Wallace Kuhl & Associates

Geotechnical Engineering Report

UCD ORCHARD PARK DEMOLITION

GEOTECHNICAL SURVEY

WKA No. 11031.01P

June 24, 2016

Prepared For:

Design and Construction Management

University of California, Davis

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Geotechnical Engineering Report
UCD ANIMAL SCIENCE TEACHING FACILITY
Davis, California

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Geotechnical Engineering Report

UCD ORCHARD PARK DEMOLITION GEOTECHNICAL SURVEY

Orchard Park Drive
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INTRODUCTION

We have completed a geotechnical engineering report for the proposed demolition of the existing housing and site utilities within the existing Orchard Park development on the University of California – Davis (UCD) campus in Davis, California. The purposes of our work have been to provide geotechnical engineering conclusions and recommendations regarding demolition of the existing improvements. This report presents the results of our work.

Project Description

We understand the project will consist of the demolition and removal of several existing improvements, including utilities, within the Orchard Park development. We understand the demolished structures will then be backfilled and prepared for future development. The extent and nature of the future development was not known at the time this report was prepared.

CONCLUSIONS

Excavation Conditions

Based on our experience in the area, we anticipate the soils at the site will be readily excavatable with conventional earthmoving and trenching equipment. However, subsurface remnants from previous development of the site (i.e., foundations, underground tanks, vaults, etc.) may be encountered at the site and can be slow to excavate with a standard, rubber-tired backhoe; however, experience has shown that excavators can remove these materials with moderate effort.

We anticipate soils exposed in trench sidewalls and below-grade excavations will consist of interbedded layers of clays, silts and/or silty sands, which typically remain stable at near-vertical inclinations without significant caving for relatively short periods (i.e., less than one day). However, when saturated and/or disturbed soils are encountered excavation bracing or shoring will be required to control sloughing and caving. Excavations deeper than five feet should be

sloped or braced in accordance with current Occupational Health and Safety Administration (OSHA) regulations.

Temporarily sloped excavations should be constructed no steeper than a one horizontal to one vertical (1:1) inclination. Temporary slopes likely will stand at this inclination for the short-term duration of construction, provided significant pockets of loose and/or saturated granular soils are not encountered that could slough into excavations. Flatter slopes would be required if these conditions are encountered.

The contractor must provide a safely sloped excavation or an adequately constructed and braced shoring system in accordance with federal, state and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, proper shoring must be used to resist the extra pressure due to the superimposed loads.

Soil Suitability for Use in Fill Construction

Based on our experience in the area, we anticipate the existing on-site materials will be suitable for use as engineered fill, provided they are free of significant quantities of organics, rubble and deleterious debris, and at a suitable moisture content to achieve the recommended compaction.

Soils beneath existing pavement and slab areas and irrigated areas will likely be at an elevated moisture content regardless of the time of construction and will require drying before compaction or use as fill.

Existing pavements and flatwork (asphalt concrete and concrete) may be broken up and pulverized for use as fill. Asphalt and Portland cement concrete rubble may be used as fill provided it is processed into fragments less than three inches in largest dimension, is mixed with soil to form a compactable mixture, and is approved by the Owner.

Existing aggregate base encountered below the asphalt concrete and concrete surfaces, if any, is considered suitable for reuse as engineered fill. Consideration may also be given to reusing the existing aggregate base as aggregate base or subbase. However, additional laboratory testing would be required after demolition and stockpiling to verify the material meets the requirements for Caltrans Class 2 aggregate base or subbase.

Groundwater

The permanent groundwater table should not be a significant factor in site development for excavations extending less than about 20 feet below the existing ground surface. However, it is

possible that perched groundwater may be encountered in excavations if construction begins in the winter and early spring months. In general, standard sump pit and pumping procedures should be adequate to control localized seepage from perched groundwater.

Seasonal Water

Infiltrating surface run-off water from seasonal moisture during the winter and spring months will create saturated surface soil conditions. It is probable that grading operations attempted following the onset of winter rains and prior to prolonged drying periods will be hampered by high soil moisture contents. Such soils, intended for use as engineered fill, will require a significant period of dry weather and aeration or chemical treatment to reach a moisture content suitable for proper compaction. In addition, soils located beneath existing pavements, slabs, and flatwork, will likely be at elevated moisture contents regardless of the time of year of construction and also require drying. Wet soils should be anticipated and considered in the construction schedule for this project.

RECOMMENDATIONS

The recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and early spring months, and will not be compactable without aeration or chemical treatment to dry the soils. Should the construction schedule require work during wet conditions, additional recommendations can be provided, as conditions warrant.

Soils under existing pavement or slabs and irrigated areas will be wet regardless of the time of year of construction.

Site preparation should be accomplished in accordance with the provisions of this report. A representative of the Geotechnical Engineer should be present during site grading and demolition backfill to evaluate compliance with our recommendations. The Geotechnical Engineer of Record referenced herein should be considered the Geotechnical Engineer that is retained to provide geotechnical engineering observation and testing services during construction.

Site Clearing and Demolition

From a geotechnical standpoint, the most effective method of mitigating the existing underground structures is to completely remove them from the site, including all associated backfill soils.

In general, all subsurface structures should be removed to a depth of at least 2½ feet below the lowest future structural improvement. In building areas, structures should be removed to at least 2½ feet below the bottom of any foundations, or to at least four feet below the final building pad elevation, whichever is deeper. The area of removal should include the entire building pad and an area extending at least five feet beyond all exterior foundations, including exterior columns. In pavement areas, the depth of removal should be at least 2½ feet below final pavement subgrade elevation, and should extend at least five feet beyond all structural improvements. The structures to remain in-place should be relatively competent (e.g., minimal cracking and deterioration) and the Geotechnical Engineer's representative must approve below-grade structures to remain in-place, if any.

The bottom of all structures to be left in place, if any, should be perforated on a four-foot by four-foot grid to allow for the percolation of water. Structures with sloped or irregularly surfaced bottoms should be evaluated on a case-by-case basis to determine an appropriate perforation grid. In general, structures with sloped/irregular bottoms should be perforated at the low point of the structure to remain in place. Demolition should include removal of all vertical walls to the depths outlined above. Debris should be removed from the site, or processed into recycled aggregate base materials, as outlined below. It will not be acceptable to place debris in the deeper portions of the subsurface structures unless processed to smaller than three inches in maximum size and mixed with soil to create a compactable material.

Existing utilities within future proposed building footprints should be rerouted around the structures. All abandoned utilities should be removed and backfilled with engineered fill and/or existing onsite soils. As an alternate, abandoned utilities below proposed pavement areas may be left in place and fully grouted provided the abandoned utility is situated at least 2½ feet below the final subgrade level to reduce the potential for "hard spots". Since the condition of the backfill in existing utility trenches is unknown, the soils in existing utility trenches where the utility is abandoned and grouted in place should be evaluated to confirm these soils are adequate for support of engineered fill, grade slabs, and/or pavements. Unsuitable existing trench backfill should be removed and replaced with engineered fill.

All trees/large brush designated for removal should include the rootballs and roots ½ inch or larger in size. Depressions resulting from removal of underground structures (e.g., foundations, utilities, etc.) should be cleaned of loose soil and properly backfilled in accordance with the recommendations of this report.

The existing pavements (asphalt concrete and concrete), slabs-on-grade, and concrete structures that are not incorporated into the new design may be broken up, pulverized and reused as engineered fill, or removed from the site. If existing pavements are reused as

engineered fill, they should be pulverized to fragments less than three inches in largest dimension and mixed with the underlying subgrade, and be approved by the Owner.

Pulverized pavements, slabs-on-grade, and concrete structures may be reused as Class 2 aggregate base and/or subbase provided those materials are pulverized to fragments less than 1½ inches in largest diameter and the resulting materials conform to Caltrans Class 2 aggregate base/subbase specifications. It should not be assumed that existing materials will meet the requirements for Class 2 aggregate base/subbase. Laboratory testing should be performed on the pulverized materials to verify materials quality and conformance to Caltrans Class 2 aggregate specifications, prior to pavement construction.

Subgrade Preparation

The bottoms of the excavations to remove below-grade structures should be scarified to a depth of 12 inches, moisture conditioned to the optimum moisture content and compacted to at least 90 percent of the maximum dry density per American Society of Testing and Materials (ASTM) D1557. The excavations should be restored to grade with engineered fill in accordance with the recommendations provided in the Engineered Fill Construction section of this report.

Following clearing operations, surfaces to receive fill, at-grade areas, and subgrades achieved by excavation should be scarified to a depth of at least 12 inches, moisture conditioned to at least the optimum moisture content, and compacted to at least 90 percent relative compaction. Relative compaction should be based on the maximum dry density as determined in accordance with the ASTM D1557 Compaction Test.

Compaction operations should be performed in the presence of the Geotechnical Engineer's representative who will evaluate the performance of the subgrade under compactive load and identify loose or unstable soils that could require additional subgrade preparation.

Engineered Fill Construction

Any fill placed within the construction area should be an approved material, free of significant quantities of organics, oversized rock, or other deleterious materials. The fill should be spread in level layers not exceeding six inches in compacted thickness and compacted to a minimum of 90 percent of the maximum dry density. Maximum dry densities shall be determined in accordance with ASTM D1557.

Engineered fill should be moisture conditioned to at least the optimum moisture content and maintained in that condition.

Based on our experience on campus, the on-site soils will likely be considered suitable for use as engineered fill provided they are free of rubble and organic concentrations. Imported fill should be an approved compactable, well-graded, granular material, have an Expansion Index of 40 or less, an R-value of 20 or more used within the upper three feet of the final pavement subgrade, and be free of particles larger than three inches in maximum dimension. The contractor also should supply appropriate documentation for imported fill materials indicating the materials are free of known contamination and have corrosion characteristics within acceptable limits. The Geotechnical Engineer must approve import material before being transported to the project site.

The upper six inches of pavement subgrades, whether achieved by excavation, filling, or left at-grade, should be processed, properly moisture conditioned to at least the optimum moisture content, and uniformly compacted to at least 95 percent relative compaction.

Utility Trench Backfill

Bedding and initial backfill for new utility construction should conform with the pipe manufacturers recommendations and applicable sections of the governing agency standards. General trench backfill should consist of engineered fill backfilled in maximum nine-inch thick loose lifts with each compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. Utility trench backfill within the upper six inches of the final subgrade within pavement areas should be compacted to at least 95 percent of the maximum dry density.

We recommend that all underground utility trenches aligned nearly parallel with existing or new foundations be at least five feet from the foundations, wherever possible. If this is not practical, the trenches should not encroach on a zone extending at a one horizontal to one vertical (1:1) inclination below the foundations.

Site Drainage

Site drainage should be accomplished to provide positive drainage of surface water away from the buildings and prevent ponding of water adjacent to foundations. The subgrade adjacent to the buildings should be sloped away from foundations at a minimum two percent gradient for at least 10 feet, where possible. We recommend consideration be given to connecting all roof drains to solid PVC pipes which are connected to available drainage features to convey water away from the structures, or discharging the drains onto paved, or hard surfaces that slope away from the foundations. Ponding of surface water should not be allowed adjacent to buildings or pavements.

Construction Observation Services

Site preparation should be accomplished in accordance with the recommendations of this report. Geotechnical testing and observation during construction is considered a continuation of our geotechnical engineering investigation. The Geotechnical Engineer of Record should be retained to provide testing and observation services during site demolition at the project to verify compliance with this geotechnical report and the project plans and specifications, and to provide consultation as required during construction. These services are beyond the scope of work authorized for this investigation.

Section 1803.5.8 Compacted Fill Material of the 2013 CBC requires that the geotechnical engineering report provide a number and frequency of field compaction tests to determine compliance with the recommended minimum compaction. Many factors can effect the number of tests that should be performed during the course of construction, such as soil type, soil moisture, season of the year and contractor operations/performance. Therefore, it is crucial that the actual number and frequency of testing be determined by the Geotechnical Engineer during construction based on their observations, site conditions, and difficulties encountered.

The Geotechnical Engineer retained to provide these services should indicate in writing that they agree with the recommendations of this report, or prepare supplemental recommendations as necessary. A final report by the "Geotechnical Engineer" should be prepared upon completion of the project.

Future Services

As noted previously, the nature and extent of future development following demolition and site clearing was not known at the time this report was prepared. Prior to design and construction of any future developments, we recommend a geotechnical engineering report with an appropriate subsurface exploration and laboratory testing program be performed to address specific conclusions and recommendations with respect to any future development at the site. In addition, we recommend that WKA be given the opportunity to review the final plans and specifications to determine if the intent of our recommendations has been implemented in those documents.

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed project, combined with our experience on the UCD campus. We have used prudent engineering judgment based upon the information provided and our experience.

This report has been prepared in substantial compliance with generally accepted geotechnical engineering practices that exist in the area of the project at the time the report was prepared. No warranty, either express or implied, is provided.

If the proposed construction is modified or re-sited, we should be afforded the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations must be modified.

We emphasize that this report is applicable only to the proposed construction and the investigated site, and should not be utilized for construction on any other site.

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