BAY PLANNING COALITION
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June 3, 2004 Seminar: The Use and Permitting of Treated Wood in San Francisco Bay and Estuary

This seminar report summarizes BPC's June 3, 2004 Seminar on the use and permitting of treated wood in San Francisco Bay and Estuary. The report is available on the BPC website at www.bayplanningcoalition.org.

BACKGROUND

Wood is a widely used material in marine construction, for both structural and aesthetic purposes. In order to prevent structural damage that inevitably results from fouling and boring marine organisms, the wood is often treated with chemical preservatives. Both the U.S. EPA and the California Department of Pesticide Registration must register the preservatives; the registration process includes a thorough scientific review to identify adverse environmental and human health effects. The agencies require the manufacturer to place label restrictions, which govern the application of the preservatives to wood products. Nonetheless, these chemicals may leach from the finished (treated) wood products into the marine environment during the life of the product. The movement of chemicals from treated wood (ACZA[1]) into the environment, and the potential adverse impacts of these chemicals on aquatic species (especially endangered fish species), are at the heart of the treated wood debate.

In March 2003, prompted by the National Oceanic and Atmospheric Administration Fisheries – Northwest Fisheries Science Center's (NOAA) disapproval of projects using treated wood, BPC held its first meeting to:

- Discuss the state of the science on the effects of treated wood
- Discuss the translation of this science into regulatory decision-making
- Explore NOAA's basis for its recommendations against the use of treated wood
- Plan a seminar for further discussion of this topic

Meeting participants included NOAA, U.S. Army Corps of Engineers (USACE), S.F. Bay Regional Water Quality Control Board (RWQCB), and industry stakeholders. NOAA reiterated its growing concern about chemical leaching (particularly copper) from treated wood. The USACE exercises

[1] There are a number of wood preservatives available to industry (see www.wwpinstitute.org). ACZA (ammoniacal copper zinc arsenate) is the most widely used wood preservatives for the San Francisco Bay at this time. The primary chemical of concern for this treatment is copper. Creosote and CCA-C [chromated copper arsenate type-c], though effective preservatives, are generally not used in San Francisco. Creosote, which contains PAHs, is discouraged by the California Department of Fish and Game, though no formal review or decision on this matter has been issued. CCA-C is not a good treatment for Douglas fir, one of the more common woods on the west coast.

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regulatory authority over marine construction projects and, based on NOAA's advice, has been reluctant to permit ACZA treated wood, advocating instead for the use of alternative materials such as concrete and steel. However, industry representatives, including local contractors, project sponsors, and the Western Wood Preservers Institute (WWPI), argued that scientific evidence supports a conclusion of minimal or insignificant risk from leaching; therefore, they continue to recommend the use of treated wood in marine environments. Absent regulation prohibiting the use of treated wood, the BPC is concerned that the combined NOAA and USACE position constitutes *de facto* regulation.

INTRODUCTION TO JUNE 2004 SEMINAR

As a follow-up to the 2003 roundtable discussion, BPC held the June 3, 2004, educational seminar to air and bring some resolution to the treated wood debate. The panelists addressed a variety of issues, notably:

- The importance of wood in marine construction (structurally, economically and aesthetically)
- Processes, technologies and complexities of wood preservation
- Scientific data and data gaps for chemical movement from treated wood
- Translation of science to policy
- Current permitting procedures

One of the primary sticking points, particularly between NOAA and industry scientists, was the state of the science and how this science is translated into policy. Questions remain regarding how much copper leaches into the marine environment, the threshold at which there are adverse impacts to fish, the scientific studies on which we can all agree, and scientific data gaps that need to be addressed.

The goal of the seminar was to develop consensus, based upon the best available science, on the use and permitting of treated wood in marine environments. The seminar set out to answer the following questions:

- Treated wood – what are its uses, applications and alternatives?
- What is the state of the science of the potential environmental effects of treated wood?
- What types of information and documentation should a permit applicant provide to the regulatory agencies, and what are the applicable regulations, practices and procedures?
- Can environmental risk-based models be used to facilitate permitting of treated wood?
- What are the tools for solutions – BMPs, certifications, programmatic permits?

STATE OF THE SCIENCE

In sum, the science panelists representing NOAA and industry had very different positions on how to consider laboratory and field studies in the evaluation of treated wood in the marine environment. This report summarizes the positions of the 'science panel' on the leaching of

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chemicals (principally copper) from treated wood, including the different perspectives on the potential effects of leaching on water quality and biological resources.

S.F. Bay RWQCB - Copper and San Francisco Bay

- Although San Francisco Bay is currently being removed from the 303(d) list with respect to copper, this metal remains a potential threat to beneficial uses because concentrations in the water column of the Bay remain at levels just below the threshold of concern for protecting aquatic natural resources. This threshold is driven by the sensitivity to dissolved copper of the larval stage of blue mussels. Additionally, concentrations of copper in the sediments are still higher than background due to higher historical loading. There are still questions regarding the contribution of copper to observed toxicity to benthic organisms.

- The S.F. RWQCB is currently developing site-specific objectives (SSO) for copper in S.F. Bay. The SSOs will be computed by multiplying the chronic criterion (as a 4-day average) by a water effects ratio. The SSOs have not been determined for the portion of the Bay North of the Dumbarton Bridge. The copper chronic SSO for waters South of the Dumbarton is 6.9 ug/L, and the SSOs for waters North of the Dumbarton will be no greater than this value. The SSO will have an implementation plan that will include (1) ongoing actions to control loads of copper from all sources, (2) copper monitoring in the Bay, and (3) a so-called 'trigger level' that represents a specific increase of copper above current levels (trigger level will be lower than SSO). If a trigger is exceeded, additional actions to control copper loads would then be required of dischargers. Should the SSOs ever be exceeded, the Bay would be considered impaired due to ambient dissolved copper concentrations and would be placed back on the Federal impaired waters 303(d) list, and a TMDL would likely be initiated.

NOAA Position

- Dr. Tracy Collier of NOAA spoke about copper (and other chemical) leaching, as well as chemical exposure for organisms that use wood as a natural habitat and/or food source. On leaching, NOAA's concerns are not just acute toxicity and potential lethal endpoints, but also chronic toxicity, cumulative effects, exposure to multiple stressors and/or contaminants, and sublethal endpoints.

- NOAA pointed out that leaching of chemicals from ACZA treated wood (the most common treated wood in SF Bay) occurs primarily within the first 10 days of placement in water (Poston, 2001), but may continue for up to five weeks (Applied Technical Services, 2001). Leaching can be reinitiated as a result of abrasion, which exposes new surface area. Leaching rates also increase with pH.

- NOAA also reported that, in laboratory tests, adverse effects on rainbow trout were observed at copper concentrations ranging from 1.4 to 4.4 ppb (summarized from Sorensen, 1991). Exact lifestage of the fish was not reported, but it was believed to be juvenile. Lethal concentrations for 50% of the sample population (LC50) range from 13 to 38 ppb copper, depending on the lifestage and the species examined. Damaged

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chemoreceptors have been found in coho salmon (likely juveniles) at copper concentrations of 5 ppb. These data represent freshwater exposures.

- Herring eggs laid on creosote pilings can suffer 100 percent mortality (Vines, 2000).

Industry Position (WWPI input)

- Contrary to the 10-day leaching time-frame presented by NOAA, WWPI pointed out that seawater empirical data obtained from Dr. Kenneth Brooks of Aquatic Environmental Sciences, an independent scientist, indicate a copper loss rate equal to $32.5*exp^{-1.114*Time}$ (Brooks, 1997). In seawater, copper losses decline rapidly during the first few days to low rates for the remainder of the wood structure's lifespan.

- Small-scale laboratory studies conducted in de-ionized freshwater or artificial seawater using disproportionately large pieces of treated wood have no applicability with respect to the environmental performance of these products in the 'real world'. In addition, WWPI points out that they do not believe Ted Poston's work (Poston, 2001) represents independent research, since it is based on the algorithms developed by Dr. Brooks;

- Risk assessments completed by numerous researchers in many parts of the world over the last 30 years have failed to find adverse effects associated with the use of pressure treated wood products. Furthermore, models developed by Dr. Brooks have been repeatedly field tested and validated (Brooks 1996; Goyette and Brooks 1998, 2000). They have been found to slightly, but consistently, overestimate environmental concentrations of wood preservatives around treated wood products, thereby serving as conservative (protective) predictors of 'real world' effects;

- Existing U.S. EPA and State water and sediment quality criteria provide a valid and protective basis for evaluating the use of pressure treated wood in aquatic environments. WWPI stands by these criteria and believes strongly in thorough review of proposed standards and criteria by agencies and the scientific community.

- Extensive field risk assessments conducted on behalf of the U.S. Department of Agriculture (Brooks 2004a, b, and 2004c), the Canadian Departments of Fisheries and Oceans, and Environment Canada (Goyette and Brooks 1998, 2000) have shown that treated wood structures used in marine environments provide habitat to abundant and diverse communities of invertebrates – many of which are intolerant of pollutants. No evidence of bioaccumulation or biomagnification has been found in these organisms (Brooks, 2004b and 2004d).

In summary, WWPI and other industry practitioners believe that treated wood serves the public interest by providing a sound balance of economic and environmental benefits. The use of treated wood in marine environments has minimal risk, which can and should be managed. Tools are available to allow project proponents and regulators to effectively evaluate and manage this risk, and to thereby ensure the continued and safe use of treated wood in aquatic environments.

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ALTERNATIVES & BEST MANAGEMENT PRACTICES (BMPs)

There are various wood and non-wood alternatives to/variants on treated wood in marine construction. This section discusses several options that were explored during the seminar. *Note*: Refer to the reference section of this report for additional resources and contacts.

For practical reasons of structural integrity, cost-effectiveness, cost savings, and aesthetics, wood is a necessary marine construction material. Many existing bulkwalls, retaining walls, wharves, piers, and docks have been constructed using wood products; repair of these structures with alternative materials is often difficult and costly due to material mis-matching.

BMP Treated Wood – Third Party Certified

Treated wood is often preferred to untreated timber because of its greater resistance to fouling organisms and decay; treated wood is approximately 20% more expensive than untreated wood. BMPs can minimize the potential for leaching of preservatives into the environment. The industry has advocated for more than a decade the position that all treated wood entering aquatic environments should be produced and certified under the BMP program. The program has been adopted by numerous agencies including the U.S. Forest Service, Bureau of Land Management, U.S. Fish & Wildlife, Canadian Government, USACE, State governments and Departments of Transportation. It is important to note that NOAA is currently reviewing this guidance as well as other literature, and has yet to formalize their position on BMPs. Current BMPs advocated by WWPI and the Canadian Institute of Treated Wood (2002) include:

- Treatment procedures that minimize the amount of preservative applied and surface residues, and that promote the fixation of chemicals.
- Post treatment processes (dependent upon the preservative system used and the design of the treatment plant) that remove excess preservative and/or the oils used to carry the preservative in some systems, thereby minimizing the potential for movement to the environment.
- Inspection and rejection of improperly treated wood.
- Ongoing process to update the BMPs and incorporate new and improved BMP-related procedures and technologies.

Polymer-Coated Treated Wood

Industry has developed several sealants or coatings that are applied to treated wood. *21 Poly*, for example, is a polymer coating membrane that bonds to the wood and minimizes leaching, boring, and fouling. The long-term environmental impacts, and advantages and disadvantages, of coating have not been researched or documented. B.K. Cooper, representing local contractors, indicated that for several projects, polymer coated pilings increased project costs by 15% to 20%. Currently, there are no *21 Poly* vendors in the Bay Area; the closest vendor is in Houston, Texas. The absence of local vendors leads to concerns about reliability, which makes it difficult for local contractors to ensure reliable service to their customers when alternative products must be used.

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Plastic-Encased and Composite Pilings

Plastic encasements for treated wood can prevent boring and fouling organisms, as well as deterioration of the wood, but generally remain in the research and development stage. As with polymer-coated wood, supply reliability concerns exist. In addition, many new wood alternative products cannot meet the load requirements of docks, wharves, and piers. Composite products are approximately 120% and 100% more expensive than untreated wood and treated wood products, respectively.

Concrete and Steel

Concrete and steel, both alternatives to treated wood, are long-time effective marine construction materials; however, they are more costly than treated wood, and do not provide the installation and structural characteristics required by many projects. Concrete and steel piles are approximately 20% and 80% more expensive than treated wood piles, respectively. In addition, chemicals and coatings in or on these products may pose potential environmental risks that have not been evaluated and for which guidance has not been established.

Problems in permitting the use of concrete and steel pilings arose in 2003-2004 because of pile-driving 'noise' (underwater sound pressure waves) and its potential impacts on fish and wildlife. In October of 2003, BPC and Caltrans held an interagency-stakeholder educational workshop on noise associated with pile driving. Below is NOAA's current guidance:

- Drive piles in summer, when listed species are less likely to be present
- Attenuate the noise through a bubble curtain or in-water coffer
- Use a vibratory hammer
- Utilize currents and low tides (to drive in mud, not water)
- NOAA will use a decibel threshold (peak underwater sound pressure level – SPL - less than 180 decibels) until more info is available from project monitoring

Considerable debate surrounds this guidance. Some seminar attendees and panelists expressed concern that the 180 decibel criterion is arbitrary (why not 182 or 184?), and suggested looking at Canadian standards which waive attenuation criteria for small projects (small = less than 18" in diameter). On this point, NOAA notes that Canada does not have an Endangered Species Act to address sublethal effects; rather, it has a 'no fish kill' policy.

PERMIT PROCEDURES

The USACE, NOAA and S. F. RWQCB are the primary resource and regulatory agencies with authority over marine construction and the use of treated wood. Listed below are the State and Federal legislative authorities governing these agencies.

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NOAA (Fisheries Southwest Region)
- Endangered Species Act (ESA)
- Magnuson-Stevens Fishery Conservation and Management Act/Essential Fish Habitat (EFH)
- Marine Mammal Protection Act

USACE
- Section 404 – Clean Water Act
- Section 10 – Rivers and Harbors Act

S.F. RWQCB
- Porter-Cologne Water Quality Control Act (state)
- Clean Water Act – Section 404 (federal)

The USACE is the key regulatory permit agency for marine construction projects. Because the effects of chemical leaching from treated wood are still being debated, the USACE has adopted a precautionary approach. Specifically, the USACE has told BPC that they will defer to the recommendations of the resource agencies - NOAA and S.F. RWCQB, but primarily NOAA. BPC and other industry stakeholders are concerned about this application of the 'precautionary principle.' The USACE hopes that it, the resource agencies, and the regulated community can reach consensus on practicable BMPs, and perhaps, on less stringent conditions for 'small' projects that require a limited number of treated piles – assuming, however, that the literature review currently being conducted (see below under 'Post-Seminar Events') indicates no or only minor effects from the placement of treated piles.

The RWQCB reviews all projects for conformance with the Clean Water Act Section 404 (b) (1), 'Guidelines for Specification of Disposal Sites for Dredge or Fill Material,' for determining the circumstances under which fill may be permitted. This section of the CWA requires, in order of priority: 1) avoidance; 2) minimization of adverse effects; 3) mitigate to assure no net loss of functional use. During review, the RWQCB also considers whether the applicant has proposed the 'least environmentally damaging practicable alternative'. The RWQCB's goal in issuing permits is to be consistent with the Basin Plan; thus the RWQCB may not necessarily apply the same rigor as the USACE or EPA with regard to meeting all the specific administrative procedures of the Clean Water Act 404(b)(1) guidelines. The RWQCB said that it is more concerned with meeting the intent or spirit of the regulation.

SEMINAR CONCLUSION

The seminar facilitated open dialogue, pointed debate, and substantial exchange of information and education. Participants commented that the seminar improved their understanding of the issues at hand, and reconfirmed the need to achieve prompt and balanced resolution to the debate of treated wood in marine environments. The day concluded with the agreement that BPC would continue to lead a collaborative process effort between industry and the regulatory agencies, toward the goal of furthering the review of the science of treated wood in marine environments and developing fair and balanced regulatory guidance. Because NOAA is the lead resource agency providing recommendations to USACE on this issue, it is a key participant in this process. WWPI has extensive data related to the environmental impacts of treated wood, as well as knowledge of treatment processes, and is fully participating.

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POST-SEMINAR EVENTS

Since the seminar, NOAA has obtained funding for a contract to review existing scientific literature on chemical leaching from treated wood and potential adverse impacts on the environment. This review will be the basis for the development of regional, and possibly national, guidance on the use of treated wood in marine environments. The target completion date for this review is February 2005; draft guidelines for public review will be issued in April 2005. BPC expects to be actively involved in the public review of these guidelines and to remain in contact with NOAA representatives in the interim.

Additionally, studies of the effect of sound pressure waves on fish species were recently conducted at the Port of Oakland. A consortium of pile driving interests, led by Manson Construction, engaged the services of a team of scientists to investigate the effects of pile driving on exposed fish. A replicated field experiment was performed in Oakland Outer Harbor, using 24-inch concrete, jetted piles and caged fish of three species – northern anchovy, shiner perch, and chinook salmon. Test fish were exposed (at a distance of 10 meters from the piles) to 200 – 400 hammer blows, delivered by a diesel-powered pile driving hammer operated at a fuel pump setting that has a manufacturer-rated energy of 147 kilojoules. Control fish were exposed to ambient harbor conditions for periods of approximately 10 minutes. Average peak sound levels during the experiment ranged from 185 to 189 peak dB (re: 1 µPa), which exceeded the ad-hoc NOAA guideline of 180 dB peak for an exposure distance of 10 meters. The Manson team scored short-term mortality, nine gross necropsy conditions, and some 23 histological lesions from liver, kidney, intestine, swim bladder, and various other tissues for a total of 204 fish. No significant differences were found between exposed and control fish in any measured variable.

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BMPs

Treated Wood Resources, BMPs and general information

- Western Wood Preservers Institute: www.wwpinstitute.org

Polymer Coatings

- *21 Poly:* http://www.americanpoleandtimber.com/html/hpoly.htm

Plastic coated and composite pilings

- Crane Materials International: http://www.cmilc.com/
- Bellingham Marine: http://www.bellingham-marine.com/
- Crane Plastics: http://www.crane-plastics.com/