

REVELL COASTAL | Selected Projects

CITY OF MARINA: LOCAL COASTAL PROGRAM UPDATE WITH SEA LEVEL RISE

Lead: EMC Planning

Firm Project Manager: Polaris Kinison-Brown

Client Project Manager: Christy Hopper, Principal Planner, City of Marina, 831-884-1220,
chopper@cityofmarina.org

Award Date: May 2018

Completion Date: Anticipated June 2020

Project Description: Revell Coastal as part of a team with EMC Planning to update the City of Marina LCP with funding from the California Coastal Commission. Revell Coastal work includes technical analysis, mapping, and completion of the Existing Conditions, Vulnerability, and Adaptation Plan report. Revell Coastal will lead stakeholder engagement on the vulnerabilities and potential adaptation strategies to the City Council, Planning Commission and public outreach process. Revell Coastal will be providing input to EMC Planning on the LCP policies and Implementation plan language.

SANTA CLARA RIVER ESTUARY: SCIENTIFIC REVIEW PANEL

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Gina Dorrington, Wastewater Utility Manager
Ventura Water, (805)677-4131, gdorrington@venturawater.net

Award Date: September 2017

Completion Date: Anticipated September 2018

Project Description: Revell Coastal, LLC working as part of a consent decree appointed three (3) member science advisory panel reviewing technical reports, model results, field data, and summary reports to provide a recommendation on future wastewater discharge levels from the Ventura Wastewater Reclamation Facility. Dr. Revell is coordinating with other scientists and consultants to develop independent scientific recommendations to support permitting, policy and community infrastructure planning. The review panel recommendation will be used to develop Regional Water Quality Control Board permits as well as a basis of for a recycled water facility in the City of Ventura.

COUNTY OF VENTURA: VC RESILIENT COASTAL ADAPTATION PROJECT

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Aaron Engstrom, Planner, County of Ventura. (805) 654-2936, aaron.engstrom@ventura.org

Award Date: June 2017

Completion Date: Anticipated December 2018

Project Description: Revell Coastal, LLC working for the County of Ventura is conducting a Vulnerability and Fiscal Impact Study to support adaptation planning and LCP policy updates. This project includes data analysis, additional hazard modeling to round out data gaps in the COSMOS 3.0 and Coastal Resilience hazard modeling, integrating with the economic team, and public outreach and communication.

COUNTY OF VENTURA: TECHNICAL REVIEW OF PRELIMINARY FEMA COASTAL FLOOD MAPS

Lead: Moffat and Nichol Engineers

Firm Project Manager: Weixia Jin, P.E.

Client Project Manager: Sergio Vargas, Deputy Director Ventura County Watershed Protection District, County of Ventura, (805) 650-4077, Sergio.Vargas@ventura.org

Award Date: December 2016

Completion Date: Completed August 2017

Project Description: Revell Coastal, LLC working with Moffat and Nichol Engineers, reviewed the recently released Preliminary Coastal Flood Insurance Rate Maps for the County of Ventura. Specific work focused on the technical review of modeling assumptions, calculations, and geomorphic interpretation to evaluate the accuracy and shortcomings of the new proposed regulatory maps. The final report has been submitted to FEMA to consider additional work to improve the mapping accuracy.

NATURAL GAS AND ELECTRICITY VULNERABILITY ASSESSMENT FOR THE SAN DIEGO REGION

Lead: ICF

Firm Project Manager: Dr. Robert Kay

Client Project Manager: Guido Franco, Team Lead for Climate Change and Environmental Research, California Energy Commission 916-654-4542, Guido.Franco@energy.ca.gov

Award Date: June 2016

Completion Date: Anticipated April 2018

Project Description: As part of the 4th California Climate Assessment, Revell Coastal has been leading the coastal hazard and sea level rise assessment for ICF on the SoCal Natural Gas and San Diego Gas and Electric Utility infrastructure. Work has included evaluation of COSMOS 3.0 modeling, Department of Defense hazard modeling, and integrating all modeling initiatives into the vulnerability assessment by filling data gaps and interpreting the modeling results. Technical workshops on the vulnerability and adaptation responses are currently underway.

CITY OF CARPINTERIA: LOCAL COASTAL PROGRAM AND GENERAL PLAN UPDATE

Lead: AMEC Foster Wheeler

Firm Project Manager: Rita Bright and Dan Gira

Client Project Manager: Steve Goggia, Community Development Director, City of Carpinteria, 805-755-4414, steveg@ci.carpinteria.ca.us

Award Date: August 2017

Completion Date: Anticipated April 2019

Project Description: Revell Coastal, is working with AMEC Foster Wheeler in updating the City of Carpinteria LCP and General Plan. Specific tasks for Revell Coastal are to conduct a Vulnerability Study and Fiscal Impact Study and work with the Steering Committee and City to incorporate the findings into policy and implementation language. This project has included data analysis, evaluation and interpretation of various Coastal Hazard model outputs (COSMOS 3.0 and Coastal Resilience), and public outreach and communication.

CITY OF OXNARD: LOCAL COASTAL PROGRAM UPDATE FOR SEA LEVEL RISE

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Isidro Figueroa, Principal Planner, City of Oxnard, 805-385-8207, Isidro.figueroa@oxnard.org

Award Date: September 2014

Completion Date: Anticipated June 2018

Project Description: Revell Coastal, working on retainer for the City of Oxnard, has been guiding Rincon Consultants to conduct a Vulnerability Study and Adaptation plan in support of the LCP update. This project has included data analysis, additional adaptation modeling, integration with the economic team, and public outreach and communication. Presently, the project team is revising policy documents and embarking on the City Council and Planning Commission engagement as well as public outreach and education.

CITY OF IMPERIAL BEACH SEA LEVEL RISE STUDY: “ADAPTIVE” VULNERABILITY AND ADAPTATION PLANNING

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Jim Nakagawa, Principal Planner, City of Imperial Beach, 619-628-1355, jnakagawa@imperialbeachca.gov

Award Date: September 2014

Completion Date: September 2016

Project Description: Revell Coastal, teamed with USC Sea Grant, conducted a Sea Level Rise Vulnerability and Adaptation Study in Imperial Beach, San Diego, CA. With funding from the State Coastal Conservancy, Revell Coastal led the City through a facilitated process to characterize existing and future vulnerabilities, identify potential adaptation strategies, and then help educate the local community to garner support for implementing of prioritized actions. An expanded scope, with San Diego Foundation funding, enabled an economic analysis and expanded educational outreach to elected officials and regional partners to be included. Part of the project built technical capacity within the City to support future incorporation of

new relevant data. Key partners in the initiative include the Tijuana River National Estuarine Research Reserve, the Port of San Diego, and the U.S. Navy.

SANTA BARBARA COUNTY COASTAL RESILIENCY PHASES 1 AND 2

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Mindy Fogg, Supervising Planner, (805) 884-6848, mfogg@countyofsb.org

Award Date: June 2015

Completion Date: September 2016

Project Description: With funding from the California Coastal Conservancy, the Coastal Commission, and the Ocean Protection Council, Revell Coastal (with subcontractor ESA) modeled projected coastal hazards exacerbated by sea level rise to the Santa Barbara County coast at a scale suitable for planning purposes. Deliverables included projected future coastal hazards, which include a new integrated approach of stepping through; time eroding the coast and flooding newly eroded areas through hydraulic connectivity. Additional modeling was completed that included existing coastal armoring structures to support other jurisdictional efforts on LCPs in understanding the implications of maintaining coastal armoring. Working with the County, model results for Phase 1 (South Coast) were incorporated into a vulnerability assessment, while Phase 2 results (North Coast including armoring), was integrated into a revision to the County wide Vulnerability study which will be used to inform revised LCP policies and adaptation discussions. Results for Phase 1 and 2 are available on the Nature Conservancy website (www.coastalresilience.org).

CITY OF MONTEREY VULNERABILITY ASSESSMENT IN SUPPORT OF THE LOCAL COASTAL PROGRAM UPDATE

Lead: EMC Planning Group

Firm Project Manager: Polaris Kinison Brown

Client Project Manager: Kim Cole, Principal Planner, City of Monterey, 831-646-3759, cole@monterey.org

Award Date: July 2015

Completion Date: expected June 2017

Project Description: Revell Coastal was contracted as part of a team with EMC Planning to update the City of Monterey LCP with funding from the California Coastal Commission. Revell Coastal work included technical analysis, hazard modeling and mapping, and completion of the Existing Conditions and Vulnerability report. Revell Coastal has also been the lead in presenting on the vulnerabilities and potential adaptation strategies to the City Council, Planning Commission and stakeholder engagement process. Revell Coastal will be providing input and review on the LCP policies and Implementation plan language.

CITY OF CARLSBAD LOCAL COASTAL PROGRAM

Lead: Moffat and Nichol Engineers and Michael Baker International

Firm Project Manager: Brian Leslie

Client Project Manager: Carl Stiehl, Planner, City of Carlsbad, 760-602-4605
carl.stiehl@carlsbadca.gov

Award Date: September 2015

Completion Date: expected December 2017

Project Description: Revell Coastal, LLC was contracted as part of a team with Moffat and Nichol to support the LCP update process. Revell Coastal work provided technical advisement on interpretation of hazard modeling, adaptation and outreach. Revell Coastal presented on adaptation options and wrote the sections on various adaptation strategies to community work groups, and provided scientific input to the City Council, Planning Commission and stakeholder process including review of proposed LCP policies and Implementation plan language.

CITY OF PACIFIC GROVE LOCAL COASTAL PROGRAM

Lead: EMC Planning Group

Firm Project Manager: Polaris Kinison Brown

Client Project Manager: Anastazia Aziz, Senior Planner, City of Pacific Grove, 831-648-3183,
aaziz@cityofpacificgrove.org

Award Date: July 2015

Completion Date: June 2016

Project Description: Revell Coastal was contracted as part of a team with EMC Planning to support the LCP update process. Revell Coastal work included technical analysis, hazard modeling and mapping and outreach. Revell Coastal has presented on various adaptation strategies to community work groups, and provide scientific input to the City Council, Planning Commission and stakeholder engagement process including review of proposed LCP policies and Implementation plan language.

VULNERABILITY ASSESSMENT FOR POWER GENERATING STATIONS IN THE CITY OF OXNARD

Lead: Rincon Consultants

Firm Project Manager: Jennifer Haddow

Client Project Manager: Chris Williamson, Principal Planner, City of Oxnard, 805-385-8156,
chris.williamson@ci.oxnard.ca.us

Award Date: November 2014

Completion Date: Ongoing

Project Description: Revell Coastal was contracted as an expert witness to conduct a vulnerability assessment for the industrial sites within the Coastal Zone in the City of Oxnard from current and future coastal hazards. The assessment utilized a variety of modeling work completed as part of the Nature Conservancy's Coastal Resilience Ventura project. This assessment provides the City information to review the California Energy Commission application for additional energy development at the Mandalay Generation Station. The vulnerability assessment also bolsters the understanding of the City as to the timing and failure so the Ormond Beach Generating Station as the City considers methods to remove the aging energy infrastructure. Dr. Revell continues to provide expert witness testimony to the California Public Utilities Commission and the California Energy Commission.

CITY OF GOLETA: INCORPORATING CLIMATE CHANGE INTO THE LOCAL COASTAL PROGRAM

Lead: Revell Coastal, LLC

Firm Project Manager: Dr. David Revell

Client Project Manager: Anne Wells, Advanced Planning Manager, City of Goleta 805-961-7544, awells@cityofgoleta.org

Award Date: July 2014

Completion Date: December 2015

Project Description: Revell Coastal worked for the City of Goleta to update and draft their LCP policies to include climate change impacts consistent with the California Coastal Commission Guidance on Sea Level Rise. This included a vulnerability assessment, co-authored a fiscal impact section and identified and evaluated adaptation strategies to provide policy recommendations and sections of the Local Coastal Program related to coastal hazards, specifically in the open space, safety and conservation elements. Funding for this work was acquired from the California Coastal Commission through their climate grant program as well as the City's General Fund.

GOLETA SLOUGH SEA LEVEL RISE VULNERABILITY AND ADAPTATION STUDY AND ECOSYSTEM MANAGEMENT PLAN UPDATE

Lead: ESA (former employer of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: Rachel Couch, California Coastal Conservancy for the Goleta Slough Management Committee, 805-845-8853 rcouch@scc.ca.gov

Award Date: October 2012

Completion Date: January 2016

Project Description: The Goleta Slough Ecosystem Management Plan was prepared by the Goleta Slough Management Committee and adopted by the City of Santa Barbara in 1997. As part of an update to the Management Plan, the Coastal Conservancy funded a vulnerability and adaptation study to re-evaluate the study area based on projected sea level rise. Through a facilitated stakeholder process and technical analyses, the study assessed vulnerability and risk to both natural and human resources and infrastructure. Based on results of the vulnerability assessment a series of adaptation strategies were recommended that include both capital improvements and policy recommendations. Dr. Revell managed the project, the stakeholder process, led the technical analyses and provided guidance and direction to the subcontractors.

MONTEREY BAY SEA LEVEL RISE VULNERABILITY ASSESSMENT, MONTEREY AND SANTA CRUZ COUNTIES

Lead: ESA (former employer of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: Dennis Long, Executive Director, Monterey Bay Sanctuary Foundation (831) 647-4209, dennis@mbnmsf.org

Award Date: June 2012

Completion Date: June 2014

Project Description: With funding from the California Coastal Conservancy, the Natural Capital Project, and the City of Capitola, ESA PWA (former employer of Dr. Revell) modeled projected

climate change impacts to the coast of Monterey Bay at a scale suitable for planning purposes. Deliverables included projected future coastal hazards, which include a new integrated approach of stepping through; time eroding the coast and flooding newly eroded areas through hydraulic connectivity. The project was advised by a Monterey Bay region wide technical advisory group comprised of research institutions (UCSC, Naval Postgraduate School, Moss Landing, CSUMB and USGS), local planning agencies (Santa Cruz, Monterey Counties, Cities of Monterey, Santa Cruz, Seaside, Sand City, Capitola), and other technical experts. Uncertainty in the sea level rise projections were represented by mapping a variety of projected impacts then overlapping them and developing an uncertainty index that showed relative risk of coastal hazard impacts. Dr. Revell managed the project and led the technical work for ESA.

THE NATURE CONSERVANCY'S COASTAL RESILIENCE PROGRAM

Lead: ESA (former employer of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: Sarah Newkirk, J.D., Coastal Programs Director, (415) 730-7437, snewkirk@tnc.org

Award Date: September 2012

Completion Date: July 2014

Project Description: The Coastal Resilience Ventura (www.coastalresilience.org) project encompasses the entire Ventura County coastline, including Mugu Wetlands, the Santa Clara River, and the Ventura River. Working through an interactive stakeholder process with multiple agencies, local government representatives, and several non-profit organizations, Dr. Revell led a technical team which modeled current and potential future coastal and fluvial hazards for a variety of climate change scenarios, including sea level rise and changes to rainfall and sediment delivery. We applied a habitat evolution model (Sea Level Affecting Marsh Migration - SLAMM) to predict long-term wetland conversion with sea level rise, as well as to identify areas of ecological vulnerability based on potential adaptation strategies. SLAMM model results were then used to calculate the greenhouse gas emissions related to multiple adaptation strategies. The results are being used by local communities and the Department of Defense to evaluate vulnerabilities and consider adaptation strategies. Dr. Revell was the project manager, led the technical modeling, and worked with the client on a project development team and as a co-facilitator for the stakeholder process.

GOLETA BEACH EROSION PROJECTS FOR THE COUNTY OF SANTA BARBARA

Lead: PWA, ESA, UCSC (former employers of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: (multiple) Current project manager is Alex Tuttle, Planner, Development Review County of Santa Barbara, 805-884-6844, atuttle@countyofsb.org

Award Date: September 2003

Completion Date: April 2014

Project Description: The 1997-98 El Niño catalyst an erosion wave that caused substantial erosion to Goleta Beach County Park in Santa Barbara County. Dr. Revell has been involved in multiple stakeholder processes and technical studies over the last 11 years working primarily for the County of Santa Barbara. These studies have included peer reviewed scientific research,

technical studies on various adaptation strategies with several alternative park reconfigurations and managed retreat options. Dr. Revell also peer reviewed other technical modeling and led a technical team to conduct wave run-up and climate change modeling to support the Environmental Impact Report on a managed retreat strategy. Throughout the process, Dr. Revell presented research results to stakeholder group.

NESKOWIN SHORELINE ASSESSMENT, NESKOWIN, TILLAMOOK COUNTY, OREGON

Lead: ESA (former employer of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: Patrick Corcoran, Oregon Sea Grant Coastal Hazard Specialist, 503-325-8573, patrick.corcoran@oregonstate.edu

Award Date: August 2012

Completion Date: May 2013

Project Description: In response to high rates of erosion and sea level rise that have diminished the beaches and now threatens homes and roads in Neskowin, OR, Dr. Revell analyzed the viability of various coastal erosion mitigation strategies on an eroding shore, utilizing existing information from local academics (Oregon State University) and agencies (including the Department of Geology and Mineral Industries), as well as applying his experience completing assessments for similar high-energy wave-exposed coastal areas. We applied modeling to evaluate physical changes from various adaptation strategies and provided conceptual level engineering cost estimates for each strategy to inform community decision-making. The community was striving to find a balance of private property protection with maintenance of a sandy beach to support the tourist economy. Dr. Revell managed the project, led the technical analyses and co-facilitated the community process.

TECHNICAL EVALUATION OF EROSION MITIGATION ALTERNATIVES AND REGIONAL SEDIMENT MANAGEMENT PLAN FOR SOUTHERN MONTEREY BAY

Lead: PWA (former employer of Dr. Revell)

Firm Project Manager: Dr. David Revell

Client Project Manager: Brad Damitz, Natural Resource Specialist, 415-250-840, brad.damitz@noaa.gov

Award Date: October 2010

Completion Date: May 2012

Project Description: The Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay provided an assessment of various erosion mitigation measures (adaptation strategies) to support development of a regional strategy to address coastal hazards. (Alternatives Study - <http://montereybay.noaa.gov/research/techreports/esapwa2012.pdf>). In this study, 22 different erosion mitigation measures including land use planning tools, soft engineering solutions and hard engineering solutions. The measures were compared using a variety of criteria including an innovative effectiveness criteria which compared each measures merit at protecting upland property and beach widths (a highly valued community resource). The Study then compared the costs and benefits of each measure over multiple time horizons by tracking the physical impacts of each measure on the beach and upland through time. The holistic cost/benefit analysis included accounting for beach recreation and ecosystem services in

addition to traditional storm damages. While this initial study did not include climate impacts directly, it began to inform adaptation strategies across the region Dr. Revell managed the project for ESA and led the technical work.

PACIFIC INSTITUTE COASTAL INFRASTRUCTURE AND VULNERABILITY IMPACTS ASSESSMENT

Lead: Pacific Institute

Firm Project Manager: Dr. David Revell (working for Philip Williams and Associates)

Client Project Manager: Matt Heberger, P.E., Water Resource Associate/Climate Program Coordinator, Pacific Institute, 510-251-1600, mheberger@pacinst.org

Award Date: June 2008

Completion Date: January 2009

Project Description: With funding from the Ocean Protection Council as part of the 2008 California Climate Impacts Assessment through the California Energy Commission, Dr. Revell working for PWA conducted the first California statewide coastal hazard assessment resulting from sea level rise. This groundbreaking project, the first of its kind on the U.S. West Coast, mapped projected future coastal erosion and coastal flooding hazards. (<http://www.energy.ca.gov/2009publications/PWAOPC-1000-2009-013/PWAOPC-1000-2009-013.PDF>) To complete this project, PWA (led by Dr. Revell) developed a new methodology which evaluated geomorphic response of various backshore types by applying a total water level methodology (Revell et al 2011); collaborated with climate change researchers at Scripps, USGS, and Oregon State; organized and engaged a technical and regulatory peer review team on methods and results; then collaborated with Pacific Institute to vulnerability assessment associated with coastal hazards which were published in the Pacific Institute Report: The Impacts of Sea Level Rise to the California Coast. Dr. Revell managed the project and led the technical work for PWA.

USGS-UCSC COASTAL PROCESSES STUDY FOR SANTA BARBARA AND VENTURA COUNTIES

Lead: USGS

Firm Project Manager: Dr. David Revell (for University of California Santa Cruz)

Client Project Manager: Dr. Patrick Barnard, Coastal Hazards Scientist, USGS 831-460-7556, pbarnard@usgs.gov

Award Date: October 2005

Completion Date: December 2007

Project Description: The USGS and UCSC collaborated on a large-scale coastal process study of the Santa Barbara littoral cell. <http://pubs.usgs.gov/of/2009/1029/>. Building on research by Dr. Revell (formerly at UCSC) assessing the long-term changes to beaches from climate change and human impacts, the study examined seasonal changes through extensive field data collection campaigns and conducted numerical modeling to further inform observations of short term and seasonal changes and provide insights into long term shoreline evolution. Dr. Revell, conducted research and managed the UCSC research team led by Dr. Gary Griggs.