POOLLC PLATFORM HOGAN SUBMARINE CABLE REPAIR PROJECT

MARCH & APRIL 2008

SANTA BARBARA CHANNEL

PRESENTED BY MARK STEFFY

LONGITUDE 123, INC.

PRESENTATION OVERVIEW:

- The California offshore oilfield marine infrastructure is aging. Many facilities exceed 40 years old and some exceed 50 years. These facilities will require increasing levels of maintenance, repair or replacement in the decades to come. Planning, permitting and performing these activities in California will continue to require creative approaches and extraordinary levels of agency/owner cooperation.

- This presentation uses a recent submarine cable repair project to illustrate the successful planning, permitting, and execution of a California offshore oilfield marine repair/replacement project.

- This presentation also shares personal lessons learned about planning, permitting and performing coastal marine repair and maintenance projects, taking place in California, over the past 16 years.

POOL PLATFORM HOGAN SUBMARINE CABLE REPAIR PROJECT

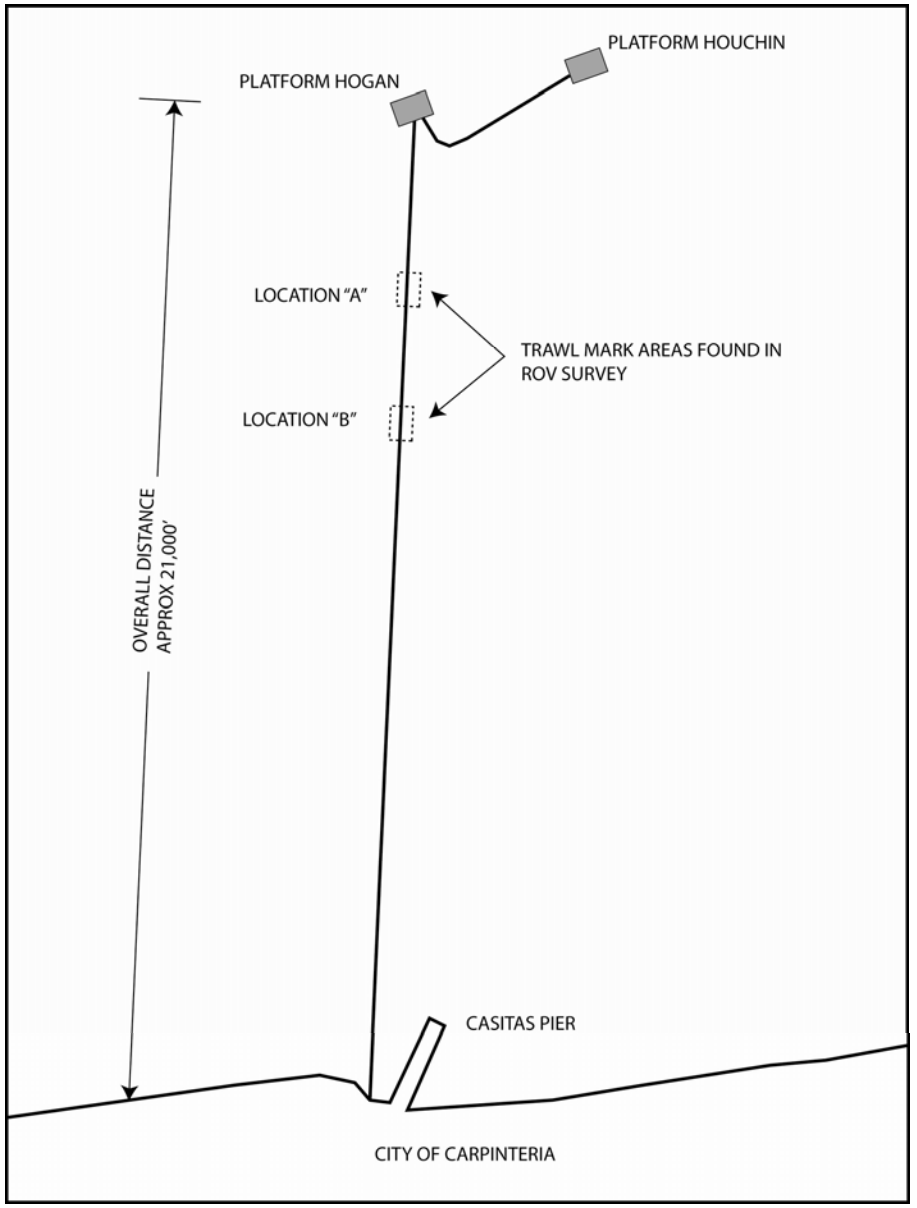
THE REPAIR SCENARIO:

- The submarine power cable providing electrical power to Platform Hogan and Platform Houchin breaks on November 17, 2007.
- The break is thought to be the result of commercial fishing activities.
- All power to both platforms is lost.
- Backup generators on the platforms are used to provide operating power but require large quantities of diesel fuel that must be transported by boat to the platforms.
- At least one, and possibly two, faults are found in the cable during preliminary testing, but the location and total number of faults are unknown.
- The length of the replacement cable segment is consequently unknown.
- Time is of the essence!

FACILITY HISTORY:

- Platforms Hogan and Houchin were constructed and installed by Phillips Petroleum in 1967 and 1968.
- Both platforms were operated by Phillips Petroleum until 1991 when they were purchased by the current owner and operator, POOLLC.
- A single 25KV submarine electrical cable spans between the shoreline of Carpinteria at the Casitas Pier and Platform Hogan, a distance of approximately 21,000 feet. This three-conductor, armored cable was installed in 1967.
- It sustained damaged to the nearshore segment in October of 1980 and was repaired with three splices at that time.
- A second cable sends shore power from Platform Hogan to Platform Houchin and was not part of this project.

SITE MAP:



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PROJECT CHALLENGES SPECIFIC TO THE POOLLC SUBMARINE CABLE REPAIR PROJECT:

- Winter Weather Patterns
- Long Lead Time for Replacement Cable Manufacturing
- Limited West Coast Submarine Cable Repair Resources
- Number and Location of Faults Unknown
- Cable Within 50’ of Existing Nearshore Pipelines and Power Cables
- Cable Within 1,000’ of Designated Fishing Area
- Water Depths Up To 150 Feet Limiting Diver Bottom Times
- Emergency Permits Required

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OWNER'S RESPONSE:

- **Commissions Subsea Survey of Cable Route – HDI conducts ROV survey of seafloor cable route.**
- **Hires Environmental Sciences Consultants Padre Associates, Inc. and M.F. Strange & Associates, Inc. – They begin by consulting with agencies to determine permitting strategy.**
- **Contracts High Voltage Electrical Engineering Contractor – Conducts tests to determine number and location of faults.**
- **Commissions Manufacture of Replacement Cable**

RESULTS OF INVESTIGATION & ROV SURVEY:

- The high voltage electrical contractor uses a time-domain reflectometer in an attempt to locate the fault or faults in the cable. The reflectometer indicates one fault located approximately 11,000 feet offshore of the shore-side substation (total distance to the platform is 21,000 feet).

- The ROV survey is then started approximately 12,000 feet offshore of the shore-side substation in 140 feet of water. The survey works shoreward. The cable is found to be buried under the seafloor and not visible. The ROV flies the cable route as indicated by Fugro surface navigation based the original installation as-built survey. The cable is never seen.

- Trawl marks, net debris and wire rope from recent commercial fishing operations are found at two locations near the as-built cable route. Location “A” is in 120 feet of water and located approx 14,000 feet offshore. Location “B” is in 110 feet of water and located approx 12,000 feet offshore. At both locations the electrical cable is not seen and assumed to be buried.

- Trawl-mark Location “A” is near the supposed fault location per the reflectometer. The distance between Location “A” and Location “B” is approximately 2,000 feet. Based on this information POOLLC orders a 2,500 foot long section of replacement cable with the intent to replace all the cable between the two trawl mark locations.

PERMITTING EFFORT:

Padre Associates, Inc and M.F. Strange & Associates, Inc. immediately pursue the necessary permits on an emergency basis. Ray de Wit of Padre heads up the Padre effort, Marianne Strange of M.F. Strange pursues the necessary air quality permits.

- **U.S. Minerals Management Service - Determines they have no jurisdiction but ask for updates as the work progresses.**
- **U.S. Army Corp of Engineers - Authorizes the work under a Nationwide Permit and Letter of Authorization for Rivers and Harbors Act Section 10. No Clean Water Act Section 404 necessary.**
- **Regional Water Quality Control Board – Determines no Section 401 Certification necessary because Section 404 was not necessary.**
- **California State Lands Commission – Determines efforts are consistent with lease. CEQA exempt.**
- **California Coastal Commission – Issues Emergency Permit with conditions, requires Coastal Development Permit be completed at project conclusion. Done so under a De Minimis Waiver.**
- **Santa Barbara County Energy Division - No authorization required, asked for updates as the work progresses.**
- **Santa Barbara APCD – After much effort, an APCD project exemption is acquired.**
- **City of Carpinteria – No formal authorization is required, requests updates as the work progresses.**

PROJECT STAKEHOLDERS:

Stakeholders on this project included:

- Minerals Management Service (no jurisdiction, notification only)
- U.S. Army Corp of Engineers (Nationwide Permit/Section 10, notification, conditions)
- Regional Water Quality Control Board (notification only)
- California State Lands Commission (no permit needed, notification, conditions)
- California Coastal Commission (Emergency Permit/Coastal Development Permit, conditions)
- Santa Barbara County Energy Division (notification only)
- Santa Barbara APCD (permit, notification)
- City of Carpinteria (notification only)
- Pacific Offshore Operators Limited Liability Corporation
- Venoco
- Padre Associates, Inc. and M.F. Strange & Associates, Inc.
- Hampton Tedder (electrical contractor) and Prysmian (cable supplier)
- Contractor Team (L123, APC, Maripro, Fugro, Maritime Logistics, Pac Weather)

REPAIR TEAM ASSEMBLED:

POOLLC contracts Associated Pacific Constructors, Inc. (APC) to perform the repair work. APC assembles the following team:

- **Longitude 123, Inc. (L123) – Provides project manager.**
- **APC – Provides derrick barge, tugboat/anchor handling vessel, inflatable vessel, deck crews and dive crews.**
- **L3-Maripro, Inc. – Provides linear cable engine, cable chute, cable sheaves, cable reel, Phantom ROV system and electronic cable tracker. Also to provide burial sled but this is later eliminated when scope of work changes.**
- **Fugro West, Inc. – Provides DRONE differential global positioning system and expert survey technicians (Eddie and Doug).**
- **Maritime Logistics – Provides ROV support vessel/berthing vessel.**
- **Pacific Weather Analysis – Provides site-specific weather forecasting throughout project.**

ASSOCIATED PACIFIC
marine constructors, morro bay

LONGITUDE 123, INC.
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and Construction Management

L3 communications
MariPro, Inc.

FUGRO

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REPAIR TEAM ASSEMBLED:

In addition, POOLLC contracts the following services to support the work:

- **Hampton Tedder Electric Company – Provides repair cable segment (through Prysmian), high voltage crews and all splicing materials.**
- **Padre Associates, Inc. – Provides mammal monitors and compliance monitoring.**

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CABLE REPAIR SPREAD:

D/B JC Freese - 120' LOA x 40' Breadth, 30 Ton Revolving Crane, 4-Point Mooring System

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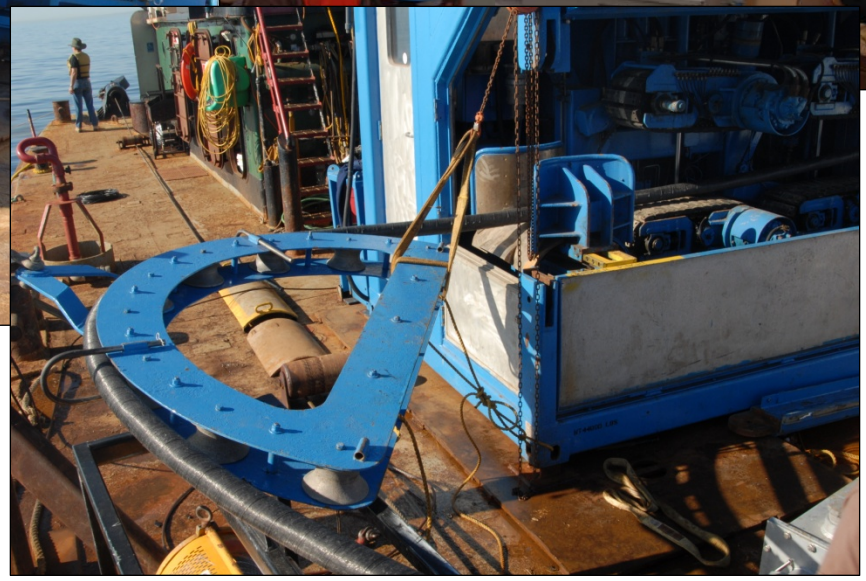
CABLE REPAIR SPREAD:

Cable Handling Equipment



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CABLE REPAIR SPREAD:

Tugboat/Anchor Handling Vessel – T/B Moe - 60’ LOA x 14.5’ Breadth

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CABLE REPAIR SPREAD:

M/V Michael Uhl – ROV Support Boat/Berthing Vessel - 100' LOA x 24' Breadth, A-Frame, 5 Ton Knuckle Boom Crane, Anchor Winch

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CABLE REPAIR SPREAD:

Fugro West Surface Navigation System - DRONE System

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FINAL PROJECT SCOPE OF WORK:

To summarize a long story, the final scope of work consisted of the following elements:

- **Instead of one repair with two splices, the existence of three potential fault locations requires three repair sites with two splices at each location (total of six splices). Two faults are actually found. Cable burial with a burial sled is now ruled out due to shorter length of repair segments. Hand-jetting is required. These changes represent a 300% increase in work scope.**
- **The cable is cut and recovered through trawl-mark Location "B" (Cable Repair Site #1), a distance of approx 307 feet. The cable is found located east of the trawl marks, no fault is found. A "Dutchman" repair cable segment of approx 600 feet is installed (including vertical legs). This repair site is located between 11,948' and 12,255' offshore.**
- **The cable is cut and recovered through trawl-mark Location "A" (Cable Repair Site #2), a distance of approximately 700 feet. A fault is found in the cable. A "Dutchman" repair cable segment of approx 1,000 feet is installed (including vertical legs). This repair site is located between 13,776' and 14,474' offshore.**
- **The cable is cut and recovered at Cable Repair Site #3, a distance of approximately 400 feet. This is the location of three repair splices performed in 1980. One of the existing repair boxes is removed with this segment. A fault is found in the cable. A "Dutchman" repair cable segment of approx 700 feet is installed (including vertical legs).**
- **All repair segments are buried a minimum of 1 meter below the seafloor using hand-jetting techniques.**
- **The work was completed in 26 days working 7-day weeks. There were no accidents, injuries or incidents of any kind.**

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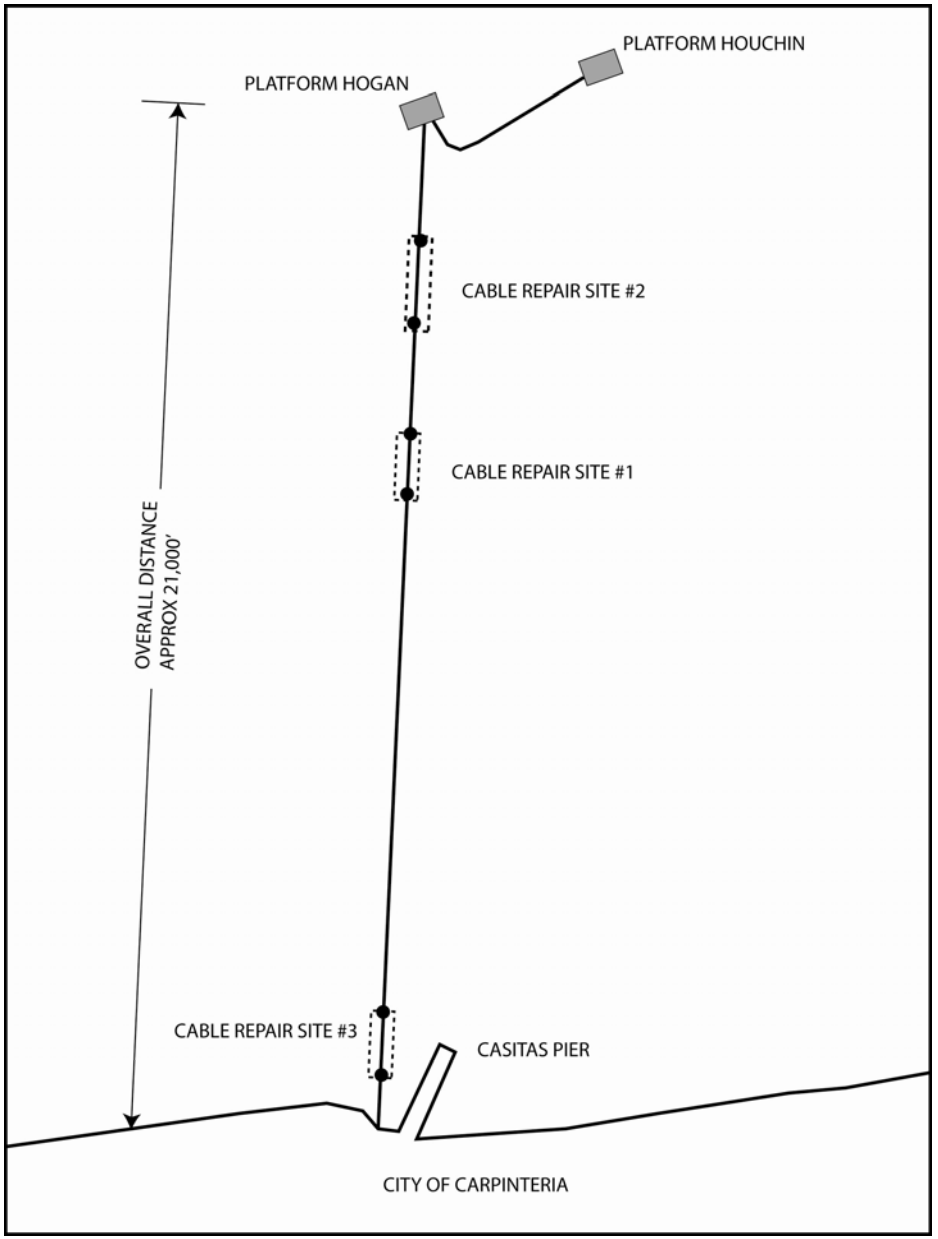
FINAL PROJECT SITE MAP:



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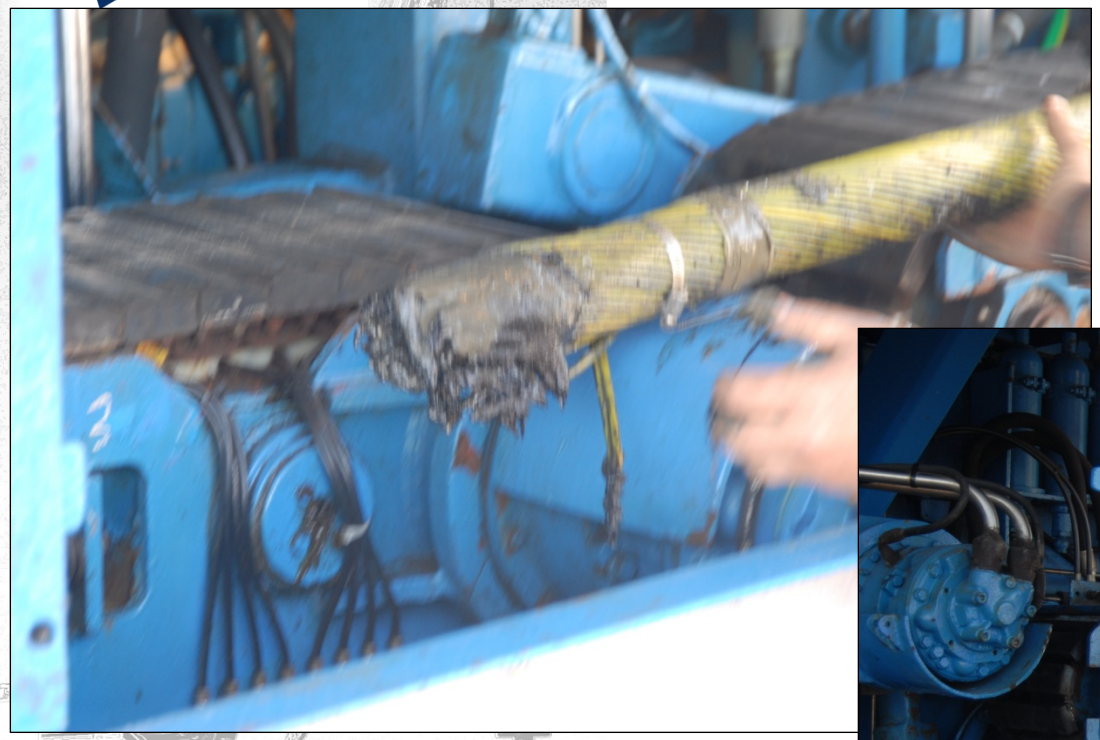
PROJECT PHOTOS:



First cable cut in the LCE.

LCE hauling existing cable aboard.

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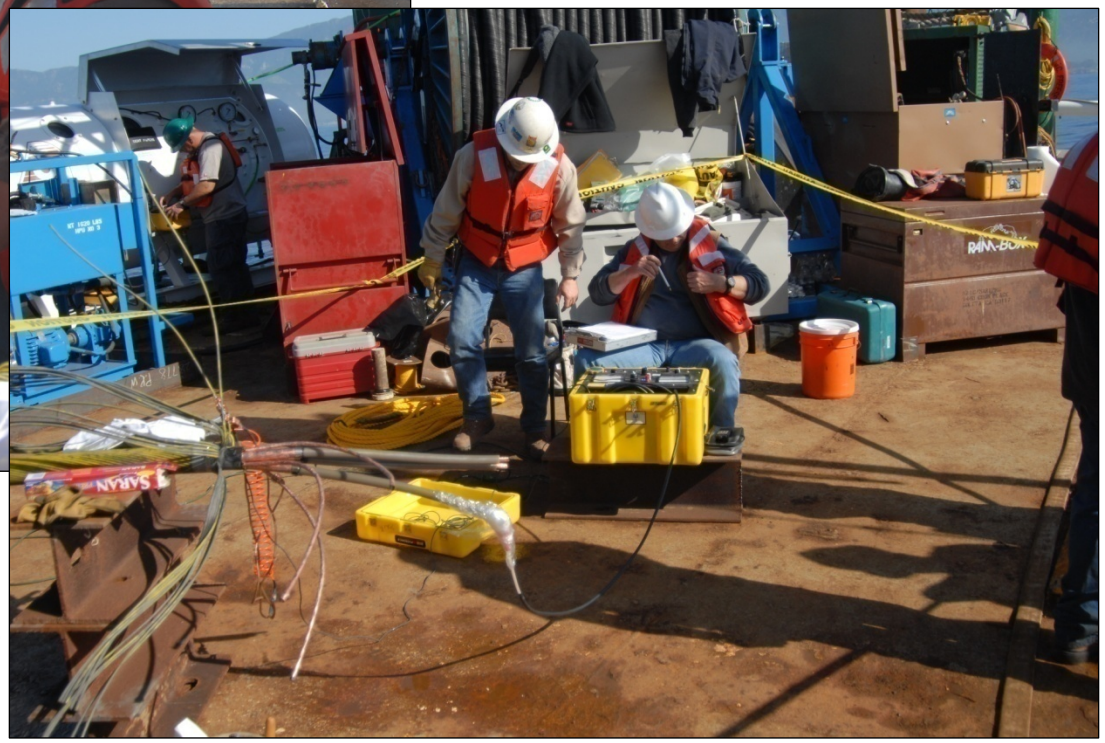
PROJECT PHOTOS:

Hampton Tedder crews preparing cable end for testing.



Hi-Pot testing cable segment.

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PROJECT PHOTOS:

L3-Maripro ROV operator locating cable with cable tracker.

APC diver exiting water after cable location and recovery.

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PROJECT PHOTOS:

APC crews cut old cable into 25’ pcs w/ handheld electric bandsaw.

Cut pcs of old cable were stored on T/B Moe.

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PROJECT PHOTOS:

Hole in side of cable at cable fault created when cable was “thumped”.

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PROJECT PHOTOS:

Cable splice under construction.

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PROJECT PHOTOS:

Splice box being filled with No-Void.

Splice box rigged and ready to overboard.

LESSONS LEARNED:

- Use a cable tracker in conjunction with the ROV to ensure that the ROV is actually tracking the cable when doing the initial cable surveys for a buried faulted cable. Power the cable tracking signal through an un-faulted leg of the cable.
- Calibrate the reflectometer using known physical lengths rather than relying on supposed cable velocities.
- Use a cable tracker during diver location of the cable to speed up location and recovery of a buried cable.
- Ensure high voltage electricians are available to work around the clock once splicing begins.
- Consider replacing the entire cable from the platform to a shallow water splice point. Requires only one splice, installation time may be reduced by two-thirds, thereby paying for cost of additional cable.
- Use mooring system with anchor legs suited to the water depths and capable of longest excursion distances possible.

ACKNOWLEDGEMENTS & THINGS THAT WORKED WELL:

- APC – Knowledgeable crews and good equipment. Special thanks to Paul Gillen, Keith Hood and Ed Thomas!
- Hampton Tedder Electrical – Extraordinarily professional and knowledgeable. Worked 24 & 30 hour days without a complaint.
- Padre Associates – Intelligent permit acquisition, move swiftly and efficiently, great environmental monitors and marine biologists.
- M.F. Strange & Associates – Thanks for the hard work!
- Fugro West – Always got your back, know their stuff, keep you out of trouble. Thanks Jeff, Ed and Doug!
- L3-Maripro – Great crews, great equipment, extraordinarily professional.
- Maritime Logistics – Versatile and capable boat, great crews, can-do attitude.
- Pacific Weather Analysis – Solid weather forecasting, dependable.

PERSONAL LESSONS LEARNED PLANNING, PERMITTING AND PERFORMING OFFSHORE PROJECTS IN CALIFORNIA IN PAST 16 YEARS:

- **Expect a Team Approach – No One West Coast Contractor Can Do Everything In-House**
- **Select Your Contractor Prior to the Start of Planning – Include the Contractor or Technical Consultant in Engineering and Planning Phases**
- **Do the Research - Be Aggressive in Locating and Examining Facility History**
- **Always Perform a Thorough Bathymetric Survey. Always Make Sure the Survey Encompasses the Entire Possible Work Area Including Potential Anchorages**
- **Determine Agency and Public Hot-Button Issues in Initial Planning Phase**
- **Use Experienced Environmental Consultants and Technical Consultants**
- **Do What You Say, Say What You Do**
- **Take Pains to Keep All Stakeholders in the Loop – Report and Communicate**

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