APPENDIX A-6: Castro Cove Habitat Equivalency Analysis Summary

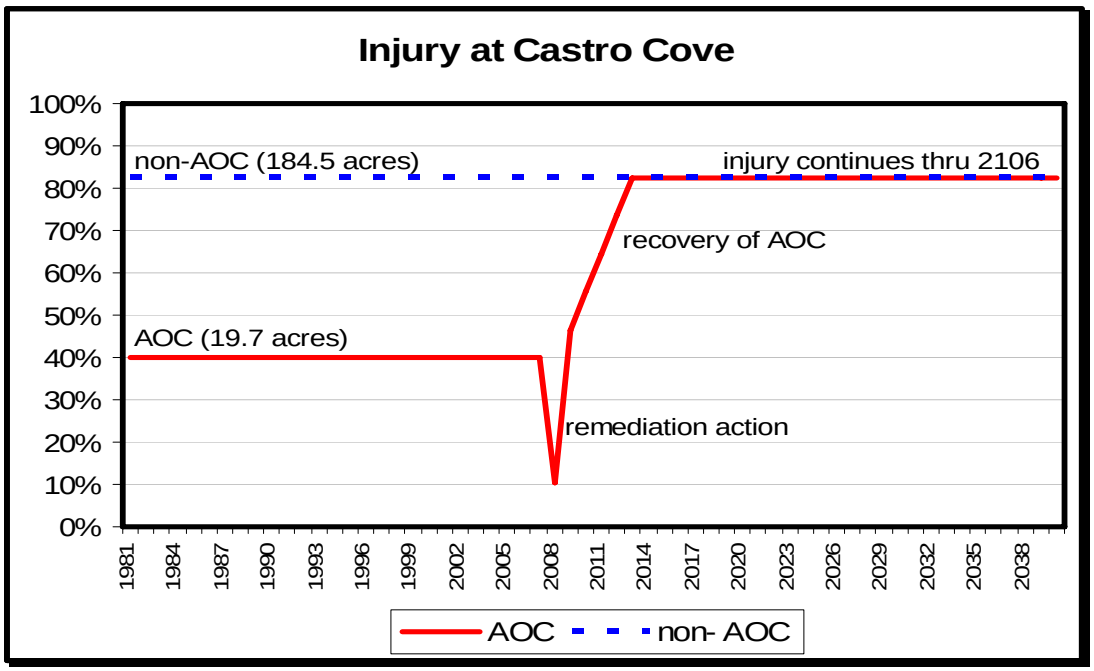
INJURY CALCULATION

For quantification purposes, the impacted area was divided into two areas:

1. AOC (Area of Concern, excavated by remediation actions)
2. Non-AOC (areas outside of the AOC)

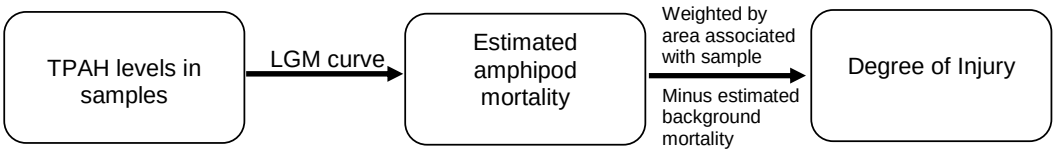
	AOC	Non-AOC
Size of area	19.7 acres	184.5 acres
Injury start date	1981 (per CERCLA law)	1981
Injury end date	2106	2106
Initial degree of injury*	60.0%	17.5%
Injury trajectory	Assumes maximum injury (minus background levels) in 2008, due to excavation associated with remediation. Assumes a rapid recovery to the level of the non-AOC in the following five years. 1981-2007: 60.0% 2008: 89.3% 2009: 53.5% 2010: 44.5% 2011: 35.5% 2012: 26.5% 2013 - 2106: 17.5%	Assumes no change between 1981 and 2106. 1981-2106: 17.5%
Lost discounted acre-years of services	620	2,338
Total lost discounted acre-years	2,958	

* See below for derivation of initial degree of injury.



Initial Degree of Injury

The degree of injury was assumed to be equal to the estimated amphipod mortality within each area, minus the expected baseline mortality expected from background pollution in the bay.



Expected mortality was estimated from TPAH sample results from 54 sites spread across the AOC and non-AOC, according to the following steps:

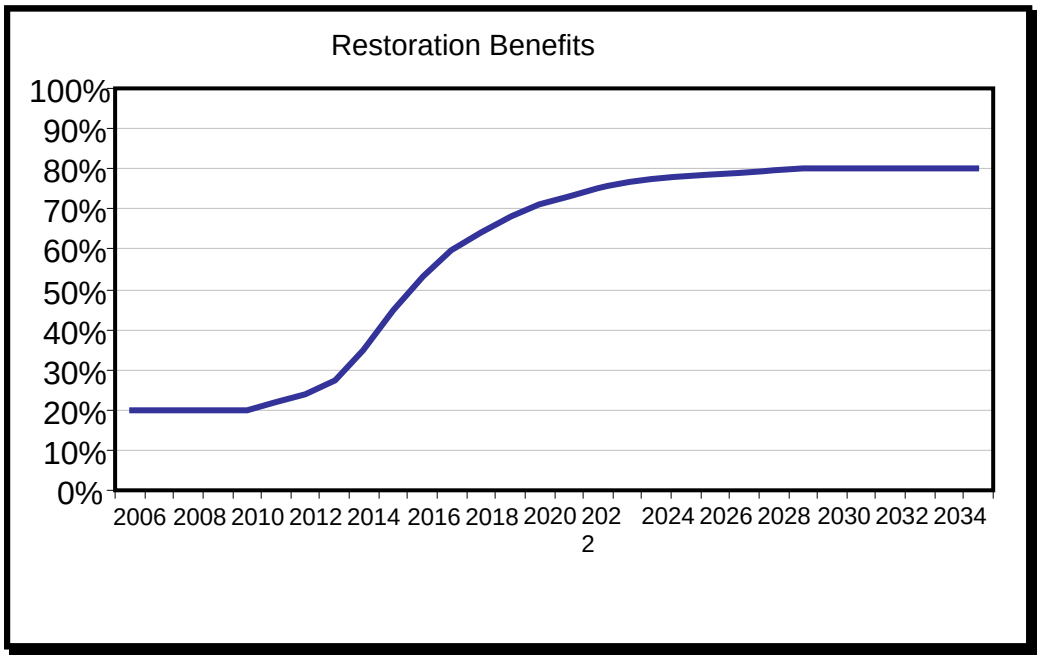
1. TPAH levels from the 0-1 foot depth samples were used. At the 26 sample sites where those were not available, surface samples were used.
2. Amphipod mortality at each sample site was estimated using the Logistic Growth Model described in Appendix I2d (% of Amphipod Mortality = $1/1+B_0e^{B_1 \log[TPAH]}$, where B_0=121,354 and B_1=-3.3478).
3. Each sample site was associated with an area (tessellation polygons). These areas were weighted according to size.
4. Total amphipod mortality, and thus service loss, within the AOC and the non-AOC was based on the weighted average of the estimated amphipod mortality of each area (tessellation polygon) associated with a sample site. This was estimated to be 70.7% in the AOC and 28.2% in the non-AOC.
5. Background mortality, which was derived similarly using data from around the San Pablo Bay, was subtracted from the injury estimate. This was estimated to be 10.7%. Thus, the initial degrees of injury were 60.0% in the AOC and 17.5% in the non-AOC.

CREDIT CALCULATION (projected restoration benefits *per acre*)

Benefits over time from a compensatory restoration project were based upon studies from other restoration projects in saltmarsh habitats. The key assumptions were:

- Time period: project benefits begin in 2011 and continue thru 2106.
- Net gain in resource services: 60% (going from a base of 20% to a maximum of 80%).
- Trajectory: a logistic-type curve which assumes a relatively quick restoration of some services, but approximately 20 years until the maximum level is achieved.

The graph below illustrates the assumed restoration benefits trajectory. Note that benefits are assumed to continue thru 2106.



Here are the actual net benefit values of the restoration trajectory:

Year	Net benefits	Year	Net benefits
2010	0%	2021	53.3%
2011	2.0%	2022	55.1%
2012	4.0%	2023	56.4%
2013	7.5%	2024	57.4%
2014	15.0%	2025	58.2%
2015	24.8%	2026	58.8%
2016	33.1%	2027	59.3%
2017	39.5%	2028	59.7%
2018	44.4%	2029	59.9%
2019	48.2%	2030	60.0%
2020	51.1%	thru 2106	60.0%

A project with this restoration benefits trajectory would need to be 203 acres in size to provide for the 2,958 discounted acre-years of services lost due to the injury.