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ECONOMIC EFFECTS OF CRITICAL HABITAT DESIGNATION FOR THE ALAMEDA WHIPSNAKE IN FOUR CALIFORNIA COUNTIES

Prepared For

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I EXECUTIVE SUMMARY

I.1 PURPOSE AND APPROACH

On October 18, 2005, the U.S. Fish & Wildlife Service (Service) proposed critical habitat for the Alameda Whipsnake (AWS), *Masticophis lateralis euryxanthus*, pursuant to the Endangered Species Act of 1973. For this economic analysis, a total of 203,342 proposed acres are examined, of which 60,357 are proposed excluded and not considered. The habitat units span Contra Costa, Alameda, San Joaquin, and Santa Clara counties.

This report quantifies the economic effects associated with the proposed designation of critical habitat. It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities that may adversely affect the habitat within the proposed boundaries. The report combines information on current and projected land uses within critical habitat areas with a defined economic model to calculate these impacts. This report also disaggregates individual critical habitat units defined by the Service to identify the sub-regions where most economic impacts occur.

The economic analysis considers both the economic efficiency and distributional effects that may result from species and habitat protection. Economic efficiency effects generally reflect opportunity costs associated with the commitment of resources required to accomplish species and habitat conservation and lost economic surplus resulting from reduced levels of economic activity. Distributional effects reflect which sectors of the economy experience changes in costs or revenues as a consequence of critical habitat designation.

I.2 REPORT ORGANIZATION

Following the Executive Summary is an outline of the analytical framework and approach used in the analysis and an overview of the socioeconomic conditions in the affected counties. The impacts to land development, public projects, and private activities are presented next, followed by an evaluation of the regional costs and impacts to small businesses.

I.3 DESCRIPTION OF HABITAT AND AFFECTED COUNTIES

The primary constituent elements used to determine suitable habitat for the AWS fall into three categories: scrub/shrub communities; woodland or annual grassland plant communities; and lands containing rock outcrops, talus, and small mammal burrows.

The Service proposes to designate approximately 203,342 acres across four counties. Table II-1: Proposed Habitat Units displays acres of critical habitat by county. A variety of economic activities are undertaken within the affected counties, from housing construction to farming. For profiles of the socioeconomic conditions in the affected counties, please see section III.

I.4 IMPACTS ON REAL ESTATE DEVELOPMENT

Critical habitat designation for the AWS is expected to have the largest impacts on real estate development. Mitigation requirements affect the welfare of both producers and consumers. Table I-1: Overall Economic Effects shows losses for each affected county. Contra Costa and Alameda counties are the most affected; combined they bear nearly all impacts of designation.

The impacts of critical habitat designation vary widely even within counties. That is, the impacts of designation are frequently localized. This finding is sensible from an economic point of view and is consistent with the teachings of urban economics. Housing prices vary over urban areas, typically declining as the location of the house becomes more remote. Critical habitat is not evenly distributed across the landscape, and large impacts may result if a particular area has a large fraction of developable land in critical habitat. Some areas have few alternate sites for development, or have highly rationed housing resulting in high prices. Any of these factors may cause the cost of critical habitat designation to increase.

The disaggregated spatial scale of the analysis permits identification of specific locations, or parts of individual critical habitat units, that result in the largest economic impacts. The maps contained at the end of this section are instructive in this regard. The maps identify the Census tracts within the counties where the impacts are predicted to occur. They appear in order of impact per county.

I.5 PUBLIC SECTOR ACTIVITIES

Data from California Department of Transportation, Federal Highway Administration, and Metropolitan Transportation Commission was examined to detect the potential for critical habitat to disrupt planned road construction. No such overlaps were discovered, although certain local road projects occur close to planned critical habitat. The report also considers potential impacts on the energy sector. This analysis examines planned power production facilities within the study area for proximity to proposed critical habitat. It finds the sites are too far from critical habitat to be affected.

There are overlaps between critical habitat and land managed by the National Park Service and Bureau of Land Management. After consideration and discussion with Service staff, it was determined that the impacts from designation on these organizations will be minimal. We invite comments on the potential impacts of designation on these agencies.

I.6 REGIONAL ECONOMIC EFFECTS

Designation of critical habitat alters the level of economic activity. As a result, regulation has impacts that spread beyond the sectors directly affected. Indirect and induced impacts of the regulation are calculated using the standard IMPLAN model. Counties with the largest change in new residential home construction were included in this analysis. Critical habitat designation has little effect on the regional economy. New residential construction is reduced by approximately $19 million, which causes output in other industries to decrease by approximately $14 million. These combined reductions represent only 0.02 percent of the region's output. Included among the industries most affected are wholesale trade and architectural/engineering services.

I.7 Small Business Impacts

Critical habitat is not expected to result in significant small business impacts since revenue losses are less than one percent of total small business revenues in affected areas. From permit data, it appears that large businesses greatly dominate greenfield development. It is estimated that no more than a single small business will be affected annually as a consequence of designation.

I.8 Costs for Excluded Lands

The Service has proposed for exclusions lands within critical habitat which are owned by the East Bay Regional Parks District and lands which are covered by the Eastern Contra Costa Habitat Conservation Plan. In Section V.4, this analysis estimates the value of the resources that have been expended to protect the whipsnake and its habitat within the excluded lands.

I.9 Overall Economic Impacts

The economic impacts of critical habitat designation vary widely among the four affected counties, and even within counties. The counties most affected by the critical habitat designation are Alameda ($195 million, $17 million annually) and Contra Costa ($335 million, $30 million annually) San Joaquin and Santa Clara Counties are minimally affected. There are an additional $524,972 in costs for the East Bay Regional Parks district and Eastern Contra Costa Habitat Conservation Plan Association, and small, unquantifiable costs for the Bureau of Land Management.

Table I-1: Overall Economic Effects

	Rationing Scenario		Densification Scenario		
County	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**	**Public Projects**
Contra Costa	$334,717,458	$29,528,000	$125,569,690	$11,077,468	
Alameda	$195,348,747	$17,233,215	$81,415,515	$7,182,288	
San Joaquin	$1,616,259	$142,583	$653,874	$57,683	
Santa Clara	$93,082	$8,211	$98,575	$8,696	
Total	**$531,775,546**	**$46,912,009**	**$207,737,654**	**$18,326,135**	**$524,972**

Source: CRA analysis.

II RELEVANT BACKGROUND AND ANALYTICAL FRAMEWORK

II.1 REPORT PURPOSE

On October 18, 2005, the U.S. Fish & Wildlife Service (Service) proposed critical habitat for the Alameda Whipsnake (AWS), *Masticophis lateralis euryxanthus*, pursuant to the Endangered Species Act of 1973. For this economic analysis, a total of 203,342 proposed acres are examined. The habitat units span Alameda, Contra Costa, San Joaquin and Santa Clara counties. This report quantifies the economic effects associated with the proposed designation of critical habitat. It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities that may adversely affect the habitat within the proposed boundaries. The report combines information on current and projected land uses within critical habitat areas with a defined economic model to calculate these impacts. This report also disaggregates individual critical habitat units defined by the Service to identify the sub-regions where most economic impacts occur.

This information is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the biological benefits of including them.[1] In addition, this information allows the Service to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[2] This report also complies with direction from the U.S. 10th Circuit Court of Appeals that "co-extensive" effects should be included in the economic analysis to inform decision-makers regarding which areas to designate as critical habitat.[3]

This section provides the framework for this analysis. First, it describes the general analytic approach to estimating economic effects, including both efficiency and distributional effects. Next, it discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. Finally, it describes the information sources employed to conduct this analysis.

II.2 APPROACH TO ESTIMATING ECONOMIC EFFECTS

This economic analysis considers both the economic efficiency and distributional effects that may result from species and habitat protection. Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species

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[1] 16 U.S.C. §1533(b)(2).

[2] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993; Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001; 5 U.S.C. §§601 *et seq* ; and Pub Law No. 104-121.

[3] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001)).

and habitat conservation. Efficiency losses also include reductions in surplus levels resulting from economic activities such as land development. Similarly, the costs incurred by a Federal action agency to consult with the Service under section 7 represent opportunity costs of habitat conservation.

This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation activities on small entities and the energy industry. This information may be used to determine whether the effects of the designation unduly burden a particular group or economic sector. For example, while habitat conservation activities may have a small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience a significant level of impact. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

II.3 EFFICIENCY EFFECTS

At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to discern the implications on a societal level of a regulatory action. For regulations specific to the conservation of the AWS, efficiency effects represent the opportunity cost of resources used, or benefits foregone, by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surplus in affected markets.[4]

In some instances, compliance costs may provide a reasonable approximation of the efficiency effects associated with a regulatory action. For example, a lead Federal agency may enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The end result of the consultation may be a small amount of additional mitigation for on-site impacts of the proposed activity. The cost of the additional mitigation would have been spent on alternative activities if the proposed project not been designated critical habitat. In the case that compliance activity is not expected to significantly affect markets – that is, not result in a shift in the quantity of a good or service provided at a given price, or in the quantity of a good or service demanded given a change in price – the measurement of compliance costs provides a reasonable estimate of the change in economic efficiency.

More generally, where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, a designation that precludes the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the real estate market.

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[4] For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see Gramlich, Edward M., A Guide to Benefit-Cost Analysis (2nd Ed.), Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/ webpages/Guidelines.html.

II.4 Distributional and Regional Economic Effects

Measurements of changes in economic efficiency focus on the net impact of conservation activities, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.[5] This analysis considers several types of distributional effects, including impacts on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that these are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

Regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using input / output models. These models investigate the effects of a change in one sector of the economy on economic output, income, or employment in other local industries. These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.

Regional input / output models may overstate the long-term impacts of a regulatory change because they provide a static view of the regional economy. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by affected businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity within the region.

Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. Thus, these types of distributional effects are reported separately from efficiency effects (i.e., not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects, but should be considered as distinct measures of impact.

II.5 Scope Of The Analysis

This analysis identifies those economic activities believed to most likely threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the proposed critical habitat. In instances where critical habitat is being proposed after a species is listed, some future impacts may be unavoidable, regardless of the final designation and exclusions under 4(b)(2). However, due to the

[5] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be coextensive with the designation.[6,7]

Coextensive effects may also include impacts associated with overlapping protective measures of other Federal, State, and local laws that aid habitat conservation in the areas proposed for designation. We note that in past instances, some of these measures have been precipitated by the listing of the species and impending designation of critical habitat. Because habitat conservation efforts affording protection to a listed species likely contribute to the efficacy of the critical habitat designation, the impacts of these actions are considered relevant for understanding the full effect of the proposed designation. Enforcement actions taken in response to violations of the Act, however, are not included.

II.5.1 Sections of the Act Relevant To the Analysis

The analysis focuses on activities that are influenced by the Service through sections 4, 7, 9, and 10 of the Act. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as critical habitat designation. According to section 4, the Secretary is required to list species as endangered or threatened "solely on the basis of the best available scientific and commercial data."[8]

The protections afforded to threatened and endangered species and their habitat are described in sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections are the focus of this analysis:

Section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action they authorize, fund, or carry out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of the species' designated critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent compliance costs associated with the listing of the species and the designation of critical habitat.[9]

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[6] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (New Mexico Cattle Growers Assn v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001)).

[7] In 2004, the U.S. 9th Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (Gifford Pinchot Task Force v. United States Fish and Wildlife Service). The Service is currently reviewing the decision to determine what effect it (and to a limited extent Center for Biological Diversity v. Bureau of Land Management (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

[8] 16 U.S.C. §1533.

[9] The Service notes, however, that a recent Ninth Circuit judicial opinion, Gifford Pinchot Task Force v. United States Fish and Wildlife Service, has invalidated the Service's regulation defining destruction or adverse modification of critical habitat. The Service is currently reviewing the decision to determine what effect it (and to a limited extent

Section 9 defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, or collect, or to attempt to engage in any such conduct."[10] The economic impacts associated with this section manifest themselves in sections 7 and 10.

Under section 10(a)(1)(B) of the Act, an entity (i.e., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for an endangered animal species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.[11] The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately minimized and mitigated. The designation of critical habitat does not require completion of an HCP; however, the designation may influence conservation measures provided under HCPs. Federal agencies are not typically the sole stakeholder agency involved with development of an HCP. Federal agencies, however, can be the lead agency on a multi-jurisdictional HCP.

II.5.2 Other Relevant Protection Efforts

The protection of listed species and habitat is not limited to the Act. Other Federal agencies, such as the Army Corps of Engineers, as well as State and local governments, may also seek to protect the natural resources under their jurisdiction.[12]

CEQA is a California State statute that requires State and local agencies (known here as "lead agencies") to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. Projects carried out by Federal agencies are not subject to CEQA provisions. CEQA regulations require a lead agency to initially presume that a project will result in a potentially significant adverse environmental impact and to prepare an EIR if the project may produce certain types of impacts, including when:

"[T]he project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the

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Center for Biological Diversity v. Bureau of Land Management (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

[10] 16 U.S.C. §1538 and 16 U.S.C. §1532.

[11] U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," http://endangered.fws.gov/hcp/.

[12] For example, the Sikes Act Improvement Act (Sikes Act) of 1997 requires Department of Defense (DOD) military installations to develop Integrated Natural Resources Management Plans (INRMPs) that provide for the conservation, protection, and management of wildlife resources (16 U.S.C. §§ 670a - 670o). These plans must integrate natural resource management with the other activities, such as training exercises, taking place at the facility.

number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory."[13]

State law instructs the lead agency (typically a county or city community development or planning department in the case of land development projects) to examine impacts from a very broad perspective, taking into account the value of animal and plant habitats to be modified by the project. The lead agency must determine which, if any, project impacts are potentially significant and, for any such impacts identified, whether feasible mitigation measures or feasible alternatives will reduce the impacts to a level less than significant. It is within the power of a lead agency to decide that negative impacts are acceptable in light of economic, social, or other benefits generated by the project.

II.5.3 Time Frame

The analysis examines activities taking place both within and adjacent to the proposed designation. It estimates impacts based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Accordingly, the analysis bases estimates on activities that are likely to occur within a 20-year time frame, beginning on the day that the current proposed rule becomes available to the public.

II.5.4 Benefits

Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.[14] OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits and ancillary benefits*. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.[15]

In the context of CHD, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.[16] *Rather than rely on*

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[13] California Natural Resources Code §15065(a)

[14] Executive Order 12866, *Regulatory Planning and Review*, September 30, 1993.

[15] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

[16] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.

economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.

Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.

It is often difficult to evaluate the ancillary benefits of critical habitat designation. To the extent that the ancillary benefits of the rulemaking may be captured by the market through an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if decreased off-road vehicle use to improve species habitat leads to an increase in opportunities for wildlife viewing or hiking within the region, the local economy may experience an associated measurable, positive impact. Where data are available, this analysis attempts to capture the *net* economic impact (i.e., the increased regulatory burden less any discernable offsetting market gains), of species conservation efforts imposed on regulated entities and the regional economy.

II.6 INFORMATION SOURCES

The primary sources of information for this report were communications with and data provided by the Service. In addition, the analysis relies on information from the following entities.

- University of California, Berkeley Department of City and Regional Planning;
- DataQuick Information Systems;
- U.S. Census 1990 and Census 2000;
- U.S. Department of Commerce, Bureau of Economic Analysis;
- U.S. Department of Labor, Bureau of Labor Statistics;
- California Department of Finance;
- California Department of Transportation;
- California Employment Development Department;
- Federal Highway Administration;
- California Department of Conservation Farmland Mapping and Monitoring Program;
- U.S. Bureau of Land Management;
- Federal Emergency Management Agency;

- U.S. Geological Survey;
- Marshall & Swift;
- IMPLAN;
- Dun & Bradstreet;
- Robert Morris Associates;
- Environmental Systems Research Institute (ESRI); and
- Association of Bay Area Governments (ABAG).

II.7 HABITAT DESCRIPTION

In identifying areas as critical habitat for the AWS, the Service considered those physical and biological habitat features that are essential to the conservation of the species. These essential features are referred to as the species' primary constituent elements (PCEs). Areas that do not contain any PCEs at the time of critical habitat designation are not considered critical habitat, whether or not they occur within a mapped critical habitat unit. The primary constituent elements for the AWS are as follows:

Scrub/shrub communities with a mosaic of open and closed canopy: Scrub/shrub vegetation dominated by low to medium-stature woody shrubs with a mosaic of open and closed canopy as characterized by the chamise, chamise-eastwood manzanita, chaparral whitethorn, and interior live oak shrub vegetation series,

Woodland or annual grassland plant communities contiguous to lands containing PCE 1: Woodland or annual grassland vegetation series comprised of one or more of the following: blue oak, coast live oak (*Quercus sp.*), California bay (*Umbellularia californica*), California buckeye, and California annual grassland vegetation series.

Lands containing rock outcrops, talus, and small mammal burrows. These areas are used for retreats (shelter), hibernacula, foraging, dispersal, and provide additional prey population support functions.

Because of limitations in GIS data, the Service did not exclude all developed areas, such as towns, housing developments, or other lands unlikely to contain the PCEs essential for the conservation of the species. Existing features and structures within the boundaries of the mapped units, such as buildings, roads, most intensively farmed areas, etc., are unlikely to contain one or more of the PCEs, and are therefore not considered critical habitat. As a result, Federal actions in those areas would not trigger section 7 consultations unless the actions affect the species or PCEs in adjacent critical habitat.

II.8 PROPOSED CRITICAL HABITAT AND AFFECTED COUNTIES

At total of six habitat units for the AWS are proposed for four counties in California. Habitat units located partially or wholly within each county are shown in Table II-1: Proposed Habitat Units.

The relative size of the designation in each county is shown in Table II-2: Relative Size. The six proposed habitat units cover 203,342 acres, of which 60,357 are proposed for exclusion. The designation covers approximately 7.3% of the overall land area of the affected counties.

Table II-1: Proposed Habitat Units

Habitat Unit	County	Proposed	Proposed Excluded	Total
1	Alameda	46		46
	Contra Costa	25,966	8,108	34,074
Unit 1 Total		26,012	8,108	34,119
2	Alameda	7,839	1,120	8,959
	Contra Costa	12,277	3,288	15,565
Unit 2 Total		20,116	4,408	24,524
3	Alameda	27,146	404	27,551
Unit 3 Total		27,146	404	27,551
4	Contra Costa	23,040	46,558	69,598
Unit 4 Total		23,040	46,558	69,598
5A	Alameda	22,494	246	22,740
	San Joaquin	1,984		1,984
Unit 5A Total		24,477	246	24,723
5B	Alameda	15,307	361	15,668
	Santa Clara	2,546		2,546
Unit 5B Total		17,854	361	18,214
6	Alameda	1,057	55	1,112
	Contra Costa	3,283	217	3,500
Unit 6 Total		4,340	272	4,612
Total		**142,985**	**60,357**	**203,342**

Source: CRA analysis.

Table II-2: Relative Size

County	Designation (ac.)	Total Area (ac.)	% Designated
Alameda	76,076	524,750	14.5%
Contra Costa	122,736	514,952	23.8%
San Joaquin	1,984	911,726	0.2%
Santa Clara	2,546	835,905	0.3%
Total	**203,342**	**2,787,332**	**7.3%**

Source: CRA analysis.

III SOCIOECONOMIC PROFILE OF AFFECTED COUNTIES

To understand the economic impacts of critical habitat designation for the AWS, it is essential to have an accurate picture of current and projected economic activity. This section presents a summary of the current conditions and forecasts for the affected counties by examining population growth, employment sectors and patterns, and housing trends.

Assuming the present growth trends continue, the population in California will likely total 40 million in 2010 and 45.5 million in 2020.[17] The California Department of Finance estimates a statewide growth rate of 1.3 percent per year from 2010 to 2020 and a total change of 29 percent between 2000 and 2020. The population increase will strain the urban housing markets and an estimated 220,000 additional housing units will have to be constructed every year through 2020 in order to keep pace with the expanding population. For comparison, an average of 100,000 permits were issued for new home construction in the state each year between 1990 and 2000. Single-family home construction has been the trend; between 1987 and 2001, this type of development represented 80 percent of new home construction.[18]

The following sections review the growth patterns in the counties that contain proposed critical habitat. Table III-1 presents the changes in population, jobs, and housing units that occurred between 1990 and 2000 and the change in the unemployment rates between 2000 and 2004. Table III-2: Changes in Population: 2000-2020 displays the predicted changes in population between 2000 and 2020, as estimated by the Demographic Research Unit of the California Department of Finance. In addition, economic activity is characterized by the current and future employment sectors. Table III-3: 2002 Business and Employment Pattern summarizes the business and employment patterns for the 25 counties with critical habitat units, and Table III-4: Jobs to Housing Ratios displays the jobs-to-housing ratios in the counties as of the 1990 Census and 2000 Census.

Between 2000 and 2020, the population is predicted to increase by 413,036 (28.5 percent) in Alameda, 372,577 (39 percent) in Contra Costa, 315,809 (18.7 percent) in Santa Clara, and 421,664 (74.3 percent) in San Joaquin.[19] The four counties with critical habitat are predicted to grow by 1,523,086 residents between 2000 and 2020.

As of 2002, the following principal industries, in terms of annual payroll, existed in the region: manufacturing; health care and social assistance; finance and insurance; professional, scientific, and technical; construction; and information services.[20] The largest industries, ranked by number of

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[17] California Department of Housing and Community Development, "Raising the Roof, California's Housing Development Projections and Constraints, 1997-2020," May 2000, http://www.hcd.ca.gov/hpd/hrc/rtr/index.html.

[18] California Department of Housing and Community Development, "Raising the Roof, California's Housing Development Projections and Constraints, 1997-2020," May 2000, http://www.hcd.ca.gov/hpd/hrc/rtr/index.html.

[19] State of California, Department of Finance, "Population Projections by Race / Ethnicity for California and Its Counties 2000-2050," May 2004, http://www.dof.ca.gov/html/demograp/DRU_Publications/Projections/P1.htm.

[20] U.S. Census Bureau,"2002 County Business Patterns," http://censtats.census.gov/cbpnaic/cbpnaic.shtml.

employees in 2002, include trade, government, and professional services. The region is expected to add additional jobs in the services, financial, education, healthcare, hospitality, and retail sectors.[21] As of the 2000 Census, the jobs-housing ratio was between 1.3 (San Joaquin and Contra Costa) and 1.9 (Santa Clara). The jobs-housing balance is of particular concern for this area, given the current strain on the transportation networks and the expectations for future growth.[22]

[21] California Department of Transportation, Office of Transportation Economics, "Long-Term Socioeconomic Forecasts by County 2003-2020," May 2000, http://www.dot.ca.gov/hq/tpp/offices/ote/socio-economic.htm.

[22] "ABAG Regional Housing Need Determination, Chapter 2, 2001-2006," October 2002.

Table III-1: Population, Housing, and Employment Characteristics

County	Change in Population, 1990-2000	Percent Change in Population, 1990-2000	Change in Housing Units, 1990-2000	Percent Change in Housing Units, 1990-2000	Change in Number of Jobs, 1990-2000	Change in Unemployment Rate, 2004-2000
Alameda	164,559	12.9	36,074	7.2	140,605	2.9
Contra Costa	145,084	18.1	38,407	12.1	77,486	2.3
Santa Clara	185,008	12.4	39,089	7.2	237,999	4.1
San Joaquin	82,970	17.3	22,886	13.8	43,729	1.1

Sources:

1. Fulton, W., Guide to California Planning, Second Edition, 1999
2. "Census 2000 PHC-T-4. Ranking Tables for Counties: 1990 and 2000", released 2 April 2001, U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File and 1990 Census, http://www.census.gov/population/www/cen2000/phc-t4.html
3. U.S. Census 1990 Summary File 3, Table H1: Housing Units and U.S. Census 2000 Summary File 3, Table H1: Housing Units, http://factfinder.census.gov
4. U.S. Bureau Economic Analysis, Regional Economic Information System, Table CA30, May 2004, http://www.bea.doc.gov/bea/regional/reis/
5. U.S. Bureau of Labor Statistics, Unemployment Rates by County in 2000 and 2005, Not Seasonally Adjusted, http://data.bls.gov/map/servlet/map.servlet.MapToolServlet?survey=la

Table III-2: Changes in Population: 2000-2020

County	Population Change	Percent Change
Alameda	413,036	28.5
Contra Costa	372,577	39.0
Santa Clara	315,809	18.7
San Joaquin	421,664	74.3

Source:

State of California, Department of Finance, Population Projections by Race/Ethnicity for California and Its Counties 2000–2050, Sacramento, California, May 2004, available for download http://www.dof.ca.gov/html/demograp/DRU_Publications/Projections/P1.htm

Table III-3: 2002 Business and Employment Patterns

County	Top Three Industries[23]	Number of Employees	Percent of Employees in County
Alameda / Contra Costa	Trade, Transportation, and Utilities	203,900	19.5
	Government	185,500	17.7
	Professional and Business Services	151,200	14.5
Santa Clara	Manufacturing	203,600	22.3
	Professional and Business Services	172,500	18.9
	Trade, Transportation, and Utilities	134,600	14.7
San Joaquin	Trade, Transportation, and Utilities	44,300	21.1
	Government	40,100	19.1
	Educational and Health Services	23,300	11.1

Sources:

1. Counties divided into regions based on Association of Government organizations and the Guide to California Planning, Second Edition, 1999 by W. Fulton.
2. California Employment Development Department, Labor Market Information Division, 2002 County Snapshots, http://www.calmis.ca.gov/htmlfile/subject/COsnaps.htm

[23] Ranked by number of employees in 2002.

Table III-4: Jobs to Housing Ratios

County	Jobs-to-Housing Ratio, 1990	Jobs-to-Housing Ratio, 2000
Alameda	1.5	1.7
Contra Costa	1.3	1.3
Santa Clara	1.9	2.2
San Joaquin	1.3	1.4

Sources:

1. Fulton, W., Guide to California Planning, Second Edition, 1999
2. U.S. Census 1990 Summary File 3, Table H1: Housing Units, http://factfinder.census.gov
3. U.S. Census 2000 Summary File 3, Table H1: Housing Units, http://factfinder.census.gov
4. U.S. Bureau Economic Analysis, Regional Economic Information System, Table CA30, May 2004, http://www.bea.doc.gov/bea/regional/reis/

IV ECONOMIC IMPACTS ON LAND DEVELOPMENT

A primary aim of this analysis is to estimate the economic impacts of designation on the markets for land, housing and commercial development. The methodology used to estimate these impacts is described below, followed by a discussion of the calculated results. The section concludes with an estimate of the total costs of critical habitat designation attributable to regulation of land development.

IV.1 METHODOLOGY

The total economic impact of critical habitat designation depends on a variety of factors, including the size of the designation, the nature of pre-existing markets and regulation, and geographical features of the designated land itself. Because these factors vary across the landscape, the methodology adopts the Census tract as its baseline unit of analysis. This modeling choice invests the results with a high degree of spatial precision.

Economic repercussions of the designation have the potential to affect landowners, builders and housing consumers in different ways. Accordingly, the methodology analyzes both the net impacts of critical habitat and their incidence across various groups.

The steps followed to determine the impacts of critical habitat designation on housing markets are:

1. Describe current and projected economic and demographic characteristics in the proposed critical habitat areas;
2. Determine the effects and significance of prior regulation of land development in affected areas;
3. Determine the intersection of future development and critical habitat determination;
4. Determine the incremental, project-level regulatory requirements resulting from critical habitat designation;
5. Calculate the market effects of critical habitat and estimate economic costs for these areas.

Each step is discussed in greater detail below.

IV.1.1 Regional Growth Projections

Data on current and future socioeconomic characteristics for areas affected by critical habitat designation are necessary precursors to this analysis. To obtain present-day estimates, data were obtained from several sources, including population and household data the most recent United States Census, and data on new home characteristics from DataQuick, a housing market research firm. These are used to establish the economic baseline against which the market impacts of the critical habitat designation are measured.

The analysis also requires forecasted data to investigate impacts at the end of the 20-year time frame. Population forecasts were derived from several sources, including federally-recognized metropolitan planning organizations and forecasting performed in prior studies for transportation planning purposes. County-level forecasts on gross urban density—including residential, commercial and public development—along with shares of greenfield and infill development were obtained from a study performed by urban planning researchers at the University of California.[24,25] Combining density and population forecasts yields an estimate of the overall urban footprint within each Census tract.

Table IV-1: Development Projections summarizes some of this baseline information. Each FIPS code corresponds to a distinct Census tract within a county. Median home prices are in 2005 dollars and are for newly constructed single-family residences. Average square footage is indicative of the size of these homes. The projected housing increase indicates the Census tracts projected to experience the most rapid development. Since these are net increases, they are used to specify the demand for new housing in each census tract. The last column shows the number of new acres of land needed to accommodate the projected population increase in each Census tract. These projections are created by ABAG and include acres of residential and commercial development.

IV.1.2 Prior Regulation in Affected Areas

Markets for land, housing and commercial real estate are highly regulated by governments at the local, State and Federal level. The welfare impacts of critical habitat designation are affected by the nature and extent of prior regulation, and by the response of governments at all levels to the designation of critical habitat.

Regulation can have several types of effects on land and housing markets. Zoning and other interventions in the land market can limit the stock of developable land and increase its price. Local regulations can also directly limit the construction of new housing. This latter type of intervention is important as it generates qualitatively different predictions about the effects of critical habitat than regulations that simply limit the amount of developable land.

As explained in Appendix B, when the pre-designation number of new housing units constructed is limited by prior regulation, there is a “shadow value” of housing that is not necessarily incorporated in the price of land. These rents are earned by providers of fixed factors to the homebuilding process. When critical habitat designations impose further restrictions on an already constrained homebuilding process, welfare impacts can be larger than if the number of housing units constructed is not directly controlled by regulation.

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[24] John D. Landis and Michael Reilly, "How We Will Grow: Baseline Projections of the Growth of California's Urban Footprint through the Year 2100" (August 1, 2003). Institute of Urban & Regional Development. IURD Working Paper Series. Paper WP-2003-04. http://repositories.cdlib.org/iurd/wps/WP-2003-04

[25] Greenfield development refers to development occurring on land that was not previously urbanized. Infill development refers to the redeveloping of already-urbanized land—for example, leveling an old home and building a new apartment complex over it.

Recent research has uncovered methods to test for the existence of rationing in the market for new housing.[26] Such testing entails a comparison of the "extensive" and "intensive" margin values of land which are loosely defined as the value of land with a house on it and the willingness of homebuyers to pay for an additional unit of lot size. In the conventional case where regulation may limit the supply of land but not the number of housing units built, extensive and intensive margin values should be the same since density will adjust to equate the two. When housing is directly limited by regulation, the extensive margin value will exceed the intensive margin value. The rationale is that the extensive margin value incorporates the shadow value of housing while the intensive margin value is simply the value of additional lot size.

This test was implemented using the data on newly constructed homes in three of the five study regions. Appendix A contains a description of the data and the hedonic regression used to calculate intensive margin land values. Two regions were excluded due to an absence of data on lot sizes of newly constructed homes. Test results strongly indicate that the number of new homes built in the regions of California containing AWS critical habitat is indeed constrained by prior regulation. Thus, the market for new housing is rationed even before the imposition of incremental regulations related to critical habitat.

One implication of this finding is that the ultimate impacts of critical habitat may depend in an important way on how local governments respond to the designation. If housing restrictions are relaxed in response to the designation of critical habitat, then impacts will be lower than in the case where regulations are unaffected. For example, if cities accommodate critical habitat designation by allowing for higher density development, then economic losses may be lower than if housing is even further restricted by critical habitat.

Following this line of reasoning, two scenarios are presented in this analysis. First, the more conservative scenario is that critical habitat results in a reduction in the housing stock in Census tracts where avoidance requirements place some land off-limits to development. In this case, critical habitat will result in housing price increases to clear the market and potential gains to developers and landowners who benefit from the increased price. These potential producer gains must be counterbalanced against the requirement for mitigation expenditures resulting from development in critical habitat areas, and profits lost through the reduction in housing units constructed. An alternative scenario is that critical habitat designation is accommodated entirely through densification. Consumer losses in this case result from reductions in lot size since the number of housing units is unaffected. Producer losses will result mainly from mitigation expenditures. Comparing welfare losses between the two scenarios illustrates potential gains from policy coordination among levels of government.

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[26] David Sunding and Aaron Swoboda, *Does Regulation Ration Housing?*, UC Berkeley Working Paper, 2004, and Ed Glaeser and Joseph Gyourko, *The Impacts of Building Restrictions on Housing Affordability*, Federal Reserve Board of New York Economic Policy Review, 2003.

IV.1.3 Critical Habitat Likely To Be Developed

The method for calculating the quantity of new development per Census tract was described in the preceding section. It remains to allocate that development within the tract itself. To do so, GIS analysis was used to calculate overlap between proposed critical habitat and the development probabilities that form the basis of an urban growth model designed at the University of California, Berkeley. The California Urban and Biodiversity Analysis (CURBA) model uses GIS technology to provide spatial predictions of the extent of urban growth in the year 2025.

The basis of the CURBA model is a set of econometrically estimated development probabilities that incorporate the preferences of consumers for distance and landscape features in their choice of location. These development probabilities are cardinal, as opposed to the ordinal (1/0) predictions of location of development that are ultimately generated by CURBA. The probabilities also are a good indication of the degree to which consumers view alternative development sites as substitutes. By overlaying the proposed critical habitat unit areas over CURBA predictions, it is possible to measure the expected amount of development that is likely to take place within critical habitat. Furthermore, the precise nature of the CURBA model—predictions have resolution of one one-hundredths of a hectare—invests this analysis with a high degree of specificity, resulting in a more accurate impact assessment.

IV.1.4 Avoidance, Mitigation and Indirect Effects of Critical Habitat

The Service has performed Section 7 consultations for seven private development projects affecting the AWS. The projects were subject to an average mitigation or compensation ratio of between 2.4:1, and an avoidance requirement of approximately 15%. Projects may fulfill the requirement for compensation by purchasing conservation credits from a conservation bank, purchasing suitable habitat and managing that habitat in perpetuity, or dedicating land already owned by the project applicant and having suitable habitat. Avoidance requirements result in a reduction in new construction.

Conservation bank prices are used to estimate the value of resources redirected to offsite mitigation. The analysis uses market data collected from several private conservation banks in the Bay Area and central California regions to determine off-site mitigation prices by county. Mitigation credits are assumed to cost an average of $10,000 per acre.[27]

The Section 7 consultation process may result in time delays and other effects that have impacts that are incremental to direct compliance costs. If such effects would not have occurred in the absence of critical habitat (i.e., “but for” critical habitat), then they are considered by this analysis to be an impact of the designation.

These costs include project delays stemming from the consultation process or compliance with other regulations, or, in the case of land location within or adjacent to the designation, loss in

[27] These estimates were derived from personal interviews with developers, conservation bank administrators and other affected entities.

property values due to regulatory uncertainty, and loss (or gain) in property values resulting from public perceptions regarding the effects of critical habitat.

Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the Section 7 consultation process and / or compliance with other laws triggered by the designation. The need to conduct a Section 7 consultation will not necessarily delay a project, as often the consultation may be coordinated with the existing baseline regulatory approval process. However, depending on the schedule of the consultation, a project may experience additional delays, resulting in an unanticipated extension in the time needed to fully realize returns from the planned activity.

IV.2 Calculation of Market Effects and Welfare Losses

Estimates of welfare impacts on the markets for land, housing and commercial development proceed directly from the spatial and socioeconomic data described above. This analysis adopts a supply and demand approach based on partial equilibrium to assess those impacts.

Estimating the regulatory impact requires several steps within the context of this framework:

- Identify the supply and demand functions and determine the market equilibrium "but for" the regulatory action.
- Determine the effects of regulation on supply, demand and relevant constraints.
- Estimate the resulting new market equilibrium and resultant changes in producer and consumer surplus.

New residents' demand for housing in each Census tract is specified as linear and of unit price elasticity as suggested by the academic literature.[28] The number of new housing units is taken from the population growth forecasts and new home prices are taken from DataQuick as described above.

IV.2.1 Delay Cost

The Section 7 consultation process may result in time delays and other effects that have impacts that are incremental to direct compliance costs. The analysis considers the cost of time delays

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[28] The seminal analysis of Muth (1964) suggested that the price elasticity of demand for residential land could be expressed as $\varepsilon_L = -k_N\sigma + k_L\varepsilon_H$, where ε_L and ε_H are the own-price elasticities of residential land and housing, respectively, σ is the elasticity of substitution between land and capital in the production of housing, and k_L and k_N are the shares of land and non-land factors in housing production. Thorsnes (1997) has estimated the value of σ as roughly -1.0. Reid (1962) first demonstrated that the price elasticity of housing was near -1.0. While several studies have reported lower elasticities, Rosen (1979) reported a price elasticity of -1.0 using time series data. Representative cost shares for land and non-land factors of production are 0.3 and 0.7, respectively. Richard Muth, "The Derived Demand for a Factor of Production and the Industry Supply Curve," *Oxford Economic Papers* (July 1964): 221-234; Paul Thorsnes, "Consistent Estimates of the Elasticity of Substitution between Land and Non-Land Inputs in the Production of Housing," *Journal of Urban Economics* (1997): 98-108; Harvey Rosen, "Housing Decisions and the U.S. Income Tax," *Journal of Public Economics* (1979): 1-23.

associated with Section 7 consultation or other requirements triggered by the designation above and beyond project delays resulting from baseline regulatory processes. Delay costs are measured as the incremental carrying costs on the underlying option to purchase land for development. The delay period is six months and the value of the land held was calculated using a hedonic regression of home sales. The effect of this assumption is that delay increases development cost and reduces producer surplus, but does not affect consumer welfare. A more conservative analysis (i.e., more likely to result in larger impacts) might consider that designation of critical habitat would delay completion of the project beyond when it would have been completed without the designation of critical habitat. However, since the possible presence of the AWS is widely known to developers, it is reasonable to assume that they would initiate the development process sooner in anticipation of the extra regulation flowing from listing.

IV.2.2 Sample Calculation

A sample calculation is provided to assist with understanding the model. Consider a hypothetical census tract with the following characteristics:

- 200 new homes are projected to be built at a cost of $500,000 each;
- The cost of building each of these homes is $300,000;
- Housing demand is unit elastic, meaning an increase in price will provoke an equivalent (in percent terms) reduction in demand;
- The price of mitigation land is $100,000 per acre; and
- Critical habitat lengthens the permitting period by six months.

Suppose that 100 of the projected 200 homes are to be built within critical habitat, and that avoidance requirements result in the loss of 5 homes, or 2.5% of the overall pre-regulation housing stock.

Since demand is unit elastic, this output reduction implies a 2.5% increase in the overall price of new housing, so the post-regulation price of new housing is now $512,500, or

$$\frac{dQ}{Q_0}\frac{P_0}{dP} = -1 \Rightarrow \frac{dQ}{Q_0} = -\frac{dP}{P_0}$$
$$\frac{dQ}{Q_0} = \frac{Q' - Q_0}{Q_0} \approx -.025 \Rightarrow \frac{dP}{P_0} = .025$$

where Q_0 is the initial quantity of housing within critical habitat and P is the pre-critical habitat price of housing.

The welfare loss calculation has three components. First are impacts to producer and consumer surplus.[29] The surplus impacts for this example total $1,031,250.

Second are mitigation costs. Suppose that developers must mitigate impacts at 2:1 at a cost of $100,000 per acre of disturbance. Calculating the total land footprint within critical habitat requires knowledge of the incremental gross urban density. Assume it is two homes per acre. Then a total of 47.5 acres of habitat must be mitigated at 2:1. This yields a total of $9.5 million in mitigation costs.

The final component of welfare loss is due to delay. Delay is calculated using a 7% discount rate for 182 days. Assume for the purpose of this example that the purchase price of land is $200,000 per acre. Then the incremental carrying cost of land is $7,000 per acre for a total of $332,500.

Total lost surplus in this example is then $10.9 million.

IV.3 Results of the Analysis

In the base scenario where critical habitat reduces the amount of new housing, designation of critical habitat results in $532 million in losses to consumers and producers between the present and 2025. In the event that on-site avoidance can be accomplished through increases in density, welfare losses from critical habitat are $208 million over the same time period. Table IV-1: Development Projections displays projected development within the Census tracts affected by designation. For each tract projected development (in terms of households and footprint) is displayed. For Alameda, Contra Costa and Santa Clara counties, these were calculated by ABAG. The total projected new development includes both residential and commercial development. For San Joaquin, these figures were calculated using data from the San Joaquin Council of Governments.

Table IV-2: Change in Housing Development Activity shows how critical habitat perturbs the housing market equilibrium in the case where critical habitat results in construction of fewer housing units. For each Census tract, the table shows the number and of new housing units projected to be built, as well as change due to regulation. On-site avoidance requirements result in the loss of a certain number of housing units.

Table IV-3: Welfare Effects combines these market impacts with mitigation expenditures to arrive at welfare losses in each Census tract, along with annualized impacts. (Table IV-4: Welfare Effects, Descending presents these impacts in descending order.) Losses per Census tract range from $0 to over $69 million for the rationed housing analysis. Table IV-5: Welfare Effects by County displays impacts at the county level. Figure 1: Unit 1 Impacts through Figure 6: Unit 6 Impact display maps of each unit color by impact.

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[29] As explained in the appendix, these losses are given by the expression $-\left[\frac{dP}{2}+(P-c)\right]dQ$.

Table IV-1: Development Projections

Census Tract	County	Average Sq. Ft.	Median New Home Price	New Homes	Acres of Greenfield Development
06001400100	Alameda	3,621	$1,585,570	109	64
06001404400	Alameda	3,390	$1,537,408	123	30
06001404502	Alameda	3,242	$1,293,979	140	14
06001421100	Alameda	2,615	$920,758	54	0
06001421500	Alameda	2,274	$852,574	100	10
06001421600	Alameda	2,274	$925,009	112	2
06001422600	Alameda	1,327	$398,482	11	1
06001430100	Alameda	2,123	$818,459	189	86
06001430200	Alameda	2,288	$771,117	208	49
06001430300	Alameda	3,022	$1,018,224	62	11
06001435101	Alameda	2,520	$835,469	940	307
06001438000	Alameda	3,189	$1,067,910	103	28
06001440100	Alameda	1,857	$529,361	147	29
06001441100	Alameda	2,198	$659,709	239	96
06001450601	Alameda	4,003	$1,765,690	479	291
06001450701	Alameda	4,447	$2,070,809	734	556
06001451101	Alameda	2,058	$647,508	2,054	3,149
06013321103	Contra Costa	2,931	$887,238	371	117
06013342000	Contra Costa	3,502	$1,451,183	411	63
06013345201	Contra Costa	2,726	$1,020,894	213	139
06013345202	Contra Costa	2,965	$1,060,896	874	177
06013346101	Contra Costa	2,843	$879,848	177	54
06013346102	Contra Costa	4,641	$2,121,475	72	44
06013346201	Contra Costa	4,561	$2,163,563	138	91
06013347000	Contra Costa	2,896	$1,192,682	274	138
06013348000	Contra Costa	3,823	$1,835,313	156	109
06013351100	Contra Costa	2,122	$1,090,521	549	79
06013351200	Contra Costa	2,615	$917,039	248	154
06013352101	Contra Costa	2,918	$1,069,348	100	46
06013352102	Contra Costa	3,157	$1,560,373	170	72
06013352202	Contra Costa	2,350	$864,085	135	31
06013353001	Contra Costa	3,438	$1,589,128	150	70
06013354001	Contra Costa	2,426	$920,935	64	26
06013354002	Contra Costa	4,248	$2,838,929	179	108
06013355104	Contra Costa	3,016	$1,158,514	3,672	1,433
06013355301	Contra Costa	3,211	$951,614	739	380

Census Tract	County	Average Sq. Ft.	Median New Home Price	New Homes	Acres of Greenfield Development
06013355302	Contra Costa	3,468	$1,063,339	200	48
06013355303	Contra Costa	2,880	$797,672	47	44
06013356002	Contra Costa	2,507	$733,044	495	237
06013359202	Contra Costa	2,501	$450,727	277	77
06013360100	Contra Costa	2,501	$470,386	510	191
06013361000	Contra Costa	2,179	$595,105	478	103
06013362000	Contra Costa	2,085	$409,108	134	19
06013369002	Contra Costa	1,706	$329,412	104	25
06013385100	Contra Costa	2,615	$735,863	85	19
06013392000	Contra Costa	2,312	$734,269	54	5
06077005500	San Joaquin	2,239	$488,184	3,346	2,282
06085512700	Santa Clara	2,312	$1,272,126	266	572
Total				**20,492**	**11,676**

Table IV-2: Change in Housing Development Activity

Census Tract	County	Projected New Housing	Change in New Homes
06001400100	Alameda	109	-14
06001404400	Alameda	123	-3
06001404502	Alameda	140	-1
06001421100	Alameda	54	-
06001421500	Alameda	100	-
06001421600	Alameda	112	-
06001422600	Alameda	11	-2
06001430100	Alameda	189	-8
06001430200	Alameda	208	-12
06001430300	Alameda	62	0
06001435101	Alameda	940	-106
06001438000	Alameda	103	-3
06001440100	Alameda	147	-20
06001441100	Alameda	239	-7
06001450601	Alameda	479	-56
06001450701	Alameda	734	-10
06001451101	Alameda	2,054	-17
06013321103	Contra Costa	371	-42
06013342000	Contra Costa	411	-2
06013345201	Contra Costa	213	-19
06013345202	Contra Costa	874	-40
06013346101	Contra Costa	177	-10
06013346102	Contra Costa	72	-4
06013346201	Contra Costa	138	-5
06013347000	Contra Costa	274	-14
06013348000	Contra Costa	156	-7
06013351100	Contra Costa	549	-25
06013351200	Contra Costa	248	-3
06013352101	Contra Costa	100	-12
06013352102	Contra Costa	170	-17
06013352202	Contra Costa	135	-15
06013353001	Contra Costa	150	-15
06013354001	Contra Costa	64	-6
06013354002	Contra Costa	179	-13
06013355104	Contra Costa	3,672	-41
06013355301	Contra Costa	739	-59

Census Tract	County	Projected New Housing	Change in New Homes
06013355302	Contra Costa	200	-29
06013355303	Contra Costa	47	-5
06013355305	Contra Costa	164	0
06013356002	Contra Costa	495	-54
06013359202	Contra Costa	277	-16
06013360100	Contra Costa	510	-2
06013361000	Contra Costa	478	-26
06013362000	Contra Costa	134	-16
06013369002	Contra Costa	104	-16
06013385100	Contra Costa	85	-1
06013392000	Contra Costa	54	-1
06077005500	San Joaquin	3,346	-5
06085512700	Santa Clara	266	0
Total		**20,656**	**-780**

Sources:

1. ABAG;
2. CRA analysis.

Table IV-3: Welfare Effects

				Rationing Scenario		Densification Scenario	
Census Tract	**County**	**Unit(s)**	**Size (ac.)**	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**
06001400100	Alameda	1, 6	1,029	$15,761,437	$1,390,438	$5,512,920	$486,337
06001404400	Alameda	6	60	$2,771,701	$244,513	$463,490	$40,888
06001404502	Alameda	6	1	$796,610	$70,275	$74,805	$6,599
06001421100	Alameda	1	3	-	-	-	-
06001421500	Alameda	1	1	-	-	-	-
06001421600	Alameda	1	2	-	-	-	-
06001422600	Alameda	6	8	$562,386	$49,612	$124,718	$11,002
06001430100	Alameda	2	7,576	$5,116,612	$451,376	$2,364,797	$208,617
06001430200	Alameda	2	262	$5,133,449	$452,861	$1,743,642	$153,820
06001430300	Alameda	2	1	$8,659	$764	$1,948	$172
06001435101	Alameda	3	10,444	$57,476,800	$5,070,471	$22,670,828	$1,999,968
06001438000	Alameda	3	52	$1,831,143	$161,539	$602,452	$53,147
06001440100	Alameda	3	6,198	$7,449,073	$657,140	$2,620,947	$231,214
06001441100	Alameda	3	625	$3,358,017	$296,237	$1,778,500	$156,895
06001450601	Alameda	3	9,828	$69,339,088	$6,116,934	$22,209,204	$1,959,245
06001450701	Alameda	5B	15,307	$13,873,381	$1,223,878	$4,800,279	$423,470
06001451101	Alameda	5A	22,494	$11,870,391	$1,047,178	$16,446,984	$1,450,915
06013321103	Contra Costa	1	552	$23,064,938	$2,034,736	$8,595,160	$758,245
06013342000	Contra Costa	2	7	$1,451,975	$128,090	$180,266	$15,903
06013345201	Contra Costa	2	4,267	$14,010,468	$1,235,971	$8,194,567	$722,906
06013345202	Contra Costa	2	307	$23,232,028	$2,049,476	$5,165,517	$455,690
06013346101	Contra Costa	4	749	$5,464,768	$482,089	$1,876,912	$165,577
06013346102	Contra Costa	4	1,825	$6,280,762	$554,074	$1,718,567	$151,608
06013346201	Contra Costa	4	638	$7,257,081	$640,203	$2,069,392	$182,557
06013347000	Contra Costa	1	1,714	$10,791,043	$951,961	$4,392,800	$387,523
06013348000	Contra Costa	1	341	$9,371,027	$826,690	$3,264,964	$288,028
06013351100	Contra Costa	2	348	$17,798,634	$1,570,154	$2,341,364	$206,550
06013351200	Contra Costa	2	87	$2,080,945	$183,576	$1,188,206	$104,821
06013352101	Contra Costa	2	1,863	$7,322,996	$646,018	$3,536,552	$311,986
06013352102	Contra Costa	2	3,705	$18,673,386	$1,647,323	$4,698,722	$414,510
06013352202	Contra Costa	2, 6	2,077	$9,091,185	$802,003	$2,205,987	$194,607
06013353001	Contra Costa	6	1,759	$15,849,660	$1,398,220	$4,396,117	$387,815
06013354001	Contra Costa	1, 6	1,787	$3,953,979	$348,811	$1,487,315	$131,208
06013354002	Contra Costa	1	472	$28,512,298	$2,515,289	$4,955,556	$437,168
06013355104	Contra Costa	4	6,211	$28,231,884	$2,490,552	$10,059,380	$887,415

				Rationing Scenario		Densification Scenario	
Census Tract	**County**	**Unit(s)**	**Size (ac.)**	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**
06013355301	Contra Costa	4	775	$34,012,784	$3,000,529	$19,577,808	$1,727,109
06013355302	Contra Costa	4	974	$16,919,196	$1,492,572	$4,551,165	$401,493
06013355303	Contra Costa	4	11,866	$3,229,166	$284,870	$3,052,131	$269,252
06013355305	Contra Costa	4	1	$0	$0	$0	$0
06013356002	Contra Costa	1	20,133	$26,843,606	$2,368,081	$16,960,784	$1,496,241
06013359202	Contra Costa	1	755	$3,580,952	$315,903	$2,884,427	$254,457
06013360100	Contra Costa	1	22	$406,970	$35,902	$383,154	$33,801
06013361000	Contra Costa	1	1,288	$9,097,837	$802,590	$3,581,794	$315,978
06013362000	Contra Costa	1	31	$3,305,408	$291,595	$1,522,864	$134,344
06013369002	Contra Costa	1	2	$3,714,573	$327,691	$2,472,500	$218,118
06013385100	Contra Costa	1	6	$635,285	$56,043	$190,054	$16,766
06013392000	Contra Costa	1	1	$532,626	$46,987	$65,667	$5,793
06077005500	San Joaquin	5A	1,984	$1,616,259	$142,583	$653,874	$57,683
06085512700	Santa Clara	5B	2,546	$93,082	$8,211	$98,575	$8,696
Total			**142,985**	**$531,775,546**	**$46,912,009**	**$207,737,654**	**$18,326,135**

Source: CRA analysis.

Note: Tracts 06001421100, 06001421500 and 06001421600 are completely urbanized in the CURBA model

Table IV-4: Welfare Effects, Descending

			Rationing Scenario		Densification Scenario	
Census Tract	**County**	**Size (ac.)**	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**
06001450601	Alameda	9,828	$69,339,088	$6,116,934	$22,209,204	$1,959,245
06001435101	Alameda	10,444	$57,476,800	$5,070,471	$22,670,828	$1,999,968
06013355301	Contra Costa	775	$34,012,784	$3,000,529	$19,577,808	$1,727,109
06013354002	Contra Costa	472	$28,512,298	$2,515,289	$4,955,556	$437,168
06013355104	Contra Costa	6,211	$28,231,884	$2,490,552	$10,059,380	$887,415
06013356002	Contra Costa	20,133	$26,843,606	$2,368,081	$16,960,784	$1,496,241
06013345202	Contra Costa	307	$23,232,028	$2,049,476	$5,165,517	$455,690
06013321103	Contra Costa	552	$23,064,938	$2,034,736	$8,595,160	$758,245
06013352102	Contra Costa	3,705	$18,673,386	$1,647,323	$4,698,722	$414,510
06013351100	Contra Costa	348	$17,798,634	$1,570,154	$2,341,364	$206,550
06013355302	Contra Costa	974	$16,919,196	$1,492,572	$4,551,165	$401,493
06013353001	Contra Costa	1,759	$15,849,660	$1,398,220	$4,396,117	$387,815
06001400100	Alameda	1,029	$15,761,437	$1,390,438	$5,512,920	$486,337
06013345201	Contra Costa	4,267	$14,010,468	$1,235,971	$8,194,567	$722,906
06001450701	Alameda	15,307	$13,873,381	$1,223,878	$4,800,279	$423,470
06001451101	Alameda	22,494	$11,870,391	$1,047,178	$16,446,984	$1,450,915
06013347000	Contra Costa	1,714	$10,791,043	$951,961	$4,392,800	$387,523
06013348000	Contra Costa	341	$9,371,027	$826,690	$3,264,964	$288,028
06013361000	Contra Costa	1,288	$9,097,837	$802,590	$3,581,794	$315,978
06013352202	Contra Costa	2,077	$9,091,185	$802,003	$2,205,987	$194,607
06001440100	Alameda	6,198	$7,449,073	$657,140	$2,620,947	$231,214
06013352101	Contra Costa	1,863	$7,322,996	$646,018	$3,536,552	$311,986
06013346201	Contra Costa	638	$7,257,081	$640,203	$2,069,392	$182,557
06013346102	Contra Costa	1,825	$6,280,762	$554,074	$1,718,567	$151,608
06013346101	Contra Costa	749	$5,464,768	$482,089	$1,876,912	$165,577
06001430200	Alameda	262	$5,133,449	$452,861	$1,743,642	$153,820
06001430100	Alameda	7,576	$5,116,612	$451,376	$2,364,797	$208,617
06013354001	Contra Costa	1,787	$3,953,979	$348,811	$1,487,315	$131,208
06013369002	Contra Costa	2	$3,714,573	$327,691	$2,472,500	$218,118
06013359202	Contra Costa	755	$3,580,952	$315,903	$2,884,427	$254,457
06001441100	Alameda	625	$3,358,017	$296,237	$1,778,500	$156,895
06013362000	Contra Costa	31	$3,305,408	$291,595	$1,522,864	$134,344
06013355303	Contra Costa	11,866	$3,229,166	$284,870	$3,052,131	$269,252
06001404400	Alameda	60	$2,771,701	$244,513	$463,490	$40,888
06013351200	Contra Costa	87	$2,080,945	$183,576	$1,188,206	$104,821

			Rationing Scenario		Densification Scenario	
Census Tract	**County**	**Size (ac.)**	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**
06001438000	Alameda	52	$1,831,143	$161,539	$602,452	$53,147
06077005500	San Joaquin	1,984	$1,616,259	$142,583	$653,874	$57,683
06013342000	Contra Costa	7	$1,451,975	$128,090	$180,266	$15,903
06001404502	Alameda	1	$796,610	$70,275	$74,805	$6,599
06013385100	Contra Costa	6	$635,285	$56,043	$190,054	$16,766
06001422600	Alameda	8	$562,386	$49,612	$124,718	$11,002
06013392000	Contra Costa	1	$532,626	$46,987	$65,667	$5,793
06013360100	Contra Costa	22	$406,970	$35,902	$383,154	$33,801
06085512700	Santa Clara	2,546	$93,082	$8,211	$98,575	$8,696
06001430300	Alameda	1	$8,659	$764	$1,948	$172
06013355305	Contra Costa	1	$0	$0	$0	$0
06001421600	Alameda	2	-	-	-	-
06001421500	Alameda	1	-	-	-	-
06001421100	Alameda	3	-	-	-	-
Total		**142,985**	**$531,775,546**	**$46,912,009**	**$207,737,654**	**$18,326,135**

Source: CRA analysis.

Note: Tracts 06001421100, 06001421500 and 06001421600 are completely urbanized in the CURBA model.

Table IV-5: Welfare Effects by County

	Rationing Scenario		Densification Scenario	
County	**Surplus Lost**	**Annualized Impact**	**Surplus Lost**	**Annualized Impact**
Contra Costa	$334,717,458	$29,528,000	$125,569,690	$11,077,468
Alameda	$195,348,747	$17,233,215	$81,415,515	$7,182,288
San Joaquin	$1,616,259	$142,583	$653,874	$57,683
Santa Clara	$93,082	$8,211	$98,575	$8,696
Total	**$531,775,546**	**$46,912,009**	**$207,737,654**	**$18,326,135**

Source: CRA analysis.

Figure 1: Unit 1 Impacts

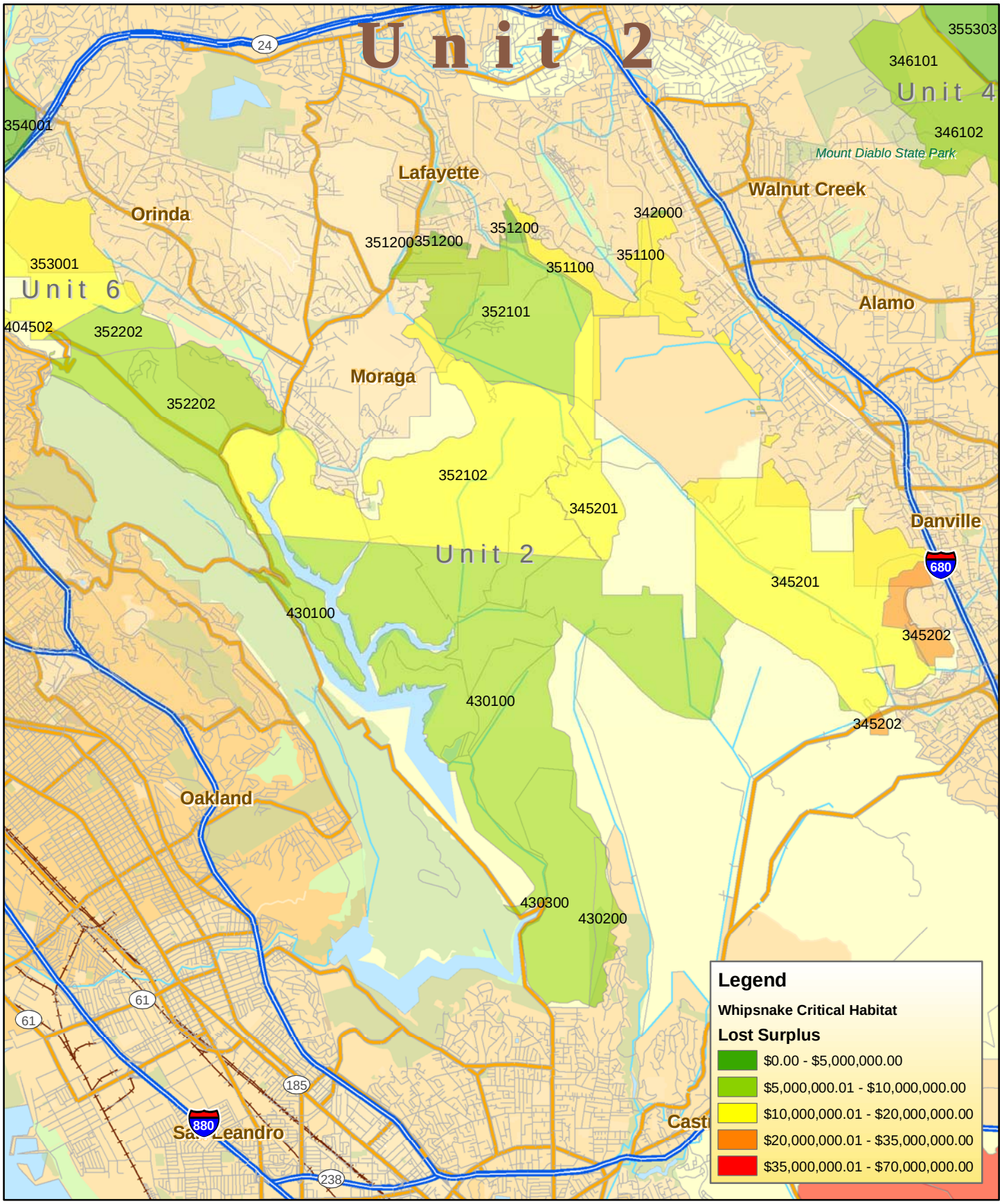

Figure 2: Unit 2 Impacts

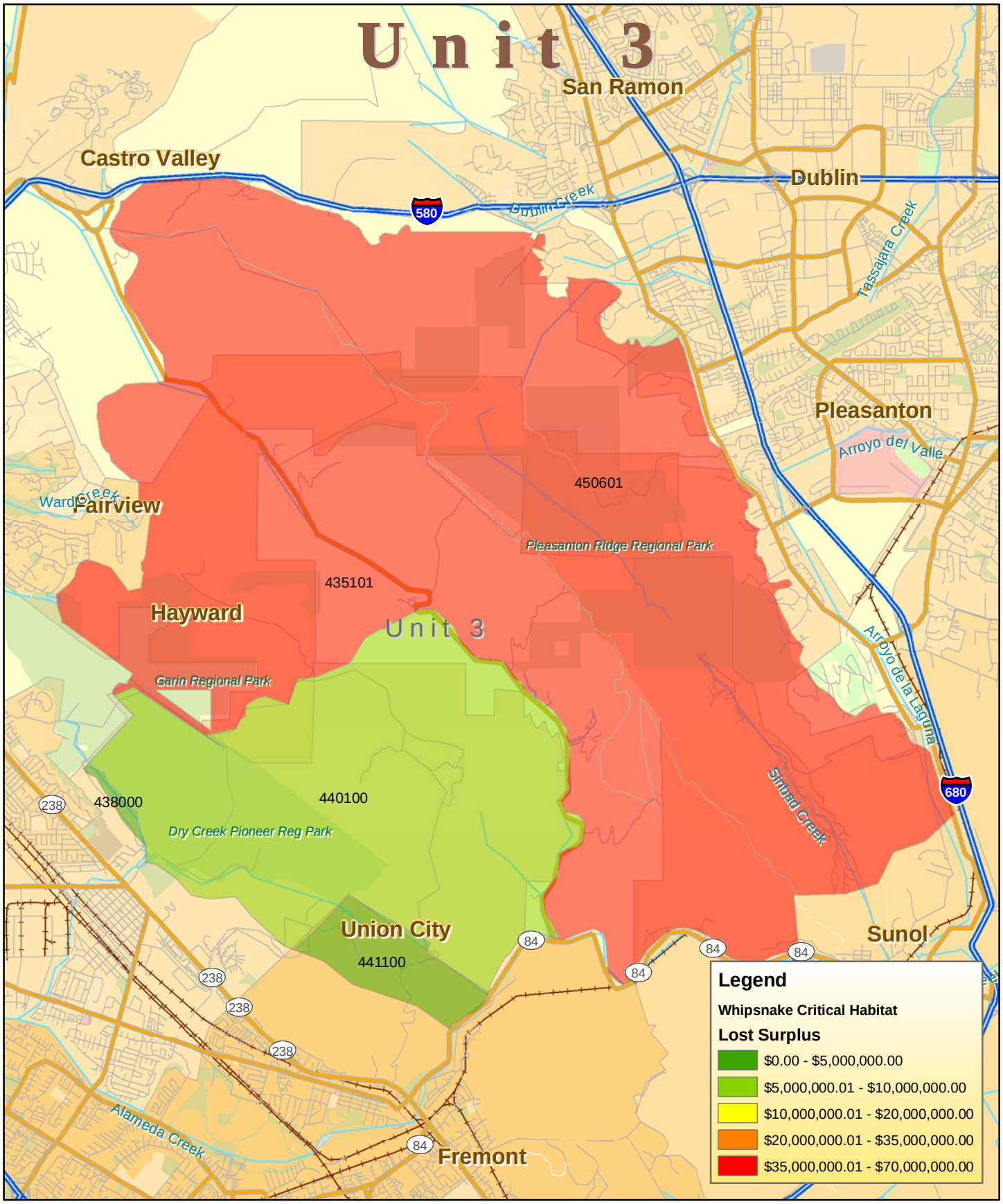

Figure 3: Unit 3 Impacts

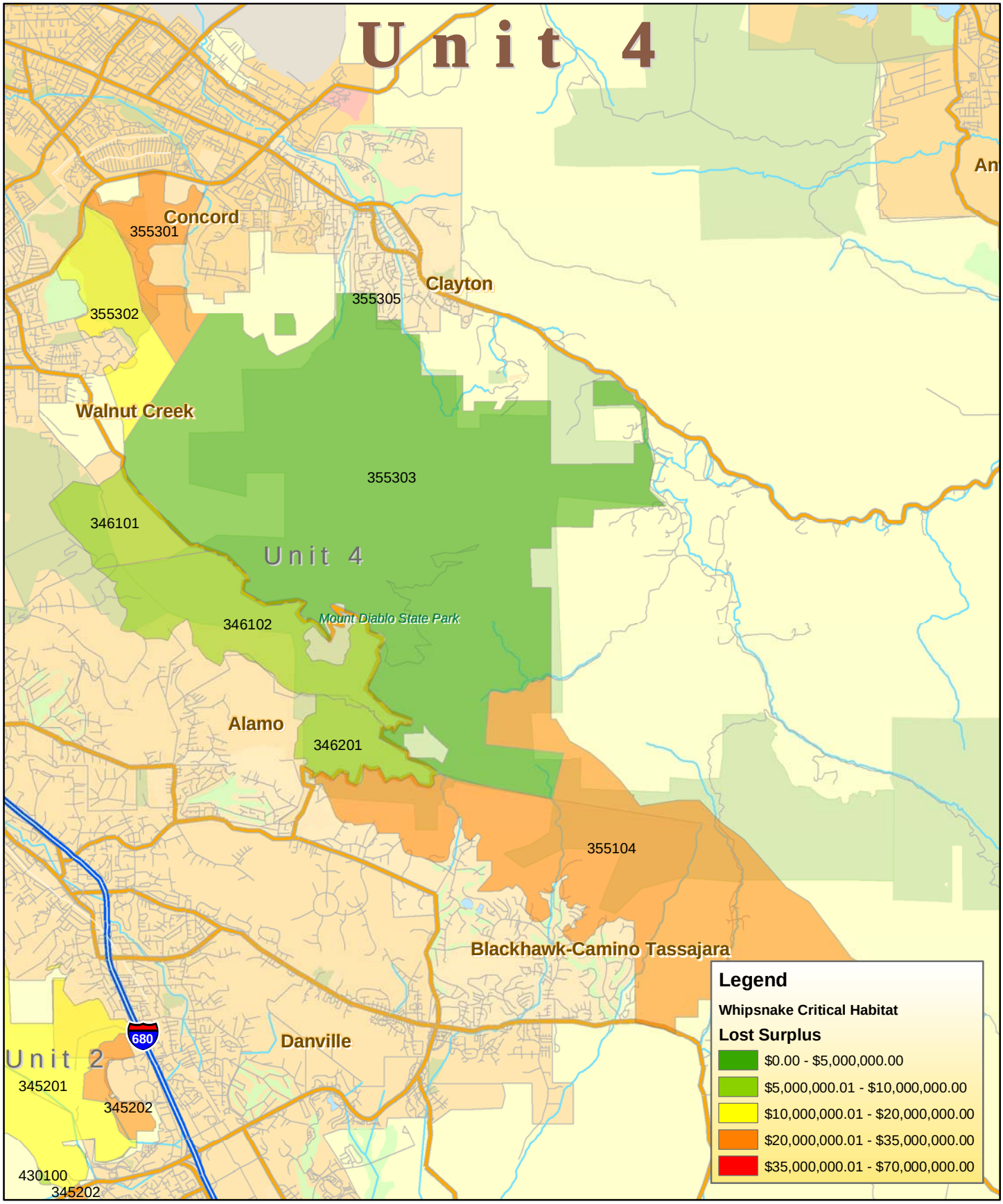

Figure 4: Unit 4 Impacts

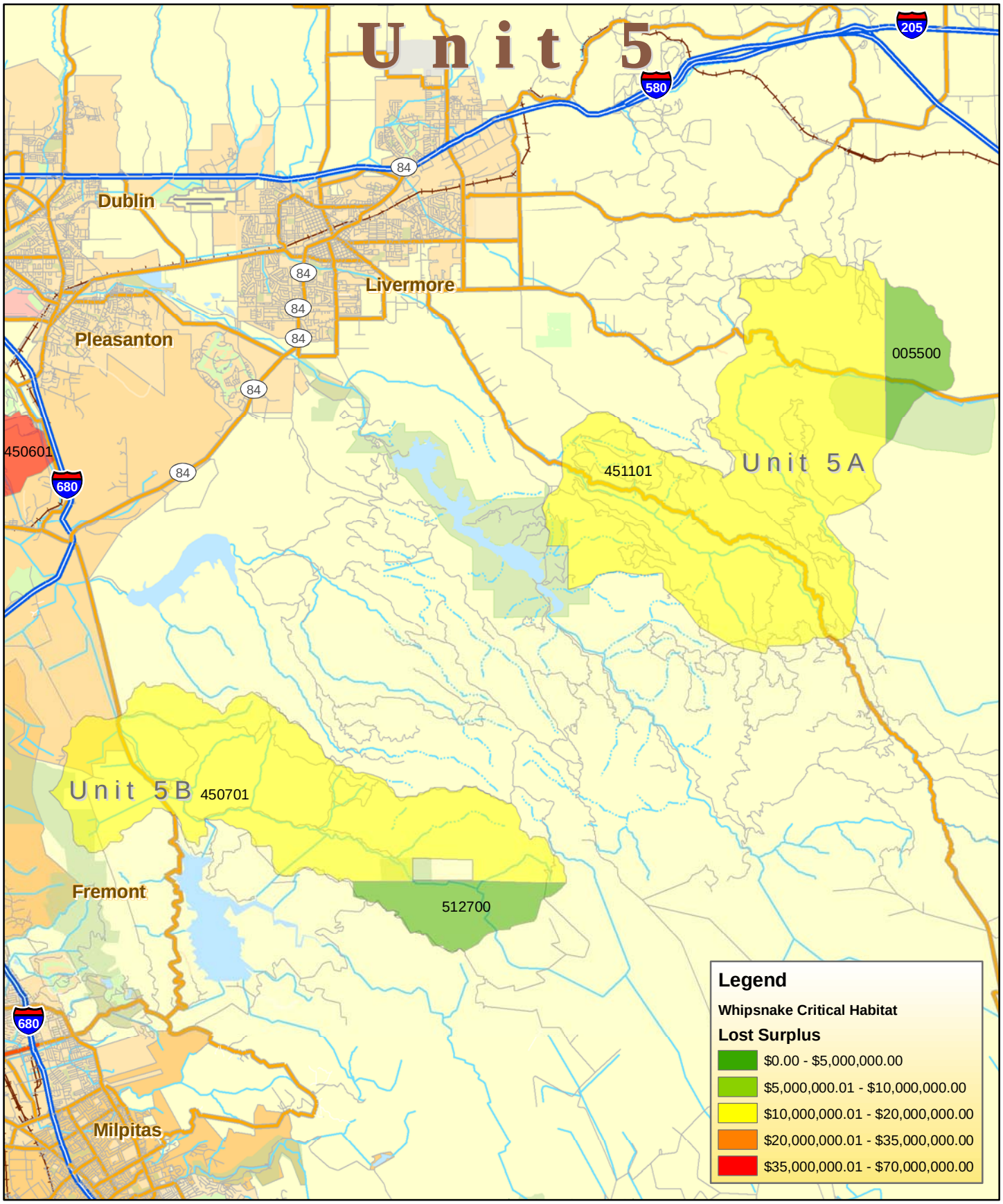

Figure 5: Unit 5 Impacts

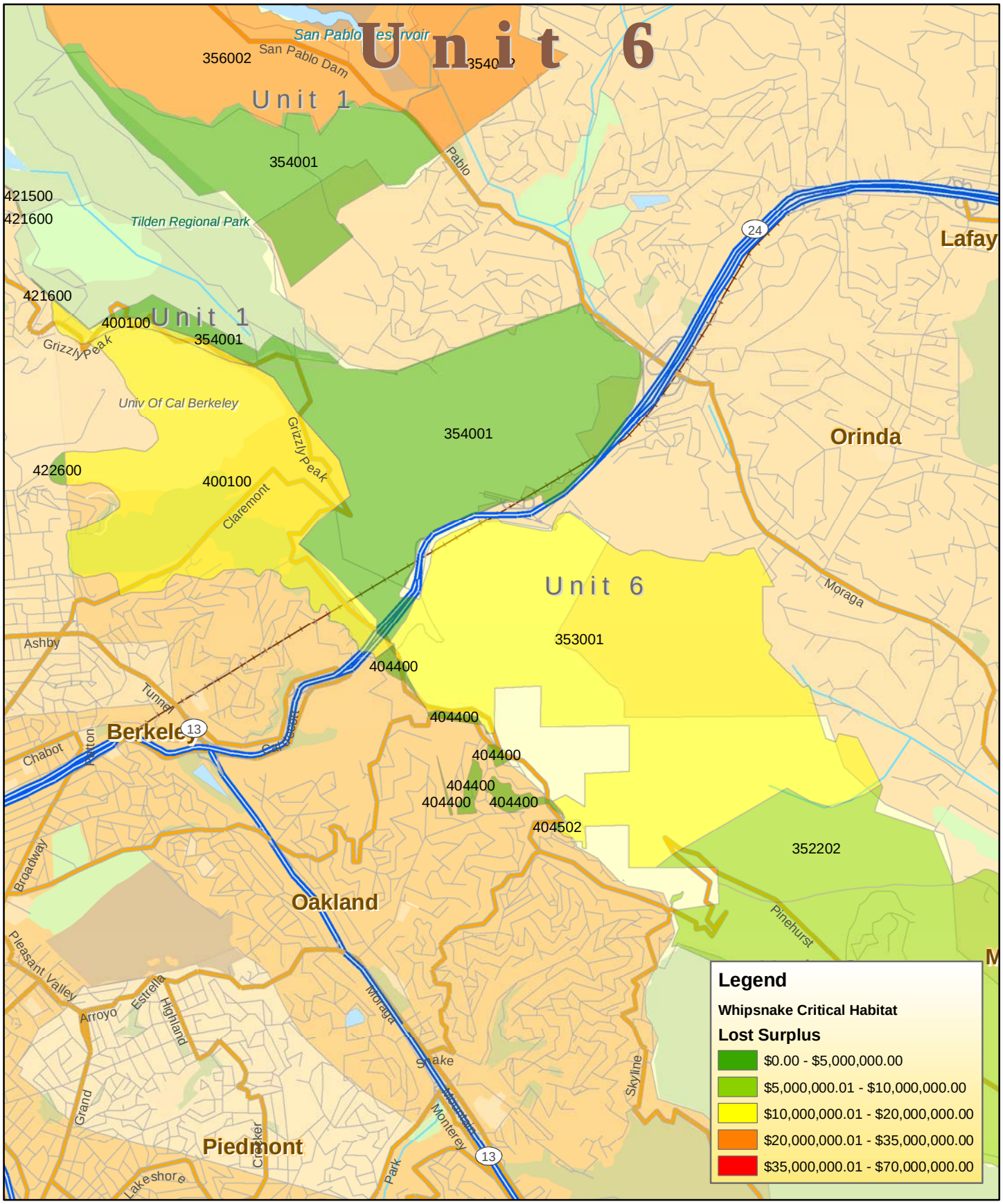

Figure 6: Unit 6 Impacts

V ECONOMIC IMPACTS ON PUBLIC PROJECTS AND ACTIVITIES

This section reviews the potential economic impacts on transportation projects and the energy industry as a result of critical habitat designation. In addition, the possible impacts to activities by the Department of the Defense, the Bureau of Land Management, the Bureau of Reclamation, the Forestry Service, the Fish and Wildlife Service, and the Bureau of Indian Affairs are examined.

V.1 ECONOMIC IMPACTS ON TRANSPORTATION PROJECTS

The Federal Highway Administration (FHA) and the California Department of Transportation maintain GIS databases of current and predicted transportation projects. The FHA data, known as the National Highway Planning Network, includes information for interstates, principal arterials, and rural minor arterials.[30] The California Department of Transportation source, known as the California Transportation Investment Tool (CTIS Tool), incorporates information about projects overseen by the State Transportation Improvement Program, the State Highway Operations and Protection Program, the Interregional Transportation Strategic Plan, the California Aviation System Plan, and various regional transportation planning organizations.[31] Aviation, rail, highway, transit, bicycle and pedestrian projects are all represented. Developed to assist transportation planners, the CTIS Tool is a Geographic Information System that displays the mapped location, as well as the timeframe and cost of the projects. Version 1.3.2 was used for this analysis.

The data layers contained in the CTIS Tool were mapped onto the habitat boundary files provided by the Service to determine the number of proposed acres affected by each transportation project. No projects overlapped with critical habitat.

The Metropolitan Transportation Commission (MTC), the agency tasked with transportation planning for the Bay Area, maintains a regional transportation plan which lists intended projects through 2030.[32] The most recent version of this plan was adopted in February, 2005.

GIS analysis was used to map the location of planned construction in relation to critical habitat. The results are shown in Table V-1: Planned Transportation Projects, Alameda County and Table V-2: Planned Transportation Projects, Contra Costa County.[33] Most planned transportation projects occur more than one mile from critical habitat.

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[30] U.S. Department of Transportation, Federal Highway Administration, http://www.fhwa.dot.gov/planning/nhpn/

[31] California Department of Transportation, Office of State Planning, http://www.dot.ca.gov/hq/tpp/offices/osp/ctis.htm

[32] http://www.mtc.ca.gov/planning/2030_plan/index.htm

[33] The tables list planned widenings, expansions or new construction. The plan also earmarks roughly $2 billion in Alameda and $1.5 billion in Contra Costa for general maintenance. We invite comments on the potential effects of critical habitat on these projects.

Although no projects were found to be within critical habitat, those within one mile of critical habitat may be affected by the proposed rule depending on the project footprint. At this time, all of the projects in the most recent version of the 2030 plan have yet to reach the stage of development where they have detailed plans[34]. Thus, project specific analyses of the effects of the proposed rule could not be done. The effects of the proposed rule will vary by project and depend on whether a federal nexus exists. We invite comment on the potential effect of the proposed rule on these projects.

V.2 Economic Impacts on the Energy Industry

Pursuant to Executive Order 13211, Federal agencies are required to submit a summary of the potential effects of regulatory actions on the supply, distribution, and use of energy, assuming those actions meet certain criteria outlined by the OMB:[35]

- Reductions in crude oil supply in excess of 10,000 barrels per day;
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of 5 million tons per year;
- Reductions in natural gas production in excess of 25 million mcf per year;
- Reductions in electricity production in excess of 1 billion kilowatt-hours per year or in excess of 500 megawatts of installed capacity;
- Increases in energy use required by the regulatory action that exceed any of the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.

Table V-3: Proposed Energy Facilities lists the energy production facilities that are planned or under construction in the counties with critical habitat. A GIS analysis was used to compute their proximity to the nearest critical habitat designation.[36] All planned facilities are at least two miles from proposed critical habitat. Thus, none of the above criteria are met.

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[34] Personal communication with Doug Kimsey, planning manager, Metropolitan Transportation Commission, February 9, 2006.

[35] U.S. Office of Management and Budget, "Memorandum for Heads Of Executive Departments And Agencies, And Independent Regulatory Agencies," July 13, 2001.

[36] Because some plants are only in the planning stages, precise location information was not available for all plants. Whenever possible, plant locations were geocoded to the nearest intersection or city block.

V.3 Economic Effects on Public Lands

This section describes potential impacts of designation on lands administered by the Federal government. The analysis is divided among the various Federal agencies that are impacted, since each may potentially have its own set of development requirements and costs associated with designation.

An overall breakdown by agency and habitat unit of overlap between critical habitat and Federal lands is given in Table V-4: Overlaps with Federal Lands. Critical habitat overlaps land managed by the National Park Service and Bureau of Land Management (BLM). The 351 acres of critical habitat within the John Muir National Historic Site have no past or future costs. Park Service personnel were unaware of the presence of the whipsnake and said no management activities have been undertaken as a result of listing, and no there are no planned uses for the land that could threaten the species.[37]

There are isolated parcels of BLM land near Mt. Diablo, totaling less than 40 acres, that are within the whipsnake range. BLM personnel stated that there are small, unquantifiable costs associated with the listing due to a biological assessment currently in progress for a resource management plan for those lands. The listing could also result in future costs to the BLM if it decides to transfer those lands into private ownership, due to the need for a formal Section 7 consultation. However, no such transfers are currently foreseeable.[38]

V.4 Economic Impacts on Local Agencies

V.4.1 East Bay Regional Park District

A portion of the proposed habitat designation falls within East Bay Regional Park District (EBRPD) boundaries. The EBRPD has attempted to protect and manage the Alameda whipsnake habitat since at least 1997, including the whipsnake as a protected species in the EBRPD 1997 Master Plan. The EBRPD protects the habitat through both general best management practices and activities specifically protecting the whipsnake.

The best management practices and site consultations that occur throughout the year often involve the whipsnake, but it is difficult to attribute a certain portion of those costs specifically to the whipsnake. The EBPRD is also unable to calculate how much of the cost of the 1997 Master Plan, or future updates, should be attributed to the whipsnake.

The EBRPD identifies many projects that are not able to move forward due to the whipsnake listing. The lack of a federal nexus requires a Section 10 permit and HCP, which makes initiating most projects that may encroach whipsnake habitat cost prohibitive. The EBRPD has no measure of the value of those lost projects.

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[37] Personal communication with Tad Shay, ranger, National Park Service, March 22, 2006.

[38] Personal communication with Jason Lowe, wildlife biologist, Bureau of Land Management, March 22, 2006.

Two projects were identified as producing direct costs associate with the protection of the whipsnake. First, the EBRPD applied for a FEMA grant in 1996 to provide funding for fire protection and fuel management issues. As a result of the application process, the biological opinion called for specific mitigation measures to protect the whipsnake. To date, the EBRPD has paid $175,000 to a consultant to trap, release, and monitor the species. Additionally, an estimated $45,000 worth of staff time has been spent on the accompanying administration and field work to monitor the project. Looking forward, the consultant is contracted for another $25,000 a year over the next three years and staff time is estimated at $15,000 a year over the next five years.

Second, the EBRPD is currently in the process of creating a resource management plan. The total cost of the plan, including outside consultant fees is estimated at over $400,000, some of which would be attributable to conservation and management of the whipsnake. In addition, the EBRPD predicts the plan will call for mitigation measures that would result in upwards of $150,000 of further contract consultant work specifically for whipsnake habitat mitigation39. The overall present value of the costs attributable directly to the whipsnake is $474,972.

V.4.2 Eastern Contra Costa HCP

The Eastern Contra Costa Habitat Conservation Plan (ECCHCP) is a habitat conservation plan covering 28 endangered species, including the whipsnake, in the 175,435-acre eastern Contra Costa planning area. The plan was prepared and submitted to the Service by the East Contra County Habitat Conservation Plan Association, a joint powers authority consisting of the following seven agencies: Contra Costa County; the cities of Brentwood, Clayton, Oakley, and Pittsburg; Contra Costa Water District; and, East Bay Regional Park District. A draft of the proposed HCP was announced on September 2, 2005, and the Service is in the process of reviewing it.[40] ECCHCP Association personnel estimated that $50,000 have been spent on designing conservation measures, performing historical research, and documenting suitable habitat restoration needs for the whipsnake.[41]

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[39] Personal communication with Joe Didonato, Stewardship Manager, East Bay Regional Park District, February 15, 2006.

[40] 70 FR 52434

[41] Personal communication with John Kopchik, principal planner, Contra Costa County, March 23, 2006.

Table V-1: Planned Transportation Projects, Alameda County

Project	Project Cost ($millions)	Nearest Habitat Unit	Approximate Distance (mi)
Crow Canyon Road safety improvements (Stage 1)	$5.1	2	0.2
I-680/Bernal Avenue interchange improvements	$17.5	3	0.5
Construct a 4-lane major arterial connecting Dublin Boulevard and North Canyons Parkway	$10.0	3	0.6
I-580/San Ramon Road/Foothill Road interchange improvements	$3.9	3	0.7
I-680/Sunol Boulevard ramp improvements (includes signal improvements and widening under existing structure)	$0.9	3	0.8
Widen I-680 for northbound HOV lane from Route 237 to Stoneridge Drive (includes ramp metering and auxiliary lanes)	$165.0	3	0.8
Widen Mowry Avenue from Mission Boulevard to Peralta Boulevard	$0.5	3	0.9
Reconfigure Marin Avenue from San Pablo Avenue to Albany/Berkeley city line from 2 lanes to 1 lane in each direction to accommodate turn lane and bike lanes	$1.0	1	2.0
Extend Scarlett Drive from Dublin Boulevard to Dougherty Road	$5.8	3	2.1
Paseo Padre Parkway/Peralta Boulevard (Route 84) intersection improvements	$0.5	3	2.3
Widen unimproved segment of Industrial Parkway between Whipple Road and improved segment of Industrial Parkway from 2 lanes to 4 lanes	$0.5	3	2.3
I-580 on- and off-ramp improvements in Castro Valley	$25.2	2	2.3
I-80/Ashby Avenue/Shellmound Street interchange modifications	$2.8	6	2.4
I-80/Gilman Avenue interchange improvements (includes roundabouts)	$1.5	1	2.8
East 14th Street/Hesperian Boulevard/150th Street channelization improvements	$1.8	2	3.0
Widen Route 84 to 6-lane parkway from I-880 to Paseo Padre and 4-lane parkway from Paseo Padre to Mission Boulevard along the Historic Parkway alignment	$118.2	3	3.1
Warren Avenue/Warm Springs Boulevard intersection improvements	$0.5	5B	3.1
Washington/Paseo Padre Parkway grade separation	$72.9	5B	3.2
I-580 auxiliary lanes between Santa Rita Road/Tassajara Road and Airway Boulevard interchanges	$11.9	3	3.2

Project	Project Cost ($millions)	Nearest Habitat Unit	Approximate Distance (mi)
Dumbarton Express park-and-ride: 90 spaces on Decoto Road near I-880 by the Dumbarton Bridge (includes right-of-way acquisition)	$1.5	3	3.3
I-880 from Hegenberger Road to I-980 operation improvements (includes freight movement to Port of Oakland)	$20.0	6	3.4
Widen Kato Road from Warren Avenue to Milmont Drive	$3.0	5B	3.4
Reconstruct I-880/Route 262 interchange and widen I-880 from Route 262 (Mission Boulevard) to the Santa Clara County line from 8 lanes to 10 lanes (8 mixed-flow and 2 HOV lanes)	$162.6	5B	3.5
Construct direct HOV connection between southbound I-880 to westbound Route 84 (Dumbarton Bridge approach)	TBD	3	3.8
Lewelling Boulevard/East Lewelling Boulevard road modifications from Hesperian Boulevard to East 14th Street to improve channelization and accommodate pedestrian and bicycle facilities	$20.5	2	3.8
Widen I-880 for HOV lanes northbound from Hacienda overcrossing to 98th Avenue and southbound from 98th Avenue to Marina Boulevard	TBD	2	3.8
Washington Avenue/Beatrice Street interchange improvements	$1.4	2	4.1
Extend Fremont Boulevard to connect to I-880/Dixon Landing Road	$4.5	5B	4.1
Route 84 westbound HOV lane extension from Newark Boulevard to I-880	$6.0	3	4.3
Route 84 westbound HOV on-ramp from Newark Boulevard	$6.1	3	4.3
Route 84/Ardenwood Boulevard westbound offramp intersection improvements	$0.6	3	4.3
Widen Stevenson Boulevard from I-880 to Blacow Road from 4 lanes to 6 lanes	$1.0	3	4.5
I-880/High Street interchange improvements	$15.9	2	4.6
I-880/Oak Street on-ramp reconstruction	$30.0	6	4.7
I-205/I-580 Altamont Pass westbound truck lane	$58.9	5A	4.7
Auto/truck separation lane at I-580/I-205 interchange	$15.7	5A	4.7
Widen I-880 by adding one lane in each direction between Whipple and Jackson	TBD	6	4.7
Replace I-880/Marina Boulevard overcrossing	$8.0	2	4.7
Construct 4-lane airport roadway (mostly on Port of Oakland property) from I-880/98th Avenue interchange to Oakland International Airport and then to Bay Farm Island	$114.7	2	5.0

Project	Project Cost ($millions)	Nearest Habitat Unit	Approximate Distance (mi)
Extend Whitesell Street as a 4-lane arterial from Enterprise to Depot Road	$11.0	3	5.1
Replace I-880/Davis Street overcrossing	$10.2	2	5.1
Reconstruct southbound I-880 on- and off-ramps in conjunction with I-880/5th Street seismic retrofit	$20.0	6	5.1
Extend Tinker Avenue from Webster Street to 5th Avenue (includes Transit Center at College of Alameda)	$14.8	6	5.6
Extend Eden Road from Doolittle Drive to city of San Leandro water pollution control plant	$2.0	2	5.7
I-580/Greenville Road interchange improvements	$35.0	5A	6.0
I-580 high-occupancy/toll (HOT) lanes from Greenville Road west to I-680	$50.0	5A	6.0
Construct I-580 eastbound auxiliary lane from First Street to Vasco Road	$2.0	5A	6.4
I-580/Vasco Road interchange improvements	$40.0	5A	6.4
I-580/First Street interchange improvements	$30.0	5A	6.5

Source: "Transportation 2030", Metropolitan Transportation Commission.

Table V-2: Planned Transportation Projects, Contra Costa County

Project	Project Cost ($millions)	Nearest Habitat Unit	Approximate Distance (mi)
Widen Alhambra Avenue from 2 lanes to 4 lanes from Route 4 to McAlvey Drive	$14.6	1	0.1
Widen Ygnacio Valley/Kirker Pass Roads from 4 lanes to 6 lanes from Michigan Boulevard to Cowell Road	$6.0	4	0.2
Route 4 Bypass, Segment 3: construct a 2-lane facility from Balfour Road to Walnut Boulevard, and upgrade Marsh Creek Road	$47.0	1	2.0
Widen and extend Bollinger Canyon Road to 6 lanes from Alcosta Boulevard to Dougherty Road	$4.4	2	2.1
Widen Pacheco Boulevard from 2 lanes to 4 lanes from Blum Road to Arthur Road	$15.0	1	2.3
Widen Dougherty Road to 6 lanes from Red Willow to Contra Costa County line	$45.0	4	2.4
I-680/Route 4 interchange freeway-to-freeway direct connectors: east-bound Route 4 to southbound I-680, and northbound I-680 to westbound Route 4 (Phases 1 and 2)	$112.0	1	2.5
Extend Commerce Avenue between Pine Creek and Waterworld Parkway to connect Willow Pass Road with Route 242/Concord Avenue interchange	$6.2	1	3.0
Extend Panoramic Drive from North Concord BART Station to Willow Pass Road	$10.0	4	4.4
Construct safety and operational improvements (including potential realignment) on Vasco Road from Brentwood to Alameda County line	$50.0	5A	4.5
Route 4/Range Road interchange construction	$10.0	4	6.1
Widen Route 4 from Railroad Avenue to Loveridge: interchange improvements and highway widening to 6 mixed flow lanes and 2 HOV lanes	$100.0	4	6.7
Widen Route 4 from 4 lanes to 8 lanes with HOV lanes from Loveridge Road to Somersville Road	$70.0	4	6.9
Route 4 Bypass, Segment 2, Phase 2: widen to 4 lanes from Lone Tree Way to Balfour Road	$12.0	4	7.3
Route 4 Bypass, Segments 2 & 3: widen and upgrade to full freeway (widen segment 2 to 6 lanes from Lone Tree to Balfour, and widen segment 3 to 4 lanes from Balfour to Walnut)	$130.0	4	7.3
Construct auxiliary lane along eastbound Route 4 and widen Hillcrest Avenue eastbound off-ramp from 1 lane to 2 lanes	$2.5	4	7.8
Extend Laurel Road from Route 4 Bypass to Empire Avenue	$20.0	4	8.5

Project	Project Cost ($millions)	Nearest Habitat Unit	Approximate Distance (mi)
Route 4 Bypass, Segment 1: construct a 6-lane facility from Route 4 to Laurel Road and a 4-lane facility from Laurel Road interchange to Lone Tree Way, and add interchanges at Laurel Road and Lone Tree Way	$85.0	4	9.1
Route 4 Bypass, Segment 1: Route 160 freeway-to-freeway connectors to and from the north	$23.0	4	9.5

Source: "Transportation 2030", Metropolitan Transportation Commission

Table V-3: Proposed Energy Facilities

Plant	City	Nearest Habitat Unit	Distance (mi.)
Tesla Combined Cycle - FPL	Tracy	5A	2.9
Valero Cogen. Unit 2	Benicia	1	4.3
Russell City - Calpine	Hayward	3	5.1
Los Esteros Combined Cycle - Calpine	San jose	5B	7.6
East Altamont - Calpine	Byron	5A	8.3

Source: California Energy Commission, Energy Facilities Siting / Licensing Process. http://www.energy.ca.gov/sitingcases/index.htm

Table V-4: Overlaps with Federal Lands

Agency	Area	Habitat Unit	Overlap (ac.)
National Park Service	John Muir National Historic Site	1	351.3
Bureau of Land Management	Public Domain Land	5B	653.5
Total			**1,004.8**

VI REGIONAL ECONOMIC IMPACTS

VI.1 METHODOLOGY

The distributional effects of critical habitat designation are quantified using IMPLAN Economic Modeling Software.[42] The IMPLAN Model is a widely used tool for analysis of economic events such as a change in industrial output. IMPLAN was developed by the U.S. Forest Service, which continues to use it today, and is now also used by 1,500 agencies and companies, including the California Energy Commission, the California Departments of Finance, Transportation, Water Resources, and Labor and Employment, San Diego State, Stanford, U.C. Berkeley, and numerous private consulting companies.[43]

The core of IMPLAN is an input-output model. This type of model traces the "multiplier effect" of an industry making purchases from other industries.[44] The economy is described by 509 IMPLAN industry sectors, which are based on the North American Industry Classification System (NAICS) and the Bureau of Economic Analysis (BEA) commodity classifications. "Direct effects" are the changes in final demand being modeled (the goods and services produced or purchased from an industry). "Indirect effects" estimate inter-industry purchases. Regional purchase coefficients are used to estimate the proportion of inter-industry purchases occurring within the study area. In addition to the interactions between the 509 IMPLAN industries, "induced effects" estimate the impact of household spending caused by the change in final demand.[45] In the table and discussion that follow, the sum of indirect and induced effects are referred to as secondary effects.

Critical habitat designation reduces the construction of new housing, as described in Section IV. IMPLAN is used to describe how this decrease in new home construction results in a decrease in the demand for inputs from other industries. The change in final demand for new housing construction is calculated as the product of building costs per house multiplied the change in number of houses built. The calculation of building costs for each census tract is described in VIIAppendix B.

Contra Costa and Alameda counties were selected for IMPLAN analysis because they are projected to incur the largest change in residential construction demand. The change in final demand for residential construction in these counties represented greater than 0.25% of the county's pre-designation industry revenue. The change in final demand for residential construction in San

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[42] MIG, Inc., IMPLAN Professional Version v.2.0.1024, 1997-2004.

[43] http://www.implan.com/references.html

[44] For a detailed discussion of this modeling method see, Ronald Miller and Peter Blair, *Input Output Analysis, Foundations and Extensions*, New Jersey: Prentice Hall.

[45] Direct impacts – the direct purchases by the facility under study – and indirect impacts –the purchases made by the firms supplying the facility – are captured in the standard input-output model. Induced impacts – purchases by employees of the facility and indirect firms – are captured when the model is "closed" with respect to households. The version of IMPLAN used here is closed.

Joaquin is approximately 0.005% of the county's pre-designation industry revenue. Impacts for Santa Clara are less than 0.001%. Consequently, the impacts in these two counties are considered negligible. The change in building costs are aggregated for Contra Costa and Alameda counties and annualized. Note that in this analysis, the direct effects are the costs associated with the construction of new homes; this is different from the price paid by homebuyers for a new home. Restricting the supply of new homes may increase revenue to home sellers, but it will decrease the demand for inputs needed to construct new homes.

In addition to the IMPLAN model of the impacts on new home construction, the distributional impacts of CHD resulting from mitigation costs and a change in home prices are discussed below.

VI.2 RESULTS

Table VI-1: Secondary Impacts of Designation demonstrates that the secondary impacts from decreased new home construction are small relative to the industry output of the two-county region. Critical habitat designation of the Alameda whipsnake has a relatively small effect on the regional economy. Total annual industry output is reduced by approximately $19.2 million directly and another $14.3 million secondarily. These combined reductions represent less than 0.02 percent of the region's output. Included among the most affected industries are wholesale trade and architectural/engineering services.

Note that mitigation costs are not accounted for in this analysis. Mitigation costs, principally land acquisition costs, are incurred by the individuals or businesses developing the land. If the land developers do not currently own the land, these costs may be borne by the landowners through a decrease in land price. If developers own the lands, then the mitigation expenditures are a transfer to a conservation bank, i.e., a transfer from one landowner to another or a transfer from a land developer to a landowner. At the census tract level of examination, mitigation expenditures flow out of the census tract and are a cost to producers. Regionally, however, mitigation costs are a transfer that would have minimal distributional effects.

In IMPLAN, the decrease in dollars spent on new housing construction results in decreased spending by the employees in the construction industry. IMPLAN allocates a large portion of this decrease in spending to "owner-occupied dwellings" and "real estate." Note that another larger group of consumers may increase spending in "owner-occupied dwelling" as the supply of housing is restricted and home prices increase. This group of consumers may be diverting money from entertainment, travel, or other industries in response to higher mortgage payments. These dollars flow to home sellers, who in turn may spend more on entertainment, travel, or other activities. In this regard, the diversion of one group of consumer expenditures to new housing may result in another group of consumers spending more on other activities.

Table VI-1: Secondary Impacts of Designation

Industry [1]	Study Area Data: Industry Output	Model Results: Direct Effects	Model Results: Secondary Effects [2]	Impacts as a Percent of Output
	(1)	(2)	(3)	(4)=((2)+(3))/(1)
New residential 1-unit structures- nonfarm	3,907,075,000	-19,179,212	0	-0.49%
Wholesale trade	9,746,585,000	0	-1,359,378	-0.01%
Owner-occupied dwellings	8,336,773,000	0	-952,962	-0.01%
Motor vehicle and parts dealers	1,900,717,000	0	-545,278	-0.03%
Real estate	8,939,340,000	0	-527,301	-0.01%
Architectural and engineering services	2,485,433,000	0	-503,169	-0.02%
Food and beverage stores	2,369,084,000	0	-412,178	-0.02%
Hospitals	3,648,553,000	0	-395,072	-0.01%
Offices of physicians- dentists- and other health	3,954,862,000	0	-372,620	-0.01%
Monetary authorities and depository credit interme	4,659,098,000	0	-352,222	-0.01%
Truck transportation	1,464,525,000	0	-345,062	-0.02%
Food services and drinking places	3,113,864,000	0	-344,683	-0.01%
General merchandise stores	991,300,000	0	-313,887	-0.03%
Insurance carriers	2,197,714,000	0	-289,857	-0.01%
Other State and local government enterprises	2,899,691,000	0	-242,540	-0.01%
Building material and garden supply stores	887,306,000	0	-239,886	-0.03%
Telecommunications	5,277,848,000	0	-238,442	0.00%
Management of companies and enterprises	4,089,973,000	0	-222,439	-0.01%
Miscellaneous store retailers	631,563,000	0	-200,246	-0.03%
Health and personal care stores	596,532,000	0	-199,008	-0.03%
Petroleum refineries	18,316,758,000	0	-194,025	0.00%
Plastics plumbing fixtures and all other plastics	393,642,000	0	-192,196	-0.05%
Legal services	1,170,832,000	0	-189,624	-0.02%
Clothing and clothing accessories stores	713,287,000	0	-188,102	-0.03%
Nondepository credit intermediation and related a	1,598,415,000	0	-185,487	-0.01%
Automotive repair and maintenance- except car wash	1,718,146,000	0	-158,047	-0.01%
Securities- commodity contracts- investments	1,269,659,000	0	-149,630	-0.01%
Employment services	1,179,592,000	0	-147,219	-0.01%
Electronics and appliance stores	855,616,000	0	-137,041	-0.02%
Gasoline stations	512,707,000	0	-134,159	-0.03%
Furniture and home furnishings stores	471,342,000	0	-127,857	-0.03%
Machinery and equipment rental and leasing	756,806,000	0	-116,836	-0.02%
Accounting and bookkeeping services	711,582,000	0	-113,228	-0.02%

Industry [1]	Study Area Data: Industry Output	Model Results: Direct Effects	Model Results: Secondary Effects [2]	Impacts as a Percent of Output
Nonstore retailers	419,319,000	0	-113,140	-0.03%
Other ambulatory health care services	1,031,342,000	0	-109,995	-0.01%
Management consulting services	1,175,094,000	0	-108,873	-0.01%
Wood kitchen cabinet and countertop manufacturing	56,660,000	0	-105,246	-0.19%
Custom architectural woodwork and millwork	83,811,000	0	-105,233	-0.13%
Pharmaceutical and medicine manufacturing	2,121,047,000	0	-102,166	0.00%
Nursing and residential care facilities	922,982,000	0	-100,424	-0.01%
Total, All Industries [3]	**193,776,034,000**	**-19,179,212**	**-14,267,692**	**-0.02%**

Source: IMPLAN.

Notes:

1. Only industries with "Total Effects" greater than $100,000 are listed in this table.
2. "Secondary Effects" include indirect and induced effects.
3. Includes industries with impacts less than $100,000 in addition to the industries listed above.

VII ECONOMIC IMPACTS ON SMALL BUSINESSES

According to the Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act, an agency has to determine whether proposed legislation will have a "significant economic impact on a substantial number of small entities."[46] There are three categories of entities: small business, small government, and small nonprofit organizations. The impacts on non-profits and small governments are expected to be negligible and are not examined in this analysis.

The effects of CHD on small businesses in new home construction, however, are examined. In some census tracts, the quantity of new housing decreases as a result of CHD. This results in decreased revenue to home construction. The impact to the new home construction industry is characterized as the decrease in the number of housing units multiplied by the average building cost per housing unit. The change in building costs is calculated for each census tract and then summed by county. This is conservative, as some construction firms may actually gain from an increase in housing price when the supply of housing is restricted.[47] In this analysis, the total but-for revenue is equivalent to building costs per house multiplied by the pre-regulation projected number of housing units. Table VII-1: Impact of CHD on New Home Construction Revenue summarizes the revenue loss by county.

To isolate the revenue losses attributable to small businesses we examined the share of new housing construction permits reported in Sacramento County.[48] To estimate the number of affected small businesses, the number of housing units lost to small businesses was calculated as the percent of housing permits to small firms multiplied by the change in housing units from CRA's housing model. Next, the number of houses built per small firm was calculated. Then, the lost housing units attributable to small firms was divided by the average number of houses per small firm. This provides an estimate of the number of affected small businesses. These calculations are presented in Table VII-2 and Table VII-3.

As shown in the tables, less than four small firms are projected to suffer annual revenue losses equal to their expected annual revenues.[49] In addition, rising land prices may lead to more luxurious home designs. As consumers demand a certain level of utility from a given housing price,

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[46] EPA, "Revised Interim Guidance for EPA Rulewriters: Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act," 29 March 1999, p.11.

[47] On one hand, there a fewer homes for construction companies to build; on the other, if construction companies are selling the houses to consumers, then they will obtain the benefits of increased price.

[48] Sacramento County serves as a proxy for the affected counties for both practical and empirical reasons. The county maintains electronic, readily-available (at a price) permit records. The county is also home to a large number of small businesses.

[49] If three firms close in the first year, then these same three firms will be affected in subsequent years; that is, the number of small firms supplying homes will decrease by three for the entire study period. The number of small firms will not decrease every year.

less land may result in more interior designing. Part of this increased demand is likely to be met by small firms.

Table VII-1: Impact of CHD on New Home Construction Revenue

County	Annual Pre-Regulation Revenue	Annual Change in Revenue	Annual Change in Housing Units
Contra Costa	$1,404,125,958	($12,611,001)	-25.71
Alameda	$1,840,515,586	($6,568,211)	-13.02
San Joaquin	$1,134,421,990	($62,086)	-0.24
Santa Clara	$2,048,695,658	($1,774)	0.00

Table VII-2: Small Business Impacts From Residential Construction

County	Proportion of Houses built by Small Businesses	Total Revenue, Annualized	Total Housing Units, Annualized	Average Building Cost	Average Revenue per Small Business
	[1]	[2]	[3]	[4]=[2]/[3]	[5]
Contra Costa	22%	$1,404,125,958	3,747	$374,740	$797,592
Alameda	22%	$1,840,515,586	6,158	$298,900	$774,223
San Joaquin	22%	$1,134,421,990	5,243	$216,373	$776,284
Santa Clara	22%	$2,048,695,658	8,551	$239,575	$785,805

Notes:

1. From Table 2, part A, based on data from Department of Building Inspection, Municipal Services Agency, Sacramento County.
2. From CRA's housing model.
3. From CRA's housing model.
4. RMA data on revenue by size class and D&B data on number of firms in each size class.

Table VII-3: Small Business Impacts From Residential Construction

	Annual Houses built per Small Business	Annualized change in number houses	Annualized change in number of houses to small businesses	Number of affected Small Businesses
	[6]=[5]/[4]	[7]	[8]=[1]*[7]	[9]=[8]/[6]
Contra Costa	2.1	-25.7	-5.8	-2.7
Alameda	2.6	-13.0	-2.9	-1.1
San Joaquin	3.6	-0.2	-0.1	0.0
Santa Clara	3.3	0.0	0.0	0.0

	Annual Houses built per Small Business	Annualized change in number houses	Annualized change in number of houses to small businesses	Number of affected Small Businesses

Notes:

[7] From CRA's housing model.

Appendix A ECONOMETRICS

A hedonic regression was used to estimate the regional intensive margin value of land within the main regions of the study area. Using DataQuick data on new home sales, we fit the model

$$price = \beta_0 + \beta_1 lotsize + \beta_2 sqft + \beta_3 beds + \beta_4 baths + \boldsymbol{\beta}\mathbf{tract}$$

- for each region affected by critical habitat designation, where:
- *lotsize* is the size of the home's lot in square feet;
- *sqft* is square footage of the dwelling unit;
- *beds* is the number of bedrooms;
- *baths* is the number of bathrooms, including half bathrooms;
- **tract** is a vector of indicator variables capturing fixed effects for each census tract.

Coefficient β_1 denotes the marginal effect on price of an acre increase in lot size, holding the other major determinants of home price constant. Table A-1 displays OLS results for the region containing the AWS critical habitat. Observations were subsampled to eliminate outliers and present a representative estimate of the type of greenfield development expected to be affected by critical habitat designation.

The values contained in these tables denote the intensive margin value of an acre of land. In a perfectly competitive market, these estimates will equal the extensive margin value of land, defined as the producer's margin on new home production, scaled by lot size.[50] If the values differ, they suggest that housing is rationed, lending support to that portion of this analysis as the relevant method of assessing the economic impacts of designation. A secondary analysis reveals that, among the five census tracts with highest projected developed in critical habitat, the extensive margin value exceeded the intensive more than 97% of the time; a *t* test strongly rejects the null hypotheses that the two are equal (*p*-value: 0.000).

[50] Extensive margin = (price – buildcost) / lot size

Table A-1: Regression Results for Bay Area

Independent variable	Coefficient	Standard error	t	p-value
Lot Size	13.2	0.9	15.3	0.000
Square Feet	159.0	4.3	37.2	0.000
Bedrooms	9,852.9	2,572.5	3.8	0.000
Bathrooms	-925.7	2,121.9	-0.4	0.663
Constant	159.0	4.3	37.2	0.000
N	3,471			
R^2	0.7549			

Appendix B WELFARE IMPACTS OF CRITICAL HABITAT DESIGNATION

The model of urban growth and the markets for land and improvements to land is adapted from the standard Alonso-Muth-Mills model of urban economics. The approach taken in this study is a partial equilibrium analysis for various portions of the overall critical habitat. Given the relatively small land and housing price changes resulting from critical habitat, together with the localized nature of housing supply and demand, the use of a partial equilibrium approach seems justified.

At each location, the housing developer is assumed to solve the following maximization problem:

$$\max_{H,L,\lambda} pH - k(H) + \lambda(\bar{N} - HL)$$

where p is the price of housing (taken as constant by an individual developer), H is the number of housing units constructed, k is the cost of building H units of housing, L is the amount of land per housing unit, and $\bar{N}$ is the amount of developable land at the location. Landowners earn rents equal to λ, which is determined in equilibrium. The profit-maximization conditions for the developer's problem are as follows:

$$H: p(H,L) - k_H - \lambda L = 0$$
$$L: p_L - \lambda = 0$$
$$\lambda: \bar{N} - HL = 0$$

The second term indicates that the price of land will equal the consumer's marginal valuation of lot size in equilibrium. Rearranging the first two equations, it follows that

$$p_L = \frac{p - k_H}{L}.$$

This expression implies that the intensive margin value of land (p_L) will equal the extensive margin value of land ($\frac{p - k_H}{L}$) when the quantity of developable land is fixed by geography or regulation. In this scenario, further limitations on the stock of developable land will increase the price of housing and increase the price of developable land.

When the amount of new housing is also limited by regulation, the developer's profit maximization problem becomes

$$\max_{H,L,\lambda,\mu} pH - k(H) + \lambda(\bar{N} - HL) + \mu(\bar{H} - H).$$

The first-order conditions for this problem are

$$p(H,L) - k_H - \lambda L - \mu = 0$$
$$p_L - \lambda = 0$$
$$\bar{N} - HL = 0$$
$$\bar{H} - H = 0$$

The first result of interest is to develop a test for rationing of new housing. From the first order conditions in the housing-rationed scenario, we see that

$$\lambda = p_L > \frac{p - k_H}{L} \text{ if } \mu > 0 .$$

Thus, when housing is rationed the intensive margin value of land will be less than the extensive margin value. A comparison of p_L and $\frac{p - k_H}{L}$ is equivalent to a test for rationing of the new housing stock.

In the empirical analysis, two special cases of these scenarios are used to measure the impacts of critical habitat designation. In the first approach, housing is assumed to be rationed and lot size fixed. Since density cannot adjust and the stock of land is fixed, on-site avoidance requirements can only be accommodated by reducing the housing stock. The second approach makes the opposite assumption that avoidance requirements have no effect on the housing stock, and critical habitat is accommodated entirely through densification. As shown in the comparative statics results, a combination of these two responses may well occur in reality. Understanding impacts in the extreme cases helps to bracket actual welfare changes.

In the event where housing is rationed by regulation and lot size is fixed, the housing market equilibrium can be described with the aid of the following figure:

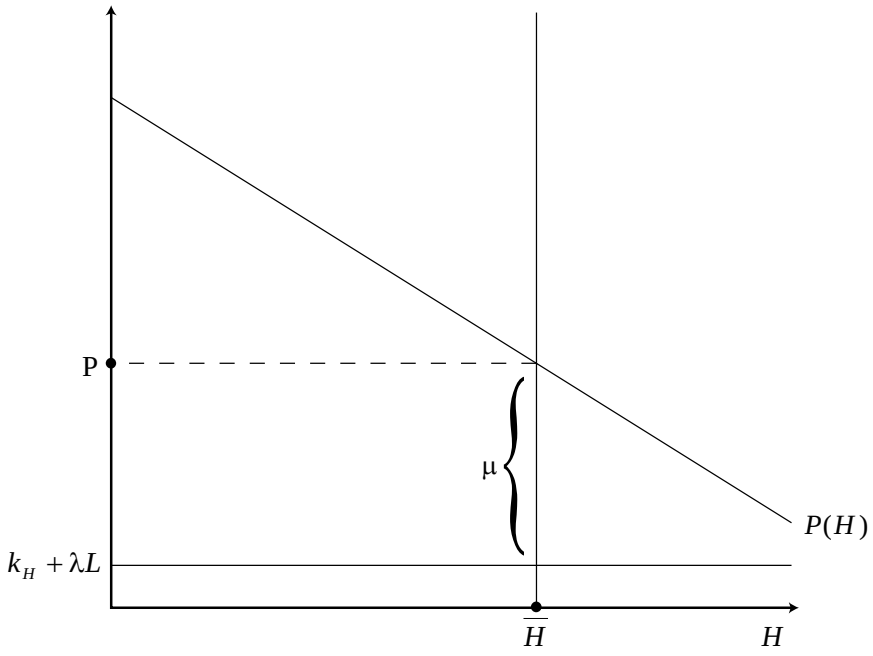

Figure 7: Rationed-Housing Model

Critical habitat designation has three main effects on consumer and producer welfare. First, critical habitat tightens the housing constraint, resulting in higher housing prices and lost rents to developers and landowners. Second, mitigation requirements drive up the marginal cost of housing development, subtracting from the rents earned through the production of scarce housing. Third, the need for Section 7 consultations can delay the completion of housing projects, resulting in surplus losses to producers as land and other fixed inputs must be carried for a longer period of time.

When the number of housing units are unaffected by critical habitat and all adjustments occur through reducing consumption of land, the relevant market equilibrium is described by the following figure:

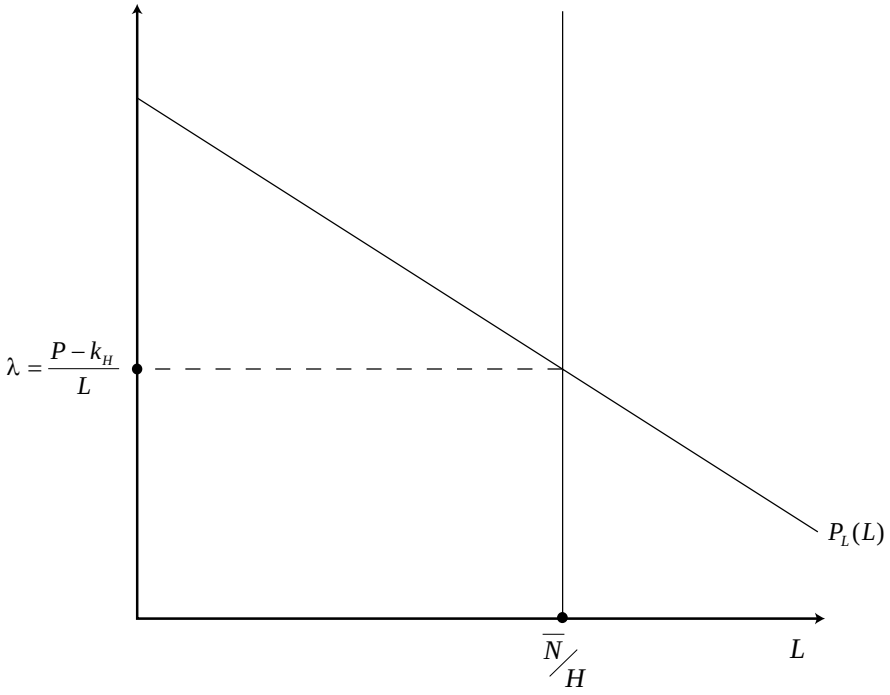

Figure 8: Densification Model

In the densification scenario, critical habitat has similar effects as in the rationed housing scenario: further constraints, increased costs and delay. The next section discussed specification of empirical demand and supply curves to estimate the surplus changes described in this section.

B.1 Empirical Estimation

Empirical estimates of welfare impacts on the land market are based on the conceptual model outlined and on the spatial and socioeconomic data described earlier. This analysis adopts a supply and demand model for housing and land to compute the welfare impacts of designation. The model's primitives are functions describing the producer's marginal cost (the housing supply

function), and the marginal benefit to consumers (the demand functions for land and housing). Estimating these functions permits measurement of the regulatory impact.

The analysis can be broken down into several steps:

Identify the supply and demand functions and determine the market equilibrium "but for" the regulatory action.

Determine the effects of regulation on consumers' marginal benefits and / or producers' marginal costs.

Estimate the resulting new market equilibrium and resultant changes in producer and consumer surplus.

The median home price per census tract was obtained from DataQuick, which maintains a database of new home transactions for the state of California. This analysis uses data on all new homes bought or sold in counties containing critical habitat after 1998 for a total of approximately 60,000 observations.

In some tracts, DataQuick had no observations on new home sales. For these tracts, the median home price and median number of rooms from the 2000 Census were used to approximate new home price and size.[51] Since California home prices have exhibited considerable volatility in recent years, it is necessary to inflate all home prices to present value. This was accomplished using the Freddie Mac Conventional Mortgage Home Pricing Index.

Marshall and Swift's Residential Cost Handbook provides detailed estimates of construction costs per square foot for houses of various size, material (e.g., stud framed, masonry), and quality. DataQuick data provides median square footage estimates per census tract. By using a single-story, stud-framed, stucco house estimates as the basic house profile and assigning construction quality based on median home price, building costs estimates were then generated in each census tract.

In addition to these "vertical" costs of homebuilding, it is also necessary to include development costs (not counting the developer's profit or returns to the landowner). There are two types of development costs that should be considered: "soft" costs and "hard" costs. Soft costs include the cost of design, permitting, marketing and sales. Hard costs of development include costs of grading, construction of local roads, installation of water collection systems, construction of parks, clubhouses and other amenities within the development, bringing utilities to the project, installation of streetlights, and other physical costs. These costs are summarized in table. For purposes of this study, total horizontal costs are assumed equal to 23% of the vertical cost of homebuilding. The sum of the building cost, soft cost and hard cost is the builder cost of new housing.

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[51] The median number of rooms is defined in the census to include bedrooms, kitchens, living rooms and dining rooms but not bathrooms, closets or hallways. This measure was inflated to square footage by assuming each "gross" room was 380 square feet. This estimate was obtained by an auxiliary regression of the DataQuick data.

To determine the supply function for land, this analysis assumes the supply of developable land is fixed within each census tract (the supply curve is vertical.) The pre-regulation supply of land in census tract i is set equal to the total acreage of projected greenfield development:

$$q_0^i \equiv G_i$$

To determine greenfield development in each census tract, we adopt a method used by Landis and Reilly (2003), in which the overall urban footprint (including residential, commercial and public development) equals total new population divided by the gross density of people per acre, scaled to account for infill development.[52] Mathematically, projected greenfield development G is expressed as

$$G_i = (1 - F_i)\frac{\Delta P_i}{D_i},$$

where F is the infill share, P is population, and D is the gross density of persons per acre.[53]

Determining the change in population requires forecasts of population at the end of the analytic timeframe and estimates of present-day population. Population forecasts are derived from several sources, in order of preference. Wherever available, they were derived from the region's federally-designated metropolitan planning organization (MPO). Typically created by county governments, these forecasts are the preferred source for growth estimates because they are created using detailed knowledge about local growth trends and characteristics, potentially resulting in higher quality data than those obtained with mathematical forecasting techniques.

For counties where such forecasts were not available, the analysis uses projections created by researchers at UCLA and CalTrans for transportation planning.[54]

Present-day population figures were obtained from Applied Geographic Systems, a private supplier of demographic data. These data draw from a wide range of sources, including the Census, Internal Revenue Service, the Bureau of Labor Statistics, the United States Postal Service and the credit reporting agency, Experian.

The demand[55] function is identified using the pre-regulation equilibrium quantity and supply of land, along with an estimate of the elasticity of demand for land derived from the land economics

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[52] John D. Landis and Michael Reilly, "How We Will Grow: Baseline Projections of the Growth of California's Urban Footprint through the Year 2100" (August 1, 2003). Institute of Urban & Regional Development. IURD Working Paper Series. Paper WP-2003-04. http://repositories.cdlib.org/iurd/wps/WP-2003-04

[53] For brevity, the i subscript is omitted in future formulas. All calculations are indexed at the census tract level.

[54] See "California Travel Trends and Demographics Study," California Department of Transportation, Division of Transportation Planning, Office of State Planning. December 2002.

literature. This elasticity is taken to be -1.0. The quantity of land to be developed must equal the fixed supply discussed in the preceding section. The price of land is determined by estimating bid-rent functions for the area designated as critical habitat and using intensive margin land values.

Combining the pre-regulation equilibrium price and quantity of land demand with the elasticity of demand for land identifies the land demand curve. Let η be the elasticity of demand for land. Then,

$$\eta = \frac{dQ}{dP}\frac{P}{Q} \Rightarrow \frac{dP}{dQ} = \frac{p_0}{q_0\eta} \Rightarrow P = \frac{p_0}{q_0\eta}Q + \beta \Rightarrow P = \frac{p_0}{q_0\eta}Q + p_0\left(1 - \frac{1}{\eta}\right).^{56}$$

The rationed housing scenario uses a similar method, with prices and quantities expressed in terms of new housing units in each census tract. New housing units are calculated using the same procedure as for the densification scenario, but also accounting for average numbers of persons per household in each census tract, obtained from the 2000 Census.

B.2 Spatial Allocation of Economic Activity

A key assumption implicit in the above model is the ability to accurately predict the spatial distribution of housing and land development.

The quantity of development within critical habitat is calculated probabilistically using a mathematical identity. First, divide the census tract enclosing one or more habitat units into one-hectare grid cells, supposing there are *n* cells. The analysis proceeds according to whether the tract is covered by the CURBA model.

If so, then the CURBA model gives a probability that each cell will be developed by 2025. Define the CURBA prediction function $C : \{1, \ldots, n\} \to [0,1]$ mapping each cell to its respective probability of development. The analysis assumes the identity

$$G = \lambda \sum_{i=1}^{n} C(i)$$

holds—in other words, the sum of probability scores within each census tract, scaled by a fixed multiplier, is identically equal to the total projected greenfield development for that tract. Now solve for λ and let the sets H_A and H_B be those cells that fall in Group A and B critical habitat.

Then the expected development in Group A habitat is given by:

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[55] For purposes of calculating changes in the price of land, the demand curves for land and housing are assumed to be linear. This is a valid assumption since only small deviations around the initial equilibrium typically result from critical habitat designation.

[56] This calculation is valid as long as there is developable land within the census tract, i.e. $q_0 > 0$. If there is no developable land than the impact of designation is zero.

$$G_A = \lambda \sum_{j \in H_A} C(j),$$

with G_B defined similarly