

Recommendations, Clarifications, and Understandings of GeoStrata Aug 24, 2020 Report

Introduction; It is really appreciated that the Public Comment Power Point presentation was forwarded by Cottonwood Heights to GeoStrata for evaluation. This response is directly aligned with each of the concerns identified in the GeoStrata response report and the Power Point Presentation. Our additions/modifications to GeoStrata recommendations are for clarification and understanding for a precise path forward. GeoStrata's specific recommendations for each concern are printed in the attached appendix for reference.

Geologic Hazard Concern 1 – Fault location and orientation; We agree with GeoStrata's recommendation as presented with the added clarification and understanding that follows;

- A) We strongly agree with GeoStrata's recommendation for additional trenching to be completed before Developer's Site plan is submitted to the Planning Commission. Since the Power Point Presentation identified fault strike data that would impact a building's location in the site plan, it would be prudent to complete investigating all fault locations to avoid a cascading change of buildings in the site plan requiring resubmission.
- B) Measured fault orientation in trenches needs to be used to establish the location and direction of faults in all cases. In addition, fault strike data for each trench should be plotted on the site map for review (Example; page four of Public comment power point presentation).
- C) The Planning Commission approval should be for a precise site plan with each building's footprint, precise location, and external "box" dimensions

Geologic Hazard Concern 2 – Landslide exposed in Trench 6; We agree with GeoStrata's recommendation as presented with the added clarification and understanding that follows;

- A) We agree that the relict landslide exposed in the excavation of trench T-6 needs to be analyzed for its potential re-activation and "*...addition slopes stability cross-sections should be prepared to fully assess the slope stability of the slopes within and adjacent to the subject property.*"
- B) Recommend DRC needs to have technical resources in the Scoping Meeting process to evaluate the proposed static and dynamic slope stability model study and ensure public safety issues have been mitigated by the study conclusions and recommendations.

Geologic Hazard Concern3 – Landslide exposed in Trenches 1-5; We understand GeoStrata's recommendations for the landslide exposed in Trenches 1-5 with the added clarification that follows;

- A) This landslide covers almost 50% of the project area and we believe it could re-activate.

- B) DRC needs to determine process to evaluate and understand “updated and additional cross sections” for the saturated soils.
- C) We still believe, in the interest of public safety, that it is best practice to remove this material during site preparation.

Geologic Hazard Concern 4 – Ground Tilting during earthquake; This is not identified in the current SLEDS Ordinance as a geologic hazard, but this hazard is associated with the zone of deformation within a fault rupture zone. We agree with the comments in the GeoStrata report with the addition of the following;

- A) Recommend services of structural engineers be engaged to develop design concepts to mitigate the back tilting issues.
- B) Ask Utah Geological Survey for design examples that have been successfully used to mitigate back tilting issues.
- C) Cottonwood Heights needs to further study this issue to determine how this hazard should be incorporated into new updated SLEDS Ordinance.

Conclusion

The gravel pit is geologically complex with numerous faults, slope stability issues, and back tilting of sediment layers in this 21-acre parcel. The August 24, 2020 Report from GeoStrata identifies a series of geologic hazards that must be accurately defined, evaluated, potential impacts determined, and a plan established to mitigate for Public Safety issues.

All of these issues need to be resolved before building design and construction. One example of the hazards was shown in the Public Comment power point presentation. This one example if verified would have an immediate impact to one of the major proposed buildings in the current site plan. (attached)

We strongly believe that the Geologic Hazards Recommendations be implemented and mitigation plans developed and approved for each hazard so we know the site building plan works before the Planning Commission reviews and makes a recommendation to the City Council. Otherwise these hazard issues will be resolved on a building by building as they seek approval over time. We owe it to the Developer, City Council, and the Public to present a plan that meets all Public Safety issues as best we can before we ask for approvals of the site plan and PDD.

Thank you for the opportunity to be a contributing participant in this process.

September 27, 2020

Appendix

This is a summary of the recommendations from GeoStrata in the August 24, 2020 report. Each Geologic Hazard is identified with GeoStrata's corresponding recommendation.

Geologic Hazard Concern 1- Fault location and orientation;

"GeoStrata recommends that Cottonwood Heights City require the applicant to allow Western Geologic to review the final design site plans and make any necessary comments on the grading plan and adjustments to their recommended fault setback. We further recommend that Cottonwood Heights City require the applicant to allow Western Geologic to perform a final surface fault rupture hazard assessment of each proposed structure on a case-by-case basis to assess each proposed buildable area for active faults and make any necessary modifications to their surface fault rupture hazard mitigation and recommendations. We recommend that Western Geologic perform the final surface fault rupture hazard assessment of each proposed structure once final grading plans and design plans have been prepared and prior to final approval of the development plans by Cottonwood Heights City."

Geologic Hazard Concern 2 – Landslide exposed in Trench 6;

"We (GeoStrata) concur that assessing the extent and thickness of the landslide deposit is an essential part of assessing the slope stability for the site. We recommend that the means and methods used by the consultant for defining the limits of the landslide and obtaining samples for strength testing for use in slope stability modeling be defined by the consultant and submitted to the city in a scoping meeting for city consideration. We concur that samples of the landslide mass should be obtained and include in the slope stability model used to assess the slope stability of the slope in the area of Trench 6. Again, we recommend that the means and methods used by the consultant for defining the limits of the landslide and obtaining samples but strength testing for use in slope stability modeling be defined by the consultant and submitted to the city in a scoping meeting for city consideration. We concur that additional slope stability cross-sections should be prepared to fully assess the slope stability of the slopes within and adjacent to the subject property."

Geologic Hazard Concern 3 – Landslide exposed in Trenches 1-5;

"Based on the logs prepared by Western Geologic, it is our opinion that there is no evidence reported in the trench logs that seismic events (earthquakes) that occurred after the low-energy subaqueous landslides event produced any additional

liquefaction induces deformation of the low-energy subaqueous landslide deposit or the overlying interbedded and crossbedded silt, sand, and gravel deposits. It is our opinion that during the consultant's fieldwork to collect additional subsurface data needed to prepare updated and additional geologic cross-sections, the reported medium dense nature of the deeper saturated granular soils across the site could be confirmed to further substantiate that liquefaction at the project site is not anticipated during the design seismic event."

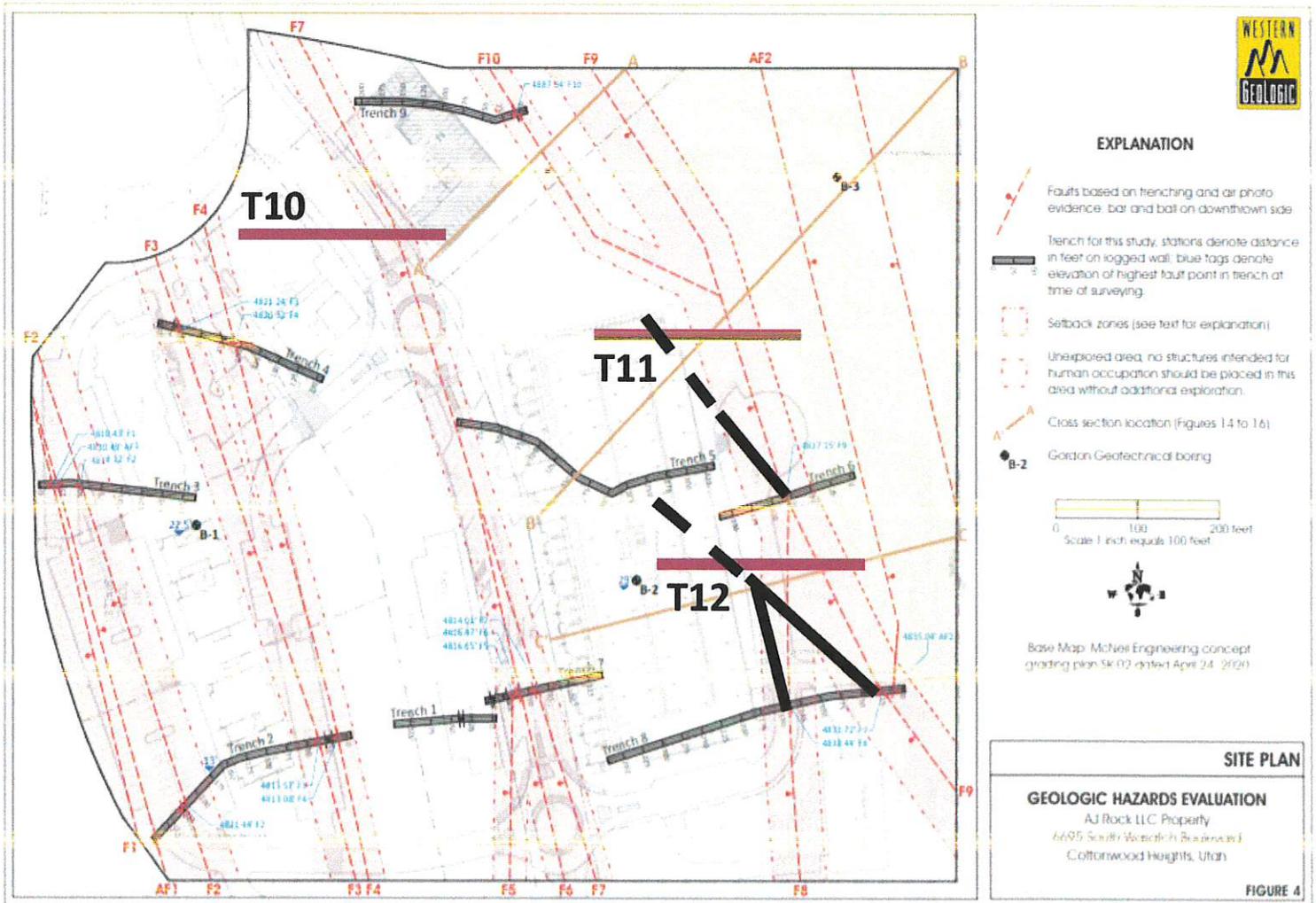
Geologic Hazard Concern 4 - Ground Tilting during earthquake;

"It is important to note that Section 5.5 Tectonic Deformation of Western Geologic's May 11, 2020 Geologic Hazards Evaluation report states "...Given the above, the Project is in an area at high risk from tectonic deformation. Tectonic deformation is not typically a life-safety issue but can tilt building pads and alter sewer and water flow gradients, which may require expensive subsequent repairs. The owner and all future owners should understand and be willing to accept the risk. We recommend that the hazard from tectonic deformation be disclosed to all future real estate transactions." "Geostrata continues, "we generally concur that it would be an appropriate recommendation that the structural engineer designing any structures planned as part of the development for the AJ Rock Property to consider the potential for ground surface tilting during a future surface fault rupture earthquake event."

Concern # 1: Fault Locations and Orientations

New trenches will verify fault locations.

Will ensure buildable areas are correctly located.



Proposed Development – AJ Rock Property

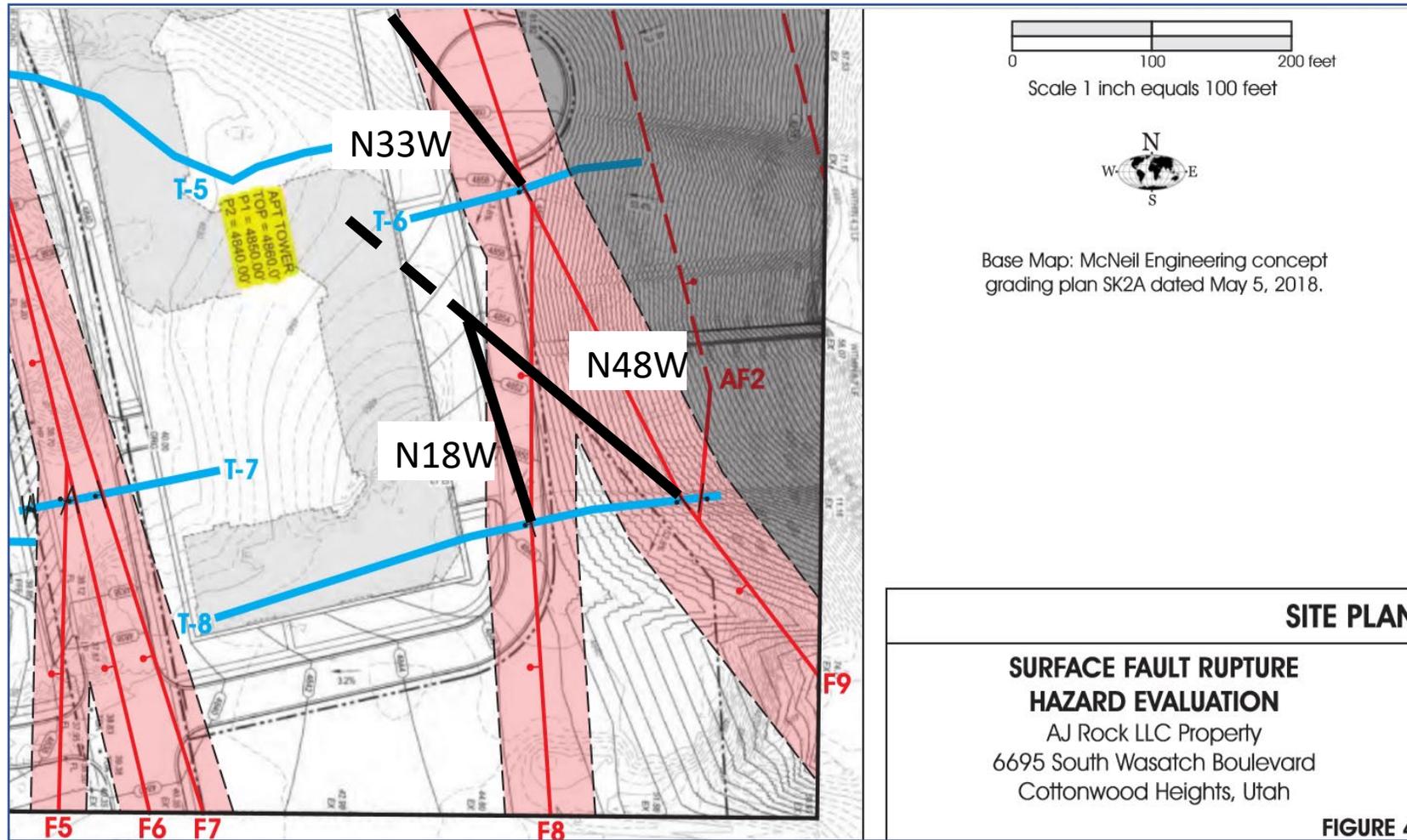


Geologic Hazard Concerns

- 1) Fault locations and orientations
- 2) Landslide exposed in Trench 6
- 3) Landslide exposed in Trenches 1 - 5
- 4) Ground tilting during earthquake

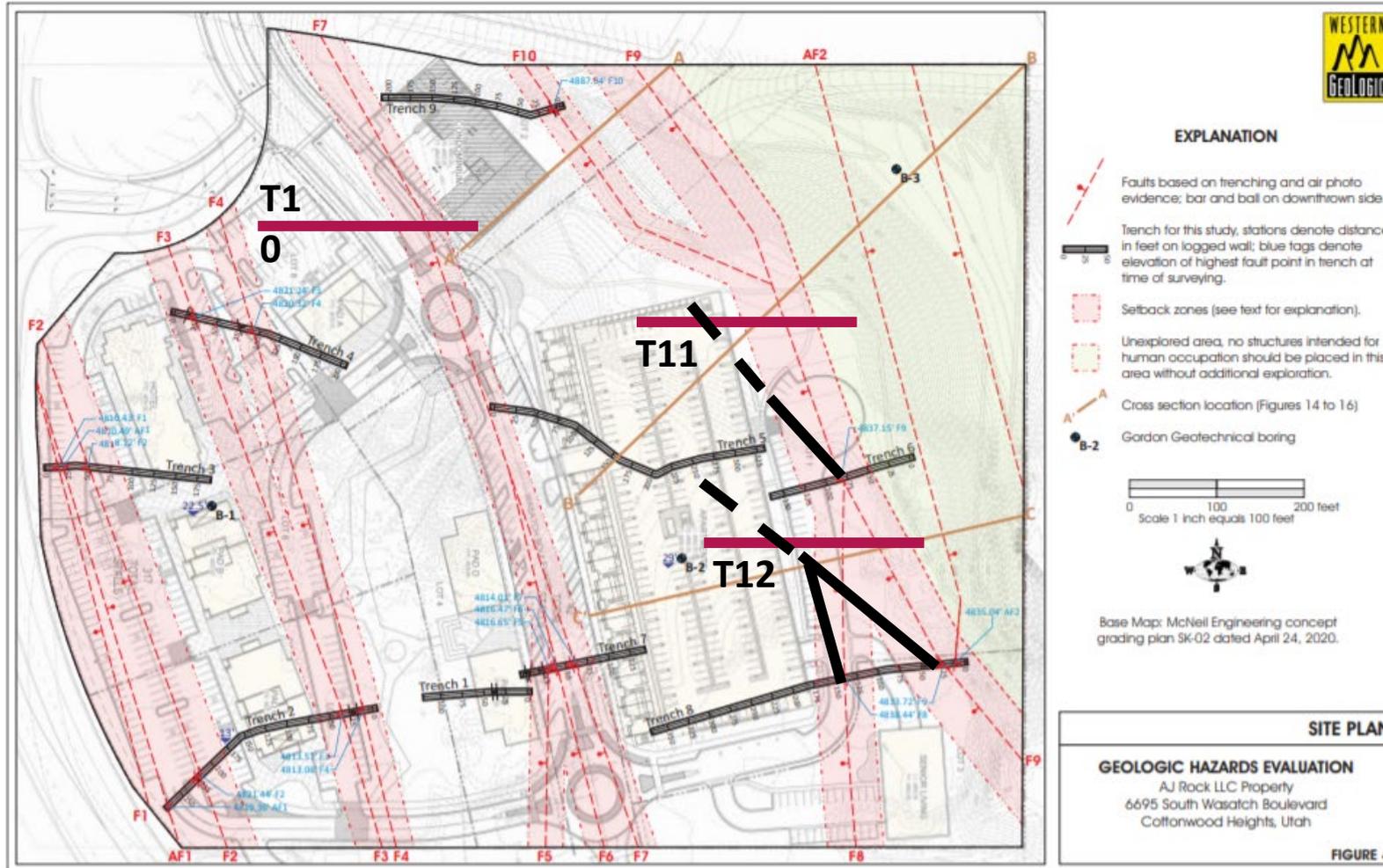
These geologic hazard concerns first presented to Cottonwood Heights city officials on November 5, 2019.

Concern # 1: Fault Locations and Orientations



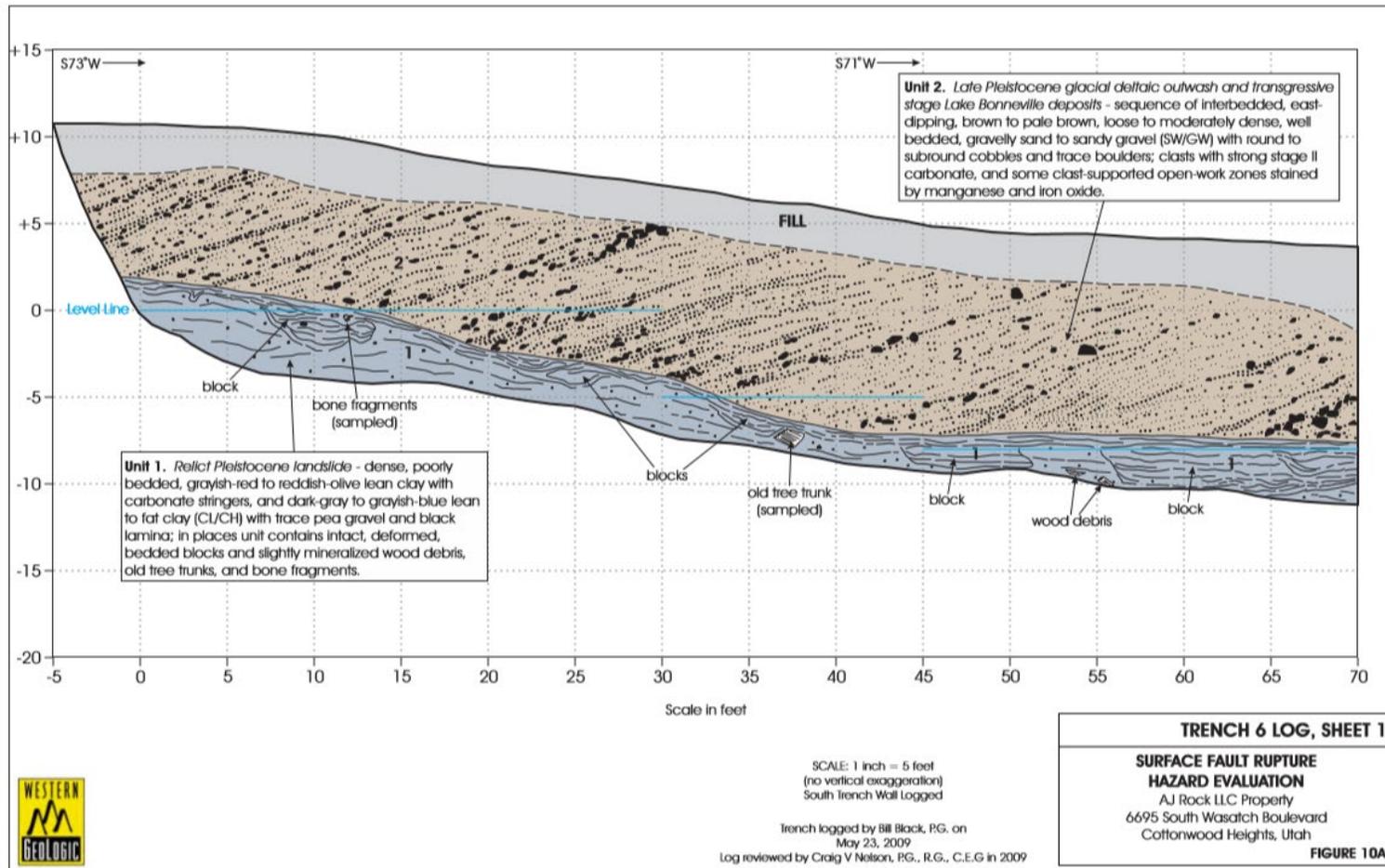
Fault orientations are reported as compass directions. The orientations are measured in the trenches.

Solution: Dig Additional Trenches



New trenches will verify fault locations. Will ensure buildable areas are correctly located.

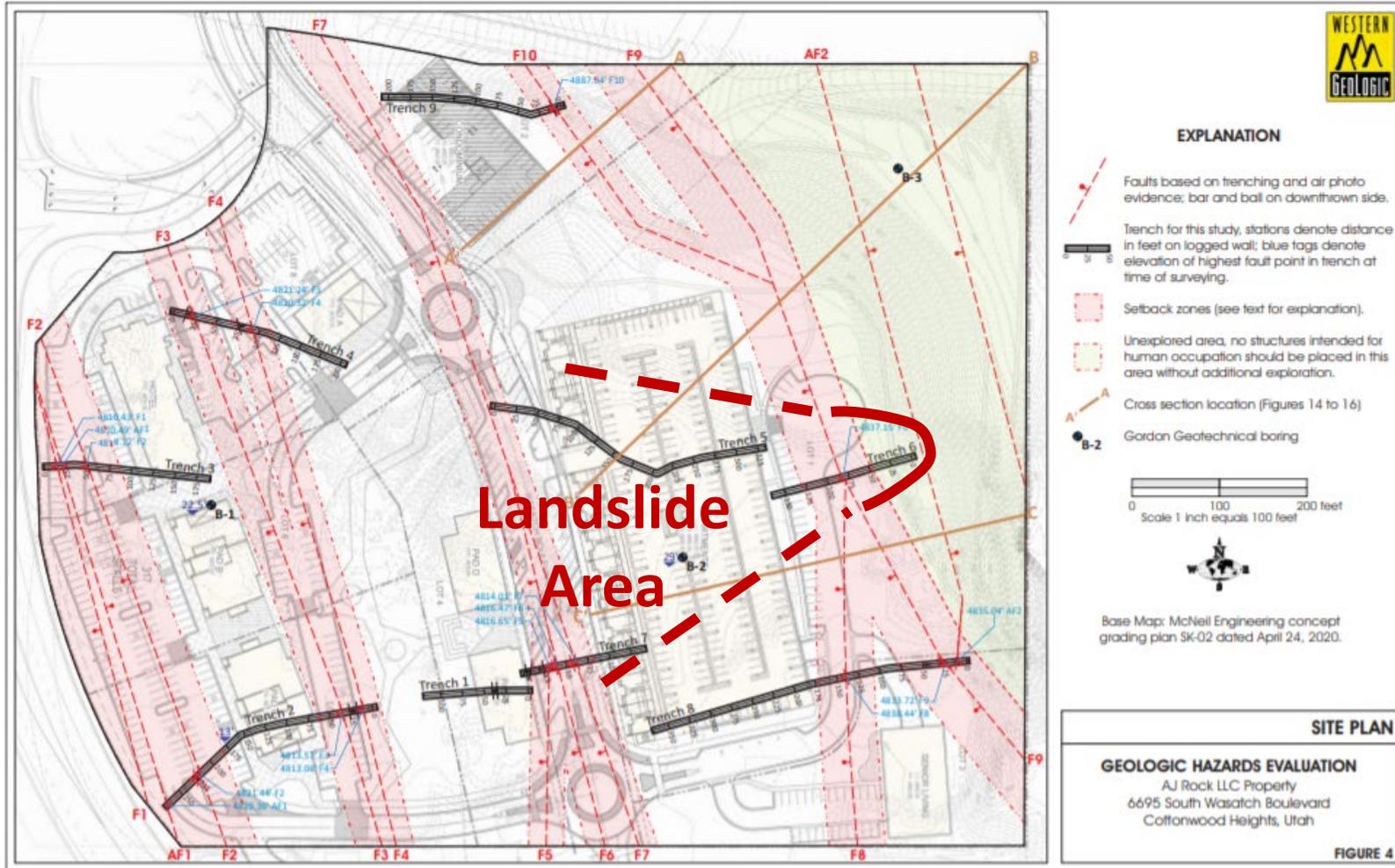
Concern # 2: Trench 6 Exposed Significant Landslide



Bottom layer of landslide not exposed. It controls stability of the ground during major earthquake.

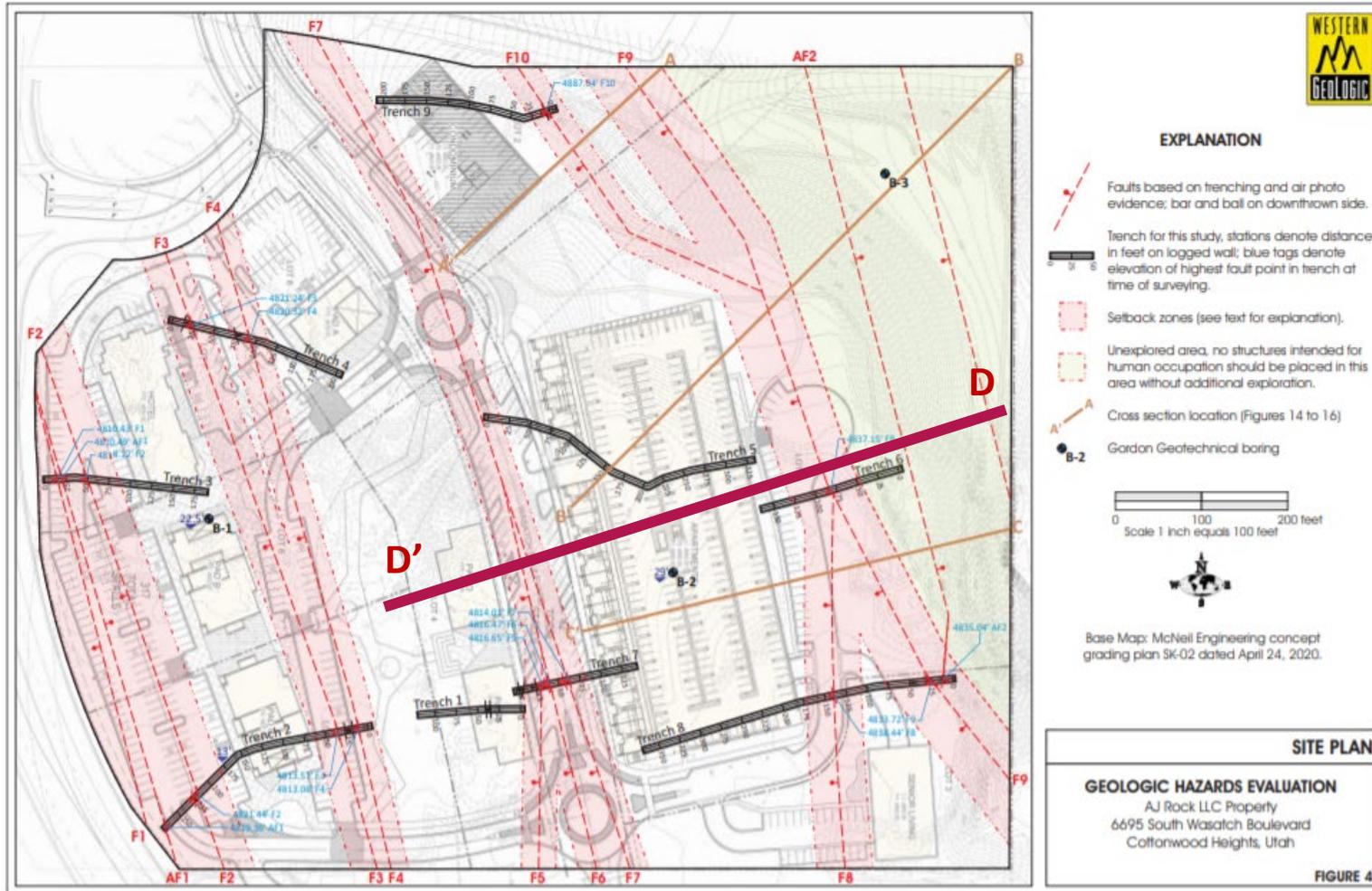


Solution: Drill Borings to Locate Entire Landslide



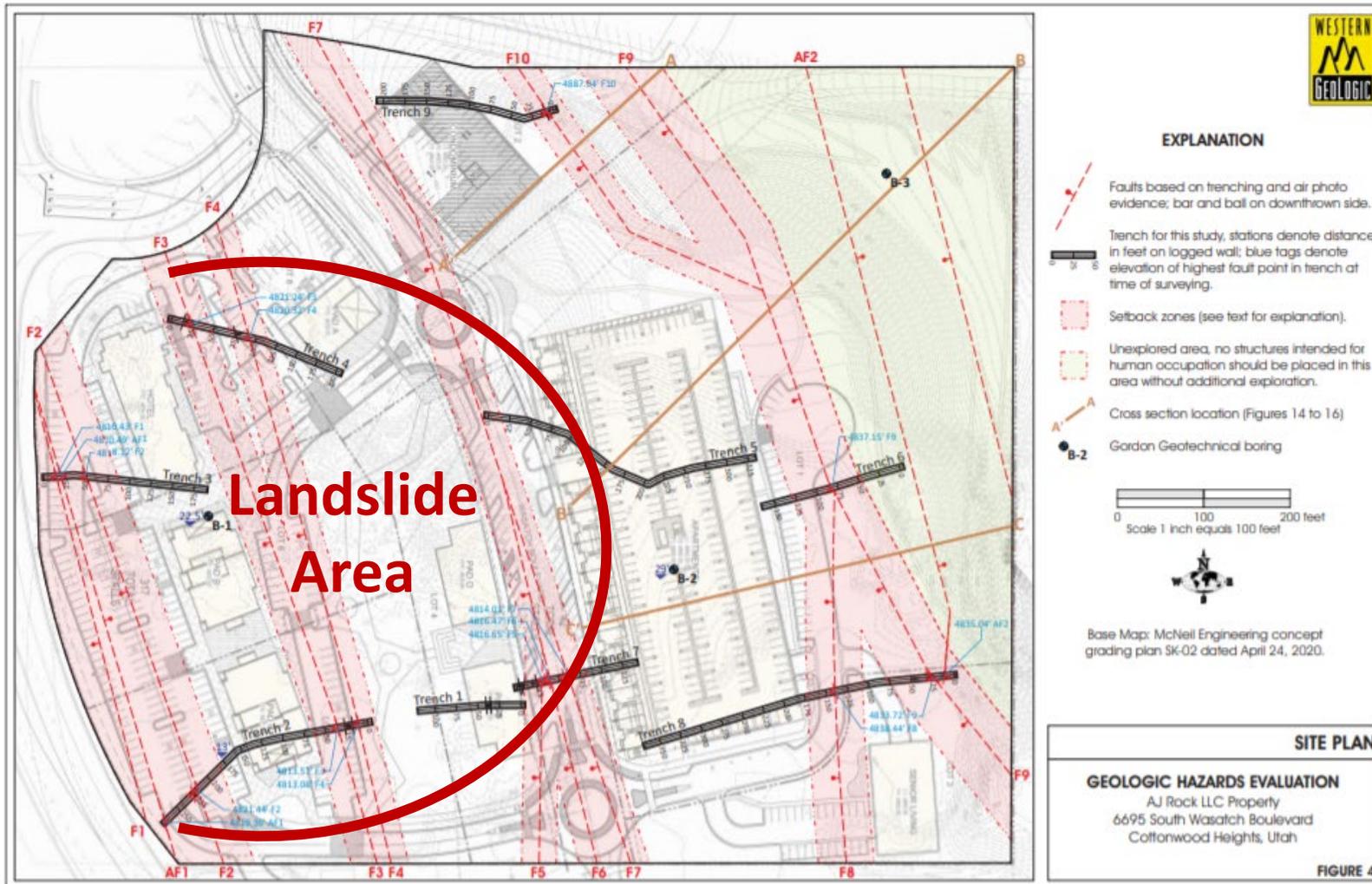
Borings will verify extent and thickness of landslide. Take samples of bottom layer for slope stability analysis.

Solution: Perform Slope Stability Analysis



Analysis of new cross-section D-D' will answer question of stability of old landslide during earthquake.

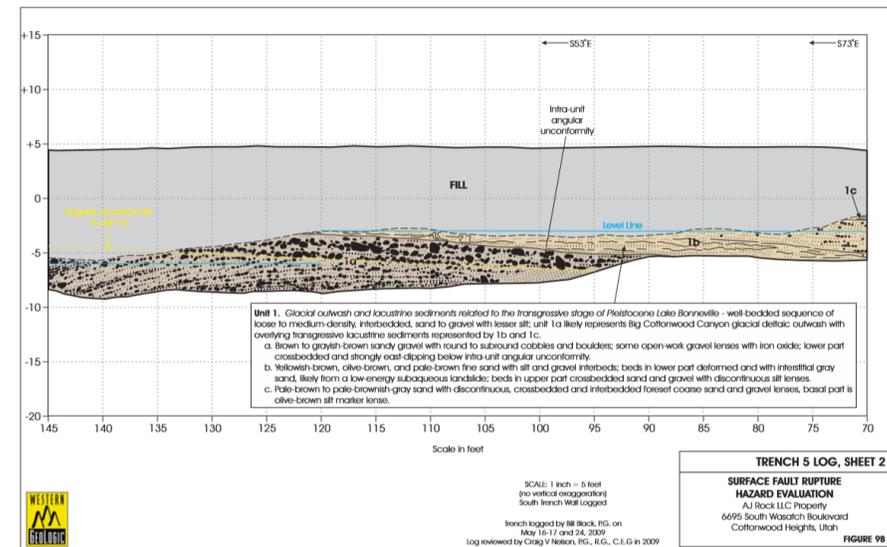
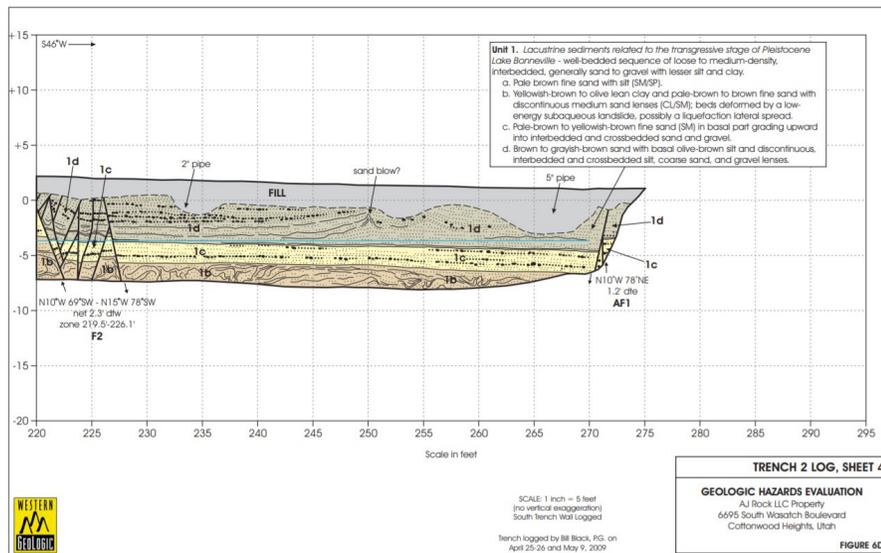
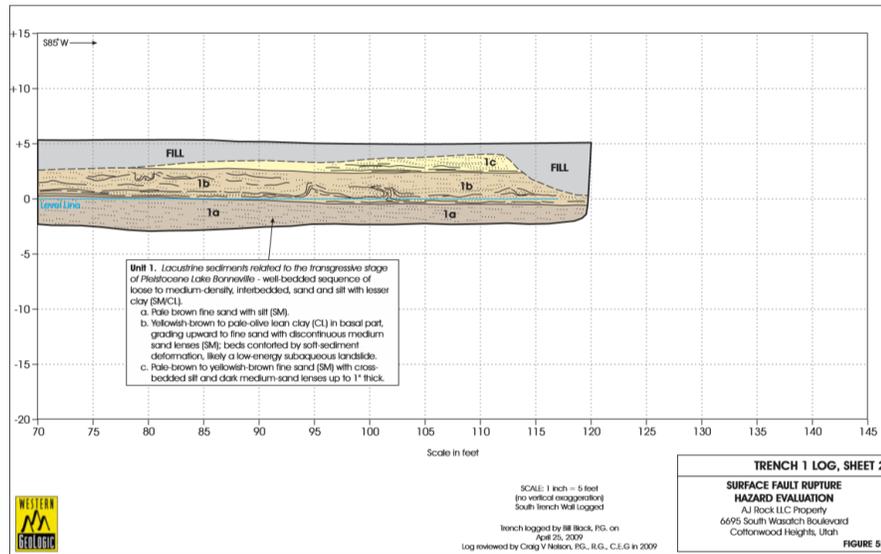
Concern # 3: Six Trenches Exposed Shallow Landslide



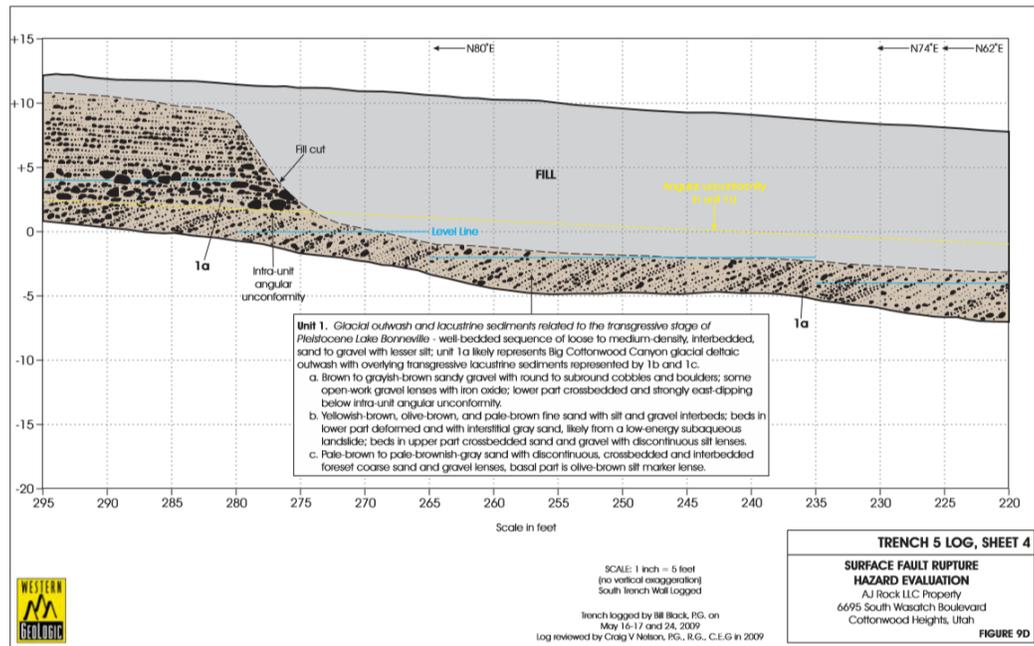
Landslide at shallow depth below ground surface. At risk to “liquefy” during earthquake. Verify extent and thickness.

Solution: Remove Landslide Material

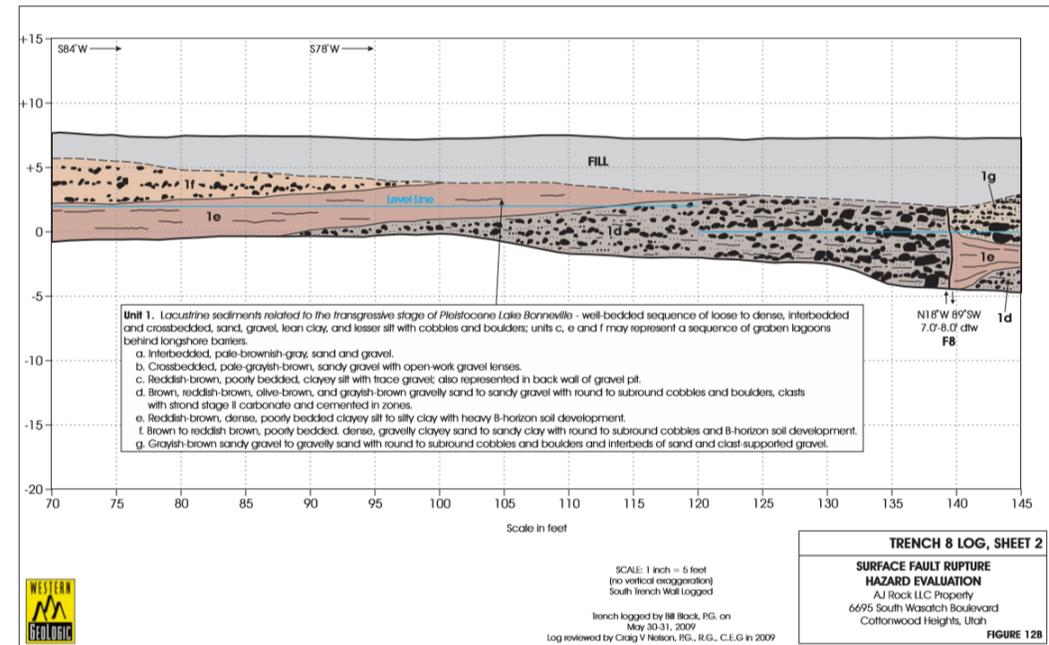
Use trench logs to guide excavation. Remove material during site preparation.



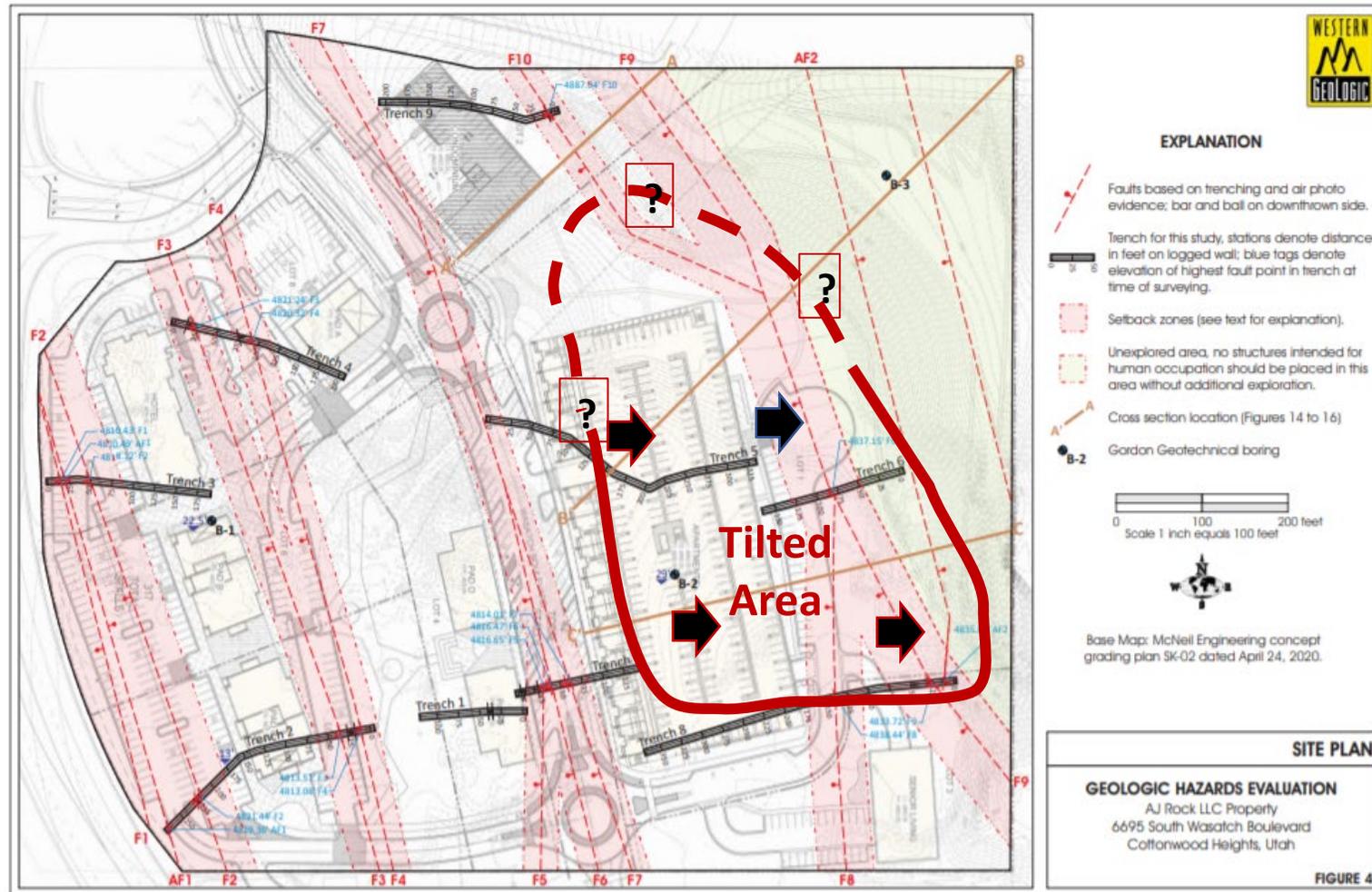
Concern #4: Ground Tilting During Earthquake



Trench logs reveal ground tilted during previous earthquakes.



Solution: Assess Impact of Ground Tilting During Earthquake



Engage structural engineers to analyze tilting. Can building structures be designed to withstand ground tilting during a major earthquake?

While it may never be possible to predict earthquakes, we can prevent disasters.



Christchurch NZ, 2011