Appeal No. A-1-MEN-09-034 (Marr & Malin, CDP-57-2008)

California Coastal Commission question #2

2. Information Needed to Evaluate Project Consistency with Coastal Act Section 30010: If the project cannot be found consistent with the ESHA and visual resource policies of the certified Mendocino County LCP, the Commission will need to evaluate whether an alternative proposal could be approved, and if not, whether denial of the project would result in an unconstitutional taking of private property for public use. In order to make that evaluation, the Commission needs additional information from the applicants concerning the applicants' reasonable investment-backed expectations to make such determinations prior to holding a *de novo* hearing on the project. Specifically, the landowner of the property that is the subject of A-1-MEN-09-034 must provide the following information for the property that is subject to A-1-MEN-09-034 as well as all property in common contiguous ownership, *i.e*. any immediately adjacent property also owned by the applicant:

2.1) When the property was acquired, and from whom:

- Purchased on 05-04.05 from Don S. Johnston, 16315 Old Casper Rail Rd, Fort Bragg, CA 95437

2.2) The purchase price paid for the property:

- Purchase price $500,000.00
- Closing costs $2,507.97
- Total $502,507.97

2.3) The fair market value of the property at the time it was acquired and the basis upon which fair market value was derived;

- Market value was determined by the Seller and his agent. After spending several years looking for property in the Mendo/Sonoma area it was our view that we paid a fair price for this property.
- In 2009 the Mendocino County Assessor accessed the property at $530,605.

2.4) Whether a general plan, zoning, or similar land use designations applicable to the property changed since the time the property was purchased. If so, identify the particular designation(s) and applicable change(s).

- No changes.

EXHIBIT NO. 14

Property Interest Summary

No. A-1-MEN-09-034 (Marr-Malin)

2.5) At the time the property was purchased, or at any subsequent time, whether the project been subject to any development restriction(s) (e.g., restrictive covenants, open space easements, etc.), other than the land use designations referred to in the preceding question;

- None.

2.6) Whether the size or use of the property changed in any way since it was purchased. If so, identify the nature of the change, the circumstances and the relative date(s);

- No change.

2.7) Whether a portion of, or interest in, the property was sold or leased since the time the applicants purchased it, and the relevant date(s), sales price(s), rent assessed, and the nature of the portion or interest sold or leased;

- Mike Marr was the original buyer. My girl friend Judith Malin was added to the title in 2008.

2.8) A copy of any title report, litigation guarantee or similar document that might have been prepared in connection with all or a portion of the property, together with a statement of when the document was prepared and for what purpose (e.g., refinancing, sale, purchase, etc.);

- A Preliminary title report by FIRST AMERICAN TITLE COMPANY was drafted in March 10 of 2005 for the purpose of purchasing the land. Copy sent to CCC on 09-25-09.

2.9) The approximate date and offered price of any offers to buy all or a portion of the property since the time the applicants purchased the property;

- Property has not been for sale.

2.10) The costs associated with ownership of the property on an annualized basis for the last five calendar years. These costs should include, but not necessarily be limited to, the following:

DESCRIPTION:	5 year total	Annualized
- Property taxes	$27,928.00	$5,585.60
- Project Development Costs	$99,494.00	$19,898.80
- Property Assessments	none	
- Debt Service	none	
- Operational/Management Costs	none	

2.11) Whether apart from any rent received from leasing all or a portion of the property (see question #7 above), current or past use of the property generates any income. If the answer is yes, the amount of generated income on an annualized basis for the past five calendar years and a description of the use(s) that generates or has generated such income.

- Not Applicable.

2.12) "Reasonable investment backed expectations of the property"

1. According to the County Assessor's office, in 2009 the property was valued at $530,605.00 an increase of approximately $30,000 above purchase price.
2. Although we have no intention of selling the property, it should be noted that this is an investment property. Acting as the General Contractor and Builder, we will save 60% of actual out-of-pocket building costs. Costs which will become profit when/if we sell the property. The following calculations are provided to describe this number.

   Construction costs for building if we hired a General Contractor:

Description	$/sq-ft	sq-ft	cost
House	$340/sq-ft	2524	$858,160
Covered deck	$100/sq-ft	450	$45,000
Garage	$100/sq-ft	634	$63,400
Guest suite	$175/sq-ft	600	$105,000
Shop	$100/sq-ft	1428	$142,800
TOTAL:			$1,214,360

   By building the home/workshop myself, I will net a savings of ($728,616.00) for future profit if we sell.

3. Additional value comes from having the workshop on property and not having to pay rent. And the sooner we get the workshop constructed we can be generating income by working on the coast.

   Shop operation calculations:

   Rent for shop area = $1,750/month, or $21,000/year
   4 years lost = 4 x $21,000 = $84,000

4. Lost income from delays :

   $38,000/yr x 4 yr = $152,000

5. Net value of project development:

Description	cost
Building profit (from 2.12.2)	$728,616
Rent for shop (from 2.12.3	$84,000
Lost business opportunity (from 2.12.4)	$152,000
Prop taxes (from 12.10)	$27,928
Development cost (from 12.10)	$99,494
Closing cost (from 2.2	$2,508
Land value (from 2.12)	$530,605
TOTAL:	$1,625,151

OWNERS INTENT:
We ask that the CCC recognize the reason why we selected this property and why development of this property needs to meet our needs if we are able to live and work in Mendocino County. We selected this property because it offered area to build both a workshop and a home. We reviewed the Local Coastal Plan and met with the County Planning Department to review the rules and codes prior to purchase of the property. We hired many local design professionals familiar with the coastal plan, the rural architecture and the county process. We sought out to create a design that not only met our needs but also fits with the landscape and rural character of the coast. We support the coastal plan and we respect the planning process.

Mike is a building contractor and wood worker. Judy is a health care professional. Mike will be building our home and workshop and once established, he will be working in the community building for others and creating custom cabinetry. The workshop will provide affordable space to work, store equipment and materials and earn an income. Our modest sized home will be a full time residence for Mike and Judy and their son. It is also our hope that our aging parents will be able to visit with us and if desired, stay with us as their health allows.

We spent a large portion of our savings on this property because we recognized the beauty of the land, and the surrounding landscape and the town of Albion. We invested 4 years (to date) on developing this project and spent significant money on reports, permits, and design services, as well costs for traveling from the east coast and missed work to pursue this project.

We hope that the CCC recognizes our needs for developing this property and does not pursue a “taking of the property” without fully understanding the loss of income and building opportunity put against us.

HOUSE
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Providing expertise in agricultural science, management, and appraisal since 1977

Agricultural Feasibility Study

Malin-Marr Property, Albion, California

EXHIBIT NO. **15**
APPLICATION NO.
A-1-MEN-09-034
MARR & MALIN
AGRICULTURAL ANALYSIS REPORT (1 of 88)

House Agricultural Consultants

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The revision number of this report is 3502. The publishing date of this report is 2012-05-15.

This report supercedes any previous version having a smaller revision number or older publishing date than shown above.

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1 Introduction

1.1 Executive summary

In this report we study and report on the agricultural potential of a 4.17-acre rural property in Albion, California. The small size, steep slopes, erosion hazard, and limited water availability of the property are major impediments to commercial farming or ranching. However, the owners desire to maintain the property in agriculture, and we find that the property can be used successfully for part-time farming that combines subsistence-farming, or home-food-production, with local marketing of surplus eggs, honey, and vegetables that will be produced seasonally.

1.2 Organization of the report

This report is organized to go from the broad to the specific, describing the greater geographic area first and then focusing on the subject property in detail. It concludes with an evaluation of a proposed plan to use the property for agriculture, and how this affects the greater neighborhood.

Section 2 describes the geographic area of the subject property and its regional agricultural economy. Section 3 examines the subject property: its physical site characteristics, specific resources, and historical land use. Section 4 reviews the key variables impacting agricultural uses of the property, and evaluates the most suitable uses. Section 5 presents the property owners' proposed agricultural management plan, reviews the impacts of the proposed agricultural management plan on the property and adjoining agricultural lands and examines the economics of the proposed plan.

1.3 Authorization

This study is written under the authorization of Michael Marr and Judith Malin, owners of the property described and analyzed in this study.

1.4 Purpose of report

The purpose of this study is to analyze the feasibility of using the Malin-Marr property for agriculture.

1.5 Intended use of report and intended users

This report is written at the request of the California Coastal Commission and is intended for its use in evaluating the application for a building permit on the Malin-Marr property.

1.6 Identification of subject property

The real estate that is the subject of this report is located at 2800 North Highway One, Albion, California. The Mendocino County Assessor's office identifies this property as assessor's parcel number 123-350-06-00. According to the assessor's plat maps, the area of the subject is 4.17 gross acres in size.

1.7 Scope of work

1.7.1 Methodology

To complete this assignment, we undertook the following actions.

- Reviewed July 18, 2011 request from California Coastal Commission (CCC) for an agricultural feasibility study. A copy of this letter is reproduced in the appendices to this report.

- Reviewed correspondence between CCC and Michael Marr, and CCC and Stephen Butler, the subject property owners' attorney.

- Reviewed letter from M. Biaggi to CCC regarding the agricultural use of the subject property.

- Reviewed the applicable zoning code, and other regulations affecting the subject property.

- Made a field visit to the site and spent approximately one-half day examining the land and vegetation; also collected a soil sample for laboratory analysis.

- Reconnoitered the neighborhood of the subject property for approximately one full day, from Elk to Mendocino on the coast, and inland approximately 10 miles up Albion Ridge Road, examining types of agriculture and potential markets, and evaluating productivity.

- Met with the architect at the site and reviewed his plans for the building development.

- Researched the subject property's soils, climate, water source, biological resources, and land-use history.

- Researched the subject property's range productivity and calculated its its carrying capacity (AUMs).

- Researched crops, yields, and prices from Mendocino County Agricultural Commissioner's office's annual reports, 2006 through 2010; conversed with Chuck Morris, Agricultural Commissioner of Mendocino County, concerning the crops of the subject's neighborhood; researched yields and prices from the National Agricultural Statistics Service; consulted other publications and our own business data files.

- Researched production costs through university cost studies, other publications, and our own business data files.

- Calculated potential net income at county and state level.

- Performed an agronomic analysis of the physical suitability of the subject property for various crops and livestock, including an analysis of soil profile characteristics, soil chemistry, applicable soil conservation practices, quantity of water available, and climate considerations.

- Performed an economic analysis of the economic viability of various agricultural uses of the subject property.

- Evaluated the impacts of the proposed development on the subject site and its neighboring properties.

- Prepared a management plan for the property, including a description of proposed enterprises, capital expenses required, operating expenses, and expected gross and net income.

1.7.2 Sources referenced

Numerous sources referenced on in the preparation of this report have been footnoted in the text. A complete list of references is in the appendices to this report.

1.7.3 Experience and qualifications of report authors

Since 1977, House Agricultural Consultants has provided clients with a wide range of appraisal, consulting, and management services. Clients include farmers, landowners, institutions, insurance companies, law firms, municipalities, public agencies, non-governmental organizations, and many others. A sample list of clients is included in the appendices to this report.

House Agricultural Consultants has prepared numerous studies concerning the agronomics, economics, and agricultural viability of farm properties over the years. We have professionally managed farm properties for over 25 years, and have prepared hundreds of farm management plans and reports on agricultural enterprises ranging from fruit and nut orchards to vegetable crops, field crops, vineyards to cattle ranches, sheep ranches, and goat operations.

Gregory House, co-author of this report, is a qualified expert witness on agricultural matters in California Superior Court, United States Tax Court, and United States Bankruptcy Court. Mr House has over 30 years of experience as an agricultural consultant throughout California and the western states, and is also a farmer of 30 years. Coco Ranch, the family farm, produces organic apples and other organic tree fruits on 40 acres of land near Dixon, California. The resume of Mr House is included in the appendices (page 55). Mr House is credentialed by the American Society of Farm Managers and Rural Appraisers as an Accredited Farm Manager and as an Accredited Rural Appraiser. Mr House is accredited by the American Society of Agronomy as a Certified Professional Agronomist and Certified Crop Advisor. Mr House holds a professional license from the state of California as a Certified General Appraiser, number AG-001999, and is qualified by the USDA-NRCS to prepare conservation plans for government programs.

Jennifer House, co-author of this report, is a farmer, agricultural consultant, and ethnobotanist. She is an Academic member of the American Society of Farm Managers & Rural Appraisers, and has over 30 years experience in agricultural appraisal, contracts, farm planning, and marketing of agricultural commodities. Ms House taught Farm Management and Farm & Rural Resources Appraisal as an adjunct lecturer in the Agricultural Economics Department of the University of California at Davis from 1987 to 1999. She has taught taxonomy and plant usages courses for the University of California at Davis Arboretum, and the University of California at Berkeley Botanical Garden for the past 15 years. Her current activities concentrate on managing the family farm in Dixon, California; however she continues to work with agricultural students and lead seminars for the University of California at Davis.

1.8 Certification

Each undersigned consultant certifies that, to the best of his or her knowledge and belief:

The statements of fact contained in this report are true and correct.

The reported analyses, opinions, and conclusions are limited only by the reported assumptions, and are my personal, unbiased professional analyses, opinions, and conclusions.

I have no present or prospective interest in the property that is the subject of this report, and I have no personal interest or bias with respect to the parties involved.

My compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client, the attainment of a stipulated result, or the occurrence of a subsequent event.

This consulting report has been made in conformity with, and is subject to, the requirements of the Professional Code of Ethics and the Standards of Professional Practice of the American Society of Farm Managers and Rural Appraisers.

I have made a personal inspection of the property that is the subject of this report.

No one other than the undersigned parties prepared the analyses, conclusions, and opinions concerning the subject property that are set forth in this report.

Gregory A. House, AFM, ARA, CPAg

Jennifer House

2 Neighborhood setting and characteristics

2.1 Legal and regulatory setting: Agriculture policies and goals

A research of the official Mendocino County web site indicates the subject property lies within the COASTAL ZONE land-designation area of the current general plan of Mendocino County, which further classifies the subject property as "Base Zoning District RL", and "Coastal Plan Classification RL-160". In chapter 3 of Mendocino County's land-use plan, the intent of the RL use classification is described as follows:

> Policy DE-17:
>
> Land Use Category: RL — Range Lands
>
> Intent: The Range Lands classification is intended to be applied to lands which are suited for and are appropriately retained for the grazing of livestock. The classification should include land eligible for incorporation into Type II agricultural preserves, other lands generally in range use, intermixed smaller parcels and other contiguous lands, the inclusion of which is necessary for the protection and efficient management of range lands. The policy of the County and the intent of this classification shall be to protect these lands from the pressures of development and preserve them for future use as designated.
>
> General Uses: Residential uses, agricultural uses, forestry, cottage industries, residential clustering, uses determined to be related to and compatible with ranching, conservation, processing and development of natural resources, recreation, utility installations.
>
> Minimum Parcel Size: One hundred sixty acres.
>
> Maximum Dwelling Density: One dwelling per 160 acres, County review and approval required for more than one dwelling per legally created parcel.

We note that Mendocino County has determined that the subject property is a legal nonconforming parcel that cannot be subdivided. Therefore one dwelling is permitted on the subject property.

Section 20.456 of the Mendocino County land-use plan permits additional structures on legal (nonconforming) parcels:

> In addition to principle permitted uses ... such use types shall be deemed to include (A) private garages, (B) porches, (D) shops, (E) Barns, (F) Accessory living units.

Because the subject property is located in the coastal zone, it is also subject to the following:

> Sec. 20.532.100 Supplemental Findings.
>
> In addition to required findings, the approving authority may approve or conditionally approve an application for a permit or variance within the Coastal Zone only if the following findings, as applicable, are made:
>
> (A)(2)(a) The proposed use is compatible with the long term protection of resource lands.
>
> (B) Agricultural Land Impact Findings.
>
> (1) Development in Agricultural Zones. No development subject to a coastal development use permit shall be issued on agricultural land until the following findings are made:
>
> (a) The project maximizes protection of environmentally sensitive habitat areas;
>
> (b) The project minimizes construction of new roads and other facilities;

(c) The project maintains views from beaches, public trails, roads and views from public viewing areas, or other recreational areas;

(d) The project ensures the adequacy of water, waste water disposal and other services;

(e) The project ensures the preservation of the rural character of the site.

(f) The project maximizes preservation of prime agricultural soils;

(g) The project ensures existing land use compatibility by maintaining productivity of on- site and adjacent agricultural lands.

(2) Impact Findings for Conversion of Prime Agricultural or Williamson Act Contracted Lands. Conversion of prime land and/or land under Williamson Act

Contract to non-agricultural uses is prohibited, unless all of the following findings are made. For the purposes of this section, conversion is defined as either development in an AG or RL designation not classified as a residential, agricultural, or natural resource use type or the amending and rezoning of the Coastal Element Land Use Designation AG or RL to a classification other than AG or RL including amendments to add visitor-serving facilities.

(a) All agriculturally unsuitable lands on the parcel have been developed or determined to be undevelopable;

(b) Agricultural use of the soils cannot be successfully continued or renewed within a reasonable period of time, taking into account economic, environmental, social and technological factors;

c) Clearly defined buffer areas are established between agricultural and non-agricultural uses;

(d) The productivity of any adjacent agricultural lands will not be diminished, including the ability of the land to sustain dry farming or animal grazing;

(e) Public service and facility expansions and permitted uses do not impair agricultural viability, either through increased assessment costs or degraded air and water quality; and

(f) For parcels adjacent to urban areas, the viability of agricultural uses is severely limited by contacts with urban uses, and the conversion of land would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development.

(3) Impact Findings for Conversion of Non-prime Agricultural Lands. Conversion of all other agricultural lands to non-agricultural uses will be prohibited unless it is found that such development will be compatible with continued agricultural use of surrounding lands and at least one of the following findings applies:

(a) Continued or renewed agricultural use is not feasible as demonstrated by an economic feasibility evaluation prepared pursuant to Section 20.524.015(C)(3);

(b) Such development would result in protecting prime agricultural land and/or concentrate development.

2.2 Geography

We define the subject property's neighborhood as the Mendocino County coastal area spanning from the town of Mendocino, which lies approximately 7 miles north of the subject, to the unincorporated community of Elk (population 208), which lies approximately 7 miles south of the subject, and extending approximately 7 miles inland to the east. The Pacific Ocean forms a natural boundary to the west. Throughout this report we will refer to this defined area as the subject property's neighborhood.

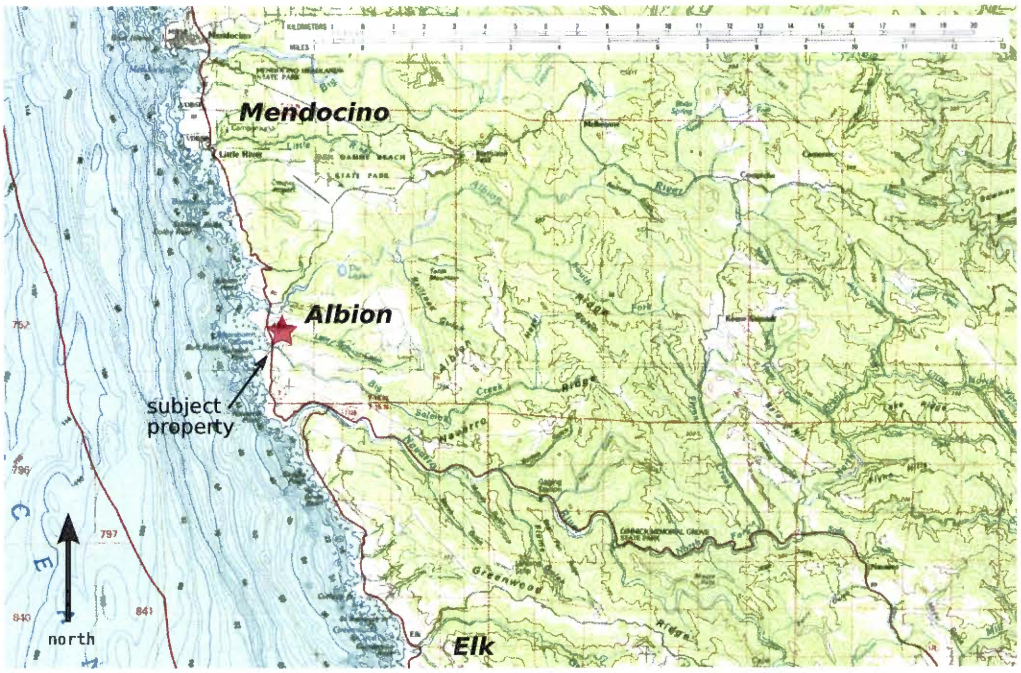

Figure 2.1 Location map of the subject property and its neighborhood.

2.2.1 Elevation

Elevation ranges from sea level at the coast to 1,000 feet several miles inland.

2.2.2 Soils and topography

The topography of the subject property's neighborhood varies from terraces of rolling hills to steep, rugged terrain dissected by canyons with perennial streams that drain into the Pacific Ocean.

2.2.2.1 Formation and classification

The Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service), a unit of the United States Department of Agriculture, has completed soil surveys of most of the agricultural land in the United States. The NRCS soil surveys are widely used as a objective, consistent measurement of the value of land for agriculture. Both the printed soil-survey book covering the area of the subject property and the most current digital mapping data have been referenced for this study.

The most recent soil survey of the subject's area is the *Soil Survey of Mendocino County, Western Part.* According to this source, the neighborhood of the subject property lies within the general soil map unit of *Ferncreek-Quinliven-Shinglemill.* Older soil surveys referred to these general map units as ASSOCIATIONS and this remains a useful if somewhat outdated description of the relationship of the various soil units found in the map unit.

2.2.2.2 General soil characteristics affecting use of the area soils

Map unit *Ferncreek-Quinliven-Shinglemill* is located on uplifted marine terraces bordering the Pacific Ocean. It consists of very deep, gently sloping to steep, poorly drained to moderately well drained soils that have little seasonal fluctuation in soil temperature and that formed in marine

terrace deposits. The vegetation is mainly redwood, douglas fir, bishop pine and Mendocino cypress.

About 31 percent of this map unit is Ferncreek and similar soils, 25 percent Quinliven and similar soils, 11 percent Shinglemill and similar soils, and 33 percent other soils and miscellaneous areas of minor extent.

Ferncreek soils are somewhat poorly drained. Typically, the surface layer is sandy loam. The subsoil is clay loam, clay, or sandy clay loam. The substratum to a depth of 60 inches or more is sandy loam. Slope ranges from 2 to 30 percent.

Quinliven soils are moderately well drained. Typically, the surface layer is sandy loam. The subsoil is clay. The substratum to a depth of 60 inches or more is sandy loam. Slope ranges from 2 to 50 percent.

Shinglemill soils are poorly drained. Typically, the surface layer is loam. The subsoil extends to a depth of 60 inches or more. It is clay or sandy clay. Slope ranges from 2 to 15 percent.

Of minor extent in this unit are Dystropepts, Tropaquepts, Abalobadiah, Aborigine, Biaggi, Blacklock, Bruhel, Cabrillo, Caspar, Cleone, Crispin, Fishrock, Flumeville, Gibney, Gibwell, Harecreek, Havensneck, Heeser, Iversen, Mackerricher, Mallopass, Seaside, Sirdrak, Stornetta, Tregoning, Vandamme, Vizcaino, and Windyhollow soils. Also included are areas of coastal beaches, duneland, pits and dumps, riverwash, rock outcrop, and urban land.

Most areas of this map unit are used for timber production or homesite development. Some areas are used for recreation. The main limitations in areas used for timber production are seasonal wetness and the slope. The main limitations in areas used for homesite development are the slope, low strength, seasonally saturated soil conditions, and restricted permeability in the subsoil.

2.3 Climate

2.3.1 Temperature

The average annual air temperature is about 53 degrees F for the subject property's neighborhood. The winter months are the coolest, averaging in the low 40s F. A record low of 18 degrees F was recorded in December 1990. The late summer and early fall months are the warmest, averaging in the mid 60s F. A record high of 94 degrees F was recorded in October 1985. While this temperature range is quite moderate, the lack of higher summer temperatures limit the range of crops that the area's cropland will support. Pasture grass thrives under this climate regime, but tree fruits, wine grapes, and summer vegetables such as tomatoes, squashes and peppers do not. One will occasionally see very old apple trees in domestic settings in this area, but the cool temperatures are not conducive to commercial production of even this hardy tree fruit.

The cool, moist air over the Pacific Ocean strongly influences the air temperature in the subject property's neighborhood, minimizing the difference in temperature between the winter and summer months. The difference widens with increasing elevation and distance as one travels inland away from the coast. The strong marine influence that minimizes seasonal fluctuation in air temperature also results in little fluctuation in soil temperature throughout the year.

2.3.2 Precipitation

The average annual precipitation is approximately 38 inches for the subject property's neighborhood. Approximately 96 percent of this rain occurs between November and April.

2.3.3 Sunlight

Sunlight in the Albion area is moderate, with cloudy weather common in the rainy season and coastal morning fog usual in the warmer months.

2.3.4 Length of growing season

The average frost-free period is 250 to 330 days.

2.3.5 Coastal winds

The Albion area is subject to moderate prevailing winds from the west. These winds typically carry cool, saline, moist air.

2.4 Land use history of adjacent lands and the greater coastal Mendocino County area

2.4.1 Current

At the present time the key human land uses for the subject property's adjoining parcels are rural residences; commercial establishments for the tourist trade such as inns, small grocery stores and fueling stations; and cattle grazing. While the grazing land is primarily grassland, a majority of the area remains in native forest. Immediately southwest and adjoining the subject property is a residence at the end of Spring Grove Road. This road, which abuts the subject property on its southern border, continues west and crosses under Highway One, then heads north, looping back to a level intersection with Highway One. Along this interval are approximately ten rural residences within approximately one-quarter mile of the subject property. Approximately one-quarter mile southwest of the subject property (west of Highway One) lies the Pacific Reef Development which contains approximately 35 residences.

Inland, approximately 5 to 7 miles east of the subject property, is a somewhat more level area where there are a higher concentration of rural residences, a solid waste facility for Mendocino County, and several plant nurseries, notably Digging Dog Nursery and Albion Ridge Nursery. Due to the current economic recession, however, plant nurseries that sell to the residential home market have experienced a sharp decline in sales.

Other agricultural activities in the coastal Mendocino area include keeping goats for milk and cheese, chickens for eggs, apiaries, and vegetable production. The vegetables are limited mainly to cool season crops such as leafy greens and root crops. While the real property in the subject's neighborhood is primarily privately owned, portions of this neighborhood are publicly owned, particularly Van Damme State Park which extends from the Pacific shoreline at the community of Little River east approximately 5 miles into the redwood forest.

Chapter 3.2 of the land-use plan of Mendocino County describes the current agriculture of the Mendocino coastal area thus:

> About 3,500 acres of land in the coastal zone are tilled, irrigated or cropped, mostly for forage. Milk production has been reduced to three dairies, and former dairy operators are raising replacement dairy heifers. There are 40 livestock operators in the coastal zone, raising 1,200 head of beef and 4,300 sheep. However, only one-quarter of these farms are operated as the full- time occupation of their owners. Full-time operations are concentrated between

Elk and Point Arena, where the largest areas of prime soils are found. Elsewhere, highly productive soils are found only in small patches, rendering full-time farming uneconomical at this time. North of the Navarro River, agricultural activity has been affected by residential development. This trend is not significant in the Point Arena area, but some farmers, uncertain about the continued viability of agriculture in the coastal zone, may have deferred capital investment. The land use policies of the Coastal Element, with its emphasis on the preservation and enhancement of agriculture, should encourage these landowners to maintain their farms in production.

Coastal agriculture includes several nurseries principally raising fuchsias, azaleas, and rhododendrons. Forty acres near Caspar supports daffodils, suggesting a potential for a bulb industry similar to that in Del Norte County. Many farms sell produce locally and many residents are industrious part-time fruit and vegetable farmers.

Only 10 ranches have "full-time" acreage and are operated as a principal source of income. Minimum parcel sizes for field crops are smaller — about 10 acres of specialty vegetables and general crops is sufficient to realize a return on the cost of production and labor. Marketing is a primary constraint: a few growers could saturate the local market, while a large total acreage (perhaps as many as 1,000 acres of a crop such as Brussels sprouts) would be necessary to make marketing outside the County economically feasible.

2.4.2 Historical

The cool, moist coastal terrace soils have historically been used to produce a number of crops such as hay, berries, potatoes, peas, and other field and truck crops. Pasture for dairy cows and pasture and range for beef cattle and other livestock also have been historically significant uses.

Chapter 3.2 of the land-use plan of Mendocino County relates the agricultural history of the Mendocino coastal area as follows:

> Coastal terraces and bottom land historically were farmed in small units by families dependent on agriculture for their livelihood. Potatoes, truck crops, hogs, poultry, beef cattle and dairies did well and farm products were sold both locally and outside the area. However, in the past 30 years, government regulations and technological changes in food processing and trucking have encouraged large-scale, centralized agricultural operations, ill-suited to the coast's small areas of prime soils, relatively small land holdings, and family-run enterprises. Since the late 1960's, commercial coastal agriculture has consisted primarily of livestock and dairy farms and flower and plant nurseries.

2.4.3 Proximity of agricultural and urban land uses

The adjoining property to the north and east of the subject is used for cattle grazing. This is the only nearby agricultural land use. A residence on Spring Grove Road is approximately 200 feet from the southern boundary of the subject. Another residence is approximately 700 feet to the northwest of the subject property, lying between Spring Grove Road and Highway One.

2.4.4 Agricultural operations in area utilizing more than one parcel

Based on Mendocino County Assessor data and information from the Mendocino County Agricultural Commissioner, the only agricultural operation utilizing more than one parcel in the subject property's neighborhood is the cattle ranch of Mike Biaggi who rents the land adjacent to the subject property.

2.4.5 Agricultural land uses not dependent on soil such as nurseries, greenhouses, caged-poultry operations (battery hens) and apiaries

As noted above, there are several plant nurseries located approximately 5 to 7 miles inland from the Pacific Ocean amid redwood forest on the more level Albion Ridge area. Noyo Food Forest, near Fort Bragg, produces warm season vegetables such as tomatoes in greenhouses. Small holders in the area keep free-range, or pastured, chicken flocks and produce small quantities of eggs mostly for home consumption, but there are no battery-hen operations in the area now. There are several local beekeepers who have apiaries in numerous areas of the county, and sell their honey locally: Lovers Lane Farm in Ukiah, Happy Bear Honey in Mendocino, and Mendocino Gold in Ukiah.

2.5 Agricultural economics

2.5.1 Historical gross income of area crops per Mendocino County Agricultural Commissioner's crop reports

2.5.1.1 Overall per acre average of Mendocino County agricultural production

We calculate the average per acre gross income statistic for all Mendocino County's agricultural production from two sources, the 2010 Mendocino County Agricultural Commissioner's annual report and the California Statistical Abstract.[1] From the former source we note a total of $173,864,818 total gross income for all agricultural commodities produced in Mendocino County in 2010, and also the acres of fruit and nuts, nursery, vegetables, and field crops which include pasture and range land; in 2010 these totaled 754,892 acres in Mendocino County. From the latter source we also note that Mendocino County has 854,000 acres in the timber production zone. Since the gross income reported by the Agricultural Commissioner for all commodities includes timber and other forest products, we have added the two acreage figures to arrive at an estimate of all land in Mendocino County that produces agricultural commodities: 1,609,000 acres. Dividing the total gross income of $173,864,818 by the 1,609,000 acres allows us to estimate the average gross income for all Mendocino County agricultural land at $108 per acre.

2.5.1.2 Gross income of selected crops

The top agricultural commodities produced in Mendocino County, documented by the Mendocino County Agricultural Commissioner as "Million Dollar Crops" are wine grapes, timber, cattle and calves, Bartlett pears, pasture, milk, nursery, Bosc pears, apples, red pears and irrigated pasture.

Of these, only cattle, pasture and nursery products are produced in significant quantity in the subject property's greater area, the Mendocino coast; however, pasture is reported as dollar value per Animal Unit Month, or AUM. Chuck Morse, the Mendocino County Agricultural Commissioner explained in a personal communication that this dollar value refers to leased pasture, not land grazed by the landowner's own herd. Since it is the rental value of the land only, and does not refer to the production of any agricultural commodity per se, and therefore will not lead to further analysis of profitability, we have omitted it from further consideration in this study.

[1] Reference: ⟨www.dof.ca.gov/html/fs_data/stat-abs/sec_G.htm⟩, table G-29 for acres of timber production.

For the two commodities, cattle and nursery, adequate and distinct economic records concerning production yields and gross dollar value are published by the Mendocino County Agricultural Commissioner. The economic value of cattle is reported as dollars per hundred pounds (cwt) of live weight. The economic value of nursery products is reported as total dollars without reference to quantity of product but for analysis can be converted to dollars per acre as the acres used for nursery are reported.

Although not as common on the coast as cattle and nurseries, vegetable crops are also reported with distinct data by the Mendocino County Agricultural Commissioner, and are stated to include "beans, sweet corn, garlic, herbs, melons, peas, potatoes, squash, tomatoes, etc." The economic value of vegetables is reported as total dollars without reference to quantity of product but for analysis can be converted to dollars per acre as the acres used for vegetables are reported.

Other commodities of interest in this study, such as meat goats, eggs, and honey are not produced in sufficient quantity to justify separate reporting by the Mendocino County Agricultural Commissioner. Instead they are grouped in the larger categories of Miscellaneous Livestock and Miscellaneous Livestock Products. Miscellaneous Livestock consists of livestock other than cattle, sheep, or hogs, and include pigeons, poultry, goats, turkeys, bison, and aquaculture. Miscellaneous Livestock Products include eggs, apiary, emu, cheese, manure and ostriches. The economic value of these miscellaneous categories are only reported by the Mendocino County Agricultural Commissioner as total dollars, with no separate units such as number of eggs or pounds of honey or cheese.

Because of this lack of county price and production information, we have utilized national statistics from the USDA Economic Research Service for honey and eggs.[2] Live goat prices are not even available from the USDA. We have therefore utilized University of California Cooperative Extension information[3] for the price of live goats, supplemented by our own recent market transaction information.

Table 2.1 assembles these data for the most recent five years for which records are available, 2006 through 2010 from the Mendocino County Agricultural Commissioner's crop reports, USDA, and the University of California Cooperative Extension. However, it is understood that these records are for the entire county, state, or entire country, and therefore provide only broad averages rather than information specific to the subject property's neighborhood. Table 2.1 presents the average of five years (2006 through 2010) of gross income data for the following commodities in Mendocino County: vegetables, nursery products, live cattle, live goats, eggs, and honey.

The subject property is zoned as rangeland by Mendocino County and has only limited potential for other agricultural uses, issues which will be considered in detail in section 4. At this point in our study, however, it is important to note that because of these limitations, in its current state the subject property's productive potential ranks economically somewhere in the lower half of the range between the highest and lowest dollar-value agricultural enterprises of Mendocino County.

2.5.2 Operational costs excluding cost of land in geographic area

Farming and ranching business costs include direct production costs, business overhead, and depreciation of fixed assets such as equipment or buildings needed for the operations. Production

[2] Reference: USDA/ERS's *Agricultural Outlook: Statistical Indicators*, table 13, "Poultry & Eggs", ⟨www.ers.usda.gov/Publications/AgOutlook/AOTables/⟩ (retrieved 2012-04-11); USDA/ERS's *Sugar and Sweeteners: Recommended Data*, table 47, "Honey: number of colonies, yield, production, stocks, price, and value by top producing States and United States", ⟨www.ers.usda.gov/Briefing/Sugar/Data.htm⟩ (retrieved 2012-04-11).

[3] Davy, J.S., et al., *2010 Sample Costs for a Goats for Meat Operation in Northern California*, University of California Cooperative Extension.

Commodity	Total value	Reporting units	Value per unit
vegetables	$1,030,920	acres	$3,222 /ac
nursery	$3,314,580	acres	$50,994 /ac
live cattle	$6,305,680	cwt	$82.37 /cwt
live goats	–	head	$200 /head
eggs	–	dozen	$1.13 /dozen
honey	–	hive	$84.45 /hive

Table 2.1 Five-year gross income average of selected Mendocino County agricultural commodities. Nursery, vegetables, and cattle values from Mendocino County Agricultural Commissioner's annual crop reports 2006–2010; goats, eggs and honey from other sources — see text, section 2.5.1.

Enterprise	Full investment amount	Annual depreciation	Per production unit
vegetables	$1,401	$145	acre
nursery	$16,618	$1,612	acre
live cattle	$128	$12.80	cwt
live goats	$372	$37.16	head
eggs	$0.53	$0.05	dozen eggs
honey	$195.57	$1.96	hive

Table 2.2 Estimated investment of selected Mendocino Coast agricultural enterprises. The investment is expressed both as the full, up-front investment and as an annual depreciation charge based on a 10-year straight-line basis.

costs and business overhead are commonly referenced as "cash costs" as they are expenses that are paid when occurred. Depreciation is often considered a "non-cash cost" because it is not paid during the operating period during which the production occurs, but instead represents capital investment costs fully paid in advance, and permitted by tax law to be deducted over a period of years in bookkeeping and tax compliance reporting. Depreciation is thus more properly understood as the repayment over time of the investment required to set up the business and launch the income stream. For purposes of clarity, then, we present table 2.2 to illustrate the substantial investment costs that are required for each enterprise examined in this study. However, in table 2.3 we consider only the cash costs of producing the crops and products, so that operating costs are only "cash costs" paid in the year incurred. In addition, we note that the cost of acquiring land for any of these enterprises is specifically excluded from this study, as land is generally not depreciable.

Table 2.3 presents estimated current costs for agricultural enterprises for the farm commodity categories discussed in section 2.5.1. Live goats raised for meat are the example used to illustrate the Miscellaneous Livestock category of section 2.5.1, and eggs and honey are presented as two examples of the Miscellaneous Livestock Products category. The cost estimates are based on cost studies from the University of California Cooperative Extension (UCCE), and on studies and research of our professional work in agriculture. As the UCCE cost studies date from 1976 (for honey) to 2010 (for goats) our cost estimates have been adjusted by the Prices Paid Index published by USDA[4] for the applicable time period, thus bringing all costs current to the end of 2011.

Enterprise	Operating	Overhead	Total	Production unit
vegetables	$2,295	$185	$3,612	acre
nursery	$14,251	$27,529	$41,780	acre
live cattle	$79.63	$2.54	$82.17	cwt
live goats	$132	$9	$141	whole animal
eggs	$0.89	$0.07	$0.96	dozen eggs
honey	$61.20	$4.50	$65.70	hive

Table 2.3 Estimated production costs of selected Mendocino coast agricultural enterprises. All figures are in dollars per production unit.

Enterprise	Gross income	Production costs	Net income	Per unit
vegetables	$3,222	$2,480	$742	acre
nursery	$50,994	$42,752	$8,242	acre
live cattle	$82.37	$92.34	⟨$9.97⟩	cwt
live goats	$200	$141	$59	head
eggs	$1.13	$0.96	$0.17	dozen
honey	$84.45	$65.70	$18.75	hive

Table 2.4 Estimated net income of selected Mendocino coast agricultural enterprises.

Table 2.3 presents the two categories of cash costs, production and overhead, and their total for each of the six agricultural enterprises selected to illustrate the economics of the Mendocino coastal area in which the subject property is located.

2.5.3 Net income for selected agricultural enterprises in Mendocino coast area for past five years

Table 2.4 combines the gross income information of table 2.1 with the cost estimates of table 2.3 to present the estimated net income of the six example agricultural enterprises for the Mendocino coast area. All are profitable based on the data presented with the exception of live cattle, which is not profitable based on these data.

2.5.4 California per acre average returns-to-operator

Comparing and rating the various enterprises for profitability is an important step in proceeding with a farm plan. As previously noted, because the Mendocino County data is reported in various units such as acres, cwts, and AUMs (and we have also added head, dozen and hives as other units from the USDA data) it is difficult to make direct comparisons between the various enterprises, and there is no simple way to covert all into one unit — acres — for comparison.

For this reason we turn to the USDA's Economic Research Service (USDA/ERS), which compiles mass data from its Census of Agriculture conducted every five years, and from other sources

[4] United States Department of Agriculture, National Agricultural Statistics Service, Agricultural Prices, Released January 31, 2003; January 21, 2007; January 31, 2010; January 31, 2011; January 31, 2012; Prices Paid Indexes, Monthly, Items Used for Production, Interest, Taxes, and Wage Rates

annually. Among other things these data include, for each of the 50 states, the total acres of farmland (used for any and all agriculture—crops, pastures, forestry) and the total RETURNS TO OPERATORS of farms. This latter statistic estimates the net farm income less any value attributed to on-farm dwellings, thus excluding the rental value of any farm dwellings.

According to these data, for the five years 2006 through 2010, California's average return-to-operator was $8,707,180,000. During the same time period the total farmland was 25,364,695 acres. Dividing the former by the latter, the average return-to-operator for 2006 through 2010 in California was $343 per acre.

The $343 per acre return-to-operator figure for all of California greatly exceeds even the Mendocino County average gross income per acre, which we calculated to be $108 per acre in section 2.5.1.1. The major reason for this great disparity between Mendocino County and the state average is that while California has 37.3 percent of its entire farmland in cropland (years 2006 through 2010), Mendocino County has only 1 percent of its total farmland in cropland (that is, such crops as fruits, vineyards, nursery, and vegetables). A similar disparity is present in the woodland category, with Mendocino County having 53 percent of its total farmland in timber production, while on average California only has 5 percent. On the other hand the statistics are better matched in percentage of pastureland, with California at 52 percent pastureland to Mendocino County's 46 percent.[5]

Notwithstanding these discrepancies, the California farmland returns-to-operators average of $343 per acre is a useful guideline for understanding the potential returns in farming the subject property, and will be used in this study as means of evaluating the potential of the subject property, and the outcome of this farm plan.

2.5.5 Markets

Markets for agricultural products produced on the subject property are best discussed in terms of scale and volume. Locally farmers can make direct sales to grocery stores, restaurants and inns, at several farmer's markets and through subscription-delivery as in Community Supported Agriculture (CSAs). These local markets are generally supportive of local agriculture and make good potential outlets for selected agricultural products from the subject property. Our inquiries in March 2012 at local inns, restaurants and grocery stores indicate good demand and a strong preference for locally produced food, including pastured eggs, meat, honey and vegetables. The sales volume is quite limited, however, by the low resident population and functional limit of tourism.

An inquiry at the local Albion market indicated that the local butcher cannot buy live animals or carcasses for processing and resale unless the meat is certified by California meat inspectors. This is not practical for the subject property. The local butcher can, however, perform cut-and-wrap service if customers provide a fresh slaughtered animal carcass.

Larger markets, whether retail or wholesale, are more distant in the population centers such as Santa Rosa and the Bay Area, which are several hours by motor vehicle from the subject property. This puts the subject at a disadvantage compared to the many farms which are located closer to these urban centers.

[5] Sources: ⟨www.ers.usda.gov/StateFacts/CA.htm⟩, 2010 Mendocino County Agricultural Commissioner's Report, and California Statistical Abstract.

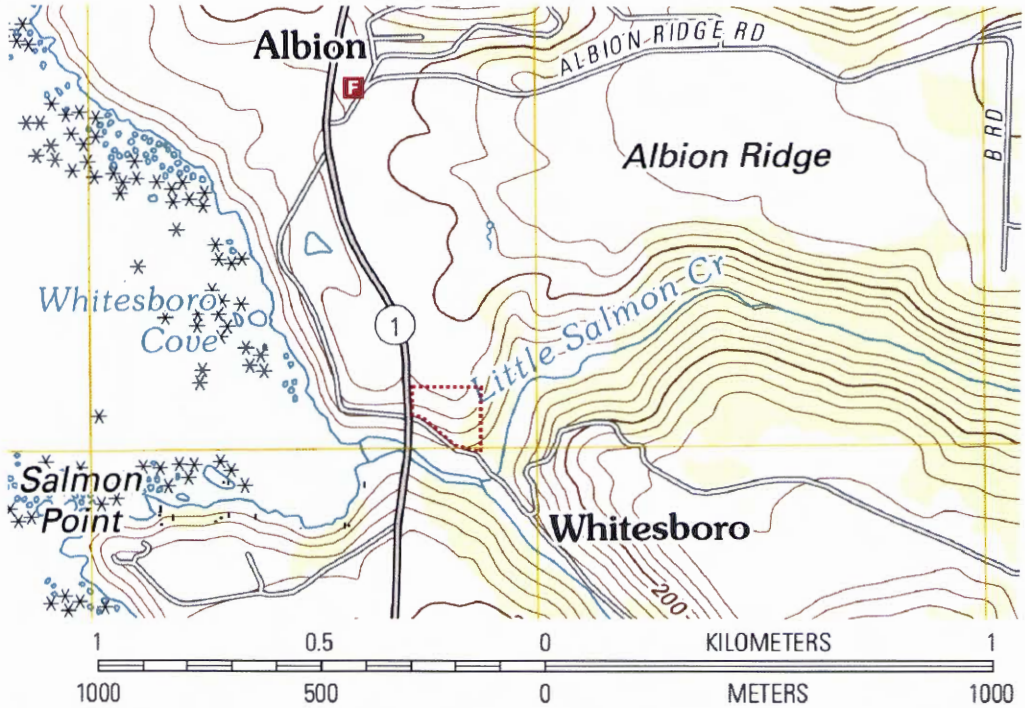

Figure 3.1 Topographic map of the subject property (shown as dotted red outline—location approximate—consultants' estimate, not an accurate survey), from the the United States Geological survey's topographic map of the Albion Quadrangle, 7.5-minute series (2012 edition). Contour interval 40 feet. Universal Transverse Mercator projection (zone 10).

3 Site characteristics

3.1 Location and size

The subject property is 4.17 gross acres in size, according to the Mendocino County Assessor's Office. It is located at 2800 North Highway One, Albion, California, and is approximately three miles from the Albion Post Office, grocery store and hardware store located near the intersection of Highway One and Albion Ridge Road. Figure 2.1 illustrates the subject property's location on the Mendocino coastal area of California.

3.2 Topography

The subject property is located on a hilly marine terrace with shear cliffs formed by mass wasting. The land on this parcel slopes in multiple directions, primarily to the east, southeast, and south; the latter being a shear cliff, and the former a steeply sloping forested hillside. Figure 3.1 illustrates the topography.

3.3 Soils

The subject property consists of two soil units identified by the *Soil Survey of Mendocino County, California, Western Part*. Based on a delineation using the interactive Web Soil Survey of the

United States Department of Agriculture Natural Resource Conservation Service, the subject property contains approximately 60 percent, or 2.5 acres of soil unit 139, *Dystropepts, 30 to 75 percent slopes*, and 40 percent, or 1.67 acres of soil unit 117, *Cabrillo-Heeser complex, 0 to 5 percent slopes.* The *Cabrillo* soil is classified as fine-loamy, mixed, isomesic Ultic Haplustalfs. The *Dystropepts* soil falls within the Dystropepts class of soils.

3.3.1 Storie index and USDA capability classification ratings

The soil surveys depict SOIL UNITS, which are distinct areas of soil that have a common physical origin and perform similarly under agricultural use. To permit objective comparison of soils, NRCS has devised the LAND CAPABILITY CLASSIFICATION SYSTEM, which rates soil units on a scale of I (most favorable) to VIII (the least favorable). These eight Roman-numeral levels, which are referred to as CAPABILITY CLASSES, broadly indicate the agricultural utility and adaptability of the soil. Class I is the best rating, indicating few or no limitations to the land's agricultural uses and adaptability to many different crops. As the Roman numeral increases, the limitations to agricultural uses and management requirements for successful use increase. A class-II soil, for instance, can be used for many of the same uses as a soil rated class-I, but will typically yield less, require special management, or both. Typically cropping uses cease after class-IV; class-V through class-VII soils are typically used for livestock range or timber. Class-VIII soils are typically rocky outcroppings, gravel beds, and the like, with very minimal agricultural utility. Capability classes are specific to the irrigation regime (irrigated or non-irrigated); thus some soil units have two ratings, one when irrigated and one when not irrigated (inferior, reflecting a penalty for lack of water). Some soil ratings incorporate a penalty for seasonal flooding. The soil surveys also demarcate land areas that are not properly considered soils (called LAND-TYPE UNITS rather than soil units in this context); examples include permanent water and quarries. Such non-soil land types, which are unsuitable for cropping or forage production, are not assigned any capability rating. Within the capability classes, further characterization of the soils may be specified by additional letter and numeric suffixes following the Roman-numeral; these indicate the type or types of limitations likely to be present in these soils. The suffixes are not used, however, with the class-I rating, as class-I indicates essentially no limitations to agricultural use. The full rating code (Roman-numeral class plus any additional suffixes) is called the CAPABILITY UNIT.

Some California soil surveys use an alternative rating system, in addition to or in place of the capability-class system, known as the STORIE INDEX, which is a simple numerical scale from one to one-hundred. Larger numbers indicate better fertility and lesser limitations on agricultural use according to a complex analytical formula of numerous factors developed by Dr. Earl Storie of the University of California. The *Soil Survey of Mendocino County, Western Part* does not give specific Storie Index ratings for the soil units it maps. The USDA's Web Soil Survey, an on-line mapping service offers a partial Storie Index rating for the Mendocino coastal soils, by indicating in which grade the soil units fall. For simplification, six soil grades are identified by combining soils having ranges in Storie index ratings as follows: Grade 1 (excellent): Soils that on the Storie Index rate between 80 and 100 per cent and which are suitable for a wide range of crops including alfalfa, orchard, truck and field crops. Grade 2 (good): Soils that rate between 60 and 79 per cent and which are suitable for most crops. Yields are generally good to excellent. Grade 3 (fair): Soils that rate between 40 and 59 per cent and which are generally of fair quality with less wide range of suitability than grades 1 and 2. Soils in this grade may give good results with certain specialized crops. Grade 4 (poor): Soils that rate between 20 and 39 per cent and which have a narrow range in their agricultural possibilities. For example a few soils in this grade may be good for rice but not good for many other uses. Grade 5 (very poor): Soils that rate between 10 and 19 per cent are of very limited use except for pasture because of adverse conditions such as shallowness, roughness,

and alkali content. Grade 6 (nonagricultural): Soils that rate less than 10 per cent include, for example, tidelands, riverwash, soils of high alkali content and steep broken land.[6]

3.3.2 Soil quality: slope, depth, drainage, capability ratings, and texture

According to the *Soil Survey of Mendocino County, Western Part*, the *Dystropepts* soil unit is used as watershed or wildlife habitat. It is severely limited by slope, effective rooting depth and erosion hazard. The capability classification is VIIe(4), non-irrigated. It is not rated by the California Storie Index.

According to the *Soil Survey of Mendocino County, Western Part*, the *Cabrillo-Heeser complex* soil unit is used mainly for recreation, homesite development, livestock grazing, hay production, or pasture. A few areas are used for production of bulbs and vegetables. The capability classification of this *Cabrillo-Heeser complex* soil is IIIw-2(4), non-irrigated, and if irrigated, IIw-2. If this soil unit is used for crop production, the main limitation is the droughty nature of the Heeser soil and the seasonally saturated conditions of the Cabrillo soil. This soil unit is rated Grade 3, fair, by the California Storie Index.

3.3.3 Soils description

The *Dystropepts* soil unit consists of soils on side slopes of marine terraces. These soils formed in material derived from sandstone or shale. The vegetation is mainly brush or grass and grand fir, douglas fir, and redwood. Dystropepts are shallow or moderately deep to bedrock and are well drained. Included in mapping are small areas of other different soil units, areas of rock outcrop, and areas of mass wasting along ocean bluffs. Also included are small areas that have slopes of 15 to 30 percent or 75 to 99 percent. These included areas make up about 25 percent of the total acreage of the unit. The percentage varies from one area to another. Permeability and available water capacity are extremely variable in the Dystropepts. The effective rooting depth is limited by bedrock at a depth of 10 to 40 inches. Surface runoff is rapid or very rapid, and the hazard of water erosion is severe or very severe.

The *Cabrillo-Heeser complex* soil unit has both Cabrillo sandy loam and Heeser sandy loam intermingled such that the soil survey found it impractical to map them separately. The vegetation of this soil unit is mainly perennial grasses and forbs. The soils of this complex are very deep and effective rooting depth expends to 60 inches or more. Water holding capacity is moderate, at 0.11 to 0.13 acre-inches/inch in the top 30 inches of soil; the subsoil varies according to soil specie, with the Cabrillo soil remaining moderate at 0.14 to 0.16 acre-inches/inch in the subsoil, while the Heeser soil, with its sandy texture, lowers to 0.07 to 0.10 acre-inches/inch water holding capacity in the subsoil.

The Cabrillo portion was formed in marine sediments, has moderately slow permeability and is somewhat poorly drained. The Cabrillo soil has moderate available water holding capacity but effective rooting depth in this soil can be limited by saturation for brief or long times during the rainy season. The saturation zone typically starts between 30 and 48 inches below the soil surface, and extends to a depth below 60 inches. Surface runoff is very slow or slow, and if the surface is left bare, as when tilled, there is a slight hazard of water erosion.

[6] Referenced from *Storie Index Soil Rating* Division of Agricultural Sciences, University of California, Publication 3203, Revised December 1978.

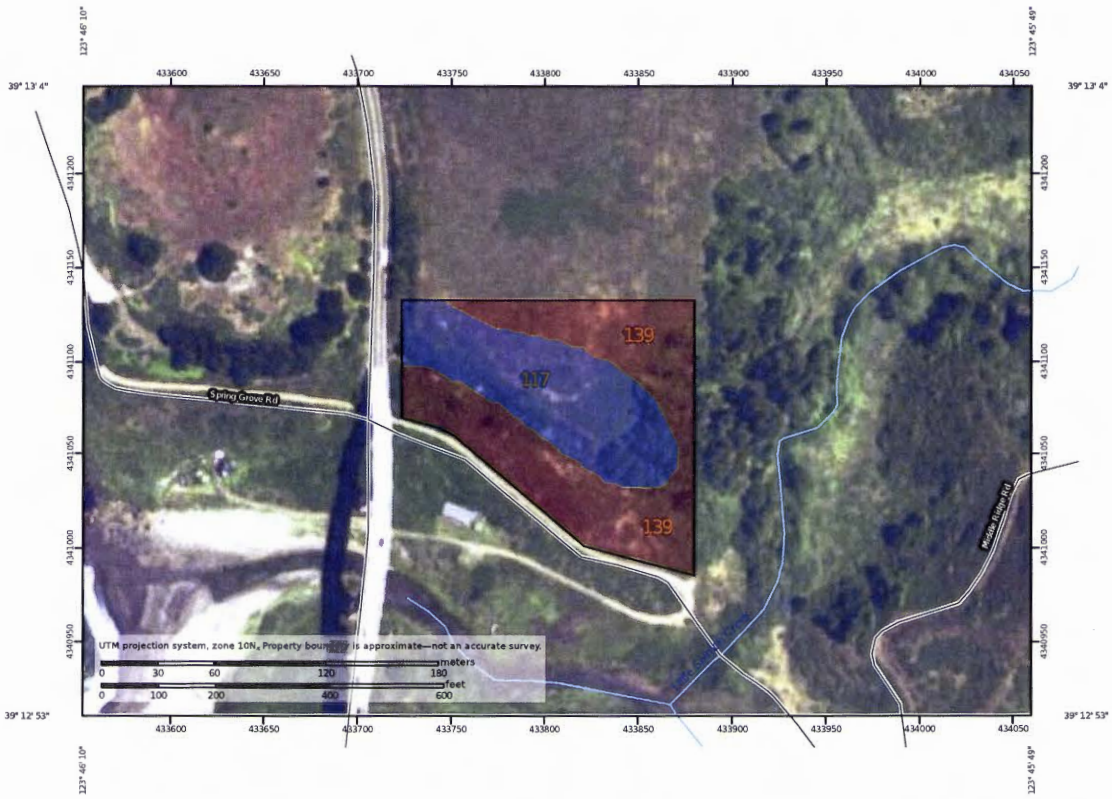

Figure 3.2 Soils of subject property[8]. See narrative for descriptions of the soil units. 117 refers to *Cabrillo-Heeser complex* soil unit, and 139 refers to *Dystropepts* soil unit.

The Heeser portion was formed in eolian sands, has moderately rapid permeability and is somewhat excessively drained. This leads to droughty conditions in the non-rainy seasons; as noted, the sandy texture of this soil allows for only moderate available water holding capacity. Surface runoff is very slow or slow, and if the surface is left bare, as when tilled, there is a slight hazard of water erosion.

Wind erosion is also a substantial hazard for both soil components of the *Cabrillo-Heeser complex* soil unit, as this unit is rated as in in wind-erosion group 3.[7]

Figure 3.2 illustrates the location of the soil units on the subject property.

3.3.4 Area useable for agriculture

Close examination of the soil survey overlaid with the subject property's boundary using the Web Soil Survey website reveals that approximately one-third of an acre of the area mapped as *Dystropepts* appears to be relatively flat and have been grazed in the past, and approximately the same amount, one-third of an acre of the area mapped as *Cabrillo-Heeser complex* appears on the Web Soil Survey website to be steep and forested, and not grazed.

We spent considerable time on the site walking the property to confirm this observation. We examined the slope, the resident vegetation, and the soil texture of these areas. It is not unusual to

[7] Rating and definitions of WIND-EROSION GROUP were obtained from ⟨soils.usda.gov/technical/handbook/contents/part618p7.html⟩. This system rates soils from 1 to 8 in susceptibility to wind erosion, with 1 being the most susceptible and 8 not susceptible.

[8] The boundary of the subject property shown is approximate — not an accurate survey.

find slight discrepancies of this type in the soil surveys. As the *Soil Survey of Mendocino County, California, Western Part* states on page 23,

> Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Our on-site observations bear out the conclusion that overall the subject property has 1.67 acres that are usable for agriculture; this estimate will be utilized in this study for calculation purposes.

3.3.5 Soil analysis by HAC

On 2012-03-09 we collected a composite soil sample from four locations on the subject property, all of which lie within the *Cabrillo-Heeser complex* soil unit. The sampling depth was 0 to 12 inches. No impervious layers were detected.

The soil sample was shipped to AgSource Laboratory in Lincoln, Nebraska. The laboratory performed routine soil analytical tests for soil fertility and salinity on the sample and reported the results on 2012-03-20. The complete results are reproduced in the appendices to this report (see page 63). The appendices also include a section describing the soil properties tested for and their significance; see section 8 on page 47.

In brief, the soil sample returned a pH of 5.3, indicating a highly acid soil with consequent limited availability of key plant nutrients including phosphorus. Application of lime to increase the pH is indicated, at a rate of 6 tons per acre (see section 8.3). Organic matter is quite high at 6.4 percent, indicating the soil has been well managed and not tilled. The cation-exchange capacity (CEC) is mid-range at 16.6, consistent with a sandy loam soil as described in the soil survey. There are no evident soluble salt problems measured as electrical conductivity (mmhos/cm); sodium content is in the satisfactory range. The calcium to magnesium ratio is a healthy 2.4:1, and therefore good soil structure is indicated, as we observed. The macro-nutrients nitrogen, phosphorus, and potassium, plus other minor nutrients including calcium and sulfur are present in low supply, however; this warrants supplementation for improved crop production.

3.3.5.1 Management techniques that could be used to improve soil quality

The following practices and soil management techniques can be used to improve the soil quality.

1. The soil of the subject property should be kept vegetated at all times to avoid water and wind erosion.

2. Soil cultivation should be limited to raised beds that have a impervious perimeter structure to prevent erosion. Planting leguminous cover crops in the beds will assist in developing fertility and tilth. The use of chemical fertilizers should be avoided. Animal manure can be added as a supplemental fertility source. Poultry manure is particularly high in phosphorus. Adding agricultural lime to the soil will raise the pH and help with plant nutrient availability.

3. Irrigation water should be applied to these soils in amounts that are sufficient to wet the root zone but limited to minimize the leaching of plant nutrients. Attention should be given to the seasonally saturated soil conditions of the Cabrillo soil which reduce the amount of irrigation water needed.

4. Managed rotational grazing can improve the diversity of the forage species present as well as the total yield of forage. Grazing should commence when the grass is 6 to 8 inches tall and be discontinued when the grass is 3 to 4 inches tall. A series of small paddocks is essential to practice

rotating the grazing in this manner. The paddocks can be constructed of permanent fencing or utilize the movable electrified fence systems now widely available.

3.3.6 Expected animal-unit-months (AUMs)

According to the *Soil Survey of Mendocino County, Western Part*, the *Cabrillo-Heeser complex* soil unit is located in the *Perennial Grass — Sandy Loam Terrace (4b)* range site. The characteristic vegetation is 45 percent bentgrass, 15 percent common velvetgrass, and 15 percent sweet vernalgrass. The most recent soil survey[9] states this soil unit will produce 3,600 pounds of dry weight vegetation per acre in a normal-rainfall year. In our own experience this forage productivity compares very favorably with most California rangeland. The *Dystropepts* soil unit is not rated for rangeland productivity by the soil survey, and is not recommended for grazing use.

The 3,600 pounds of dry matter includes all grass, forbs, and the current year's growth of leaves, twigs, and fruits of woody plants, whether or not it is palatable to grazing animals. Our site inspection indicates the subject property's range has a high percentage of palatable forage. We are therefore comfortable using the 3,600 pounds as a starting point for our AUM calculations below.

The soil survey does not calculate the Animal Unit Months (AUMs) for any of the soil units described in the survey; therefore we have performed our own calculations based on a preferred range conservation practice as described by the University of California's California Rangelands Research and Information Center in its publication *California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands.* Sustainable management of the forage resource of soils requires that a portion of the vegetation remain on the soil surface uneaten at all times to protect the soil from erosion, and to insure that the desired species remain or can re-populate. In practice this typically means that a minimum 3 to 4 inches of growth, measured from the ground surface upward, remain in place at all times. This can be casually ascertained by observation. When looking down onto the grass, no bare surface soil should be visible at any time.

By use of this recommended conservation practice the rancher will generally be utilizing the forage resource at or below its carrying capacity. CARRYING CAPACITY is a term that refers to the capability of the land to provide adequate forage to maintain a specified number of grazing animals without damaging the long-term productivity of the range; this necessarily includes leaving a portion of edible forage uneaten as noted above.

To perform our AUM calculation for the subject property, we assumed that the 3 to 4 inches of always uneaten vegetation weighs approximately 800 pounds dry weight, and so this amount of forage is subtracted from the 3,600 pounds of total forage production per acre in the calculation of carrying capacity; thus 2,800 pounds of dry matter per acre will be available to be eaten in a normal rainfall year.

One animal unit (AU) is considered to be one cow (approximately 1000 pounds) with nursing calf. Smaller animals are less than an AU; for instance, 5 sheep or goats make up one AU, and 70 to 75 laying hens make up one AU. This AU will consume approximately 20 pounds of dry matter per day. Dividing the 20 pounds per day into the 2,800 pounds of dry matter available per acre to be eaten annually results in 140 days; hence one AU can graze one acre of the *Cabrillo-Heeser complex* soil unit for 140 days. Dividing 140 days by 30 days per month yields 4.67 months. We estimate this soil unit on the subject property to have 4.67 AUMs per acre.

As the subject property has 1.67 acres of land suitable for grazing, in practical terms 4.67 AUMs per acre means that the subject property can support:

[9] websoilsurvey.nrcs.usda.gov, Suitabilities and Limitations for Use, Vegetative Productivity, Normal Year

- one head of cattle for slightly more than half a year (about 7 months) or seven head of cattle for one month;

- 1 or 2 sheep or 1 or 2 goats year round;

- approximately 30–35 chickens year round.

It is therefore clear that owning and grazing cattle is not practical due to the size of the property. Mr Marr inquired of his neighboring cattle rancher Mike Biaggi if he would be interested in running cattle on the property for approximately one month per year. He replied that he was not interested; it would not be practical or economic for any other cattleman to bring in 6 or fewer head for such a short time.

Likewise, the land cannot support enough goats or sheep to create an enterprise, as 1 to 2 such animals do not create a flock or herd; this number limitation makes reproduction of the animals impractical. On the other hand, a small flock of chickens could produce enough eggs to make local sales practical, and can reproduce themselves.

3.3.7 Expected net dollar return for potential crops grown on each soil type on site

Although there are two soil units composing the subject property, only the *Cabrillo-Heeser complex, 0 to 5 percent slopes* portion has agricultural utility. When irrigated this soil is rated in USDA's Land Capability Classification System as class II and thus, if irrigated, is considered PRIME FARM LAND by the California Department of Conservation. Therefore the general economic analysis presented in section 2.5 is applicable to this soil unit.

3.3.8 Water resource for agriculture: sources, quantity, quality

The property owners have installed a 195-feet deep water well on the northwest portion of the subject property. This well remains unused at present but according to the well driller the well will produce an estimated 4 gallons per minute when fitted with an electric-power submersible pump. The water will be used for both domestic and agricultural purposes.

This production rate is insufficient to supply much more than domestic needs (80–100 gallons per day per person or 400 gallons per household per day[10] plus a small plot of irrigated land, which we calculate to be 0.05 acre (2,210 square feet) of irrigated vegetation, including trees, shrubs, and crops. This calculation is based on an maximum summer-time evapo-transpiration rate of 0.15 inches per acre per day[11] when there is no rainfall, and allowing a 50 percent recharge time for the groundwater as a sustainable practice — in other words, the pump would run 12 hours per day, not 24.

Livestock have lesser water requirements than crops when considering their drinking needs. Cattle require approximately 10 gallons of drinking water per day in the warm months. Sheep and goats are much lower at 1 gallon per animal per day. Chicken drinking water requirements vary with the amount of dry feed, such as grain, versus wet feed, such as pasture grass and insects; nevertheless the total amount per bird will rarely exceed 0.25 gallons per day[12] and thus, a flock of 30 birds would need no more than 7 or 8 gallons per day.

[10] Reference: ⟨www.epa.gov/WaterSense/pubs/indoor.html⟩.
[11] Reference: ⟨wwwcimis.water.ca.gov/cimis/images/etomap.jpg⟩.
[12] References: *Farm Management Livestock Manual*, University of California Press, 1949; and *Poultry Drinking Water Primer B 1301*, University of Georgia.

3.3.9 Drainage and salt water intrusion

Rain water runoff follows the natural slope of the land, which falls in multiple directions off the higher elevations of the parcel toward the lower reaches of Little Salmon Creek south of the property. We are unaware of any history of salt water intrusion into the ground water at this site.

3.3.10 Access

The subject property is accessed via an approximately 800-feet long private road easement off Highway One. At present this easement is unimproved native soil.

3.4 On site land use

3.4.1 Existing land use

The subject property is currently vacant land not used for any agricultural purpose.

3.4.2 Historical land use

The subject property has been used in the past as range land for cattle when this parcel was owned by a family which owned numerous parcels of conjoining lands.

4 Analysis

4.1 Favorable factors for agriculture

The subject property enjoys a number of features which are favorable for its agricultural use.

1. Agricultural uses are legal under its Mendocino County zoning designation;

2. The adjoining property is used for cattle range, and there are no residences nearby that would object to the noise, smells and other peculiarities of agricultural operations;

3. Bee forage and bee water is widely available in the neighborhood in adjacent lands and nearby waterways;

4. The Cabrillo soil portion of the subject property is relatively highly rated, and produces substantial AUMs per acre compared to other rangeland in Mendocino County;

5. Water is available from a well on site to provide water for livestock and limited vegetable gardening;

6. The neighborhood community and tourist trade is enthusiastic about local food, small-farm production, and generally supportive of local agriculture.

4.2 Key factors impacting agricultural use of property

The subject property is limited in its agricultural uses by a number of important factors which have been discussed in the preceding sections of this report.

1. The cool marine climate, with average summer high temperatures reaching only into the mid 60s (degrees F), combined with summer morning fog limits the cropping choice to essentially cool season crops; a further limitation is imposed by perennial ocean winds that often can be quite strong.

2. The amount of water available from the water well is limited; the production of 4 gallons per minute (gpm), if used exclusively for irrigating vegetables or nursery stock in the summer would only support 1/10th of an acre, or about 4,000 square feet of area, based on an maximum summer-time evapo-transpiration rate of 0.15 inches per acre per day. Because of this lack of water for irrigation, it is not feasible for this property to be used as a plant nursery, as the size of the operation would necessarily be too small to support the costs and infrastructure needed. Vegetables are possible on a small scale as these will contribute directly to the farm household welfare and offset some income needs.

3. The property's size, especially considering it has under 2 acres of land that is either not shear cliffs or steeply sloping redwood forest, imposes limitations of scale and total productivity, whether measured in AUMs for grazing, or by amount of food crops or nursery products that could be grown. This is primarily an economic viability issue for agriculture on this site. Total productivity, as reviewed in section 2.1 does not translate into sufficient net income to create a stand-alone business.

The total amount of AUMs available on the subject property for cattle, sheep or goats has already been discussed as inadequate to support their year-round production. As previously noted, the neighboring cattle rancher, Mr Biaggi, has made clear that he is not interested in running cattle on the subject property. Moreover, cattle production is demonstrated to be uneconomic based on Mendocino County statistics, while goat production would generate $118 net annual income assuming it were possible to produce 2 goats per year on the property.

The highest return usage reviewed is nursery, which requires a very substantial $16,618 per acre (on average) up-front investment to generate an average of $8,242 per acre net income, and requires highly specialized knowledge and business skills while requiring years to establish and develop. However, the small amount of water available for irrigation limits the productive area to approximately 0.05 acre (see section 3.3.8), thus the calculated possible net income would be $412 per year. Similarly to the nursery business, vegetable income is limited not only by area available, but by lack of irrigation water. See section 3.3.8 for details.

Egg production, based on an average of 180 eggs per fowl per year, national average prices, and 30 birds per acre would net $918 per acre.

Overall, then, such net returns are not sufficient to justify a commute from off-site to the subject property for the sole purpose of operating an agricultural enterprise. For this reason the residence discussed in section 5.3 is necessary for agricultural use of the property, as it permits farmer-presence and a subsistence-oriented agriculture on-site with diverse crops and livestock as discussed in section 5.

4. A problem specific to nursery-use of the subject property is that a nursery business on the subject property would require numerous tall structures, such as greenhouses and shadehouses; however, the California Coastal Commission strongly desires to limit visibility of new structures on the land.

5. The subject property's access is not conducive to extensive vehicle traffic for conducting business. The gravel road that will lead from Highway One to the subject property is long and narrow.

6. The slope of what we have identified as land useable for agriculture is a limitation in the sense that tillage would exacerbate the erosion hazard from water run-off. The erosion hazard is increased by the sandy loam soil texture, which when exposed through tillage, is highly subject to the eroding action of both wind and water.

7. The subject property's location also imposes a number of limitations. It is distant from population centers which provide farm product marketing opportunities on a commercial, economic scale. The local population is small and does not present a substantial market for large commercial farms. The subject property location is distant from typical farm supplies and services such as fertilizer and pesticide dealers, farm equipment sales and service, building supplies, technical supplies and support for livestock enterprises including poultry and apiculture, and farm labor.

8. We anticipate a high, economically significant, amount of livestock predation on the subject property due to extensive forests and other wild lands in the neighborhood. This can be mitigated by good fencing, securing animals within predator-proof shelters every night, and human living presence on the property.

9. Finally, availability of credit for agricultural production is limited due to the property's size, location, and economic prospects.

4.3 Suitable agricultural uses of subject property

In consideration of the advantages as well as the limitations to the subject property discussed above, we find the following agricultural uses most suitable for the subject:

- pastured chickens kept for egg production;
- apiary for honey production;
- climatically adapted vegetable production.

The latter, climatically adapted vegetable production, means cool season crops that can be grown outdoors in raised beds without greenhouses or protective covering.

5 Proposed agricultural management plan

5.1 Owners' objectives

It is a goal of Michael Marr and Judith Malin to live on-site and operate a small subsistence-oriented organic farm. They understand that the subject property is not large enough to "make a living" by farming alone and therefore supplemental income will come from Mr Marr's on-site woodworking projects and woodworking services to the local community. (Mr Marr is a professional woodworker.)

Detailed below are their specific agricultural objectives that will produce seasonably available farm commodities, such as eggs, honey, and vegetables.

5.2 Agricultural land use

5.2.1 Utilization for agriculture

Over 90 percent of the subject property's land that is physically suited for agriculture will be used directly in crop or livestock production. The remaining 10 percent is utilized for buildings which support that agriculture.

5.2.2 Crops and livestock

The farm will operate three enterprises: pastured chickens for egg production, an apiary for honey production, and seasonal vegetable production.

5.2.2.1 Egg production

The farm will keep a small flock of chickens that will be pastured on the acre site around the residence and barn. Fencing is needed to keep the poultry within the designated area of the pasture. This can include the septic leach field. A hen house within the fenced pasture will be needed to lock the birds up at night when most predators are out. Mobile hen houses have been demonstrated to reduce predation as predators typically are cautious and hesitant to break into houses that are frequently moved. A flock of 30 laying hens can be expected to produce 300 to 400 dozen eggs per year with higher production between March and October, and negligible production December through January.

Some supplemental feeding is required for laying hens. A mature laying hen consumes approximately 100 to 120 pounds of grain and mash annually, plus 20 pounds of greens when raised indoors. We estimate the native pasture, grazed at or less than its carrying capacity, can provide roughly half of the nutritional needs of the birds, calories and nutrients both. Therefore, for egg production at the level described in section 2.5, approximately 50 pounds of grain per year per mature bird will be required. Currently organic chicken scratch grain costs approximately $0.50 to $0.60 per pound when purchased in bulk. The pasture will provide all the greens needed by the birds, though they will also benefit from vegetable scraps from the garden beds.

For best results we recommend purchasing 4 to 6 month old pullets ready for laying rather than trying to initially brood chicks. The choice of breed is important, as well. For pasturing, we recommend good foragers such as Araucana, Australorp, and Rhode Island Red. A mix of breeds

will lead to more even egg laying over the course of the seasons, as the different breeds have slightly different laying habits and production rates. The former two breeds are also good brooders, which will be important to maintain the flock in the ensuing years.

5.2.2.2 Honey production

An apiary of 4 to 5 hives has the potential to make 250 to 300 pounds of honey annually, based on national averages. The hives should be sited within the fenced chicken pasture to provide protection from marauding animals. The chickens will eat dead bees as they are cast out of the hive by the living colony. Mike Marr can build and repair hives as an adjunct to his woodcraft business.

5.2.2.3 Vegetable production

Approximately 600 square feet of raised beds will be constructed in which to grow seasonal vegetables adapted to the climate. These include beets, broccoli, cabbage, lettuce, kale, potatoes, swiss chard and turnips. The raised beds will be constructed with an impervious perimeter such that the ground surface is not tilled and there is no runoff or other erosion hazards created. The beds will rise approximately 12 inches above the ground surface. They can be filled with a combination of native soil and organic compost made primarily from on-site vegetation.

The vegetables will require approximately 7,000 gallons of irrigation water per year, applied mainly from June through October. Several crops per year can be grown in the same space. Many of the leafy greens and root crops mature in 3 months or less time from sowing, therefore several crops can be grown in succession annually. For disease control, the species should be rotated, that is, avoid growing the same crop continuously in the same location.

5.2.3 Site plan and layout

Figure 5.1 illustrates the site plan for the property, with location of the water well, buildings, bee-yard, and vegetable beds.

5.2.4 Organic production practices

Marr and Malin will farm in accordance with the USDA's National Organic Program (NOP). Although organic practices are site-specific and take time to develop for each individual farm, the basic principles are relatively straightforward: improve the fertility and structure of the soil to foster plant health; use only approved production inputs as fertilizers and pest control[13]; as much as possible design production practices to work in concert with the resident, natural biological system of the place.

Third-party organic certification will not be required for the Malin/Marr farm as the gross income of the farm is projected to be less than $5,000 annually. Federal law permits the labeling of agricultural products as organic from farms grossing less than $5,000 annually provided all organic production regulations as specified in the NOP are followed.[14]

[13] The Organic Material Research Institute maintains a freely available list of production input materials that comply with the National Organic Program at ⟨www.omri.org⟩.

[14] Code of Federal Regulations, Title 7–Agriculture, Subtitle B–Regulations of the Department of Agriculture, Chapter 1–Agricultural Marketing Service (Standards, Inspections, Marketing Practices) Deparment of Agriculture, Subchapter M–Organic Food Producution Act Provisiions, Part 205–National Organic Program, Subpart 101–Applicability

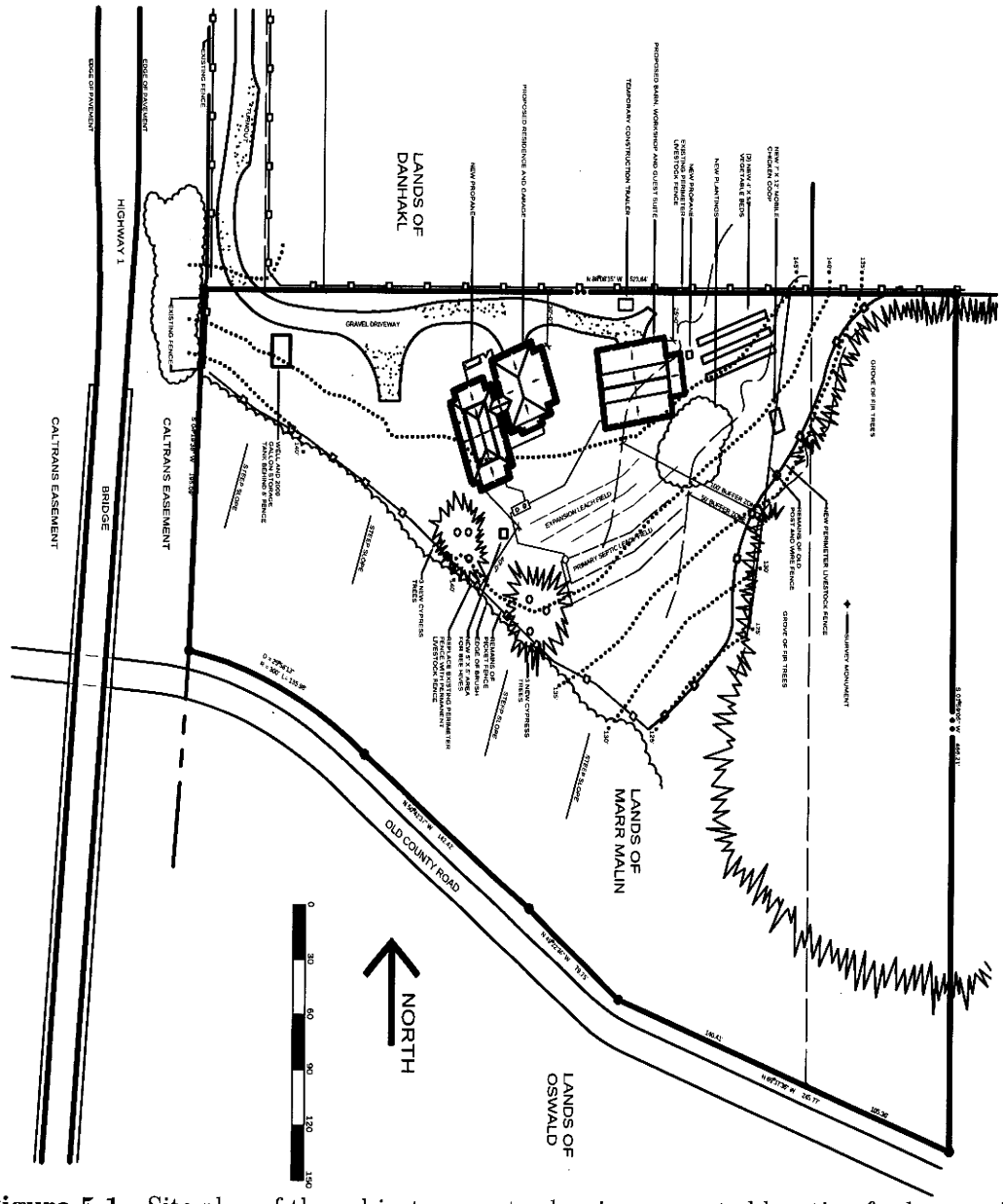

Figure 5.1 Site plan of the subject property showing suggested location for bee-yard, vegetable beds, and mobile chicken coop. Forested ravine discussed in the text is on the east outlined by a zigzag; the shear cliff face is on the south noted as "steep slope". Agriculturally useable area is roughly triangular in shape and shows slope contour lines. (A full page copy of this site plan by Bob Hartstock is reproduced in the appendices).

5.2.5 Soil fertility and management

As noted in section 3.3.5 the subject property's soil is deficient in several plant nutrients. Soil fertility can be improved through the addition of manure and compost following typical organic farming methods. Cover cropping with legumes such as vetch or fava beans is also a good method to increase nitrogen levels in the soil in the raised vegetable beds.

5.2.6 Conservation practices

The farm plan incorporates a number of well established conservation techniques.

First, there will be no tillage of the native soil for vegetable production. Instead, the vegetables will be grown in raised beds with impervious perimeters that prevent erosion.

Second, the chicken pasturing will be kept at carrying capacity by limiting flock size to under 35 birds. This will maintain a vegetative cover at all times on the pasture, minimizing erosion hazard, and promoting the diversification of the resident species. Many native grasses and forbs, such as blue wildrye (*Elymus glaucus*), and Indian lettuce (*Claytonia perfoliata*) are already present on the subject property and make excellent forage. These and other native species can be encouraged to propagate by managing the poultry's access, timely exclusion, and further by seed collection and re-distribution.

Third, the forest on the east side of the property will be maintained as grand fir forest habitat, functioning as protected watershed draining into Little Salmon Creek. Likewise the south facing cliff, with its marine/shoreline habitat and wealth of native vegetation will be maintained as is; this too functions as watershed for Little Salmon Creek down slope.

Finally, all production practices will be in accordance with the National Organic Program, which incorporates many resource conservation practices and requires consideration of wildlife habitat management.

5.3 Buildings

5.3.1 Description

Two building structures are planned for the farm, a residence and a barn/workshop/guestroom. The residence, including an exterior deck, will occupy 2,719 square feet in area. The barn will occupy 2,040 square feet of area. The barn will be used to store farm and gardening equipment, for farm processing such as egg packaging and honey extraction, vehicle storage, mowing equipment, as a wood-working shop, and also has a guest room, which can be used to house occasional farm interns. Figure 5.1 illustrates the siting of the buildings.

5.4 Marketing

The surplus eggs, honey, and vegetables produced on the subject property will be marketed by the producers, Malin and Marr. No agents or brokers are contemplated. The marketing effort will concentrate on the local area, from Elk to Mendocino. No special arrangements or transportation needs are required. Likely markets are discussed in section 2.5.5.

5.5 Impacts of proposed agricultural management plan

The agricultural plan presented in this report is designed to minimally impact the environment and maintain the property in productive agricultural use. Adherence to organic production practices described in the National Organic Program help insure sensitivity to adjacent wildlife habitat. As there are no nearby residences, human disturbance is minimal.

5.5.1 Whether lands not suitable for agriculture are being developed before converting agricultural lands

The land not suitable for agriculture on the subject property is steeply sloping land, with grand fir forest on its east side, and mass-wasting cliff face on the south side. Both the forest land and the cliff face are unsuitable for building due to slope, erosion hazard, and watershed flow disruption. The only land that is suitable for building is also the only land suitable for agriculture.

5.5.2 Impact of proposed development on agricultural production on site and on adjoining agricultural land

There are no intensive agricultural uses on nearby lands that could be affected by the proposed building of a residence and barn on the subject property. The neighboring property is used for cattle range, and its productivity for this use will not be diminished by the proposed farm plan and development for the subject property, as this plan emphasizes the use of the property for livestock production, specifically, the pasturing of chickens, bee forage, and beekeeping.

On the other hand, the proposed development has a major impact on the use of the subject property for agriculture: it will make agriculture possible on the site; due to limitations discussed above (see section 4.2) agriculture is not economically feasible unless it is a subsistence-type agriculture supported by the farmer living on-site. Moreover, in this farm plan the loss of approximately 4,700 square feet of area to building footprints is balanced by the purchasing of organic chicken feed to supplement the flock's diet. If 30 birds are kept, the amount of feed needed is estimated at 50 pounds per bird per year times 30 birds or 1,500 pounds of grain. This is equivalent to the average annual production of approximately 0.28 acre (or 12,197 square feet) of wheat in California.[15]

The woodshop in the proposed barn will be used to support the farm operation in the construction and repair of hen housing and bee hives[16]. The woodshop also will be used for Mike Marr's carpentry and woodworking business. As such the woodshop will contribute to the household income and thereby support the continuance of agriculture on the property. It is not unusual in America today that farming income needs to be supplemented with off-farm income. Recent USDA statistics record that 90 percent of all farm household income comes from off-farm sources[17], and 47 percent of all farms in California are small farms producing less than $9,999 gross revenue (and another 22 percent of farms gross between $10,000 and $49,999).[18]

5.5.3 Whether agricultural viability is limited by conflicts with urban uses

The nearest urban area is the town of Mendocino, which is 7 miles to the north of the subject property. The community of Elk is 7 miles to the south. There is no conflict causing agricultural viability issues between the subject and these areas.

[15] *California Field Crop Review*, United States Department of Agriculture, National Agricultural Statistics Service, March 15, 2012.

[16] The woodshop can also be used s a place to package eggs and to extract and bottle honey produced on the farm

[17] USDA publication AIS-88, December 2009

[18] Reference: ⟨www.ers.usda.gov/StateFacts/CA.htm⟩.

5.6 Economics

Below are enumerated costs and income estimates for the enterprises and operations discussed above.

5.6.1 Capital expenditures

5.6.1.1 Land and building improvements

The cost of land and building improvements is estimated as

- hen house: estimated cost $750 for materials, construction labor provided by Mike Marr at no charge;

- raised beds: estimated cost $1,200 for materials, construction labor provided by Mike Marr at no charge;

- pasture fencing, no-climb type tight mesh, 60 inches tall, metal T post every 10 feet, with end anchor posts: $2.25 per linear foot times 1,000 linear feet, $2,225 total; use of family farm labor to install.[19]

5.6.1.2 Equipment

The cost of equipment is estimated as

- bee hives: materials, $175 for hive body, frames, base, etc.; packaged live bees, $50 per establishment colony, total $200 per hive times 4 hives;

- beekeeping equipment: coveralls/bee suit, veil, gloves, smoker, hive tool, bee brush, $250;

- honey-processing equipment: $500.

The total estimated startup cost for the apiary is $1,550.

Garden tools for vegetable production are already owned.

5.6.1.3 Flock expenses

Flock expenses are estimated as $5 per bird for the cost of pullets. This gives a total for 30 birds of $150.

5.6.1.4 Depreciation and interest

No borrowing is anticipated for the agricultural enterprises, therefore there will be no interest paid. The capital items and the start-up costs total $5,875; using a 10-year straight-line depreciation method the annual depreciation charge is $588. N.B.: actual depreciation charges for accounting purposes will likely vary.

[19] Alternatively, portable electric fencing can be used. The cost of portable electric fencing varies and can be as much as permanent fencing as described.

5.6.2 Operating expenses

5.6.2.1 Fixed costs

Fixed costs are assumed to be constant regardless of annual yield, and are based solely on current costs and do not including land costs. There are two fixed costs: insurance, and taxes. Insurance can be added to homeowner's insurance at an estimated $100 per year. County taxes for agricultural structures and personal property are estimated at an extra $50 per year.

5.6.2.2 Variable costs

Labor: Only unpaid family labor will be used; hence this cost is not estimated.

Supplies and materials: The following supplies and materials will be needed for the farm.

- annual feed cost (organic scratch grain): 1,500 pounds at $0.50 per pound, $750 per year;
- jars for honey: $1.00 per 16-ounce (1-pound) jar times 250 jars, $250 per year;
- egg cartons, $0.25 each, with recycling, buy 300 per year. Total annual cost $75.

Energy and fuel: Electricity will be used for pumping water; with the low water usage for the farm enterprises, this cost will be included in household expenses.

Due to the modest amount of produce from the farm and the overall small income to be generated, we anticipate no special trips will be made to market farm produce but instead the trips to the Albion and Mendocino stores for supplies can also be used to deliver eggs, honey and vegetables from the farm. Therefore, there is no separate charge for farm fuel.

Repairs: The premises and equipment will be maintained using family labor and on-hand tools and supplies.

Outside consultants: Potential veterinarian fees are estimated at $100 per year.

Harvest cost based on unit of yield: Harvest will be performed by family labor.

5.6.2.3 Total variable expenses

The variable expenses listed above total $1,175.

5.6.3 Gross income

5.6.3.1 Eggs

We anticipate locally produced organic eggs from pastured chickens will fetch a much higher price than the national average presented in section 2.5. While the national average is $1.13 per dozen gross income, fresh local organic eggs from pastured chickens in California generally retail for $5.00

Line item		Amount
gross income		$2,725
fixed expenses		⟨$150⟩
variable expenses		⟨$1,175⟩
net income	=	$1,400
depreciation		⟨$588⟩
net income after depreciation	=	$812

Table 5.1 Calculation of net farm income.

to $6.00 per dozen when sold individually as at farmers' markets, or for approximately $2.50 to $3.00 per dozen when sold in quantity to such customers as the local inns and grocery stores.

The yield is estimated to be 180 eggs per bird per year. If 30 birds are kept, the total annual yield would be 450 dozen; at $3.00 per dozen, the gross sales of eggs would produce $1,350 per year.

5.6.3.2 Honey

We estimate that the honey can be sold locally, one-half at the retail price of $6.00 per pound, and one half at a wholesale price of $3.00 per pound; therefore the average price would be $4.50 per pound. For the estimated 250 pounds of production, this amounts to $1,125. There will be some value to the wax cut off the comb, but we have not included its value in this study.

5.6.3.3 Vegetables

While the vegetables will be primarily consumed by Marr and Malin or fed to the chickens, there may be occasional excess production. We estimate this not to exceed $250 in annual gross revenue.

5.6.3.4 Total gross income

The total gross income is the sum of the egg, honey and vegetable sales discussed above, which amount to $2,725 annually.

5.6.4 Net income

The net farm income is the total gross income less fixed and variable expenses. The depreciation is then deducted from this to reflect the capital and start-up costs. The calculation is shown in table 5.1.

We estimate an annual net income of $812 after cash costs and depreciation utilizing the management plan presented in this report. This can be converted to a per-acre basis by dividing $812 by the subject property's 1.26 acres of usable agricultural land, equalling $644 per acre.

5.7 Conclusion of farm plan

This $644 per acre, our estimate of the annual net income from this farm plan, compares very favorably with the California average farmland return-to-operator statistic we derived from the

USDA-ERS data sets in section 2.5.4. That figure was $343 per acre, and thus the subject farm plan, at $644 per acre, is nearly double the California average. It greatly exceeds the $108 per acre gross annual income estimate for Mendocino County calculated in section 2.5.4.

This substantially higher than average net income is possible, despite the subject property's major limitations, for several reasons. The enterprises selected, vegetables, eggs and honey, are well suited to and make good use of the property's physical agricultural resources and Malin and Marr's personal skills and resources. These enterprises were also selected for their profitability in a small-holder's farm context. There is good prospect for local marketing of the eggs and honey, and this offers the potential of minimal marketing costs with higher prices than what would be obtained from wholesale marketing outside the neighborhood. The farm operation will rely on unpaid family labor, and is made economically possible because the operators will live on-site and have an opportunity to supplement their household income from woodworking projects that can be made on the farm property.

The farm plan has been designed to create a holistic sustainable farming system, with integrated crop and livestock enterprises, and numerous conservation practices that will maintain and enhance the farm land over time. Through this plan Malin and Marr will be able to bring agriculture back to this small property that otherwise would no longer be viable for agriculture, fulfilling Mendocino County and California Coastal Commission requirements that the proposed use maintains productivity of on-site and adjacent agricultural lands and be compatible with long term protection of resource lands.

6 Appendix: References

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7 Appendix: General assumptions and conditions of this report

This study is subject to the following general assumptions and conditions.

7.1 Limiting conditions

This study has been prepared at the request of the client to whom this report is addressed. No third party has a right to use or rely on this report for any purpose, unless so authorized by client. Possession of this report does not grant right of publication.

Opinions and estimates expressed in this report represent the consultants' best professional judgment but should not be construed as recommendation to act. The findings, assumptions, and conclusions contained in this report are the consultants' personal opinions and are not assurances that any event will or will not occur.

The consultants have no requirement, by reason of this report, to give testimony or appear in court or any hearing or appearance required by subpoena with reference to the subject of this report, unless additional arrangements are agreed upon by consultants and client.

The consultants accept no responsibility for legal matters, especially those affecting title to the property.

7.2 Assumptions concerning accuracy and reliability of data

This feasibility study is based on knowledge available to the consultants at the time of publication. If additional information becomes available at a later date, the opinions reflected in this report could be affected.

Certain estimates, data, and information furnished by others (including the client and all other persons identified in section 1.7.1) in the course of this investigation are assumed to be correct and accurate. The data relied upon in this report are believed to be from reliable sources.

No survey of the subject property has been made by the consultants. All figures, photographs, maps, and exhibits in this report are presented as aids to understanding the analysis and are not guaranteed as to their scale or accuracy. Maps in this report, which are not original research, are derived from public GIS data and published maps from the United States Geological Survey, the United States Census Bureau, the United States Department of Agriculture, the State of California, and local governments, which are offered to the public by these agencies with the disclaimer that they are believed accurate but are not guaranteed.

Concerning numerical quantities, all calculations have been made with the most accurate figures available to the consultants. Intermediate calculations have been made with the maximum feasible number of digits to prevent the accumulation of round-off error, but are generally presented in rounded form, showing only an appropriate number of significant figures. This both to help readability and to avoid implying to the reader that there is greater accuracy in the data than, in fact, exists.

Concerning property areas, the county assessor's plat maps are the source of acreage figures unless another source is specified. Assessor's measurements are typically given in tenths or hundredths of an acre, although this large number of written significant figures does not necessarily

reflect true accuracy. Assessor's plat maps have been used to approximately locate the boundaries of properties. All assessor's plat maps, and hence acreage figures read from them, are accompanied by the disclaimer that the measurements are for assessment purposes only, and are not an accurate survey.

7.3 Assumptions concerning property condition

Regarding the subject property, it is assumed that there is full compliance with all applicable federal, state, and local environmental regulations and laws, including zoning and land use, unless otherwise stated. A comprehensive examination of laws and regulations affecting the subject property has not been performed for this appraisal. The consultants are not qualified to give legal opinions concerning the subject property.

It is assumed there are no hidden or unapparent conditions of the property, subsoil, or structures that would render it more or less valuable. No responsibility is assumed for such conditions. The observed condition of all improvements existing at the time of the property inspection is based on a casual inspection only. Wells, pumps, and fences are assumed to be in good working condition except as otherwise indicated in the narrative.

Particle type	Particle diameter (mm)
clay	<0.002
silt	0.002–0.05
very fine sand	0.05–0.10
fine sand	0.10–0.25
medium sand	0.25–0.50
coarse sand	0.50–1.00
very coarse sand	1.00–2.00

Table 8.1 The system for naming soil particles by size used by USDA soil scientists.

8 Appendix: Soil properties analyzed

The fertility of a soil is a consequence of numerous interrelated properties, both mechanical and chemical. This supplementary section gives a brief description of these properties and their significance to help you understand the results presented in this report.

8.1 Soil texture and soil structure

Soils are composed primarily of mineral and rock particles, which are called SAND, SILT, or CLAY depending on their size, from smallest to largest (see table 8.1). The ratios among the three sizes of particles determine the overall SOIL TEXTURE. The term LOAM indicates a mixture of roughly equal amounts of sand, silt, and clay — a highly desirable soil texture. Since the amounts of the components are never exactly equal, we generally speak of CLAY LOAM, SILTY CLAY LOAM, SANDY LOAM, and so on, indicating that the one or two of the size components are more prominent than the others, while the soil still falls within the definition of a loam.

The manner in which the constituent particles of soil are assembled in aggregate form is SOIL STRUCTURE. Good soil structure includes abundant small voids between the solid soil particles, known as PORE SPACES, which allow oxygen and water to enter and exit the soil and offer space for plant roots to grow. Poor soil structure reduces plant growth by restricting root development, restricting percolation, promoting waterlogging, and creating conditions for root disease.[20] Therefore, maintaining and enhancing good soil structure (which essentially means maintaining good POROSITY — size and abundance of pore spaces) is a key goal of soil management for agriculture. Although we have described soil structure as a mechanical property of soil, its quality, good or poor, is strongly affected by the chemical properties of the soil, described next.

8.2 Ions and the soil solution

As water percolates through the voids between solid soil particles, wetting their surfaces, substances dissolve in the water, forming a chemical solution, known as the SOIL SOLUTION. Other than water, the components of the soil solution most relevant to the agricultural use of a soil are ions. In chemistry, an ION is an atom or molecule that has a net electrical charge due to the presence of a different number of electrons and protons in the atom or molecule. If electrons outnumber protons,

[20] Hausenbuiller, R. L. *Soil science principles and practices.* W. C. Brown Co. (Dubuque, Iowa), 1974.

the structure has a net negative charge and is known as an ANION. If protons outnumber electrons, the structure has a net positive charge and is known as a CATION.

The chemical properties of soil arise from the ion composition of the soil solution. Laboratory testing of soil uses a one-to-one mixture of soil and water. The solution formed is representative of the solution that would form naturally in the field when irrigating crops or when the soil is saturated by rainfall.

8.3 Acidity and basicity (pH)

The soil samples have been analyzed for pH of the soil solution.

The pH scale, which typically ranges from 0 to 14, is a measurement of acidity or basicity. In chemistry, ACIDITY and BASICITY of an aqueous solution (that is, some mixture of water and dissolved substances) are a highly important physical property. In this case, the soil solution is the solution being considered. A pH value represents the concentration of hydronium cations (H_3O^+) and hydroxide anions (OH^-) in the soil solution or other chemical solution. A pH below 7.0 is considered ACIDIC meaning that hydrogen cations are present in greater concentration than hydroxide anions. A pH above 7.0 is considered BASIC or ALKALINE, meaning that hydroxide anions are present in greater concentration than hydronium cations. At a pH of 7.0, hydronium and hydroxide are equally numerous. Pure water, which is neither an acidic nor a basic solution, has a pH of 7.0, because it contains both hydronium and hydroxide ions in equal, though minute, amounts. We call chemicals that cause the formation of excess hydronium when dissolved in water ACIDS and chemicals that cause the formation of excess hydroxide when dissolved in water BASES.[21]

Hydronium and hydroxide are antagonists and hence their concentrations are always related by a single mathematical formula. The difference between the two ions is a hydrogen cation. Removal of a hydrogen cation (H^+) from a molecule of water (H_2O) gives hydroxide (OH^-), while addition of a hydrogen ion to a molecule of water gives hydronium (H_3O^+). For this reason, we consider hydronium and hydroxide concentrations (acidity and basicity) as two aspects of the same phenomenon, not as separate, unrelated chemical properties.

As crops and other plants absorb nutrients in dissolved form from the soil solution, acidity is highly important for crops as well. The pH of any soil is a consequence of the various chemicals in the soil (principally salts, discussed next), which react with water as they dissolve and cause the movement of hydrogen ions, resulting in the formation of either excess hydronium or excess hydroxide. The net effect is reflected in pH of the soil solution. Soil pH is one of the most fundamental and important chemical properties of soil, as it underlies the chemical and biological functioning of the soil. Essential plant nutrients are maximally available at or close to pH 7.0. Hence, a soil pH between 6.6 and 7.3 is best for essentially all crops. Slightly alkaline soils, having a pH of 7.4 to 7.8, are generally not detrimental to crops, except very alkali-sensitive crops, if properly managed to avoid nutrient deficiencies. However, few crops can produce optimal yields growing in soil of pH approximately 7.9 or higher, which is considered moderately alkaline. Alkaline soils are typically found in arid regions, where basic salts have accumulated over geologic time. Slightly, moderately, and strongly alkaline soils are common throughout California. Acid soils, having a pH of less than 6.5, are less common in California than other parts of the USA. Increasing soil acidity (the pH decreases) is associated with reduced availability of phosphorus, calcium and magnesium deficiencies, manganese toxicity, restricted root growth or regeneration due to aluminum toxicity, reduced efficiency of N and K use, poor response to N and K fertilizers, and reduced populations

[21] To be precise, such acids or bases are Arrhenius acids or Arrhenius bases in chemistry. Other, more general definitions of acids and bases used by chemists are of no relevance to the soil chemistry discussed in this report.

Term	Indicated pH range
ultra acid	<3.5
extremely acid	3.5–4.4
very strongly acid	4.5–5.0
strongly acid	5.1–5.5
moderately acid	5.6–6.0
slightly acid	6.1–6.5
neutral	6.6–7.3
slightly alkaline	7.4–7.8
moderately alkaline	7.9–8.4
strongly alkaline	8.5–9.0
very strongly alkaline	>9.0

Table 8.2 The system for describing soil acidity or basicity used by USDA soil scientists.

of soil bacteria. Applying agricultural lime, calcium carbonate, to the soil in specific quantities is an age-old method to amend and neutralize highly acid soils.

8.4 Salts, salinity, and electrical conductivity

The soil samples have been analyzed for electrical conductivity of the soil solution (a measurement of salinity, that is, quantity of salts present).

In chemistry, a SALT is an ionic compound consisting of an anion (negatively charged ion) and a cation (positively charged ion) other than hydronium or hydroxide. In aggregate, the salt is electrically neutral as the negative charge of the anion is balanced by the positive charge of the cation. Ions always occur in soil in such an balanced form, as soil has no net electrical charge. There are many types of salts that dissolve readily in water, and hence are important components of the soil solution.[22] Other salts are somewhat soluble, contributing to the composition of the soil solution by dissolving partially. All plant nutrients are salt-forming ions of some sort (see table 8.3). The pH of the soil solution is largely determined by the proportions and quantities of the various salts present — salts can be acidic (causing soil pH to decrease), neutral (not affecting soil pH), or basic (causing soil pH to increase).

The property SALINITY indicates the quantity of salts dissolved in the soil solution. Total salinity is determined indirectly by measuring the ELECTRICAL CONDUCTIVITY of the soil solution. Pure water does not conduct electricity, while water containing ions of dissolved salts does because of the electrical charge of the ions. Therefore, the electrical conductivity of the soil solution is a measurement of the quantity of dissolved salts and can be used to estimate the effect of those salts on plant growth. It is measured in decisiemens per meter ($dS \cdot m^{-1}$). Alternatively, the measurement can be expressed as millimhos per centimeter (abbreviated $mmho \cdot cm^{-1}$); these two units are exactly equivalent.

As plant nutrients are ions that necessarily contribute to salinity, some degree of electrical conductivity in a soil is desirable. However, excessive salinity is toxic to plants. The critical

[22] Common table salt is just one of the many possible salts, in the chemical sense of the word, consisting of sodium (the cation) and chloride (the anion).

Element	Importance	Ionic form in soil
nitrogen	primary macronutrient	NH_4^+, NO_3^-, NO_2^-
phosphorus	primary macronutrient	HPO_4^{2-}, $H_2PO_4^-$
potassium	primary macronutrient	K^+
sulfur	secondary macronutrient	SO_4^{2-}
calcium	secondary macronutrient	Ca^{2+}
magnesium	secondary macronutrient	Mg^{2+}
zinc	micronutrient	Zn^{2+}
manganese	micronutrient	Mn^{2+}
copper	micronutrient	Cu^{2+}
iron	micronutrient	Fe^{2+}, Fe^{3+}
boron	micronutrient	$H_2BO_3^-$

Table 8.3 Plant nutrients found in soil, which occur as salt-forming ions.

Class	Electrical conductivity ($dS \cdot m^{-1}$)
non-saline	0–2
very slightly saline	2–4
slightly saline	4–8
moderately saline	8–16
strongly saline	>16

Table 8.4 Descriptive classes of soil salinity used by USDA soil scientists.

threshold is 2 $dS \cdot m^{-1}$, above which problems due to salinity will occur for sensitive crops. Many common crops are salt-sensitive. Increasing problems for plant growth are expected as the levels rise above 2.0. At this level the total amount of salts in the soil will be toxic to sensitive plants and will restrict the growth of moderately tolerant plants. Most crops are adversely affected when salinity exceeds 3 $dS \cdot m^{-1}$. Only highly salt-tolerant plants can grow optimally well under these conditions.

8.5 Cation-exchange capacity and exchangeable-cation percentages

The soil samples have been analyzed for cation-exchange capacity and exchangeable-cation percentages.

Besides existing as part of a salt, cations are also found within the soil adsorbed onto clay particles and organic matter (discussed in section 8.9 on page 53), which have negatively charged surfaces that counterbalance the positive charge of the cations. The negatively charged surface sites on these soil particles are known as CATION-EXCHANGE SITES, because these sites typically hold cations until they are replaced by another cation of equivalent charge. This holding capability means that cation-exchange sites are a reserve of plant nutrients, which are released slowly into the soil solution as plant growth removes cations from the soil solution. The quantity of cation-exchange sites found in a portion of soil is known as the CATION-EXCHANGE CAPACITY, measured

in milliequivalents per 100 grams, abbreviated meq · (100 g)$^{-1}$. The higher the cation-exchange capacity of a soil is, the greater is its nutrient-holding capacity.

The specific identity of the cations occupying the cation-exchange sites strongly affects soil structure. Hence, the soil samples have been analyzed for their EXCHANGEABLE-CATION PERCENTAGES, meaning the percentage of all cation-exchange sites occupied by each type of cation. The three cations that mostly strongly affect soil structure are calcium (Ca^{2+}), magnesium (Mg^{2+}), and sodium (Na^{+}). When soil structure is good, soil particles bind to each other and to soil organic molecules electro-chemically to form a matrix with many small voids (pore spaces) for circulation of water and air. Calcium and magnesium cations are an essential structural component of the soil matrix, making such aggregation possible. A two-to-one ratio of calcium cations to magnesium cations occupying cation-exchange sites leads to aggregation with an optimal structure. When the ratio of calcium to magnesium cations is less than two-to-one (in other words, when excess magnesium is present), the manner of aggregation is less than optimal.

The exchangeable cation percentage of sodium is perhaps of even greater importance, because the presence of sodium in the soil is purely negative — as the percentage of sodium increases in the soil, the poorer the soil structure and water-holding capacity. High-sodium, or SODIC, soils tend to stay wet longer than low-sodium soils, and thus are sometimes observed to puddle. In sodic soils plant growth is retarded or ceases. Sodium has the electro-chemical property that it can readily displace calcium and magnesium in the soil matrix. By adsorbing to the soil particles, sodium disintegrates soil aggregates and collapses the pore spaces. The resulting soil mass is amorphous and low in permeability due to its lack of porosity. Most crops fare poorly in soils containing more than five percent exchangeable sodium. As sodium rises above this level, problems with soil structure and water availability problems increase. Soil amendments such as gypsum (calcium sulfate) can be used to modify sodic soils, alleviating the poor structure, the puddling, and the lack of oxygen and nutrients.

8.6 Plant nutrients

The soil samples have been analyzed for plant-nutrient content.

The elements nitrogen, phosphorus, and potassium (N, P, and K) are said to be the PRIMARY PLANT MACRONUTRIENTS because they are required in high amounts compared to all other plant nutrients. These are the typically the main yield-limiting nutrients in agriculture and hence are the focus of any fertilization program.

Nitrogen, the most important yield-limiting nutrient, is absorbed by plants in the form of ammonium (NH_4^{+}) cations or nitrate (NO_3^{-}) anions; these forms are known as ORGANIC NITROGEN.[23] Elemental (inorganic) nitrogen is ubiquitous in nature, composing approximately 78 percent of air as the gas N_2, but most crop plants cannot use it in that form.[24] Test results for nitrogen have not been given, as ionic nitrogen is highly mobile in the soil and a test now would not predict nitrogen needs in the future.

Fertilizers are labeled with an N-P-K RATING, a combination of three numbers describing its content of usable nitrogen, phosphoric anhydride (P_2O_5 or P_4O_{10}) or equivalent, and potassium oxide (potash, K_2O) or equivalent. You can think of the numbers as the percent of the weight of the fertilizer consisting of each of the three plant nutrients. As the phosphorus and potassium

[23] An additional form of organic nitrogen is the nitrite anion, NO_2^{-}. This ion is not absorbed by plants, and is in fact toxic, but can be converted to nitrate by soil-resident bacteria.

[24] Legumes, such as alfalfa, peas, beans, and vetch, are an exception. These plants are capable of using atmospheric nitrogen gas under proper conditions by associating with bacteria that perform the required conversion into ionic nitrogen.

content are expressed as oxides not as the elements themselves for historical reasons, it is necessary to multiply the phosphorus rating by .436 and the potassium rating by .84 to obtain the actual content of these nutrients.[25] For example, applying one hundred pounds of ammonium phosphate, rated 11-48-0, to one acre of land would supply 11 pounds per acre of nitrogen, 20.9 pounds ($48 \times .436$) per acre of phosphorus, and no potassium.

In addition to their importance in forming soil structure, calcium (Ca^{2+}) and magnesium (Mg^{2+}) are also nutrients used in substantial amounts by plants, though in lesser amounts than the primary macronutrients. Magnesium is a component of chlorophyll. Another nutrient required in substantial amounts is sulfur, whose plant-available form is sulfate ($SO_4{}^{2-}$). Calcium, magnesium, and sulfur are the three SECONDARY MACRONUTRIENTS. Of these three, sulfur is needed in somewhat greater quantities than the others.

Manganese (Mn^{2+}), zinc (Zn^{2+}), copper (Cu^{2+}), iron (Fe^{2+} or Fe^{3+}), and boron ($H_2BO_3{}^-$) are PLANT MICRONUTRIENTS. While essential for crops to grow, these are needed in small amounts only and can be toxic when present in excess. The potential problems from excessive boron are discussed in the next section.

8.7 Boron

The soil samples have been analyzed for boron content.

Boron, the fifth element of the periodic table of elements, is a micronutrient needed in trace amounts by plants, at approximately one part per million (ppm) in soil. A boron level above 1.0 ppm indicates a need for management to avoid boron accumulation, although is it not an immediate cause for concern below 3.0 ppm, unless irrigation water is also high in boron. At concentrations beginning around 3 ppm, boron damages sensitive plant species. Most crop plants are boron-sensitive; see table 8.5 for the boron tolerance of selected crops.[26] As its concentration increases above 4 ppm, rapidly toxicity increases.[27][28] In the amounts that can be tolerated by plants, boron has no measurable effect on the physical properties of soil or on soil salinity.

Symptoms of boron toxicity include retarded growth, brown leaf margins, and death of shoots. Its presence in soil at levels toxic to plants is rare worldwide, although it is not uncommon in California due to the commonality of high-pH soils.

Soluble soil boron exists largely as the dihydrogenborate anion ($H_2BO_3{}^-$) or as boric acid (H_3BO_3). Under basic conditions (high pH), the tetrahydroxyborate ion, $B(OH)_4{}^-$, forms. Salts of tetrahydroxyborate are sparingly soluble. Hence, irrigation or drainage water high in dissolved boron applied to basic soil tends to result in boron being deposited in the soil. Over time, large concentrations of boron can accumulate, leading to toxicity to crops. The original source of boron in water may be volcanoes or ancient marine salt deposits. Basic (alkali) soils are typically found in semi-arid or arid regions, where the problem of boron accumulation is compounded by a shortage of rainfall that would otherwise mitigate the problem by leaching some boron out of the soil. Large expanses of boron-laden soils exist in the arid parts of the world, such as Australia, the Middle East, and the Mojave Desert of southern California. Borax (boron ore) is mined in the Mojave Desert.

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[25] Phosphoric anhydride consists of 57.4 percent oxygen and 43.6 percent phosphorus by weight. Potassium oxide consists of 17 percent oxygen and 83 percent potassium by weight.

[26] See: Tanji, K, and Kielen, N. *Agricultural drainage water management in arid and semi-arid areas* (FAO irrigation and drainage paper no. 61). Food and Agriculture Organization of the United Nations (2002). ISBN 92-5-104839-8.

[27] Ayers, Robert. *Quality of water for irrigation.* In: *Journal of the irrigation and drainage division*, June 1977, page 136, table 1, "Guidelines for interpretation of water quality for irrigation".

[28] Nable, R.O.; Bañuelos, G.S.; and Paull, J.G. *Boron toxicity.* In: *Plant and soil*, issue 193, pp. 181–198 (1997).

Crop	Boron sensitivity	Salinity sensitivity
alfalfa	tolerant	somewhat sensitive
almond	sensitive	sensitive
blackberry	very sensitive	sensitive
corn	somewhat tolerant	somewhat sensitive
grape	sensitive	somewhat sensitive
lemon	very sensitive	sensitive
pistachio	tolerant	somewhat sensitive
sorghum	very tolerant	somewhat tolerant
sunflower	sensitive	somewhat tolerant
tomato	tolerant	somewhat sensitive
purple vetch	tolerant	somewhat sensitive
walnut	sensitive	sensitive
wheat	sensitive	somewhat tolerant

Table 8.5 Boron and salinity tolerance of selected crops. The maximum boron concentration in irrigation water or soil solution before yields are reduced is 0.3 (mg B) $\cdot$ L^{-1} for boron-sensitive crops, 1–2 (mg B) $\cdot$ L^{-1} for semi-tolerant crops, and 2–4 (mg B) $\cdot$ L^{-1} for boron-tolerant crops. Salinity-sensitive crops may have reduced yields where salinity exceeds 2 dS $\cdot$ m^{-1}. Yield reductions for somewhat-sensitive crops begin at 3 dS $\cdot$ m^{-1}; for somewhat-tolerant crops, at 6 dS $\cdot$ m^{-1}.

In acidic conditions, boric acid and salts of dihydrogenborate are the predominant forms of boron in soil. Due to their high solubility, these forms of boron readily enter the soil solution and can then be leached out of soil. Hence, excessive boron is rarely a problem with acidic soils. Wherever soil is acidic and there is substantial rainfall (for example, in the Pacific Northwest and the eastern USA), boron deficiency can be observed.

8.8 Sodium

The soil samples have been analyzed for sodium content.

The detrimental effect of sodium on soil structure has already been discussed in the context of exchangeable-cation percentages (section 8.5). Sodium is not used as a nutrient by most plants, although it is an essential nutrient for humans and other animals. Sodium is directly toxic to plants in sufficient amounts. However, at the levels typically encountered in agricultural soils, its direct toxicity is not the principle concern. Rather, its undesirability comes from its effect on soil structure and from its contribution to total salinity.

8.9 Organic matter

The soil samples have been analyzed for percent organic matter.

Organic matter in soil originates from the remains of plant and animal matter that have partially decomposed. Its main source in agriculture is crop residue. Much soil organic matter exists in the form of HUMIC ACID, which consists of very large organic molecules of variable structure with numerous ion-exchange sites, which contribute to the cation-exchange capacity of the soil. Humic acid is reasonably stable in soil unless unfavorable management practices, such as excessive

tillage or overfertilization, accelerate its decay. The beneficial properties of soil organic matter for agriculture are numerous, including moderating pH, retaining water and plant nutrients, and improving soil structure.[29] Soil organic matter also contains a reserve of organic nitrogen, which is released slowly and can be used by crops.

The organic-matter content of soil is highly susceptible to either improvement (increase) or worsening (decrease) depending on management.

[29] *The importance of soil organic matter: Key to drought-resistant soil and sustained food and production* (FAO soils bulletin no. 80). Food and Agriculture Organization of the United Nations (2005). ISBN 92-5-105366-9.

9 Appendix: Consultant qualifications

Qualifications of Gregory A. House

Agricultural Consultant
Agronomist
Professional Farm Manager
Rural Appraiser
Farmer

Experience

Agricultural Consultant, House Agricultural Consultants, providing agricultural science, economics, management, and appraisal services, 1983–present

Farmer, 1987–present. Organic apples, peaches, cherries, apricots, and field crops

Corporation Secretary & Consulting Agronomist, Hannesson, Riddle & Associates, Inc., 1977–1983.

Professional Affiliations

- American Society of Farm Managers & Rural Appraisers
- American Society of Agronomy
- Crop Science Society of America
- Soil Science Society of America
- California Certified Organic Farmers
- California Farm Bureau

Accreditations

- Accredited Farm Manager (A.F.M.), American Society of Farm Managers & Rural Appraisers, Certificate #501
- Certified Professional Agronomist (CPAg.), American Registry of Certified Professionals in Agronomy, Crops. & Soils, Ltd. Certificate # 2319
- Certified Crop Advisor (CCA), American Registry of Certified Professionals in Agronomy, Crops. & Soils, Ltd.
- Accredited Rural Appraiser (A.R.A.), American Society of Farm Managers & Rural Appraisers, Certificate #749
- Certified General Appraiser, State of California License # AG 001999

These credentials have continuing education requirements with which I am in compliance.

Qualifications of Gregory A. House, continued

Education

- B.S., Crop Ecology, University of California, Davis, 1975, with Honors
- Numerous courses from the University of California Extension in agricultural economics, crop management, real estate, & hazardous waste management
- Courses of the American Society of Farm Managers and Rural Appraisers:
  - Principles of Rural Appraisal
  - Advanced Rural Appraisal
  - Eminent Domain
  - Report Writing School
  - Economics of Farm Management
  - Principles of Farm Management
  - Standards and Ethics
  - Permanent Plantings Seminar
  - Standards and Ethics for Farm Managers
  - ASFMRA Code of Ethics
  - National Uniform Standards of Professional Appraisal Practice
- Courses of the Appraisal Institute:
  - Basic Valuation Procedures
  - Real Estate Statistics and Valuation Modeling
  - Advanced Income Capitalization
  - Valuation of Conservation Easements Certificate Program
  - Condemnation Appraising: Principles and Applications

Expert Witness Court Testimony

- Superior Court Qualified Expert Witness in the following California counties: Alameda, Colusa, Fresno, Madera, Monterey, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Sonoma, Sutter
- United States Tax Court Qualified Expert Witness
- United States Bankruptcy Court Qualified Expert Witness
- A list of depositions and trial appearances is available upon request

Qualifications of Gregory A. House, continued

Appointments & Activities

- Instructor, "Principles of Farm Management", an Internet course of the American Society of Farm Managers and Rural Appraisers, 1996 to 2007
- President, California Chapter American Society of Farm Managers & Rural Appraisers 1994–1995; Secretary-Treasurer, 1984 to 1990
- Board of Directors, Yolo Land Trust, 1993–2001
- Board of Directors, American Red Cross, Yolo County Chapter 1987–1989
- Member, Yolo County Right to Farm Grievance Committee 1992–1995
- Vice Chairman, Management Education Committee, American Society of Farm Managers and Rural Appraisers, 1998–2000 (committee member since 1986)
- Yolo County LAFCo Agricultural Forum LESA subcommittee, 1999
- California Certified Organic Farmers

  Treasurer of the Board of Directors, 1998–2003

  Executive Director, 1999-2000

  Chairman of Certification Committee, Yolo Chapter, 1993-2005

  Member of the Finance Committee, 1998-current
- CCOF Foundation Going Organic Program, Management Team member and Chapter Leader, 2006-current
- USDA Organic Grant Panel member, 2002
- City of Davis Open Space and Habitat Commission, Chairman, 2006–current
- Member, Fruit Orchard Technical Advisory Group, Filoli Gardens, Woodside, California
- Member, Organic and Sustainable Agriculture Program Steering Committee, University of California Cooperative Extension, Yolo and Solano Counties, California, 2008-current

Awards

- CCOF Presidential Award, California Certified Organic Farmers, February, 2001
- Meritorious Service in Communications, American Society of Farm Managers and Rural Appraisers, November 2004
- H.E. Buck Stalcup Excellence in Education Award, American Society of Farm Managers and Rural Appraisers, October, 2011

Qualifications of Gregory A. House, continued

Speaking Engagements

- Guest Lecturer, University of California at Davis, Agricultural Economics 145, Farm and Rural Resources Appraisal, on professional farm appraisal (1985–1997)
- Guest Lecturer, University of California at Davis, Agricultural Economics Department, Course 140, "Farm Management", on adoption of new technologies, farm budgeting, cash flow management, cost accounting, etc. (1985–present)
- Guest Lecturer, University of Florida at Gainesville, Vegetable Crops Department, seminar on transition to organic agriculture, (November, 1994)
- Featured Speaker, 1995 Eco-Farm Conference, Asilomar, California , on economics of organic apple production
- Guest Speaker, Community Alliance with Family Farmers, on farm management and agricultural economics, 1996 and 1997
- Instructor, American Society of Farm Managers and Rural Appraisers, Course M-12, "Standards and Ethics for Professional Farm Managers", March, 1997
- Guest Speaker, American Horticultural Society, "Challenges of Organic Stone Fruit Production", Sacramento, California, July 2001
- Organizer and Presenter, Going Organic Kickoff Meetings, November 2005 and December 2006
- Master of Ceremonies, California Certified Organic Farmers, Annual Meeting, February, 2006, Sacramento, California
- Featured Speaker, 2012 Eco-Farm Conference, Asilomar, California , "Imitating Natural Systems: Towards an Indigenous Agro-forestry"

Publications

- "Principles of Farm Management", Course M-10, a 40-hour professional credit Internet educational offering of the American Society of Farm Managers & Rural Appraisers
- "Conservation Issues in Agriculture", a unit of Course M-25, a 15-hour professional credit Internet educational offering of the American Society of Farm Managers & Rural Appraisers
- "A Primer on Organic Agriculture," an article in *2006 Trends in Agricultural Land and Lease Values*, a publication of the California Chapter of the American Society of Farm Managers & Rural Appraisers
- "Case Study: Using Indigenous Agroforestry Management Techniques to Support Sustainability in Production Agriculture", a paper-poster presented at Harlan II, An International Symposium on Biodiversity in Agriculture: Domestication, Evolution and Sustainability, September 14-18, 2008, University of California, Davis

Qualifications of Henry House

Experience

Agricultural Consultant, House Agricultural Consultants, providing agricultural science, economics, management, and appraisal services, 1999–present

Education

- B.S., Natural History, University of California, Davis, 1999, with Honors, coursework in agronomy, botany, ecology, entomology, geology, hydrology, nematology, plant pathology, pomology, soil biology, sustainable agriculture, statistics, and wildlife biology
- Numerous courses from the Appraisal Institute

Appointments

- Assistant instructor, "Principles of Farm Management", an Internet course of the American Society of Farm Managers & Rural Appraisers, current
- Course proctor, "M-25: Enhanced Client Services", an Internet course of the American Society of Farm Managers & Rural Appraisers, current
- Board of Directors, Davis Farmers Market Association, 2001–2003
- Board of Directors, Linux Users' Group of Davis, 2000–present
- Volunteer for U.C. Davis Arboretum, 1996–present

Professional Skills

- GIS technology including raster and vector analysis
- Statistical Analysis including regression analysis and anova
- Computer programming languages: C, C++, Ruby, and Perl

House Agricultural Consultants
Partial Listing of Clients Served

Allied Insurance Group

American Farmland Trust

Bank of America

City of Davis

City of Fairfield

City of Sacramento

Continental Casualty Company
Chicago, Illinois

County of Solano

County of Yolo

Downey, Brand, Seymour & Rohwer
Sacramento, California

Glenn-Colusa Irrigation District

Hamel Ranch Partnership
Davis, California

Farmers' Home Administration (U.S.D.A.)
Sacramento, California

McMahon-Graf Partners
Winters, California

Morrison & Foerster
San Francisco, California

Oakdale Irrigation District

Pajaro Valley Water Management Agency
Watsonville, California

Republic Indemnity Company of America
San Francisco, California

Royal & Sun Alliance

Sacramento Valley Farm Credit Banks
Woodland, California

San Andreas Farms
Fresno County, California

San Joaquin Council of Governments

San Luis Delta Mendota Water Authority

Sanwa Bank, N.A

Stanford University

State of California, Department of Fish & Game, Wildlife Conservation Board

State of California, Department of Justice

The Nature Conservancy

The Prudential Agricultural Group
Sacramento, California

The Travelers Insurance Company

The Trust for Public Land

United States Fish & Wildlife Service

United States Department of Justice

United States Department of Treasury, Internal Revenue Service

University of California, Davis

Wells Fargo Bank, N.A.

10 Appendix: Exhibits

STATE OF CALIFORNIA – NATURAL RESOURCES AGENCY EDMUND G. BROWN, JR., *GOVERNOR*

CALIFORNIA COASTAL COMMISSION
NORTH COAST DISTRICT OFFICE
710 E STREET • SUITE 200
EUREKA, CA 95501-1865
VOICE (707) 445-7833
FACSIMILE (707) 445-7877

July 18, 2011

Bob Hartstock
P.O. Box 319
The Sea Ranch, CA 95497

SUBJECT: Information needed for *de novo* review of Appeal No. A-1-MEN-09-034 (Michael Marr & Judith Malin), Proposed 2,524-Square-Foot Single-Family Home with 2,138-Square-Foot Accessory Structure and Related Development at 2800 North Highway One, Albion, Mendocino County

Dear Mr. Hartstock:

Thank you for your recent submittals addressing proposed and past uses of the subject parcel (APN 123-350-06). The information you submitted has raised some additional questions regarding the consistency of the proposed development with the agricultural policies of the Mendocino County LCP, requiring further information and clarification to complete our analysis of the project's consistency with the agricultural policies of the certified LCP and to prepare a recommendation for review by the Commission. Therefore, we are requesting that you provide the additional information described below.

The submittal from applicant Mike Marr dated December 17, 2009 and received at our office on December 22, 2009 (and which responds to Commission staff's requested "Information Needed to Evaluate Project Consistency with Coastal Act Section 30010" in the August 27, 2009 staff report), describes the owners' intent for the subject parcel as an "area to build both a workshop and home." The document describes that Mr. Marr "...is a building contractor and wood worker...Mike will be building our home and workshop and once established, he will be working in the community building for others and creating custom cabinetry. The workshop will provide affordable space to work, store equipment and materials and earn an income. Our modest sized home will be a full time residence for Mike and Judy and their son..."

As you are aware, the subject parcel is zoned RL-160 (rangelands, 160-acre minimum). Mendocino County land use plan (LUP) Chapter 2 describes the intent of the rangelands land use classification as follows:

> *The Range Lands classification is intended to be applied to lands which are suited for and are appropriately retained for the grazing of livestock and which may also contain some timber producing areas. The classification includes land eligible for incorporation into Type II Agricultural Preserves, other lands generally in range use, intermixed smaller parcels and other contiguous lands, the inclusion of which is necessary for the protection and efficient management of range lands.* (Emphasis added)

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The 4.17-acre size of the subject parcel is recognized by the County of Mendocino as a legal non-conforming parcel size that cannot be subdivided. Regardless of the parcel size, Mendocino County Coastal Zoning Code (CZC) Section 20.532.100(A)(2) requires supplemental findings to be made to approve development on resource lands designated AG, RL, and FL. These policies require findings to be made by the County or by the Commission on appeal that demonstrate in part the following: (a) The proposed use is compatible with the long-term protection of resource lands[1]; and (b) The project ensures existing land use compatibility by maintaining productivity of onsite and adjacent agricultural lands[2]. These two findings are also needed to find that the proposed development is consistent with LUP Policies 3.2-5 and 3.2-16 as well as Coastal Zoning Code Section 20.532.100(B)(3).

In a memo you submitted dated June 28, 2011, you describe that the subject parcel was previously leased by a landowner with adjacent landholdings for cow grazing from the late 1970's to the late 1990's. The memo describes that at the time, the cows grazed approximately 2 acres of the property. In the same memo, you state, "Because of the small size of the Marr/Malin property, it is not feasible to graze animals on their land. Less than 2 acres have slopes of 5% or less. According to a report from the University of Arizona, College of Agriculture 11/2004 (assuming 450 lbs of forage/acre, far below the USDA average), one 1000 lb cow could graze 2 acres in 15 days. Beyond that, hay and water would have to be trucked in, on a regular basis."

Based upon the information provided, it appears that some agricultural use of the property has occurred in the past. CZC Section 20.532.100(A)(3) mandates the following:

> *Conversion of all other agricultural lands to non-agricultural uses will be prohibited unless it is found that such development will be compatible with continued agricultural use of surrounding lands and at least one of the following findings applies:*
>
> *(a) Continued or renewed agricultural use is not feasible as demonstrated by an economic feasibility evaluation prepared pursuant to Section 20.524.015(C)(3);*
>
> *(b) Such development would result in protecting prime agricultural land and/or concentrate development.*

CZC Section 20.524.015(C)(3), as referenced in the above stated policy, describes the feasibility study requirements as follows:

> *(3) An economic feasibility evaluation prepared by a land use economist with expertise in the economics of agriculture which shall contain the following:*
>
> *(a) An analysis of the gross revenue from the agricultural products grown in the area for the five (5) years immediately preceding the date of the filing of proposed conversion and/or division; and*
>
> *(b) An analysis of the operational expenses beyond the control of the owner/operator associated with the production of the agricultural*

[1] CZC 20.532.100(A)(2)(a)
[2] CZC 20.532.100(A)(2)(g)

products grown in the area for five years immediately preceding the date of the filing of the proposed conversion and/or division.

(c) The economic feasibility analysis shall be reviewed for adequacy by the Department of Planning and Building Services and the County Agricultural Commissioner prior to a determination that the application is complete for processing. If the report is determined inadequate, the applicant shall submit the required information to the satisfaction of the Department of Planning and Building Services and County Agricultural Commissioner. The application will not be considered complete until the feasibility analysis is submitted and deemed acceptable.

(4) For purposes of this subsection "area" means a geographic area of sufficient size to provide an accurate evaluation of the economic feasibility of agricultural uses for those lands included in the Coastal Element. (Ord. No. 3785 (part), adopted 1991)

Section 3.2 of the Mendocino Land Use Plan incorporates by reference Sections 30241 and 30242 of the Coastal Act. Section 30241(b) of the Coastal Act limits conversions of agricultural lands to the periphery of urban areas to the lands where the viability of existing agricultural use is already severely limited by conflicts with urban uses or where the conversion of the lands would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development. This section of the Act applies to situations where urban uses are already compromising the agricultural viability of adjacent agricultural lands by conflicts with urban uses such as light, noise, human activity, stormwater runoff associated with developed areas, and other similar urban use conflicts.

As part of Commission staff's analysis of the proposed project, staff must determine, among other things, whether "the proposed development is in conformity with the certified local coastal program,"[3] and whether "The proposed development is consistent with the purpose and intent of the zoning district applicable to the property, as well as the provisions of this Division and preserves the integrity of the zoning district."[4] Refer to Attachment A for some of the key LCP Policies related to projects proposed on agricultural lands (which includes lands designated RL).

Additional information is needed to evaluate the proposal for consistency with the agricultural protection policies of the LCP. Specifically, additional information is needed to determine whether (a) the proposed development is compatible with the long-term protection of resource lands, and (b) that it maintains the productivity of on-site and adjacent agricultural lands. Furthermore, additional analysis is needed to determine the feasibility of continued or renewed agricultural use of the site, both for grazing and cultivation.

Therefore, please provide an analysis that addresses these key provisions of the agricultural policies of the certified LCP and specifically addresses the following items. The analysis should be prepared by a land use economist with expertise in the economics

[3] CZC Section 20.532.095(A)(1)
[4] CZC Section 20.532.095(A)(3)

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of agriculture (or equivalent professional) and should be large enough in scope to cover surrounding agricultural lands in the coastal zone of Mendocino County. The information provided should include but not be limited to the following:

1. A description of the site characteristics affecting agricultural land use and production. This should include descriptions of
    a. Description of soils (see #2 below);
    b. Water resources (in terms of availability, sources, and water quality issues that impact agricultural operations in the area, such as high mineral content, saltwater intrusion);
    c. Access (in terms of adequacy of access to agricultural operations in the area. If access is problematic, discuss the nature of the conflict; and the impacts the access limitations have on agricultural operation(s));
    d. key variables impacting agriculture
    e. Potential impacts of the proposed development in general, and for each of the proposed structures (residence and workshop/guest suite) in particular, on agricultural food production both on-site and on the adjoining agricultural lands.
    f. whether available lands on the parcel not suitable for agriculture are being developed before converting agricultural lands;
    g. an analysis of whether and how the viability of agricultural uses is severely limited by conflicts with urban uses;
2. <u>Soils Characterization of Subject Site and Surrounding Rangelands.</u> Provide:
    a. A description of the soils in the area, including a current soil classification map showing soil types found both at the subject parcel and on other designated rangelands in the area;
    b. Storie index and capability classification ratings or equivalent ratings of all identified soil types (as published by the NRCS, United States Department of Agriculture);
    c. The expected AUM (animal unit per month) yield for each soil type.
    d. The expected net dollar return for potential crops (tree crops, row/field crops) grown on each soil type.
3. <u>Other Agricultural Uses.</u>
    a. Discuss opportunities for cooperative agreements with neighboring properties (for example, whether this parcel could be leased to other ranchers, including the adjacent parcel, for grazing).
    b. Identify agricultural uses in the area that are not dependent upon the soil (e.g., greenhouse-based cultivation, small-scale poultry operations, apiary, etc.), if any, and, the location and nature of their operation(s).

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4. Geographic/Historical information. Document the following:
    a. Existing land uses on the site;
    b. Adjacent land uses;
    c. Potential effects of the proposed agricultural land conversion or development on agricultural food production, both short-term and long-term; and recommendations and conclusions of the development's effects on existing or potential agricultural production;
    d. Description of factors such as slope, temperature, adequate sunlight, length of growing season, precipitation, coastal winds, soil quality (depth, drainage, capability classification rating, texture, development, unique qualities) affecting agricultural operations in the area.
    e. Description of management techniques currently used, or that could be used, to improve soil quality for agricultural operations.
    f. Identification of agricultural operations that utilize more than one parcel for production in the area, and identification of the current agricultural practices and average acreage for each individual operation.
    g. Description of the relationship or proximity of agricultural and urban land uses.
    h. The types of agricultural operations that have taken place in the area in the past and where have they occurred.
5. Operational expenses. For the subject property, provide an analysis of the costs that would be associated with grazing, livestock, and producing crops grown in the Mendocino coastal zone, and include the following:
    a. Fixed costs for each livestock and crop type, assumed to be constant regardless of the annual yield, based solely on current costs and not speculative on potential future circumstances. Note: Land costs are not to be included into the cost analysis pursuant to Coastal Act Section 30241.5.
    b. Capital costs including:
        i. Land improvements (i.e., fences, roads, clearing, leveling, wells and pumps, etc.
        ii. Equipment, i.e. trucks, tractors, buildings, special equipment (e.g. irrigation), etc.
        iii. Herd expenses, i.e., payment for bulls and heifers; and
        iv. Miscellaneous expenses. Cost determination must also include depreciation and interest expenses.
    c. Cultivating cost including operating costs for:
        i. Labor (i.e., the amount of hours necessary for planting and the rate of pay per hour including benefits;

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ii. Materials, i.e., water, seed, feed supplements, salt, fertilizer, and pesticides;

iii. Machinery;

iv. Fuel and repair; and

v. Outside consultants (i.e., veterinary and management).

d. Variable costs. The harvest costs based on the amount of yield only, expressed as the cost per unit of yield (e.g., tons, bushels, 100 weight, or pounds).

6. Gross revenue. Provide:

a. Economic evaluation of the gross revenue and operational costs, excluding land values, of the livestock and crops in the geographic area of the proposed land conversion

b. An analysis of the gross revenue from the agricultural products grown in the area for the five (5) years immediately preceding the date of the filing of proposed development factoring in the appropriate Producer Price Index (PPI) value to account to inflation over time.

7. Evaluations incorporating cost and revenue figures. Provide information regarding:

a. The requisite minimum acreage for continued viable agricultural operation (farm family approach). Demonstration of continued viability shall be based upon:

i. A determination of projected net income, taking into account production costs by crop computed on a per acre basis and subtracted from gross market receipts expected from that crop. The resulting farmer income per acre of productive land shall then be divided into the county's median income figure to compute the number of acres required to support a farm family; or

ii. A determination of net return per acre, per crop type, for the area only by crop type. The gross revenue per acre for subject crop types as listed in the County Agricultural Commissioner's annual report subtracting the cost per acre associated with each crop type.

Again, thank you for your cooperation in providing the above-listed items. If you have any questions, please don't hesitate to call me at 445-7833.

Sincerely,

SIGNATURE ON FILE

TAMARA L. GEDIK
Coastal Program Analyst

cc: Mike Marr and Judith Malin

ATTACHMENT A

LCP EXCERPTS

(emphasis added)

I. Agriculture LCP Policies

"Agriculture Issues" narrative of Mendocino County Land Use Plan (LUP) **Section 3.2** states the following:

> *Coastal terraces and bottom land historically were farmed in small units by families dependent on agriculture for their livelihood. Potatoes, truck crops, hogs, poultry, beef cattle and dairies did well and farm products were sold both locally and outside the area. However, in the past 30 years, government regulations and technological changes in food processing and trucking have encouraged large-scale, centralized agricultural operations, ill-suited to the coast's small areas of prime soils, relatively small land holdings, and family-run enterprises. Since the late 1960's, commercial coastal agriculture has consisted primarily of livestock and dairy farms and flower and plant nurseries.*
>
> *Several physical and market factors limit agricultural production in the coastal zone, including insufficient soil depths; excessive or irregular drainage; lack of water; a cool climate; predation of livestock; isolation from agricultural support services; limited labor availability; and small parcels.*
>
> *About 3,500 acres of land in the coastal zone are tilled, irrigated or cropped, mostly for forage. Milk production has been reduced to three dairies, and former dairy operators are raising replacement dairy heifers. There are 40 livestock operators in the coastal zone, raising 1,200 head of beef and 4,300 sheep. However, only one quarter of these farms are operated as the fulltime occupation of their owners. Full-time operations are concentrated between Elk and Point Arena, where the largest areas of prime soils are found. Elsewhere, highly productive soils are found only in small patches, rendering full-time farming uneconomical at this time. North of the Navarro River, agricultural activity has been affected by residential development. This trend is not significant in the Point Arena area, but some farmers, uncertain about the continued viability of agriculture in the coastal zone, may have deferred capital investment. The land use policies of the Coastal Element, with its emphasis on the preservation and enhancement of agriculture, should encourage these landowners to maintain their farms in production.*
>
> *Coastal agriculture includes several nurseries principally raising fuchsias, azaleas, and rhododendrons. Forty acres near Caspar supports daffodils, suggesting a potential for a bulb industry similar to that in Del Norte County. Many farms sell produce locally and many residents are industrious part-time*

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fruit and vegetable farmers. For raising sheep and cattle, the minimum parcel size required to support an operator varies from year to year, depending upon livestock prices.

Only 10 ranches have "full-time" acreage and are operated as a principal source of income. Minimum parcel sizes for field crops are smaller-about 10 acres of specialty vegetables and general crops is sufficient to realize a return on the cost of production and labor. Marketing is a primary constraint: a few growers could saturate the local market, while a large total acreage (perhaps as many as 1,000 acres of a crop such as brussel sprouts) would be necessary to make marketing outside the County economically feasible.

There are two main barriers to assembling parcels of a size sufficient for profitable, full-time farming. Land division and conversion to non-agricultural uses has progressed in certain sections of the coast to the point that consolidation to raise livestock is no longer practical. In other areas, property owners, anticipating subdivision of their Williamson Act lands, ask high prices of would-be buyers.

However, the outlook for coastal agriculture in Mendocino may not be as bleak as the previous discussion implies. Small-scale or part-time farming could become more practical if current agricultural trends change. Energy costs could increase to the point that local production of food becomes competitive. Indeed, many residents stress that coastal agriculture is not dead but growing in directions other than toward large-scale, one-crop farming.

Offering Williamson Act tax benefits to small agricultural parcels is seen by many residents as a potential means of encouraging local agriculture. Although the Board of Supervisors has accepted parcels as small as 10 acres at a few locations, allowing small parcels that are primarily used for rural residential purposes into an agricultural preserve could invite a legal challenge. The County has received few applications for Williamson Act contracts from coastal property owners since Proposition 13 diminished potential tax benefits. However, if there is a dramatic rise in the assessed value of coastal land when ownership changes, Williamson Act contracts will become increasingly attractive.

LCP Policies

LUP Chapter 2 describes the intent of the RL (rangelands) land use classification as follows:

The Range Lands classification is intended to be applied to lands which are suited for and are appropriately retained for the grazing of livestock and which may also contain some timber producing areas. The classification includes land eligible for incorporation into Type II Agricultural Preserves, other lands generally in range use, intermixed smaller parcels and other contiguous lands,

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the inclusion of which is necessary for the protection and efficient management of range lands.

Coastal Act Section 30241 "Prime agricultural land; maintenance in agricultural production" (incorporated by reference in LUP Chapter 3.2) states:

The maximum amount of prime agricultural land shall be maintained in agricultural production to assure the protection of the areas' agricultural economy, and conflicts shall be minimized between agricultural and urban land uses through all of the following:

(a) By establishing stable boundaries separating urban and rural areas, including, where necessary, clearly defined buffer areas to minimize conflicts between agricultural and urban land uses.

(b) By limiting conversions of agricultural lands around the periphery of urban areas to the lands where the viability of existing agricultural use is already severely limited by conflicts with urban uses or where the conversion of the lands would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development.

(c) By permitting the conversion of agricultural land surrounded by urban uses where the conversion of the land would be consistent with Section 30250.

(d) By developing available lands not suited for agriculture prior to the conversion of agricultural lands.

(e) By assuring that public service and facility expansions and nonagricultural development do not impair agricultural viability, either through increased assessment costs or degraded air and water quality.

(f) By assuring that all divisions of prime agricultural lands, except those conversions approved pursuant to subdivision (b), and all development adjacent to prime agricultural lands shall not diminish the productivity of such prime agricultural lands.

(Amended by: Ch. 1066, Stats. 1981; Ch. 43, Stats. 1982.)

Section 30241.5 Agricultural land; determination of viability of uses; economic feasibility evaluation

(a) If the viability of existing agricultural uses is an issue pursuant to subdivision (b) of Section 30241 as to any local coastal program or amendment to any certified local coastal program submitted for review and approval under this division, the determination of "viability" shall include, but not be limited to, consideration of an economic feasibility evaluation containing at least both of the following elements:

(1) An analysis of the gross revenue from the agricultural products grown in the area for the five years immediately preceding the date of the filing of a proposed local coastal program or an amendment to any local coastal program.

(2) An analysis of the operational expenses, excluding the cost of land, associated with the production of the agricultural products grown in the area for the five years immediately

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preceding the date of the filing of a proposed local coastal program or an amendment to any local coastal program.

For purposes of this subdivision, "area" means a geographic area of sufficient size to provide an accurate evaluation of the economic feasibility of agricultural uses for those lands included in the local coastal program or in the proposed amendment to a certified local coastal program.

(b) The economic feasibility evaluation required by subdivision (a) shall be submitted to the commission, by the local government, as part of its submittal of a local coastal program or an amendment to any local coastal program. If the local government determines that it does not have the staff with the necessary expertise to conduct the economic feasibility evaluation, the evaluation may be conducted under agreement with the local government by a consultant selected jointly by local government and the executive director of the commission.

(Added by Ch. 259, Stats. 1984.)

Coastal Act Section 30241 "Lands suitable for agricultural use; conversion" (incorporated by reference in LUP Chapter 3.2) states:

All other lands suitable for agricultural use shall not be converted to nonagricultural uses unless (l) continued or renewed agricultural use is not feasible, or (2) such conversion would preserve prime agricultural land or concentrate development consistent with Section 30250. Any such permitted conversion shall be compatible with continued agricultural use on surrounding lands.

LUP Policy 3.2-1 states:

All agricultural land use, as represented within the agriculturally designated boundaries on the land use maps, shall be designated AG 60 or RL 160 for the purpose of determining density.

This will support continued coastal agriculture use. One housing unit will be allowed for each existing parcel. Additional dwellings for resident agricultural workers shall be considered as conditional uses, subject to the provisions of this plan.

LUP Policy 3.2-4 states:

Zoning regulations shall not discourage compatible activities that enhance the economic viability of an agricultural operation. These may include cottage industry, sale of farm products, timber harvesting, not subject to the Forest Practices Act and limited visitor accommodations at locations specified in the plan. Visitor accommodations shall be secondary to the agricultural activity. Proposed projects shall be subject to a conditional use permit. Granting of the permit shall require affirmation findings to be made on each of the following standards. The project shall:

- *maximize protection of environmentally, sensitive habitats;*
- *minimize construction of new roads and other facilities;*
- *maintain views from beaches, public trails, roads and views from public viewing areas, or other recreational areas;*
- *ensure adequacy of water, sewer and other services;*
- *ensure preservation of the rural character of the site; and*
- *maximize preservation of prime agricultural soils;*
- *ensure existing compatibility by maintaining productivity of on site and adjacent agricultural lands.*

No permit shall be issued to convert prime land and/or land under Williamson Act to non-agricultural uses, unless all of the following criteria are met:

1. *all agriculturally unsuitable lands on the parcel have been developed or determined to be undevelopable; and*
2. *agricultural use of the soils can not be successfully continued or renewed within a reasonable period of time, taking into account economic, environmental, social, and technological factors (Section 30108 of the Coastal Act); and*
3. *clearly defined buffer areas are developed between agricultural and nonagricultural uses (see Policies 3.2-9, 3.2-12 and 3.2-13); and*
4. *the productivity of any adjacent agricultural lands is not diminished, including the ability of the land to sustain dry farming or animal grazing; and*
5. *public service and facility expansions and permitted uses do not impair agricultural viability, either through increased assessment costs or degraded air and water quality; and*
6. *in addition, for parcels adjacent to urban areas, the viability of agricultural uses is severely limited by conflicts with urban uses, and the conversion of land would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development.*

Coastal Zoning Code (CZC) Section 20.532.095 "Required Findings for All Coastal Development Permits" states:

(A) The granting or modification of any coastal development permit by the approving authority shall be supported by findings which establish that:
(1) The proposed development is in conformity with the certified local coastal program; and
(2) The proposed development will be provided with adequate utilities, access roads, drainage and other necessary facilities; and
(3) The proposed development is consistent with the purpose and intent of the zoning district applicable to the property, as well as the provisions of this Division and preserves the integrity of the zoning district; and

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(4) The proposed development will not have any significant adverse impacts on the environment within the meaning of the California Environmental Quality Act.
(5) The proposed development will not have any adverse impacts on any known archaeological or paleontological resource.
(6) Other public services, including but not limited to, solid waste and public roadway capacity have been considered and are adequate to serve the proposed development.

(B) If the proposed development is located between the first public road and the sea or the shoreline of any body of water, the following additional finding must be made:
(1) The proposed development is in conformity with the public access and public recreation policies of Chapter 3 of the California Coastal Act and the Coastal Element of the General Plan. (Ord. No. 3785 (part), adopted 1991)

Coastal Zoning Code (CZC) Section 20.532.100 "Supplemental Findings" states in applicable part the following:

In addition to required findings, the approving authority may approve or conditionally approve an application for a permit or variance within the Coastal Zone only if the following findings, as applicable, are made:

(A) Resource Protection Impact Findings.
(1) Development in Environmentally Sensitive Habitat Areas.
...

(2) Impact Finding For Resource Lands Designated AG, RL and FL. *No permit shall be granted in these zoning districts until the following finding is made: (a) The proposed use is compatible with the long-term protection of resource lands.*

(B) Agricultural Land Impact Findings.
(1) Development in Agricultural Zones. *No development subject to a coastal development use permit shall be issued on agricultural land until the following findings are made:*
(a) The project maximizes protection of environmentally sensitive habitat areas;
(b) The project minimizes construction of new roads and other facilities;
(c) The project maintains views from beaches, public trails, roads and views from public viewing areas, or other recreational areas;
(d) The project ensures the adequacy of water, waste water disposal and other services;
(e) The project ensures the preservation of the rural character of the site.
(f) The project maximizes preservation of prime agricultural soils;
(g) The project ensures existing land use compatibility by maintaining productivity of onsite and adjacent agricultural lands.

(2) Impact Findings for Conversion of Prime Agricultural or Williamson Act Contracted Lands. *Conversion of prime land and/or land under Williamson Act Contract to non-agricultural uses is prohibited, unless all of the following findings are made. For the purposes of this section, conversion is defined as either development in an AG or RL designation not classified as a residential, agricultural, or natural resource use type or the amending and rezoning of the Coastal Element Land Use Designation AG or RL to a classification other than AG or RL including amendments to add visitor-serving facilities.*

(a) All agriculturally unsuitable lands on the parcel have been developed or determined to be undevelopable;

(b) Agricultural use of the soils cannot be successfully continued or renewed within a reasonable period of time, taking into account economic, environmental, social and technological factors;

(c) Clearly defined buffer areas are established between agricultural and non-agricultural uses;

(d) The productivity of any adjacent agricultural lands will not be diminished, including the ability of the land to sustain dry farming or animal grazing;

(e) Public service and facility expansions and permitted uses do not impair agricultural viability, either through increased assessment costs or degraded air and water quality; and

(f) For parcels adjacent to urban areas, the viability of agricultural uses is severely limited by contacts with urban uses, and the conversion of land would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development.

(3) Impact Findings for Conversion of Non-prime Agricultural Lands. *Conversion of all other agricultural lands to non-agricultural uses will be prohibited unless it is found that such development will be compatible with continued agricultural use of surrounding lands and at least one of the following findings applies:*

(a) Continued or renewed agricultural use is not feasible as demonstrated by an economic feasibility evaluation prepared pursuant to Section 20.524.015(C)(3);

(b) Such development would result in protecting prime agricultural land and/or concentrate development.

LUP Policy 3.2-5 states:

<u>All other lands suitable for agricultural use shall not be converted to nonagricultural uses unless (1) continued or renewed agricultural use is not feasible</u>, or (2) such conversion would preserve prime agricultural land or concentrate development consistent with Section 30250. <u>Any such permitted</u>

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conversion shall be compatible with continued agricultural use on surrounding lands.

Coastal Act Section 30250 states in applicable part the following:

> *(a) New residential, commercial, or industrial development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.*

LUP Policy 3.2-16 states the following:

> *All agricultural lands designated AG or RL shall not be divided nor converted to non-agricultural uses unless (1) continued or renewed agricultural use is not feasible, or (2) such conversion would preserve prime agricultural land or (3) concentrate development consistent with Section 30250. Any such permitted division or conversion shall be compatible with continued agricultural use of surrounding parcels.*
>
> *"Feasible", as used in this policy, includes the necessity for consideration of an economic feasibility evaluation containing both the following elements:*
>
> 1. *An analysis of the gross revenue from the agricultural products grown in the area for the five years immediately preceding the date of the filing of proposed local coastal program or an amendment to any local coastal program.*
> 2. *An analysis of the operational expenses beyond the control of the owner/operator associated with the production of the agricultural products grown in the area for the five years immediately preceding the date of the filing of a proposed local coastal program or an amendment to any local coastal program.*
>
> *For purposes of this policy, "area" means a geographic area of sufficient size to provide an accurate evaluation of the economic feasibility of agricultural uses for those lands included in the local coastal plan.*

Coastal Zoning Code (CZC) Section 20.524.015 "Coastal AG and RL Land Divisions" which is incorporated by reference in CZC Section 20.532.100(B)(3) states:

> *Before any division of prime agricultural land is granted tentative approval, the applicant shall file a master land division plan which shall contain at a minimum:*
>
> ...
>
> *(3) An economic feasibility evaluation prepared by a land use economist with expertise in the economics of agriculture which shall contain the following:*

(a) An analysis of the gross revenue from the agricultural products grown in the area for the five (5) years immediately preceding the date of the filing of proposed conversion and/or division; and

(b) An analysis of the operational expenses beyond the control of the owner/operator associated with the production of the agricultural products grown in the area for five years immediately preceding the date of the filing of the proposed conversion and/or division.

(c) The economic feasibility analysis shall be reviewed for adequacy by the Department of Planning and Building Services and the County Agricultural Commissioner prior to a determination that the application is complete for processing. If the report is determined inadequate, the applicant shall submit the required information to the satisfaction of the Department of Planning and Building Services and County Agricultural Commissioner. The application will not be considered complete until the feasibility analysis is submitted and deemed acceptable.

(4) For purposes of this subsection "area" means a geographic area of sufficient size to provide an accurate evaluation of the economic feasibility of agricultural uses for those lands included in the Coastal Element. (Ord. No. 3785 (part), adopted 1991)

Coastal Zoning Code (CZC) Chapter 20.508 "Agricultural Resources" states the following:

Section 20.508.005 Applicability.

This Chapter shall apply to all lands designated AG or RL within the County of Mendocino's Coastal Zone. (Ord. No. 3785 (part), adopted 1991)

Sec. 20.508.010 Purpose.

The purpose of this Chapter is to insure that the maximum amount of agricultural land shall be maintained in agricultural production to assure the protection of the area's agricultural economy. All other lands suitable for agricultural use shall not be converted to non-agricultural uses unless (1) continued or renewed agricultural use is not feasible, or (2) such conversion would preserve prime agricultural land or concentrate development consistent with Section 30250. Any such permitted conversion shall be compatible with continued agricultural use on surrounding lands. (Ord. No. 3785 (part), adopted 1991)

Sec. 20.508.015 General Criteria.

An owner of property within an agricultural district, either AG or RL, may request agricultural preserve status under a Williamson Act contract pursuant to Chapter 22.08 of the Mendocino County Code. No permit shall be issued to convert prime lands and/or land under Williamson Act contracts to non-agricultural uses, without complying with Chapter 22.08 of the Mendocino County Code and making supplemental findings pursuant to Section 20.532.100(B)(2) and making the finding that continued, renewed, or potential

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agricultural use of the property is not feasible based upon an economic feasibility evaluation prepared pursuant to Section 20.524.015(C)(3). (Ord. No. 3785 (part), adopted 1991)

Sec. 20.508.020 Buffer Areas.

Development adjacent to agriculturally designated parcels is subject to the following:

(A) Development Adjacent to Agriculturally Designated Parcels.

(1) No new dwellings in a residential area shall be located closer than two hundred (200) feet from an agriculturally designated parcel unless there is no other feasible building site on the parcel.

(2) New parcels shall not be created that would result in a dwelling within two hundred (200) feet of an agriculturally designated parcel.

AgSource Laboratories
A Subsidiary of Cooperative Resources International

300 Speedway Circle, Suite 2
Lincoln, NE 68502

Tel: 402-476-0300
Fax: 402-476-0302

TRIPLE OPTION SOIL ANALYSIS

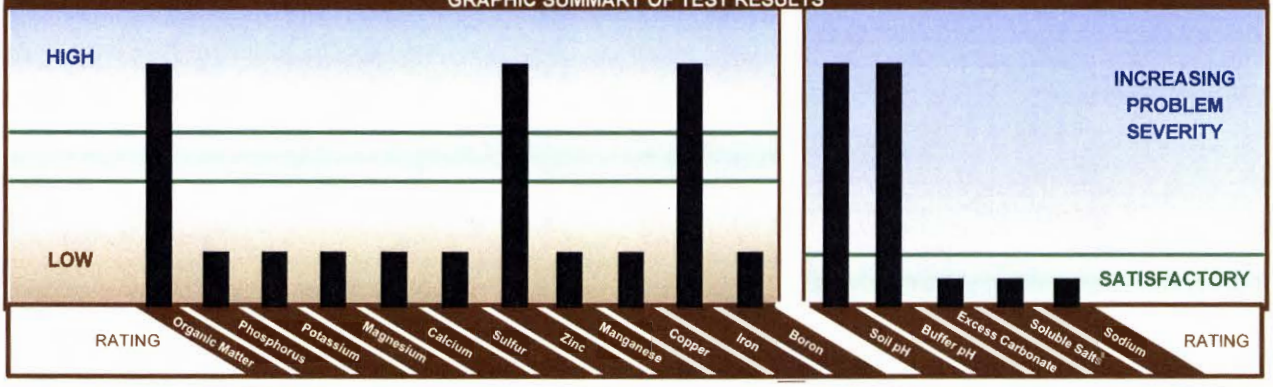
093356

Submitted By: 9561612
House Agricultural Cons.
1105 Kennedy Place
Suite 1
Davis, CA 95616

Submitted For:
MICHAEL MARR
ALBION, CA

Date Reported	Laboratory Turnaround	Samples Will Be Stored Until	Laboratory Sample #	Field Identification
20-Mar-2012	1 Day	03-Apr-2012	AG41533	

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS	
YOUR SAMPLE NUMBER	001
Soil pH	5.3
Buffer Index	5.9
Excess Carbonate	VL
Soluble Salts mmhos/cm	0.3
Sodium ppm	33.0
% Organic Matter	6.4
ANALYSIS OF NUTRIENT ELEMENTS IS IN PARTS PER MILLION (ppm)	
Nitrate N	4.2
Phosphorus Bray 1	11
Olsen	--
Potassium	147
Magnesium	142
Calcium	578
Sulfate Sulfur	8
Zinc	4.8
Manganese	2.6
Copper	0.5
Iron	43.2
Boron	0.1
Bulk Density	1.1

FERTILIZER GUIDLINES IN: Lbs/Acre

1st Option Intended Crop			2nd Option Intended Crop			3rd Option Intended Crop		
Pasture			Cabbage			Alfalfa		
Yield Goal			Yield Goal			Yield Goal		
			15 TO			6 TO		
Preceding Crop			Preceding Crop			Preceding Crop		
Pasture			Pasture			Pasture		
PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES
N	40.0	90	N	55.0	105	N	0.0	0
P_2O_5	50.0	40	P_2O_5	45.0	33	P_2O_5	70.0	63
K_2O	35.0	48	K_2O	20.0	68	K_2O	125.0	132
MgO	21.5		MgO	10.8		MgO	21.5	
S	3.0		S	3.5		S	5.3	
Zn	0.0		Zn	0.0		Zn	0.0	
Mn	1.5		Mn	2.3		Mn	4.8	
Cu	0.0		Cu	0.0		Cu	0.0	
Fe	0.0		Fe	0.0		Fe	0.0	
B	0.5		B	1.3		B	2.0	
Lime	13200		Lime	13200		Lime	15900	

Lime Guidelines are for 100% Effective Calcium Carbonate (ECC) with a 6" Incorporation Depth.

ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)								ESTIMATED		
Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC for Your Soil
72.3	0 - 5	2.3	4.1 - 7	7.1	15 - 20	17.4	65 - 75	0.9	0 - 5	16.6

Additional Tests

Sample Number	001
Salinity Boron ppm	0.05
Salinity Calcium meq/L	0.35
Salinity Chloride ppm	12.1
Salinity ECE mmhos/cm	0.13
Salinity Magnesium meq/L	0.31
Salinity Moisture %	58.82
Salinity pH	5.4
Salinity Potassium meq/L	0.20
Salinity SAR	0.85
Salinity Sodium meq/L	0.5

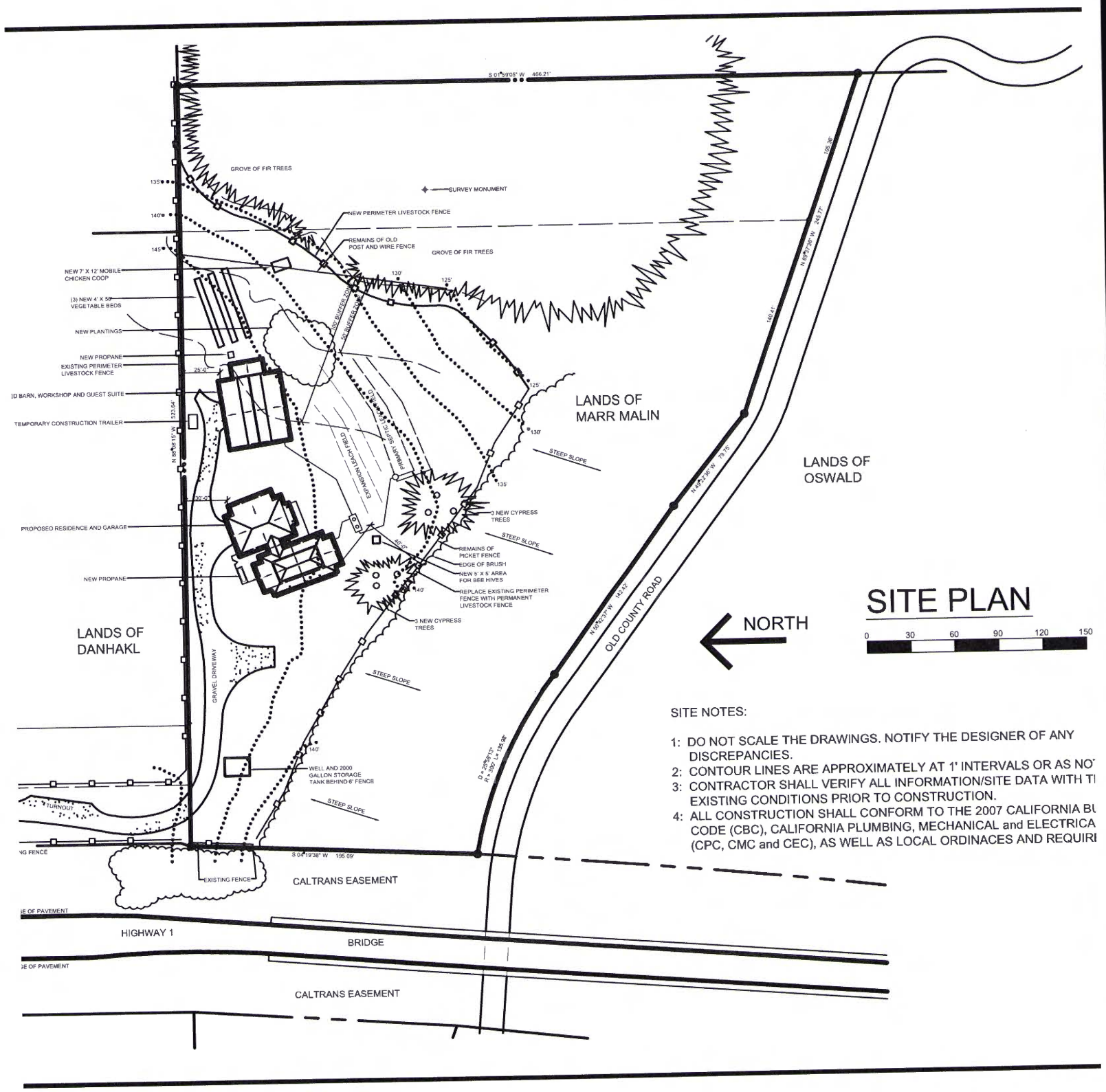

SITE PLAN
0 30 60 90 120 150
NORTH
GROVE OF FIR TREES
SURVEY MONUMENT
NEW PERIMETER LIVESTOCK FENCE
REMAINS OF OLD POST AND WIRE FENCE
GROVE OF FIR TREES
NEW 7' X 12' MOBILE CHICKEN COOP
(3) NEW 4' X 50' VEGETABLE BEDS
NEW PLANTINGS
NEW PROPANE
EXISTING PERIMETER LIVESTOCK FENCE
TEMPORARY CONSTRUCTION TRAILER
PROPOSED RESIDENCE AND GARAGE
NEW PROPANE
LANDS OF DANHAKL
GRAVEL DRIVEWAY
LANDS OF MARR MALIN
LANDS OF OSWALD
STEEP SLOPE
3 NEW CYPRESS TREES
REMAINS OF PICKET FENCE
EDGE OF BRUSH
NEW 5' X 5' AREA FOR BEE HIVES
REPLACE EXISTING PERIMETER FENCE WITH PERMANENT LIVESTOCK FENCE
3 NEW CYPRESS TREES
WELL AND 2000 GALLON STORAGE TANK BEHIND 6' FENCE
OLD COUNTY ROAD
EXISTING FENCE
CALTRANS EASEMENT
HIGHWAY 1
BRIDGE
CALTRANS EASEMENT
SITE NOTES:
1: DO NOT SCALE THE DRAWINGS. NOTIFY THE DESIGNER OF ANY DISCREPANCIES.
2: CONTOUR LINES ARE APPROXIMATELY AT 1' INTERVALS OR AS NO
3: CONTRACTOR SHALL VERIFY ALL INFORMATION/SITE DATA WITH T EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
4: ALL CONSTRUCTION SHALL CONFORM TO THE 2007 CALIFORNIA BU CODE (CBC), CALIFORNIA PLUMBING, MECHANICAL and ELECTRICA (CPC, CMC and CEC), AS WELL AS LOCAL ORDINACES AND REQUIRI

Figure 11.1 View of subject property looking east showing proposed grazing area; forest tree-tops visible beyond grass land.

11 Appendix: Photographs

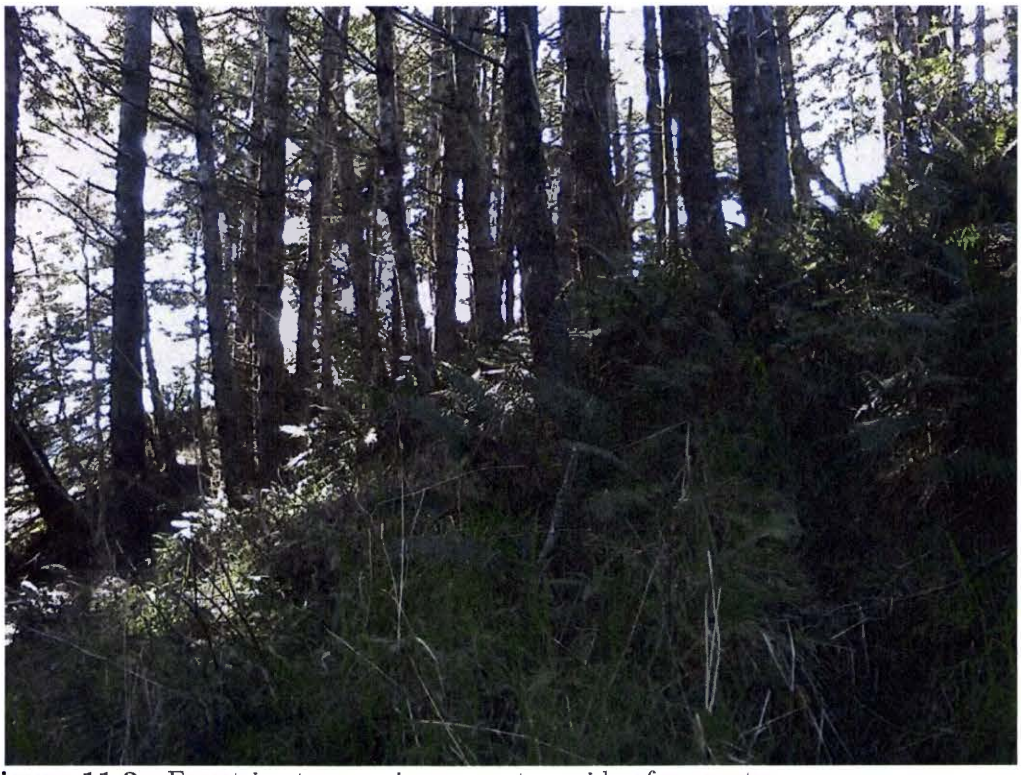


Figure 11.2 Forest in steep ravine on eastern side of property.

Figure 11.3 Cliff face on south side of property.

Figure 11.4 View of north side of subject property; grazed land on north side of fence is cattle range of Mike Biaggi; ungrazed area is subject property.

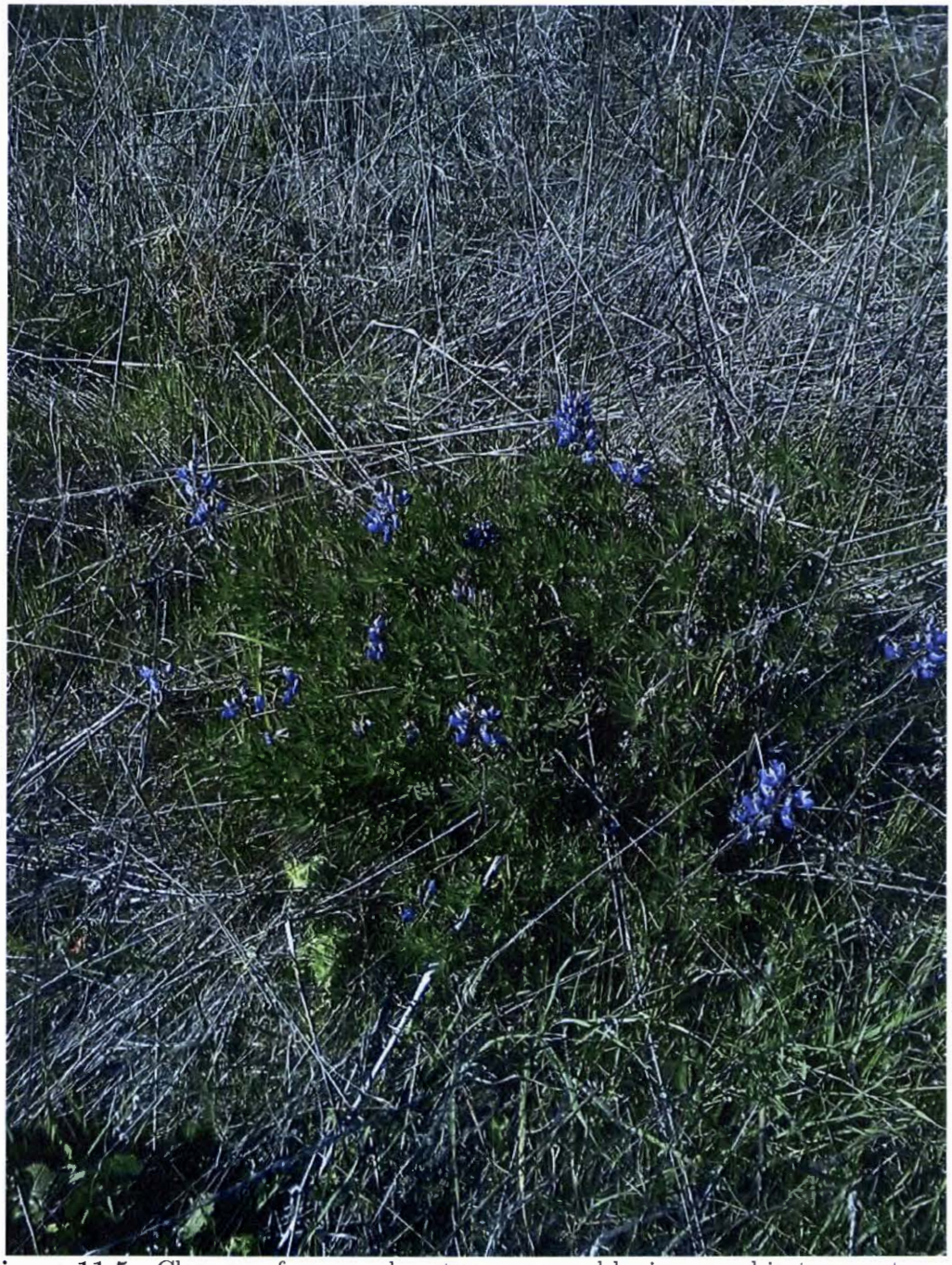


Figure 11.5 Close up of ungrazed pasture grass and lupine on subject property.

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Geotechnical and Geologic Investigation

Proposed Single-Family Residence
2800 North Highway 1
Albion, Mendocino County, California
APN 123-350-06

Prepared for:

Mike Marr
43 Hillside Ave.
Portsmouth, RI 02871

EXHIBIT NO. **16**
APPLICATION NO.
A-1-MEN-09-034
MARR & MALIN
GEO REPORT
ADDENDUM (1 of 22)

Consulting Engineers & Geologists, Inc.

493 South Main Street
Willits, CA 95490
707/459-4518

June 2008
408020

CONSULTING ENGINEERS & GEOLOGISTS, INC.
493 S. Main Street • Willits, CA 95490 • 707-459-4518 • Fax 707-459-1884 • willitsinfo@shn-engr.com

Reference: 408020

June 12, 2008

Mike Marr
43 Hillside Ave.
Portsmouth, RI 02871

Subject: **Proposed Single Family Residence; 2800 North Highway 1, Albion, Mendocino County, California; APN 123-350-06**

Dear Mr. Marr:

The enclosed report documents the results of our investigations for the proposed project. In the report we discuss Geotechnical and Geologic site characteristics and risks, and provide specific recommendations for site preparation, and design and construction of foundation and floor slab systems, etc.

We hope that this report presents the information that is needed at this time. This report concludes our work on the project in accordance with our current agreement. If you have any questions, please call me at 707/459-4518.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Chandler H. Koehn, P.E.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
CHANDLER H. KOEHN
No. C 63119
Exp. 6/30/10
CIVIL
STATE OF CALIFORNIA

CHK:alh

Enclosure: report

Reference: 408020

Geotechnical and Geologic Investigation

Proposed Single Family Residence
2800 North Highway 1
Albion, Mendocino County, California
APN 123-350-06

Prepared for:

Mike Marr
43 Hillside Ave.
Portsmouth, RI 02871

Prepared by:

Consulting Engineers & Geologists, Inc.
493 South Main Street
Willits, CA 95490
707/459-4518

June 2008

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Abbreviations and Acronyms

ft/yr	feet per year
Km	Kilometers
mm/yr	millimeters per year
pcf	pounds per cubic foot
psf	pound per square foot
tsf	tons per square foot
ASTM	American Society for Testing and Materials
Caltrans	California Department of Transportation
CBC	California Building Code
HA-#	boring-number
ICBO	International Conference of Building Officials
K	erosion factor
MSL	Mean Sea Level
SHN	SHN Consulting Engineers & Geologists, Inc.
IBC	International Building Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey

1.0 Introduction

This report documents the results of SHN Consulting Engineers & Geologists, Inc.'s (SHN's) Geotechnical and Geologic investigation of the parcel located at the 2800 North Highway 1,Albion, in Mendocino County, California, as shown on the attached Site Location Map, Figure 1. Our geologic and geotechnical investigations were conducted from April to June of this year. The project site is identified in the County Assessor's Map Book as 123-350-06 bordered by Highway 1 right-of-way to the west, Little and Big Salmon Rivers to the south, and open space to the north and east. The project site history includes probable agricultural use. The subject site is currently undeveloped.

We assumed for this report that a single-family residence and guesthouse with supporting improvements are planned for construction. We assume that buildings will be two-story wood-framed structures with raised structurally supported floors with a detached slab on grade garage. A site plan labeled "Lands of Marr" by I.L. Welty and Associates dated April 2003 has been provided. This site plan was used as a base map for our Plot Plan, Figure 2

This report provides the owner with our findings, conclusions, and recommendations related to geotechnical and geologic aspects of project design and construction. The recommendations contained in this report are subject to the limitations presented herein. Attention is directed to the "Section 8.0: Additional Services" and "Section 9.0: Limitations" of this report.

2.0 Field Investigation and Laboratory Testing

SHN conducted a Geotechnical and Geologic investigation to evaluate subsurface soil conditions, and to provide foundation design and site development criteria for the proposed buildings. Our field investigation was limited to reconnaissance of the project site, excavation and sampling of five exploratory test pits.

The exploratory test pits were advanced to a maximum depth of 9.0 feet below the ground surface. Test pits were excavated with a Case 580 backhoe equipped with a 36-inch wide smooth bucket. Test pits were logged in general accordance with the Unified Soil Classification System by our Geologist. Subsurface exploration locations are shown on the attached Plot Plan, Figure 2. Selected relatively undisturbed drive and disturbed bulk samples were collected, and laboratory tests were conducted. Laboratory testing included in-place density and moisture content, sieve analysis and strength testing. See attached Appendix A for field logs and Appendix B for laboratory testing results.

3.0 Site Conditions

The project area is located approximately ¼ of mile south of Albion on a gently, southwest sloping stream valley wall or bluff-top. The bluff top is composed of an uplifted marine terrace that is bound to the south by the left bank of the Little - Big Salmon Rivers and to the west by Highway 1(Figure 1). The southerly boundary of the project area abuts the crown of a southwest facing cliff that parallels the north bank of the River.

Slope gradients on the face of the bluff range from 50% to near vertical, with the steeper areas affiliated with resistant bedrock outcrops. The bluff has an access road cut across the lower benches. Recent and historic ground movement is evident along portions of the bluff edge as well

as on the surfaces of the bluff slope leading down to the Little and Big Salmon Rivers. Several depressions were observed along the southwest edge of the bluff as shown on the Plot Plan, Figure 2.

Vegetation at the site consists mainly of grasses and forbs covering the open sites and several stands of trees to the east, with dense brush extending down the face.

Elevations in the project area range from 140 feet above Mean Sea Level (MSL) at the bluff edge to about 20 feet MSL along the southern margin of the project area. The upper rim of the bluff is situated between 400 feet (slope distance) and 500 feet upslope of the back edge of the water at the foot of the steep hillside.

Our field reconnaissance was conducted on April 17, 2008. Little or no grading has been detected on the site except for utility services. Temporary wood framing for proposed building limits and a well pipe were observed.

3.1 Subsurface Soil

Specific descriptions of site soils encountered by the subsurface explorations are presented on the attached field logs in Appendix A. In general, surficial soils at the site are composed of moist, soft, black hummus topsoil. Depths to marine deposits encountered in subsurface exploration generally occurred at 1.5 to 3.5 feet below existing grade and consisted of moist, loose to weak, reddish brown to yellowish brown fine sand to sandstone with trace silt and clay. The near surface soils appear very low in expansion potential (tendency for soil volume change with changes in moisture content) based on laboratory testing and soil classification.

3.2 Groundwater and Soil Erosion

No groundwater was encountered in the subsurface exploration. Note that the subsurface investigation was conducted at the end of the spring/summer dry season. Water levels at periods of the year can be expected to fluctuate in response to seasons, storm events, and other factors, and may become significantly higher than observed.

The susceptibility of a soil to sheet and rill or gully is rated by an erosion factor (K) and is one of six factors used in the Universal Soil Loss Equation (USLE) to estimate a rate of erosion in tons per acre per year. The factors are based primarily on soil structure, percentage of soil type and up to 4% of organic matter, and permeability. K factor values can range from 0.05 to 0.43 with a higher value indicating a greater risk of sheet and rill erosion. For most of the site, an erosion factor K is identified as 0.24 (USDA, June 2001).

4.0 Geologic Conditions

4.1 Geologic Setting

Jennings and Strand (1960) have mapped the site as underlain by Pleistocene age marine terrace deposits. Geologic mapping on the same surface but immediately east of the site also identifies the surface as a Pleistocene marine terrace (Manson, 1984). A typical marine terrace sequence consists of an abrasion platform carved into bedrock, covered by up to 30 feet of terrace cover sediments. These terrace cover sediments consist of coarse sands and gravel near the base, fining upward into

silty sands and sandy silts. Marine terraces are often topped by 2-3 feet of dark brown silt with fine sand, referred to as the eolian cap. This cap is believed to consist of wind-blown sediment blown off the exposed continental shelf during sea level low stands.

According to published geologic maps, the terrace deposits cap Cretaceous to Tertiary age Coastal belt of the Franciscan Complex bedrock (Manson, 1984). The Franciscan Complex is a regional bedrock unit that is composed of three broad belts: the Eastern, Central, and Coastal belts. These belts represent terranes--discrete fault-bounded masses of highly deformed oceanic crust that have been welded to the western margin of the North American plate during the subduction process over the past 140 million years.

The Coastal belt is the youngest of the three belts and has been subdivided into four tectono-stratigraphic terranes based on the age, lithology, or metamorphic character of the particular rocks: Yager, Coastal, King Range, and False Cape (Aalto and others, 1995; McLaughlin and others 1997). It is our understanding that the "Coastal terrane," the largest and most extensive of this series of terranes underlies the project area. The Coastal terrane has been interpreted as an accretionary complex composed of trench and lower continental slope deposits (Clarke, 1992). This terrane is composed principally of graywacke sandstone, greenstone, and argillite. In addition, it includes exotic blocks of basaltic intrusive, limestone, and glaucophane schist. Sediments associated with the Coastal terrane are often more deformed than those identified as parts of the Yager, the King Range, or the False Cape terranes. Typically, this material is competent (hard), moderately- to highly-jointed, and can be highly sheared locally. The relative stability of slopes underlain by Franciscan sedimentary bedrock is often influenced by the abundance of mudstone--which is more susceptible to surficial weathering processes--and the frequency and orientation of joints and/or shears.

4.2 Seismic Setting

Coastal northern California is seismically active and susceptible to strong earthquake shaking. There are six distinct sources of damaging earthquakes in Albion region:

1. **The San Andreas Fault Zone** is a predominantly right lateral strike-slip system that accommodates movement between two crustal plates, the Pacific to the west and the North American to the east. A trace of the San Andreas Fault is located approximately 3 miles west (off the coast) of the project site. Historic evidence (the 1906 San Francisco Earthquake) demonstrated that the San Andreas fault system is capable of generating large to very large magnitude earthquakes (magnitude 7.9+). Such earthquakes are likely to produce very strong levels of seismic shaking at the project site similar to those noted during the 1906 earthquake. In 1906 most of brick buildings in Fort Bragg, ~ 15 miles north of the project site, were destroyed, while many of the wood-framed structures in town were shifted off their foundations.

2. **The Maacama Fault** is a right-lateral strike-slip fault within the San Andreas fault system. This roughly N30W trending fault is located approximately 25 miles east of the project area and is considered active because of its youthful geomorphic expression, paleoseismic evidence, its association with a linear trend of microseismicity (small earthquakes), and distinct evidence of aseismic surface creep. The Maacama fault, however, has not produced a significant historic earthquake, and its seismic hazard potential is poorly understood. The largest historic earthquake in the vicinity of the Maacama fault was a magnitude 4.8 earthquake that occurred near Willits in November 1977; the epicenter was determined to be about 9 miles east of the Maacama fault. Modeling of geodetic data suggests the

Maacama fault accommodates approximately 14 millimeters per year (mm/yr) of strike-slip motion (Freymueller and others, 1999), while comparison to the Hayward and Rodgers Creek faults suggests about 9 mm/yr (USGS Working Group, 1996). Freymueller and others (1999) suggest that the Maacama fault poses a significant seismic hazard because it has a high slip rate, and has accumulated a sufficient slip deficit to generate a magnitude 7 earthquake.

3. **The Mendocino Fracture Zone** is a high angle, east-west trending fault representing the plate boundary between the Gorda and Pacific plates. This fault zone extends westward from the Mendocino Triple Junction near Petrolia, approximately 20 miles north of Shelter Cove.

4. **The Mendocino Triple Junction** produces infrequent moderate magnitude earthquakes . These events are generally shallow, onshore events in the magnitude 5 to 6 range.

5. **The Cascadia Subduction Zone** is the most significant potential seismic source in the region, capable of producing very large earthquakes up to magnitude 9.5. Such earthquakes could affect the entire Pacific Northwest, from Cape Mendocino to British Columbia. Several feet of uplift and subsidence may occur in coastal areas as a result of very strong, long duration seismic events. In addition, the intense ground shaking affiliated with these events will likely cause large landslides. Earthquakes with a magnitude of 8 to 9 are expected to occur about every 300-500 years, with the last great event likely occurring in the year 1700. On April 25, 1992, a magnitude 7.1 earthquake occurred near Petrolia; this earthquake was the first major documented subduction zone event, and was proceeded by two strong aftershocks in the magnitude 6 range.

No known faults have been mapped passing through the project site, nor was any evidence of active faulting observed in the field. The site is not located within an Alquist-Priolo fault zone as defined by the State of California (Hart and Bryant, 1997).

5.0 Evaluation of Potential Geologic Hazards

5.1 Stream Valley Wall Stability

The steep-faced valley wall situated below the project area is located along the inner edge of a broad, northward migrating meander of the Big and Little Salmon Rivers. This meander is positioned near the back edge of Whitesboro Cove. The steepest part of the valley wall slope extends from the top of the terrace to another smaller terrace approximately 50 feet below (Figure 3). This terrace has a relatively gentle slope of roughly 20%, with a dirt road built along the downward edge of the terrace. Below the road, the slope steepens to over 30%, becoming gentler toward the toe of the slope. A 50- to 100-foot wide, roughly lens-shape point bar/beach is situated at the toe of the slope.

Seven aerial photographs dated between 1963 and 2005 were reviewed to determine historic valley wall retreat rates in the vicinity of study area. Two measurements were made from a fence line at the top of the slope to the edge of the upper and lower sections of a dirt road visible on all photograph years. An increase in distance between these points would indicate the top of the valley wall has retreated between the photograph years measured. The edges of the river and beach were not used in the measurements as these features vary with tide and season. We anticipate that change on the order of 5 feet or more would be detected on the photographs.

Comparison of aerial photographs taken between 1963 and 2005 displayed no discernable change in the location or configuration of the bluff edge situated above the point bar/beach. Less than two feet of retreat was measured at both measurement points; this small amount is considered insignificant due to the error inherent in measuring distances from aerial photographs. Due to the resistant character of the Coastal belt bedrock, and the general lack of surf impact at the toe of the slope, it appears that the rate of retreat along this stretch is relatively low and insignificant on the aerial photographs.

Although evidence suggests that coastal bluff retreat rates along the eastern section of the bluff in the project area has been relatively low over the period covered by historic records, we cannot preclude the possibility of unpredictable events, which could result in accelerated retreat of the valley wall slope. In our opinion, the probability of such events is low but should not be ignored. Though the amount of retreat measured was insignificantly small, we have applied the 2-foot retreat over the 42-year period to this section of river valley wall. From these measurements, we calculated a long-term average rate of bluff retreat of 0.05 feet per year (ft/yr), or about half an inch. This long-term average rate of bluff retreat is based upon the precedence that the hillslope processes affecting this study area, recently and in the near future, will be similar to those that occurred in recent geologic times.

5.2 Top of Slope Setbacks and Recommendations

If the long-term average rate of retreat to the design life (75 years) is applied to the project site, about 4 feet of retreat would occur. However, given the site's proximity to the San Andreas fault, there is a potential it will experience strong seismic shaking during the lifetime of the structure. Such shaking could lead to coseismic landsliding along slopes that have not experienced recent mass wasting. The earliest aerial photograph, taken in 1963, was nearly 60 years after the 1906 earthquake. Evidence of coseismic slope failure in the site vicinity from the 1906 event could not be discerned in the aerial photographs. In order to assign an appropriate setback, we have included geomorphic observations from the field in our assessment. A possible older scarp feature was observed south west of the proposed residence, and the head of a small gully ("erosion feature") exists immediately south of the project (Figure 2). Given the relatively low rates of erosion observed, and the proximity of the San Andreas fault, we recommend a setback of 40 feet from both the potential scarp and bluff edge.

5.3 International Building Code Seismic Design Parameters

The maximum considered earthquake ground motion for Site Class B is summarized on maps prepared by the U.S. Geological Survey, presented within the 2006 IBC and 2007 CBC. The subject site is located at a north latitude of 39.2170° and a west longitude of 123.35.38°. Based on our subsurface explorations and research, the subject site soils can be classified as Site Class C, very

dense soil and soft rock. Correction of the mapped acceleration Site Class B are summarized in Table 1 below.

Table 1 Mapped Acceleration Parameters			
Period (seconds)	Mapped Spectral Acceleration (g) for Site Class B	Site Coefficient Site Class C	Max Considered Spectral Response Accelration (g)
0.2	1.56 (Ss)	1.0 (Fa)	1.568 (SMs)
1	0.793 (S1)	1.3 (Fv)	1.031 (SM1)

5.4 Liquefaction

Liquefaction is described as the sudden loss of soil shear strength due to a rapid increase of soil pore water pressures caused by cyclic loading from a seismic event. In simple terms, it means that a liquefied soil acts more like a fluid than a solid when shaken during an earthquake. In order for liquefaction to occur, the following are needed:

- granular soils (sand, silty sand, sandy silt, and some gravels);
- a high groundwater table; and
- a low density of the granular soils (usually associated with young geologic age).

The adverse effects of liquefaction include local and regional ground settlement, ground cracking and expulsion of water and sand, the partial or complete loss of bearing and confining forces used to support loads, amplification of seismic shaking, and lateral spreading. Lateral spreading is defined as lateral earth movement of liquefied soils, or competent strata riding on a liquefied soil layer, downslope toward an unsupported slope face, such as a creek bank, or an inclined slope face. In general, lateral spreading has been observed on low to moderate gradient slopes, but has been noted on slopes inclined as flat as one degree.

Geologic materials most susceptible to liquefaction are geologically recent (late Holocene age) sand- and silt-rich deposits, located adjacent to streams, rivers, bays, or ocean shorelines. It should be noted that these "most susceptible" conditions do not exist at the subject site. Susceptibility to liquefaction decreases with increasing geologic age. For example, Table 2 in Youd and Perkins (1978) estimated liquefaction susceptibility of Holocene marine terraces as low, and Pleistocene marine terraces as very low. The subject site is situated on a late Pleistocene age marine terrace.

Liquefaction has been documented on numerous occasions in the greater Fort Bragg area following historic moderate to large magnitude earthquakes. Specific accounts of historic ground failures following the 1906 San Andreas fault earthquake are presented in reports prepared by Lawson and others (1908) and Youd and Hoose (1978). Review of these reports, indicates that liquefaction events in the area were generally confined to recent alluvial sediments along the Noyo River was common on the uplifted marine terraces occupied by Fort Bragg or this project.

Subsurface investigations in the project area and other nearby sites indicate the presence of apparently liquefiable materials. Poorly-indurated, clean or silty sands, below the seasonal water table, we observed in bedrock outcrops exposed in the bluff faces. However, from a geologic standpoint, these materials are of such age and have experience so many cycles of ground

movement that there is a very low probability that they will liquefy. The general absence of historic evidence of liquefaction on the "Caspar Point" terrace during strong earthquakes in 1853, 1865, 1906, 1922, 1927, 1932, 1954, 1980, and 1992 support the qualitative geologic interpretation that liquefaction potential at the site is low.

In summary, the risk of liquefaction is considered negligible for earthquakes of small to moderate magnitude. In relatively rare, great earthquakes, for example those with a moment magnitude of 7.5 or greater, there may be low to moderate risk of liquefaction. Risk of damage to the proposed structures from these soil behaviors, should they occur, is considered likely to be within building code criteria for upper bound (rare, great) earthquakes.

6.0 Geotechnical Conclusions and Discussion

Based on the results of our field and laboratory investigations, it is our opinion that the project site can be developed as proposed, provided that our recommendations are followed.

The primary geotechnical site considerations are bluff stability, foundation to bluff setback, and unsupportive near surface soils. Consequently, recommendations presented below include provisions for footings and grading recommendations. As is all of Mendocino County, the site is subject to strong ground motion from seismic sources.

In this report, recommendations are provided to remove and replace near surface soils beneath planned improvements to create supportive foundation soils. Based on our subsurface work, the proposed building development area has 1 to 3 feet of unsupportive soils. The laboratory testing results show most of the near surface soils (excluding topsoils) are suitable for use as engineered or structural fill. See "Section 7.1: Site Preparation and Grading" of this report for fill placement and compaction recommendations.

Building foundations that are founded in non-uniform soils can experience differential settlement due to different soil strength properties. We recommend foundations be embedded in relatively uniform soils such as entirely supportive native soils or entirely engineered fill. Foundations embedded entirely in native supportive soils will likely result in foundations extending to depths of 18- to 48-inches below existing grade based on our subsurface exploration and depending on planned site grades. Alternatively, remove the upper 18- to 40-inches of topsoil and replace with engineered fill beneath the areas of improvement and for five feet beyond the perimeter, creating a relative uniform competent and supportive underlying soil. Be advised that on-site grading should be observed and tested by a qualified Soils Engineer. See "Section 7.1: Site Preparation and Grading" of this report for fill placement and compaction recommendations.

Clayey soils strata were not encountered in the subsurface explorations. Therefore the risk of distress to improvements from near surface expansive soils is considered low.

Recommendations for a capillary break beneath the slab-on-grade floors, positive surface drainage away from the building perimeter in all directions, retaining wall drainage/water proofing, and for the floor slab to be slightly higher than surrounding exterior grade are provided to avoid post-construction damp floor slab conditions.

Co-seismic compaction of poorly consolidated, sandy, relatively cohesionless soils or unconsolidated fill can occur above or below groundwater, and is characterized by soil

densification resulting from dynamic loading of relatively loose, non-cohesive soil materials. That is, shaking or vibration can densify loose granular soils, resulting in settlement of the ground surface. In our opinion, seismic compaction would typically be negligible due to the nature of the site soils in all but major earthquakes. In relative rare, strong, prolonged earthquakes, it may result in a lowering of finished grade.

The amount of building settlement depends on the magnitude, area, and duration of the loading, and on the compressibility of the underlying deposits. The rate of settlement is correlated to soil type and permeability, and to the degree of soil saturation. Quickly permeable soils, such as sands or gravel with little clay or silt, or materials such as wood waste, will settle relatively quickly. The risk of significant post-construction settlement will be mitigated to a low level if the recommended site preparation is completed. Due to the variability of soils deposits and the inherent limitations of current engineering and construction practices, some post-construction vertical settlement may occur. We estimate that with the project constructed in accordance with the following recommendations, total post construction settlement is not likely to exceed one-half inch, and post-construction differential settlement is not likely to exceed one-quarter inch.

7.0 Recommendations

7.1 Site Preparation and Grading

We recommend the following:

1. As appropriate, notify Underground Service Alert (1-800-642-2444) prior to commencing site work, and use this location service and other methods to avoid injury or risk to life from underground and overhead utilities, and to avoid damaging them.
2. Strip all existing improvements, cultural debris, vegetation, root systems, topsoil and old fill (if encountered) from areas to receive structural fill or improvements, and for five feet outside.
3. Conduct a geotechnical engineering review of exposed subgrade soils exposed by site grading to identify and mitigate any unsupportive soils zones. The soils engineer will recommend that remaining unsuitable soils, such as overly weak, compressible, or disturbed soils, be additionally stripped. The exposed subgrade should be scarified and moisture condition and proofrolled using a relatively heavy vehicle, such as a heavy drum compactor, a loader with a full bucket, or equivalent. The proofrolling should be accomplished with the soil damp or moist (not wet or dry), and a firm, non-yielding surface should be evident during the proofrolling. If a yielding surface is observed (pumping, weaving under wheel loads), additionally excavate the yielding area, and replace the overexcavated material with Caltrans specification Class 2 baserock, in a manner that will result in a stable subgrade surface under the proofrolling, following the overexcavation and replacement. Prior to placement of structural fill the subgrade should not be allowed to dry and shrink. Maintain subgrade soils in a moist condition by covering with plastic to avoid saturation from rain or immediate placement of engineered fill as recommended below. Do not cover overwet or muddy subgrade soil conditions and avoid grading during wet weather conditions.
4. Structural fill material should consist of relatively non-plastic (Liquid Limit less than 35, Plasticity Index less than 12) material containing no organic material or debris, and no

individual particles over 8 inches across. Bulk samples taken from our subsurface work indicate near surface site soils (excluding topsoils) are suitable for structural fill.

5. Structural or engineered fill should be placed to design grades and compacted to a minimum of 90% of the maximum relative dry density as determined by the American Society for Testing and Materials (ASTM) D1557-02 test method (see attached Summary of Laboratory Tables, Figure No. 4). Place fill in lifts not exceeding 6 inches in loose thickness, and thoroughly compact each lift into place until further consolidation ceases. Thoroughly trackwalk and compact finished fill surface. If imported material is too dry, dampen it to a uniform moist condition prior to placement as fill. Do not overwet it.
6. Planned fill or cut slopes are not known at this time but it appears unlikely that significant grading will occur due to the site topography.

7.2 Foundations

Following site preparation and specific foundation recommendations, foundations may be constructed. Our recommendations for Foundations are as follows:

1. Foundations should be setback between 40 feet from existing site bluff top (see Section 5.2: Bluff Edge Setbacks and Recommendations). Foundations should be no less than 12 and 15 inches wide for one and two-story construction and reinforced with a minimum of 2 - # 4 bars, one top and bottom. In addition to CBC/IBC minimums, a conventional, shallow foundation system is recommended below. All foundation elements should be strongly reinforced and structurally integrated to act as a rigid frame.
2. All foundation excavations should penetrate into structural or competent native soils at least 12 inches for single-story residential construction or at least 18 inches for two-story residential construction. Shallow conventional foundations may be designed so they do not exceed an allowable bearing capacity of 2,000 pounds per square foot (psf) for dead plus live loads, which may be increased by one-third to account for the short-term effects of wind and/or seismic loading. Footing excavations should be straight and bottoms should be clean and free of "slough" (loose) material.
3. Embedment depth should be determined starting at the surface of competent, undisturbed, native soils, or the surface of structural fill placed as recommended above. The provided bearing values are applicable to both competent, undisturbed, native soils, and structural fill placed as recommended.
4. The bearing pressure values may be increased for increases in footing depth as provided in the current edition of the IBC provided foundations are resting on uniform soils as stated in "Section 6.0: Geotechnical Conclusions and Discussion" of this report.
5. Frictional resistance may be calculated in conjunction with an allowable lateral passive pressure represented by an equivalent fluid weighing 250 pounds per cubic foot (pcf) for short-term loadings, such as lateral foundation resistance in response to wind or earthquake loadings. A friction coefficient of 0.35 may be used for the footing/soil contact. Lateral passive pressure can be calculated where footings bear laterally against neat competent undisturbed native subsoils, or structural fill. The lateral pressure values may be increased for increases in depth and width as provided in the current edition of the IBC.
6. The ground surface around the structure perimeter should be sloped away, or other design measures implemented to provide positive surface water drainage away from perimeter foundation areas.

7. If the project includes slab-on-grade construction where the finished slab grade is one-half foot or less above exterior grade elevation, or if the project includes depressed crawl spaces resulting in crawl space grade below exterior grade elevation, subdrains may be desirable to prevent excess moisture problems, and the specific building plans should be reviewed, and subdrainage recommendations provided if appropriate (see Section 7.3.5 below).
8. If decks are planned, they should be cantilevered out from or braced back to the residence structure. Alternatively, if separate deck foundations are to be embedded into the slope, the deck design should consider the possibility of long-term downhill settlement or creep of these foundations.

7.3 Slabs-on-Grade

Following site preparation and grading as recommended, slabs-on-grade may be constructed. Our recommendations for slabs-on-grade are as follows:

1. It has been common practice to cover the membrane with a few inches of sand, to protect the membrane during construction, and to aid in concrete curing. However, some designers consider the sand layer to be a potential source of moisture that can adversely affect the slab, either from the water present in the sand during construction, or from surface water or groundwater gaining access to the sand layer above the membrane. We understand the American Concrete Institute has produced recommendations or guidelines with respect to this issue. Whether or not a sand layer is placed above the membrane, the membrane should be protected against tearing or puncture during construction.
2. Concrete slabs can become damp from capillary water migration. As a precaution to minimize transmission of soil moisture up through floor slabs in habitable areas, or other areas where damp slabs should be avoided, we recommend that the slabs be underlain by a polyethylene vapor reduction membrane at least six mils in thickness. This membrane should overlie a capillary break consisting of a 4-inch layer of No. 4 U.S. Sieve (0.187 inch) minimum, up to 1 inch maximum, drain rock, or Class 1 Type A permeable material per Caltrans Standard Specifications 68-1.025. A thin layer of clean sand should be placed over the membrane to protect it during concrete placement. (The capillary break provides a layer with relatively large, intergranular, void spaces, which inhibits the capillary rise of ground moisture.)
3. Highly plastic soils should not underlie slabs, and should be removed and replaced as recommended in the "Section 7.1: Site Preparation and Grading" above. Subgrade soils should be quickly covered by structural fill, intermittently sprinkled, or covered temporarily with plastic, in order to maintain their moisture content until the overlying fill is placed. They also should not be allowed to become overly wet (saturated). The purpose of this recommendation is to avoid placing slabs on overly dried, or overly wet, silty or clayey subgrade soils. If covered when overly dried, they may subsequently become moistened by capillary groundwater, and swell slightly. Slab areas are particularly vulnerable to distress from underlying swelling soils. Similarly, if over-wetted, they may shrink upon returning to normal in-place moisture contents.
4. Floor slabs should be designed to be relatively strong, to be resistant to cracking from bending or differential settlement. We suggest a minimum slab thickness of 5 inches with a minimum of No. 4 rebar at 18 inches in both directions, at mid-height of the slab, for example. Reinforcement bars should be placed on chairs so that they are at the mid-point of

the slab. Additional footing and slab reinforcement may be required by the Structural Engineer or Architect.

5. Where floor slabs lie at or below adjacent finished exterior ground elevations, the capillary break material beneath the slab should be thickened to 8 inches in minimum thickness, and this layer should be compacted with a walk-behind vibratory plate compactor. The 8-inch minimum subdrainage/capillary break layer should be drained by 3- or 4-inch diameter perforated drainpipe. The drainpipe may be placed level in the bottom of the layer of drainage material, or placed level in trenches below the drainage layer, with trench backfill comprised of permeable material extending up and hydraulically connected with the subdrainage layer above. The perforated drainpipes should be spaced not exceeding 10 feet on centers if the drain piping is placed in the drainage layer, or 15 feet on centers if placed in shallow trenches just below the drainage layer. The drainage piping should be gravity drained to daylight through collector piping. Outside the building perimeter, the tightline drainpipe should be used to drain any collected water to daylight or into a storm drain system that should slope at least ¼ inch per foot. Subdrain surface outlets should be screened or otherwise protected to prevent the entry of animals.

7.4 Corrosion

USDA Web Soil Survey indicates a high risk of corrosion for uncoated steel at the subject site. Furthermore, the survey indicates a moderate risk of corrosion for concrete due to soil induced chemical or electrochemical action. Typical construction methods for coastal residential structures such as type II Portland cement should be applied at the subject site.

7.5 Drainage and Erosion

To mitigate erosion and reduce bluff instability potential, we recommend the following measures:

1. Design finished grade to allow sheet runoff rather than concentrated runoff.
2. Provide structures with roof gutters and downspouts and tie them into the storm drain system where possible.
3. Where concentrated runoff will occur, minimize its velocity by controlling slopes, and protect the channel and discharge area by dissipating flow energy, using erosion resistant surfacing as appropriate.
4. Protect slopes and bluffs from concentrated runoff or heavy sheet runoff by appropriate drainage control facilities. Do not allow concentrated run off onto the bluff slope.
5. Perform site work and vegetation establishment during seasons not subject to repeated or prolonged rainfall.
6. Provide periodic maintenance of erosion control measures.
7. No landscaping should be allowed against the structure unless moisture accumulation is considered. Moisture accumulation or watering adjacent to foundations can result in deterioration of wood/stucco.

For additional information regarding drainage and erosion control see the Erosion and Sediment Control Field Manual from the California Regional Water Quality Control Board.

8.0 Additional Services

During the design phase, it is important that communications between the design team and SHN be maintained to optimize compatibility between the design and soil and groundwater conditions.

We have assumed, in preparing our recommendations, that we will be retained to review those portions of project that pertain to earthwork and foundations. The purpose of this review is to confirm that our earthwork and foundation recommendations have been properly interpreted and implemented during design.

In order to assess construction conformance with the intent of our recommendations, it is important that a representative of our firm:

- monitor adequate subgrade preparation and grading of structural fill, and
- monitor foundation excavations.

This construction phase monitoring is important because it provides the owner and SHN the opportunity to verify anticipated site conditions, and recommend appropriate changes in design or construction procedures if site conditions encountered during construction vary from those described in this report. It also allows SHN to recommend appropriate changes in design or construction procedures if construction methods adversely affect the competence of on-site soils to support the structural improvements.

Plan review and construction phase monitoring are not considered part of our preliminary soils investigation and, therefore would require an additional service agreement and fees.

9.0 Limitations

The analyses, conclusions, and recommendations contained in this report are based on site conditions that we observed at the time of our investigation, data from our subsurface explorations and laboratory tests, our current understanding of proposed project elements, and on our experience with similar projects in similar geotechnical environments. We have assumed that the information obtained from our limited subsurface explorations is representative of subsurface conditions throughout the site. In order to confirm this assumption, a representative of our firm must observe and evaluate actual soil conditions encountered during project construction operations.

Subsurface conditions may differ from those disclosed by our limited investigations. If differing conditions are encountered during construction, our firm should be notified immediately so that we can reevaluate the applicability of our conclusions and recommendations. Such an evaluation may result in reconsidered and/or amended recommendations. If the scope of the proposed construction, including the proposed loads, grades, or structural locations, changes from that described in this report, our recommendations should also be reviewed.

Our firm has prepared this report for your exclusive use on this project in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study, including time and budget constraints. No warranty is expressed or implied. The recommendations provided in this report are based on the assumption that an adequate program

of tests and observations will be conducted by our firm during the construction phase in order to evaluate compliance with our recommendations.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we should review our report to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse. This report is applicable only to the project and site studied.

The field and laboratory work was conducted to investigate the site characteristics specifically addressed by this report. Assumptions about other site characteristics, such as hazardous materials contamination, or environmentally sensitive or culturally significant areas, should not be made from this report.

10.0 References Cited

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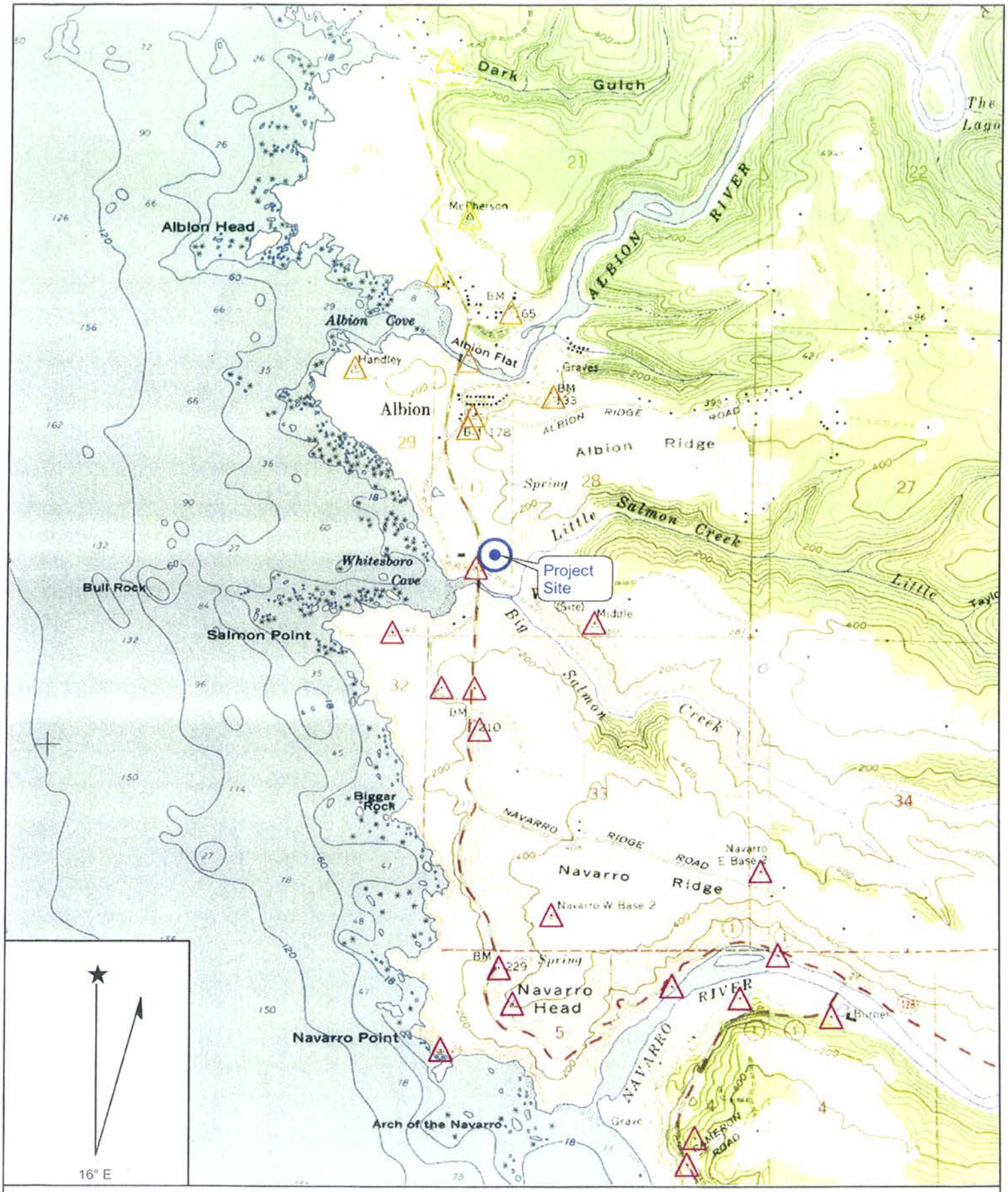

Name: ALBION
Date: 6/13/2008
Scale: 1 inch equals 2000 feet

Location: 039° 12' 54.57" N 123° 45' 55.17" W
Caption: Site Location Map
Project No. 408020
June 2008 - Figure 1

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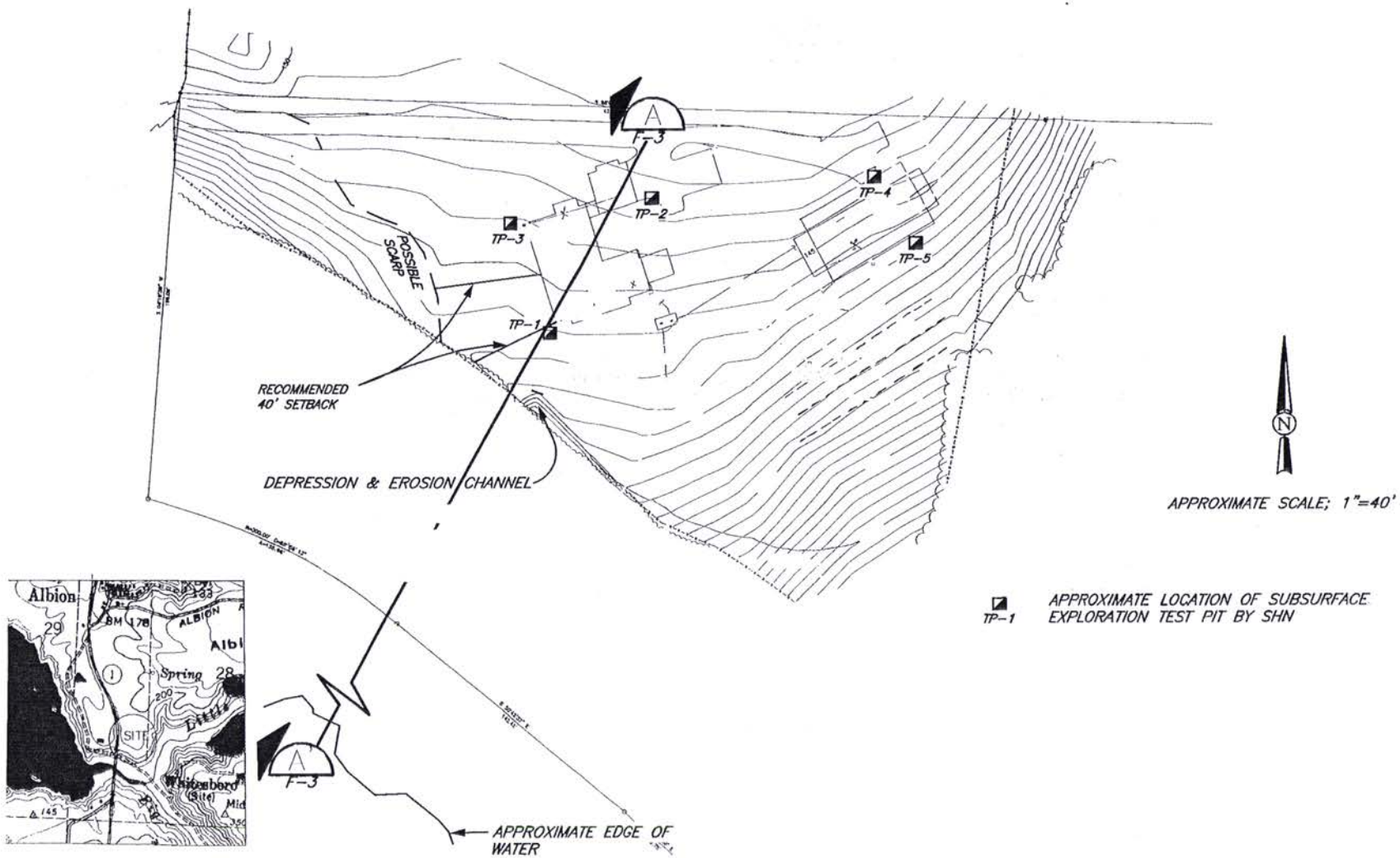
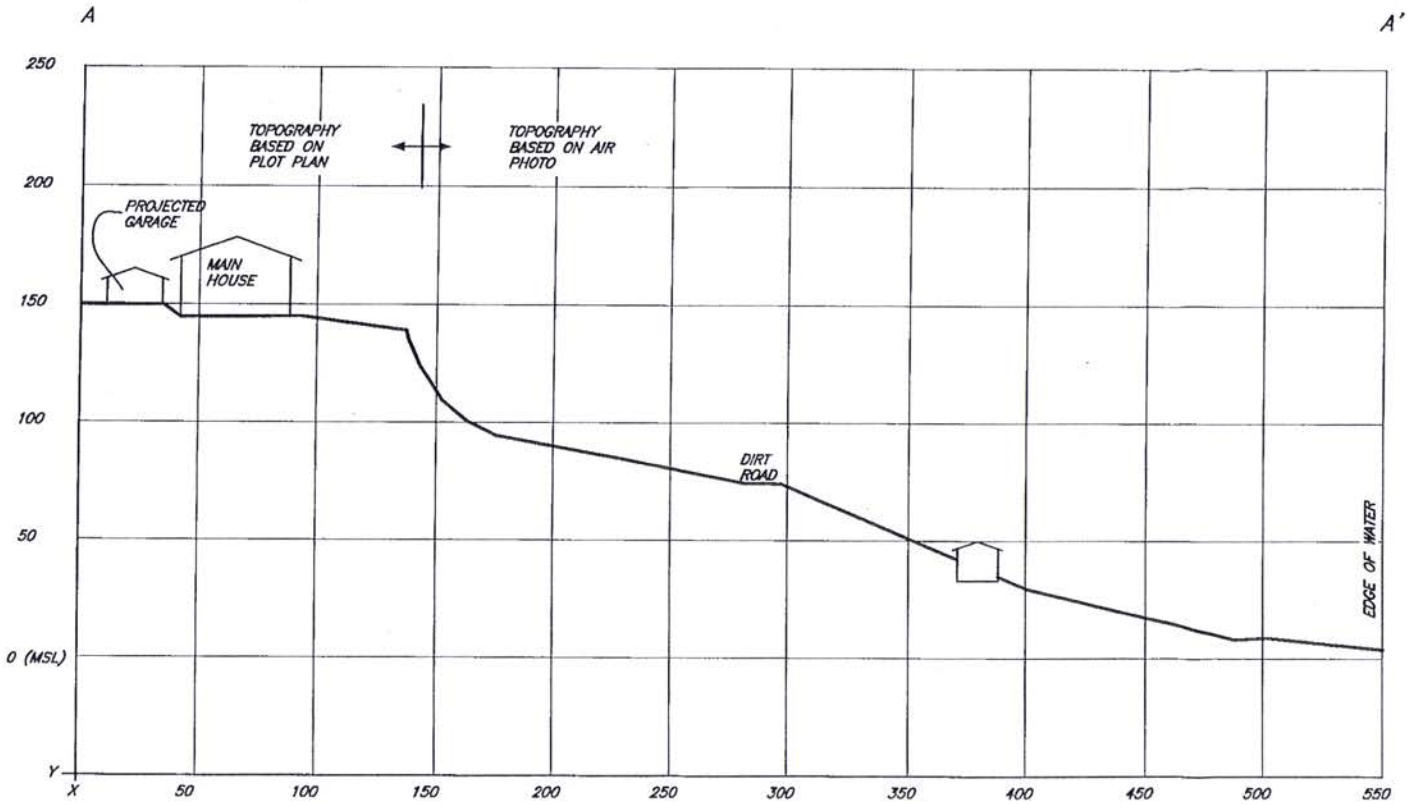


SHN Consulting Engineers & Geologists, Inc.	SHN Consulting Engineers AutoCAD Standards Eureka, Redding, Coos Bay, Willits	MARR RESIDENCE PLOT PLAN SHN 408020	
	JUNE 2008	408020-PLAT-2	Figure 2

O:\2008\408020 MARR\DWG, SAVED: 6/24/2008 2:53 PM LBUTZBEE, PLOTTED: 6/27/2008 1:44 PM, LARRY BUTZBEE



SITE SECTION

SCALE; 1"=50' (V)
1"=50' (H)

SHN Consulting Engineers & Geologists, Inc.	SHN Consulting Engineers AutoCAD Standards Eureka, Redding, Coos Bay, Willits	MARR RESIDENCE PLOT PLAN SHN 408020	
	JUNE 2008	408020-PLAT-2	Figure 3

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