Recommended Earth Pressures for Cantilever Soldier Pile Wall (Not to Scale)

Notes:
1. The soldier pile wall is assumed to be flexible, such that the wall will be capable of 1 to 2 inches of displacement, or more, during the design seismic event.
2. All earth pressures are in units of pounds per square foot (psf).
3. All earth pressures are nominal (i.e., unfactored). Passive earth pressures should be reduced by a resistance factor based on the limit state. Per the WSDOT GDM, the WSDOT BDM, and AASHTO, we recommend resistance factors of 0.75 for the Strength Limit State and 1.0 for the Service and Extreme Event Limit States.
4. Above the bottom of excavation, active pressures are assumed to act over the pile spacing. Below the bottom of excavation, active pressures are assumed to act over the pile width/diameter.
5. Passive resistance for the upper 2 feet should be ignored. Passive resistance should be applied over 3 times the width/diameter of the piles of the spacing of the piles, whichever is smaller.
6. Design permanent timber lagging for 60% of lateral earth pressure.
7. Design facing to account for soil arching in accordance with AASHTO LRFD BDS (2020) Section 11.8.5.2.
8. Surcharge loading should be added to the active pressures, where appropriate. See Figure 2.
9. Earth pressures assume drained conditions behind the wall to the bottom of excavation, such that hydrostatic groundwater pressures are assumed balanced behind and in front of the wall beneath the bottom of excavation.
10. Wall embedment, D, should consider kickout resistance. Embedment should be determined by satisfying horizontal static equilibrium about the bottom of the pile. Minimum recommended embedment is 1.5 to 2 times the total height of the exposed wall, H, for cantilever walls.
11. Seismic earth pressures include the static earth pressure component.
12. We recommend the following nominal vertical soldier pile resistance below bottom of wall:
   - Side Resistance of Peat = 0.25ksf
   - Side Resistance of Recessional and Advance Outwash = 2ksf
   - Base Resistance of Recessional and Advance Outwash = 50ksf (after loose/disturbed soil at bottom of hole is removed)
   Resistance factors of 0.55 and 0.50 should be applied to side and base resistance, respectively.
13. The earth pressures assume that lagging will be placed down to an elevation of 327ft and backfilling to a final elevation of 329ft in front of the wall will be completed before backfill placement behind the wall.
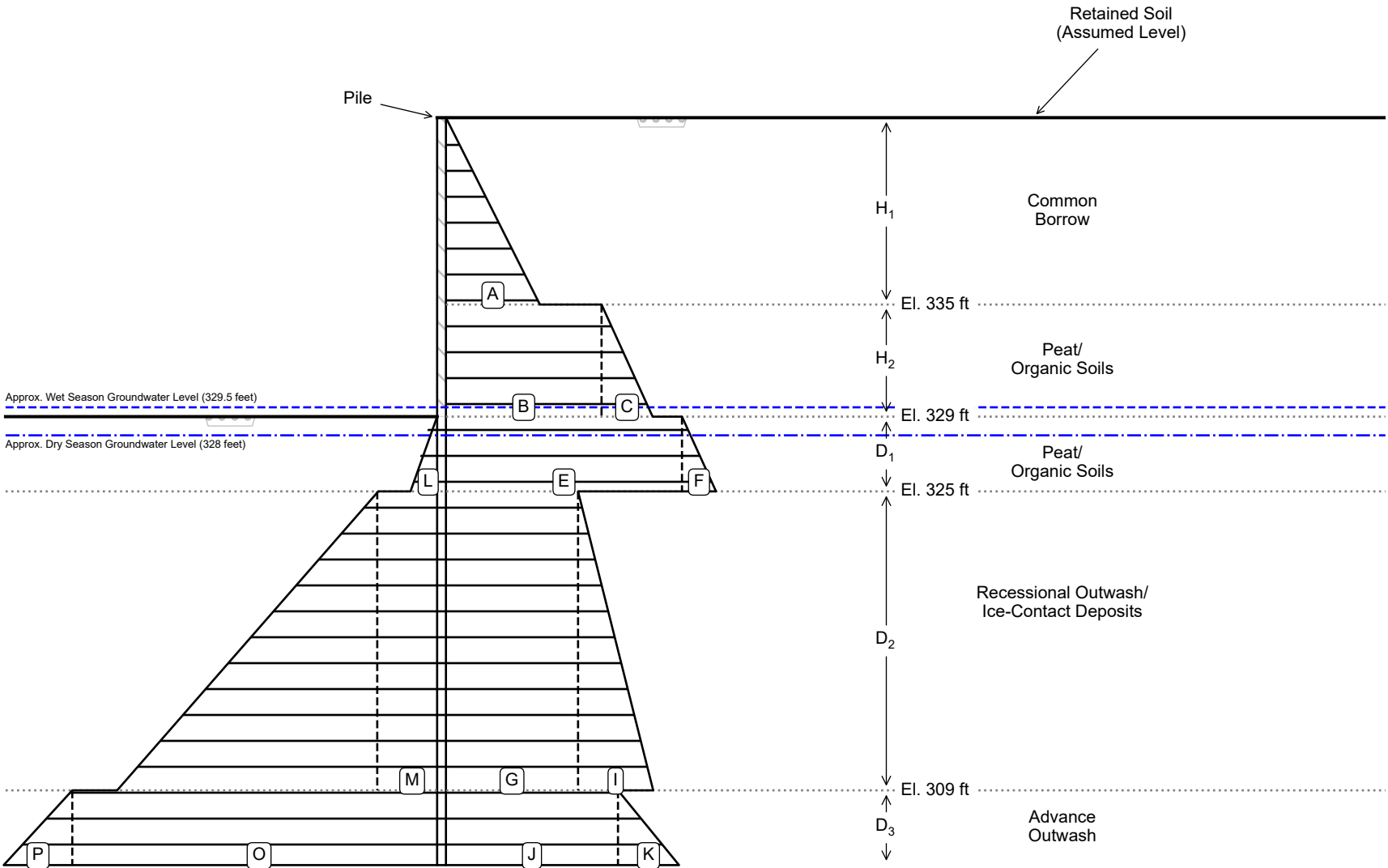
LEGEND

H_1	Height of Exposed Wall Above El. 335 ft (feet)
H_2	Height of Exposed Wall Below El. 335 ft (feet)
D_1	Embedment Below El. 329 ft (feet)
D_2	Embedment Below El. 325 ft (feet)
D_3	Embedment Below El. 309 ft (feet)
A, B, C, E, F...	Earth Pressure Factors
ODE	Operating Design Earthquake
MDE	Maximum Design Earthquake

Letter	Static	Seismic ODE	Seismic MDE
A	$32H_1$	$56H_1$	$73H_1$
B	$53H_1$	$88H_1$	$127H_1$
C	$38H_2$	$63H_2$	$92H_2$
E	$53H_1+38H_2$	$88H_1+63H_2$	$127H_1+92H_2$
F	$38D_1$	$63D_1$	$92D_1$
G	$29H_1+21(H_2+D_1)$	$52H_1+38(H_2+D_1)$	$68H_1+49(H_2+D_1)$
I	$16D_2$	$28D_2$	$37D_2$
J	$25H_1+18(H_2+D_1)+14D_2$	$46H_1+33(H_2+D_1)+25D_2$	$60H_1+43(H_2+D_1)+33D_2$
K	$13D_2$	$23D_2$	$30D_2$
L	$194D_1$	$194D_1$	$194D_1$
M	$370D_1$	$370D_1$	$370D_1$
N	$278D_2$	$278D_2$	$278D_2$
O	$420D_1+316D_2$	$420D_1+316D_2$	$420D_1+316D_2$
P	$292D_3$	$292D_3$	$292D_3$

Sound Transit
Operations & Maintenance Facility South
Federal Way, Washington

LATERAL EARTH PRESSURES FOR SOLDIER PILE WALL DESIGN WALL 336SW AND 336SE

April 2024   21-1-30130-301