Humboldt Bay Vertical Reference System (HBVRS)

Draft Science Plan Outline Oct-29-2010

Goal(s) of Project
◊ Study vulnerability of southern CSZ Deformation Zone
◊ Improve vertical reference accuracy in southern CSZ region

Project Benefits and Management Applications
◊ Foundational information for all sea level rise predictions
  o Downscaling of global models to local and regional areas
  o Remove significant tectonic impacts to SLR predictions
  o Geoid rectification
◊ Pre-disaster (tsunami, flood) mitigation planning
  o Establish pre-seismic baseline survey to assure accurate and timely post-earthquake survey results
  o Use vertical tectonic rates to estimate future co-seismic subsidence & inundation from Cascadia subduction zone
  o Improve flood modeling
  o Quantify uncertainty
  o Analyze potential changes to roads, navigation channels, and mariculture environment due to tectonic uplift/subsidence
◊ Contribute updated leveling data to NGS NAVD88 bench marks
◊ Contribute GPS data to NGS Height Modernization Program

Framework
◊ Collaborators
  o Expertise of each
  o Role/research of each
  o Contact West Coast Governors Agreement Action Coordination Team members
    ▪ Compare & align project benefits with WCGA directives (examples below)
      • Climate Change; SLR, shoreline changes, coastal hazards
      • Integrated Ecosystem Assessment; HBI as EBM partner
      • Sustainable Coastal Communities; support local planning to sustainable fisheries and infrastructure
      • Seafloor Mapping; map habitat of tidelands
◊ Budget estimate
  o Number of people/students
  o Estimate time/resources
  o Equipment needs
  o Transportation needs
  o Other budget items
Project Scope

◊ Geographic
  o Shelter Cove, Eel Delta, Humboldt Bay, Trinidad, Klamath, Crescent City
  o Pt. Arena/Arena Cove?

◊ Tide gages & water levels
  o How many; 7 new tide gages: 1 Shelter Cove, 1 Eel Delta, 3 Humboldt Bay, 1 Trinidad, 1 Klamath
  o Re-occupy all NOAA temporary historic tide gage locations (#?) in Crescent City, Trinidad, and Eureka.
  o CENCOOS upgrade for water level measurements
    ▪ Stationary gage with vented system and external data logger; tie gage height to leveled bench marks
  o Stream gage stations
    ▪ USGS Mad River bridge Arcata– tie to NAVD88

◊ Leveling line surveys
  o Level survey training of students/personnel; Univ. of Oregon/HSU collaboration
  o Equipment
    ▪ Ray Weldon
    ▪ Humboldt County Surveyors Office
    ▪ Cal Trans
  o Personnel
    ▪ Univ of Oregon & HSU
    ▪ Caltrans
    ▪ Humboldt County Surveyors Office
    ▪ Private sector surveyors
  o Evaluate proposed bench marks to be included in survey
  o Re-level 1988 level lines; tie to 1931, 1944, & 1967 where possible
  o Analyze vertical rates (1931, 1944, 1967, 1988, present)
  o Local survey controls – other opportunities to re-level and tie to
    ▪ Public
      Humboldt County – New Navy Base Rd
      NRCS – Eel Delta
      CalTrans – Various project leveling
    ▪ Private
      Northern Hydrology – Mad River slough, Jacoby Creek

◊ Height Modernization Program
  o Collect new GPS horizontal control data to NGS Height Mod. Standards
  o Occupy bench marks with gravimeter to improve local geoid values

◊ Data processing/archiving/dissemination/modeling – support some endusers
  ▪ Anaylyze and difference historic level line elevations
  ▪ Identify expert to ‘Blue Book’ new level data – submit to NGS to publish updates in NGS database
  ▪ Process all available GPS observations 1993-present.
• Bring new tide gage and CGPS data online for daily downloads and real time data stream
• Test new leveling and tide data in local hydrologic/circulation models
• Model observed vertical rates with most current subduction zone model
• Model eel grass and mariculture habitat changes change due to tectonic uplift/subsidence
• Model horizontal and vertical data across all mapped faults
• Others

◊ Monitoring/maintenance of reference network
• Budget to resurvey with levels and GPS after large earthquake
• Budget for initial re-level plus 25% (?) to re-level as deemed necessary
• Update bench mark elevations and determine relative baseline measurements to nearby CGPS stations through repeated GPS surveys
• QA/QC and periodically analyze data from tide gages and any new CGPS
• Add, replace, or make effort to preserve bench marks as deemed necessary
• Maintain power/communications at new tide gage and CGPS locations