County Geologist, Peer Review Letter Dated February 23, 2016

DARWIN MYERS ASSOCIATES
ENVIRONMENTAL RESEARCH ■ ENGINEERING GEOLOGY

February 23, 2016

Francisco Avila, Project Planner
Contra Costa County
Department of Conservation & Development
30 Muir Road
Martinez, CA 94553

Subject: **Geologic Peer Review – 30-Day Comments**
SD16-9429 (Gloria Terrace, LLC, Applicant)
APN 166-200-032 & 166-210-008)
Lafayette Area, Contra Costa County
DMA Project # 3007.16

Dear Francisco:

At your request we have reviewed the tentative map for the captioned project. Our approach to this review included: a) review of published geologic maps and reports; b) review of a 1973 stereo pair of vertical angle aerial photographs; [1] c) a site visit, and d) review of pertinent Safety Element policies. With that background, we reviewed the geotechnical report submitted with the application,[2] along with the Vesting Tentative Map for an nine (9) lot residential subdivision.[3] We then evaluated the data gathered, and prepared our peer review letter, which presents our findings and recommendations.

The project site is a 7.68 acre property that is located in the upland area located just northeast of Gloria Terrace. All proposed residential lots will take immediate access from a proposed private road that is to have a paved width of 22 ft. within a 30 ft. wide right of way. The Vesting Tentative Map indicates that retaining walls are required along segments of the proposed road. The VTM shows proposed locations of building pads on each of the proposed lots, as well as the locations of six proposed C.3 water quality basins that are intended to control peak runoff and improve water quality. The grading shown on the VTM indicates approximately 15,000 cu. yds. of cut and 15,000 cu. yds. of fill. It should be recognized that these estimates are for the civil grading required for the project. Corrective grading needed to achieve long-term stability of the property will be in addition to the estimated civil grading volumes.

Statement of Purpose

The immediate need is for sufficient data to allow the processing of the pending application, including preparation of the California Environmental Quality Act (CEQA) document. Our most recent comments on the project were provided one year ago. The purpose of our review is to provide an opinion on the geologic and geotechnical information, along with VTM/ grading plan data needed to deem the application complete. Provisions of CEQA and associated case law acknowledge that final design studies

[1] Pacific Aerial Surveys, 1973, Aerial Photographs CC 3526-2-131 thru 133, flown on May 5, 1973 (scale 1"=1,000').

[2] GFK & Associates, Inc., 2016, *Preliminary Geologic and Geotechnical Investigation, Proposed 9-Lot Residential Subdivision, APNs 166-200-032 and 166-210-008, Gloria Terrace, Lafayette, California,* GFK Job #1668 (report dated February 4, 2016).

[3] Humann Company, 2016,Vesting Tentative Map, *A Re-subdivision of APN 166-200-032 and 166-210-008,* Humann Company Job #15012 (dated February 16, 2016)

1308 PINE STREET ■ MARTINEZ, CA 94553 ■ 925/209-9994

are not needed for the purposes of CEQA compliance. However, there must be sufficient information on the extent of potential geologic and geotechnical hazards, and guidance must be provided to the project civil engineers pertaining to the layout of the Vesting Tentative Map (VTM), including the grading and drainage plans. Therefore, the type of data needed at this time is evaluation of the VTM and associated grading and drainage plans by the project geologists and geotechnical engineers. In our experience, the County expects the project geologists and geotechnical engineers to make a preliminary evaluation of potential geologic hazards, including preparation of an original geologic map that shows the location of landslides and any other potential geologic hazards having the potential to affect the design of planned improvements using the VTM Grading Plan as a base map. As a minimum, the report should provide an assessment of the potential hazards address by CEQA Appendix G (see Table 1).

Table 1

Significance Criteria for Assessment of Potential Geologic Impacts

Appendix G of the CEQA Guidelines identifies environmental issues to be considered when determining whether a project could have significant effects on the environment. As identified in Appendix G, a project would have a significant impact to geology and soils if it would:

1 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
   a) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
   b) Strong seismic ground shaking; c) Seismic-related ground failure, including liquefaction; or d) Landslides;
2. Result in substantial soil erosion or the loss of topsoil;
3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or
5. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Background

1. Bedrock Geology

In 1995 the California Geologic Survey (CGS; formerly California Division of Mines & Geology) issued a report that included four maps, along with text, that provided data on the stability of their hillside study area.[4] It is the most recent geologic map of the SD16-9429 site and vicinity. According to this map, the site is in the outcrop belt of the Martinez Formation, Lower Member (Tmzl). The legend of CGS map indicates the rock is chiefly sandstone of Upper Paleocene age. With regard to geologic structure, the bedrock is tightly folded and faulted. The site is on the southwest limb of an anticline that trends N40°W. The axis of the anticline passes just northeast of the property. By extrapolation from nearby measurement bedding is inferred to dip to the southwest at approximately 60°. Furthermore, a northeast-trending bedrock fault is mapped approximately 300 ft.± northwest of the site. No active or inactive faults are mapped through the site.

The nearest fault considered to be active by the CGS is the Concord fault, which trends approximately N30°W and passes 4 miles northeast of the project site. The active Hayward and Calaveras faults trend northwest and pass approximately 9½ and 10 miles southwest and south of the site, respectively. The San Andreas fault is mapped 28 miles southwest of the site. Another fault of regional significance is the Franklin fault, which passes 2 miles west of the site. Although not considered active by the CGS, it is a possible seismic source.

[4] Haydon, W.D., 1995. *Landslide Hazards of the Martinez-Orinda-Walnut Creek Area, Contra Costa County, California.* DMG Open File Report 95-12.

2. Engineering Geology

In 1995 the US Geological Survey issued a professional paper that characterizes the composition and engineering properties of rock and soils that most influence slope stability.[5] According to this report, the formation mapped on the site (Unit #426) is the Martinez Formation, lower glauconitic sandstone member. It consists of about 50 percent sandstone and conglomerate, and about 50 percent clayey rock. As Table 2 indicates, the fine-grained rocks consist of a) mudstone, b) siltstone (some tuffaceous), c) fine-grained, clay-saturated sandstone, and d) shale. Much of the bedrock is rated severely expansive, and the soils and colluvial deposits are severely expansive.

Table 2
ENGINEERING GEOLOGIC PROPERTIES OF THE MARTINEZ FORMATION, LOWER MEMBER (UNIT 426)

Composition: (1) Sandstone, medium-grained, most moderately to poorly sorted (of low permeability), some well sorted and clean (of moderate permeability). About one-fifth of sandstone is calcite cemented. Minor glauconitic medium-grained sandstone of 50 percent glauconite. (2) Conglomerate of pebbles and cobbles in low permeability sandstone matrix, about one-fifth calcite cemented. (3) Mudstone, grading to siltstone, sandy claystone (some probably tuffaceous), and fine-grained silt- and clay-saturated sandstone. (4) Shale, clay to silty.
Hardness: Sandstone is largely firm where weathered and probably where fresh, some (clean sandstone) is soft where weathered. Conglomerate is largely firm with hard clasts, hard when cemented. Clayey rock (compositions 3, 4) is firm where fresh, firm to soft where weathered (soft when damp).
Bedding: Sandstone occurs in very thick (typically 6-30 ft) distinct beds, in thin to thick beds interbedded with similar thicknesses of clayey rock, and less commonly in very thick (tens of feet) intervals of laminated sandstone. Conglomerate occurs in very thick (5-20 ft) beds. Cemented zones in sandstone and conglomerate are thick to 5 ft. Clayey rock is largely indistinctly bedded in very thin to very thick beds.
Permeability: Intergranular permeability of sandstone is largely low, minor to some moderate; conglomerate low; mudstone and shale largely very low, some low. Thus, much bedrock has low intergranular permeability, much very low, minor to some moderate. Much mantle moderate, much very low.
Weathering: Some clayey rock is fresh at depths of 10-15 ft. Some sandstone weathered to depths greater than 70 ft. Some spheroidal weathering in composition 3.
Expansivity: Much bedrock is severely expansive, much unexpansive. Much mantle severely expansive, much unexpansive to possibly significantly expansive.

3. Landslide Deposits

The 1995 report issued by the CGS is the most recent landslide map of the site and vicinity. A point of departure for the CGS map was a previous landslide map issued by the U.S. Geological Survey.[6] The primary purpose of CGS study was to provide information about landslide hazards to local officials engaged in land-use planning and in evaluation of subdivision and building permit applications. The scope of the CGS investigation included literature review, geologic interpretation of historic aerial photographs, limited field mapping and evaluation of landslide susceptibility and debris flow susceptibility. Products of the CGS study included the following (a) *Landslides and Related Features Map*, (b) *Relative Landslide Susceptibility Map* and (c) *Relative Debris Flow Susceptibility Map*. According to the CGS, no landslides were confirmed on the site, but three *definite or probable* landslides and one small landslide on mapped nearby on the slopes on the northeast flank of Gloria Terrace on slopes similar to those that occur on the SD16-9429 site.

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[5] Ellen, S.D. and C.M. Wentworth, 1995. *Hillside Materials and Slopes in the San Francisco Bay Region, California.* U. S. Geological Survey Professional Paper 1357.

[6] Nilsen, T.H., 1975, *Preliminary Photointerpretation Map of Surficial Deposits, Walnut Creek 7.5-Minute Quadrangle, Contra Costa County.* U.S. Geological Survey Open File Map 75-277-47.

4. Slope Stability

The Relative Landslide Susceptible Map considered such factors as steepness of slope, and whether or not evidence of landsliding was observed; the apparent stability characteristics of the geologic materials (in this case the assessment of the engineering geologic characteristics of the Martinez Formation, Lower Member); and a variety of associated factors that can affect stability (e.g., expansive soils, proximity of a fault zone, proximity of creeks, etc.). A four-value scale was prepared to indicate relative slope stability, ranging from Area 1 (least susceptible) to Area 4 (most susceptible). The CGS map places the site and immediate vicinity in Area 3 (generally susceptible). The legend of the map indicates that Area 3 is characterized by steep terrain with slope of 30% to 50%. Although landslides are uncommon, the slopes are likely near their stability limits. The slopes can be expected to fail, locally, when natural processes or man-caused alterations modify the terrain and steepen, load or remove natural supporting buttresses.

The Relative Debris Flow Susceptibility Map was developed by the CGS using the following factors: (a) distribution of debris flows in the CGS study area, (b) geology of the area (sandstone present a higher risk than fine-grained sedimentary rock) and (c) slope gradient. Using these criteria, a three-value scale was prepared , ranging from A (least susceptible) to C (most susceptible). The CGS map places the site in Category B (marginally susceptible). The CGS interpretative maps (landslide susceptibility and debris flow susceptibility are intended as an aid in general land use planning. They are neither intended nor suitable for detailed evaluation of individual sites. Such evaluations require engineering geologic studies and soils engineering investigations for specific construction projects.

Safety Element

1. Liquefaction

The Alquist-Priolo Earthquake Fault Zone that encompasses recently active and potentially active traces of the Hayward and Concord faults pass 9½ miles southwest and 4¼ miles northeast, respectively. These faults are considered capable of generating magnitude 6.5 to 7 earthquakes.

With regard to liquefaction potential, the Safety Element of the General Plan divides Contra Costa County into three categories: "generally high," "generally moderate to low," and "generally low." According to this map, the parcel is in the "generally low" susceptibility category. The Safety Element includes a number of policies indicating that at-risk areas require evaluation of liquefaction potential and effective mitigation of the hazard posed to new development. Operative General Plan policies are presented in Table 3.

Table 3
GENERAL PLAN LIQUEFACTION POLICIES

Policy 10-18 This General Plan shall discourage urban or suburban development in areas susceptible to high liquefaction dangers and where appropriate subject to the policies of 10-20 below, unless satisfactory mitigation measures can be provided, while recognizing that there are low intensity uses such as water-related recreation and agricultural uses that are appropriate in such areas.
Policy 10-19 To the extent practicable, the construction of critical facilities, structures involving high occupancies, and public facilities shall not be sited in areas identified as having a high liquefaction potential, or in areas underlain by deposits classified as having a high liquefaction potential.
Policy 10-20 Any structures permitted in areas of high liquefaction damage shall be sited, designed and constructed to minimize dangers from damage due to earthquake-induced liquefaction.
Policy 10-21 Approvals to allow the construction of public and private development projects in areas of high liquefaction potential shall be contingent on geologic and engineering studies which define and delineate potentially hazardous geologic and/or soils conditions, recommend means of mitigating these adverse conditions, and on proper implementation of the mitigation measures.

During the processing of land development applications, the County requires rigorous evaluation of liquefaction potential in areas of "high potential," and less comprehensive investigations are demanded in the "moderate to low" category. Evaluation of liquefaction potential is not required for sites in the "generally low" category.

2. Slope Stability

County General Plans historically have classified major slope areas in excess of 26 percent as "not readily developable" and "undevelopable," recognizing the cost and engineering difficulties of grading in areas of steep slopes (Policy 10-29); and density is to decrease as slopes increase above 15 percent (Policy 10-28).

Landslides and ground slippages may be triggered by strong ground motion accompanying a major earthquake. Areas that are subject to slides and slippages from other natural causes may be very hazardous under earthquake conditions. Earthquake effects will be more extensive if a major earthquake occurs during the rainy season when ground conditions are favorable to landsliding and ground slippage. Whether a landslide will or will not occur at any specific, presently stable slope usually cannot be predicted under "natural conditions" because of the range of natural conditions and changes which occur with time. However, land which has experienced landsliding in the past is believed to be generally more slide-prone, and also is more sensitive to man-induced changes, such as grading, watering, removing or changing the type of vegetation, and changing drainage patterns, among many possible factors.

The Safety Element contains a number of policies that are directed to protect development from landslide hazards and minimize grading of steep slopes. Those which appear most applicable to SD16-9429 are presented in Table 4.

Table 4
General Plan Ground Failure Policies

Policy 10-22 Slope stability shall be a primary consideration in the ability of land to be developed or designated for urban uses.
Policy 10-23 Slope stability shall be given careful scrutiny in the design of developments and structures, and in the adoption of conditions of approval and required mitigation measures.
Policy 10-24 Proposed extensions of urban or suburban land uses into areas characterized by slopes over 15 percent and/or generally unstable land shall be elevated with regard to the safety hazard prior to the issuance of any discretionary approvals.
Policy 10-26 Approvals of public and private development projects in areas subject to slope failures shall be contingent on geologic and engineering studies which define and delineate potentially hazardous conditions and recommend adequate mitigation.
Policy 10-27 Soil and geological reports shall be subject to the review and approval of the County Planning Geologist.
Policy 10-28 Generally, residential density shall decrease as slope increases, especially above a 15 percent slope.
Policy 10-29 Significant hillsides with slopes over 26 percent or more shall be considered unsuitable for types of development which require extensive grading or other land disturbance.
Policy 10-30 Development shall be precluded in areas when landslides cannot be adequately repaired.
Policy 10-31 Subdivisions approved on hillsides which include individual lots to be resold at a later time shall be large enough to provide flexibility in finding a stable buildable site and driveway location.
Policy 10-32 The County shall not accept dedication of public roads in unstable hillside areas, or allow construction of private roads there which would require an excessive degree of maintenance and repair costs.

GFK Geologic and Geotechnical Report

1. Purpose and Scope

The purpose of the report issued by GFK & Associates (GFK) was to characterize surface and subsurface conditions and provide preliminary geotechnical recommendations. The stated scope of work included (a) review of pertinent published geologic and soils reports and maps, (b) review of a previous GFK reports for a single family residence on APN 166-200-032,[7] [8] (c) field reconnaissance and preparation of an original geologic map of the site, (d) excavation and logging of backhoe test pits, (e) laboratory testing of selected samples recovered from the test pits, (f) engineering analysis of the data gathered and (g) preparation of a report documenting the investigation and presenting GFK's evaluation and recommend-dations.

2. Soil, Geologic and Seismic Setting

GFK provides an overview of the geology of the site. Briefly summarized, the site is in the outcrop belt of the Martinez Formation of Paleocene Age. This unit is described is described as consisting of interbedded sandstone, clay shale, siltstone and clayey sandstone that has been tightly folded, faulted and uplifted. GFK indicates that their field observations are consistent with the interpretation on site conditions shown on published geologic maps.

With regard to landslides, the CEG report presents the landslide mapping of the U.S. Geological Survey (Nilsen, 1975) and California Geological Survey (Haydon, 1995). Both of these maps confirmed the presence of landslides within the vicinity of the project site but not on the property itself. Figure 5 of the GFK report presents the Nilsen surficial deposits mapping, and Figure 6 presents the Haydon landslide features mapping on the site and vicinity. Figure 5 also maps the distribution of colluvium on the site. GFK also provides a brief overview of the location of known active faults with respect to the site and their potential to trigger significant ground shaking. The nearest active fault is the Concord–Green Valley fault (located 4 miles northeast of site). There are five other active faults that range from 9½ to 28 miles from the site.

3. Surface and Subsurface Conditions

GFK logged 9 test pits on the site on January 20, 2016. Each test pit was logged by a licensed engineering geologist. Six test pits were located on the upper elevations of the ridge; one test pit was located in the area of the proposed major cut slope (near Lot #6); one test pit was located on Lot #4; and one test pit was located on the lower portion of a steep slope were evidence of shallow soil instability was observed. Additionally, for their previous geotechnical investigations, GFK logged five (5) exploratory borings. All five borings are on the southeast portion of the site, just downslope of the proposed private road. That represents a total 14 subsurface data points (test pits and borings) on the 7.68 acre project site, for an average of slightly more than 1.8 subsurface data points per acre. Figure 7 of the GFK report shows the consultant's interpretation of site conditions, and the location of borings and test pits. It also shows the location of shallow undocumented fill on the downslope flank of the existing access track (i.e. rough graded access trail/ road) on the site and two shallow landslides. GFK describes their evaluation of the surface and subsurface data as follows:

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[7] GFK & Associates, Inc., 2012, *Geotechnical Investigation, Proposed Single-Family Residence, APN 166-200-032, 3198 Gloria Terrace, Lafayette,* (report dated May 14, 2012).

[8] GFK & Associates, Inc., 2013, *Geotechnical Investigation, Proposed Single-Family Residence, APN 166-200-032, 3198 Gloria Terrace, Lafayette,* (report dated February 19, 2013).

- ***Northwest Slope and Level Area.*** The natural slope is described as smooth and regular, with a gradient of 2:1 (h:v). At the toe of this slope is a drainage swale with flank slopes of 4:1 (h:v). Test pits TP-1 and TP-2 indicate the higher elevations of this slope indicate 3 to 4 ft. of soil; TP-3 indicates that at the toe of slope soils are 5 ft. thick. In the axis of the drainage swale the soils are likely to be thicker. TP-7 was excavated on a gentle slope area just north of the swale, where a future cut slope is planned. This test pit encountered only 2 ft. thickness of soils over bedrock. The bedrock exposed in test pits TP-1 & -7 is described by GFK as fractured siltstone; and bedrock exposed in test pits TP-2 & -3 is described as sandstone.
- ***Southwest Slope.*** The slope gradient is 2:1 (h:v) at the toe of slope, but gradually flattens to 4½:1 (h:v) near the crest of the ridge. In visual evidence of active mass wasting (i.e. erosion, sloughing). Test pit TP-4 encountered 1 ft. of soil overlying hard, medium-grained sandstone. Near south corner of this slope outcrops of cemented conglomerate with cobble sized clasts.
- ***Southeast Slope.*** The slopes in this area of the site are characterized by gradients of up to 1.6:1 (h:v). Test pits TP-5 and TP-6 were placed on the upper portion of this slope and PT-9 was placed near the base of the slope. All these test pits found 1 ft. of soil over fine- to medium-grained sandstone. Much of the mid-slope are was characterized by an arcuate scare and small scale lumpy/ irregular bulges interpreted by GFK as evidence of active mass wasting (i.e. active erosion, sloughing, shallow slides, slope creep).
- ***Southern Valley.*** The 2012 and 2013 borings of GFK identified soft, compressible fill and alluvial deposits in the central portion of the valley ranging in thickness from 6 to 9 ft. in thickness. In the center of the valley, GFK's exploratory borings determined the bedrock contact was at depths 12 to 18 ft. below the ground surface.

4. Laboratory Testing

Laboratory testing was performed using ASTM testing protocols. The testing consisted of moisture/ density, plastic index, and gradation. The results of the testing are provided on the *Logs of Test Pits* and on Table 1 of the GFK report.

5. GFK Conclusions and Recommendations.

The following discussion is intended to highlight and summarize (not supersede) the evaluation of GFK. Based on the data gathered, GFK concludes that the large pad on the top of the hill will expose hard sandstone and siltstone. Lots # 5 through 9 are within at least a portion of the padded area.

a) ***Lots #6 to 8.*** No evidence of erosion or slumping was observed near Lots #6 through 8. With a conservative approach to grading and development and an efficient drainage system, no corrective grading is needed.
b) ***Lots #5 and 9.*** The steepest slopes are present below the potential building sites on Lots #5 and 9. These slopes contain clear evidence of recent shallow slumping and slope creep. There is a substantial risk of future movement. If/ when ground failure occurs, it has potential to affect the stability of the upslope improvements on Lots #5 and 9, as well as the downslope segment of the proposed private road.
c) ***Lots #1 to 3.*** GFK notes that grading of the upper elevations of the site will generate fill for use during construction of the private road and Lots #1 to 3. GFK notes that no sliver fills will be allowed. Instead, side-slope fills are to be "keyed" into firm bedrock and with proper placement of subdrains. Keyways may also be required between Lots #1 & 2; on the downslope side of Lot #1; and between Lots #2 and 3. No comments are addressing Lot #4 in this section of the GFK report.)
d) ***Foundations.*** On Lots #5 through 9, GFK recommends drilled, cast-in-place piers that are embedded into bedrock. With regard to Lots #1 to 3, there is potential to either a pier-and-grade beam foundation or a properly designed concrete mat foundations.

e) ***Private Road.*** GFK states that when grading and improvement plans are being finalized, recommendations will be provided for corrective grading of the unstable areas on Lots #5 and 9 (see Figure 7 of the GFK report for a map showing these shallow slide areas. GFK notes that it may be necessary for some additional subsurface exploration.

f) ***Undocumented Fill.*** While it is not specifically discussed in this section of the report, it appears that all existing fill on the site is to be over-excavated. Clean earth material generated by over-excavation of the fill can be used in construction of engineered fill. However, deleterious material (e.g. tree branches, construction debris) would need to be removed from the site.

Tentative Map

We have reviewed a reduced-scale copy of the VTM. At this scale we cannot provide a detailed review of the features shown on the map. For example the height of the retaining walls along the private road and the details of the upslope drainage ditch. From our perspective, grading details are not critical at this stage. Elevations on the site range from +300 feet to +457 feet (total relief 177 feet). Natural slopes on the site of 26 to 50 percent are representative of broad areas, and in at least one area of the property the natural slope is 62½ percent. As noted previously, the GFK report maps two shallow landslides on the site. The field data gathered by GFK will require future analysis to confirm the precise limits of these slides, depth of slide plane, type of slide deposit and approach to corrective grading. The grading plan indicates the proposed cut slope on Lot # 6 is to be 20 ft. high, with a planned gradient of 2½:1(h:v). Northeast of the potential building site on Lot #5 a 34 ft. high fill slope is indicated that has a design gradient of 2½:1(h:v), but must steepen where it transitions to natural topography. Additionally, we have the following comments on the graded slopes and retaining walls in the project: (a) grading plans indicate engineered slopes and retaining walls on Lots #1 through 4; (b) retaining walls are proposed along segments of the private road; and (c) retaining walls are proposed to protect the dripline of two mature oaks on Lot #6, and to protect riparian vegetation on Lot #4. Annotations on the map indicate wall heights range up to 6 ft. (maximum). The general standard for graded slopes is 2½:1(h:v).

With regard to the private road, the maximum proposed road gradient is 18 percent, with a paved width of 22 ft. A hammerhead turnaround is indicated at the terminus of the road. It appears that no guest parking is to proposed within the road easement. All guest parking would be on the individual private road. With regard to drainage, six C.3 compliant water quality basins are indicated on the plans. Ultimately, runoff that is captured by the drainage improvements on the site with be discharged into the existing Gloria Terrace drainage facilities.

DMA Evaluation

1. General

In our opinion the report of GFK & Associates provides sufficient information to serve as the primary basis for preparation of the "Geology and Soils" Chapter of the CEQA document. It should be recognized that the geologic/ geotechnical report does not specifically provide a direct/ clear assessment of the geologic and seismic hazards that are the focus of Appendix G of State of California CEQA Guidelines: (a) the risk of surface fault rupture, liquefaction, lateral spreading failures, seismically induced settlement and ground lurching, (b) the risk of damage associated with significant earthquake ground shaking, and (c) expansivity of soils. Nevertheless, the report provides sufficient data on subsurface conditions, in combination with published mapping and the original geologic map of the site to evaluate those hazards in the CEQA document. Detailed geotechnical recommendations and a corrective grading plan will be needed to accurately characterize site conditions prior to issuance of grading or building permits, but that

information is not needed at this time. In summary it is our opinion, that from a geologic perspective, the project can be deemed complete.

1. Vesting Tentative Parcel Map

The VTPM prepared by the Humann Company is required to show geologic hazards (i.e. landslides, areas subject to inundation, etc.) In our opinion the VTM should be revised to show, as a minimum, the two landslide area confirmed on site by the geologic mapping of GFK & Associates. Additionally, we recommend that the following notes be included on the VTM:

- *The general standard for graded slopes is a gradient of 2½:1 (h:v) or flatter, except where the transition from graded slope to natural terrain requires a localized steeper gradient.*

- *Where use of a 2½:1 gradient conflicts with project objectives, special engineering shall be require (e.g. use of retaining walls in combination with 2½:1 graded slope).*

- *Graded slopes over 30 ft. high shall require a J-ditch or drainage bench in the mid-slope area. Ordinarily the drainage ditch shall have a gradient or 5 percent (or greater).*

DMA Recommendations

The following are recommended "Geology & Soils" Conditions of Approval for the captioned project.

a. At least 45 days prior to requesting recordation of the Final Map, the project proponent shall submit a geology, soil, and foundation report for review by the Peer Review Geologist, and review and approval by the Zoning Administrator. Improvement, grading, and building plans shall carry out the recommendations of the approved report. This report shall include the following: California Building Code seismic parameters that are based on the prevailing code; site specific data on the orientation of bedding; evaluation of the design of water quality basin(s) and their locations with respect to planned improvements; evaluation of the potential for slope creep to adversely affect planned improvements; provide recommendations that address monitoring clearing and backfilling depressions created by removal of tree trunks and their major roots; evaluate grading plan with respect for the potential for seismic settlement and seismically-induced ground failure by recognized methods appropriate to soil conditions discovered during subsurface investigation; characterize the expansivity of the soils and bedrock on the site and provide measures to avoid/ control damage to minimize expansive soil effects on structures. The report should also identify recommended geotechnical monitoring services during grading and foundation-related work and provide a corrective grading plan for the two landslide areas, and address removal of undocumented fill.

b. During grading, the geotechnical engineer shall observe and approve any keyway excavations deemed necessary; removal of any existing fill materials down to stable bedrock or in-place material; and installation of all subdrains including their connections. All fill slope construction shall be observed and tested by the project geotechnical engineer, and the density test results and reports submitted to the County to be kept on file. Cut slopes and any keyways shall be periodically observed and mapped by the project geotechnical engineer/ engineering geologist who will provide any required slope modification recommendations based on the actual geologic conditions encountered during grading. Written approval from the Contra Costa County BID shall be obtained prior to any modification.

c. Prior to issuance of residential building permit, the applicant shall submit a geotechnical monitoring and testing report. That report shall include evidence of testing and observation services performed during rough grading, including *(i)* a map showing the as graded cut/ fill contact, along with geologic mapping of all bedrock cut slopes and cut pad areas, and *(ii)* results of all compaction test data gathered during grading.

d. Prior to requesting a final building inspection for a new residence, submit a geotechnical letter-report documenting inspections made by the project geotechnical engineer during foundation-related work and final grading, and provide the geotechnical engineer's opinion of the consistency of the as-built improvements with recommendations in the approved geotechnical report.

e. Grading, improvement, erosion control and building plans shall employ, as appropriate, the following surface drainage measures: *(i)* positive grading of building pads for removal of surface water from foundation areas; *(ii)* collection of downspout water from roof gutters; *(iii)* avoidance of planted areas immediately adjacent to structures; *(iv)* avoidance of sprinkler systems (as opposed to drip irrigation systems) in the immediate vicinity of foundations; *(v)* grading of slopes to control erosion from *over-the-bank* runoff; and *(vi)* re-vegetation of permanent slopes. Interim protective measures for runoff shall be followed during the construction phases when slopes are most susceptible to erosion. The final design shall incorporate drainage measures, including the installation of subsurface drains, where recommended by the project geotechnical engineer.

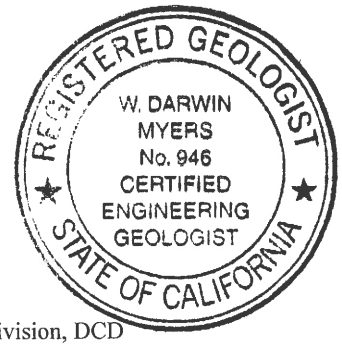
f. Geologic/ Geotechnical reports and Grading/ Drainage/ Foundation shall be subject to review by the Peer Review Geologist and approval by the Zoning Administrator.

Limitations and Purpose

The purpose of our review was to provide a professional opinion on the geologic- and grading-related documents provided by the applicant. Specifically, we provide advice to the Department of Conservation & Development with discretionary permit decisions. In this case, we reviewed the geologic/ geotechnical report prepared by GFK & Associates, and Vesting Tentative Map prepared by the Humann Company. Our role is to assist the Community Development Division in evaluation of potential geologic and geotechnical impacts and mitigation measures. Our opinions and conclusions are made in accordance with generally accepted principles and practices of the engineering geology profession. We trust that this letter provides the evaluation and comments that you requested. Please call if you have any questions.

Sincerely,

DARWIN MYERS ASSOCIATES



Darwin Myers, CEG 946
Principal

cc. Nestor Baligod, Sr. Grading Inspector, Building Inspection Division, DCD
Gus Khenaisser, GFK & Associates, 11828 Dublin Blvd., Suite D, Dublin, CA 94568
Izzat Nashashibi, Humann Company, Inc. 1021 Brown Ave., Lafayette, CA 94549
Gloria Terrace, LLC, 3189 Danville Blvd., #245, Alamo, CA 94517