.

A little bit can go a long way in the islands.

6.6 Education and awareness are needed at various levels (e.g. policy makers, information providers, remote communities).

These summarize the general consensus of the workshop participants and it is hoped that the work that was done during this workshop will provide a basis for future development of suitable systems to enhance development and safety in the Pacific Islands.

6.7 Integration and transition of systems

It is critical that the groups providing major dissemination or communication platforms in the Pacific region coordinate their content to maximize use of these

resources. Additionally the groups with specific platforms should where possible attempt to integrate their 'nodes' with other distribution networks which directly or indirectly reach remote communities. Finally, to ensure the sustainability of a regional network, significant emphasis should be placed on planning for any likely transitions.

7.0 Pacific Communications Development Steering Committee (PCDSC)

US NOAA/NWS- Edward Young - Chairperson
US NOAA/OGP/RANET - Kelly Sponberg
PI-GCOS - Garry Clarke/Howard Diamond
SPREP - Kim Nitschke
SOPAC - Atu Kaloumaira
WMO/RA V - Arona Ngari
EMWIN - Colin Schulz
UH/PEACESAT - Christina Higa/Bruce Best
RESEARCH COMMUNITY – Dr.Mark Morrissey, University of Oklahoma
PI FORUM SECRETARIAT – Dr. Robert Guild

8.0 Acknowledgments.

The Workshop wanted to express its appreciation to the US/NOAA/National Weather Service Pacific Region for organizing and hosting the workshop, and to US/NOAA/OGP, the USAID Climate Change Programs, and the US/NOAA/NESDIS GCOS Secretariat for providing financial support to bring participants from throughout the Pacific Islands. The Workshop was very grateful for PEACESAT's support and the arrangements made for the videoteleconference demonstration, which included Lt. Governor of Yap State, the American Samoa Power Authority, and a presentation from Dr. Robert Guild from the Pacific Islands Forum Secretariat. Lastly, the workshop was enhanced by the participation of other interested parties, including the US NOAA/NESDIS Office of Satellite Operations, the US NOAA/NWS ISCS and EMWIN Project Coordinators and the Office of International Activities, participation by Pacific regional programs such as SPREP, SOPAC and SPARCE, and from the SIDSnet (Small Island Developing States Network).

Appendix I- Agenda

July 8 B 10, 2003 Waikiki Terrace Hotel, 2045 Kalakaua Ave., Honolulu, HI 96815

July 8, 2003

0730 Registration and Continental Breakfast

0830 WORKSHOP OPENING

Workshop Greeting and Quick Introductions *(10 min)*
Jeff LaDouce, Director, NOAA National Weather Service (NWS) Pacific Region
Bill Thomas, Director, NOAA Pacific Coastal Services Center

Logistics and Housekeeping *(5 min)*
Edward H. Young, Jr., Deputy Director, NOAA NWS Pacific Region

Background *(15 min)*
Edward H. Young, Jr., Deputy Director, NOAA NWS Pacific Region
Kelly Sponberg, NOAA Office of Global Programs, Climate Information Access Project
Howard Diamond, US GCOS Secretariat NOAA NESDIS Office of the CIO

- Why this workshop? How did this come about? It involves bringing people with similar interests together to discuss existing satellite collection and dissemination of regional environmental information, and the potential to form new partnerships and expand opportunities.

Overview, Purpose, Workshop Goals *(10 min)*
Edward H. Young, Jr., Deputy Director, NOAA NWS Pacific Region

- Generally the idea is to create an informal consensus on next steps to improve rural and remote communication of weather and climate-related products in the Pacific, as well as create a system that can eventually serve remote communities= larger information needs. This in turn adds to the sustainability of any effort. The network is being developed/considered to improve the dissemination and information access capacities of meteorological services, other national entities, and collaborating NGOs and disaster response/mitigation professionals.

Introductions and Open Discussion to Clarify or Add to Workshop Purpose and Issues *(40 min)*

- Reflect upon what has been set in the agenda. Perhaps there will be suggestions for added topics, etc. Hopefully most of this will be done in advance via e-mail, but the idea is to give a formal, onsite opportunity to make changes. I want this to be a collaborative effort.

- Participants will pair up to exchange why they are participating in the workshop and what they would like to see as desired outcome. They will then introduce each other to the group.

0950 Break

1000 WHERE ARE WE NOW? WHAT DO WE HAVE?

Overview of the existing regional, national, and international information producers, challenges and opportunities

- Who produces what and why? What are the primary missions (by institution) driving the content that is made available? i.e. What do the various institutions care about most, and how is the existing broadcast meeting their objectives?

1) EMWIN (EMERGENCY MANAGERS WEATHER INFORMATION NETWORK) *(30–45min, 15–20min discussion)*

James Doherty, NOAA NWS EMWIN Program Manager
Bill Johnson, NOAA NWS EMWIN Program Office

Colin Schulz, Communications Consultant, SPREP

2) ISCS (INTERNATIONAL SATELLITE COMMUNICATION SYSTEM) *(30min, 15–20min discussion)*
Doug Walls, ICSC Program Manager, NOAA NWS
Donald Winter, ISCS Consultant, NOAA NWS
Jennifer Lewis, NOAA NWS Voluntary Cooperation Program Manager

1200 Lunch

1300 WHERE ARE WE NOW? WHAT DO WE HAVE? (Continued)

Overview of the existing regional, national, and international information producers, challenges and opportunities *(15–30min + 15–20min discussion each)*

3) RANET (RADIO AND INTERNET FOR THE COMMUNICATION OF HYDRO-METEOROLOGICAL AND CLIMATE RELATED INFORMATION)

Kelly Sponberg, Climate Information Access Project, NOAA OGP
Garry Clarke, International Ops Mgr. Met Service of New Zealand Ltd.
Colin Schulz, Communications Consultant, SPREP

4) PUBLIC SERVICE COMMUNICATIONS AND SUPPORT:
a. SATELLITE RESOURCES: NESDIS, NOAA
Kathy Kelly, NOAA NESDIS Office of Satellite Operations
Cindy Hampton, NOAA NESDIS Satellite Operations Control Center
Maggie Laughlin, Honeywell Corp. Satellite Operations Control Center

b. PEACESAT (PAN-PACIFIC EDUCATION AND COMMUNICATION EXPERIMENT BY SATELLITE)
Dr. Norman Okamura, University of Hawaii TIPG
Christina Higa, Director, PEACESAT Program, University of Hawai`i

c. INTERNET USE/ACCESS IN PACIFIC ISLAND COUNTRIES
Jim Bannon, Pacific Resource Education and Learning (PREL)
Bruce Best, PEACESAT Operator, University of Guam
Garry Clarke, International Ops Mgr. Met Service of New Zealand Ltd.

1540 Break

1600 What Are the Important Criteria? The Connect and Disconnect Between Information Sources and Remote Areas

Break out in small groups (30 min)

Brainstorm about the challenges in getting information from point A to point B to develop criteria for evaluating proposed solutions
Examples:

- Technology issues: Quality of power source, quality of Internet connectivity
- Economic issues: Cost of phone line use
- Social issues: Radio use, literacy
- Regulatory and policy issues: Government regulations
- Content issues: Need to translate scientific/technical content into layman's terms

1630 Plenary: Report Out on Evaluation Criteria *(30 min)*

1700 Wrap-Up of Day 1

1715 Adjourn

July 9, 2003 **WHAT DO THEY NEED? IDENTIFYING USER NEEDS**

0730 **Continental Breakfast**

0800 **Recap of Day 1** *(15 min)*

0815 **Introduction to Users Sessions** *(15 min)*
Edward H. Young, Jr., Deputy Director, NOAA NWS Pacific Region

0830 **Remote Communities: Do we know what they need, and have we asked?**

HEAR FROM THE USERS

- *Can we identify user sectors?*
- *What are priority information content and sources?*
- *When and with what frequency is information needed?*
- *How are users currently getting information*
- *How is information currently available used?*
- *Community Technologies*
    - *HF Radio*
    - *FM Radio*
    - *Tele-centers*

1) Regional and International Organizations *(10 min each)*
2) Representatives from Pacific Island Countries *(10 min each)*
3) Regional Program Administrators *(10 min each)*

1200 **Lunch**: Agency/Donor Initiatives Panel Discussion

1315 **Carpool** to the Shriners Hospital for Children

1400 **Videoteleconference Presentation/Demonstration**

- Fiji (if not by video, telephone conference) - Robert Guild, Pacific Island Forum, Suva, Fiji, "Telecommunication in the Pacific Islands" *(20 min)*
- Palau - Vice President Pierantozzi *(10 min)*
- American Samoa - Perelini Perelini, American Samoa Power Authority *(10 min)*
- Majuro - (invited), Yap - Lt. Governor (invited), National University of Samoa (invited), Saipan CNMI PSS - (invited)

1500 **Summary of Needs** (Continued Group Discussion)

1630 **Adjourn and Carpool back to Hotel**

1700-1900 Informal Gathering at the TGI Friday's 2058 Kuhio Ave (942-8443)

July 10, 2003 **DEVELOPING A COURSE OF ACTION**

0730 **Continental Breakfast**

0800 **Recap and Review of Technology and User Matrices**

0830 **PLOTTING OPTIONS: Introduction and Framing for Small Group Work**
Kelly Sponberg, Climate Information Access Project, NOAA OGP
Garry Clarke, International Ops Mgr. Met Service of New Zealand Ltd.

Backbone B What do we have, what do users need, what are the possibilities? Dream big and small

0900 **PLOTTING OPTIONS: PART I – Facilitated Discussion in Small Groups** *(30 min)*
John Marra and Kris McElwee, NOAA Pacific Services Center

Do we need a regional, multi-purpose, multi-ability broadcast backbone? And if so, what should be its requirements?

- Putting current satellite capacities aside, would there be a significant benefit to developing a regional (Pacific) satellite broadcast that could carry a vast amount of information B weather, climate, and otherwise?

- Who should we be partnering with to identify information needs, ability to use equipment, groups who can act as extension agent, etc.? What do we need to do to make any backbone worthwhile?

Connecting a backbone(s) to communities. What technologies are appropriate and sustainable? What partnerships do we need?

- Are we going to make rural communication a priority? If so, are there certain technologies (such as energy solutions, FM radio, HF radio) which we should adopt to form a community communications center?

Remote community technologies

- Do we want to adopt some standards that any FM radio station or other equipment must meet? What are the various tools we can use?

Remote community partnerships

- Is there an obvious synergy/need for health, aeronautical, agricultural, market, and other information, thereby highlighting the need to create a system that is multipurpose at the community level or at a field station/node?

0930 PLOTTING OPTIONS: PART 1 - Report out to Plenary *(30 min)*

1000 Break

1015 PLOTTING OPTIONS: PART II – Facilitated Discussion in Small Groups *(45 min)*

How to bring this concept into reality, what is required, who are the major players?

1100 PLOTTING OPTIONS: PART II - Report out to Plenary *(30 min)*

1130 FILTER OPTIONS by Commonality, Function, and Dependency *(30 min)*

1200 Lunch

1300 CHARTING A COURSE OF ACTION

Review of options generated in small group discussions *(15 min)*
Open discussion to identify what we want to do *(30 min)*
Based on identification of what we want to do, what do we need to do to make it happen *(45 min)*

- Actions and Timeline?
- Partnering?
- Funding?
- Stages?

1430 CONTINUING THE DIALOGUE: STEPPING FORWARD

What are the next steps? How will we implement these actions?

1500 Wrap-Up and Closing

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