

GEOTECHNICAL EVALUATION  
OF RIDGE ORDINANCE

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AMD TRUST PROPERTY  
LAFAYETTE, CALIFORNIA

The logo for ENGEEO INCORPORATED features the word "ENGEEO" in large, white, 3D block letters. Below it, the word "INCORPORATED" is written in smaller, white, sans-serif capital letters. The background of the logo is a composite image: the top part shows a green, rolling hillside under a blue sky, and the bottom part shows a rocky, brownish terrain with large boulders.

ENGEEO  
INCORPORATED

Submitted to:  
O'Brien Land Company, LLC  
3031 Stanford Ranch Road, Suite 2-310  
Rocklin, CA 95765

Prepared by:  
ENGEEO Incorporated

August 3, 2011  
Revised August 30, 2011

Project No. 9181.100.000

Project No.  
**9181.100.000**

August 3, 2011  
Revised August 30, 2011

Mr. David R. Baker  
O'Brien Land Company, LLC  
3031 Stanford Ranch Road, Suite 2-310  
Rocklin, CA 95765

Subject: AMD Trust Property  
Deer Hill Road  
Lafayette, California

**GEOTECHNICAL EVALUATION OF RIDGE ORDINANCE**

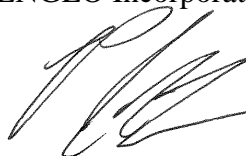
Dear Mr. Baker:

We have prepared this report to provide a geotechnical analysis of the Lafayette Area Ridge Map Hillside Overlay Ridge Map prepared by the City of Lafayette. The purpose of this study was to evaluate the ridge mapping from the standpoint of physical geography, topography and geology and to provide our opinions with respect to the applicability of the current map to the AMD Trust Property

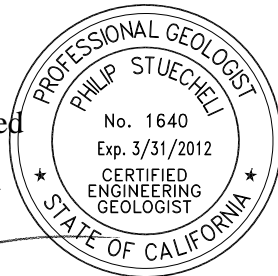
If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated



Philip J. Stuecheli, CEG  
pjs/dsh/jf:eval



Daniel S. Haynosch, GE



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## FIGURES

## **1.0 PURPOSE AND SCOPE**

The Lafayette Area Ridge Map, Hillside Overlay District Map (HODM) prepared by the City of Lafayette and incorporated into its Municipal Code designates Lafayette Ridge as a Class I ridgeline extending from the vicinity of Russell Peak in Briones Regional Park to the rough boundary of the AMD Trust Property and Deer Hill Road. Based upon purely visual observation, the HODM Class I Ridgeline designation does not appear consistent with actual field conditions as it appears that the topography of much of the area has been significantly altered due to extensive excavation and grading. ENGEEO has prepared this report as an analysis of the Lafayette Ridge landform in order to verify the accuracy of the HODM and the propriety of its ridgeline designations within the general vicinity of the AMD Trust Property.

## **2.0 LAFAYETTE RIDGE**

According to the United States Geological Survey (USGS) Briones Valley and Walnut Creek 7½-minute topographic quadrangles, the topographic feature designated as Lafayette Ridge extends from the vicinity of Russell Peak in Briones Regional Park for a distance of approximately 2.2 miles southeast. Over that distance, the ridge crest consists of a narrow steep-sided spine varying in elevation from approximately 1,200 feet to approximately 750 feet above mean sea level (msl). The main ridge spine is surrounded by numerous lower ridges extending laterally away from the main ridge at lower elevations. The regional topography of Lafayette ridge from the USGS quadrangle maps is depicted on Figure 1A.

### **2.1 AMD TRUST PROPERTY**

The AMD Trust Property is located southeast of Deer Hill Road and northwest of the intersection of Pleasant Hill Road and Highway 24 in Lafayette, California. Cuts and fills related to grading for Deer Hill Road, Highway 24 and a prior quarry operation have altered the original topography of the site (Figure 3). The current topography of the property can generally be characterized as four relatively flat-lying terraces separated by slopes that vary from inclinations of 1.5:1 to 4:1 (horizontal:vertical). Current elevations range from a high of about 463 feet above mean sea level (msl) on the northernmost terrace adjacent to Deer Hill Road to a low of about 330 feet above msl at the drainage near Pleasant Hill Road at the eastern edge of the site.

### **2.2 LAFAYETTE AREA RIDGE MAP**

The City Zoning Ordinance Section 6-2022 states:

“ For the purpose and application of this article, each ridge designated on the Lafayette area ridge map is grouped into one of three classes, I, II and III, depending upon its location, height, significance in relation to other nearby topographical features and the impact that development on or near the ridgeline would have upon scenic views of ridges and hillsides and the protection of open space, wildlife corridors, and native grassland, oak woodland, chaparral and riparian areas. “

The City HODM defines “Class I” and “Class II” ridgelines as shown on Figure 1A. Class I ridges are assigned a ridgeline setback of 400 feet and Class II ridges are assigned a setback of 250 feet. For the purposes of this study, we have focused on the southeast end of Lafayette Ridge, where the HODM identifies a single Class I ridge and 10 Class II ridges around the flanks of the Class I portion of Lafayette Ridge. The Class I ridge designation for Lafayette Ridge extends from Russell Peak at an elevation of 1,357 feet for approximately 2.2 miles, where the Class I ridge bifurcates and extends to the east and south. This portion of the HODM Class I ridge approximately coincides with the USGS designation of “Lafayette Ridge.” The HODM then indicates that the Class I Ridge extends for approximately one-half mile from the bifurcation (Figure 2; Point A1) to the south to the termination of the southern fork (Point B3). Over that same distance, the HODM Class I Ridge drops in elevation from 750 to 460 feet just southeast of Deer Hill Road, on the AMD Trust property. The USGS Walnut Creek Quadrangle topographic map was last updated in 1995. It depicts the elevation at the end of the Class I ridge at 500 feet. The USGS map uses a shaded overlay to denote areas of urbanization since prior map editions but the map contours have not been updated since the edition of 1959. The HODM and the USGS maps are approximately consistent; however, they both obviously fail to take into account the extensive alterations to site topography in the vicinity of the AMD Trust Property caused by prior excavations made in around 1968 to construct Deer Hill road and as part of the prior quarry operations (Figure 3). It appears that the HODM was based on the out-dated USGS topography. Neither map reflects actual conditions despite the more than 30 years that have lapsed since the original topography was substantially altered.

The City Zoning Ordinance Section 6-2006 states:

“...If a precise onsite measurement shows that the area within which development is prohibited varies from that shown on the City’s map, the area shown by the onsite measurement controls.”

Figures 2 and 3 show “onsite measurement” of actual post road and quarry grading conditions.

### **2.3 GEOMORPHOLOGY AND GEOLOGY**

According to the Glossary of Geology, a “ridge” is “a general term for a long, narrow elevation of the Earth's surface, usually sharp-crested with steep sides, occurring either independently or as part of a larger mountain or hill; e.g. an extended upland between valleys” or, “the top or upper part of a hill; a narrow, elongated crest of a hill or mountain.” The Glossary defines a “spur ridge” as “a subordinate ridge of lesser elevation that projects sharply from the side of a hill, mountain, or other high land surface.” In geomorphology, landforms are commonly assigned an “order” to distinguish primary landforms from subordinate features. The topography of Lafayette Ridge includes both a main, first-order “ridge” and second-order “spur ridges” that project at high angles from the main ridge as depicted on Figure 1A. Under this system of classification, the first-order landform of Lafayette Ridge ends at the approximately point A2 (Figure 2) on the HODM Class I ridge. The east and south extensions of the Class I ridge, and both HODM-designated Class I ridges would be classified as second-order spur ridges.

Lafayette Ridge is formed by layers of northwest-trending sedimentary rocks. The ridge crest runs parallel to the bedrock layers at an orientation of 65 degrees west of north and is truncated at the location of the Lafayette fault, as depicted on Figures 1A-1D. East of the fault, the topography drops approximately 200 feet over a distance of 900 feet forming a pronounced break, and the south spur ridge deviates from the orientation of the first-order ridge by about 80 degrees. This pronounced geomorphic break separates the first-order portion of Lafayette Ridge from the spur ridges to the east that are clearly second-order ridges.

## **2.4 RIDGE LINE PROFILES**

We constructed profiles of several of the HODM ridge lines to evaluate consistency of the designations based on topography as shown on Figure 1. The profiles were constructed based on a 1/9 arc-second digital elevation model produced by the USGS National Elevation Database (NED) program. On Figure 1B, the main, Class I ridge profile is depicted as a red line, while the selected Class II ridge lines are depicted as orange lines. Perspective views, shown on Figures 1C and 1D, show the relative elevations of the designated Class I and Class II ridges from a vantage point south of the site. As the figures show, the Class II ridges typically terminate at elevations of 200 to approximately 250 feet above the valley floor. The south spur ridge, which the HODM depicts as terminating at the AMD Trust Property, is classified as Class I even though it bears few, if any, of the characteristics of classified ridges shown elsewhere. Thus, the south spur ridge bifurcates at a nearly right angle from the established Lafayette Ridge Landform and then extends to an elevation of as low as 460 feet on the AMD Trust Property, which is also only about 120 feet above the adjacent valley floor (Figures 1A through 1D). The southeastern extension of this jurisdictional ridge extends approximately 650 feet beyond the logical termination of the second-order spur ridge at a well-defined slope break at an elevation of approximately 600 feet (Point B2), as depicted on Figures 1A through 1D and Figure 2.

## **3.0 CONCLUSIONS**

Based on the geology, geomorphology and topography of the southeast end of Lafayette Ridge and its appurtenant spur ridges, we conclude the following.

1. The landform designated as “Lafayette Ridge” by the USGS on the Walnut Creek and Briones Valley 7½ minute quadrangles terminates at an elevation of approximately 750 feet (Point A2) at a sharp slope break approximately 2.2 miles southeast of Russell Peak, as indicated by the USGS place-name label. This slope break is the geologic expression of the Lafayette Fault, which truncates the rock layers that form the high crest of the ridge.
2. The Lafayette Ridge landform described above fits the Glossary of Geology description of a “ridge”, and can be classified as a first-order ridgeline. The HODM Class II ridgelines fit the Glossary definition of “spur ridges” and can be considered second or third-order ridgelines. The approximately one-half mile long extension of the HODM Class I ridgeline from Point A2 should properly be classified as a spur ridge or second-order ridge, along with the adjacent HODM Class II ridges. Its classification as a Class I ridge is not consistent with the overall geomorphology of Lafayette Ridge. It can also be argued that the spur ridge that

extends on to the AMD Trust Property should, in fact, be delineated as a completely separate Class II ridge, since the contours locally close at the saddle near the Lafayette Fault, as depicted on Figure 2 (between Points B1 and B2).

3. The extension of the Class I ridge across Deer Hill Road and onto the AMD Trust Property appears to have been an error in the compilation of the HODM related to the use of out-dated USGS contours that do not accurately depict the ground surface. Excavations in the late 1960s, well before the adoption of the HODM, removed the southeast end of the former spur ridge and lowered elevations by 40 to 60 feet. These excavations effectively re-configured the topography into a series of broad, flat terraces. The landform used to define the end of the Class I ridge, designated Point B3 on Figure 2, no longer exists. Based on the existing topography, the most logical place to designate the end of the spur ridge is the slope break approximately 650 feet northwest of the site at an elevation of 600 feet, designated Point B2 on Figure 2.
4. The designation of a Class I ridgeline on the property is not consistent with designations of adjacent Class II ridge lines. The adjacent Class II ridges are consistently at least 140 feet higher in elevation (above msl), and typically 200 to 250 feet above adjacent valleys. Conversely, the Class I ridge on the AMD Trust Property extends lower in elevation than any of the supposedly subordinate Class II ridges, including one that is located only a few hundred feet to the west (D1-D2 on Figure 2).

Based on these findings and consistent with “onsite measurements” per Section 6-2006 of the Lafayette code, it is our opinion that the HODM Class I ridge defined through the AMD Trust property should terminate at Point B2 on Figure 2, at the end of the spur ridge 650 feet west of the site. In addition, it would, in our opinion, be more consistent to define the Class I ridge as a Class II ridge, based both on geomorphology and the mapping of adjacent Class II ridges on the HODM.

#### **4.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS**

This report presents preliminary geotechnical recommendations for planning purposes. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with no subsurface exploration data. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, notify ENGEO immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

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## **REFERENCES**

City of Lafayette, Lafayette Area Ridge Map Hillside Overlay District Map, Adopted July 8, 2002.

City of Lafayette, Zoning Ordinance Section 6-2022, 2000:

Dibblee, T. W., Jr., 2005, Geologic Map of the Walnut Creek Quadrangle, Alameda and Contra Costa Counties, California, DF 149, 2005.

USGS, Briones Valley and Walnut Creek 7 ½-Minute Quadrangles, Edition of 1973, at 1:24,000 scale.

USGS, National Elevation Database, 1/9 Arc-Second Digital Elevation Model, Processed to create 2-foot contours

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**FIGURES**

- |                 |   |
|-----------------|---|
| <b>Figure 1</b> | <b>Geomorphic Analysis of Ridgeline Designation</b> |
| <b>Figure 2</b> | <b>Ridge Plan</b>                                   |
| <b>Figure 3</b> | <b>Areas of Grading Disturbance</b>                 |



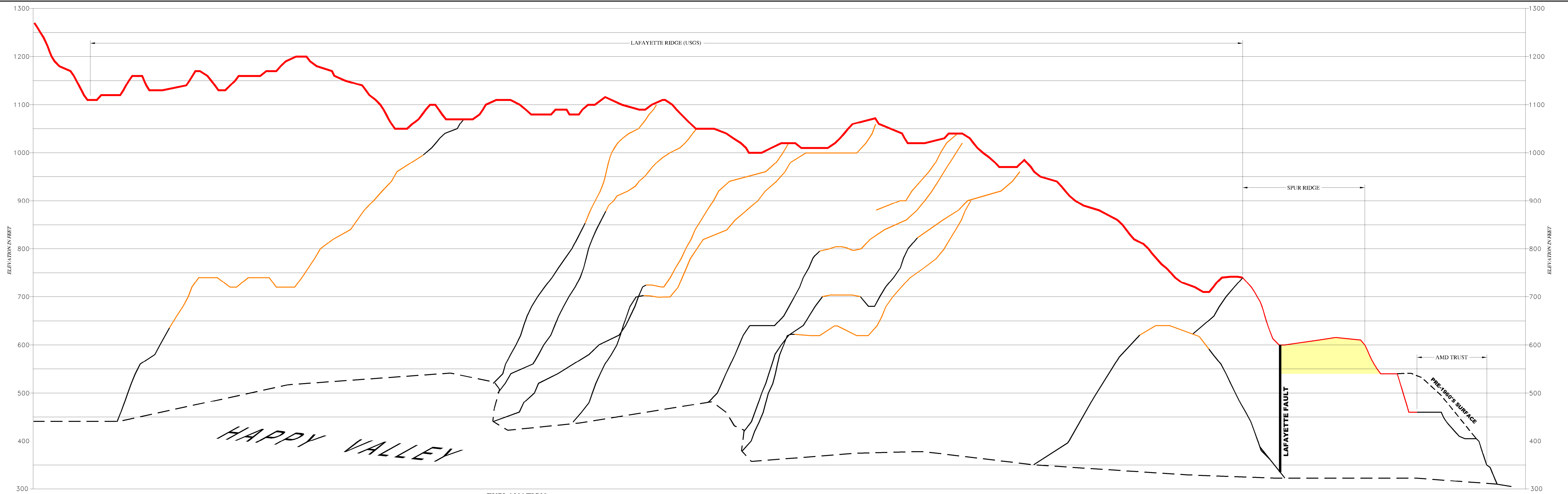


FIGURE 1B TOPOGRAPHIC PROFILES; HORIZONTAL SCALE: 1"=500'; VERTICAL SCALE: 1"=100'

- EXPLANATION**
- HODM CLASS I RIDGE
  - HODM CLASS I RIDGE EXTENSION
  - HODM CLASS II RIDGE
  - RIDGE PROFILE OUTSIDE HODM DESIGNATIONS

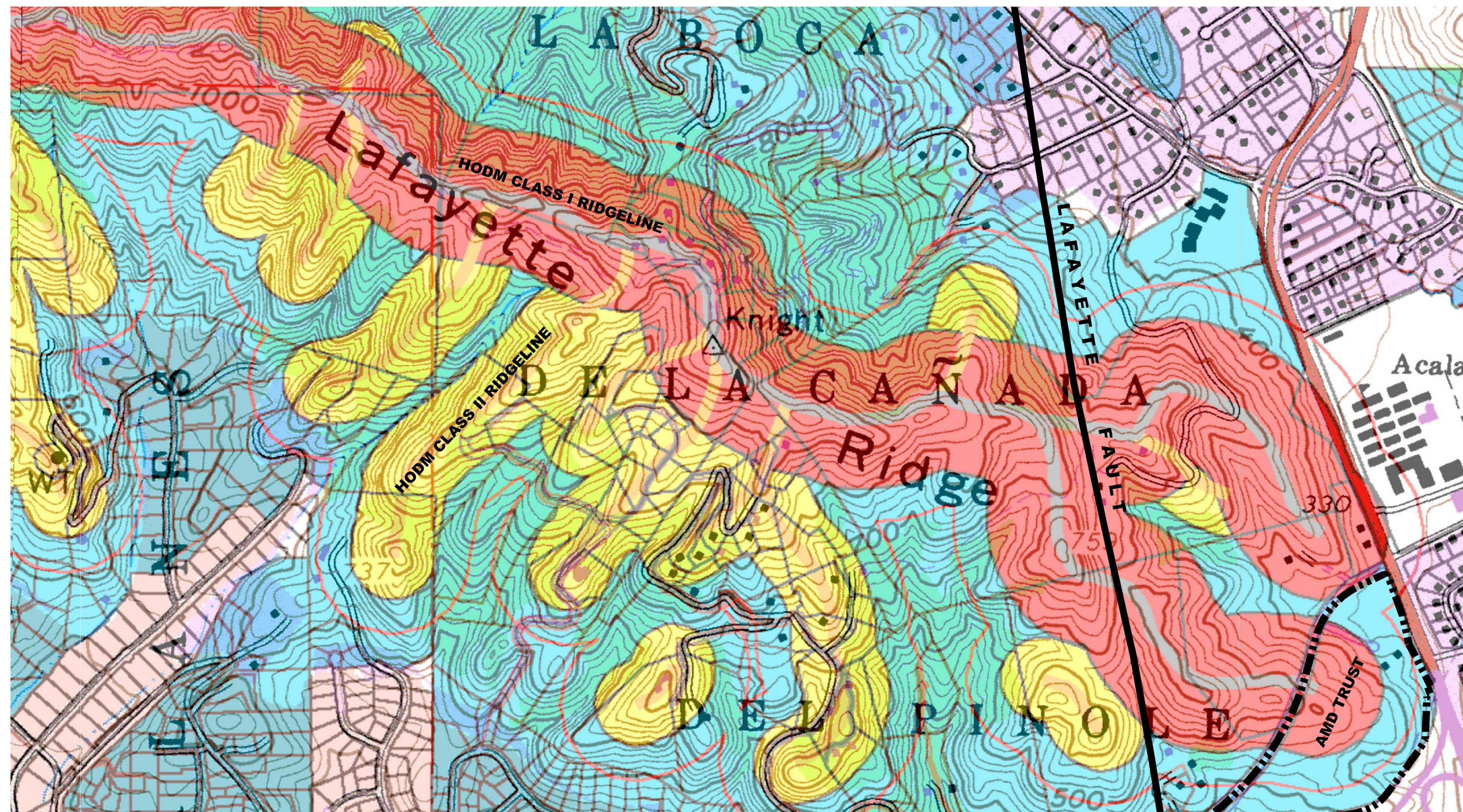


FIGURE 1A CITY HODM SUPERIMPOSED ON 1973 USGS MAP

- EXPLANATION**
- CLASS I SETBACK (400 FEET)
  - CLASS II SETBACK (250 FEET)
  - HILLSIDE OVERLAY DISTRICT

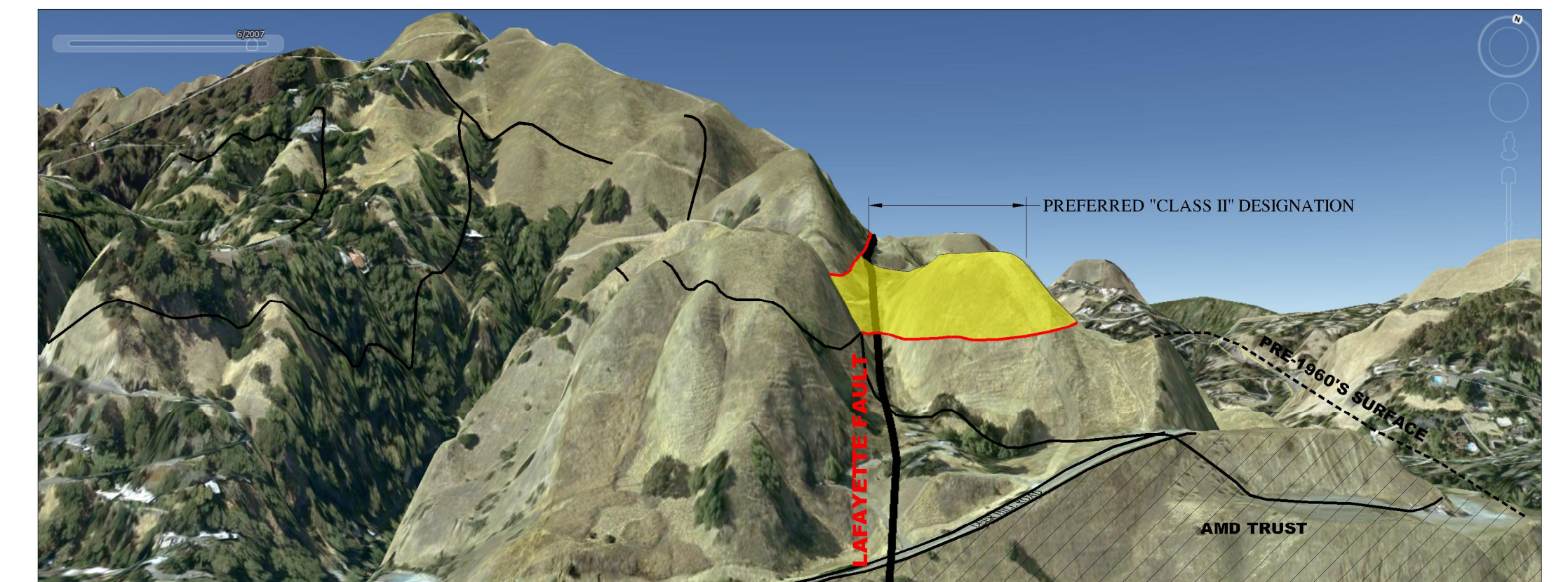


FIGURE 1C PREFERRED CONSISTENT RIDGE DESIGNATION

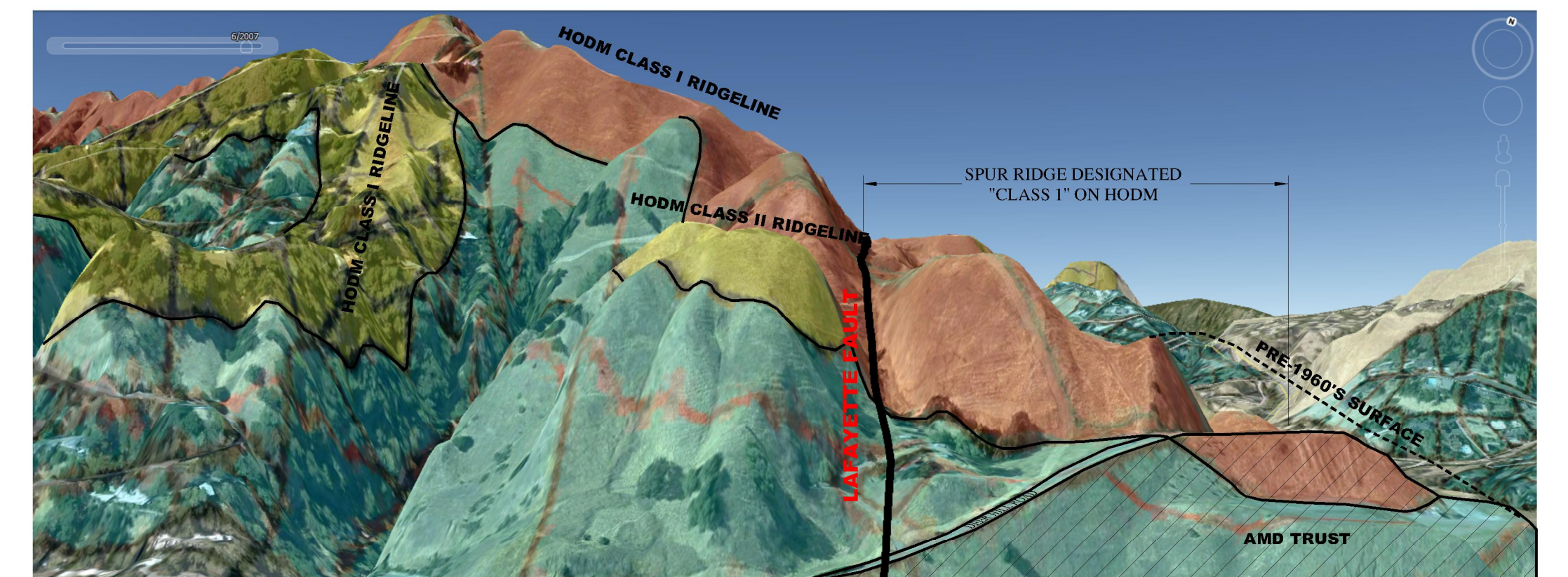
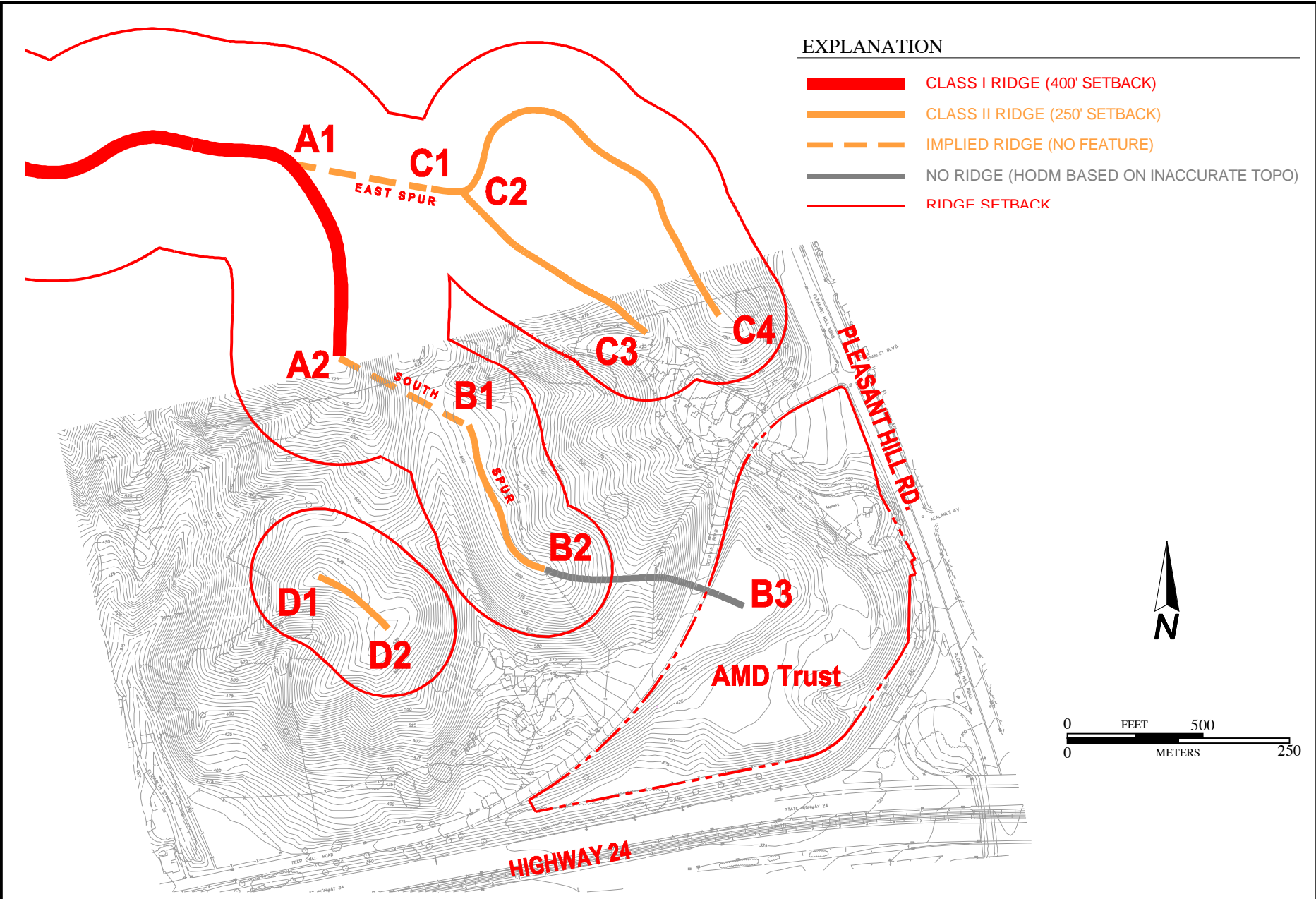


FIGURE 1D EXISTING HODM RIDGE DESIGNATION

C:\Drafting\DRAF-11\2\Draw\9181\000\Ridge Study\9181000100-GE-2-Ridgeplan-0911.dwg Plot Date: 9-01-11 Product:



BASE MAP SOURCE: LCA ARCHITECTS

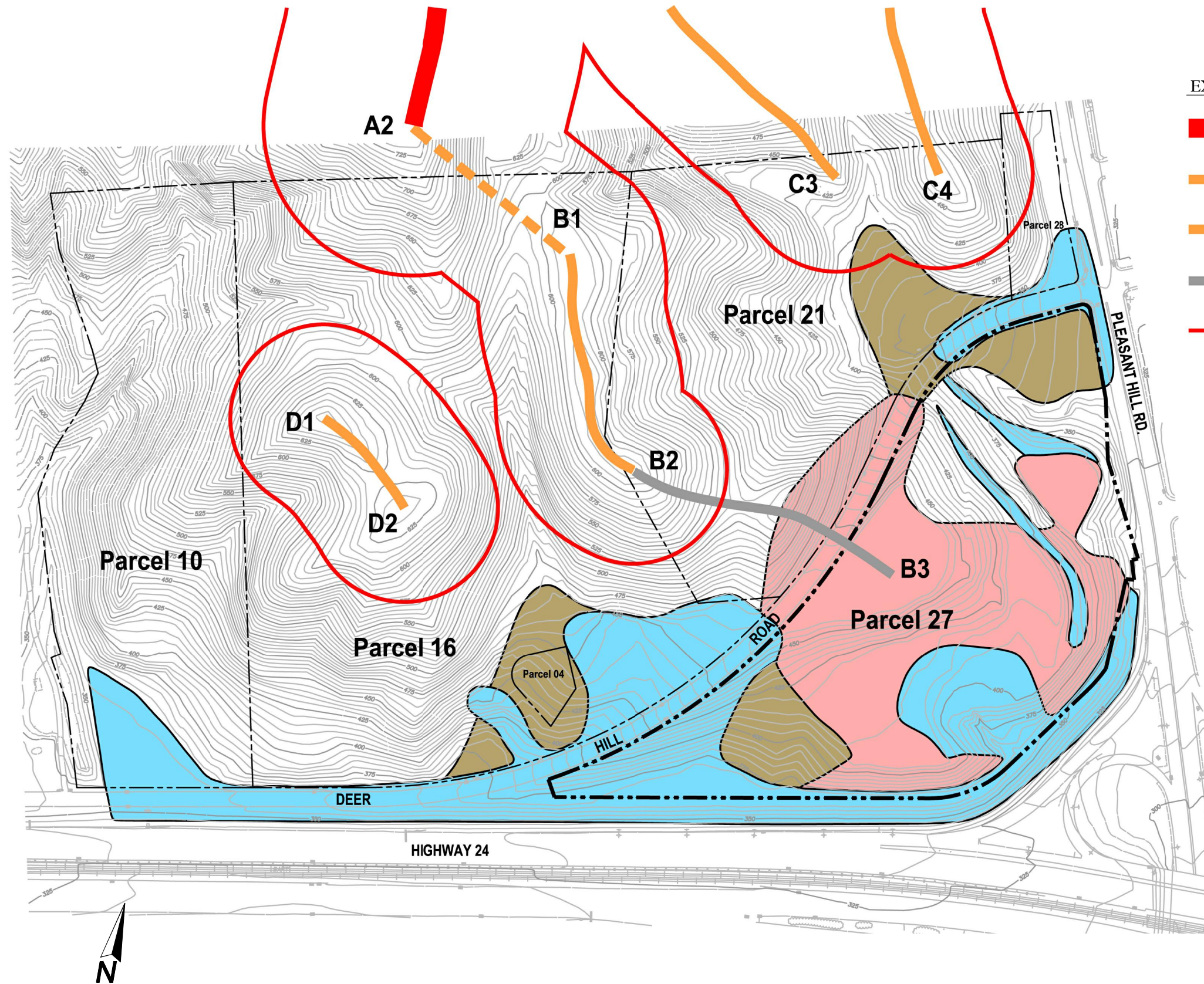


RIDGE PLAN  
 AMD TRUST PROPERTY  
 LAFAYETTE, CALIFORNIA

PROJECT NO.: 9181.000.100	
SCALE: AS SHOWN	
DRAWN BY: PC	CHECKED BY: PS

FIGURE NO.  
**2**

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EXPLANATION

- CLASS I RIDGE (400' SETBACK)
- CLASS II RIDGE (250' SETBACK)
- IMPLIED RIDGE (NO FEATURE)
- NO RIDGE (HODM BASED ON OUTDATED TOPO)
- RIDGE SETBACK
- AREAS OF SIGNIFICANT CUT
- AREAS OF SIGNIFICANT FILL
- AREAS OF OTHER DISTURBANCE

BASE MAP SOURCE: lca-architects



EASTERN DEER HILL PLANNING AREA  
 AREAS OF GRADING DISTURBANCE  
 AMD TRUST PROPERTY  
 LAFAYETTE, CALIFORNIA

PROJECT NO.: 9181.000.100	
SCALE: AS SHOWN	
DRAWN BY: PC	CHECKED BY: PS

FIGURE NO.  
**3**