

Millcreek City Hall
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Millcreek, Utah 84106
millcreekut.gov



Planning & Zoning
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LUHO-24-006

Staff Report

Meeting Date: 9/19/2024

Applicant: James Copeland

Re: Variance from retaining wall code

Property Address: 4074 S Wasatch BLVD

Zone: Olympus Hills West – Village Center Special District

Prepared By: Carlos Estudillo, Planner

REQUEST AND SYNOPSIS

The applicant, James Copeland, representing the property and business of Porsche, is seeking a variance to the Millcreek's retaining wall code to allow a modular block retaining wall of up to eighteen (18) feet in height, to meet all structural and safety standards set by Millcreek's Ordinances and Development Agreement (ORD NO.23-27), to accommodate a Porsche Dealership, at the Olympus Hills West – Village Center Special District (VCSD).

The applicant has filed a variance application to be heard by the Millcreek Land Use Hearing Officer to allow for a single-contiguous eighteen (18) foot high and 714 foot long **retaining wall** on the west side of the subject property.

Millcreek code section 19.95.090 defines the design standards for Retaining Walls, which identifies the maximum height allowed for single, retaining walls:

- If a single retaining wall is used, one (1) vertical retaining wall up to eight (8) feet in height is permitted to reduce excavation and embankment.

If the slope intended to “retain” is larger than the height of the maximum height allowed for single, retaining walls, applicants may opt for the option of “Terracing”, identified on Millcreek code section 19.95.090.

- Terracing is limited to two (2) walls with a maximum vertical height of six (6) feet each. The width of a terrace shall be a minimum of a one to one (1:1) ratio with the height of the wall. Terraces are measured from the back of the lower wall to the face of the upper wall. Terraces created between retaining walls shall be permanently landscaped or revegetated as required by this Chapter.

The ordinance establishing the VCSD included a site plan that was specific as to the placement of the building and access areas. The applicant asserts that the steep characteristics found at west side of the lot, and its proximity to I-215, creates a situation where, due to the slope desired to be “retain”, the construction of a terraced retaining wall would render approximately twelve (12) to fifteen (15) feet of land, to the west of the site, unable to meet the Metropolitan Water District Easement access requirements, violating the requirements established Ordinance No. 23-27. Additionally, a terraced retaining wall would consume enough land that would impede the construction of the proposed, and approved storm drains and retention chambers underground (near the retained area) as they will be within the terraced section of property. A terraced, retaining wall would make the proposed and approved twenty (20) feet fire lane unachievable on the west side of the structure. The site would lose eight (8) proposed and approved electric charging stations on the west side of the property if the wall is terraced. Finally, the structure’s footings would be within the zone of influence of the upper terraced wall, along the west property line.

The applicant’s proposed mitigation and request is for the approval of a single-contiguous eighteen (18) feet high and 714 feet long **retaining wall** on the west side of the subject property.

Variances are regulated by Millcreek code section 19.92.050. For a variance to be granted, the applicant must meet the five criteria laid out in this section of code. Code language outlining how variances are regulated can be found below.

19.92.050 Variances

- A. The authority shall have the following powers to authorize on appeal in specific cases a variance from the terms of this title. The authority may grant a variance only if:
1. Literal enforcement of this title would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of this title;
 2. There are special circumstances attached to the property that do not generally apply to other properties in the same district;
 3. Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same district;
 4. The variance will not substantially affect the general plan and will not be contrary to the public interest; and
 5. The spirit of this title is observed, and substantial justice is done.
- B. In determining whether enforcement of this title will cause unreasonable hardship, the authority may not find an unreasonable hardship unless the alleged hardship is located on or associated with the property for which the variance is sought and comes from circumstances particular to the property, not from conditions which are general to the neighborhood. In determining whether or not enforcement of this title would cause an unreasonable hardship, the authority may not find an unreasonable hardship if the hardship is self-imposed or economic. In determining whether or not there are special circumstances attached to the property, the authority may find that special circumstances exist only if special circumstances relate to the hardship complained of and deprive the property of the privileges granted to other properties in the same district. The applicant shall bear the burden of proving that all the conditions justifying a variance have been met.

- C. In granting a variance, the authority may impose additional requirements on the applicant that will mitigate any harmful effects of the variance or serve the purpose of the standard or requirement that is waived or modified.

Below are staff responses to the listed variance requirements found above. These responses are based on information found within the code and from the applicant. For variances, the applicant shall bear the burden of proof in justifying why a variance should be granted.

1. **Literal enforcement of this title would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of this title.**

Applicant: Section 19.95.090 (E) (1) mentions that the purpose of the retaining wall height limit of eight (8) feet is to “reduce excavation and embankment”. The Porsche development is located on a parcel situated between Wasatch Blvd and the I-215 right-of-way. There exists approximately 18 to 20 feet of elevation grade change across the property from east to west, and a large amount of fill material will be necessary to allow development of the property in a manner that has driveway access at reasonable slopes and does not situate the building at an unreasonable elevation below Wasatch Blvd. These current site conditions are peculiar to this property and not predominantly evident in other Village Center Special District zoned properties within Millcreek.

This project does not involve large amounts of traditional excavation as the site naturally sits below Wasatch Blvd in elevation. Instead, the large amount of fill necessary will further work to ensure the integrity of the proposed retaining wall. The import of the fill material on the high side of the wall will allow greater control of the fill material’s qualities and suitability, rather than estimations of the suitability of existing soils being retained by the wall.

Denial of this variance request would constitute a significant hardship for development of this property, as the building envelope would shrink considerably and render a standard commercial use (as formally approved in the Olympus Hills West Village Center Special District zoning text and Development Agreement) nearly impossible. The purpose of the title to reduce excavation and embankment have been considered in the City Engineering reviews for the development.

Staff: An abrupt change in grade of approximately eighteen (18) feet is located at west property line of the subjected lot. This steep characteristics found at west side of the lot, and its proximity to I-215, creates a situation where, due to the slope desired to be “retain”, the construction of a terraced retaining wall would render approximately twelve (12) to fifteen (15) feet of land, to the west of the site, unable to meet the Metropolitan Water District Easement access requirements, violating the requirements set on Ordinance No. 23-27.

Additionally, a terraced, retaining wall would consume enough land that would impede the construction of the approved storm drains and retention chambers underground (near the retained area) as they will be within the terraced section of property. A terraced, retaining wall would make the approved twenty (20) foot fire lane unachievable on the west side of the structure. The site would lose eight (8) proposed and approved electric charging stations on the west side of the property if the wall is terraced. Finally, the structure’s footings would be within the zone of influence of the upper terraced wall, along the west property line.

The construction of a single eighteen foot (height) retaining wall would primarily reduce approximately twelve to fifteen feet of excavation and embankment in the west side of the property. Allowing to meet the proposed design approved under Ordinance No. 23-27. Staff does not object to the applicant's rationale that literal enforcement of the zoning ordinance would cause an unreasonable hardship for the applicant. Staff does not believe that literal enforcement of the terracing requirement would undermine the purpose of the VCSD ordinance to accommodate a commercial automotive dealership between Wasatch Boulevard and I-215.

2. There are special circumstances attached to the property that do not generally apply to other properties in the same district.

Applicant: Metropolitan Water District (MWD) has provided review comments requesting an access easement through the Porsche site area in order to access their property (which lies to the south of the Porsche site). The access easement, when combined with the required fire lane width in the drive aisles around the dealership building, constricts the available development space on the property for the building itself. The access easement is no table to be placed closer to Wasatch Blvd due to the grade difference between the roadway and the MWD property, which necessitates placing the access at the lower end of the property.

As discussed above, the property is uniquely situated between Wasatch Blvd and the UDOT right-of-way for I-215. The narrow configuration of the property, as well as the existing elevations and slopes across the site, mandate retaining in excess of Title 19 standards. The elevation of the northbound I-215 travel lanes (top of asphalt) will likely sit below the top of retaining wall due to the existing elevations involved and the grade difference between Wasatch Blvd and I-215. The western face of the wall is likely to be, on average, approximately 5 feet above the elevation of the I-215 northbound travel lanes, with the highest point approximately 8 feet above I-215. Due to the horizontal separation from the I-215 travel lanes, the retaining wall will not be seen as "looming" over the interstate.

The constraints of the property width, MWD access easements and drive aisles, and property location/elevations all provide evidence of the special and peculiar circumstances for this project that would not apply to a typical commercial development located elsewhere within the City's Village Center Special Districts.

Staff: The construction of a terraced, retaining wall, would render approximately 12-15 feet of land, west of the property unusable, and would prevent the applicant from securing the vehicular access and easement access that was identified in the approved site plan adopted in the VCSD. This is the only property in the village center that is situated between an arterial road and an Interstate highway. It is also that only property in the Olympus Hills village center that is affected by a significant public utility easement. Staff does not object to the applicant's assertion that there are special circumstances attached to the property that do not generally apply to other properties in Millcreek's village centers.

3. Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same district.

Applicant: The 18 to 20 feet of elevation fall across the property from east to west means that the proposed retaining height would be required regardless of whether terracing was involved or not. Terracing the retaining wall would require a setback that would cause the site to no longer comply with parking requirements and would prevent the site from being able to provide sufficient fire lane and MWD access that serves a critical need for culinary water to the entire community. The fire lane along the western side would not comply with fire code requirements and the building envelope

would shrink to a size well below the building envelope enjoyed by other commercially zoned properties of a similar size. The building foundation would also not be likely to enjoy the same horizontal separation from a terraced retaining wall, which would potentially place the wall within the zone of influence of the building footings, creating a structural design concern.

Terracing the wall would render approximately 15 feet from the western boundary line unusable for development, which would be a significant reduction in “enjoyment of the property” due to the already narrow configuration of the parcel. The southwestern corner of the property is also the lowest natural elevation and therefore the location of onsite retention. Terracing the retaining wall would produce a hardship of locating underground retention outside of the terraced wall footprint.

The retaining wall, if terraced, would also cause a loss of eight EV charging stalls along the western boundary. The retaining wall configuration proposed allows for the desired commercial use in a manner that still meets other City planning, engineering, Unified Fire Authority and MWD standards.

Staff: Staff does not object to the applicant’s assertion that granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same district. Granting the variance would be essential to meet the standards set forth in the Development agreement, identified on ORD NO.23-27. Applicant, otherwise, would need to radically alter the site plan in an adopted ordinance in order to comply with the retaining wall standards found elsewhere in the code.

4. The variance will not substantially affect the general plan and will not be contrary to the public interest.

Applicant: This variance request will not affect the general plan due to the unique site circumstances involved. The proposed retaining wall has been designed to be aesthetically pleasing, as the western face of the wall will front I-215. The design of the retaining wall has been engineered and vetted by structural and geotechnical engineers, and the unique site conditions requiring site fill on the high side of the wall allow for a great amount of control over the soil conditions and wall stability. The public interest is best served by approving this variance so the property can be commercially developed in a manner consistent with the approved zoning and the economic development goals contained within the city’s General Plan.

Staff: Staff does not object to the applicant’s assertion that the variance will not substantially affect the general plan and will not be contrary to the public interest. Permitting a non-terraced retaining wall at the subject property does not have an effect on the adopted General Plan of Millcreek. In fact, the variance advances the goals of the general plan referenced in the staff reports for the ordinance adoption, particularly:

- **Vibrant Gathering Places Strategy 9.3:** Encourage the development or redevelopment of vacant and under-utilized properties in centers and along major corridors by using a combination of incentives, rezoning, and creative design solutions.
- **Economic Development Strategy 2.5:** Support efforts to attract, expand and retain large, medium, and small businesses that offer high quality jobs, generate local tax revenue and/or provide needed goods or services to residents.

5. The spirit of this title is observed, and substantial justice is done.

Applicant: The applicant understands the referenced section of Title 19 to attempt to prevent failure of retaining wall systems that might endanger public safety and that might unnaturally require large amounts of digging and excavation in order to shore up existing soils. This proposed project does not involve shoring of existing soils and instead will bring the site closer to the elevation of Wasatch Blvd so that customers can access the site for its intended commercial use while still preserving critical Unified Fire Authority access and critical access to the Metropolitan Water District site in the case of an emergency for the entire community.

Staff: The spirit of the title is to promote the use of high-quality materials in fences, screens, walls, and retaining walls, while providing for privacy and safety for individual properties, vehicles, and pedestrians through fence and wall design, height, and placement when standards are met. Variances are designed to give residents and business owners exceptions from certain areas of code if they face a hardship that similar properties do not face. Staff does not object to the applicant's assertion that the spirit of the title is observed, and substantial justice is down. However, the burden of proof lays with the applicant and the decision is made by an independent Land Use Hearing Officer.

Millcreek's variance code allows for the land use authority, in this case the Millcreek Land Use Hearing Officer, to impose conditions when granting a variance that may help mitigate negative externalities the variance may create. Variances run with the land in perpetuity meaning that in the future, this piece of land would benefit from any granted variance unless conditions are imposed that limit the scope of the granted variance. If a variance is granted in this case, staff recommends conditions that limit the scope of the variance to the height and length of the wall as described in the applicant's submitted plans (Supporting Documents A and C).

FINDINGS & CONCLUSIONS

Findings:

- The applicant's property sits on the Olympus Hills West – Village Center Special District, designed for the Applicant's intended use.
- The intended use is a Porsche dealership with an underground parking lot.
- All design and civil standards are set forth in ORD NO.23-27.
- The maximum height allowed for a single retaining wall is eight (8) feet.
- Terracing is limited to two (2) walls with a maximum vertical height of six (6) feet each. The width of a terrace shall be a minimum of a one to one (1:1) ratio with the height of the wall.
- Variances run with the land in perpetuity.
- The Land Use Hearing Officer may impose conditions on a variance to mitigate harmful effects that the variance may create.

Conclusions:

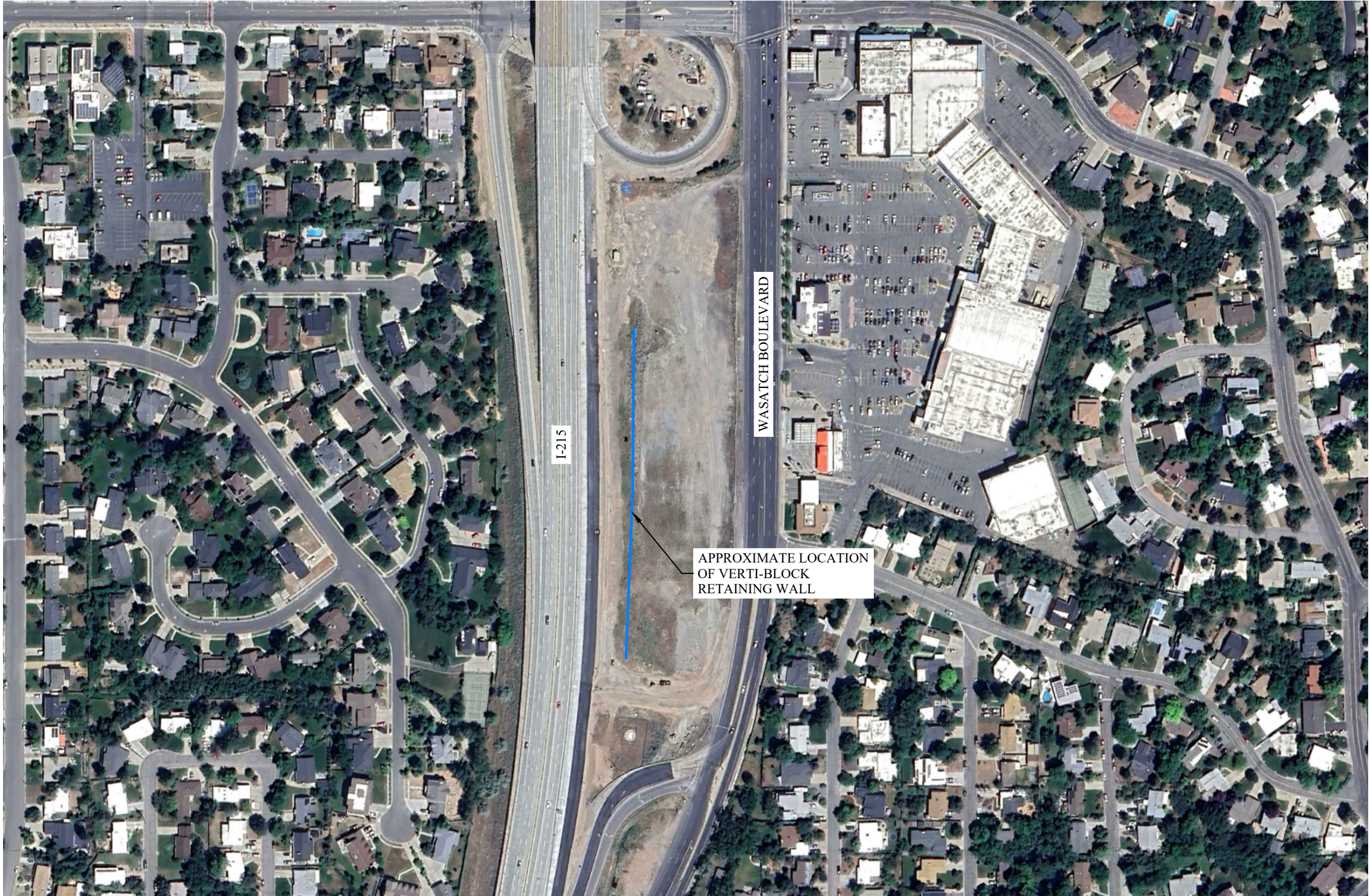
- Twelve (12) to Fifteen (15) feet of the west property would be rendered unusable if the wall is terraced. All depending on present soils and geo-gid tie backs.
- The Metropolitan Water District easement will be hindered by the terraced wall.
- Underground storms drain and retention chambers will be within the terraced section of property.

- Terraced walls will make the twenty (20) foot fire lane unachievable on the west side of the structure.
- The site will lose eight (8) electric charging stations on the west side of the property if the wall is terraced.
- The structures footing will be within the zone of influence of the upper terraced wall, along the west property line.
- Strict adherence to the terracing requirements would prohibit the applicant from developing the site in accordance with the standards established in ORD NO. 23-27.
- If a variance is granted in this case, staff recommends conditions that limit the scope of the variance to the height and length of the wall as described in the applicant's submitted plans (Supporting Documents A and C).

SUPPORTING DOCUMENTS

- **A. Potential Retaining-Wall location.**
- **B. Letter of intent from the applicant.**
- **C. Civil Plans**
- **D. Development Agreement.**

VERTI-BLOCK RETAINING WALL DESIGN PACKAGE
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH



NOTE: THIS PLAN SET HAS BEEN PREPARED WITH COLOR LINE-TYPES TO MAKE SOME DETAILS AND SPECIFICATIONS MORE CLEAR. ANY COPIES OF THESE PLANS SHOULD BE MADE IN COLOR.

PROJECT AERIAL VIEW
REFERENCE IMAGE FROM GOOGLE EARTH PRO,
IMAGE TAKEN JUNE 24, 2023.

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044

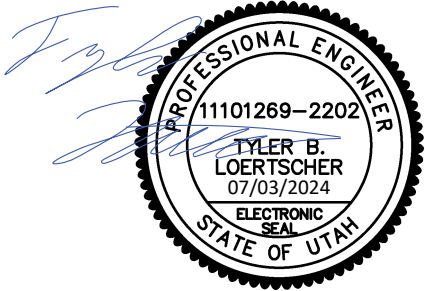
VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
COVER SHEET

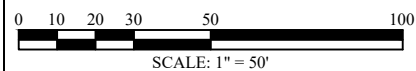
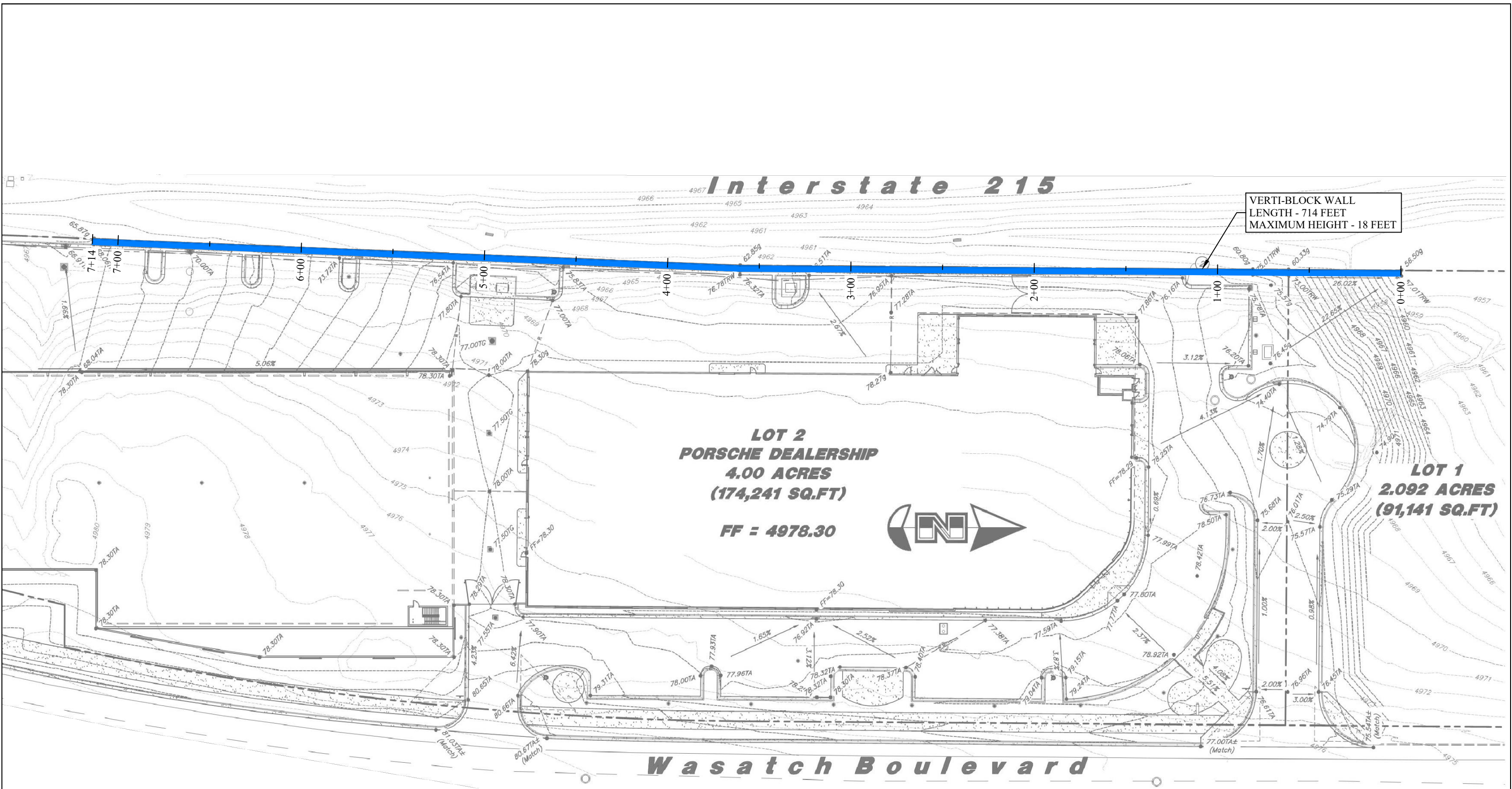
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CHECKED BY: BMJ	7-3-2024	DWG SCALE
APPROVED BY: TBL	7-3-2024	1"=250'
IGES PROJECT NO: 02228-008	SHEET NO: 1	REV N/A

DESIGN PACKAGE CONTENTS		
	SHEET NO.	DESCRIPTION
SHOP DRAWINGS	1	COVER SHEET
	2	PLAN VIEW
	3 - 5	ELEVATION VIEW
	6	TYPICAL SECTION VIEW
	7	CONSTRUCTION SPECIFICATIONS & NOTES
	8	VERTI-BLOCK DETAILS
	9	DESIGN CRITERIA
DESIGN CALCULATION PACKAGE	SECTION 2	STABILITY CALCULATIONS
	SECTION 3	GLOBAL STABILITY RESULTS
	SECTION 4	SEISMIC DESIGN CRITERIA

PREPARED FOR:
ANDERSON WAHLEN & ASSOCIATES
2010 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116
ATTN: JAMES COPELAND

PREPARED BY: TYLER B. LOERTSCHER, P.E.





PLAN VIEW
REFERENCE IMAGE FROM ANDERSON WAHLEN & ASSOCIATES (AWA), PORSCHE - COWBOY, 4074 SOUTH
WASATCH BLVD., MILLCREEK, UTAH, GRADING PLAN (SHEET C2.1, DATED 4/24/2024)

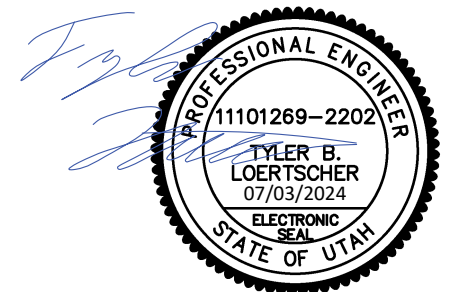
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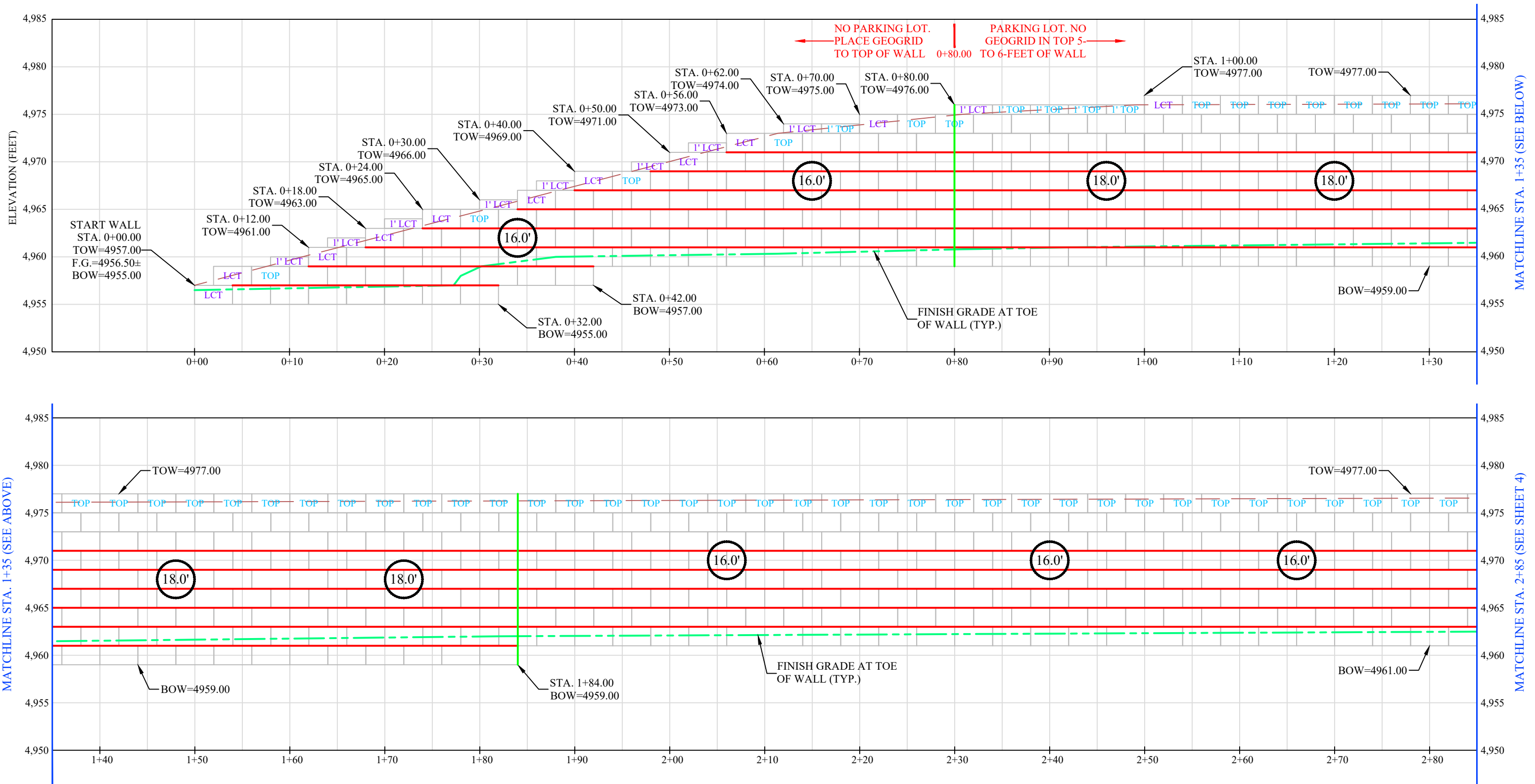


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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
PLAN VIEW

DESIGNED BY: TBL	7-3-2024	PLOT SCALE
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CHECKED BY: BMJ	7-3-2024	DWG SCALE
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02228-008	2	N/A





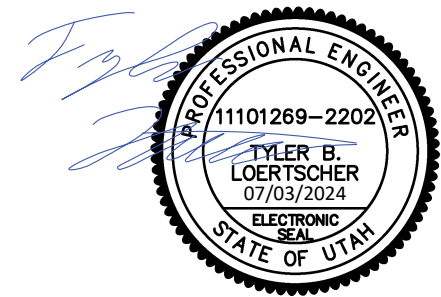
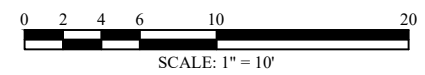
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36-INCH STANDARD BLOCK		LCOR/ RCOR LEFT/RIGHT CORNER MIDDLE BLOCK		MIRAFI 8XT GEOGRID
				CHANGE IN GEOGRD LENGTH/ TYPE

ELEVATION VIEW

REFERENCE ELEVATIONS FROM ANDERSON WAHLEN & ASSOCIATES (AWA), PORSCHE - COWBOY, 4074 SOUTH WASATCH BLVD., MILLCREEK, UTAH, GRADING PLAN (SHEET C2.1, DATED 4/24/2024). FIELD ADJUSTMENTS/CHANGES SHOULD BE EXPECTED ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.

LEGEND

TOW = TOP OF RETAINING WALL
BOW = BOTTOM OF RETAINING WALL
FG = FINISHED GRADE AT BOTTOM OF WALL



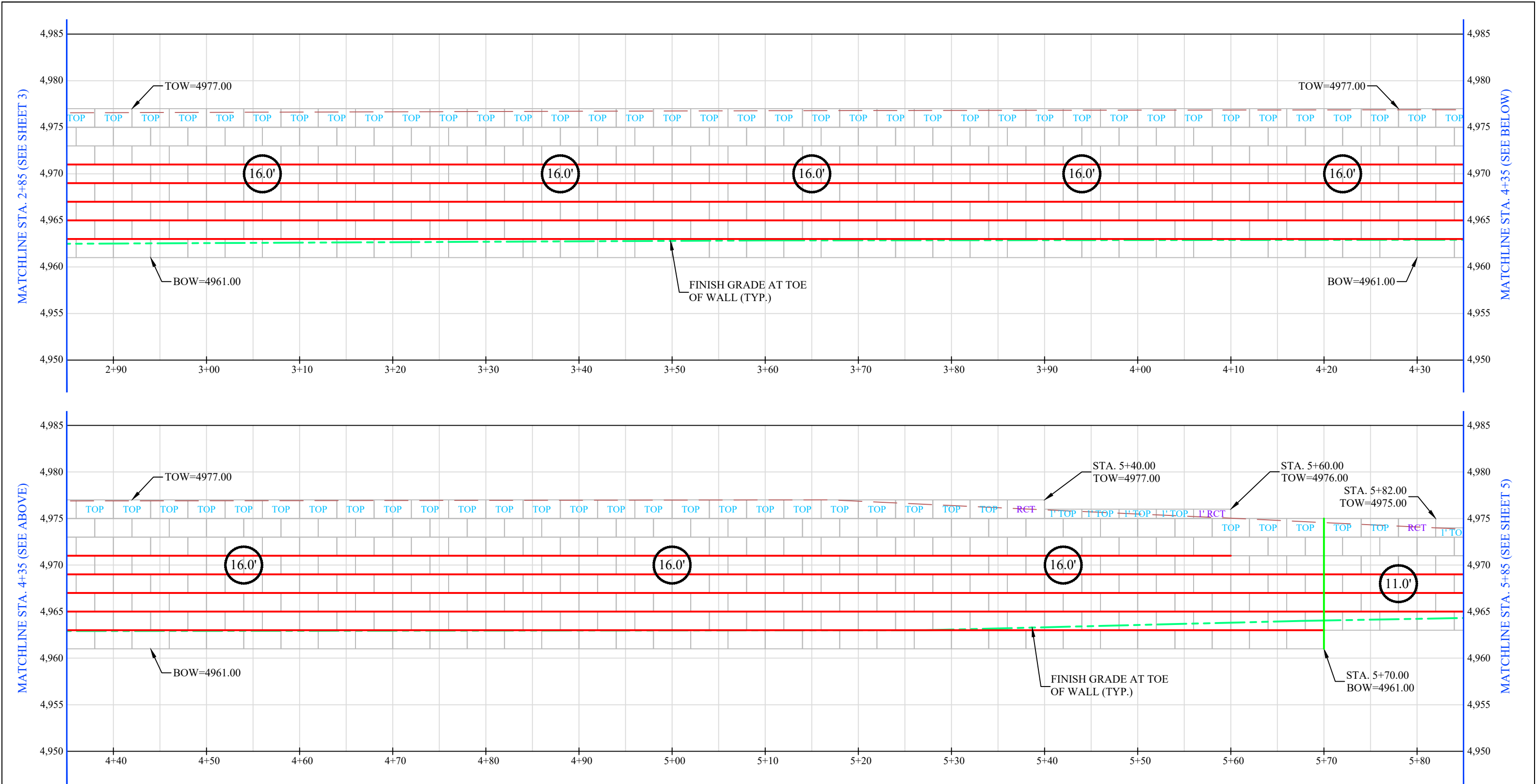
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REVISIONS				



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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
ELEVATION VIEW (1 OF 3)

DESIGNED BY: TBL		7-3-2024	PLOT SCALE 1=1
DRAWN BY: TBL		7-3-2024	
CHECKED BY: BMJ		7-3-2024	DWG SCALE 1"=10'
APPROVED BY: TBL		7-3-2024	
IGES PROJECT NO: 02228-008		SHEET NO: 3	REV N/A



TOP 36-INCH TOP BLOCK		LCT/ RCT LEFT/RIGHT CORNER TOP BLOCK		X.X' GEOGRID LENGTH (MINIMUM)
36-INCH STANDARD BLOCK		LCOR/ RCOR LEFT/RIGHT CORNER MIDDLE BLOCK		CHANGE IN GEOGRD LENGTH/ TYPE

ELEVATION VIEW

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LEGEND

TOW = TOP OF RETAINING WALL
BOW = BOTTOM OF RETAINING WALL
FG = FINISHED GRADE AT BOTTOM OF WALL

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SCALE: 1" = 10'

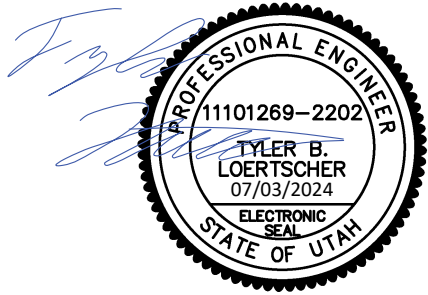
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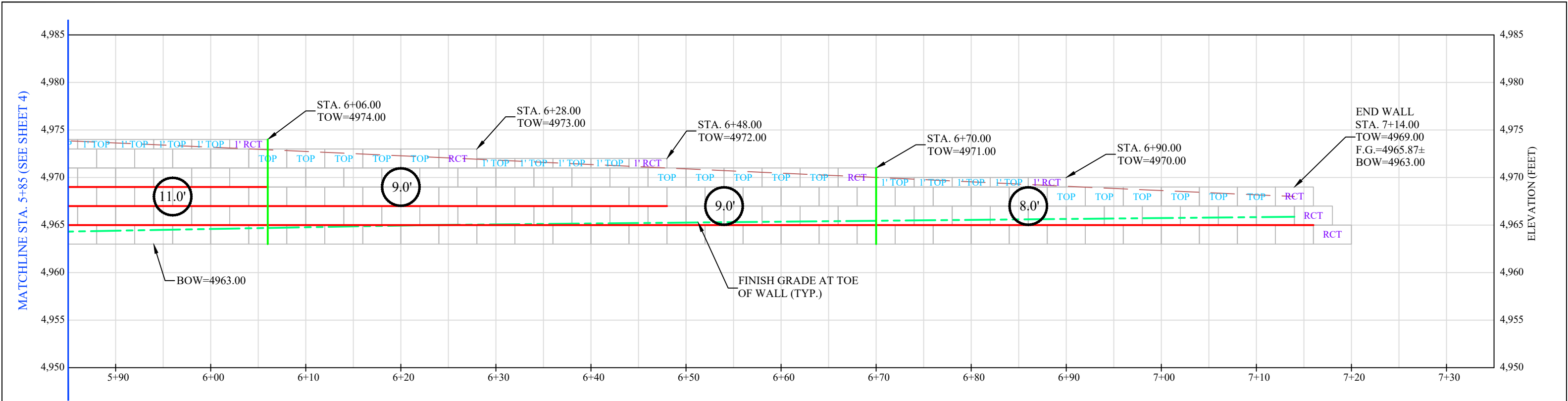


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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
ELEVATION VIEW (2 OF 3)

DESIGNED BY: TBL	7-3-2024	PLOT SCALE 1=1
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APPROVED BY: TBL	7-3-2024	
IGES PROJECT NO: 02228-008		SHEET NO: 4
		REV N/A





VERTI-BLOCK RETAINING WALL ESTIMATED QUANTITIES	
MATERIAL	TOTAL
TOTAL VERTI-BLOCK WALL AREA (ft ²)	10,132
TOP VERTI-BLOCK UNITS	135
36-INCH VERTI-BLOCK UNITS	1,096
LEFT CORNER TOP VERTI-BLOCK UNITS	11
RIGHT CORNER TOP VERTI-BLOCK UNITS	7
1-FOOT TOP VERTI-BLOCK UNITS	22
1-FOOT LEFT CORNER TOP VERTI-BLOCK UNITS	9
1-FOOT RIGHT CORNER TOP VERTI-BLOCK UNITS	4
MIRAFI 8XT GEOGRID (yd ²)	6,500
GRANULAR FILL FOR REINFORCED ZONE (yd ³)	4,750
DRAINAGE AND INFILL GRAVEL (yd ³)	600
LEVELING PAD CRUSHED STONE (yd ³)	150
CHIMNEY DRAIN GRAVEL (yd ³)	225
4-INCH PERFORATED DRAINAGE PIPE (ft)	2,100
6-OZ NON-WOVEN GEOTEXTILE FABRIC (yd ²)	1,000

* FABRIC WRAPPED BURRITO DRAIN INCLUDED IN QUANTITY ESTIMATES ABOVE. SEE TYPICAL SECTION VIEW.

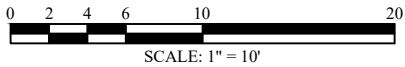
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	36-INCH STANDARD BLOCK	LCOR/ RCOR	LEFT/RIGHT CORNER MIDDLE BLOCK		MIRAFI 8XT GEOGRID
					CHANGE IN GEOGRD LENGTH/ TYPE

ELEVATION VIEW

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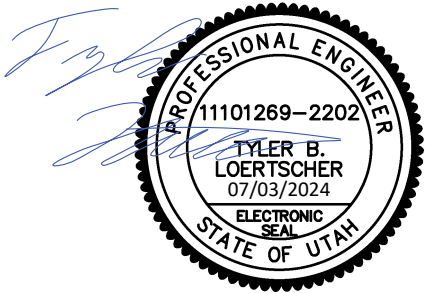
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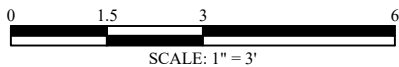
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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
ELEVATION VIEW (3 OF 3)

DESIGNED BY: TBL	7-3-2024	PLOT SCALE
DRAWN BY: TBL	7-3-2024	1=1
CHECKED BY: BMJ	7-3-2024	DWG SCALE
APPROVED BY: TBL	7-3-2024	1"=10'
IGES PROJECT NO: 02228-008	SHEET NO: 5	REV N/A



1. MAXIMUM SECTION SHOWN, ALL OTHER SECTIONS TO MEET THESE SAME SPECIFICATIONS, UNLESS NOTED OTHERWISE.
2. SOIL CUT SHOULD BE BENCHED AS NEEDED TO PROTECT WORKERS AND TO COMPLY WITH OSHA REQUIREMENTS.
3. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY PRECIPITATION EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING WALL CONSTRUCTION, AND AFTER, UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND/OR PAVING ARE COMPLETE.
4. FENCE ABOVE RETAINING WALL
 - 4.1. FENCE POST MUST EXTEND THROUGH TOP TWO BLOCK COURSES. DO NOT FILL BLOCK CORES WITH GRAVEL UNTIL FENCE POST HAS BEEN CEMENTED IN PLACE.



Professional Engineer
11101269-2202
TYLER B. LOERTSCHER
07/03/2024
ELECTRONIC SEAL
STATE OF UTAH

REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



12429 SOUTH 300 EAST
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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
TYPICAL SECTION VIEW

DESIGNED BY: TBL	7-3-2024	PLOT SCALE 1=1 DWG SCALE 1"=3'	
DRAWN BY: TBL	7-3-2024		
CHECKED BY: BMJ	7-3-2024		
APPROVED BY: TBL	7-3-2024		
IGES PROJECT NO: 02228-008		SHEET NO: 6	REV N/A

CONSTRUCTION SPECIFICATIONS & NOTES

1. INTRODUCTION
- 1.1. FOLLOW THE GUIDANCE CONTAINED IN THE VERTI-BLOCK CONSTRUCTION MANUAL UNLESS SPECIFICALLY SUPERSEDED BY MORE STRINGENT SPECIFICATION OR MATERIAL PROPERTIES PROVIDED HEREIN OR ON THE DRAWINGS.

1.1.1. IN THE EVENT THERE IS ANY CONFLICT OR AMBIGUITY BETWEEN THE FOLLOWING SPECIFICATIONS AND THE REFERENCED GUIDANCE, BRING ALL SUCH ISSUES IMMEDIATELY TO THE ATTENTION OF IGES, INC. FOR WRITTEN CLARIFICATION.

1.2. DESIGN AND CONSTRUCTION INFORMATION IS BASED ON INFORMATION OBTAINED FROM, SITE OBSERVATIONS, PROJECT PLANS, DISCUSSIONS WITH THE CLIENT AND THE ENGINEERING ANALYSIS PERFORMED AS PART OF THE SCOPE OF WORK FOR THIS PROJECT BY IGES, INC.

1.3. LOCATE ALL EXISTING UTILITIES PRIOR TO RETAINING WALL CONSTRUCTION.

1.4. IMPLEMENT THE FOLLOWING MEASURES TO REDUCE THE POTENTIAL FOR HYDROSTATIC PRESSURES TO BUILD UP BEHIND THE RETAINING WALL:

1.4.1. ESTABLISH VEGETATION OR EROSION CONTROL MEASURES ABOVE AND BELOW THE RETAINING WALLS IMMEDIATELY FOLLOWING CONSTRUCTION.

1.4.2. PLACE A 4-INCH MINIMUM PERFORATED DRAIN PIPE AT BOTTOM OF GRAVEL INFILL.

1.5. CONDITIONS SUCH AS LEAKY OR BROKEN IRRIGATION LINES AND/OR UNCONTROLLED RUNOFF FROM IMPROPER SITE GRADING (E.G., ALLOWING WALTER TO POND ABOVE THE RETAINING WALL) CAN LEAD TO SLOPE OR WALL MOVEMENT.

1.5.1. HYDROSTATIC CONDITIONS WERE NOT CONSIDERED IN THE ANALYSES AND MUST BE AVOIDED.

1.5.2. RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION OF THE RETAINING WALL BLOCKS, BUT PRIOR TO THE PLACEMENT OF THE LANDSCAPING OR FINISHING ELEMENTS AT THE SITE (E.G., 8-INCHES OF LOW PERMEABLE SOIL/HARDSCAPE, INSTALLATION OF CURB & GUTTER, VEGETATION OF SLOPES, ETC.). AS THESE ARE CRITICAL COMPONENTS TO THE OVERALL STABILITY OF THE RETAINING WALLS, THE RETAINING WALLS ARE NOT CONSIDERED COMPLETELY INSTALLED UNTIL THE LANDSCAPING/FINISHING ELEMENTS ARE COMPLETED. WE RECOMMEND THAT THESE ELEMENTS BE INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE BLOCKS.

1.5.2.1. THE OWNER SHALL BE AWARE OF THE RISK IF THESE OR OTHER CONDITIONS OCCUR THAT COULD SATURATE OR ERODE THE SOIL BEHIND THE WALL, OR IF THE FINISHING/LANDSCAPING ELEMENTS ARE NOT INSTALLED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE RETAINING WALL BLOCKS.

1.6. COMPLY WITH ALL ASPECTS OF OSHA 1926 SUBPART P APP B, SLOPING AND BENCHING FOR ALL EXCAVATED SLOPES.
2. VERTI-BLOCK RETAINING WALL MATERIALS
- 2.1. GEOGRID REINFORCEMENT CONSISTING OF MIRAFI 8XT AS SPECIFIED ON THE CONSTRUCTION DRAWINGS.

2.2. REINFORCED BACKFILL CONSISTING OF NATIVE GRANULAR SOILS OR IMPORT MATERIALS COMPLYING WITH THE FOLLOWING CRITERIA:

2.2.1. GRANULAR MATERIALS CONTAINING LESS THAN 25% FINES AND A MAXIMUM NOMINAL PARTICLE SIZE OF 4 INCHES

2.2.2. PH GREATER THAN 3 BUT LESS THAN 9 AND PI OF 6 OR LESS

2.2.3. REASONABLY FREE FROM ORGANIC OR OTHER DELETERIOUS MATERIALS

2.2.4. MINIMUM EFFECTIVE FRICTION ANGLE OF 34 DEGREES

2.2.5. ANY STRUCTURAL FILL USED BELOW OR BEHIND THE RETAINING WALL SHALL BE TESTED FOR COMPLIANCE WITH THE SPECIFICATIONS ABOVE.

2.3. LEVELING PAD

2.3.1. 6-INCHES MINIMUM OF CLEAN 1-INCH MINUS CRUSHED STONE OR CRUSHED GRAVEL.

2.4. USE NEW BLOCK MATERIALS MEETING THE MINIMUM REQUIREMENTS OF VERTI-BLOCK RETAINING WALL SYSTEMS (VERTI-CRETE, LLC).

2.5. FACING FILL AND DRAINAGE GRAVEL FILL

2.5.1. CLEAN CRUSHED STONE OR CRUSHED GRAVEL THAT COMPLIES WITH THE FOLLOWING CRITERIA:

2.5.1.1. SIEVE SIZE % PASSING

1"100

3⁄4"

75-100

3⁄8"

0-15

NO. 40-10

NO. 2000-5

2.6. 4-INCH MINIMUM PERFORATED PIPE (NO SOCK IS REQUIRED).

3. VERTI-BLOCK RETAINING WALL INSTALLATION

3.1. FIELD VERIFY PROPOSED FINISHED GRADE AT BOTTOM OF WALL TO PROVIDE THE MINIMUM WALL EMBEDMENT AS SHOWN ON THE SECTION DRAWING.

3.2. GRADE AND COMPACT FOUNDATION SUBGRADE SOILS FOR THE FULL LENGTH OF THE LEVELING PAD AND UP TO THE SOIL CUT PRIOR TO PLACEMENT OF THE LEVELING PAD AND ANY BACKFILL.

3.2.1. REMOVE ANY FOUNDATION SOILS FOUND TO BE UNSUITABLE OR UNSTABLE AND REPLACED WITH APPROVED FILL DETAILED IN THE SECTIONS ABOVE.

3.3. SET THE LEVELING PAD LEVEL SIDE TO SIDE AND FRONT TO BACK.

3.3.1. INSTALL LEVELING PAD TO A MINIMUM OF 6 INCHES THICK AND EXTEND Laterally A MINIMUM OF 6 INCHES BEYOND THE ENDS OF THE BLOCKS BOTH FRONT AND BACK AS SHOWN ON THE DRAWINGS.

3.4. SET AND CHECK THE FIRST ROW OF BLOCK UNITS FOR LEVEL AND ALIGNMENT.

3.4.1. INSTALL VERTI-BLOCK ELEMENTS IN ACCORDANCE WITH VERTI-BLOCK GUIDELINES.

3.5. POUR DRAINAGE INFILL GRAVEL INTO THE HOLLOW CORE OF EACH VERTI-BLOCK AND BETWEEN AND WITHIN THE BLOCKS AS EACH ROW OF BLOCKS IS INSTALLED. BEFORE ADDITIONAL COURSES OF BLOCKS ARE ADDED, THE CONTRACTOR MUST ENSURE THAT ALL VOIDS ARE FILLED AND NO AIR POCKETS ARE DETECTED.

3.5.1. SET DRAINAGE PIPE AT THE BASE OF THE GRAVEL INFILL ZONE AND SHALL SLOPE TO DAYLIGHT AND DISCHARGE AT THE LOW ENDS OF THE RETAINING WALLS.

3.6. REMOVE AND SWEEP OFF ALL EXCESS AGGREGATE AND OTHER MATERIALS FROM THE TOP OF THE BLOCKS BEFORE CONTINUING TO THE NEXT COURSE.

3.7. PLACE WALL BACKFILL MATERIAL IN 12-INCH MAXIMUM LOOSE LIFTS AND COMPACT TO A MINIMUM OF 95 PERCENT OF ASTM D1557 (MODIFIED PROCTOR). THINNER LIFTS MAY BE NECESSARY TO ACHIEVE REQUIRED COMPACTION.

3.7.1. PERFORM DENSITY TESTING OF THE BACKFILL SOILS AT 50-FOOT INTERVALS ON EVERY LIFT.

3.7.2. USE ONLY SMALL, WALK-BEHIND TYPE COMPACTION EQUIPMENT WITHIN 3 FEET OF THE BACK OF THE RETAINING WALL BLOCK.

3.7.3. IF ANY LOCATIONS EXIST WHERE THE RETAINING WALLS WILL NOT BE PLACED UPON NATIVE SOILS, COMPACT THE FILL TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DRY DENSITY PER ASTM D1557 (MODIFIED PROCTOR)

3.8. INSTALL THE EACH SUBSEQUENT COURSE TO BOND ON TOP OF THE BASE ROW. BLOCKS SHALL BE PLACED WITH NO SETBACK (NEAR VERTICAL BATTER) BETWEEN SUCCESSIVE COURSES.

3.8.1. CHECK EACH BLOCK COURSE FOR PROPER ALIGNMENT AND LEVEL.

3.8.2. CONTINUE TO UNIT FILL AND BACKFILL BEHIND EACH COURSE OF UNITS AS DESCRIBED IN NOTES 3.5 THROUGH 3.7.

3.9. INSTALL GEOGRID REINFORCEMENT AT THE ELEVATIONS INDICATED ON THE ELEVATION AND SECTION VIEW DRAWINGS.

3.9.1. SWEEP TOPS OF VERTI-BLOCK UNITS CLEAN OF ALL DEBRIS BEFORE INSTALLING THE NEXT COURSE OF UNITS OR PLACING GEOGRID REINFORCEMENT.

3.9.2. INSTALL THE GEOGRID REINFORCEMENT TO THE MINIMUM LENGTH SPECIFIED ON THE CONTRUCTION DRAWINGS.

3.9.3. ROLL THE GEOGRID OUT FROM THE FACE OF THE WALL (MACHINE DIRECTION) AND INSTALL IN PRIMARY STRENGTH DIRECTION.

3.9.4. PLACE THE GEOGRID ON THE FACING UNIT AND LOCATE AS DETAILED IN THE VERTI-BLOCK CONSTRUCTION MANUAL.

3.9.5. PULL THE GEOGRID TAUT TO REMOVE SLACK IN THE GEOGRID PRIOR TO FILL PLACEMENT ON THE GEOGRID.

3.9.6. OVERLAP THE GEOGRID AS NECESSARY THROUGH RADII TO PROVIDE FULL COVERAGE FOR THE ENTIRE REQUIRED LENGTH. NO OVERLAP IS REQUIRED FOR ADJACENT PARALLEL PANELS. WHERE GEOGRID IS OVERLAPPED, INSTALL A MINIMUM OF 3 INCHES OF BACKFILL BETWEEN GEOGRID LAYERS.

3.10. PROVIDE A FINAL GRADE ABOVE AND BELOW THE RETAINING WALL THAT WILL ALLOW FOR POSITIVE DRAINAGE AND PREVENT PONDING.

3.11. PROTECT FINAL COMPLETED RETAINING WALL FROM ADDITIONAL SITE CONSTRUCTION.

3.11.3. DO NOT OPERATE LARGE EQUIPMENT OR STORE MATERIALS ABOVE THE WALL THAT EXCEED THE DESIGN SURCHARGE LOADS AS SPECIFIED ON THE DESIGN CRITERIA SHEET.

4. CONSTRUCTION OBSERVATION

4.1. TO FULFILL ANY CITY, COUNTY AND/OR STATE AGENCY REQUIREMENTS, AND TO PROTECT THE CONTRACTOR AND DESIGN ENGINEER, IGES, INC. MUST PERFORM PERIODIC CONSTRUCTION OBSERVATIONS TO PROVIDE A FINAL CONSTRUCTION OBSERVATION LETTER.

4.1.1. IF IGES, INC. DOES NOT OBSERVE THE RETAINING WALL DURING CONSTRUCTION, A FINAL LETTER REGARDING COMPLIANCE OF THE WALL CONSTRUCTION WITH THE DESIGN CRITERIA AND RECOMMENDATIONS CANNOT BE PROVIDED. IF IGES, INC. DOES NOT PERFORM THE PERIODIC CONSTRUCTION OBSERVATIONS OUTLINED BELOW, THE WALL CONTRACTOR/OWNER ASSUMES ALL RESPONSIBILITY FOR THE RETAINING WALL.

4.2. WALL OBSERVATIONS SCHEDULE:

4.2.1. OBSERVE THE EXCAVATION OF THE LEVELING PAD FOUNDATION SOILS AND ASSESS THE SUITABILITY OF THE FOUNDATION SOILS.

4.2.2. OBSERVE THE INSTALLATION OF THE RETAINING WALL BLOCK AT VARIOUS STAGES OF CONSTRUCTION.

4.2.2.1. ASSESS MINIMUM EMBEDMENT REQUIREMENTS.

4.2.2.2. ASSESS DEPTH OF GRAVEL DRAINAGE ZONE AND TYPE, LOCATION AND DIAMETER OF DRAINAGE PIPE.

4.2.2.3. ASSESS BLOCK PLACEMENT AND POSITIONING FOR COMPLIANCE WITH THE REQUIREMENTS IN THE SECTIONS ABOVE.

4.2.3. OBSERVE THE INSTALLATION OF THE REINFORCED BACKFILL MATERIAL.

4.2.3.1. VERIFY THAT THE BACKFILL MATERIALS MEET THE REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.3.2. OBSERVED INSTALLATION OF GEOGRID REINFORCEMENT. CHECK FOR TYPE, LENGTH, DIRECTION, AND ELEVATION.

4.2.3.2.1. ASSESS LOOSE LIFT THICKNESS, FILL PLACEMENT AND COMPACTION.

4.2.3.2.2. ASSESS COMPACTED BACKFILL MATERIAL FOR COMPLIANCE WITH REQUIREMENTS SET FORTH IN THE SECTIONS ABOVE.

4.2.4. OBSERVE THE COMPLETED RETAINING WALL SYSTEM.

4.2.4.1. ASSESS THE FINISHED RETAINING WALL HEIGHT AND BATTER.

4.2.4.2. OBSERVE THAT BACKSLOPE AND TOESLOPE GRADING CONDITIONS DO NOT EXCEED DESIGN GEOMETRY TOLERANCES.

4.2.4.3. ASSESS SUITABILITY OF EROSION CONTROL MEASURES INSTALLED ABOVE THE RETAINING WALL
- | | | | | |
|-----|----------------------|------|----|-----|
| | | | | |
| | | | | |
| | | | | |
| REV | REVISION DESCRIPTION | DATE | BY | CHK |
| | REVISIONS | | | |
-
- 12429 SOUTH 300 EAST
DRAPER, UTAH 84020
(801) 748-4044
- VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
- CONSTRUCTION SPECIFICATIONS & NOTES
- | | | | |
|------------------|-----------|-----------|------------|
| DESIGNED BY: | TBL | 7-3-2024 | PLOT SCALE |
| DRAWN BY: | TBL | 7-3-2024 | 1=1 |
| CHECKED BY: | BMJ | 7-3-2024 | DWG SCALE |
| APPROVED BY: | TBL | 7-3-2024 | NTS |
| IGES PROJECT NO: | 02228-008 | SHEET NO: | 7 |
| | | REV | N/A |
-

RETAINING WALL GEOMETRY AND LOADING CONDITIONS			
LENGTH (FT)	MAXIMUM HEIGHT (FT)	BACKSLOPE CONDITIONS	SURCHARGE LOADING
714	18.0	VARIES (6H:1V MAX)	3,000 (BUILDING) 250 PSF (PARKING LOT)

SOIL CONDITIONS USED IN DESIGN (ASSUMED)			
EARTH MATERIALS	FRICTION ANGLE	COHESION	UNIT WEIGHT
REINFORCED SOIL (SEE CONSTRUCTION SPECIFICATIONS & NOTES FOR BACKFILL CRITERIA)	34°	0 PSF	135 PCF
RETAINED SOIL	34°	50 PSF	135 PCF
FOUNDATION SOIL	34°	50 PSF	135 PCF

SOURCES & NOTES:

- REPORT, GSH, GEOTECHNICAL STUDY, PROPOSED MILLCREEK PORSCHE DEALERSHIP, SOUTHWEST OF 3865 SOUTH WASATCH BOULEVARD, MILLCREEK, UTAH, JOB NO. 3780-001-23, REPORT DATED OCTOBER 16, 2023.
- COHESION USED ONLY DURING GLOBAL STABILITY ANALYSES.

RETAINING WALL ANALYSIS USED IN DESIGN	
ANALYSIS	DESIGN REFERENCES/SOFTWARE
INTERNAL/EXTERNAL STABILITY	VERTI-BLOCK RETAINING WALLS, 2023 VERTICRETE WALL DESIGNER SOFTWARE, VERSION 6.0.23160.945, BUILD DATE JUNE 9, 2023, AUTHOR - ROBERT RACE
GLOBAL STABILITY	SLIDE 2: ROCSCIENCE, INC., 1998-2023, VERSION 9.029, BUILD DATE SEPTEMBER 11, 2023

SEISMIC PARAMETERS USED IN DESIGN					
SEISMIC CRITERIA	MCE _G PGA	SITE CLASS	F _{PGA}	PGA _M	HORIZONTAL COEFFICIENT (k _h)
ASCE 7-16	0.540g	D	1.20	0.648g	0.401g (INTERNAL) 0.186g (EXTERNAL) 0.205g (GLOBAL)

SOURCES & NOTES:

- SEISMIC PARAMETERS DEVELOPED FOLLOWING THE CRITERIA OUTLINED IN ASCE 7-16. THE *ASCE 7 HAZARD TOOL* WAS USED TO DETERMINE THE MAPPED MCE_G PEAK GROUND ACCELERATION (MCE_G PGA) FOR THE SITE. SITE CLASS IS A PARAMETER THAT ACCOUNTS FOR SITE AMPLIFICATION EFFECTS OF SOFT SOILS AND IS BASED ON THE AVERAGE SHEAR WAVE VELOCITY OF THE UPPER 100 FEET. BASED ON OUR ENGINEERING JUDGEMENT, THE SITE SOIL CLASS IS REPRESENTED BY A SITE CLASS D. USING A SITE CLASS D, THE MCE_G PEAK GROUND ACCELERATION WAS ADJUSTED FOR SITE CLASS EFFECTS (PGA_M).
- HORIZONTAL SEISMIC COEFFICIENT (k_h)
 - TO DETERMINE THE EXTERNAL SEISMIC COEFFICIENT (k_{h-ext}), THE BRAY ET AL (2010) METHODOLOGY WAS APPLIED. (SEE SECTION 4).
 - LACKING ANY CRITICAL STRUCTURES OF FACILITIES WITHIN THE INFLUENCE ZONE OF THE WALLS, AN ALLOWABLE DISPLACEMENT OF 15 CENTIMETERS (~6 INCHES) WAS CONSIDERED ACCEPTABLE FOR THE WALLS ON THIS PROJECT.
 - THE BRAY METHOD WAS ALSO COUPLED WITH A NEWMARK DISPLACEMENT BLOCK MODEL TO ESTIMATE DISPLACEMENT FOR THE WALLS (SEE SECTION 4 FOR RESULTS). BASED ON OUR ANALYSIS, WE ESTIMATE THAT THE ANTICIPATED MEAN DISPLACEMENT FOR THE MAXIMUM SECTION WILL BE APPROXIMATELY 1.1 INCHES (OR 2.2 INCHES WITH AN 84% CONFIDENCE LEVEL) WHICH IS WITHIN THE TOLERABLE LIMITS FOR THIS WALL TYPE.
- SEISMIC GLOBAL STABILITY WAS ASSESSED USING A PSEUDO-STATIC APPROACH. A SEISMIC COEFFICIENT (k_s) WAS SELECTED USING THE GUIDELINES PRESENTED IN BLAKE AND OTHERS (2002) WHICH RECOMMENDS A SEISMIC SCREENING COEFFICIENT BE OBTAINED USING THE STEWART AND OTHERS (2003) METHODOLOGY.
 - LACKING ANY CRITICAL STRUCTURES OF FACILITIES WITHIN THE ASSUMED SLIDE MASS, A THRESHOLD DISPLACEMENT OF 15 CENTIMETERS WAS CONSIDERED ACCEPTABLE.
- REFERENCES:
 - ANDERSON, D.G., MARTIN, G.R., LAM, I., WANG, J.N., 2008, SEISMIC ANALYSIS AND DESIGN OF RETAINING WALLS, BURIED STRUCTURES, SLOPES, AND EMBANKMENTS, NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 611.
 - BLAKE, T.F., HOLLINGSWORTH, R.A., AND STEWART, J.P. (EDITORS), 2002, "RECOMMENDED PROCEDURES FOR IMPLEMENTATION OF DMG SPECIAL PUBLICATION 117 GUIDELINES FOR ANALYZING AND MITIGATING LANDSLIDE HAZARDS IN CALIFORNIA," PUBLISHED BY SOUTHERN CALIFORNIA EARTHQUAKE CENTER (SCEC), DATED JUNE 2002.
 - BRAY, J.D., TRAVASAROU, T., AND ZUPAN, J., 2010, SEISMIC DISPLACEMENT DESIGN OF EARTH RETAINING STRUCTURES, ASCE EARTH RETENTION CONFERENCE 3, BELLEVUE, WA. AMERICAN SOCIETY OF CIVIL ENGINEERS, RESTION, VA, pp. 638-655.
 - STEWART, J.P., BLAKE, T.F., AND HOLLINGSWORTH, R.A., 2003, A SCREEN ANALYSIS PROCEDURE FOR SEISMIC SLOPE STABILITY, IN EARTHQUAKE SPECTRA, 19(3), 697-712.

GENERAL NOTES:

- THE ENGINEERING PRESENTED IN THIS DESIGN PACKAGE IS BASED ON SPECIFIC PRODUCTS (E.G., VERTI-BLOCKS, MIRAFI 8XT GEOGRID, FILL MATERIAL, ETC.). ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS ENGINEERING. ANY CHANGES IN WALL LOCATION, ELEVATIONS OF LEVELING PAD, GRADES AT THE TOE OR TOP OF THE WALL, AND SOIL PARAMETERS AT THE SITE WILL ALSO INVALIDATE THE ENGINEERING. FIELD ADJUSTMENTS/CHANGES MAY BE NEEDED TO MEET ACTUAL CONDITIONS ONCE CONSTRUCTION COMMENCES. IGES SHOULD BE CONSULTED WHERE FIELD CHANGES ARE REQUIRED.
- THESE DOCUMENTS ARE INSTRUMENTS OF SERVICE AND SHALL REMAIN THE INTELLECTUAL PROPERTY OF IGES, INC. THE DESIGN PACKAGE HAS BEEN FURNISHED FOR THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT NO USE OR RE-USE OF THESE DOCUMENTS (EITHER IN WHOLE OR IN PART) SHALL BE PERMITTED UNLESS EXPRESSLY AUTHORIZED IN WRITING BY IGES, INC.
- RETAINING WALLS ARE VULNERABLE TO EROSION AND HYDROSTATIC PRESSURES IMMEDIATELY AFTER INSTALLATION BUT PRIOR TO THE PLACEMENT OF LANDSCAPING/FINISHING ELEMENTS AT THE SITE (E.G., LANDSCAPING, HARDSCAPE, CURB & GUTTER, PAVEMENT, ETC.). TO PREVENT DAMAGE TO THE WALL DURING ADDITIONAL SITE WORK, ALL SURFACE DRAINAGE SHOULD BE DIRECTED AWAY FROM THE WALL. EXCESS WATER DURING HEAVY RAIN EVENTS, IF NOT DRAINED PROPERLY, CAN CAUSE WASHOUTS AT WALL ENDS AND 'BLOWOUTS' OF INTERIOR SECTIONS. THESE PRECAUTIONS SHOULD BE TAKEN DURING WALL CONSTRUCTION, AND AFTER, UNTIL THE FINAL SITE DRAINAGE, LANDSCAPING AND PAVING ARE COMPLETE.
- MINIMUM EMBEDMENT OF THE WALL VARIES AS SHOWN ON THIS ELEVATION VIEW SHEET. EMBEDMENT AT THE WALL TOE MUST BE MAINTAINED THROUGHOUT THE LIFE OF THE RETAINING WALL.
- WE RECOMMEND THAT AN APPROPRIATE SAFETY FENCE/BARRICADE BE CONSIDERED BY THE OWNER ABOVE THE RETAINING WALL. DESIGN OF THE FENCE/BARRICADE IS SPECIFICALLY EXCLUDED FROM THE ENGINEERING OF THIS WALL.

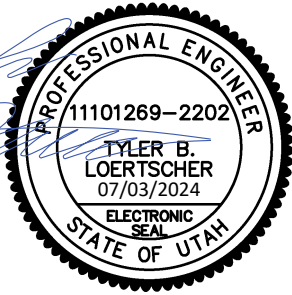
REV	REVISION DESCRIPTION	DATE	BY	CHK
	REVISIONS			



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VERTI-BLOCK RETAINING WALL
MILLCREEK PORSCHE DEALERSHIP
4074 SOUTH WASATCH BOULEVARD
MILLCREEK, UTAH
DESIGN CRITERIA

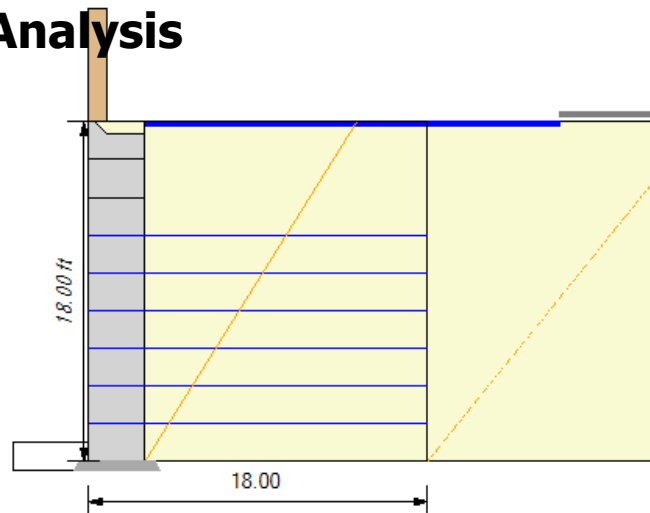
DESIGNED BY: TBL	7-3-2024	PLOT SCALE
DRAWN BY: TBL	7-3-2024	1=1
CHECKED BY: BMJ	7-3-2024	DWG SCALE
APPROVED BY: TBL	7-3-2024	NTS
IGES PROJECT NO: 02228-008	SHEET NO: 9	REV N/A



SECTION 2

REA Analysis

Project: Millcreek Porsche Dealership
 Location: Millcreek, Utah
 Designer: Tyler L
 Date: 7/2/2024
 Section: 18ft - 9 Blocks
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock
 Seismic Acc: $kh(int)=0.401g$, $kh(ext)=0.186g$



SOIL PARAMETERS	ϕ	coh	γ
Reinforced Soil:	34 deg	0 psf	135 pcf
Retained Soil:	34 deg	0 psf	135 pcf
Foundation Soil:	34 deg	0 psf	135 pcf
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	18.00 ft (17.00 ft Exp.)	Live Load:	250 psf
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.00 ft	LL2 Width:	22 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	3,000 psf
Slope Angle:	0.0 deg	Dead Load Offset:	22.0 ft
Slope Length:	0.0 ft	Dead Load Width:	100.00 ft
Slope Toe Offset:	0.0 ft		
Vertical δ on Single Depth			

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Shear:	1.50 / 1.13	Bending:	1.50 / 1.13

RESULTS (Static / Seismic)

FoS Sliding:	3.19 / [3.24]	FoS Overturning:	6.80 / [3.49]
Bearing	2,990 / [2,949]	FoS Bearing:	16.75 / [17.70]
Pullout	6.22 / [3.54]		
Total Pullout	122,118	FoS Total Pullout	18.22
Total Pullout (S)	122,118	FoS Total Pullout (S)	11.06
Top FoSot:	2.17	FoS Connection:	2.09

ID	Height	Length	Name	Ta _{tn} [Ta _{tns}]	TMax [Tmd]	FS Tal [seis]	PkCn [seis]	PkCn/FS [seis]	FS PO	FS Sldg
6	12	18	SG500	1854 [4310]	1186 [1308]	2.34 [1.73]	1652 [2203]	2.09 [1.19]	9.51 [3.54]	7.51 [5.85]
5	10	18	SG500	1854 [4310]	624 [1308]	4.46 [2.23]	1680 [2239]	4.04 [1.39]	22.65 [6.32]	4.87 [4.00]
4	8	18	SG500	1854 [4310]	751 [1308]	3.70 [2.09]	1707 [2276]	3.41 [1.32]	25.88 [8.44]	4.55 [3.69]
3	6	18	SG500	1854 [4310]	877 [1308]	3.17 [1.97]	1734 [2313]	2.97 [1.26]	29.11 [10.70]	4.27 [3.40]
2	4	18	SG500	1854 [4310]	1004 [1308]	2.77 [1.86]	1762 [2349]	2.63 [1.20]	32.35 [13.07]	4.01 [3.16]
1	2	18	SG500	1854 [4310]	1131 [1308]	2.46 [1.77]	1789 [2386]	2.37 [1.16]	35.58 [15.53]	3.78 [2.96]

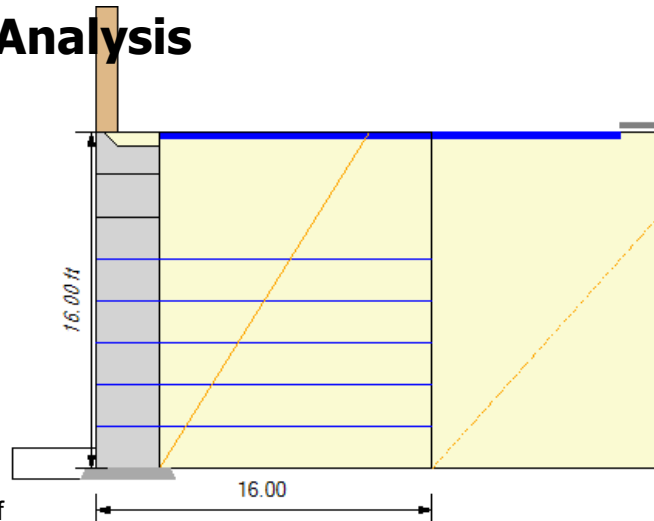
Column Descriptions:

- Ta: allowable geogrid strength
- Rc %: percent coverage for geosynthetics
- EP (Pa) internal active earth pressure
- LL (Pql) earth pressure due to live load surcharge
- DL (Pqd) earth pressure due to dead load surcharge
- Tmax maximum earth pressure on geosynthetic layer
- FSstr factor of safety on geogrid strength (LTDS/Tmax)
- Ta cn allowable tension on the connection
- FS Pkcn, factor of safety on the connection (PkCn/Tmax)
- FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
- Grid Embedment, depth of embedment beyond the theoretical failure plane.

REA Analysis

Project: Millcreek Porsche Dealership
 Location: Millcreek, Utah
 Designer: Tyler L
 Date: 7/2/2024
 Section: 16ft - 8 Blocks
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock

Seismic Acc: $kh(int)=0.401g$, $kh(ext)=0.186g$



SOIL PARAMETERS	ϕ	coh	γ
Reinforced Soil:	34 deg	0 psf	135 pcf
Retained Soil:	34 deg	0 psf	135 pcf
Foundation Soil:	34 deg	0 psf	135 pcf
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	16.00 ft (15.00 ft Exp.)	Live Load:	250 psf
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.00 ft	LL2 Width:	22 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	3,000 psf
Slope Angle:	0.0 deg	Dead Load Offset:	22.0 ft
Slope Length:	0.0 ft	Dead Load Width:	100.00 ft
Slope Toe Offset:	0.0 ft		

Vertical δ on Single Depth

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Shear:	1.50 / 1.13	Bending:	1.50 / 1.13

RESULTS (Static / Seismic)

FoS Sliding:	3.63 / [3.70]	FoS Overturning:	7.83 / [3.60]
Bearing	2,600 / [2,583]	FoS Bearing:	17.39 / [18.15]
Pullout	5.60 / [3.23]		
Total Pullout	79,910	FoS Total Pullout	14.77
Total Pullout (S)	79,910	FoS Total Pullout (S)	9.16
Top FoSot:	2.17	FoS Connection:	2.09

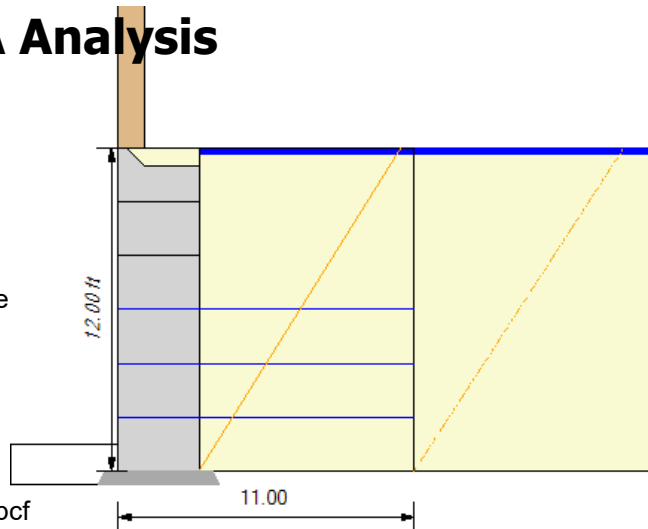
ID	Height	Length	Name	Ta _{tn} [Ta _{tns}]	TMax [Tmd]	FS Tal [seis]	PkCn [seis]	PkCn/FS [seis]	FS PO	FS Sldg
5	10	16	SG500	1854 [4310]	1186 [1280]	2.34 [1.75]	1652 [2203]	2.09 [1.21]	8.56 [3.23]	14.53 [10.89]
4	8	16	SG500	1854 [4310]	624 [1280]	4.46 [2.26]	1680 [2239]	4.04 [1.41]	20.70 [5.87]	7.18 [5.25]
3	6	16	SG500	1854 [4310]	751 [1280]	3.70 [2.12]	1707 [2276]	3.41 [1.34]	23.94 [7.93]	5.38 [4.15]
2	4	16	SG500	1854 [4310]	877 [1280]	3.17 [2.00]	1734 [2313]	2.97 [1.28]	27.17 [10.13]	5.01 [3.79]
1	2	16	SG500	1854 [4310]	1004 [1280]	2.77 [1.89]	1762 [2349]	2.63 [1.22]	30.41 [12.45]	4.60 [3.43]

Column Descriptions:

Ta: allowable geogrid strength
 Rc %: percent coverage for geosynthetics
 EP (Pa) internal active earth pressure
 LL (Pql) earth pressure due to live load surcharge
 DL (Pqd) earth pressure due to dead load surcharge
 Tmax maximum earth pressure on geosynthetic layer
 FSstr factor of safety on geogrid strength (LTDS/Tmax)
 Ta cn allowable tension on the connection
 FS Pkcn, factor of safety on the connection (PkCn/Tmax)
 FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
 Grid Embedment, depth of embedment beyond the theoretical failure plane.

REA Analysis

Project: Millcreek Porsche Dealership
 Location: Millcreek, Utah
 Designer: Tyler L
 Date: 7/2/2024
 Section: 12ft - 6 Blocks
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock
 Seismic Acc: $kh(int)=0.401g$, $kh(ext)=0.186g$



SOIL PARAMETERS	ϕ	coh	γ
Reinforced Soil:	34 deg	0 psf	135 pcf
Retained Soil:	34 deg	0 psf	135 pcf
Foundation Soil:	34 deg	0 psf	135 pcf
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	12.00 ft (11.00 ft Exp.)	Live Load:	250 psf
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.00 ft	LL2 Width:	22 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	3,000 psf
Slope Angle:	0.0 deg	Dead Load Offset:	22.0 ft
Slope Length:	0.0 ft	Dead Load Width:	100.00 ft
Slope Toe Offset:	0.0 ft		
Vertical δ on Single Depth			

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Shear:	1.50 / 1.13	Bending:	1.50 / 1.13

RESULTS (Static / Seismic)

FoS Sliding:	4.78 / [5.17]	FoS Overturning:	10.83 / [3.34]
Bearing	1,914 / [1,871]	FoS Bearing:	16.96 / [17.96]
Pullout	3.52 / [2.01]		
Total Pullout	22,457	FoS Total Pullout	6.94
Total Pullout (S)	22,457	FoS Total Pullout (S)	4.58
Top FoSot:	2.17	FoS Connection:	2.09

ID	Height	Length	Name	Ta _{tn} [Ta _{tns}]	TMax [Tmd]	FS Tal [seis]	PkCn [seis]	PkCn/FS [seis]	FS PO	FS Sldg
3	6	11	SG500	1854 [4310]	1186 [1299]	2.34 [1.73]	1652 [2203]	2.09 [1.19]	5.39 [2.01]	11.61 [8.41]
2	4	11	SG500	1854 [4310]	624 [1299]	4.46 [2.24]	1680 [2239]	4.04 [1.39]	14.23 [3.99]	9.12 [6.41]
1	2	11	SG500	1854 [4310]	751 [1299]	3.70 [2.10]	1707 [2276]	3.41 [1.32]	17.47 [5.72]	7.56 [5.21]

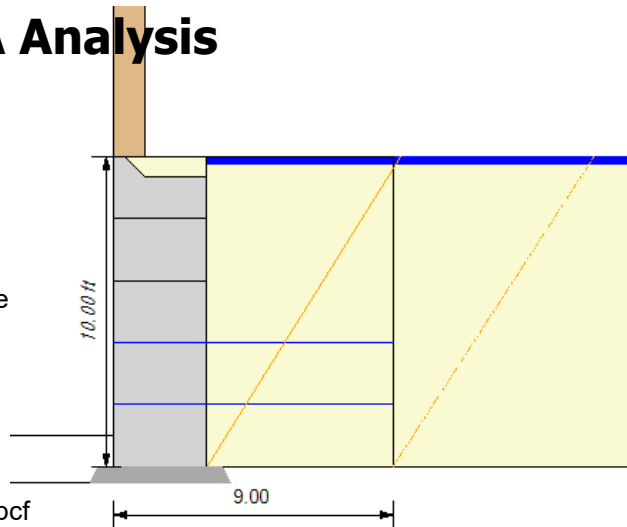
Column Descriptions:

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- EP (Pa) internal active earth pressure
- LL (Pql) earth pressure due to live load surcharge
- DL (Pqd) earth pressure due to dead load surcharge
- Tmax maximum earth pressure on geosynthetic layer
- FSstr factor of safety on geogrid strength (LTDS/Tmax)
- Ta cn allowable tension on the connection
- FS Pkcn, factor of safety on the connection (PkCn/Tmax)
- FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
- Grid Embedment, depth of embedment beyond the theoretical failure plane.

REA Analysis

Project: Millcreek Porsche Dealership
 Location: Millcreek, Utah
 Designer: Tyler L
 Date: 7/2/2024
 Section: 10ft - 5 Blocks
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock

Seismic Acc: $kh(int)=0.401g$, $kh(ext)=0.186g$



SOIL PARAMETERS	ϕ	coh	γ
Reinforced Soil:	34 deg	0 psf	135 pcf
Retained Soil:	34 deg	0 psf	135 pcf
Foundation Soil:	34 deg	0 psf	135 pcf
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	10.00 ft (9.00 ft Exp.)	Live Load:	250 psf
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.00 ft	LL2 Width:	22 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	3,000 psf
Slope Angle:	0.0 deg	Dead Load Offset:	22.0 ft
Slope Length:	0.0 ft	Dead Load Width:	100.00 ft
Slope Toe Offset:	0.0 ft		

Vertical δ on Single Depth

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Shear:	1.50 / 1.13	Bending:	1.50 / 1.13

RESULTS (Static / Seismic)

FoS Sliding:	4.48 / [4.67]	FoS Overturning:	10.07 / [2.98]
Bearing	1,659 / [1,585]	FoS Bearing:	16.24 / [17.87]
Pullout	2.90 / [1.56]		
Total Pullout	9,671	FoS Total Pullout	4.11
Total Pullout (S)	9,671	FoS Total Pullout (S)	2.84
Top FoSot:	2.17	FoS Connection:	2.09

ID	Height	Length	Name	Ta _{tn} [Ta _{tns}]	TMax [Tmd]	FS Tal [seis]	PkCn [seis]	PkCn/FS [seis]	FS PO	FS Sldg
2	4	9	SG500	1854 [4310]	1186 [1424]	2.34 [1.65]	1652 [2203]	2.09 [1.13]	4.44 [1.56]	10.44 [7.41]
1	2	9	SG500	1854 [4310]	624 [1424]	4.46 [2.10]	1680 [2239]	4.04 [1.30]	12.29 [3.23]	8.15 [5.60]

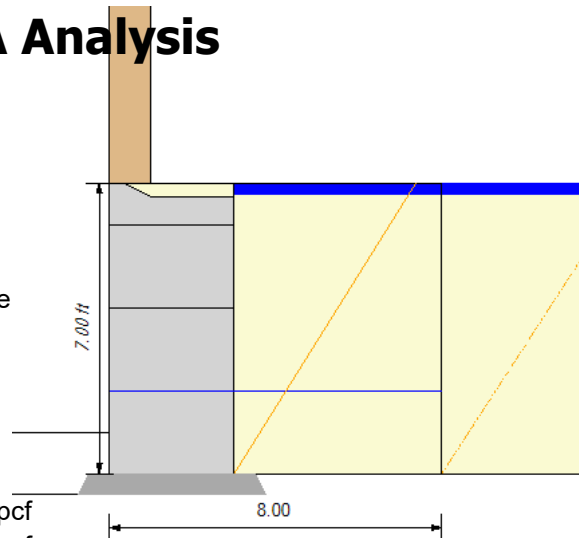
Column Descriptions:

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 Rc %: percent coverage for geosynthetics
 EP (Pa) internal active earth pressure
 LL (Pql) earth pressure due to live load surcharge
 DL (Pqd) earth pressure due to dead load surcharge
 Tmax maximum earth pressure on geosynthetic layer
 FSstr factor of safety on geogrid strength (LTDS/Tmax)
 Ta cn allowable tension on the connection
 FS Pkcn, factor of safety on the connection (PkCn/Tmax)
 FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
 Grid Embedment, depth of embedment beyond the theoretical failure plane.

REA Analysis

Project: Millcreek Porsche Dealership
 Location: Millcreek, Utah
 Designer: Tyler L
 Date: 7/2/2024
 Section: 7ft - 4 Blocks
 Design Method: NCMA_09_3rd_Ed, Include Vert. Force
 Design Unit: VertiBlock

Seismic Acc: $kh(int)=0.401g$, $kh(ext)=0.186g$



SOIL PARAMETERS	ϕ	coh	γ
Reinforced Soil:	34 deg	0 psf	135 pcf
Retained Soil:	34 deg	0 psf	135 pcf
Foundation Soil:	34 deg	0 psf	135 pcf
Leveling Pad:	Crushed Stone		

GEOMETRY

Design Height:	7.00 ft (6.00 ft Exp.)	Live Load:	250 psf
Wall Batter/Tilt:	0.00/ 0.00 deg	Live Load Offset:	0.00 ft
Embedment:	1.00 ft	LL2 Width:	22 ft
Leveling Pad Depth:	0.50 ft	Dead Load:	3,000 psf
Slope Angle:	0.0 deg	Dead Load Offset:	22.0 ft
Slope Length:	0.0 ft	Dead Load Width:	100.00 ft
Slope Toe Offset:	0.0 ft		
Vertical δ on Single Depth			

FACTORS OF SAFETY (Static / Seismic)

Sliding:	1.50 / 1.13	Pullout:	1.50 / 1.13
Overturning:	2.00 / 1.50	Uncertainties:	1.50 / 1.13
Bearing:	2.00 / 1.50	Connection:	1.50 / 1.13
Shear:	1.50 / 1.13	Bending:	1.50 / 1.13

RESULTS (Static / Seismic)

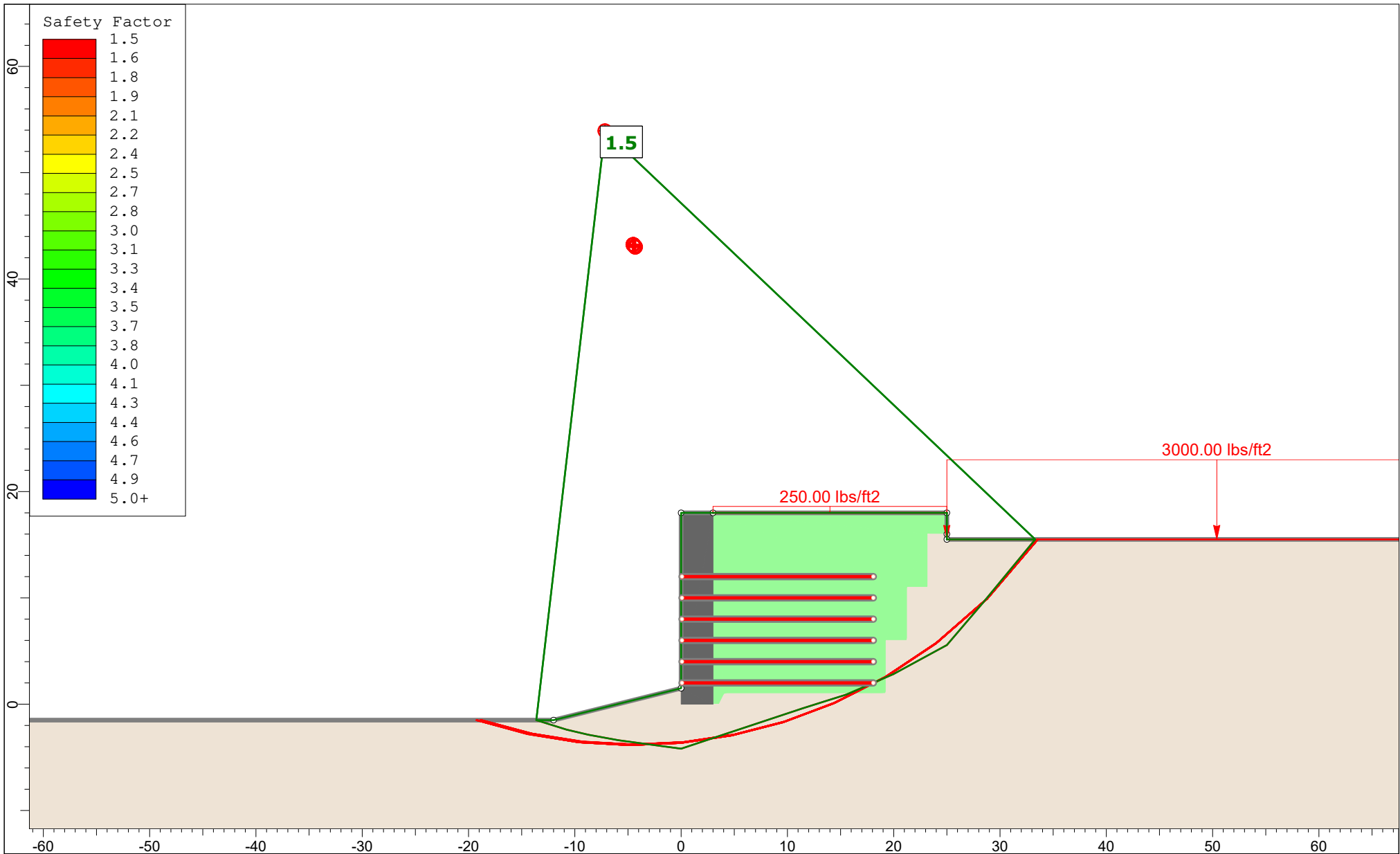
FoS Sliding:	5.13 / [4.93]	FoS Overturning:	14.57 / [3.96]
Bearing	1,226 / [1,145]	FoS Bearing:	19.75 / [22.43]
Pullout	3.33 / [1.64]		
Total Pullout	3,073	FoS Total Pullout	2.39
Total Pullout (S)	3,073	FoS Total Pullout (S)	1.84
Top FoSot:	3.04	FoS Connection:	2.68

ID	Height	Length	Name	Ta_tn [Ta_tns]	TMax [Tmd]	FS Tal [seis]	PkCn [seis]	PkCn/FS [seis]	FS PO	FS Sldg
1	2	8	SG500	1854 [4310]	922 [1302]	3.02 [1.94]	1646 [2195]	2.68 [1.32]	5.39 [1.64]	12.05 [8.53]

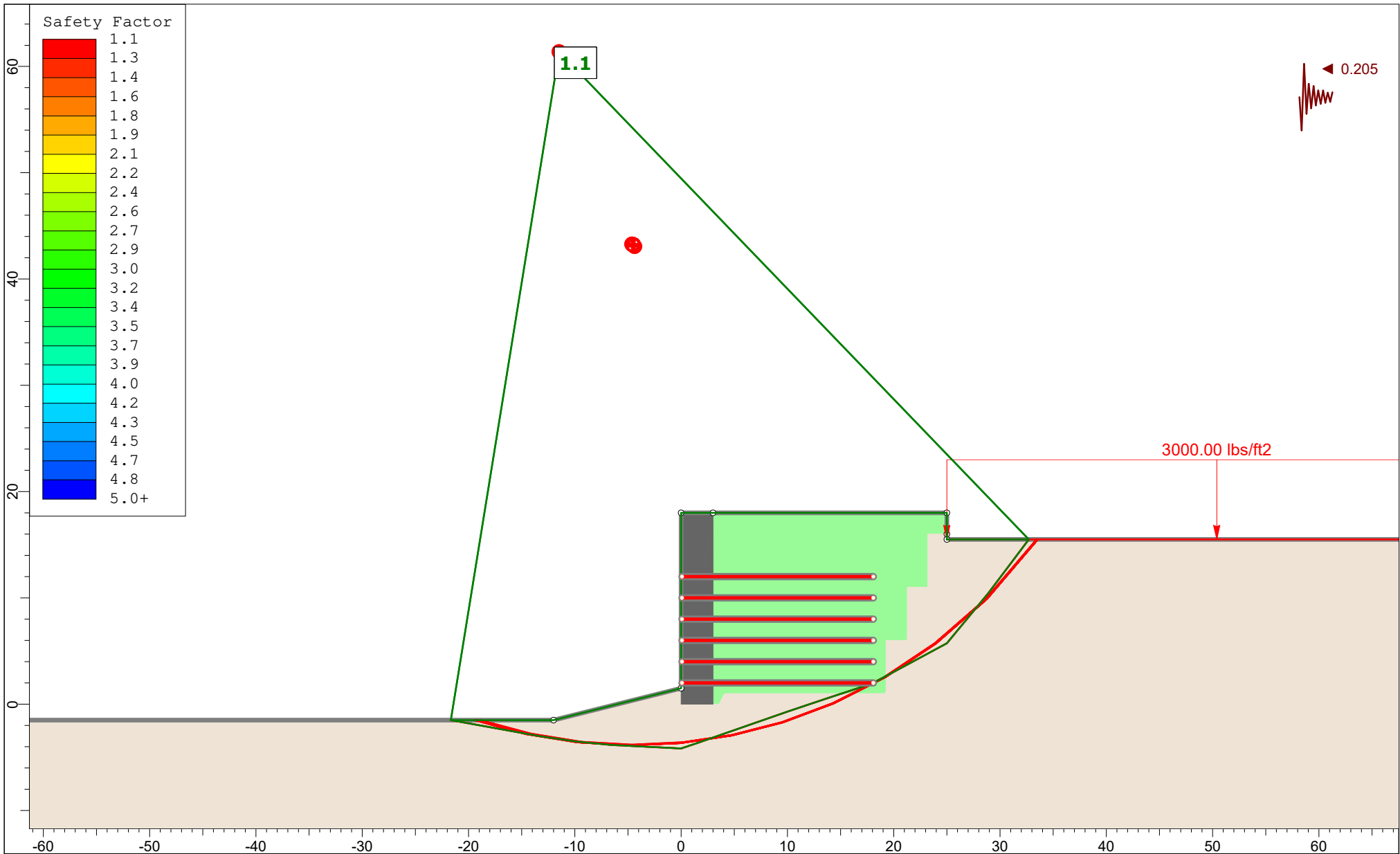
Column Descriptions:

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 DL (Pqd) earth pressure due to dead load surcharge
 Tmax maximum earth pressure on geosynthetic layer
 FSstr factor of safety on geogrid strength (LTDS/Tmax)
 Ta cn allowable tension on the connection
 FS Pkcn, factor of safety on the connection (PkCn/Tmax)
 FS PO, factor of safety on pullout (Pullout/(Tmax - LL)
 Grid Embedment, depth of embedment beyond the theoretical failure plane.

SECTION 3



Project			
Millcreek Porsche Dealership - Verti-Block Retaining Wall			
Analysis Description			
Global Stability Analysis - Static			
Drawn By	Tyler Loertscher	Scale	1:150
Date	7/2/2024	Company	IGES, Inc.
		File Name	02228-008.slmd



Project			
Millcreek Porsche Dealership - Verti-Block Retaining Wall			
Analysis Description			
Global Stability Analysis - Seismic			
Drawn By	Tyler Loertscher	Scale	1:150
Date	7/2/2024	Company	IGES, Inc.
		File Name	02228-008.slmd

Slide2 Analysis Information

02228-008

Project Summary

File Name:	02228-008.slmd
Slide2 Modeler Version:	9.029
Project Title:	Millcreek Porsche Dealership - Verti-Block Retaining Wall
Analysis:	Global Stability Analysis
Author:	Tyler Loertscher
Company:	IGES, Inc.
Date Created:	7/2/2024

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Group 1	Static	Spencer: 1.467910	00h:00m:02.502s
	Seismic	Spencer: 1.127550	00h:00m:04.17s
	ky	Spencer: 0.357196	00h:00m:01.640s

Seismic Loading

Group 1 - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Group 1 - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.205

Group 1 - ky

Advanced seismic analysis:	Yes
Locate surface with minimum critical horizontal seismic acceleration (Ky):	Yes
Target factor of safety:	1
Using Newmark analysis:	No
Staged pseudostatic analysis:	No

Loading

Group 1 - Seismic

 	
Distribution:	Constant
Magnitude [psf]:	3000
Orientation:	Normal to boundary

All other Scenarios

Distribution:	Constant
Magnitude [psf]:	3000
Orientation:	Normal to boundary
Distribution:	Constant
Magnitude [psf]:	250
Orientation:	Normal to boundary

Materials

Retained/Foundation	
Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	50 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0
Reinforced Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight	135 lbs/ft3
Cohesion	0 psf
Phi	34 °
Water Surface	Assigned per scenario
Ru Value	0
Verti-Block	
Color	
Strength Type	Mohr-Coulomb
Unit Weight	120 lbs/ft3
Cohesion	3000 psf
Phi	0 °
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Static	Seismic	ky
Retained/Foundation 			
Reinforced Fill 			
Verti-Block 			

Support

Mirafi 8XT

Color	
Type	Geosynthetic
Force Application	Passive (Method B)
Force Orientation	Bisector of Parallel and Tangent
Selected Manufacturer	TenCate Miragrid 8XT
Ultimate Tensile Strength	7400 lbs/ft
Creep Reduction Factor (RFcr)	1.44
Installation Damage Factor (RFid)	1.05
Deterioration in Service Factor (RFd)	1.1
Factor of Safety (Fr)	1.5
Strip Coverage (%)	100
Long Term Design Strength	4449.47 lbs/ft
Anchorage	None
Input Type	Friction Angle & Adhesion
Shear Strength Model	Linear
Adhesion	0 psf
Friction Angle	34 °
Material Dependent	No
Use External Loads in Strength Computation	Yes

SECTION 4

Horizontal Seismic Acceleration Coefficient Determination

Bray, J.D., Travarasrou, T., and Zupan, J., 2010, Seismic Displacement Design of Earth Retaining Structures, ASCE Earth Retention Conference 3, Bellevue, WA. American Society of Civil Engineers, Reston, VA, pp.638-655.

Also Found in AASHTO LRFD Bridge Design Specifications, see Section A11.5.3

Site Seismic Design Values

PGA	0.540	g	Mapped MCE _G Peak Ground Acceleration (from ASCE7 Hazard Tool)
F _{PGA}	1.20		Site Coefficient from ASCE 7-16 Table 11.8-1
PGA _M	0.648	g	MCE _G Peak Ground Acceleration adjusted for site class effects
S _S	1.196	g	The mapped MCE _R spectral response acceleration parameter for short periods
S ₁	0.441	g	The mapped MCE _R spectral response acceleration parameter at a period of 1 second
F _a	1.20		Short-Period Site Coefficient from ASCE 7-16 Table 11.4-1
F _v	1.86		Long-Period Site Coefficient from ASCE 7-16 Table 11.4-2
S _{DS}	0.957	g	Design Short-Period Spectral Acceleration Parameters from ASCE 7-16 Equations 11.4-1 & 11.4-3
S _{D1}	0.547	g	Design Long-Period Spectral Acceleration Parameters from ASCE 7-16 Equations 11.4-2 & 11.4-4
T ₀	0.114	sec	Initial Period where S _a is equal to S _{DS} as per ASCE 7-16 Section 11.4.6
T _S	0.571	sec	Final Period where S _a is equal to S _{DS} as per ASCE 7-16 Section 11.4.6

AASHTO LRFD Bridge Manual A11.5.3 - Bray et al. (2010), and Bray and Travarasrou (2009):

H	18.0	feet	Maximum Height of the retaining wall
H _{heel}	18.0	feet	Height measured from bottom of heel of wall (back of blocks) to the ground surface directly above wall heel
H'	14.4	feet	80% of H _{heel}
V _s	600	ft/sec	The shear wave velocity of the soil behind the wall (estimated for a Site Class D)
T _s	0.096	sec	The fundamental period of the wall ($4 \cdot H' / V_s$)
1.5T _s	0.144	sec	Degraded period at which S _a is determined from the five percent damped response spectra for the site
S _a	0.957	g	The five percent damped spectral acceleration coefficient from the site response spectra
d	15.0	cm	The maximum wall displacement allowed
M	6.85		The moment magnitude of the design earthquake
ε	0		A normally distributed random variable with zero mean and a standard deviation of 0.66
a	2.855		$a = 2.83 - 0.566 \cdot \ln(S_a)$
b	3.043		$b = a^2 - 1.33 \cdot [\ln(d) + 1.10 - 3.04 \cdot \ln(S_a) + 0.244 \cdot (\ln(S_a))^2 - 1.5 \cdot T_s \cdot 0.278 \cdot (M-7) - \epsilon]$
k _h	0.186	g	Horizontal seismic acceleration coefficient ($k_h = \exp((-a + \sqrt{b})/0.66)$)

Newmark Displacement - AASHTO (A11.5.2) & Anderson et al. (2008) [Western US Sites - WUS-Soil]

Anderson, D.G., Martin, G.R., Lam, I., Wang, J.N., 2008, *Seismic Analysis and Design of Retaining Walls, Buried Structures, Slopes, and Embankments*, National Cooperative Highway Research Program (NCHRP) Report 611

Input Parameters			
MCE _G PGA	0.54	g	
Site Coefficient (F _{PGA})	1.20		
PGA _M (MCE _G PGA adjusted for site class effects)	0.648	g	
Long-Period Site Coefficient F _v	1.86		
MCER Spectral Acceleration Parameter S ₁ (long periods)	0.441	g	
Yield acceleration for slope stability analysis (k _y)	0.357	g	
Height of Retaining Wall (heel of wall to ground surface)	18.0	feet	
Output			
Peak Seismic Coefficient at the site (k _{max}) [Eq 7-1]	0.648	g	[k _{max} = MCE _G PGA * F _{PGA}]
Wall Height Acceleration Reduction Factor (β) [Eq. 7-2]	1.265		[β = F _v *S ₁ /k _{max}]
Wall Height Dependent Reduction Factor (α) [Eq. 7-2]	0.934		[α = 1+0.01H*[(0.5β)-1]
Wall Height Dependent Reduction Factor (α) [Eq. 7-2]	1.000		α used in analysis (for practical purposes α = 1)
Peak Seismic Coefficient scaled for Height (k _{av}) [Eq. 7-1]	0.648	g	[k _{av} = α*k _{max}]
Peak Ground Velocity (PGV) [AASHTO A11.5.2-5]	31.153	in/sec	[PGV = 38*F _v *S ₁]
			[log(D)=-1.51-0.74*log(k _y /k _{max})+3.27*log(1-k _y /k _{max})
			-0.8*LOG(kmax)+1.59*LOG(PGV)]
Mean Displacement (D) [Eq. 5-8]	1.07	inches	
2 * Mean Displacement [84% Confidence Level]	2.15	inches	[Per Section 7.6]

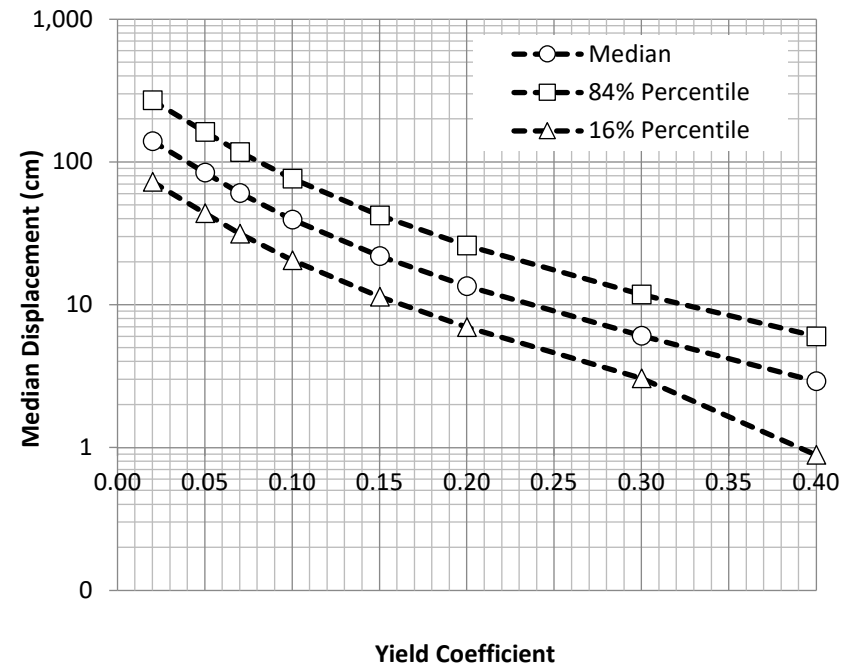
Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements

by Jonathan D. Bray and Thaleia Travararou

Journal of Geotechnical and Geoenvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007

Input Parameters		
Yield Coefficient (k_y)	0.357	
Initial Fundamental Period (T_s)	0.096	sec
Degraded Period ($1.5T_s$)	0.144	sec
Moment Magnitude (M_w)	6.85	
Spectral Acceleration ($S_a(1.5T_s)$)	0.957	g
Additional Input Parameters		
Probability of Exceedance #1 (P_1)	84	%
Probability of Exceedance #2 (P_2)	50	%
Probability of Exceedance #3 (P_3)	16	%
Displacement Threshold ($d_{\text{threshold}}$)	15.0	cm
Intermediate Calculated Parameters		
Non-Zero Seismic Displacement Est (D)	4.28	cm
Standard Deviation of Non-Zero Seismic D	0.66	
Results		
Probability of Negligible Displ. ($P(D=0)$)	0.074	
D_1	1.79	cm
D_2	4.01	cm
D_3	7.99	cm
$P(D > d_{\text{threshold}})$	0.027	
Results (inches)		
D_1	0.71	in
D_2	1.58	in
D_3	3.14	in

k_y	$P(D=0)$	D (cm)	D_{median} (cm)	D_1 (cm)	D_3 (cm)
0.02	0.00	139.8	139.8	269.5	72.5
0.05	0.00	84.1	84.1	162.1	43.6
0.07	0.00	60.6	60.6	116.9	31.5
0.10	0.00	39.5	39.5	76.1	20.5
0.15	0.00	21.9	21.9	42.2	11.3
0.20	0.00	13.5	13.5	25.9	7.0
0.30	0.02	6.2	6.1	11.8	3.0
0.40	0.14	3.3	2.9	6.0	0.9



Screening Analysis - Estimation of seismic coefficient to be used

Parameters:

Earthquake Magnitude, M:	6.85	Deaggregated Magnitude from USGS National Seismic Hazards Mapping Project
Earthquake Distance, r (km):	5.0	Distance to the fault of most concern (producing deaggregated magnitude)
Probability of Exceedance (%):	2	
Time Interval (years):	50	
Average Return Period (years):	2,475	
Earthquake Acceleration of Rock, MHA_r (g):	0.540	Peak Ground Acceleration for rock conditions for specified average return period
Duration, D_{5-95} (s):	12.51	Duration, median values estimated from Abrahamson and Silva, 1996
NRF:	0.896	Only valid for Earthquake acceleration, Rock between 0.1 and 0.8
Allowable screen displacement, u (cm):	15	
f_{eq} :	0.380	Median for screen procedure
k_{eq} (g):	0.205	Seismic coefficient for screen procedure

Equations Used:

$$NRF = 0.6225 + 0.9196 * \exp\left(\frac{-MHA_r / g}{0.4449}\right)$$

$$\ln(D_{5-95})_{med} = \ln\left[\frac{\left(\frac{\exp[5.204 + 0.851 * (M - 6)]}{10^{1.5M + 16.05}}\right)^{-1/3}}{15.7 * 10^6} + 0.063 * (r - 10)\right] + 0.8664$$

Where r > 10 km

$$\ln(D_{5-95})_{med} = \ln\left[\frac{\left(\frac{\exp[5.204 + 0.851 * (M - 6)]}{10^{1.5M + 16.05}}\right)^{-1/3}}{15.7 * 10^6}\right] + 0.8664$$

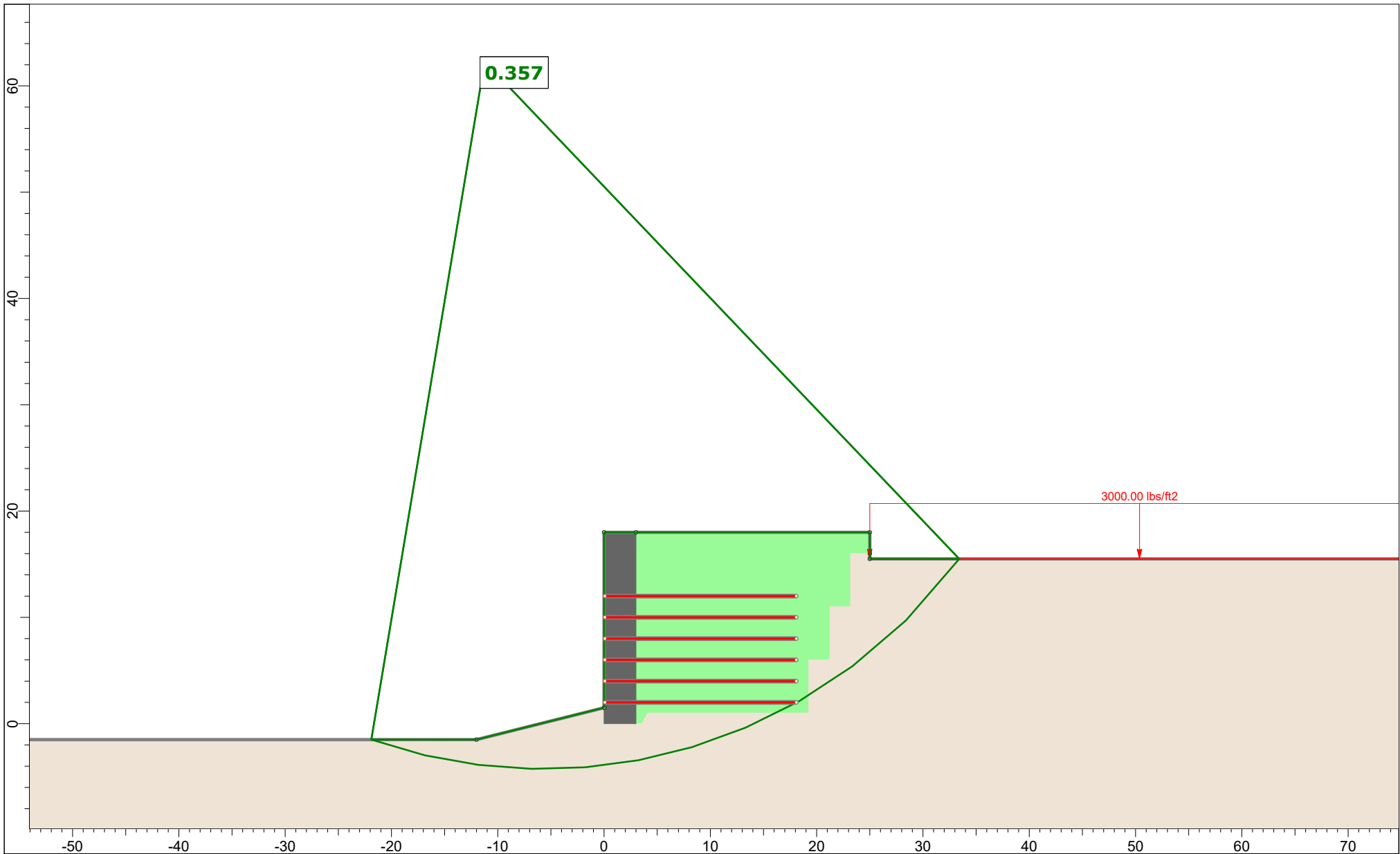
Where r < 10 km

$$f_{eq} = \frac{NRF}{3.477} * \left[1.87 - \log_{10}\left(\frac{u}{(MHA_r / g) * NRF * D_{5-95}}\right)\right]$$

$$k_{eq} = f_{eq} * (MHA_r / g)$$

Procedures & Equations from:

Stewart, J.P., Blake, T.F., & Hollingsworth, R.A., *Development of a Screen Analysis Procedure for Seismic Slope Stability*, January 2002, Appendix A of Recommended Procedures for Implementation of DMG Special Publication 117 - Guidelines for Analyzing and Mitigating Landslide Hazards in California



Project			
Millcreek Porsche Dealership - Verti-Block Retaining Wall			
Analysis Description			
Global Stability Analysis - ky			
Drawn By	Tyler Loertscher	Scale	1:150
Date		Company	IGES, Inc.
7/2/2024		File Name	02228-008.slmd



September 12, 2023

Porsche Millcreek
4074 South Wasatch Blvd.
Millcreek, UT 84124

Re: Retaining Wall Variance Approval Request

Project Name: Porsche - Millcreek

EP GT3, LLC, requests approval for a variance regarding the construction of a modular block retaining wall necessary for the development of the proposed Porsche dealership building located at 4074 S Wasatch Blvd. A conceptual site plan exhibit included in the adopted and fully executed Development Agreement dated October 23, 2023 provided a location for the proposed wall (against the western boundary line) but no grading/engineering information was provided at the time.

City code, specifically Section 19.95.090 of the Title 19 zoning, outlines design standards for retaining walls. This letter is to request a variance in regards to 19.95.090 (E) (1), which specifies the maximum height of a single retaining wall. The City has outlined five criteria for approval of this variance, each of which is addressed in more detail below:

1. *Literal enforcement of this title would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of this title.*

Section 19.95.090 (E) (1) mentions that the purpose of the retaining wall height limit of eight (8) feet is to “reduce excavation and embankment”. The Porsche development is located on a parcel situated between Wasatch Blvd and the I-215 right-of-way. There exists approximately 18 to 20 feet of elevation grade change across the property from east to west, and a large amount of fill material will be necessary to allow development of the property in a manner that has driveway access at reasonable slopes and does not situate the building at an unreasonable elevation below Wasatch Blvd. These current site conditions are peculiar to this property and not predominantly evident in other Village Center Special District zoned properties within Millcreek.

This project does not involve large amounts of traditional excavation as the site naturally sits below Wasatch Blvd in elevation. Instead, the large amount of fill necessary will further work to ensure the integrity of the proposed retaining wall. The import of the fill material on the high side of the wall will allow greater control of the fill material's qualities and suitability, rather than estimations of the suitability of existing soils being retained by the wall.

Denial of this variance request would constitute a significant hardship for development of this property, as the building envelope would shrink considerably and render a standard commercial use (as formally approved in the Olympus Hills West Village Center Special District zoning text and Development Agreement) nearly impossible. The purpose of the title to reduce excavation and embankment have been considered in the City Engineering reviews for the development.

2. *There are special circumstances attached to the property that do not generally apply to other properties in the same zone.*

Metropolitan Water District (MWD) has provided review comments requesting an access easement through the Porsche site area in order to access their property (which lies to the south of the Porsche site). The access easement, when combined with the required fire lane width in the drive aisles around the dealership building, constricts the available development space on the property for the building itself. The access easement is not



able to be placed closer to Wasatch Blvd due to the grade difference between the roadway and the MWD property, which necessitates placing the access at the lower end of the property.

As discussed above, the property is uniquely situated between Wasatch Blvd and the UDOT right-of-way for I-215. The narrow configuration of the property, as well as the existing elevations and slopes across the site, mandate retaining in excess of Title 19 standards. The elevation of the northbound I-215 travel lanes (top of asphalt) will likely sit below the top of retaining wall due to the existing elevations involved and the grade difference between Wasatch Blvd and I-215. The western face of the wall is likely to be, on average, approximately 5 feet above the elevation of the I-215 northbound travel lanes, with the highest point approximately 8 feet above I-215. Due to the horizontal separation from the I-215 travel lanes, the retaining wall will not be seen as “looming” over the interstate.

The constraints of the property width, MWD access easements and drive aisles, and property location/elevations all provide evidence of the special and peculiar circumstances for this project that would not apply to a typical commercial development located elsewhere within the City's Village Center Special Districts.

3. *Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same district.*

The 18 to 20 feet of elevation fall across the property from east to west means that the proposed retaining height would be required regardless of whether terracing was involved or not. Terracing the retaining wall would require a setback that would cause the site to no longer comply with parking requirements and would prevent the site from being able to provide sufficient fire lane and MWD access that serves a critical need for culinary water to the entire community. The fire lane along the western side would not comply with fire code requirements and the building envelope would shrink to a size well below the building envelope enjoyed by other commercially zoned properties of a similar size. The building foundation would also not be likely to enjoy the same horizontal separation from a terraced retaining wall, which would potentially place the wall within the zone of influence of the building footings, creating a structural design concern.

Terracing the wall would render approximately 15 feet from the western boundary line unusable for development, which would be a significant reduction in “enjoyment of the property” due to the already narrow configuration of the parcel. The southwestern corner of the property is also the lowest natural elevation and therefore the location of onsite retention. Terracing the retaining wall would produce a hardship of locating underground retention outside of the terraced wall footprint.

The retaining wall, if terraced, would also cause a loss of eight EV charging stalls along the western boundary.

The retaining wall configuration proposed allows for the desired commercial use in a manner that still meets other City planning, engineering, Unified Fire Authority and MWD standards.

4. *The variance will not substantially affect the general plan and will not be contrary to the public interest.*

This variance request will not affect the general plan due to the unique site circumstances involved. The proposed retaining wall has been designed to be aesthetically pleasing, as the western face of the wall will front I-215. The design of the retaining wall has been engineered and vetted by structural and geotechnical engineers, and the unique site conditions requiring site fill on the high side of the wall allow for a great amount of control over the soil conditions and wall stability. The public interest is best served by approving this variance so the property can be commercially developed in a manner consistent with the approved zoning and the economic development goals contained within the city's General Plan.

5. *The spirit of this title is observed and substantial justice is done.*



The applicant understands the referenced section of Title 19 to attempt to prevent failure of retaining wall systems that might endanger public safety and that might unnaturally require large amounts of digging and excavation in order to shore up existing soils. This proposed project does not involve shoring of existing soils and instead will bring the site closer to the elevation of Wasatch Blvd so that customers can access the site for its intended commercial use while still preserving critical Unified Fire Authority access and critical access to the Metropolitan Water District site in the case of an emergency for the entire community.

As noted above, the site has current slope characteristics that are peculiar to this specific property and that are not generally seen in other properties within the city's designated Village Center Special Districts. An engineered wall design has been provided along with this variance request. The stamped and signed wall design has been coordinated with the design structural engineer as well as the geotechnical engineer for the project. This coordination is to demonstrate that the wall height, batter, geogrid, footing underdrain, etc. all function properly to ensure the wall's integrity.

Given that the proposed retaining wall is essential for the site's safety and functionality and has been designed with comprehensive engineering measures to ensure its stability and minimal impact on the surrounding area, we respectfully request the City's approval for this variance.

Thank you for your consideration of this matter.

Site Data:

Pre-dedication (Area)

Lot 2 Area = 174,241 s.f. (4.00 ac.)

Lot 1 Area = 91,143 s.f. (2.09 ac.)

Post-dedication (Area)

Lot 2 Area = 172,251 s.f. (3.954 ac.)

Lot 1 Area = 89,952 s.f. (2.065 ac.)

Landscape Area

Onsite Landscape Area = 17,196 s.f.

Porsche Offsite Landscape Area = 3,030 s.f.

Undeveloped Lot Offsite Landscape Area = 1,658 s.f.

Parking Information

Service & Employee Parking = 74

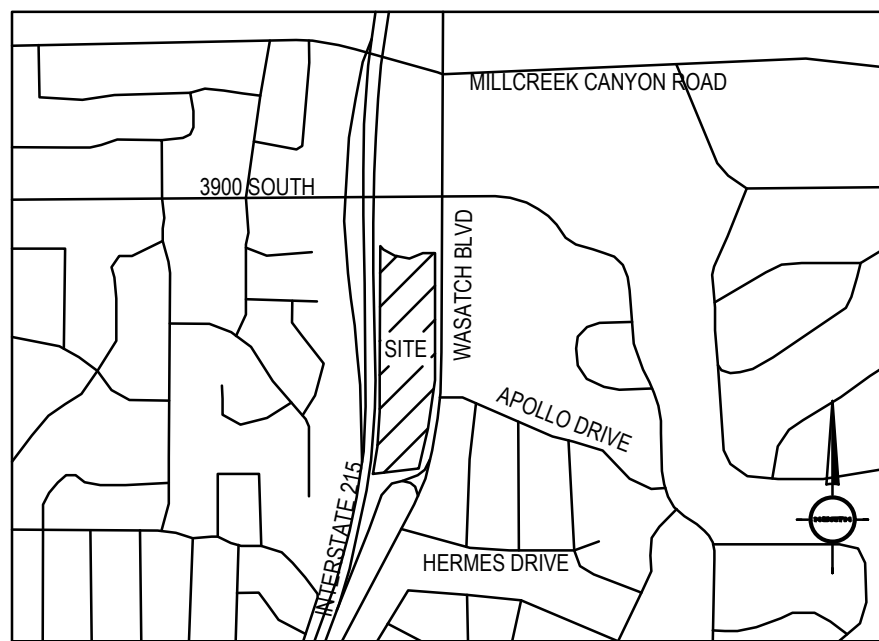
Inventory Parking = 106

Display Parking = 30

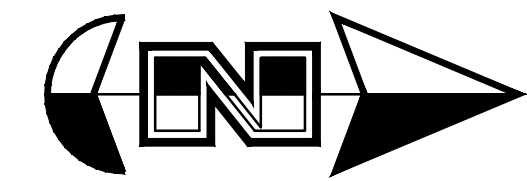
Customer Parking = 18

ADA Parking = 3

EV Parking = 17



Scale: 1" = 30'



Interstate 215

LOT 2
PORSCHE DEALERSHIP
3.95 ACRES

FF = 4978.30

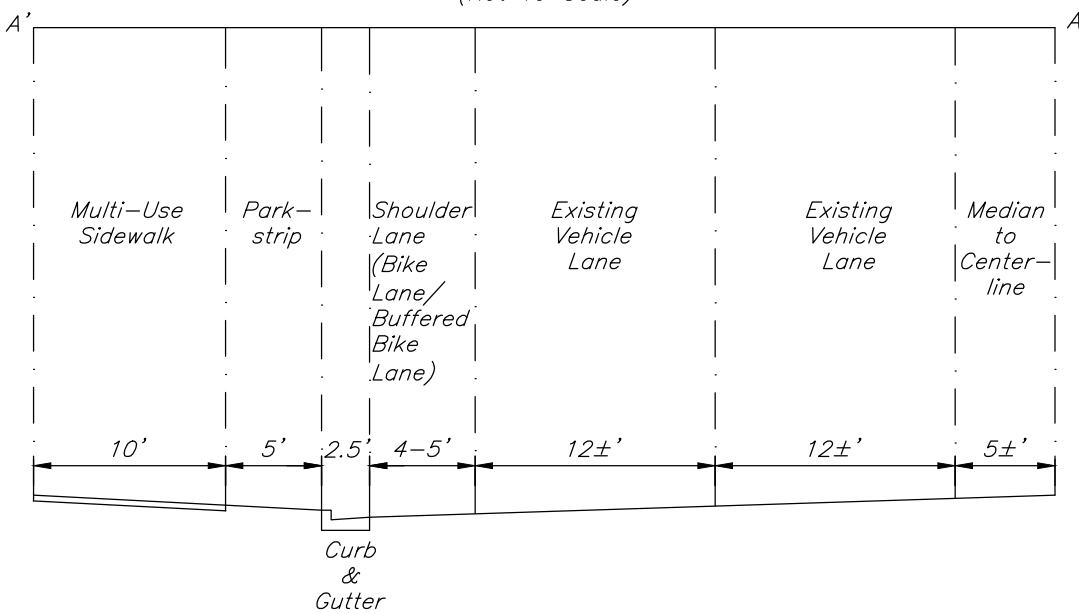
Ground Floor = 45,527 S.F.
Second Floor = 11,597 S.F.
Total = 57,124 S.F.

LOT 1
2.06 ACRES

Millcreek City Notes:

- All ROW improvements will be completed per Millcreek and APWA standards.
- Prior to any construction a land disturbance permit is to be obtained at <https://millcreekutah.portal.iwara.net/portalhome/millcreekutah>. Please contact Aaron Roberts at aroberts@millcreek.us with questions.
- Prior to any work being done in Millcreek's Right of Way an Excavation / Encroachment Permit needs to be obtained at <https://millcreek.us/436/Public-Works-Permits>. Please contact Katie Boska at kboska@millcreek.us with questions.
- A separate permit is required for the monument sign.

Cross - Section: Mixed Use Path &
Half Section of Wasatch Boulevard
(Not To Scale)



Site Plan Keynotes

- Const. Rolled Catch Curb & Gutter (24 C4.3)
- Const. Rolled Spill Curb & Gutter (24 C4.3)
- Const. Onsite Asphalt Paving (2 C4.1)
- Const. ADA Ramp per Millcreek City Standards (34 C4.5, 33 C4.5)
- RMP Sectionalizer (Refer to Rocky Mountain Power Plans)
- Const. Catch Style Curb & Gutter (25 C4.3)
- Const. Accessible ADA Sign (22 C4.3)
- Const. 4" White Paint Stripe (Typ.), 2 Coats
- Const. Light Pole and Base
- Const. Accessible Striping Detail w/ Painted ADA Parking Symbol Detail (21 C4.3)
- Sawcut; Provide Smooth Clean Edge
- Conn. & Match Existing Improvements
- Const. Trash Enclosure, Concrete Pad, and Ballards (See Arch. Plans for Enclosure and Structural Plans for Interior Concrete Pad)
- Const. Directional Arrows per Millcreek City Standards
- Const. Curb Transition
- Const. Verti-block Retaining Wall
- Const. Fence Post and Fence on Top of Retaining Wall

- Const. Transformer (Refer to Architecture Plans)
- Const. Monument Sign (Refer to Architecture Plans)
- Const. Concrete Paving (6 C4.1)
- Const. Vehicle Display Pad
- Const. Steel Gate (Refer. Architecture Plans)
- Const. EV Charging Stations (Refer to Architecture Plans)
- Const. Concrete Wheel Stop (7 C4.1)
- Const. Battery Storage Facility w/ 6" Concrete Pad (See Arch. Plans for Details on Battery Storage Unit) (6 C4.1)
- Const. 4" White Striping @ 24" O.C., 2 Coats
- Const. VAN Accessible ADA Sign (22 C4.3)

General Site Notes:

- All dimensions are to back of curb unless otherwise noted.
- Fire lane markings and signs to be installed as directed by the Fire Marshal.
- Aisle markings, directional arrows and stop bars will be painted at each driveway as shown on the plans.
- Const. curb transition at all points where curb abuts sidewalk, see detail.
- Contractor shall place asphalt paving in the direction of vehicle travel where possible.

Paving Legend:

- Proposed Concrete Paving/Sidewalk
- Proposed Onsite Standard Duty Asphalt Paving
- Existing Concrete
- Existing Asphalt Paving
- Property Line
- Right-of-Way Dedication

Notes - Mixed Use Path:

The mixed use path shown is conditionally approved and will need to be installed following the Millcreek Trails Master Plan once adopted. Items to be included but not limited to: thickened concrete, wayfinding signage, stamped concrete, directional arrows, or other items as directed during construction.

Construction Survey Note:

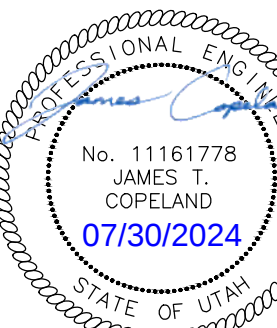
The Construction Survey Layout for this project will be provided by Anderson Wahlen & Associates. The Layout Proposal and Professional Services Agreement will be provided to the General Contractor(s) for inclusion in base bids. The Survey Layout proposal has been broken out into Building Costs and Site Costs for use in the Site Work Bid Form.



Site Plan

Porsche - Millcreek

4074 South Wasatch Blvd.
Millcreek, Utah



22 Jul 2024

SHEET NO.

C1.1

PVC Pipe Protection During Construction:
PVC Pipe must have 24" cover for heavy construction loading during construction. The Contractor is responsible to temporarily protect any pipes with less than 24" cover by barning over the pipes.

Prior to any construction of any accessible improvements, a pre construction meeting shall be held between Contractor and Engineer. Contractor is responsible to contact Engineer and schedule pre construction meeting.

Notes - Mixed Use Path:

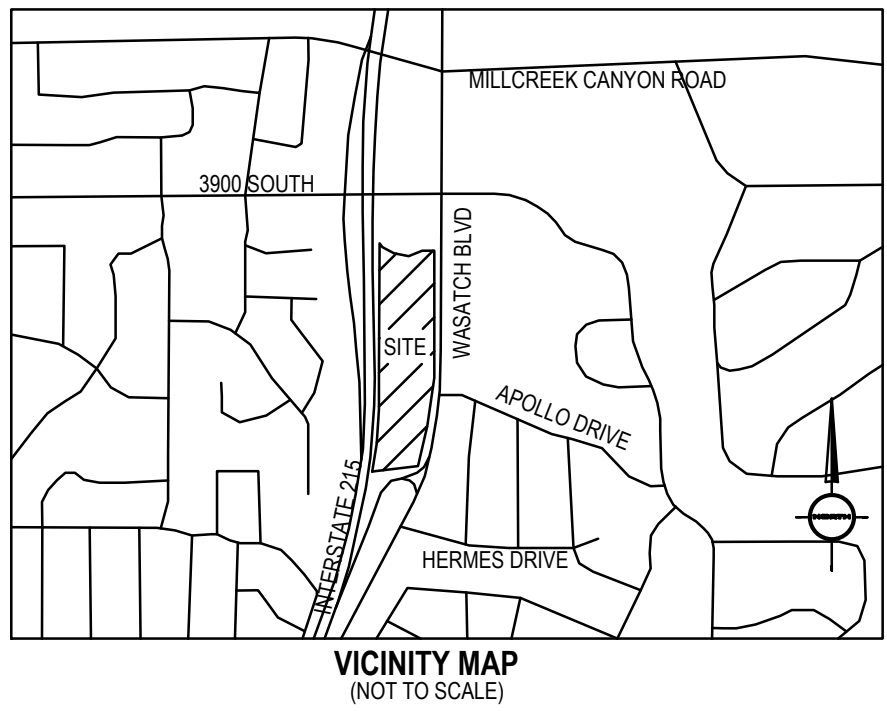
The mixed use path shown is conditionally approved and will need to be installed following the Millcreek Trails Master Plan once adopted. Items to be included but not limited to: thickened concrete, wayfinding signage, stamped concrete, directional arrows, or other items as directed during construction.

Millcreek City Notes:

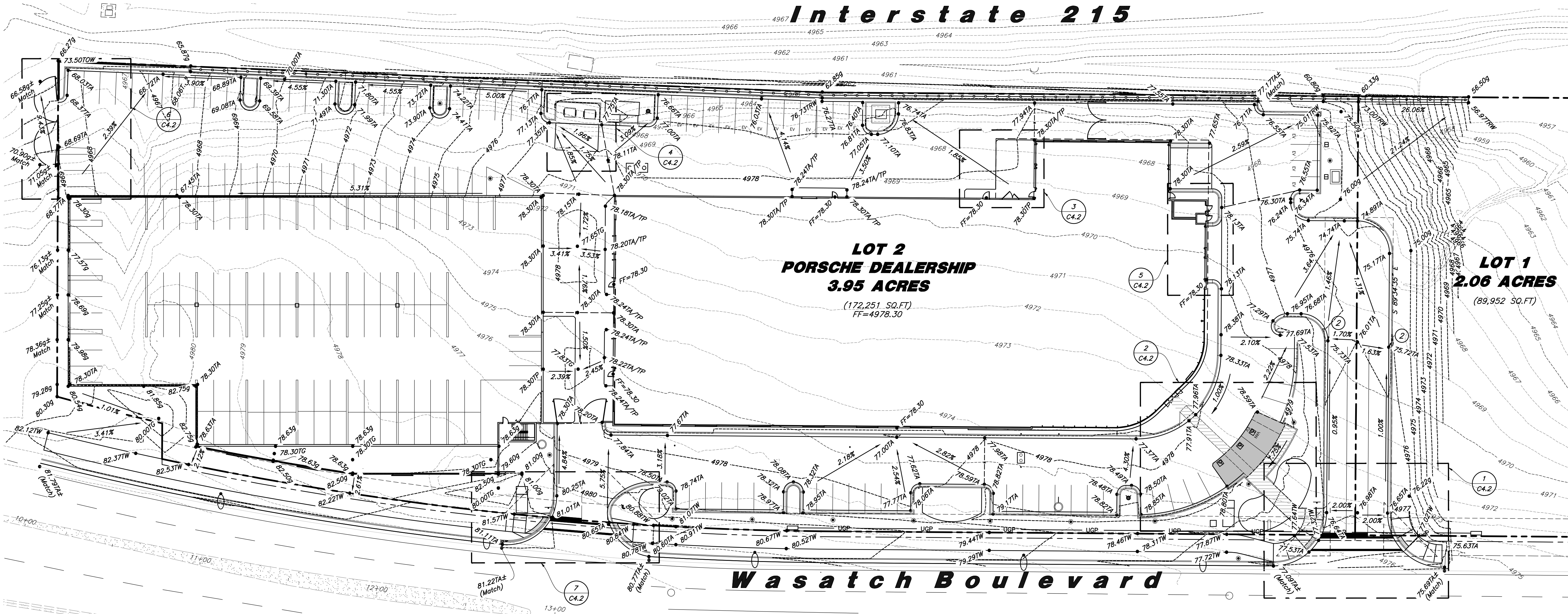
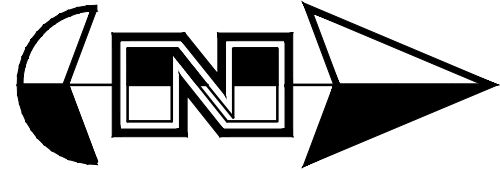
- All ROW improvements will be completed per Millcreek and APWA standards.
- Prior to any construction a land disturbance permit is to be obtained at <https://millcreekutpw.portal.iworg.net/portalhome/millcreekutpw>. Please contact Aaron Roberts at aroberts@millcreek.us with questions.
- Prior to any work being done in Millcreek's Right Of Way an Excavation / Encroachment Permit needs to be obtained at <https://millcreek.us/436/Public-Works-Permits>. Please contact Katie Bosko at kbosko@millcreek.us with questions.

Construction Survey Note:

The Construction Survey Layout for this project will be provided by Anderson Wahlen & Associates. The Layout Proposal and Professional Services Agreement will be provided to the General Contractor(s) for inclusion in base bids. The Survey Layout proposal has been broken out into Building Costs and Site Costs for use in the Site Work Bid Form.



Scale: 1" = 30'



General Grading Notes:

- All grading shall be in accordance with the project geotechnical study.
- Cut slopes shall be no steeper than 3 horizontal to 1 vertical.
- Fill slopes shall be no steeper than 3 horizontal to 1 vertical.
- Fills shall be compacted per the recommendations of the geotechnical report prepared for the project and shall be certified by a Geotechnical Engineer.
- Areas to receive fill shall be properly prepared and approved by a Geotechnical Engineer prior to placing fill.
- Fills shall be benched into competent material as per specifications and Geotechnical report.
- All trench backfill shall be tested and certified by a Geotechnical Engineer.
- A geotechnical engineer shall perform periodic inspections and submit a complete report and map upon completion of the rough grading.
- The final compaction report and certification from a Geotechnical Engineer shall contain the type of field testing performed. Each test shall be identified with the method of obtaining the in-place density, whether sand cone or drive ring and shall be so noted for each test. Sufficient maximum density determinations shall be performed to verify the accuracy of the maximum density curves used by the field technician.
- Dust shall be controlled by watering.
- The location and protection of all utilities is the responsibility of the permittee.
- Approved protective measures and temporary drainage provisions must be used to protect adjoining properties during the grading process.
- All public roadways must be cleared daily of all dirt, mud and debris deposited on them as a result of the grading operation. Cleaning is to be done to the satisfaction of the City Engineer.
- The site shall be cleared and grubbed of all vegetation and deleterious matter prior to grading.
- The contractor shall provide shoring in accordance with OSHA requirements for trench walls.
- Aggregate base shall be compacted per the geotechnical report prepared for the project.
- The recommendations in the following Geotechnical Engineering Report by GSH Geotechnical, Inc. Services are included in the requirements of grading and site preparation. The Report is titled "Geotechnical Engineering Study; xxxx".
Project No.: 3780-001-23 Dated: October 16, 2023
- As part of the construction documents, owner has provided contractor with a topographic survey performed by manual or aerial means. Such survey was prepared for project design purposes and is provided to the contractor as a courtesy. It is expressly understood that such survey may not accurately reflect existing topographic conditions.
- If Contractor observes evidence of hazardous materials or contaminated soils he shall immediately contact the project engineer to provide notification and obtain direction before proceeding with disturbance of said materials or contaminated soil.

Legend:

- ADA Route - Not To Exceed A Running Slope Greater Than 5.0% or Cross Slope Greater Than 1.5%. Do Not Stripe Across Drive Aisles
- ADA Parking Areas - Not To Exceed A Slope Greater Than 1.5% In Any Direction

Note: Shading of Accessible Route and ADA Parking Areas is to Clarify Extent of These Areas Only. Do Not Stripe Across Drive Aisles or Otherwise Provide Pavement Markings Unless Shown on Site Plan.

Curb and Gutter Construction Notes:

- Open face gutter shall be constructed where drainage is directed away from curb.
- Open face gutter locations are indicated by shading and notes on the grading plan.
- It is the responsibility of the surveyor to adjust top of asphalt grades to top of curb grades at the time of construction staking.
- Refer to the typical details for standard and open face curb and gutter dimensions.
- Transitions from open face to standard curb and gutter are to be smooth. Hand form these areas if necessary.
- Spot elevations are shown on this plan with text masking. Coordinate and verify site information with project drawings.

Sidewalk Construction Notes:

- Concrete sidewalk shall be constructed with a cross slope of 1.5% (2.0% Maximum) unless shown otherwise on plan.
- Running slope of sidewalks shall be built per grades shown on the plan. Where grades are not provided, sidewalks shall be constructed with a maximum running slope of 4.5%.
- Refer to the Site Plan for sidewalk dimensions.

Flood Zone

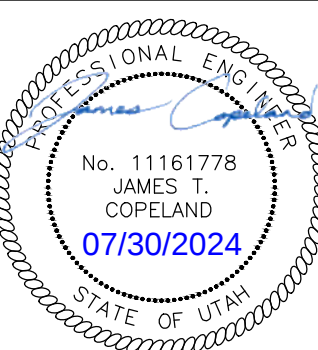
This property lies entirely within Flood Zone X as designated on FEMA FIRM Panel No. 49035C0316H dated November 18, 2021. Flood Zone X is defined as "Areas determined to be outside the 0.2% annual chance floodplain."



Grading Plan

Porsche - Millcreek

4074 South Wasatch Blvd.
Millcreek, Utah



25 Jul, 2024

SHEET NO.

C2.1

Designed by: JC
Drafted by: AA
Client Name:
Mile High 901, LLC
22-160 SP



Utility Piping Materials:

All piping materials shall be per local agency standards or the specifications below at a minimum. All utility piping shall be installed per manufacturers recommendations. Refer to project specifications for more detailed information regarding materials, installation, etc.

Culinary Service Laterals

1. Polyethylene (PE) Water Pipe (Up to 3 inches diameter), AWWA C901, PE 3408, SDR 9 (200 psi)
2. Copper Pipe (Up to 3 inches diameter): Type "K", AWWA C500, Class 235
3. Polyvinyl Chloride (PVC) (4 inches to 12 inches diameter): AWWA C900, Class 235

Sanitary Sewer Lines

1. All sewer piping to be Polyvinyl Chloride (PVC) sewer pipe, ASTM D3034, Type PSM, SDR 35

Storm Drain Lines

1. 12" pipes or smaller - Polyvinyl Chloride (PVC) sewer pipe, ASTM D3034, Type PSM, SDR 35, or ADS HP Storm Pipe
2. 15" pipes or larger - Reinforced Concrete Pipe, SDR-35, ASTM C76, Class III, or ADS HP Storm Pipe

Millcreek City Notes:

1. All ROW improvements will be completed per Millcreek and APWA standards.
2. Prior to any construction a land disturbance permit is to be obtained at <https://millcreekutp.portal.iworq.net/portalhome/millcreekutp>. Please contact Aaron Roberts at aroberts@millcreek.us with questions.
3. Prior to any work being done in Millcreek's Right Of Way an Excavation / Encroachment Permit needs to be obtained at <https://millcreek.us/436/Public-Works-Permits>. Please contact Kaile Baska at kbaska@millcreek.us with questions

Retention Chamber Notes:

1. Const. 39 Stormtech MC-3500 Chambers(or Approved Equal) per Manufacturer Standards - LID Volume: 1,743 CF
Required Volume: 10,701 CF
Top of Chambers: 4965.65
Bottom of Chambers: 4961.90
Bottom of Stone: 4958.9
2. Const. 96 Stormtech MC-3500 Chambers(or Approved Equal) per Manufacturer Standards - LID Volume: 4,101 CF
Required Volume: 20,701 CF
Top of Chambers: 4964.32
Bottom of Chambers: 4961.90
Bottom of Stone: 4958.90

Flood Plain Data

This property lies entirely within Flood Zone X as designated on FEMA FIRM Panel No. 49035C0316H dated November 18, 2021. Flood Zone X is defined as "Areas determined to be outside the 0.2% annual chance floodplain."

CAUTION:

The locations and/or elevations of existing utilities as shown on these plans are based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied on as being exact or complete.

Construction Survey Note:

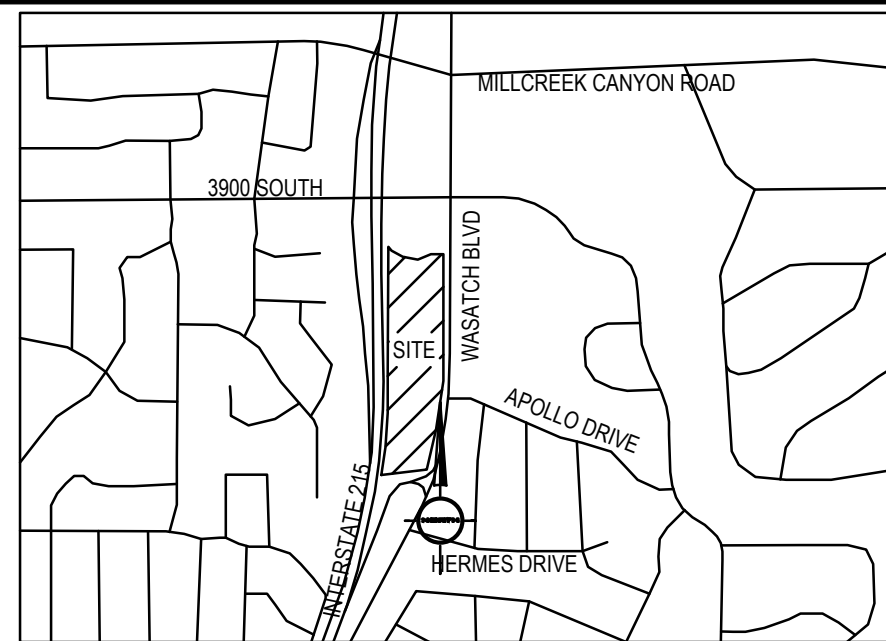
The Construction Survey Layout for this project will be provided by Anderson Wahlen & Associates. The Layout Proposal and Professional Services Agreement will be provided to the General Contractor(s) for inclusion in base bids. The Survey Layout proposal has been broken out into Building Costs and Site Costs for use in the Site Work Bid Form.

Onsite Utility Connection Notes:

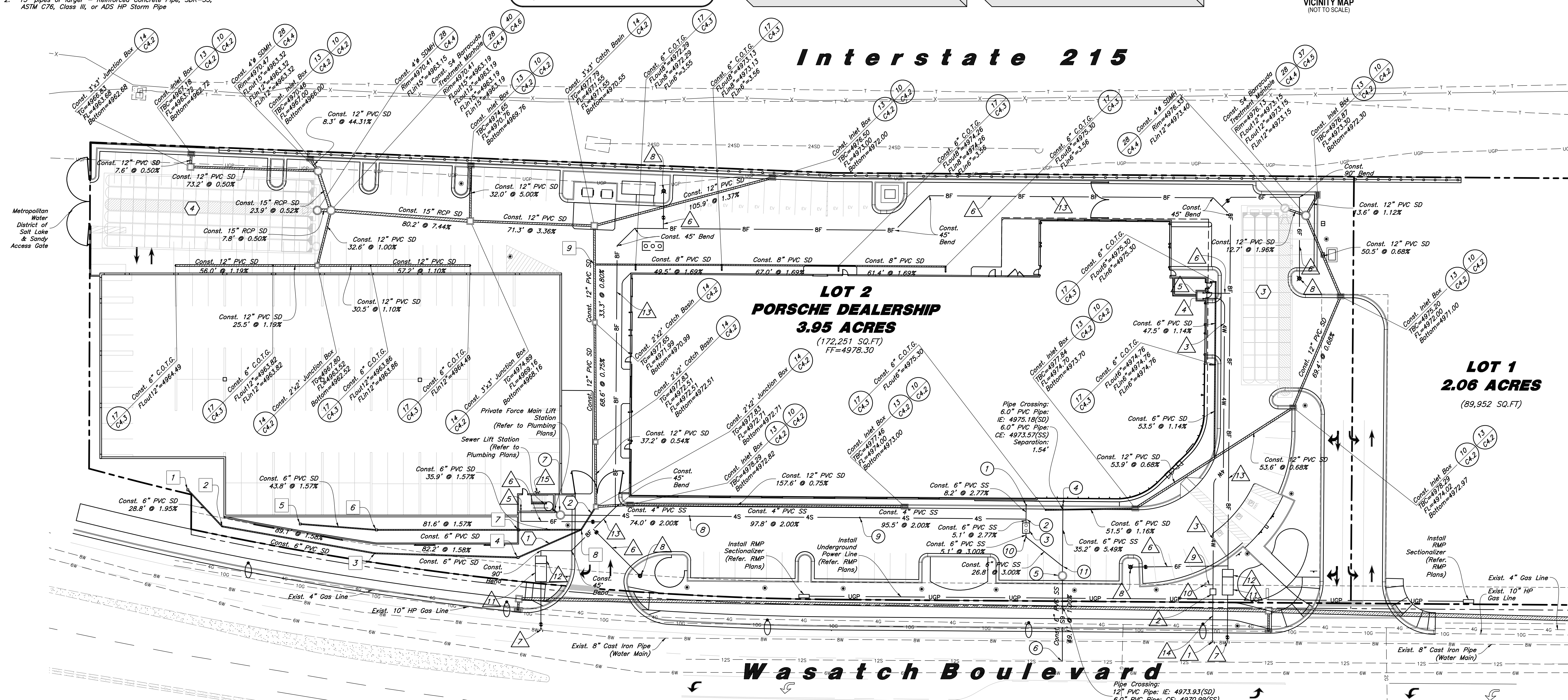
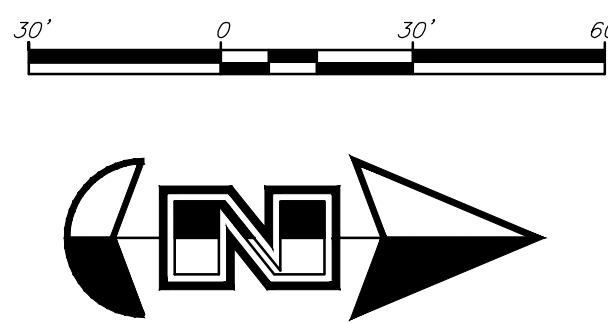
1. Contractor shall field verify all utility connection elevations prior to beginning any utility construction.
2. Contractor shall construct utility lines into site prior to any onsite utility construction. Gravity lines are to be constructed starting at the lowest point and be installed prior to any waterline installation.
3. Construction of any onsite utilities prior to the offsite connection will be done at the contractors risk.

Storm Drain & Sanitary Sewer Note:

All Storm Drainage & Sanitary Sewer Pipe Lengths and Slopes are from Center of Structure to Center of Structure



Scale: 1" = 30'



Porsche - Millcreek - North Chambers

Combined Detention Facility
Area = 1.29 Acres
Release through Infiltration = 0.040 cfs
Detention Pond Sized For The 100 Year Storm

Area =	12.39	acres
Release through Infiltration =		0.040
Detention Pond Stand for the		150 Year Storm
Time		
min	In (hr)	Out (hr)
5	0.97	0.98
10	5.30	3.462
15	4.38	4.067
20	3.73	4.84
25	3.28	5.331
30	0.95	4.747
35	2.71	6.143
40	0.96	6.162
45	2.08	6.619
50	2.09	6.758
55	1.95	6.942
60	1.93	7.131
65	1.90	7.354
70	1.90	7.593
75	1.89	7.879
80	0.93	8.014
85	0.93	8.107
90	0.93	8.154
95	0.93	8.174
100	0.93	8.174

MILLCREEK, UTAH
ORDINANCE NO. 23-37

**AN ORDINANCE AMENDING TITLE 19 OF THE MILLCREEK CODE OF
ORDINANCES BY ENACTING CHAPTER 19.62A, A NEW VILLAGE CENTER
SPECIAL DISTRICT CALLED OLYMPUS HILLS WEST VILLAGE CENTER
DISTRICT (OHV-VCSD), OTHERWISE KNOWN AS THE OLYMPUS HILLS WEST
VILLAGE CENTER TEXT AMENDMENT**

WHEREAS, the Millcreek Council (“Council”) met in a regular session on October 23, 2023, to consider among other things, approving an ordinance amending Title 19 of the Millcreek Code of Ordinances by enacting Chapter 19.62A, a new Village Center Special District called Olympus Hills West Village Center Special District, otherwise known as the Olympus Hills West Village Center Text Amendment; and

WHEREAS, Utah Code Ann. § 10-9a-503 provides in part that the Council may amend any provision of a land use regulation; and

WHEREAS, Millcreek (“City”) has adopted a comprehensive zoning ordinance (“Zoning Ordinance”); and

WHEREAS, City staff has recommended that the Council amend the Millcreek Code of Ordinances to enact the Olympus Hills West Village Center Text Amendment; and

WHEREAS, Utah Code Ann. § 10-9a-502 provides the planning commission shall provide notice as required by Subsection 10-9a-205(1)(a) and, if applicable, Subsection 10-9a-205(4) and hold a public hearing on the proposed land use ordinances; and

WHEREAS, on August 29, 2023, the required notice was published; and

WHEREAS, on September 20, 2023, the proposed amendment was submitted to the planning commission for its recommendation; and

WHEREAS, on September 20, 2023, the planning commission held the required public hearing with respect to amending Title 19 of the Millcreek Code of Ordinances; and

WHEREAS, at the September 20, 2023 planning commission meeting, the Millcreek Planning Commission recommended amending Title 19 of the Millcreek Code of Ordinances by enacting Chapter 19.62A Olympus Hills West Village Center Special District; and

WHEREAS, the Millcreek Code of Ordinances, provides among other things, that before finally adopting any such amendment, the Council shall consider the application during a public meeting which has been properly noticed in compliance with the provisions of Title 52, Chapter 4, of the Open and Public Meetings Act; and

WHEREAS, on October 18, 2023, the Council caused the required notice to be given; and

WHEREAS, on October 23, 2023, the Council considered amending Title 19 of the Millcreek Code of Ordinances by enacting Chapter 19.62A Olympus Hills West Village Center Special District; and

WHEREAS, the Council finds that the Olympus Hills West Village Center Text amendment does not conflict with any applicable policy and guidance of the General Plan; and

WHEREAS, the Council finds that the Olympus Hills West Village Center Text Amendment will provide for integrated planning and design of the site and, on the whole, better development than would be possible under the strict application of the city's zoning ordinances; and

WHEREAS, the Council finds that the Olympus Hills West Village Center Text Amendment does not adversely impact existing public utilities, including but not limited to power, gas, telecommunications, storm water, culinary water, or sanitary sewer.

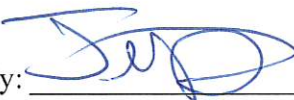
NOW, THEREFORE, BE IT FURTHER ORDAINED by the Council that Chapter 19.62A of the Millcreek Code of Ordinances is hereby enacted as Exhibit A.

This Ordinance, assigned Ordinance No. 23 -37, shall take effect as soon as it shall be published or posted as required by law, deposited, and recorded in the office of the City Recorder, and accepted as required herein.

PASSED AND APPROVED this 23rd day of October, 2023.



MILLCREEK

By: 

Jeff Silvestrini, Mayor

ATTEST:



Elyse Sullivan, City Recorder

Roll Call Vote:

Silvestrini	<u>Yes</u>	No
Catten	<u>Yes</u>	No
DeSirant	<u>Yes</u>	No
Jackson	<u>Yes</u>	No
Uipi	<u>Yes</u>	No

CERTIFICATE OF POSTING

I, the duly appointed recorder for Millcreek, hereby certify that:

ORDINANCE 23-37: AN ORDINANCE AMENDING TITLE 19 OF THE MILLCREEK CODE OF ORDINANCES BY ENACTING CHAPTER 19.62A, A NEW VILLAGE CENTER SPECIAL DISTRICT CALLED OLYMPUS HILLS WEST VILLAGE CENTER DISTRICT (OHW-VCSD), OTHERWISE KNOWN AS THE OLYMPUS HILLS WEST VILLAGE CENTER TEXT AMENDMENT was passed and adopted the 23rd day of October, 2023 and certifies that a copy of the foregoing Ordinance 23-37 was posted in accordance with Utah Code 10-3-711 this 24 day of October, 2023.

 _____

Elyse Sullivan, City Recorder

EXHIBIT A

Section 19.62A is hereby enacted as follows:

19.62A – Olympus Hills West Village Center Special District

19.62A.010 – Purpose

The Olympus Hills West Village Center Special District contains approximately 8 acres of land located between I-215 and Wasatch Boulevard, from 3900 South to the I-215 offramp at approximately 4100 South Wasatch Boulevard. The Olympus Hills West VCSD will include any land that the Utah Department of Transportation may surplus as part of a reconfiguration of the 3900 South interchange. The Olympus Hills West VCSD is intended to promote a mixed-use village center district, including a new car dealership, restaurant and neighborhood retail and service uses. The Olympus Hills West-VCSD will feature architecturally compatible buildings, retail and restaurant uses flanking a public plaza, and an updated Wasatch Boulevard Streetscape. The Olympus Hills West-VCSD will be designed to further the goals for village centers identified in the Millcreek General Plan, to include a height transition requirement with the shortest buildings on the south side of the project in order to protect critical viewsheds and an updated Wasatch Boulevard Streetscape to enhance safety and utility for pedestrians and cyclists. The boundaries of the Olympus Hills West-VCSD are indicated in **Exhibit A** in MKZ 19.62A.050 and shall be designated on the Millcreek Zoning Map.

19.62A.020 – Permitted and Conditional Uses and Use Limitations

Table 19.62A-1: Olympus Hills West-VCSD Permitted and Conditional Uses lists permitted and conditional uses for the commercial zoning districts. "P" indicates that a use is permitted. "DA" indicates that a use is subject to a phased development agreement. Any use listed "DA" may be further limited or eliminated by a development agreement in a future phase. The absence of the use from the table indicates that use is neither a permitted use nor a conditional use within that zoning district.

USE		Specific Use Standards and Limitations
Automobile Sales or Leasing	P	Must be on a site at least 4 acres in area. Vehicle sales inventories must include new vehicles. Sales of moving trucks, watercraft, mobile homes, travel trailers, campers, motorcycles, and other recreational vehicles is prohibited. Vehicle sales inventories must include hybrid or electric vehicles.
Automobile Repair	P	Must be an accessory use to automobile sales and leasing. Automobile service and repair must be conducted entirely inside a building.
Office Uses	DA	See MKZ 19.04. Approval of this use in a subsequent phase is subject to a development agreement.
Restaurant	DA	Drive-through uses are prohibited. Approval of this use in a subsequent phase is subject to a development agreement.
Neighborhood Retail Uses	DA	See MKZ 19.04. Drive-through uses are prohibited. Approval of this use in a subsequent phase is subject to a development agreement.
Neighborhood Service Uses	DA	See MKZ 19.04. Drive-through uses are prohibited. Approval of this use in a subsequent phase is subject to a development agreement.
Residential Condominiums or PUDs	DA	Condominiums or PUDs may be approved as part of a mixed use development. Condominiums are subject to MKZ 18.30, and PUDs are subject to MKZ 19.78. Approval of this use in a subsequent phase is subject to a development agreement.
Mixed Use	DA	Mixed use developments may include residential uses, but must include office, restaurant, neighborhood retail, or neighborhood service uses on the ground floor of a mixed use building. Maximum density of residential units allowed is determined by applicable development standards. Approval of this use in a subsequent phase is subject to a development agreement.

Prohibited uses include:

- A. Sales of retail tobacco as a principal use.
- B. Non-Depository Financial Institutions.
- C. Secondhand Stores.

- D. Self-storage facilities of all types, including mini-storage units, neighborhood storage and temperature controlled storage facilities.

19.62A.030 – Development Standards

- A. Automobile Sales. The primary commercial use in the Olympus Hills West-VCSD shall be the sales and leasing of new automobiles. Automobile Sales shall be located in the southernmost four acres of the Olympus Hills West-VCSD and shall be configured as shown on the site plan located in Exhibit B in MKZ 19.62A.050.
1. All buildings including accessory structures shall incorporate a similar architectural theme as depicted in Exhibit C in MKZ 19.62A.050 and shall be predominantly metal panel and glass. Design elements shall be used to add interest on all visible sides of buildings.
 2. All building facades facing Wasatch Boulevard shall consist of at least 10 percent glass. Stucco is prohibited on any façade.
 3. One auto dealership building that shall not exceed 46,000 square feet in footprint that includes office spaces, service area and bays, and auto display areas. The auto dealership building shall include a showroom that does not exceed 20,000 square feet in area.
 4. The minimum setback as measured from the Wasatch Boulevard right-of-way shall be no less than 25 feet. All other setbacks are described in the Exhibit B in MKZ 19.62A.050.
 5. The showroom portion of the building shall be no taller than 36 feet as measured from the final engineered grade of the grading and drainage plan.
 6. The service portion of the dealership building shall be no taller than 28 feet as measured from the final engineered grade of the grading and drainage plan.
 7. Maximum lot coverage shall not exceed 30% of the site.
 8. Vehicle displays. No car displays shall block minimum required clear vision areas at driveway intersections or block lanes for public safety, egress or fire access. No vehicles may be displayed on elevated pedestals.
 9. Security For Display Vehicles. To the extent deemed necessary by individual dealers, curb walls no higher than sixteen inches (16"), closely spaced concrete bollards, berms, low security fencing and rails may be used. Design must be compatible with project theme and architectural detailing in other parts of the site.
 10. Parts Storage Areas. Parts storage areas shall be provided within buildings.

11. Storage for lithium-ion batteries is subject to standards of an approval by the Unified Fire Authority and must be stored outside the main building.

12. Access and Internal Circulation.

- a. Driveway Access: Except where otherwise required for compliance with applicable codes and for fire lanes, driveways shall be a minimum of twenty-four feet (24') wide and all drives shall have a minimum 12.5-foot radius.
- b. Service Area Access: Service areas shall have sufficient stacking lanes on site to stack a minimum of one vehicle per service lane. Stacking lanes shall not block flow of traffic or fire access lanes.

13. All mechanical equipment shall be screened from view, either by enclosure or parapet wall.

14. Dumpsters shall be enclosed within a decorative masonry enclosure designed to be compatible with overall project building and fence materials.

15. No portion of the site devoted to automobile sales may be sold or leased for any other purpose.

B. Mixed Use Including Retail, Restaurant, and Plaza. Village Retail and Restaurant uses will function as a buffer and transition between the automobile sales use and a multifamily or office use, and are subject to a development agreement. Standards in this section may be further limited pursuant to MKZ 19.62.050 (E)(6). Village retail and restaurant uses shall be either a predominant feature along Wasatch Boulevard or shall flank a public plaza located between the automobile sales use and the multifamily use. A public plaza must be at least 10,000 square feet in area. Public Plazas shall follow the applicable design standards as set forth in MKZ 19.73.070(O).

1. Except as provided below, village retail and restaurants shall follow the applicable building design standards as set forth in MKZ 19.73.070 (N)(4).
2. Village retail may be located on the ground floor of a multifamily building. Retail and restaurant uses combined must be a minimum of 3,000 square feet in area, and restaurant uses shall be at least 1,500 square feet in area.
3. Retail spaces shall be a minimum of 30 feet in depth as measured perpendicular to the right-of-way or plaza.

4. Transparent windows or doors are required for at least 50 percent of the retail frontage.
5. Restaurant uses adjacent to public plaza must include at least 300 sf of outdoor seating area. Seating area may be within public plaza area.
6. No portion of the site devoted to village retail, restaurant, or plaza uses may be sold or leased for any other purpose.

C. Mixed Use Including Multifamily and Office. Multifamily and Office uses are allowed on a portion of the property as part of a mixed use development, within 700 feet of the south right-of-way line of 3900 South. Multifamily and office uses are subject to a development agreement. Standards in this section may be further limited pursuant to MKZ 19.62.050 (E)(6). Multifamily uses in the Olympus Hills West VCSD Multifamily development shall be constructed in a manner that facilitates conversion to a residential condominium in the future. Any approval of a Planned Unit Development or Condominium will require review of a site plan by the Millcreek Planning Commission.

1. Except as provided below, multifamily and office buildings shall follow the applicable building design standards as set forth in MKZ 19.73.070 (N).
2. No building may be taller than three stories. Maximum building height shall not exceed 42 feet as measured from original ground surface at the northeast corner of Parcel 2 as depicted in Exhibit A in MKZ 19.62A.050.
3. The following features may exceed the maximum building height but in no case be over 7 feet from the highest point of the coping of a flat roof or the highest gable of a pitched roof.
 - a. Elevators, stairways, ventilating fans, or similar equipment required to operate and maintain the building.
 - b. No space above the height limit shall be allowed for the purpose of providing additional habitable floor space.
4. Buildings shall not exceed 200 feet in length.
5. Façade articulation. All buildings shall be designed with the following articulation:
 - a. Visual breaks along the street-facing façade such as horizontal articulation in the plane of the façade by at least 2 feet.

- b. Change in height at the top of the building by at least 3 feet for every 50 feet of façade length.
 - c. Changes in materials, color, texture or pattern for greater than 50% of the building façade.
 - d. Indentations/recesses at least 3 feet in depth along the street facing facades at 50-foot intervals.
 - e. Building lengths greater than 200 feet in length shall include indentations/recesses of at least 6 feet in depth along the street facing facades at 50-foot intervals.
- 6. Setbacks. With the exception of the Public Plaza area, the following minimum setbacks shall apply:
 - a. Wasatch Boulevard right-of-way line shall be 20 feet.
 - b. 3900 South right-of-way line shall be 15 feet.
 - c. All interior and side property lines shall be 10 feet.
 - d. Rear property line shall be 10 feet.
- 7. Windows shall constitute at least 50 percent of first floor street-facing facades, and 25 percent of all upper story facades.
- 8. Residential amenities shall include any of the following:
 - a. Balconies or Patios of at least 40 square feet in area.
 - b. Shared Public Plaza
 - c. Indoor Amenities
- 9. No portion of the site devoted to multifamily or office uses may be sold or leased for any other purpose.

D. Building Materials and Color. Building materials and color are limited to the materials and colors described below.

- 1. Permitted primary materials for street facing facades, including facades facing plaza area include architectural metal panel, glass, carbonized wood, brick or

stone, mass timber or other durable natural wood siding.

2. Permitted accent materials include any permitted primary material; board-formed concrete; corrugated metal panels or siding; and weathered steel panels or siding.
3. Building materials such as integrally colored concrete masonry and architectural tile may be used for facades that do not face a street or plaza.
4. The use of stucco or EIFS is prohibited as use as a material.
5. Materials and colors used for the Automobile Sales building and accessory structures shall be substantially as depicted in the Exhibit.
6. Materials and colors for the village retail and office or multifamily buildings shall be substantially as depicted in Exhibit D in MKZ 19.62A.050.

E. Fencing.

1. Fencing is required to screen any utilities or vehicle service or inventory areas.
2. Excluding frontages along vehicle service inventory areas, no fencing of any kind will be allowed along Wasatch Boulevard or 3900 South frontage.
3. Permitted materials for fencing include pre-cast masonry, stone, or weathering steel.

F. Lighting.

1. The applicant must submit a photometric plan for review which indicates the type and location of lights in relation to the development and designed for pedestrian safety.
2. Direct lighting shall not exceed the boundaries of the premises.
3. Lighting fixtures shall be oriented to focus light within the property lines and shall not cause light spillage onto adjacent properties, interfering with the lawful use and enjoyment of those properties.
4. Fixture height shall not exceed 25 feet.
5. All interior streets and parking lots including travel lanes shall be dark sky compliant and shall be designed to achieve appropriate illumination levels for safety and security while minimizing light pollution.

6. Fixtures shall be designed and installed to minimize direct glare into adjacent properties, roadways, and pedestrian areas.
7. All outdoor lighting fixtures shall be shielded or directed in a way that prevents light spillage beyond the property boundaries and reduces skyglow.
8. All outdoor lighting shall be equipped with timers, motion sensors, or other automated control mechanisms that allow for dimming
9. For the purposes of this chapter, "Average Foot Candle" is the unit of measurement representing the amount of light falling on a surface from a standard candle placed one foot away over a specified area.
 - a. Average Foot Candle measurement shall be taken at ground level from the outside boundaries of the premises.
 - b. The maximum allowed "Average Foot Candle" shall not exceed 0.2 as measured from the outside boundaries of the premises.
 - c. Operational Requirements. The following operational requirements shall apply:
 - i. Parking Lot Area Lighting: Dimmed to 50% at 9:00pm to 6am.
 - ii. Building Facade Lighting: Dimmed to 50% at 9:00pm to 6am.

G. Landscaping

1. Landscaping of parking lots and required buffers shall follow the requirements of MKZ 19.77.
2. Landscaping shall incorporate plant species that are native or endemic to northern Utah.
3. Turf grass is limited to 25% of overall landscaping and shall not be installed along any streetscape.
4. The Planning Director or designee can reduce planter bed widths and lengths up to 25% to accommodate unusual circumstances.
5. Landscaping shall be installed substantially as depicted in Exhibit E in MKZ 19.62A.050.

H. Wasatch Boulevard Streetscape

1. The project shall include a consistent species of trees, planted every 30 feet on center. Trees shall be planted at a minimum of 3-inch caliper. Species of street trees shall be determined Millcreek.
2. Wasatch Boulevard streetscape shall be installed substantially as depicted in the Exhibit E in MKZ 19.62A.050.
3. Streetlights. The project shall include street lighting as approved by the City Engineer.

I. Signs

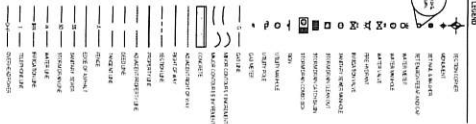
1. Automobile Sales
 - a. Ground Signs. The automobile sales use may be allowed one ground sign, not to exceed eight 32 sf in area and 8 feet in height.
 - b. Wall signs. The automobile sales use may be allowed up to one sign on the east and west facades, each sign not to exceed 132 sf in area. Wall signs must consist of logos or individual pan channel letters.
 - c. Design. The design and locations of the signs shall be substantially as depicted in the Exhibit F in MKZ 19.62A.050.
2. Village Retail and Restaurant. Signage is limited to wall signs.
3. Mixed Use. Signage is limited to wall signs.
4. District Ground Sign. One additional ground sign is allowed for the Olympus Hills West VCSD, for the purposes of identifying and branding the district itself. The ground sign may not exceed 64 sf in area and may be eight (8) feet in height.
5. General Requirements.
 - a. Wall signs must consist of logos or individual pan channel letters.
 - b. Any sign not expressly listed in this section is prohibited.
 - c. Temporary signage is prohibited, except for A-frame signs serving the village retail and restaurant uses.

6. Comprehensive Sign Plan Required. Any application for a development agreement approval of a future phase of development shall be accompanied by a complete comprehensive sign plan showing the location and sign type of all proposed signs. The comprehensive sign plan shall also include conceptual renderings of each sign.

19.62A.040 Minimum Lot Size and Land Lease Size

Except for residential and commercial condominiums, the minimum lot size for any development or any land lease in the Olympus Hills West VCSD shall be 1.5 acres.

19.62A.050 Exhibits

[illegible]

BAM 4074 PROPERTY
ALTA / ASCM LAND TITLE SURVEY
3865 SOUTH WASATCH BLVD
SALT LAKE CITY, UTAH



ALTA/ACSM
LAND TITLE
SURVEY

①

[illegible]

**JOHN MAHONEY
ARCHITECT**
950 W. ELLIOT ROAD #108
TEMPE, ARIZONA 85284
P 482.345.8457 F 482.345.1759

**PRELIMINARY ONLY
NOT FOR CONSTRUCTION**

[illegible]

The diagram shows a plan view of a road intersection. A vertical line represents the 'EXISTING ROAD'. A horizontal line represents the 'PROPOSED ROAD'. The intersection is labeled 'INTERSECTION'. To the left of the intersection, there are two circular features labeled 'CIRCULAR DRIVE' and 'CIRCULAR DRIVE'. To the right, there are labels for 'MAIN ROAD' and 'PROPOSED ROAD'. Dimensions include '10m' for the width of the existing road, '10m' for the width of the proposed road, and '10m' for the radius of the circular drives.

[illegible]

A100

Exhibit C: Automobile Sales Building Materials

03 Planning Essentials

/ Scenographic Concept
/ Materials

Exterior Materials



- E 01** Asphalt

➤ Parking lot, driveway

Product/Colour Black

Note Fine-grained surface of topmost cover layer for uniform appearance with clean seams
- E 01.1** Pavers

➤ Parking lot, driveway

Product/Colour Dark grey

Note Pavers with narrow joints
- E 02** Pre-cast concrete block pavers

➤ Pre-owned car presentation

Product/Colour Dark grey
- E 03** Grass pavers

➤ Parking lot

Product/Colour Dark grey

Note Not for customer parking areas
- E 04** Sandwich panel

➤ Showroom facade

Product/Colour Aluminum or steel panels, white aluminum RAL 9006

Note Panel side ratio of 1:3 (height to width)
- E 05** Perforated panel

➤ Canopy facade

Product/Colour Perforated aluminum or steel sheet, white aluminum RAL 9006

Note Panel side ratio of 1:3 (height to width), powder-coated steel sheet cartridges with non-perforated surrounding edge (5 cm wide), hole pattern Rv S-R (per DIN 24041)
- E 06** Sandwich panel

➤ Entrance pylon

Product/Colour Aluminum or steel sandwich panels, traffic white RAL 9016
- E 15** Sandwich panel ¹

➤ Workshop facade

Product/Colour Aluminum or steel panels, black grey RAL 7021

Note Panel side ratio of 1:3 (height to width), Half height of panels used for showroom facade

¹ product alternative for workshop facade cladding

- E 07** Trapezoidal sheet

➤ Underside of workshop canopy

Product/Colour Trapezoidal aluminum or steel sheet, grey aluminum RAL 9007
- E 08** Trapezoidal sheet

➤ Workshop facade

Product/Colour Trapezoidal aluminum or steel sheet, black grey RAL 7021, matt

Note Type SP 45/150, 0.8 mm, symmetrical, crease height 45 mm, horizontally mounted, all visible fasteners and necessary covers RAL 7021
- E 09** Coated steel

➤ Construction elements in general

Product/Colour Steel beams and supports, entrance facade stick system elements, painted, grey aluminum RAL 9007, matt
- E 10** Coated steel, aluminum

➤ Facade entrance panels

Product/Colour Lamella bottom profile coated or anodized, white aluminum RAL 9006
- E 11** Coated steel, aluminum or plastic

➤ Entrance facade, doors, gates, fences

Product/Colour Facade knife B side blades, profile covers, Steel, aluminum or plastic, painted, black grey RAL 7021, matt
- E 12** Clear glass

➤ Showroom

Product/Colour Clear glass adapted to local climate conditions, without mirroring, with silicone joints, vertical cover strips on horizontal floor cover strips in black grey RAL 7021, matt

Note Frameless mounting height of glazing 3.0 m
- E 13** Clear glass door

➤ Showroom

Product/Colour Door profiles in black grey RAL 7021

Note Climatic conditions must be taken into consideration, implementation as automatic door possible
- E 14** Clear glass window

➤ Workshop

Product/Colour Frames and profiles, aluminum, plastic in black grey RAL 7021, matt



Exhibit C: Automobile Sales Building Materials

04 Detailed Planning

/ Structural Concept
/ Facade

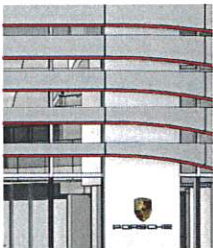
Facade

The new facade is one of the most recognizable features of Destination Porsche. The design of the aluminum lamellas has been inspired by renowned Porsche vehicle design.



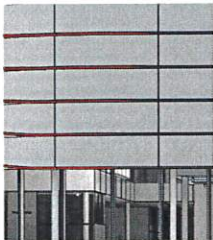
Facade Types

Entrance Facade



- Full-storey steel stick system
- Mullion spacing: 1.50 m
- Glass dimensions: max. 1.50 m x 3.00 m
- 100% vision glass infill
- External lamella features
- Composed of 5-6 rows
- Aluminum sandwich panel
- Coated RAL 9006
- Integrated LED lighting strip
- Lamella proportions
- Typical Lamella 3.00 m x 1.00 m
- Vertical joint spacing 20 mm

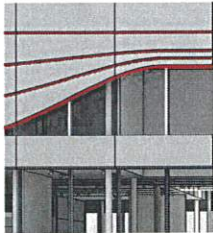
Storefront Facade



- Bottom area
- Steel stick system
- Mullion spacing: 1.50 m
- Vision glass infill
- Glass dimensions: max. 1.50 m x 3.00 m

- Upper area
- Insulated rainscreen with aluminum sandwich cladding
- Coated RAL 9006
- Integrated LED lighting in the first Column of rainscreen panels
- Rainscreen proportions
- Typical Panel 3.00 m x 1.00 m
- Vertical joint spacing 20 mm
- Horizontal joint spacing 80 mm

Glimpse

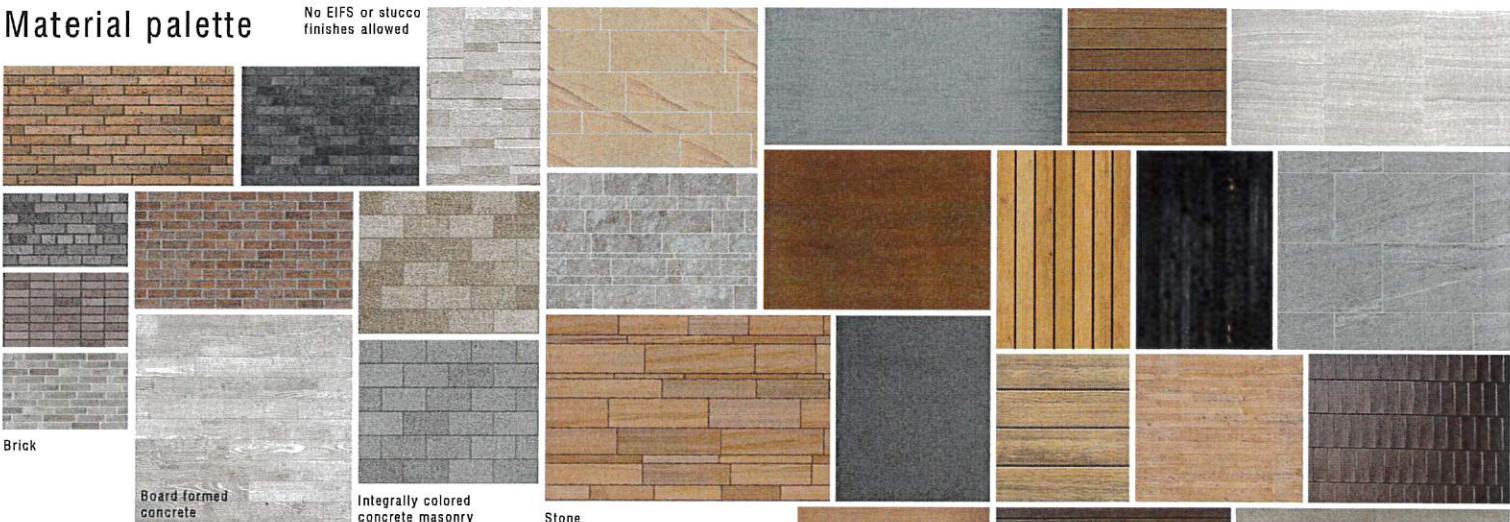


- Glazed stick system facade integrated in rainscreen system of Storefront Facade
- Steel stick system
- Mullion spacing: 1.50 m
- Vision glass infill
- Glass dimensions: max. 1.50 m x 3.00 m
- Aluminum sandwich cladding in rainscreen areas, curved in elevation
- Coated RAL 9006
- Integrated LED lighting strip
- Vertical joint spacing 20 mm
- Horizontal joint spacing 80 mm

For more information about the facade see Design Manual – Facade Planning & Construction.

Exhibit D: Materials and Colors for Village Retail, Office, and Multifamily Buildings

Material palette

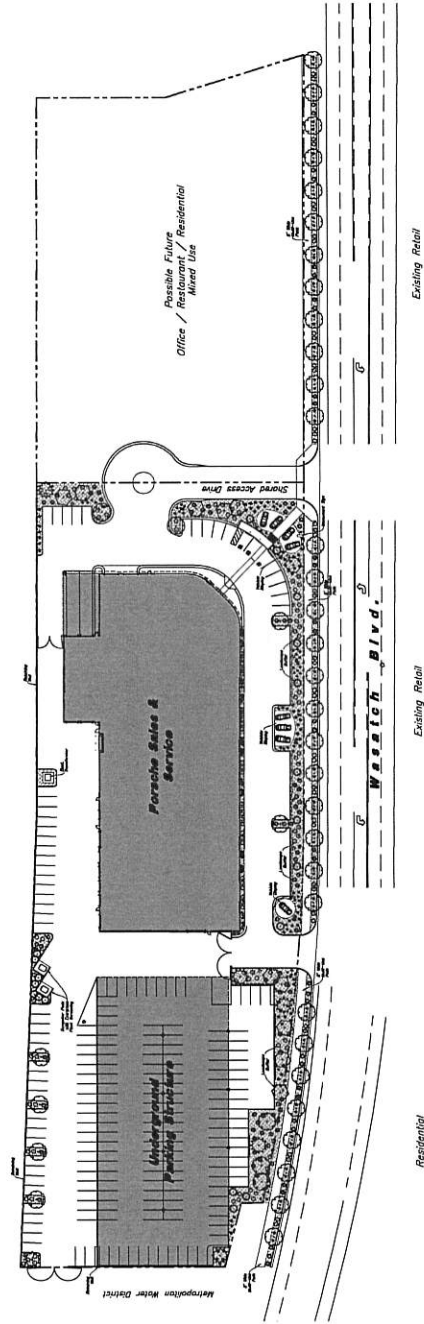


Color palette



Glass

Scale: 1" = 10'

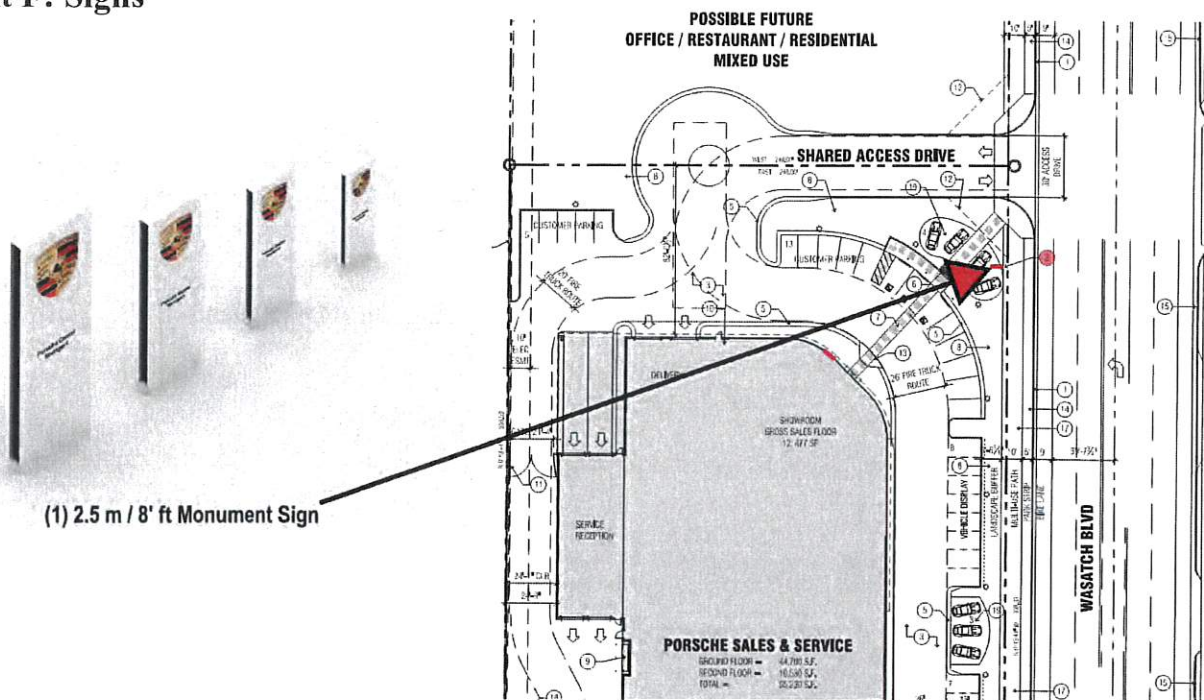
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	DECIDUOUS TREE (1" shown)
	CACTI TREE (10" x 1' AL)
	CONICAL TREE (1' / 2" canopy)
	DECIDUOUS SHRUB (2' shown)
	CONICAL SHRUB (1' shown)
	PERENNIAL (1' shown)
	CACTI SHRUB (2' shown)

Site Area = 174,241 s.f. (4.0 ac.)
Onsite Landscape Area Provided = 16,746 s.f. (10%)
Offsite Landscape Area Provided = 5,312 s.f.
1 Street Tree per 30 Lf.
75% Plant Coverage After 3 Years of Growth
40% Evergreen Shrubs and Trees

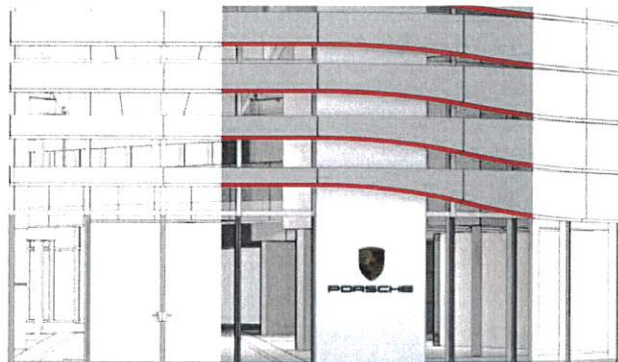
Exhibit F: Signs



(1) 2.5 m / 8' ft Monument Sign



100' SF Channel Lettering Sign



32' SF Wall Sign

