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May 1, 2024

BSK Project No. G00001941

Mr. Larry Theis, PE
City Engineer
City of Clayton
6000 Heritage Trail
Clayton, California 94517

SUBJECT: Geological and Geotechnical Site Reconnaissance
Oakhurst Geological Hazards Abatement District (GHAD)
Clayton, CA

Dear Mr. Theis:

At your request, BSK Associates (BSK) performed an annual geological and geotechnical site reconnaissance of the Oakhurst Geological Hazards Abatement District (GHAD) located in the City of Clayton (City), California (see Figure 1, Vicinity Map), as required by the First Amended Plan of Control (June 29, 1990). BSK visited properties located within the GHAD boundaries (see Figure 2, Oakhurst GHAD Boundaries) on November 17 and 27, 2023, and recently on March 5, 2024 to observe the horizontal outlet drain pipes at the toe of the slope along North Valley Park. These outlet pipes drain the vertical wells previously installed along Kelok Way. This letter presents a summary of our observations, conclusions, and our recommendations. We had previously provided a preliminary summary of our observations to you in our email dated November 29, 2023.

GEOLOGICAL AND GEOTECHNICAL SITE RECONNAISSANCE

On November 17 and 27, 2023, a project geologist from BSK visited the hilly residential portions of the GHAD to review the existing condition of slopes, drainage and erosion mitigation and control measures within the GHAD area. We also wanted to compare existing conditions to those conditions observed and noted in our March 9, 2023 letter entitled "Geological and Geotechnical Site Review, Oakhurst Geologic Hazards Abatement District (GHAD), Clayton, CA" (BSK project number G00000499). Note that our site reconnaissance was limited to only those open space areas immediately adjacent to the hilly residential areas and paved roadways within the "North Area", the "Kelok Way Area", and the "South Area" of the GHAD as described below.

Following is a summary of our observations and recommendations from our recent site reconnaissance. For ease in discussion, we have separated the GHAD into three areas as follows (see Figure 2 for subdivided area locations):

1. North Area: The first area consists of the developed portions of the GHAD including open space/slopes that is located immediately adjacent to homes in the northeastern portion of the GHAD (see Site Plan – North Area, Figure 3A).
2. Kelok Way Area: The second area is the area associated within Kelok Way and adjacent open space/slopes (see Site Plan – Kelok Way Area, Figure 3B).
3. South Area: The third area is associated with the Pebble Beach Drive, Peacock Creek Drive, and Peacock Creek, including slopes and known areas of instability and mitigation measures previously installed between Pebble Beach Drive and Peacock Creek (see Site Plan – South Area, Figure 3C).

North Area

BSK walked V-ditches and boundaries between open space slopes, homes, and other improvements along the northeastern boundary of the GHAD (see Figure 3A). We made cursory observations of homes and roadways and did not observe readily visible evidence of geologic hazards impacts to homes or roadways in the general area. Our site reconnaissance was primarily focused on the open space and slopes bordering the limits of the GHAD, where slopes either ascend from, or descend to yards and residences, primarily on the north and east side of Windmill Canyon Drive. Figure 3A presents a legend key to the locations of our observations and photos of conditions we encountered that should be considered for future repairs or should be watched and monitored annually before the onset of the annual storm season.

In general, we observed surface creep¹ above most V-ditches, particularly in areas where slopes are mowed (presumably for fire control). Periodic maintenance should be sufficient to prevent soil from entering into and disrupting flow in the ditches. We also observed shallow slope sloughing and raveling in various areas, which are also identified on Figure 3A. Overall, conditions observed remain similar to those observed and noted in our March 9, 2023 letter.

The following photographs depict the conditions documented during our site reconnaissance. The approximate photograph locations are presented on Figure 3A.

¹ The slow, gradual downward displacement of soil, rock, and organic material on slopes.



Photograph 1 – Fallen tree across V-ditch behind 3039 Windmill Canyon Drive.



Photograph 2 – V-ditch filled with soil and vegetation behind 3041 Windmill Canyon Drive. Throughout this area, V-ditches contain soil and debris originating from burrowing animal activity, vegetation, etc. Additional V-ditch cleaning should be performed.



Photograph 3 – Shallow raveling/settlement above a drop inlet uphill from 3053/3055 Windmill Canyon Drive. Condition remains the same as observed in early 2023 (see Photo B in letter dated March 9, 2023). There is a pipe coming downhill into inlet, likely from upper V-ditch. Possibly, this area experienced some settlement.



Photograph 4 – Current condition of containment basin northeast of Windmill Canyon Drive. The vertical corrugated metal pipe (CMP) riser contains some soil within it that has accumulated over time. Cleaning of this pipe should be performed.

Kelok Way Area

BSK walked V-ditches and boundaries along open space slopes north of Kelok Way, in the open space area south of Keller Ridge Drive, and both west and east of those areas (see Figure 3B). We made cursory observations of homes and roadways throughout the area, and aside from those documented below, we did not observe readily visible evidence of geologic hazards impacts to homes or roadways in the general area except for the home at 8053 Kelok Way, where conditions appear to be similar to our previous observations presented in our March 9, 2023 letter. However, concrete in the driveway/sidewalk has been repaired since we last visited this location.

Our site reconnaissance focused on the open space and slopes bordering the limits of the homes along Kelok Way, Keller Ridge Drive, and east of Acorn Drive. Figure 3B presents a legend key to the locations of our observations and photos of conditions we encountered that should be considered for future repairs or should be watched and monitored annually before the onset of the annual storm season.

In general, we observed surface creep above most V-ditches. Periodic maintenance should be sufficient to prevent soil from entering into and disrupting flow in the ditches. We also observed shallow slope sloughing and raveling in various areas, which are also identified on Figure 3B. Overall, conditions remain the similar to those observed in our March 9, 2023 letter. The V-ditches in the area could use additional cleaning/maintenance. The following photographs depict the conditions documented during our site review. The approximate photograph locations are presented on Figure 3B.

On March 5, 2024, we visited the site to observe flows from the vertical wells and horizontal outlet drain pipes located at North Valley Park (see Photograph 16 below). The drain outflow pipes terminate in a vault which is then drained to the storm drain system. There are seven (7) drain pipes terminating into the vault, six of which drain the vertical drain wells on Kelok Way. Based on the location of the vault and the location of the wells located along Kelok Way, we estimate that the pipes measure approximately 350 to 450 feet in length. One of the seven drain pipes that terminates into the vault is reported to be from one of the subdrains underlying the upslope fill in the area (we do not know which one). At the time of our visit, only two pipes out of seven pipes were discharging water. Based on our review of previous monitoring data for the GHAD, this appears to have been the case since installation of this drain system. Therefore, we have concerns about the condition of the horizontal drainage pipes. While we did not measure depth to groundwater depth in the vertical wells, historically, the depth to groundwater is significantly above the horizontal drain inlets near the bottom of the vertical wells. The cause of incomplete drainage from the vertical wells should be investigated by a video survey for damaged pipes, air locks, or other obstructions. Hydrauger or another suitable method may be needed to clean out the pipes.



Photograph 5 – Current conditions at 8053 Kelok Way. The cracks have expanded a little and concrete in the driveway/sidewalk has been repaired since we last visited this location (see Photograph 6 below).



Photograph 6 – Previous conditions at 8053 Kelok Way on December 8, 2022.



Photograph 7 – V-ditches located along the slope north of Kelok Way contain debris and cracking. Additional V-ditch cleaning and repairs should be performed.



Photograph 8 – V-ditches located along the slope north of Kelok Way contain debris and cracking. Additional V-ditch cleaning and repairs should be performed.



Photograph 9 – Condition of this inlet remains similar to that noted in Photo J of our March 9, 2023 letter: filled with soil/debris. Located west of 8049 Kelok Way. Additional cleaning of this inlet should be performed.



Photograph 10 – ditch condition remains similar as Photo I noted in March 9, 2023 letter: cracked and offset. V-ditch repairs should be performed.



Photograph 11 – Similar conditions observed as noted in March 9, 2023 letter, Photo H: the homeowner has secured trees to the V-ditch beyond property line.



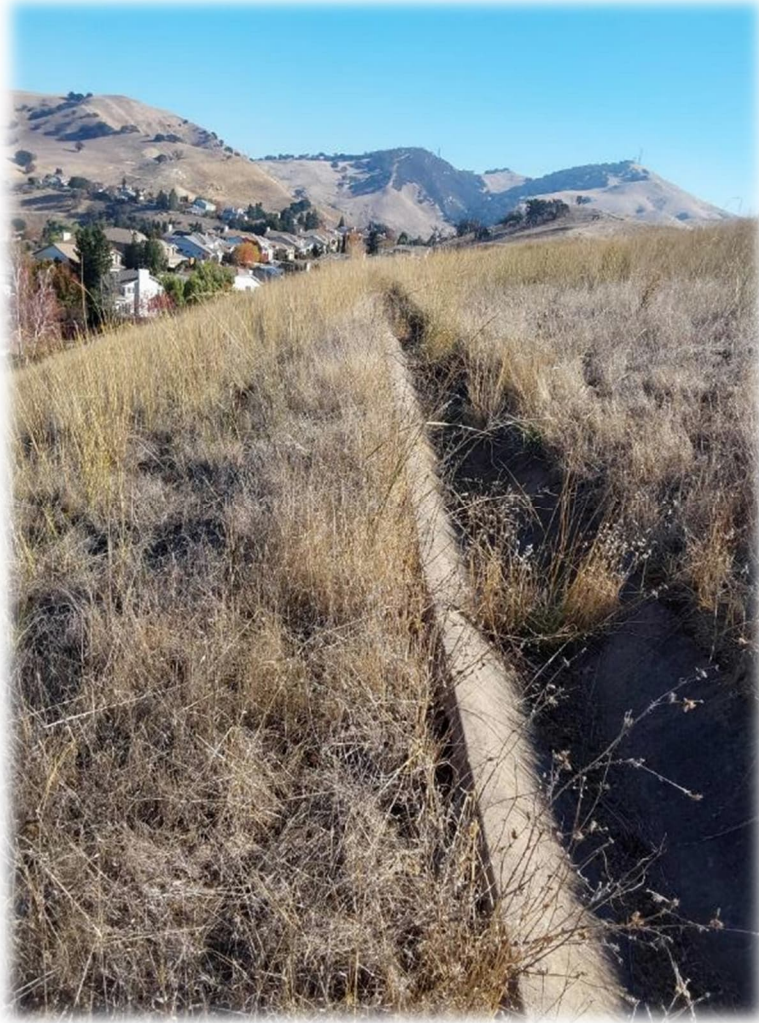
Photograph 12 – Similar conditions observed as noted in March 9, 2023 letter, Photo G: Slope creep depositing debris in V-ditch and resulting in minor cracking of V-ditch. Additional V-ditch cleaning and repairs should be performed.



Photograph 13 – Some slope erosion/creep behind 5229 Keller Ridge Drive along with debris within V-ditch. Additional V-ditch cleaning should be performed.



Photograph 14 – Just east of Photograph 12. Additional V-ditch cleaning should be performed.



Photograph 15 – Similar conditions observed in the area as noted in March 9, 2023 letter, Photo K: separation of soil from the downhill side of the V-ditch due to slope creep.



Photograph 16 – Horizontal outlet drain pipes at North Valley Park. Only two of the seven pipes were discharging water on March 5, 2024.

South Area

BSK walked V-ditches and boundaries along open space slopes north of Pebble Beach Drive (down to Peacock Creek), South of Peacock Creek Drive, and along the eastern boundary of the GHAD (see Figure 3C). We made cursory observations of improvements and roadways throughout the area, and aside from those documented below, we did not observe readily visible evidence of geologic hazards impacts to homes or roadways in the general area.

Our site reconnaissance focused on the open space and slopes bordering the homes along the north side of Pebble Beach Drive, the slopes immediately south of the homes on Peacock Creek Drive, and the slopes along the eastern boundary of the GHAD.

Figure 3C presents a legend key to the locations of our observations and photographs of conditions we encountered that should be considered for future repairs or should be watched and monitored annually before the onset of the annual storm season.

In general, we observed surface creep above most V-ditches. Periodic maintenance should be sufficient to prevent soil from entering into and disrupting flow in the ditches. We also observed shallow slope sloughing and raveling in various areas, which are also identified in Figure 3C. Overall, conditions observed remain similar to those observed and noted in our March 9, 2023 letter.

The following photographs depict the conditions documented during our site review. The approximate photograph locations are presented on Figure 3C.



Photograph 17 – Possible slope creep/shrinkage cracks formed along the slope adjacent to/east of Peacock Creek Drive (approximately 40 feet from roadway).



Photograph 18 – Additional cleaning of V-ditches along the slope should be performed.



Photograph 19 – Similar conditions as noted in March 9, 2023 letter, Photo O: slope creep and minor sloughing adjacent to V-ditch.



Photograph 20 – V-ditch separated at joint in the area of Photo 19. V-ditch should be repaired.



Photograph 21 – V-ditch separated at joint in the area of Photo 18. V-ditch should be repaired.



Photograph 22 – Slope creep behind 1116 Peacock Creek Drive.



Photograph 23 – Similar conditions as noted in March 9, 2023 letter, Photo S, behind 1122 Peacock Creek Drive: Resident has planted trees and built a short keystone-type retaining wall uphill from the V-ditch.



Photograph 24 – Wire fence installed by resident at 1126 Peacock Creek Drive.



Photograph 25 – Resident has added fence supports within v-ditch near 1146/1148 Peacock Drive.



Photograph 26 – Vegetation within V-ditch present just east of Photograph 25 nearly blocks the V-Ditch. Vegetation should be removed from the V-ditch.



Photograph 27 – Possible slope creep/shrinkage cracks along top of slope south of 185 Brandywine Place.



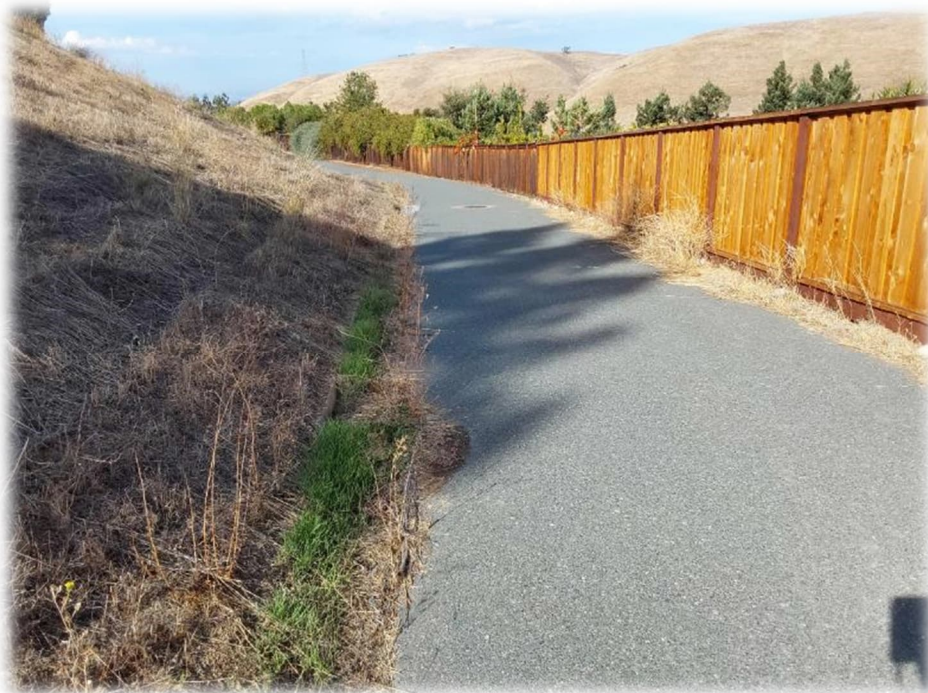
Photograph 28 – Resident at 183 Brandywine Place has added boulders and vegetation to the slope along with creating a pathway, possibly for landscaping purposes. It is not an ideal situation to regrade the slope.



Photograph 29 – 183 Brandywine Place. See note in previous photograph.



Photograph 30 – Minor slope wash along slope at 179 Brandywine Place.



Photograph 31 – Vegetation/debris along toe of slope east of 140 Inverness Way blocking water flow. Area should be cleaned.



Photograph 32 – Numerous cracks observed within pavement along Torrey Pines on 8-31-2023. No cracks observed by residents within homes. No cracks observed along slope east of Torrey Pines.



Photograph 33 – Cracks had been filled by City crew within pavement along Torrey Pines as of 11-17-2023.



Photograph 34 – Similar conditions observed as noted in March 9, 2023 letter, Photo Q: moist ground and seepage from the slope.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site reconnaissance, it is our opinion that the conclusions and recommendations presented in our March 9, 2023, letter are valid, and that current overall conditions remain similar. Areas of concern are as follows:

General

- The inlet west of and adjacent to 8049 Kelok Way should be cleaned out/unclogged.
- The horizontal outlet drain pipes located along the slope at North Valley Park should be cleaned on a regular basis to remove any sludge or silt build up. We recommended that a video survey of these pipes be conducted to check if the pipes are clogged or damaged. If the pipes are found to be clogged or damaged, they should be cleaned via hydrauger or another suitable method.
- Cracked and/or offset V-ditch panels, while not numerous, can result in drainage obstructions, overflow, and erosion to slopes. Patches and/or replacement of V-ditch panels should be prioritized and undertaken on a regular basis.
- V-ditch and drop inlet maintenance should be continued and inspections of the drainage system, slopes and pavements should be continued. We recommend that drainage system maintenance occur prior to the onset of the rainy season each year. Inspections should take place prior to maintenance.

- Residents going beyond their fence line, altering the existing slopes, which could adversely impact the shallow and global stability of such slopes.

LIMITATIONS

Our services were performed in a manner consistent with that level of care and skill ordinarily exercised by other members of BSK's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our findings and conclusions are based on our limited site reconnaissance of the GHAD area completed on November 17 and 27, 2023. It is possible that conditions could vary between or beyond the data evaluated or have changed since we visited the GHAD area or that previous GHAD files not available to us could influence the findings and conclusions presented herein. BSK makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and only for the purposes stated within a reasonable time from its issuance, but in no event later than six (6) months from the date of the report, or if conditions at the site have changed. If this report is used beyond this period, BSK should be contacted to evaluate whether site conditions have changed since the report was issued.

CLOSURE

BSK appreciates the opportunity to provide our services to you and trusts this letter report meets your needs at this time. If you have any questions concerning the information presented, please contact us at 925-315-3151.

Respectfully submitted,
BSK Associates



Omar K. Khan, PGIT
Project Professional II



Cristiano Melo, PE, GE #2756
Branch Manager



Richard E. Johnson, CEG #1452
Principal Engineering Geologist



ATTACHMENTS: Figure 1 – Vicinity Map
Figure 2 – Oakhurst GHAD Boundaries
Figure 3A– Site Plan – North Area
Figure 3B – Site Plan – Kelok Way Area
Figure 3C – Site Plan – South Area



References: 1. <https://www.arcgis.com/apps/mapviewer/index.html>, 2023

Note: Locations are approximate

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CHECKED BY: O. Khan

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Figures.indd

VICINITY MAP

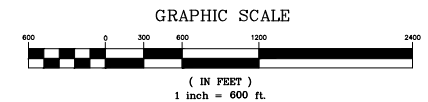
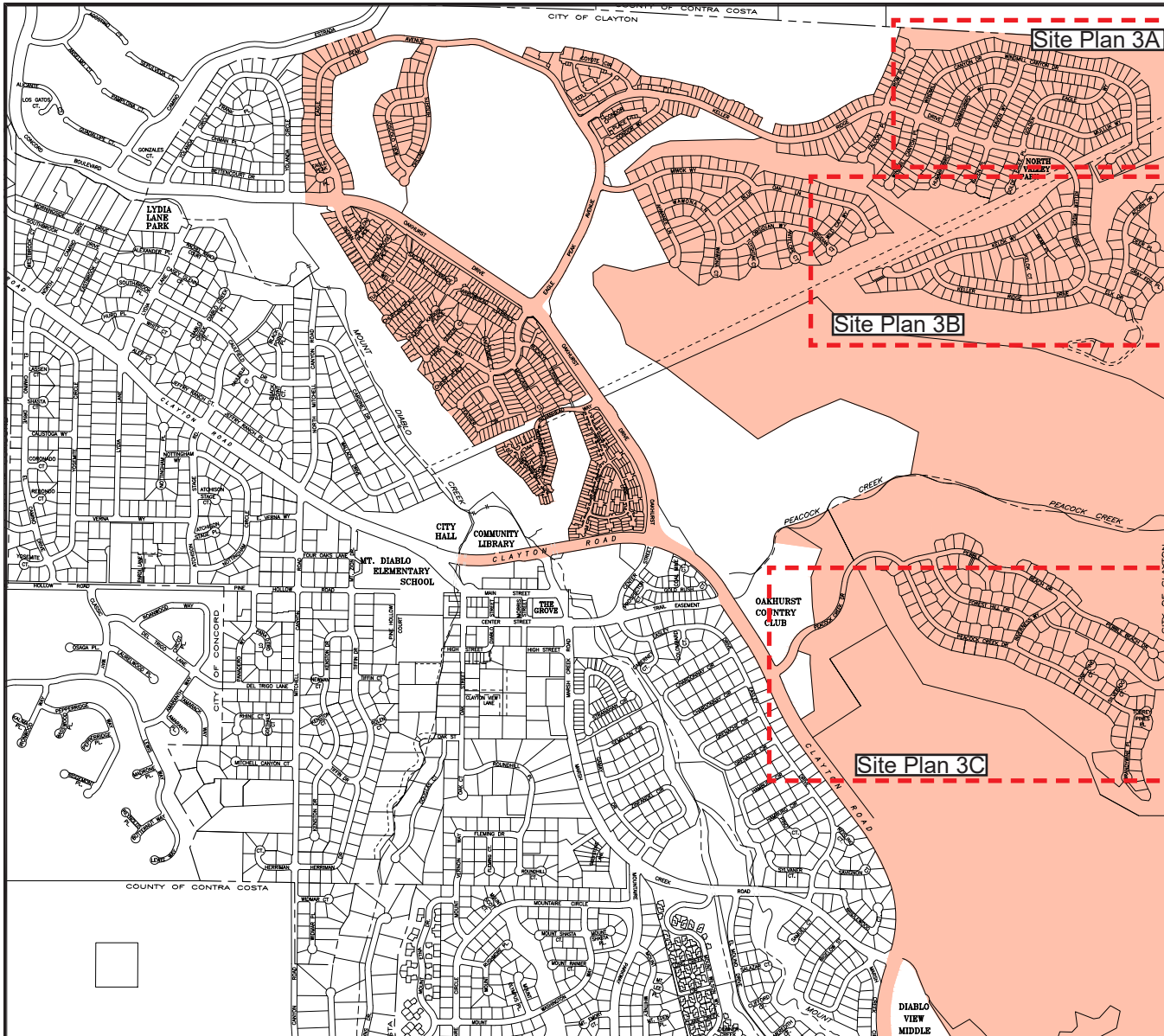
Geological and Geotechnical Site Recon
Oakhurst GHAD
Clayton, California

FIGURE

1

OAKHURST

GEOLOGIC HAZARD ABATEMENT DISTRICT



Approximate Site Plan Limits
(see Figures 3A through 3C)

GHAD PROPERTIES



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OAKHURST GHAD BOUNDARIES

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FIGURE

2

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LEGEND:

#1

Approximate location of photo



Drop Inlet - blocked or partially blocked



Slough/Ravelling

References: 1. <http://earth.google.com>, 20223
2. Locations are approximate

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SITE PLAN **North Area**

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Clayton, California

FIGURE

3A



LEGEND:

References: 1. <http://earth.google.com>, 2023
2. Locations are approximate

- | | |
|---|--|
| #5 Approximate location of photo | ⚡ V-Ditch Cracked or Offset |
| ≡ Drop Inlet - blocked or partially blocked | ↪ Slough/Ravelling |
| ↪ Incipient Failure/ Debris Flow | |

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SITE PLAN **Kelok Way Area**

Geological and Geotechnical Site Recon
Oakhurst GHAD
Clayton, California

FIGURE

3B



LEGEND:

#16 Approximate location of photo

Swampy/Wet Area

Slough/Ravelling

V-Ditch Cracked or Offset

References: 1. <http://earth.google.com>, 2023
2. Locations are approximate

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SITE PLAN **South Area**

Geological and Geotechnical Site Recon
Oakhurst GHAD
Clayton, California

FIGURE

3C