NOVEMBER 2019
CITY OF SEATTLE

WA12 N NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION

TASK 6 WALL REPLACEMENT CONCEPT DESIGN -

FINAL

COWI

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COWI PROJECT NO.	DOCUMENT NO.
A085303-013	Task 6

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
0	November 2019	Draft	BNKN	PWG	PWG
1	November 2019	Final	BNKN	PWG	PWG
2	**November 2019**	**Final**	**BNKN**	**PWG**	**PWG**

INTRODUCTION

The included deliverables have been developed to satisfy WA12 N Northlake Way Wall Replacement Alternative Evaluation, Task 6 – Wall Replacement Concept Design.

The work shown herein builds upon Task 4 – Wall Alternatives Evaluation phase of the Project (see N Northlake Way Wall Replacement - Alternatives Evaluation Final Report, dated November 2019, prepared by COWI). During the alternatives analysis phase, three alternative concepts were evaluated at a preliminary level for comparison. As a result of that analysis, the City of Seattle and COWI have recommended Alternative 3 – Ground Improvement for advancement in Task 6.

The included deliverables provide a further level of detail for cost estimation and design drawings for a ground improvement (deep soil mixing) design concept to be installed along N Northlake Way in Seattle, WA. The work also includes preliminary utilities plans based on work as described in Work Authorization 12 Amendment 3, performed by SG3 Strategies.

The following table describes key differences between the cost estimate that was developed for "Alternative 3 – Ground Improvement" shown in Task 4 – Wall Alternatives Evaluation, and the cost estimate included in this submittal for Task 6:

COST ESTIMATE BASIS	TASK 4 WALL ALTERNATIVES EVALUATION *(PREVIOUS REPORT)*	TASK 6 WALL REPLACEMENT CONCEPT DESIGN *(THIS SUBMITTAL)*
Cost Estimate Purpose	Cost estimates were developed for the purpose of comparing evaluated alternatives, and selecting a preferred alternative.	The cost estimate included here was generated for the more detailed design that has been developed for this Project Task.
Design Development	Cost estimates reflected an approximately 1 - <10% design level (all alternatives). Generally speaking, only major items were defined, quantified, and cost estimated.	Cost estimate reflects approximately 10% design level. More minor items have been defined and cost estimated compared to the Task 4 estimate.
Quantity Basis	Preliminary designs were developed for each alternative/variant considered, at the worst location along wall (i.e., location of deepest glacial till). The quantities for construction items (e.g., pounds of structural steel, volume of ground improvement, etc.) for those "worst-case" cross section were then determined. Project total construction costs were then determined as if the "worst-case" cross section design were applied for the complete wall limits.	The elevation of till and mudline both vary along the existing wall length. Therefore, the Task 6 Wall Replacement Concept Design can be varied along the limits of the wall. The cost estimate included here reflects the varying cross-section of the replacement concept design that is shown.
Unit Prices	Unit prices were generally taken from the rough guidelines listed in the WSDOT Bridge Design Manual, Appendix 12.3-A Structural Estimating Aids, or assumed.	Where possible, unit prices were developed with WSDOT Unit Bid Analysis (UBA), or SDOT input (for Seattle projects) for representative work items required for the concept design shown.

Included Exhibits:

Exhibit A Concept Level Rough-Order-of-Magnitude (ROM) Cost Estimate

Exhibit B Final Concept Level Plans (9 Sheets)

EXHIBIT A Concept Level Rough-Order-of-Magnitude (ROM) Cost Estimate

Exhibit A: Concept Level ROM Cost Estimate - Deep Soil Mixing Ground Improvement

No.	Item	Unit of Measure	Unit Cost	Total Qty	Line Cost	Explanation
(1)	Traffic Control	LS	50,000	1	$ 50,000	*COST - assume $50,000 for traffic control*
(2)	Remove Existing Wall	SF	30	6,500	$ 195,000	*ITEM - remove ex piles, lagging, tie rods, and deadmen (qty is exposed SF of wall face in existing condition); COST - assumed*
(3)	Dispose Ex Creosote Timber Wall	TON	50	110	$ 5,500	*ITEM - disposal cost of existing, creosote timber wall; COST - assumed*
(4)	Remove and Dispose Existing Boardwalk	SF	10	2,000	$ 20,000	*ITEM - remove and dispose existing boardwalks along buildings; COST - assumed*
(5)	Remove Existing Pavements	SF	5	26,000	$ 130,000	*ITEM - remove and dispose all surface pavement type items (roadway, sidewalks, curbs, etc.); COST - assumed*
(6)	Temporary Shoring Piles - Furnish	LF	35	700	$ 24,500	*ITEM - furnish temporary steel shoring piles at broken ex piles; COST - WSDOT BDM App 12.3-A2 for Furnish Steel Pile HP12x53*
(7)	Temporary Shoring Piles - Install	EA	550	40	$ 22,000	*ITEM - install temporary steel shoring piles at broken ex piles; COST - WSDOT BDM App 12.3-A2 for Drive Steel Piles (40'-70' Lengths), avg cost*
(8)	Temporary Shoring Wall	SF	35	3,300	$ 115,500	*ITEM - temp shoring around excavation; QTY - includes min 4' around entire perimeter; COST - SDOT/COWI project experience*
(9)	Excavation	CY	50	5,600	$ 280,000	*ITEM - excavation behind existing retaining wall; COST - SDOT project experience*
(10)	Granular Fill	CY	95	3,600	$ 342,000	*ITEM - place and compact granular fill in excavation; COST - SDOT project experience*
(11)	Reinf Fill (Geogrid Wrapped)	CY	140	1,900	$ 266,000	*ITEM - geogrid-wrapped fill behind cutoff wall; COST - UBA of 4025 Gravel Borrow for Str Earth Wall Incl Haul AND 7552 Const Geosynthetic*
(12)	Deep Soil Mixing Specialty Mobilization	LS	175,000	1	$ 175,000	*ITEM - additional mobilization cost of a specialty ground improvement contractor; COST - COWI project experience*
(13)	Deep Soil Mixing Ground Improvement	CY	300	6,800	$ 2,040,000	*ITEM - installation and spoils cleanup of installed DSM; COST - COWI project experience*
(14)	Deep Soil Mixing - Soil Haul	TON	60	12,000	$ 720,000	*ITEM - haul of removed soils from DSM installation; COST - COWI project experience*
(15)	Steel Sheet Pile Cut-Off Wall - Furnish	LB	1.50	640,000	$ 960,000	*ITEM - furnish st sheet pile for cut-off wall, including coatings; COST - UBA for Item 4090, WSDOT BDM App 12.3-A2 for Furnish Steel Piling (HP12x53)*
(16)	Steel Sheet Pile Cut-Off Wall - Install	EA	550	210	$ 115,500	*ITEM - install sheet pile cut-off wall; COST - WSDOT BDM App 12.3-A2 for Drive Steel Piles (40'-70' Lengths), avg cost*
(17)	Sheet Pile CIP Reinf Concrete Cap	LF	470	480	$ 225,600	*ITEM - 3'-wide x 2'-deep CIP cap along sheets; COST - using WSDOT BDM App 12.3-A3 Superstructure costs - $1400/CY for conc and $1.75 for reinf*
(18)	Concrete Fascia Panel - Furnish & Install	SF	50	2,400	$ 120,000	*ITEM - install sheet pile cut-off wall; COST - WSDOT BDM App 12.3-A2 for Concrete Fascia Panel (high estimate)*
(19)	Restored Pavements	SF	15	25,000	$ 375,000	*ITEM - install restored surface pavement type items (roadway, sidewalks, curbs, etc.); COST - assumed*
(20)	Restored Boardwalk - Furnish & Install	SF	330	2,600	$ 858,000	*ITEM - install restored boardwalk along existing buildings/piers; COST - WSDOT App 12.3-A1 for "Reinforced Concrete Flat Slab", High Cost*
(21)	New Cantilever SW - Furnish & Install	SF	330	590	$ 194,700	*ITEM - install new cantilever boardwalk to restore lost area @ finished grade due to new wall setback; COST - same as "Restored Boardwalk"*
(22)	Construction Dewatering Allowance	LS	200,000	1	$ 200,000	*ITEM - temporary ground-/stormwater drainage out of excavation during construction; COST - asssumed allowance*
(23)	Temporary Utility Support	LF	120	480	$ 57,600	*ITEM - furnish and install temp utility support along ex timber wall; COST - from assumed design of steel HP wale section and utility supports @ 8'-O.C.*
(24a)	PSE Utility - Gas Relo. and Rest.	LS	-	1	$ -	*All costs belong to the provider; see Utilities Report.*
(24b)	Century Link Utility - Comm. Relo & Rest.	LS	-	1	$ -	*All costs belong to the provider; see Utilities Report.*
(24c)	Comcast Utility - Comm. Relo & Rest.	LS	-	1	$ -	*All costs belong to the provider; see Utilities Report.*
(24d)	SCL Utility - Power Temp Relocation	LS	211,000	1	$ 211,000	*See Utilities Report.*
(24e)	SCL Utility - Power Restoration	LS	299,500	1	$ 299,500	*See Utilities Report.*
(24f)	SPU Utility - Water Temp Relocation	LS	266,000	1	$ 266,000	*See Utilities Report.*
(24g)	SPU Utility - Water Restoration	LS	230,000	1	$ 230,000	*See Utilities Report.*
(24h)	SPU Utility - Sewer Temp Relocation	LS	158,000	1	$ 158,000	*See Utilities Report.*
(24i)	SPU Utility - Sewer Restoration	LS	269,000	1	$ 269,000	*See Utilities Report.*
(24j)	SDOT - Storm Drainage Relocation	LS	-	1	$ -	*Temporary addressed by TESC plan; see Utilities Report.*
(24k)	SDOT - Storm Drainage	LS	183,750	1	$ 183,750	*See Utilities Report.*
(25)	Mobilization				$ 920,000	*10% of sum of items (1) through (24k)*
(26)	Allowance for Undefined Items				$ 4,100,000	*40% of sum of items (1) through (25)*
(27)	**Total Construction Cost**				**$ 14,200,000**	***sum of items (1) through (26)***

NOTES:

1. Cost estimates are based on 2019 dollars and a 10% level of design definition.

2. The costs presented herein were prepared for guidance in project evaluation and facility planning. Actual long-term and construction costs will differ from the costs shown. Final project costs are dependent upon many variable factors including, but not limited to, labor and material costs, site conditions, productivity, competitive market conditions, final project scope, and the contractor's implementation schedule.

Exhibit A: Concept Level ROM Cost Estimate - Deep Soil Mixing Ground Improvement

NOTES (continued):

3. The costs shown do not include:
   - > financing
   - > operation and maintenance (O&M) costs
   - > sales taxes
   - > environmental mitigation costs (if needed)
   - > contaminated soil characterization, handling, or disposal
   - > engineering costs
   - > construction contingency
   - > construction engineering
   - > right-of-way cost
   - > escalation
   - > decomissioning and removal of existing underground storage tanks
   - > groundwater drainage system for permanent conditions

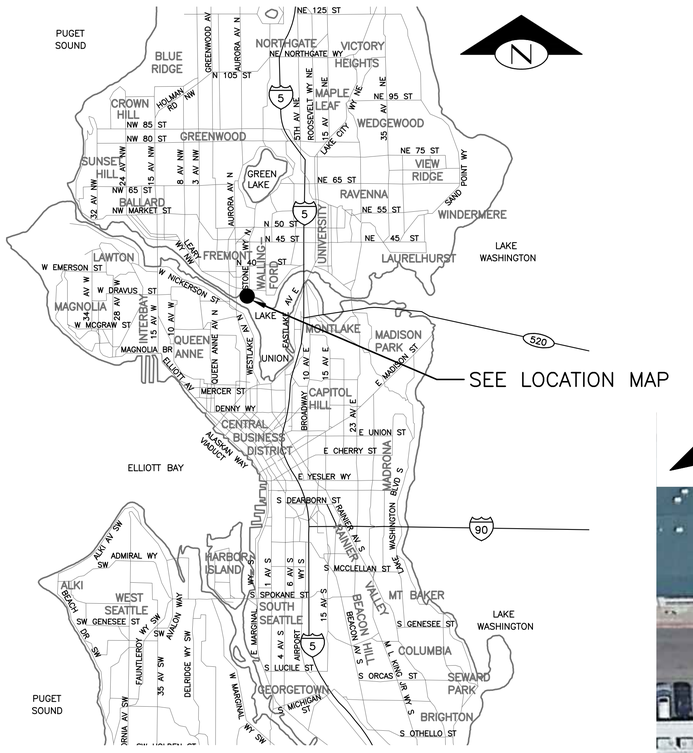
4. For detailed utility cost backup and explanation, see Utilities Report (dated Nov 2019 and prepared by SG3 Strategies, LLC) - included as Appendix D to N Northlake Way Retaining Wall - Alternatives Analysis Report. The costs shown above are the associated line item subtotals stated in that report, for a given utility owner and phase of construction.

5. As noted, unit costs were developed based on results of WSDOT Unit Bid Analysis (UBA) for representative items of the work noted (accessed online), or based on WSDOT Bridge Design Manual (BDM) Appendix 12.3-A Structural Estimating Aids, or previous COWI project experience, or assumed.

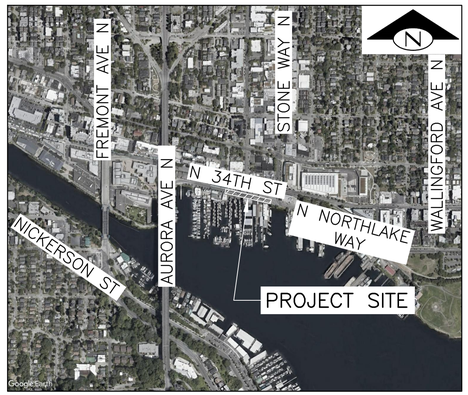
6. See the drawing set "NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION - WALL REPLACEMENT CONCEPT DESIGN", prepared by COWI and dated November 2019 for design drawings used to develop this cost estimate (included as Exhibit B to the WA12 Task 6 deliverable).

EXHIBIT B Final Concept Level Plans (9 Sheets)

NORTH NORTHLAKE WAY WALL REPLACEMENT
ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN



VICINITY MAP
SCALE: NTS



PROJECT LOCATION MAP
SCALE: NTS

PROJECT LOCATION MAP DETAIL
SCALE: NTS

SHEET INDEX		
SHEET NO.	DWG NO.	TITLE
1	G-001	COVER SHEET, VICINITY AND LOCATION MAP, SHEET INDEX
2	G-002	GENERAL AND STRUCTURAL NOTES SHEET 1 OF 2
3	G-003	GENERAL AND STRUCTURAL NOTES SHEET 2 OF 2
4	S-001	EXISTING CONDITIONS
5	S-002	EXISTING CONDITIONS – REFERENCE PHOTOGRAPHS
6	S-101	PROPOSED PLAN
7	S-201	PROPOSED SECTIONS
8	CU-101	TEMPORARY UTILITIES
9	CU-102	PROPOSED UTILITIES

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

COVER SHEET, VICINITY AND LOCATION MAPS, SHEET INDEX

COWI

APPROVED FOR ADVERTISING
LIZ ALZEER
DEPARTMENT OF FINANCE & ADMINISTRATIVE SERVICES
SEATTLE, WASHINGTON . . . . . 20 . . .
BY: . . . . . .
CITY PURCHASING & CONTRACTING SERVICES DIRECTOR

INITIALS AND DATE	INITIALS AND DATE
DESIGNED BNKN	REVIEWED:
CHECKED PWG	DES. CONST.
	SDOT PROJ. MGR.
DRAWN KNBR	RECEIVED
CHECKED BNKN	REVISED AS BUILT

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL.

PAUL W. GUERTSEN — STATE OF WASHINGTON — 23928 — PROFESSIONAL ENGINEER

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
G-001
SHEET 1 OF 9

VAULT SERIAL NO.	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

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Nov-27-19 2:40pm

CODES AND STANDARDS:

1. ALL MATERIALS, WORKMANSHIP, AND CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF THE CITY OF SEATTLE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, LATEST EDITION, THE CITY OF SEATTLE STANDARD PLANS FOR MUNICIPAL CONSTRUCTION, LATEST EDITION, AND THE CITY OF SEATTLE RIGHT OF WAY IMPROVEMENTS MANUAL, LATEST EDITION. A COPY OF THESE DOCUMENTS SHALL BE MAINTAINED ONSITE DURING CONSTRUCTION.
2. THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION.
3. REINFORCED CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF "SPECIFICATIONS FOR STRUCTURAL CONCRETE (ACI 301-10) AND "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" (ACI 318), LATEST EDITION.
4. STRUCTURAL STEEL AND MISCELLANEOUS STEEL FABRICATION AND ERECTION SHALL CONFORM TO THE "AISC STEEL CONSTRUCTION MANUAL" LATEST EDITION.
5. WELDING OF STRUCTURAL AND MISCELLANEOUS STEEL SHALL CONFORM TO THE LATEST EDITION OF "STRUCTURAL WELDING CODE – STEEL" (AWS D1.1).
6. WELDING OF REINFORCING STEEL SHALL CONFORM TO THE LATEST EDITION OF "STRUCTURAL WELDING CODE – REINFORCING STEEL" (AWS D1.4)
7. IN THE CASE OF OVERLAPPING OR CONFLICTING REQUIREMENTS, THE MORE STRINGENT CODE, STANDARD, OR REQUIREMENT SHALL APPLY.

DEMOLITION:

1. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTAIN DEMOLITION WITHIN THE LIMITS OF THE WORK SHOWN AND PREVENT DAMAGE TO PRIVATE PROPERTY AND EXISTING STRUCTURES TO REMAIN. SUPPLY, INSTALL, AND MAINTAIN DEBRIS CONTAINMENT AND FLOATING DEBRIS BOOMS AT ALL TIMES AS REQUIRED BY THE PROJECT PERMITS. REMOVE DEBRIS AND MATERIALS THAT FALL INTO THE WATER THAT SAME DAY.
2. PRIOR TO DEMOLITION, PROVIDE SAWCUTS WHERE NOTED OR OTHERWISE IF NEEDED TO PROVIDE A SMOOTH, CLEAN BREAK FROM ALL INTERFACES WITH EXISTING PAVEMENTS OR STRUCTURES TO REMAIN.
3. DAMAGE INCURRED IN THE EXECUTION OF THIS CONTRACT TO ANY PART OF THE PROPERTY, STRUCTURES, OR UTILITIES NOT SPECIFICALLY DESIGNATED FOR DEMOLITION OR REMOVAL SHALL BE REPAIRED, REPLACED, AND/OR RECONSTRUCTED BY THE CONTRACTOR, AT ITS OWN EXPENSE, TO THE PREDISTURBED CONDITIONS.
4. REMOVE AND DISPOSE OF ALL DEMOLISHED MATERIAL EXCEPT AS NOTED FOR MATERIAL TO BE RE-USED OR TURNED OVER TO THE CITY. REMOVAL, HANDLING AND DISPOSAL OF ALL DEMOLITION MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS AND PERMIT REQUIREMENTS.
5. REMOVE EXISTING PILING WHERE SHOWN AND WHERE REMOVAL IS REQUIRED FOR NEW CONSTRUCTION. UNLESS OTHERWISE SHOWN, EXISTING PILING TO BE REMOVED SHALL BE CUT AT EXISTING MUDLINE.

EXISTING CONDITIONS:

1. EXISTING CONDITIONS SHOWN IN THE PLANS ARE NOT COMPREHENSIVE AND DO NOT REFLECT ALL CONDITIONS ANTICIPATED TO BE ENCOUNTERED WITHIN THE PROJECT WORK AREA.
2. SURVEYING – EXISTING CONDITIONS SHOWN ARE PRELIMINARY AND TAKEN FROM OWNER-PROVIDED BASEMAP (TRC0314_X-BASE.DWG).
3. THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS AND SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES IDENTIFIED BETWEEN THE EXISTING SITE CONDITIONS AND CONDITIONS SHOWN IN THE PLANS THAT MAY IMPACT THE WORK.

4. REFERENCE AS-BUILT DRAWINGS FOR THE EXISTING WALL ARE AVAILABLE FROM THE CITY OF SEATTLE. THE CONTRACTOR SHALL REVIEW THE REFERENCE DRAWINGS AND SHALL FIELD VERIFY EXISTING CONDITIONS SHOWN ON THE PLANS PRIOR TO CONSTRUCTION.
5. THE CONDITION OF THE EXISTING WALL VARIES, AND IS SEVERELY DETERIORATED AT SOME LOCATIONS. CONTRACTOR SHALL FIELD VERIFY CONDITION OF EXISTING WALL PRIOR TO CONSTRUCTION, AND SHALL INSTALL TEMPORARY PILE REPAIRS OR TEMPORARY SHORING PILES AS REQUIRED IN ORDER TO MAINTAIN EXISTING WALL STABILITY DURING ALL STAGES OF DEMOLITION, REMOVAL, AND NEW CONSTRUCTION.

UTILITIES:

1. POTHOLING AND DETAILED SURVEYING OF UTILITIES HAS NOT BEEN DONE. UTILITY LOCATIONS SHOWN ARE ESTIMATES AND ARE BASED ON OWNER-PROVIDED BASEMAP (TRC0314_X-BASE.DWG) AND LIMITED PRELIMINARY FIELD OBSERVATION. CONTRACTOR SHALL FIELD VERIFY LOCATIONS PRIOR TO ANY SUBSURFACE CONSTRUCTION AND NOTIFY ENGINEER OF ANY DIFFERENCE FROM INFORMATION SHOWN ON PLANS.
2. SEE UTILITIES REPORT PREPARED BY SG3 AND DATED NOVEMBER 2019 FOR ADDITIONAL DETAILS OF EXISTING, TEMPORARY, AND PROPOSED UTILITIES.

DATUM:

1. VERTICAL DATUM: NAVD 88 DATUM.
2. HORIZONTAL DATUM: TBD.
3. WATER LEVEL: LAKE UNION WATER ELEVATION CONTROLLED BY HIRAM CHITTENDEN LOCK AND SPILLWAY COMPLEX. WATER LEVEL TYPICALLY VARIES BETWEEN +16.8'-NAVD 88 TO +18.8'-NAVD 88.

DESIGN LOADS:

1. DEAD LOAD, D:

A. SELF-WEIGHT OF ALL STRUCTURAL MATERIALS, AND ALL PERMANENTLY ATTACHED OR PLACED FEATURES.

2. LIVE LOAD, L

A. APPLICABLE LIVE LOAD TO BE DETERMINED.

3. EARTH PRESSURES

3.1 DESIGN EARTH PRESSURES ARE BASED ON THE RECOMMENDATIONS OF "DRAFT GEOTECHNICAL REPORT – N NORTHLAKE WAY BULKHEAD SEATTLE, WA" PREPARED BY SEATTLE PUBLIC UTILITIES AND DATED 2015, AND UPDATED PER THE RECOMMENDATIONS PROVIDED IN "N NORTHLAKE WAY WALL REPLACEMENT – ALTERNATIVE EVALUATION FINAL REPORT", PREPARED BY COWI AND DATED NOVEMBER 2019.

3.2 HORIZONTAL EARTH PRESSURE, EH

SOIL TYPES	DRY UNIT WEIGHT, γ (PCF)	ACTIVE EARTH PRESSURE COEFFICIENT, Ka	PASSIVE EARTH PRESSURE COEFFICIENT, Kp
NATIVE FILL (NON-LIQUEFIED)	120	0.3	3.0
NATIVE FILL (LIQUEFIED)	120	1.0	0.0
GLACIAL TILL	140	0.2	4.6

* TABULATED VALUES ARE ESTIMATES OF IN-SITU SOIL PROPERTIES WITHOUT GROUND IMPROVEMENT.

3.3 NATIVE FILL AT SITE IS CONSIDERED LIQUEFIABLE UNDER THE SEISMIC DESIGN EVENT.

3.4 LIVE LOAD SURCHARGE, LS: 250 PSF-MINIMUM (NEED NOT BE COMBINED WITH OTHER LIVE LOADS).

SEISMIC DESIGN:

1. THE BASIS FOR SEISMIC DESIGN SHALL BE AASHTO LRFD 8TH EDITION, CONSIDERING A DESIGN EVENT WITH 7% PROBABILITY OF EXCEEDENCE IN 75 YEARS.
2. EARTHQUAKE PARAMETERS:

2.1 SITE CLASS: D (SITE CLASS F RECOMMENDED FOR FINAL DESIGN)

2.2 PEAK GROUND ACCELERATION AT ROCK (PGA_{ROCK}): 0.43.

2.3 SITE COEFFICIENT (F_{PGA}): 1.07.

2.4 DESIGN PEAK GROUND ACCELERATION (PGA): 0.46.

2.5 SEISMIC COEFFICIENT (k_H): 0.23.

3. SEISMIC DESIGN SHOULD CONSIDER:

3.1 LOADING EFFECTS RESULTING FROM LIQUEFICATION OF UNIMPROVED NATIVE FILL BEHIND AND IN FRONT OF WALL.

3.2 HYDRODYNAMIC LOADING EFFECT IN ACCORDANCE WITH "THE SEISMIC DESIGN OF WATERFRONT RETAINING STRUCTURES", US NAVY – NAVAL CIVIL ENGINEERING LABORATORY 1993.

3.3 SEISMIC EARTH PRESSURE AND HORIZONTAL INERTIAL FORCE DUE TO WALL MASS, AS APPLICABLE.

3.4 COMBINE INERTIAL AND KINEMATIC EFFECTS.

CONCRETE AND REINFORCING:

1. CAST-IN-PLACE CONCRETE: 5,000 PSI MIN. COMPRESSIVE STRENGTH AT 28 DAYS UNLESS OTHERWISE NOTED.
2. PRECAST CONCRETE (CONVENTIONALLY REINFORCED): 5,000 PSI MIN. COMPRESSIVE STRENGTH AT 28 DAYS.
3. THE 90-DAY CHLORIDE PERMEABILITY FOR CONCRETE MIXES USED SHALL NOT EXCEED 1000 COULOMBS WHEN TESTED IN ACCORDANCE WITH ASTM C1202.
4. NON-SHRINK GROUT SHALL BE PREPACKAGED MATERIAL CONFORMING TO ASTM C1107 AND HAVE A MINIMUM 7,000 PSI 7-DAY COMPRESSIVE STRENGTH.
5. EXPOSED CORNERS SHALL BE CHAMFERED TO ¾ INCH UNLESS NOTED OTHERWISE.
6. ROUGHENED CONCRETE SURFACES SHALL BE CLEANED AND ROUGHENED TO A MINIMUM ¼ INCH AMPLITUDE.
7. REINFORCING STEEL AND HEADED REINFORCING BARS: UNLESS NOTED OTHERWISE, REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A706 GRADE 60. REINFORCING HEADS SHALL CONFORM TO ASTM A970 AND CAPABLE OF DEVELOPING AT LEAST 125% OF THE YIELD STRENGTH OF THE BAR. UNLESS NOTED OTHERWISE, ALL REINFORCING SHALL BE EPOXY COATED (PER ASTM A775 AND D3963) OR HOT-DIP-GALVANIZED (PER ASTM A1094).

STRUCTURAL AND MISCELLANEOUS STEEL:

1. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING UNLESS OTHERWISE INDICATED:

STRUCTURAL ELEMENT	APPLICABLE MATERIAL SPECIFICATIONS
ROLLED WIDE FLANGE SHAPES	ASTM A992, GRADE 50
HP SHAPES, CHANNELS, ANGLES, PLATES, AND BARS	ASTM A572, GRADE 50
HOLLOW STRUCTURAL SHAPES (HSS)	ASTM A500, GRADE C WELDING OF HOLLOW STRUCTURAL SECTIONS SHALL BE PER AWS D1.1. HSS SHALL NOT BE USED FOR DYNAMIC LOADING CONDITIONS WITHOUT ADDITIONAL MINIMUM CVN REQUIREMENTS BEING SPECIFIED AND APPROVED.
HIGH STRENGTH BOLTS	ASTM F3125, GRADE A325, TYPE 1 WITH THREADS EXCLUDED FROM THE SHEAR PLANE, TWO HARDENED WASHERS, ASTM F436 TYPE 1, AND HEAVY HEX NUTS, ASTM A563 GRADE DH; EACH COMPONENT SHALL BE HOT-DIP ZINC-COATED PER ASTM F2329; NUTS SHALL BE LUBRICATED.
ANCHOR BOLTS AND RODS	ASTM F1554 HOT DIPPED GALVANIZED PER ASTM F2329 GRADE 36, 55, OR 105 AS SHOWN WITH RECOMMENDED NUTS AND WASHERS. BOLT GRADES WITH TENSILE STRENGTHS OVER 145KSI SHALL BE TESTED FOR EMBRITTLEMENT IN ACCORDANCE WITH ASTM A143.
HEADED STUDS	AWS D1.1, TYPE B
SHEET PILES	ASTM A6 AND A328 BUT FROM MATERIAL CONFORMING TO ASTM A572 OR A690 WITH A MINIMUM YIELD STRENGTH OF 50 KSI.

- WELDS SHALL BE MADE IN ACCORDANCE WITH AWS D1.1 USING FILLER METALS WITH 70KSI MINIMUM TENSILE STRENGTH. RETURN ALL WELDS AROUND CORNERS AND JOIN WITH ADJACENT WELDS. SEAL WELD ALL JOINTS UNLESS OTHERWISE SHOWN.
- ALL MEMBER SPLICES SHALL BE MADE WITH COMPLETE JOINT PENETRATION WELDS UNLESS OTHERWISE NOTED.
- UNLESS NOTED OTHERWISE, ALL PLATES SHALL HAVE A MINIMUM THICKNESS OF ½".
- UNLESS NOTED OTHERWISE, MINIMUM WELD SIZE SHALL BE ¼" FILLET WELD OR EQUIVALENT.
- HOT DIP GALVANIZE ALL STEEL WORK UNLESS OTHERWISE NOTED. HOT DIP GALVANIZING SHALL CONFORM TO ASTM A123, ASTM A153 OR ASTM F2329 AS APPLICABLE.
- THE ENDS OF ALL OPEN SECTIONS SHALL BE COMPLETELY SEALED WITH MINIMUM ¼" THICK CAP PLATES AND MINIMUM 3/16" RADIUS, ALL-AROUND FILLET WELDS.
- GRIND SHARP EDGES AND BURRS SMOOTH.

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

GENERAL AND STRUCTURAL NOTES SHEET 1 OF 2

STRUCTURAL AND GROUND IMPROVEMENT LEGEND:

- CONCRETE
- DEEP SOIL MIXING (DSM) GROUND IMPROVEMENT
- EXISTING BUILDING OUTLINE
- EXISTING GROUND
- GRANULAR BACKFILL
- PAVEMENT
- SELF-SUPPORTING CDF, MSE, OR GEOGRID WRAPPED FILL
- TIMBER

NOTED ABBREVIATIONS AND SYMBOLS:

ABBREVIATION/SYMBOL	DEFINITION
±	PLUS/MINUS (APPROXIMATE)
℄	CENTERLINE
APPROX	APPROXIMATE
CB	CATCH BASIN
CDF	CONTROLLED DENSITY FILL
CONC	CONCRETE
DSM	DEEP SOIL MIXING
EL, ELEV	ELEVATION
ETC	ET CETRA (AND OTHERS)
EX, EXIST	EXISTING
FT	FEET/FOOT
KIP	KILO-POUND (1,000 POUNDS)
KSI	KIPS-PER-SQUARE-INCH
LBS	POUNS (FORCE)
MAX	MAXIMUM
MH	MAINTENANCE HOLE/MANHOLE
MIN	MINIMUM
MSE	MECHANICALLY STABILIZED EARTH
NAT	NATURAL
NAVD 88	NORTH AMERICAN VERTICAL DATUM OF 1988
NOM	NOMINAL
NTS	NOT TO SCALE
OHC	OVERHEAD COMMUNICATION
OHP	OVERHEAD POWER
PSE	PUGET SOUND ENERGY
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS-PER-SQUARE-INCH
SPU	SEATTLE PUBLIC UTILITIES
TBD	TO BE DETERMINED
TCE	TEMPORARY CONSTRUCTION EASEMENT
TEMP	TEMPORARY
TYP	TYPICAL

MARK	DATE	NATURE	MADE	CHK'D	REV'D

REVISIONS

VAULT SERIAL NO.

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GENERAL AND STRUCTURAL NOTES SHEET 2 OF 2

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DRAWN KNBR CHECKED BNKN	RECEIVED REVISED AS BUILT

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL.

PAUL W. GUENTHER
STATE OF WASHINGTON
28528
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER
PRELIMINARY

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL
REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC
CO
VPI #

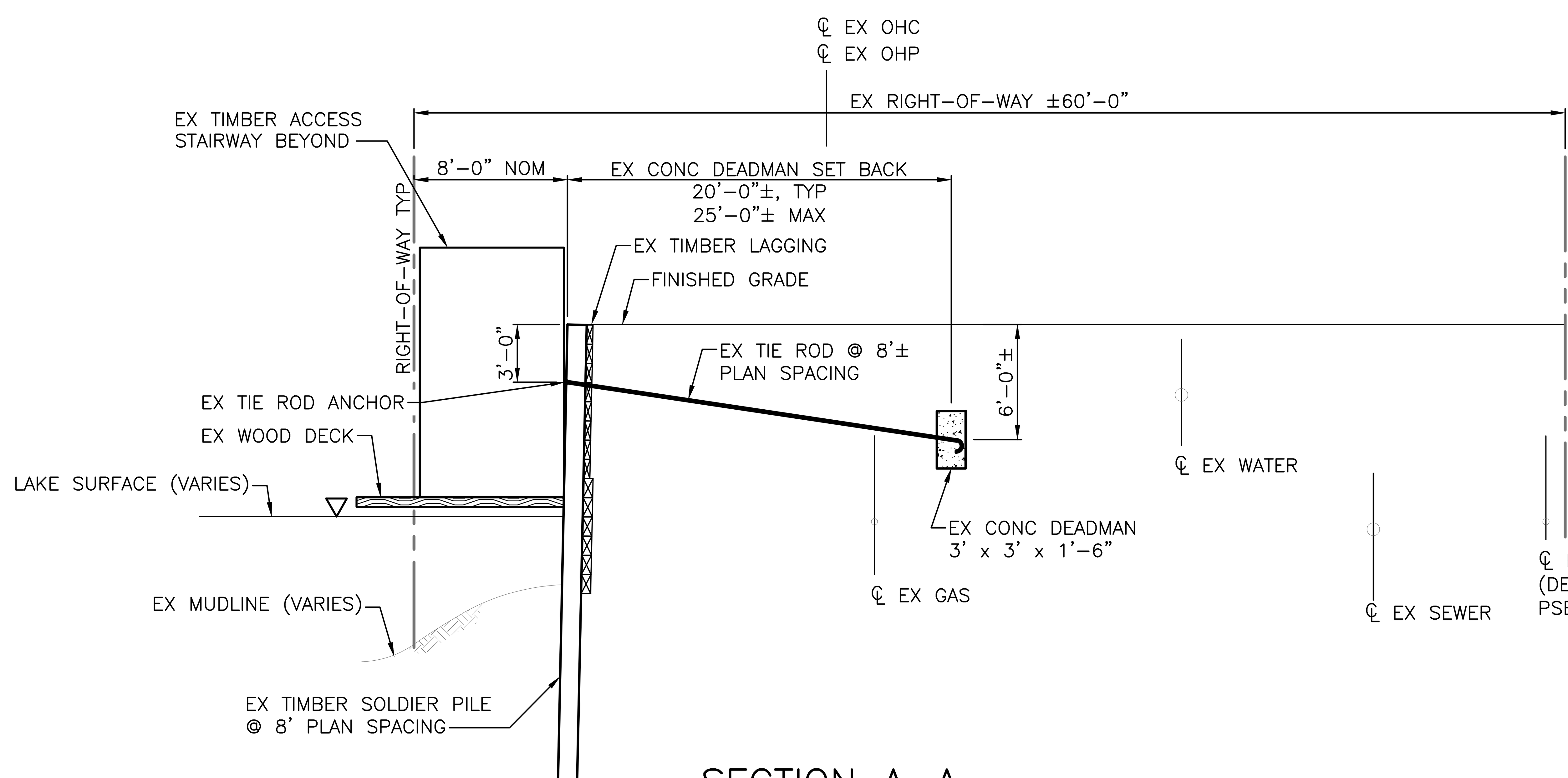
G-003

SHEET 3 OF 9

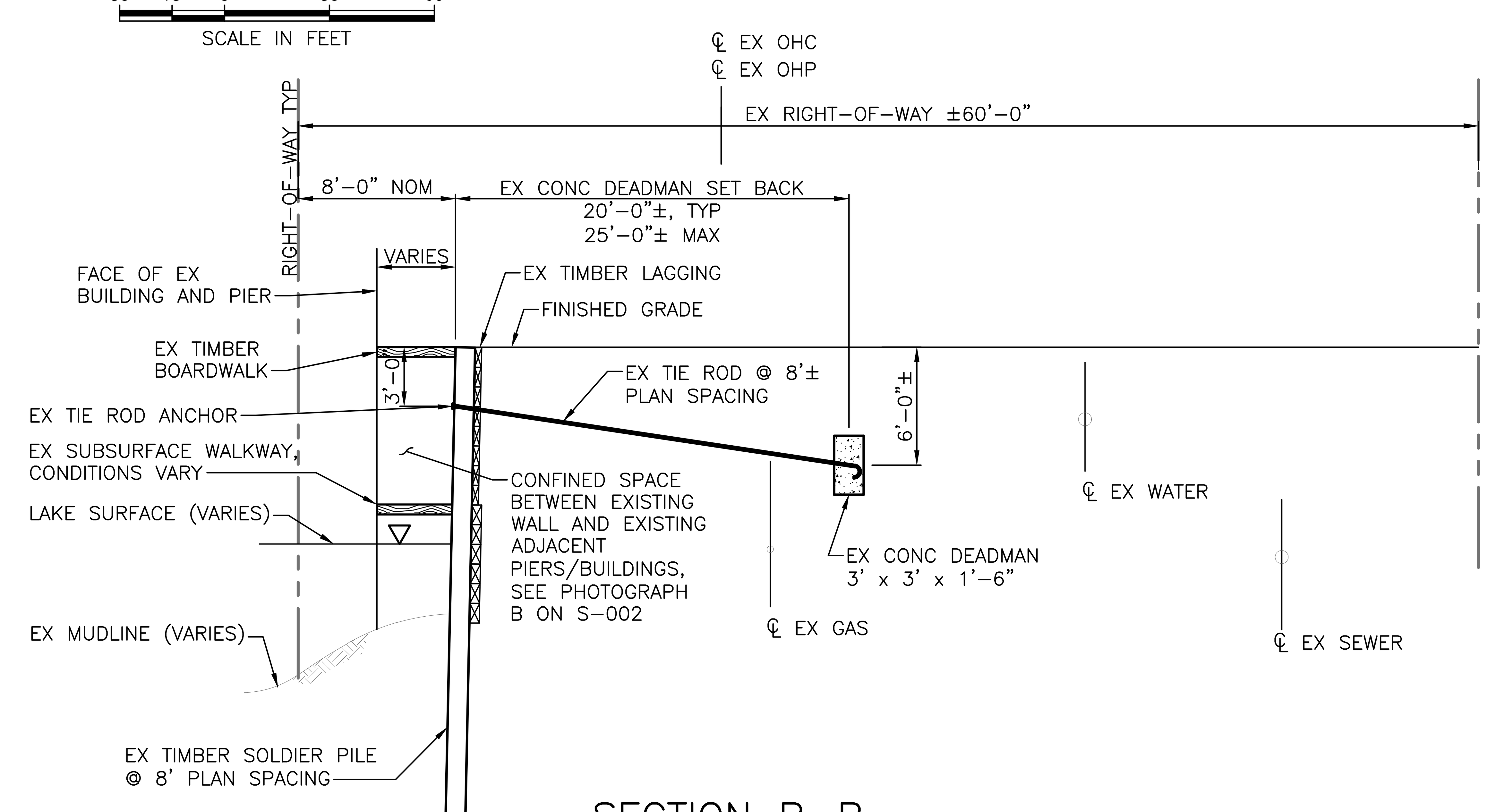
PLAN
SCALE: 1" = 30'

NOTE:

1. PROPERTY NAMES AND APPROXIMATE PROPERTY LINES TAKEN FROM KING COUNTY PARCEL VIEWER (ACCESSED ONLINE).



SECTION A–A S-001
SCALE: 3/16" = 1'-0"
SECTION AT EXISTING WOOD DECK – SEE PHOTOGRAPH A ON S-002 FOR REFERENCE PHOTOGRAPH.



SECTION B–B S-001
SCALE: 3/16" = 1'-0"
AT EXISTING PIERS AND BUILDINGS

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EXISTING CONDITIONS

REV'D	CHK'D	MADE	NATURE REVISIONS	MARK	DATE	VAULT SERIAL NO.

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PAUL W. GUENTHER — STATE OF WASHINGTON — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
S-001
SHEET 4 OF 9

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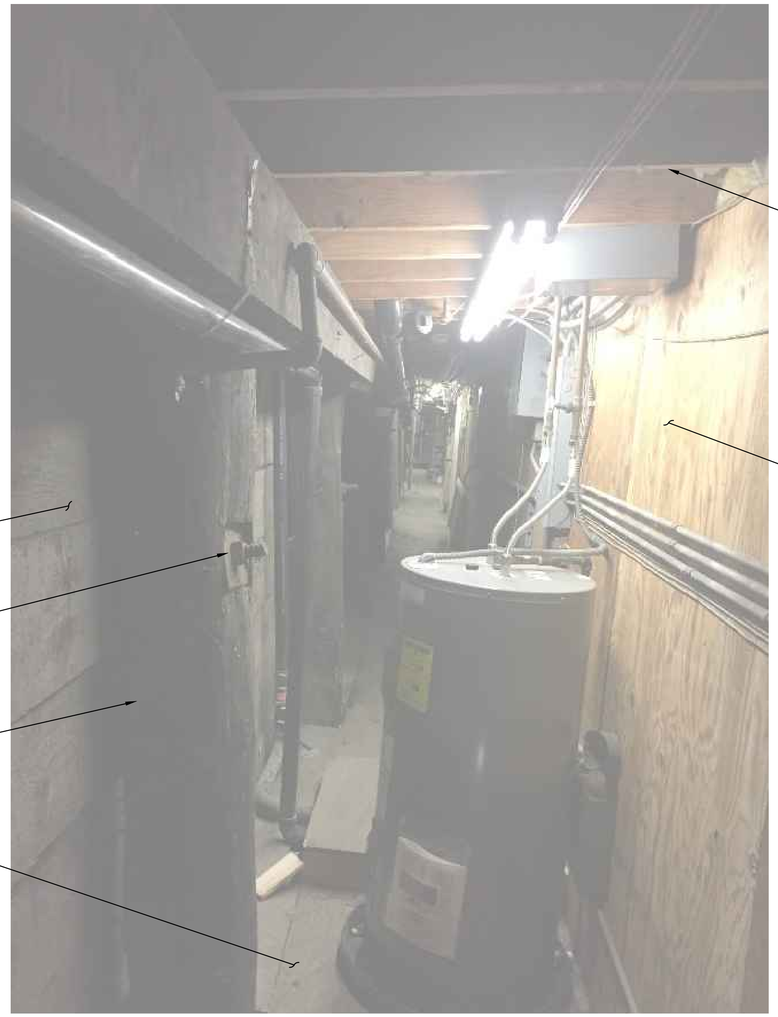
PHOTOGRAPH A
EXISTING CONDITIONS AT EX WOOD WALK



PHOTOGRAPH B
EXISTING CONFINED SPACE ALONG ADJACENT BUILDINGS/PIERS

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

EXISTING CONDITIONS – REFERENCE PHOTOGRAPHS

VAULT SERIAL NO.	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

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PAUL M. GUERRERO — STATE OF WASHINGTON — 23928 — PROFESSIONAL ENGINEER

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
S-002
SHEET 5 OF 9

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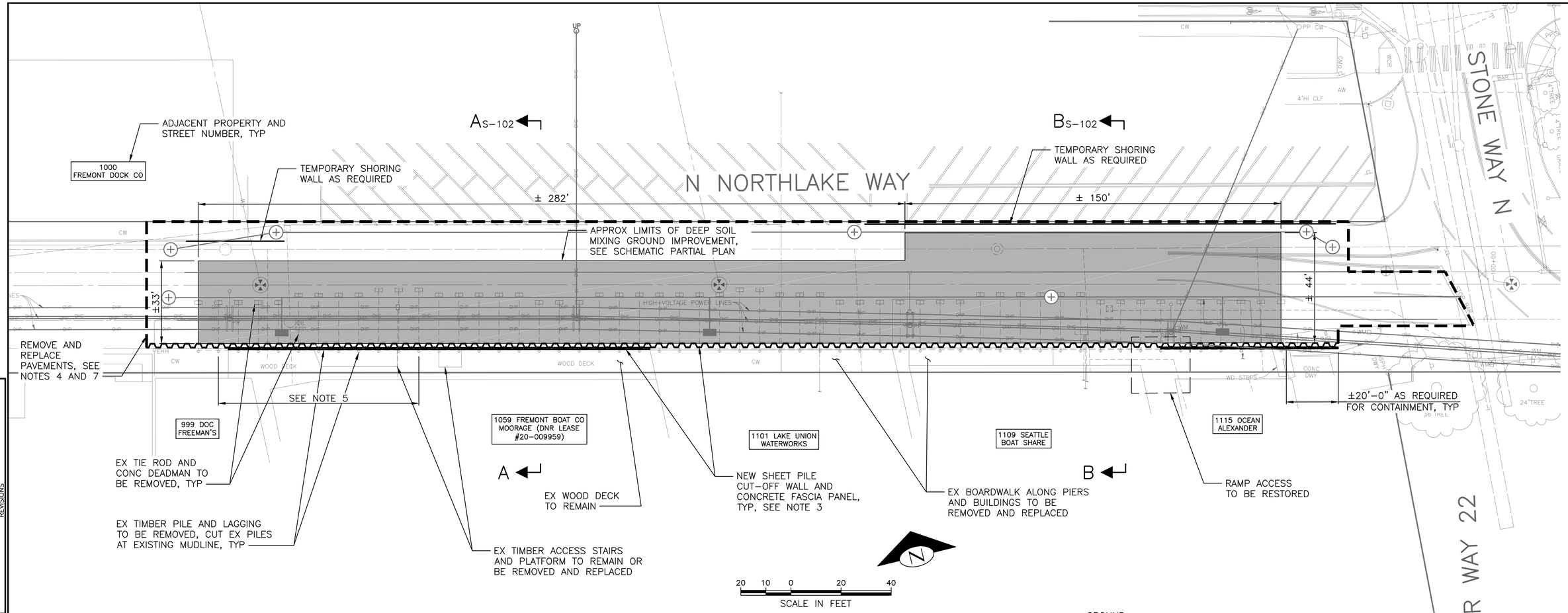
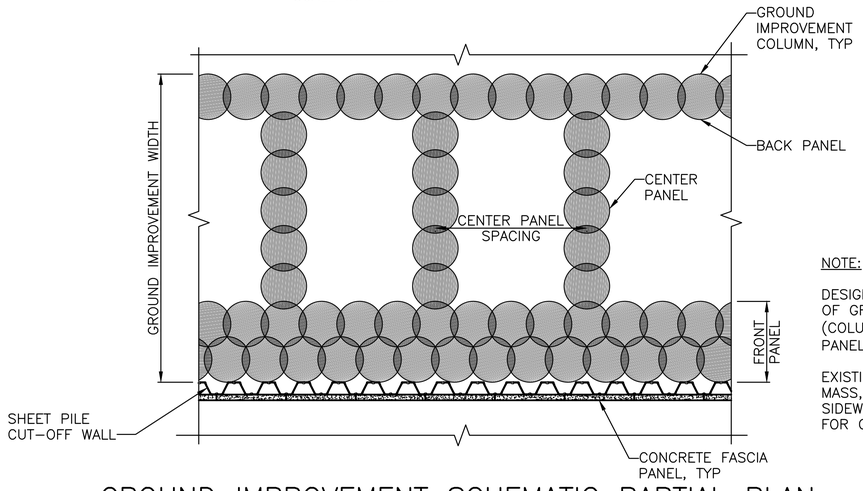


NOTES:

1. SELF-SUPPORTING SOIL MASS (CDF, MSE, OR GEOGRID WRAPPED FILL) DIRECTLY BEHIND NEW WALL NOT SHOWN FOR CLARITY.
2. SEE DRAWING CU-101 FOR TEMPORARY UTILITIES DURING CONSTRUCTION AND CU-102 FOR PROPOSED UTILITIES.
3. PROVIDE FASCIA PANEL AT EXPOSED WALL AREAS ONLY. NOT REQUIRED ADJACENT TO EXISTING BUILDINGS/PIERS.
4. REMOVE AND REPLACE PAVEMENTS FOR FULL RIGHT-OF-WAY WIDTH ALONG PROPOSED CUT-OFF WALL LIMITS, AND AS REQUIRED FOR UTILITY WORK (DESIGN TBD).
5. TEMPORARY SHORING OF EXISTING WALL REQUIRES MINIMUM 10' EMBEDMENT INTO GLACIAL TILL FOR THESE APPROXIMATE LIMITS, OR TEMPORARY ANCHORED SYSTEM REQUIRED.
6. MAINTAIN TEMPORARY ACCESS TO ADJACENT PROPERTIES DURING ALL STAGES OF CONSTRUCTION.
7. CANTILEVER SIDEWALKS AND SHEET PILE CIP CONC CAPS NOT SHOWN FOR CLARITY.



NOTE:

DESIGN SHOWN IS CONCEPTUAL REPRESENTATION OF GROUND IMPROVEMENT. DESIGN DETAILS TBD (COLUMN DIAMETERS, PANEL WIDTHS, MIDDLE PANEL SPACING, ETC).

EXISTING CONDITIONS, SELF-SUPPORTING SOIL MASS, SHEET PILE CIP CONC CAP, CANTILEVER SIDEWALKS, AND PROPOSED UTILITIES NOT SHOWN FOR CLARITY.

GROUND IMPROVEMENT SCHEMATIC PARTIAL PLAN

SCALE: NTS

CONCEPT DESIGN - FINAL
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PROPOSED PLAN

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	SDOT PROJ. MGR.
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PAUL W. GUENTHER STATE OF WASHINGTON 23528 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
S-101
SHEET 6 OF 9

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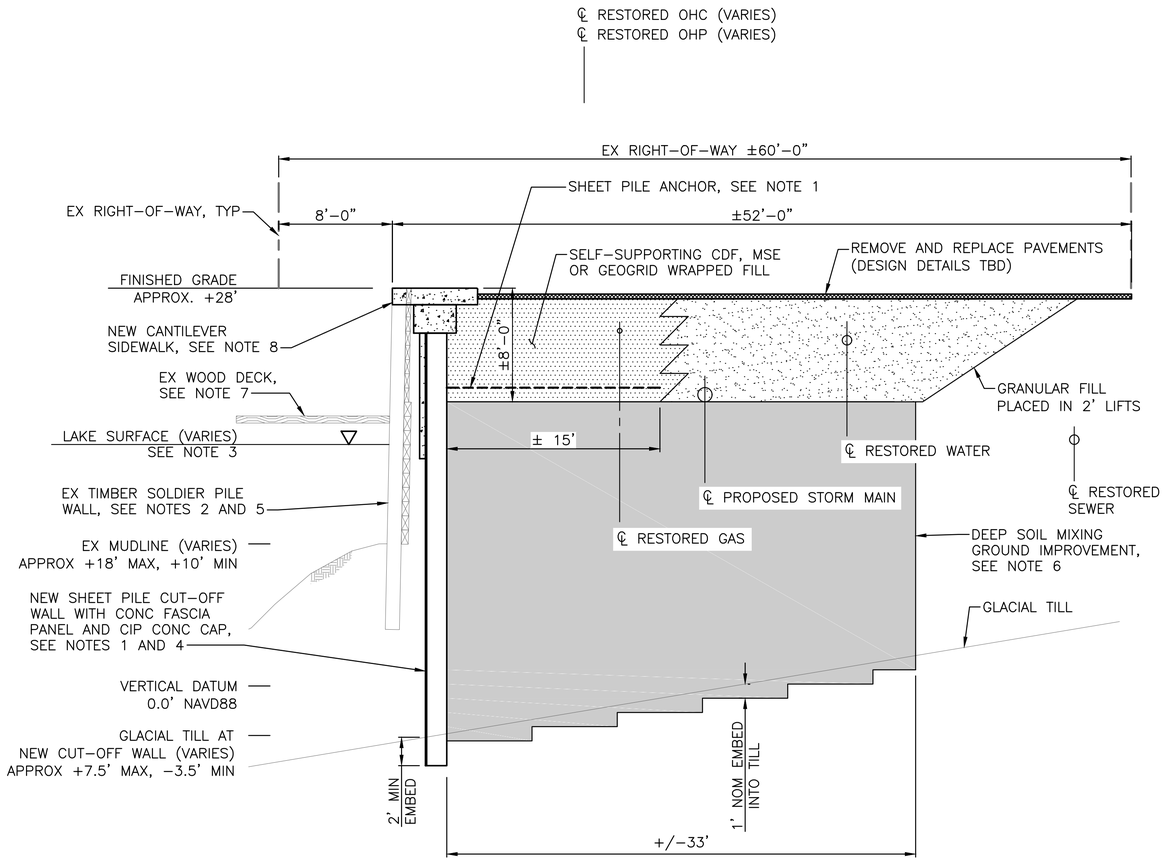
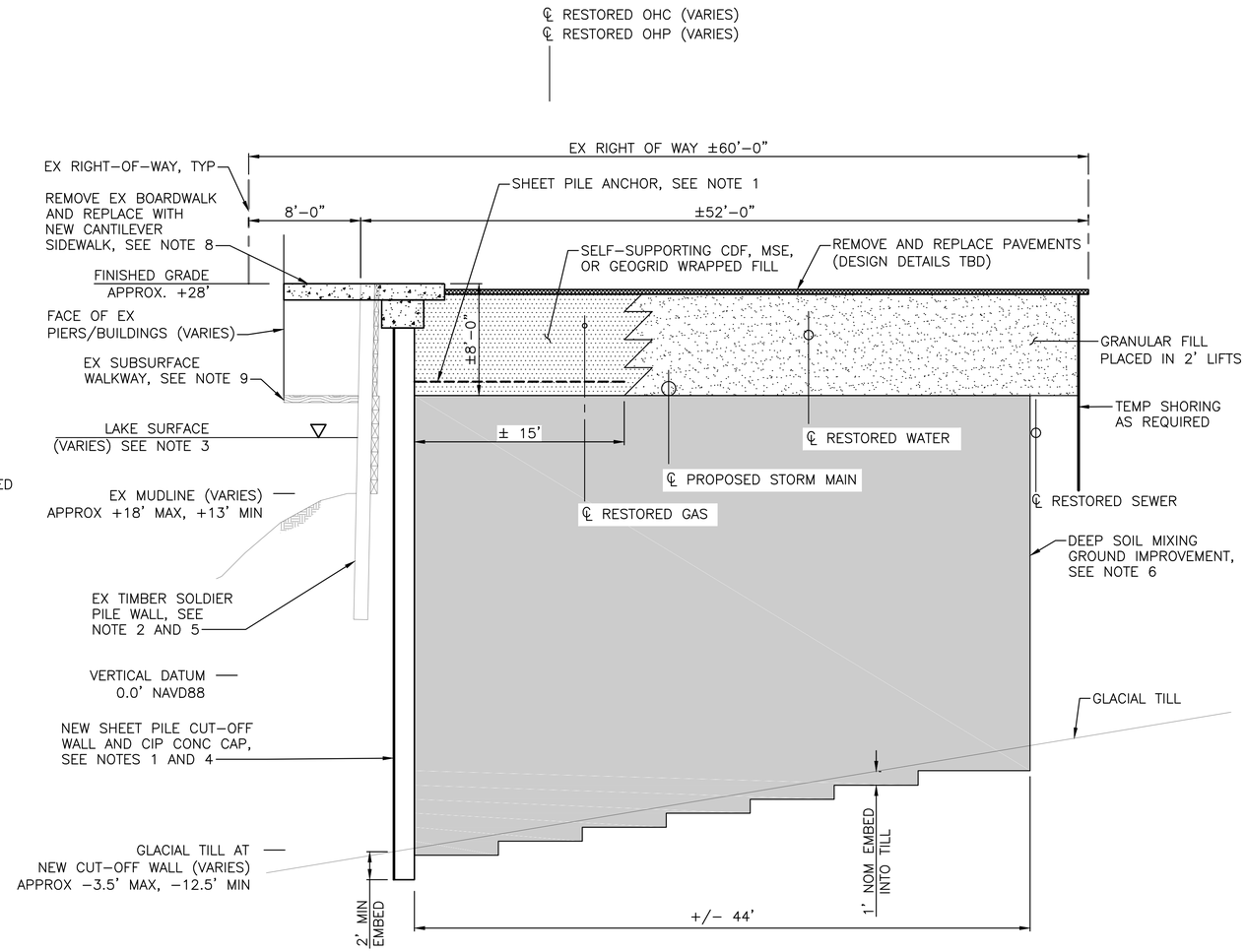


SECTION A–A S-101
SCALE: 3/16" = 1'–0"



SECTION B–B S-101
SCALE: 3/16" = 1'–0"

NOTES:

1. ANCHOR SHEET PILE CUT–OFF WALL TO SELF–SUPPORTING FILL (DETAILS TBD).
2. EXISTING TIE ROD AND CONCRETE DEADMAN ANCHOR NOT SHOWN FOR CLARITY. CUT EX PILES AT EXISTING MUDLINE AND REMOVE EX PILES, LAGGING, TIE RODS, AND CONC DEADMAN ANCHORS.
3. LAKE UNION WATER ELEVATION CONTROLLED BY HIRAM CHITTENDEN LOCK AND SPILLWAY COMPLEX. WATER LEVEL TYPICALLY VARIES BETWEEN +16.8' TO +18.8'.
4. INSTALL SHEET PILE CUT–OFF WALL 2' MIN INTO TILL (AS SHOWN), CIP CONC CAP AND CONC FACIA PANEL DESIGN DETAILS TBD.
5. INSTALL TEMPORARY PILE REPAIRS OR TEMPORARY SHORING PILES AT BROKEN EXISTING TIMBER PILES TO MAINTAIN EXISTING WALL STABILITY DURING CONSTRUCTION AS REQUIRED.
6. THE BOTTOM OF THE DEEP SOIL MIXING GROUND IMPROVEMENT SHALL EXTEND TO THE TOP OF THE GLACIAL TILL (SOUND LAYER) PLUS A ONE FOOT NOMINAL EMBEDMENT. THE GROUND IMPROVEMENT SHALL BE INSTALLED WITH A MINIMUM AREA REPLACEMENT RATIO OF 50%. MINIMUM UNCONFINED COMPRESSIVE STRENGTH (UCS) SHALL BE 300 PSI.
7. REMOVE AND REPLACE EX WOOD DECK AS REQUIRED FOR CONSTRUCTION.
8. NEW CANTILEVER SIDEWALKS TO MATCH EXISTING LAKESIDE FINISHED GRADE PLAN LIMITS AND ELEVATION, WITH 6 FT–MIN WIDTH AND CURB. FINAL DESIGN REQUIREMENTS AND DETAILS TBD.
9. REMOVE EXISTING SUBSURFACE WALKWAYS AS REQUIRED FOR CONSTRUCTION. FINAL DESIGN REQUIREMENTS AND DETAILS TBD.
10. GROUND WATER DRAINAGE DESIGN (CONSTRUCTION AND PERMANENT) TO BE DETERMINED.

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

PROPOSED SECTIONS

VAULT	SERIAL NO.	DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

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PAUL W. GUERTSEN — STATE OF WASHINGTON — 23928 — REGISTERED PROFESSIONAL ENGINEER

Seattle Department of Transportation
ORDINANCE NO. PW NO.
SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
S-201
SHEET 7 OF 9

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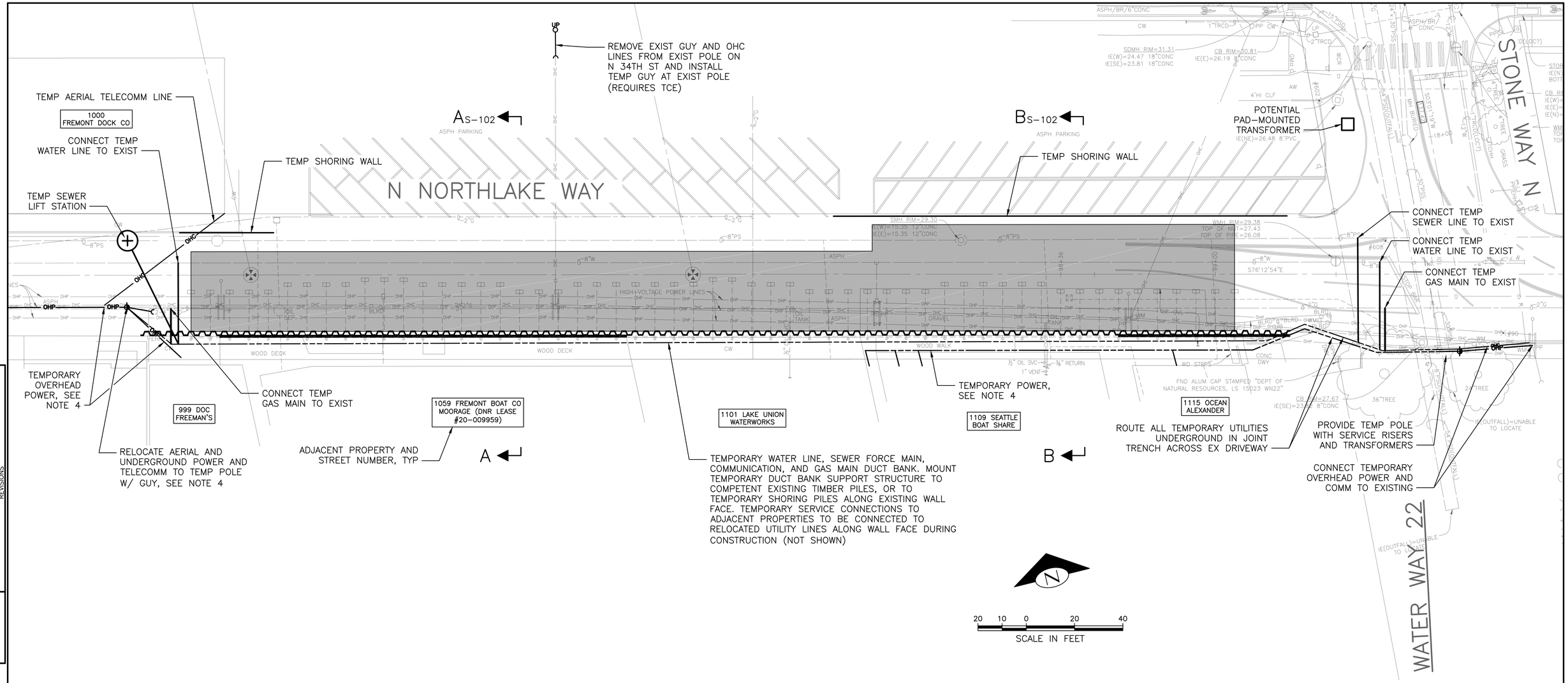

NOTES:

1. REMOVE ALL EXISTING UTILITIES THROUGH SITE AND TEMPORARILY RELOCATE AS SHOWN. REROUTE AND STOP POWER AT ENDS OF PROJECT, AND RELOCATE ALL OTHER UTILITIES TO TEMPORARY DUCT BANK ALONG EXISTING WALL FACE DURING CONSTRUCTION.
2. TEMPORARY FIRE HYDRANTS AND FIRE SERVICE CONNECTIONS NOT SHOWN.
3. REDUCE EX 26 KV POWER DISTRIBUTION BEFORE ROUTING TO GRADE AND DIRECTING TO TEMPORARY SERVICE CONNECTIONS.
4. ROUTE TEMPORARY AERIAL POWER FEED FROM N 34TH STREET, WEST OF FREMONT DOCK CO BUILDING, TO AT LEAST TWO TEMPORARY POLES (NOT SHOWN). TEMPORARY POWER ALIGNMENT REQUIRES TEMPORARY AERIAL EASEMENT OVER PARKING LOT ON WEST SIDE OF BUILDING.

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

TEMPORARY UTILITIES

NATURE REVISIONS	MADE	CHK'D	REV'D

VAULT SERIAL NO.	DATE	MARK

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SG3 STRATEGIES

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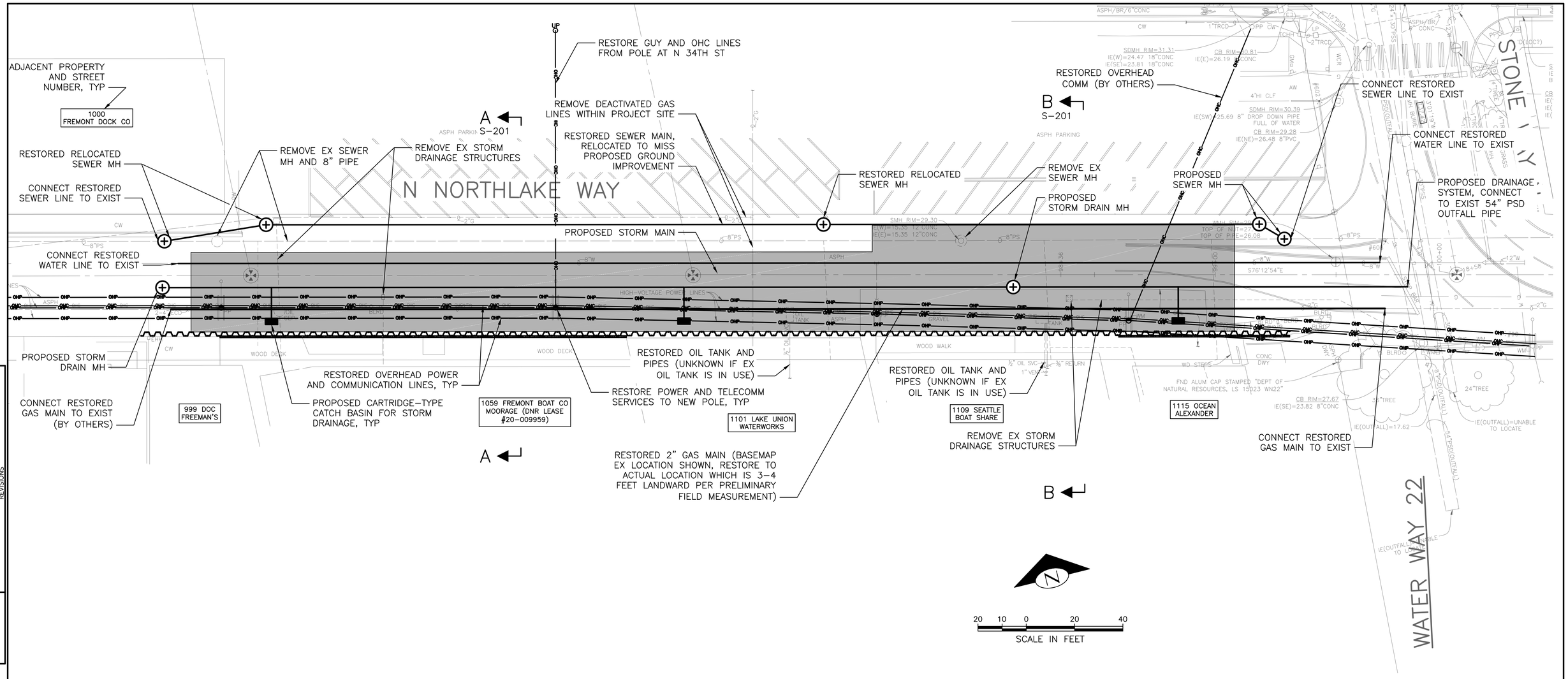
Seattle Department of Transportation

ORDINANCE NO. PW NO.

SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO
VPI #
CU-101
SHEET 8 OF 9



NOTES:

1. RESTORED WATER VALVES, METERS, AND LINES TO ADJACENT PROPERTIES NOT SHOWN.
2. RESTORED FIRE HYDRANTS AND FIRE SERVICE CONNECTIONS NOT SHOWN.
3. RESTORED SEWER, POWER, COMMUNICATION, GAS LINE CONNECTIONS TO ADJACENT PROPERTIES NOT SHOWN. RESTORE CONNECTIONS TO MATCH EXISTING CONDITIONS.
4. REMOVE ALL EXISTING DRAINAGE STRUCTURES, INLETS, OUTFALLS, AND FEATURES, AND INSTALL PROPOSED CARTRIDGE-TYPE CATCH BASIN SYSTEM.
5. RESTORED OVERHEAD COMMUNICATION AND NATURAL GAS BY OTHERS.
6. UTILITY DESIGN SHOWN IS PRELIMINARY. FINAL DESIGN, INCLUDING LOCATIONS OF RESTORED UTILITIES, TO BE DETERMINED.

CONCEPT DESIGN - FINAL
NOT FOR CONSTRUCTION

PROPOSED UTILITIES

NO.	DATE	MARK	MADE	CHK'D	REV'D

NATURE OF REVISIONS

VAULT SERIAL NO.

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SG3 STRATEGIES

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Seattle Department of Transportation

ORDINANCE NO. PW NO.

SCALE: AS SHOWN

NORTH NORTHLAKE WAY WALL REPLACEMENT ALTERNATIVE EVALUATION
WALL REPLACEMENT CONCEPT DESIGN

JOB PC CO

VPI #

CU-102

SHEET 9 OF 9

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