
**UNIVERSITY OF COLORADO
1135 BROADWAY
RENOVATION**

BOULDER, COLORADO | 4.10.2020 | DESIGN REVIEW BOARD | SCHEMATIC DESIGN REVIEW

AGENDA

DESIGN REVIEW BOARD

- **INTRODUCTION**
- **MICRO-MASTERPLAN & SITE PLAN**
- **SITE AND LANDSCAPE DETAILS**
- **SITE LIGHTING**
- **SITE SIGNAGE**
- **BUILDING DESIGN**
- **SUSTAINABILITY**

INTRODUCTION

PROJECT INTENT PROJECT GOALS

- To provide spaces that promote occupant health and wellness and support the vision of the RCWI
- To rediscover the original architecture and building quality
- To improve site-landscape function, safety and quality



PROJECT SCHEDULE



BIDDING	July 2020
CONSTRUCTION START	September 2020
CONSTRUCTION COMPLETION	August 2021
FIT UP	September 2021
OCCUPANCY	October 2021

PROJECT BUDGET

PROFESSIONAL FEES	\$901,844
CONSTRUCTION	\$4,018,980
EQUIP, FURNISHINGS MISC	\$528,318
CONTINGENCY 10%	\$541,614
<hr/>	
TOTAL PROJECT BUDGET	\$5,991,056

MICRO-MASTERPLAN

 BUS STOP
 PROPERTY LINE

 PEDESTRIAN CIRCULATION
 VEHICULAR APPROACH

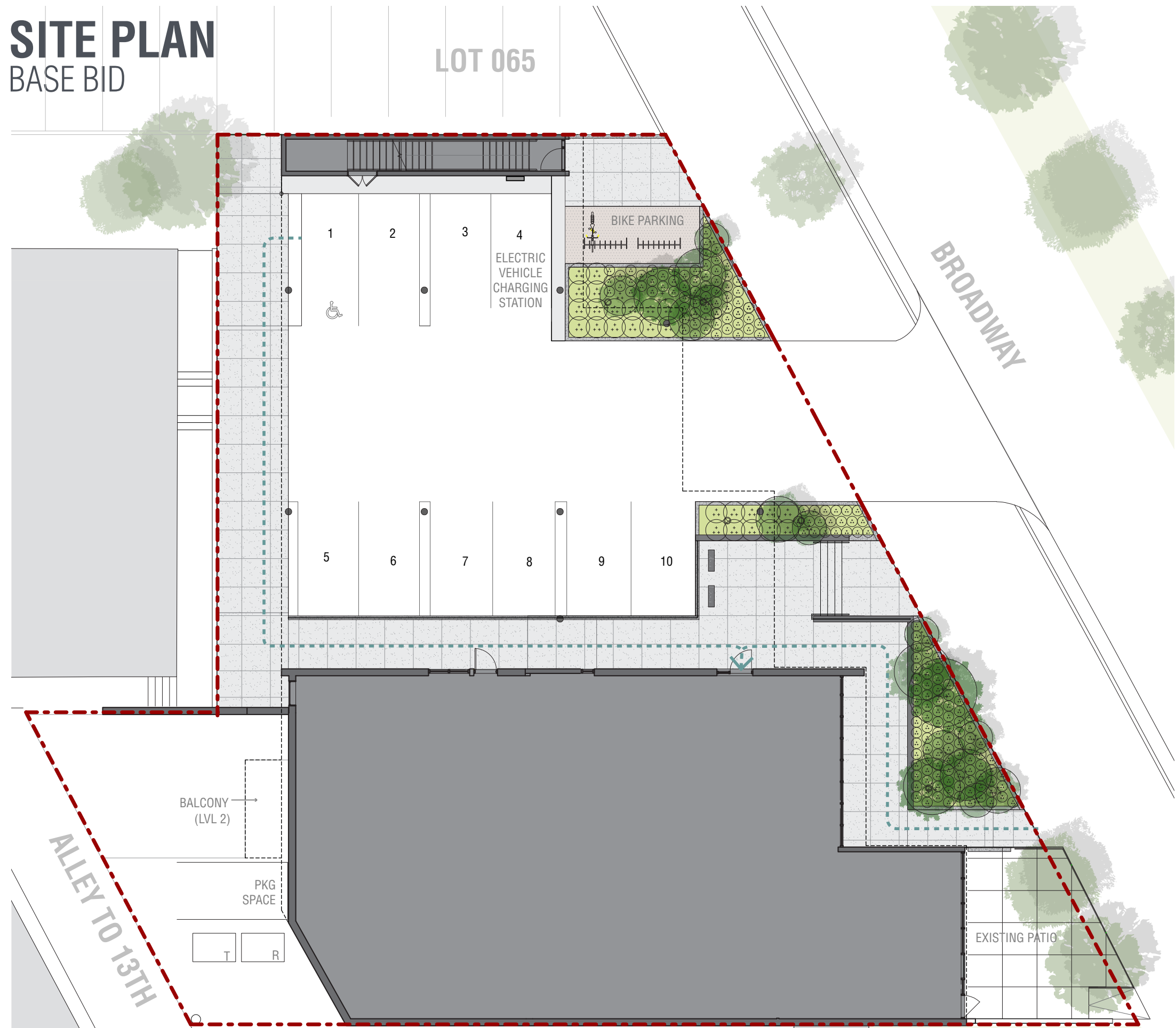




SITE PLAN

BASE BID

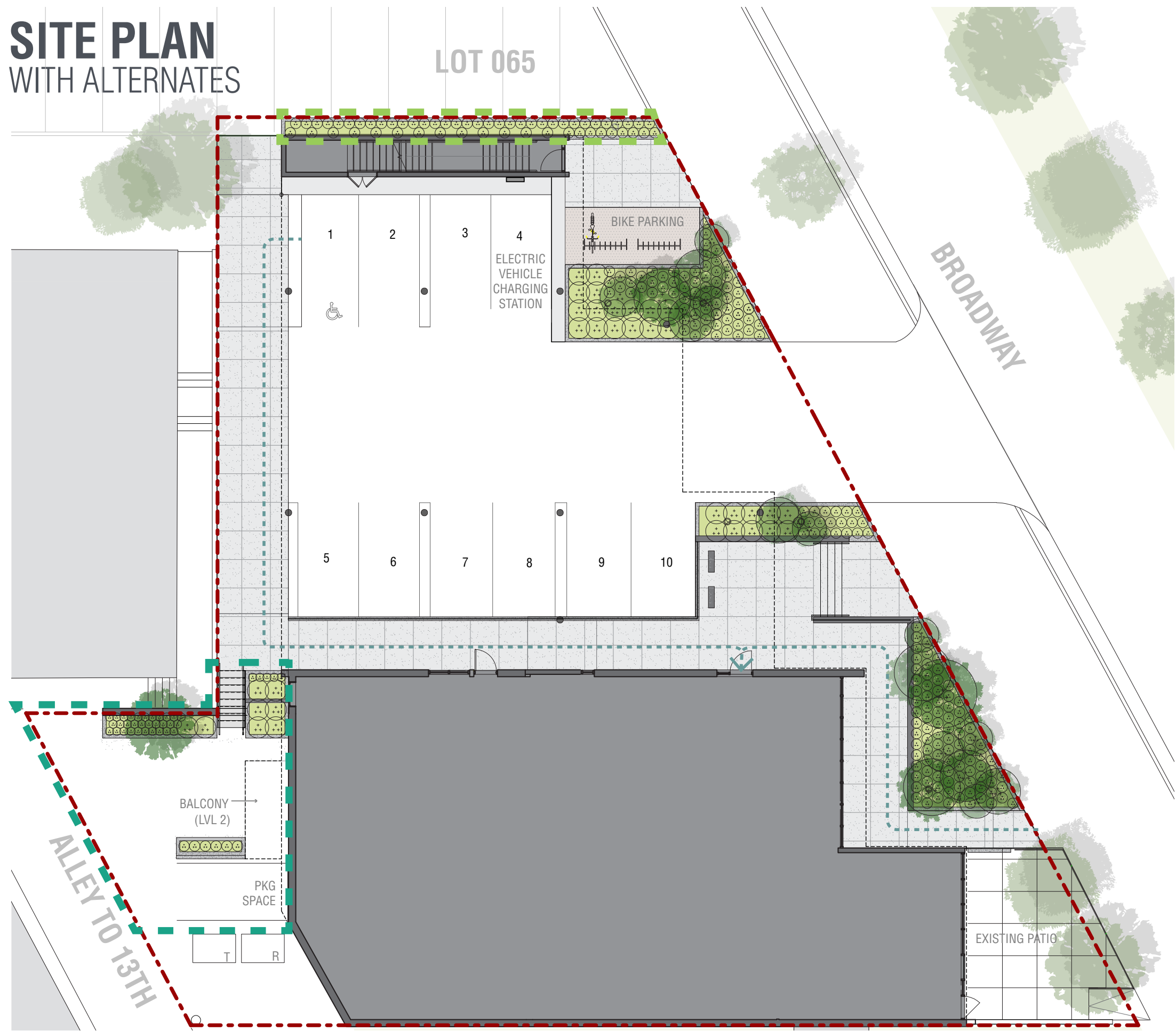
LOT 065





SITE PLAN WITH ALTERNATES

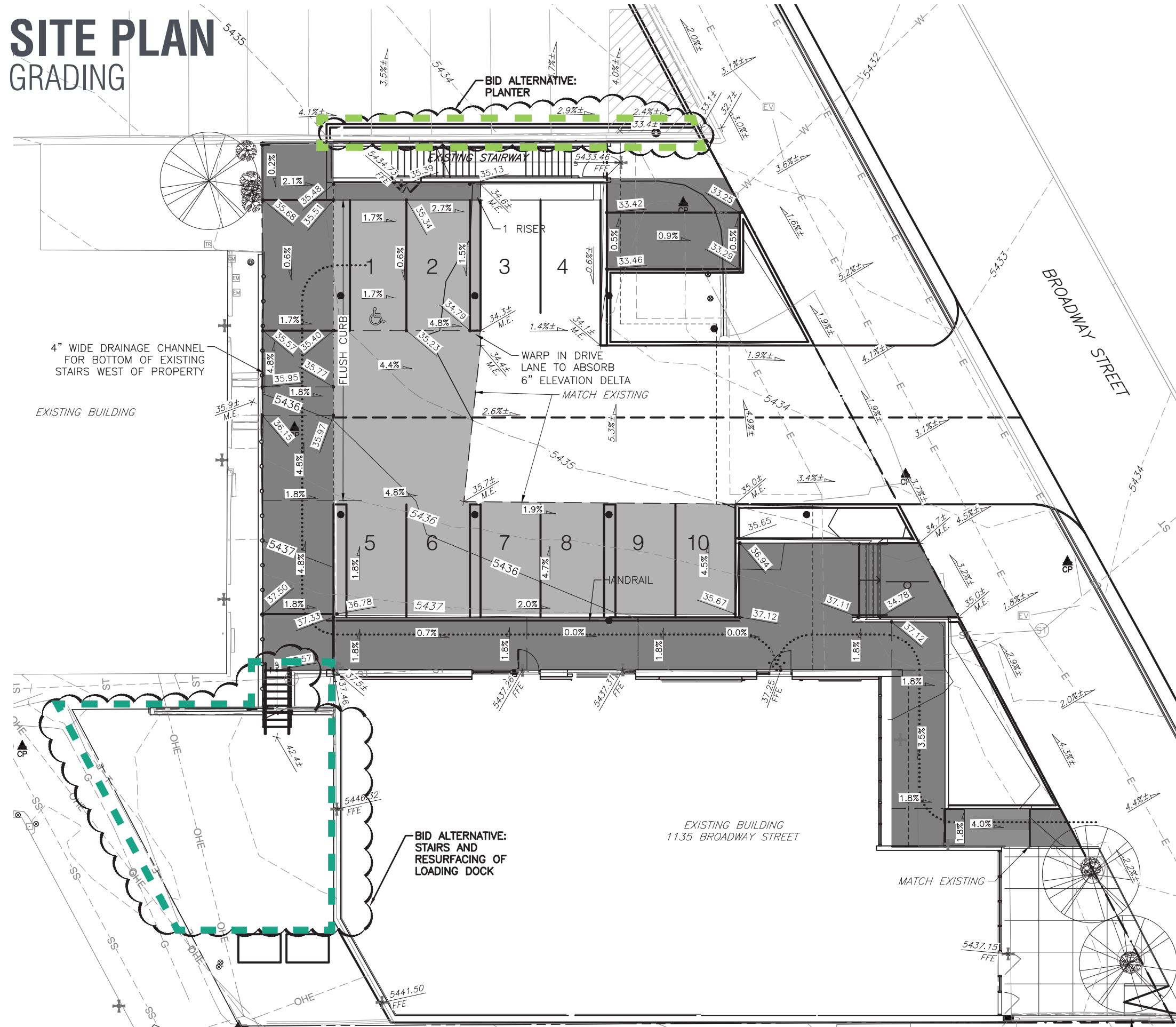
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ADD ALTERNATES

- 1 NORTH GREEN WALL
- 2 ALLEY PLAZA

SITE PLAN GRADING



LEGEND

EXISTING		PROPOSED
---	PROPERTY LINE	---
---	RIGHT-OF-WAY LINE	---
---	SECTION LINE	---
---	EASEMENT	---
---	RETAINING WALL	---
---	CURB & GUTTER	---
---	CONTOURS	---
---	STORM SEWER	---
○	STORM MANHOLE	○
---	ROOF DRAIN	---
□	INLET	■
<	FLARED END SECTION	◁
↑	SIGN	↑
→	GRADING ARROW	→
○	DECIDUOUS TREE	○
⊙	EVERGREEN TREE	⊙
⊙	BUSH/SHRUB	⊙
---	DRIVE	---
•	SPOT ELEVATIONS	•
■	CONCRETE	■
■	ASPHALT	■

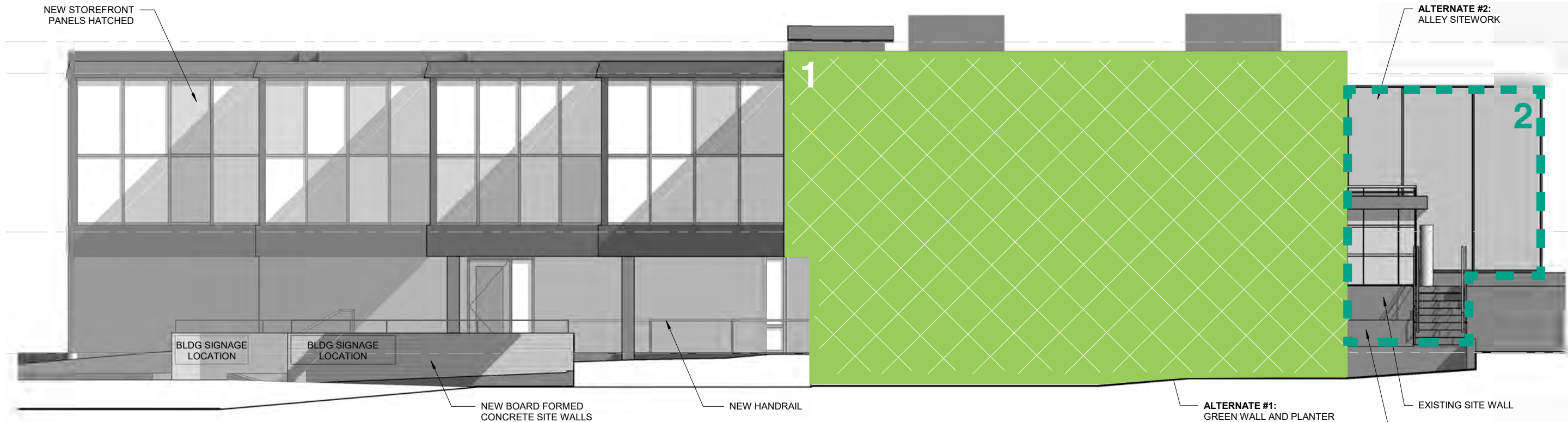
ADD ALTERNATES *

- 1 NORTH GREEN WALL
- 2 ALLEY PLAZA

* for reference only - alternates do not affect grading

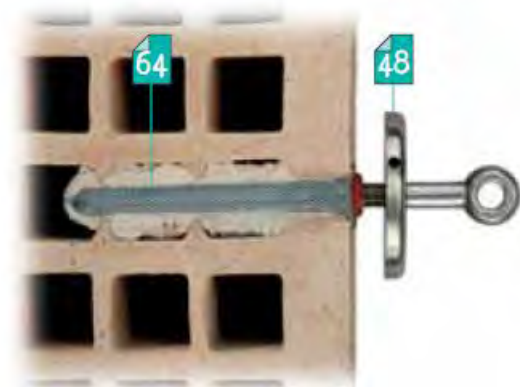
ALTERNATE 1

NORTH GREEN WALL

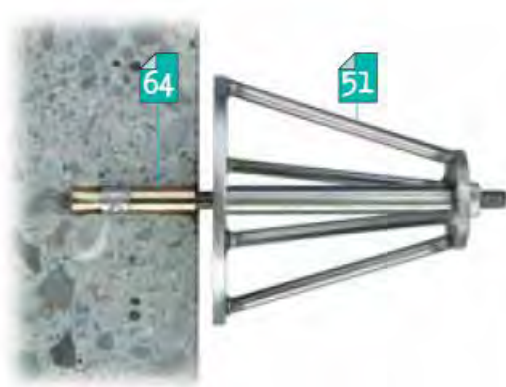


PROPOSED NORTH ELEVATION

- 1 NORTH GREEN WALL
- 2 ALLEY PLAZA

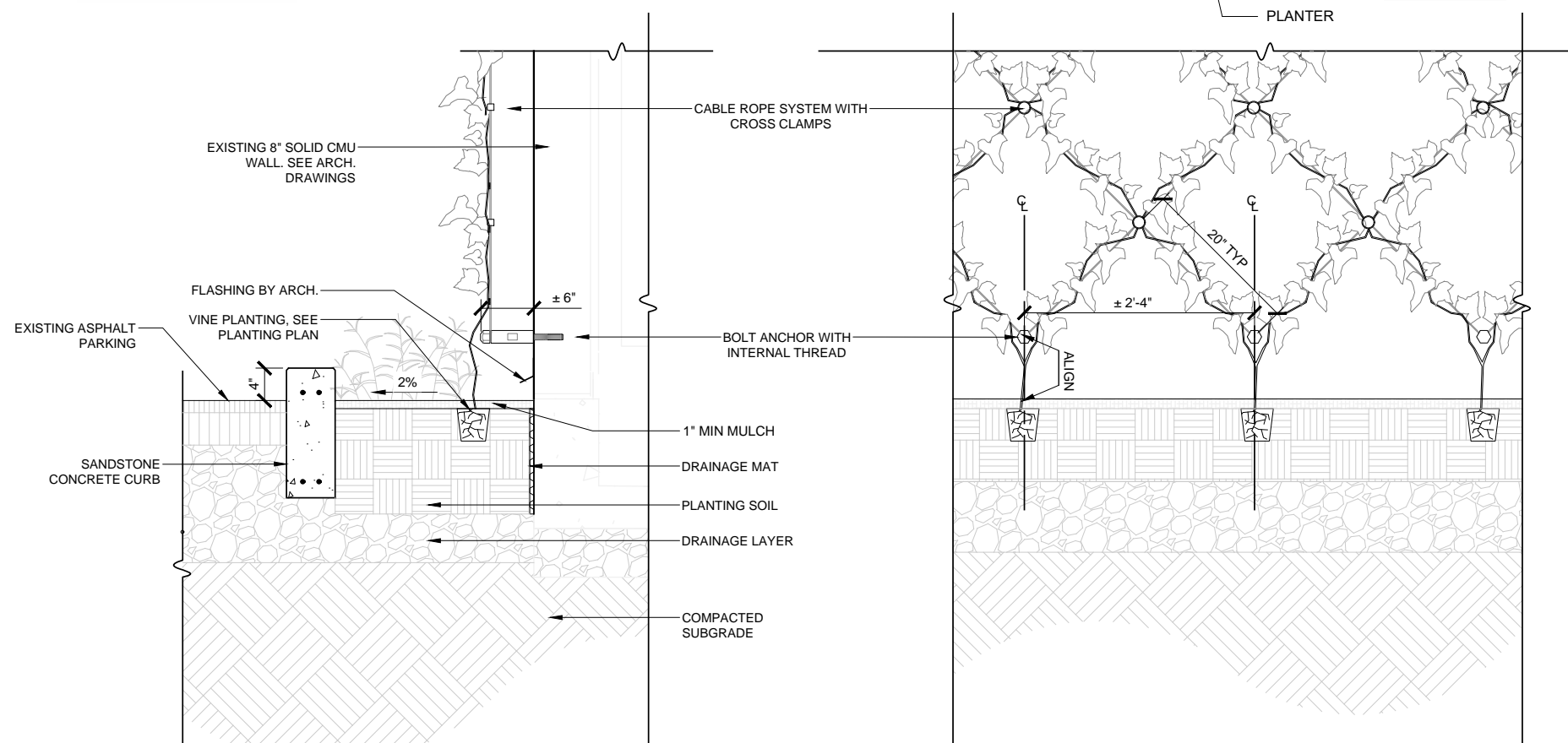


Perforated hollow wall anchor
The perforated anchor is secured with a two-component mortar. The metric internal thread accepts a rope holder.



Bolt anchor with internal thread
Suitable for concrete façades and hard stone. The bolt anchor expands and grips when the threaded rod is screwed in.

STEEL CABLE TRELLIS ANCHOR DETAIL OPTIONS



STEEL CABLE TRELLIS SECTION + ELEVATION

BASE BID

NORTH GREEN WALL



NORTH PERSPECTIVE

EXISTING CONDITIONS PHOTOS

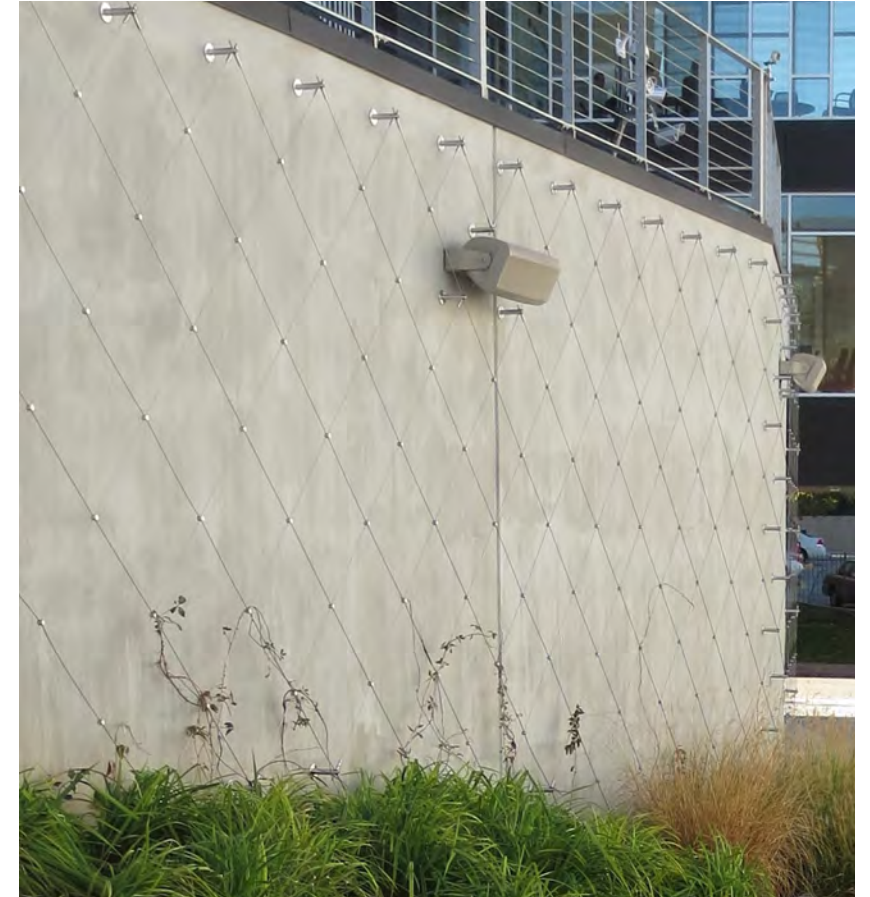


ALTERNATE 1

NORTH GREEN WALL



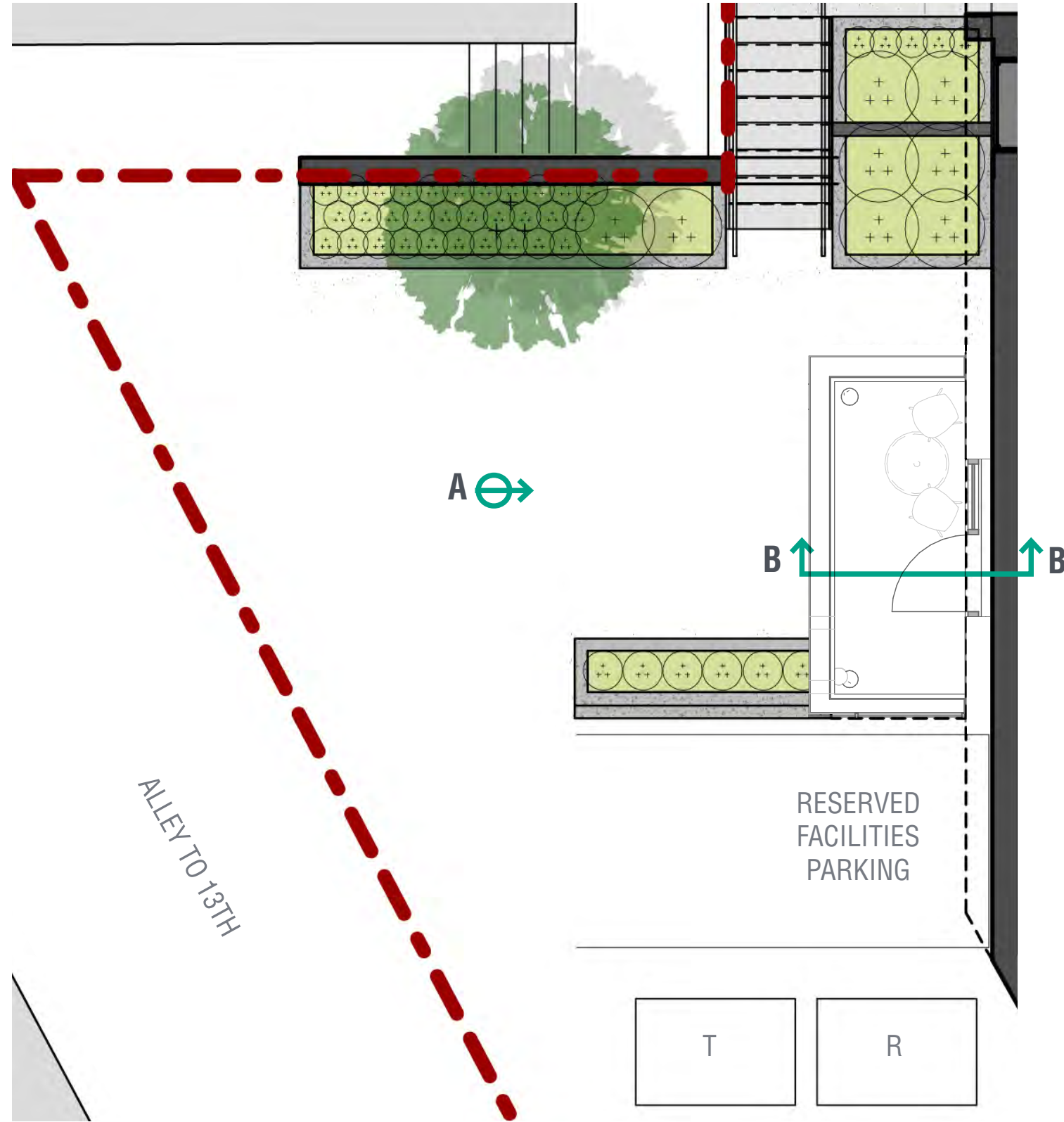
NORTH PERSPECTIVE



1 STEEL CABLE TRELLIS
GREEN WALL

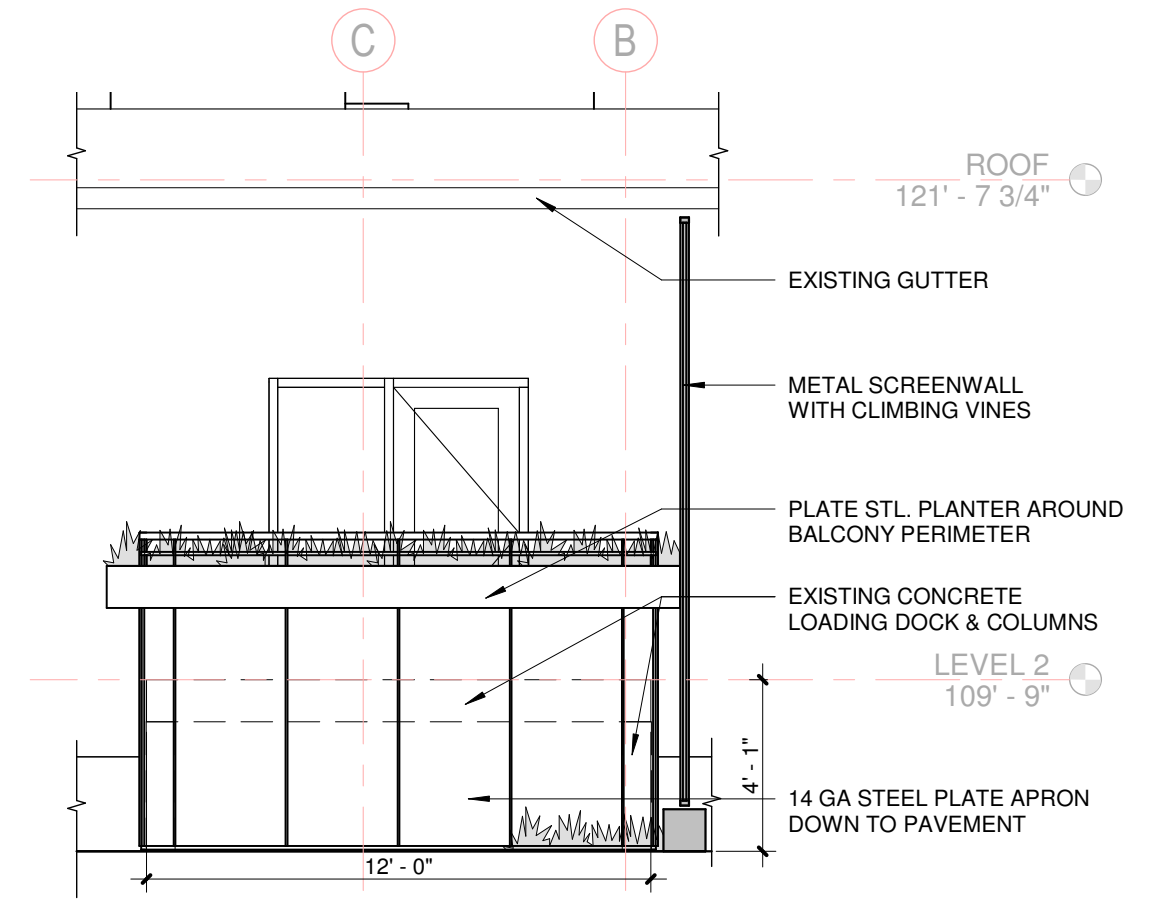
ALTERNATE 2

ALLEY PLAZA

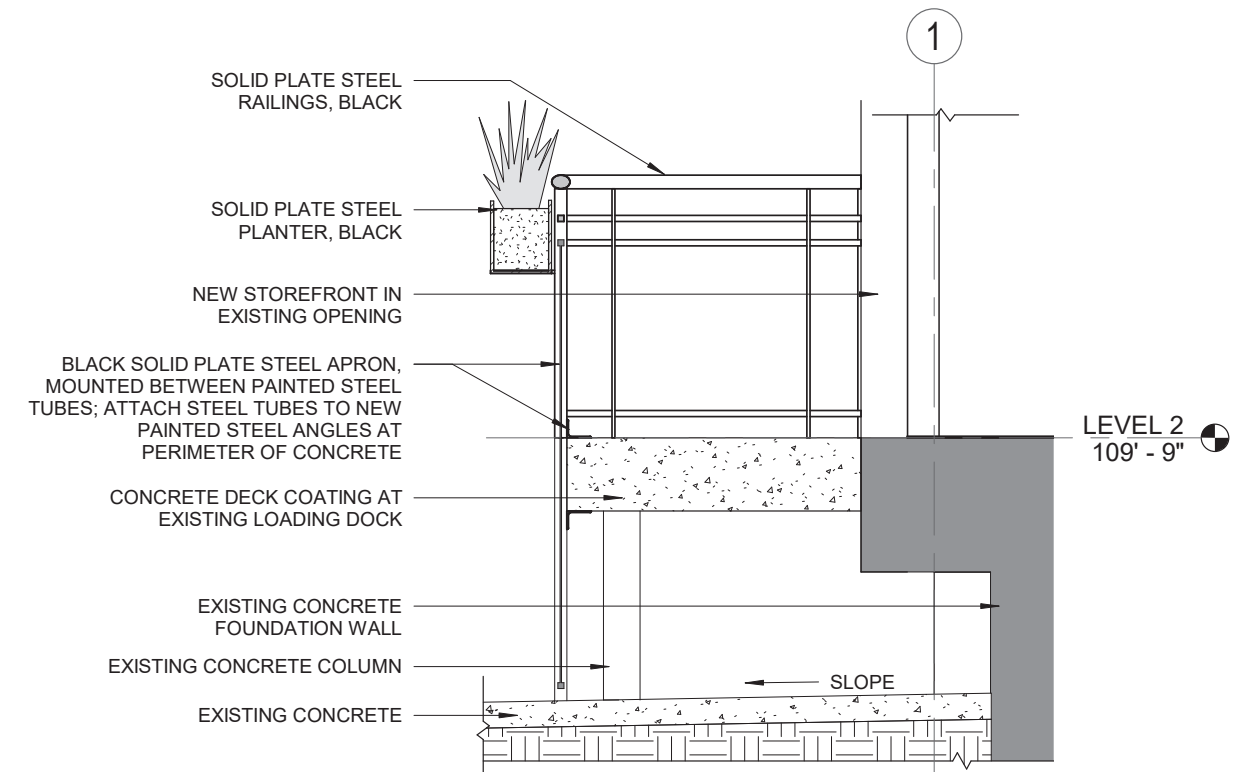


ENLARGED BACK PATIO PLAN

BALCONY ELEVATION A



BALCONY SECTION B-B



BASE BID

ALLEY PLAZA



ALLEY BIRDSEYE PERSPECTIVE

EXISTING CONDITIONS PHOTOS

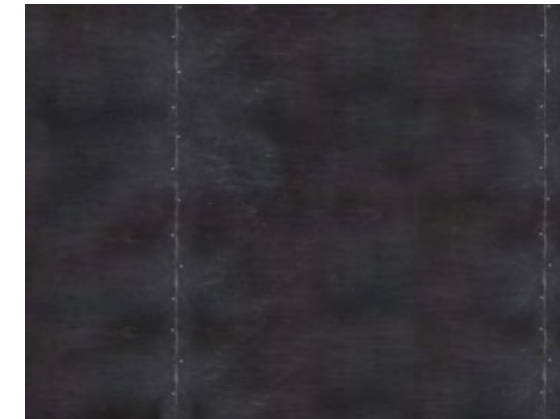


ALTERNATE 2

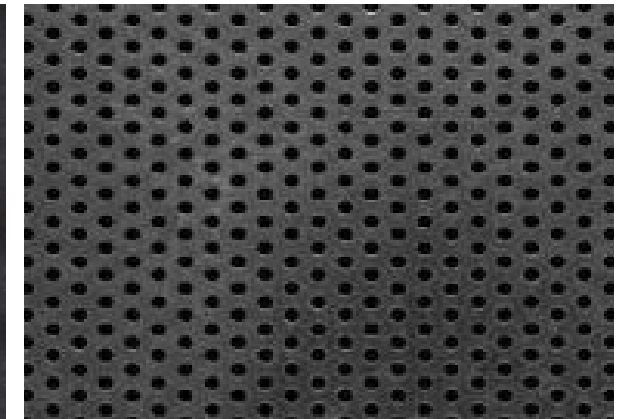
ALLEY PLAZA



ALLEY BIRDSEYE PERSPECTIVE



1 BLACK STEEL PLATE
BALCONY APRON



1 BLACK PERFORATED METAL
BALCONY APRON ALTERNATE

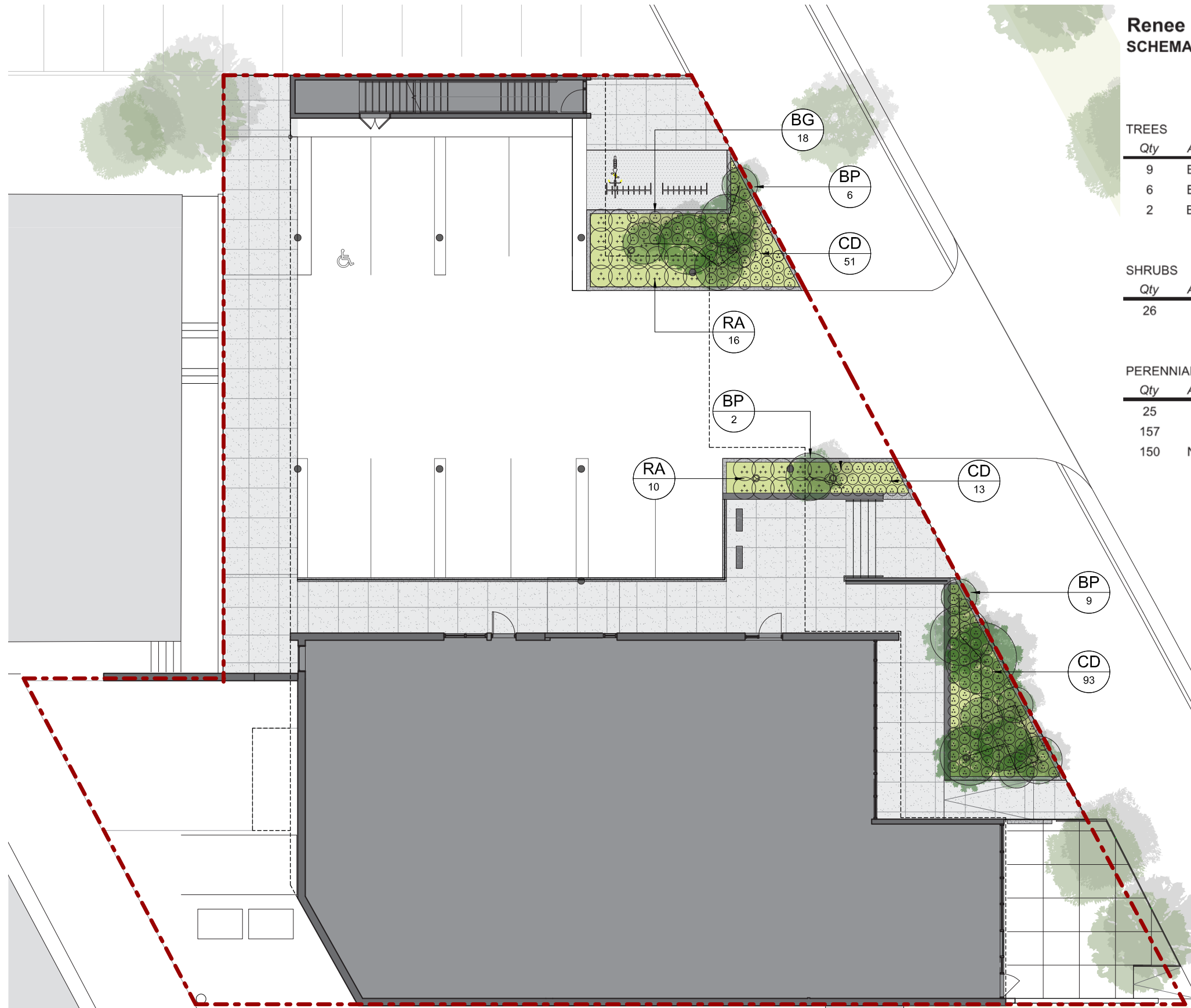


2 METAL SCREENWALL
FEATURE WALL



SITE AND LANDSCAPE DETAILS

PLANTING - BASE BID



Renee Crown Wellness Institute SCHEMATIC PLANTING SCHEDULE - BASE BID

TREES

Qty	Abbr	Botanical name	Common name	Size
9	BP-A	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	10' - 12' Ht
6	BP-B	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	12' - 15' Ht
2	BP-C	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	15' - 20' Ht

SHRUBS

Qty	Abbr	Botanical name	Common name	Size
26	RA	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	15"- 18" Ht

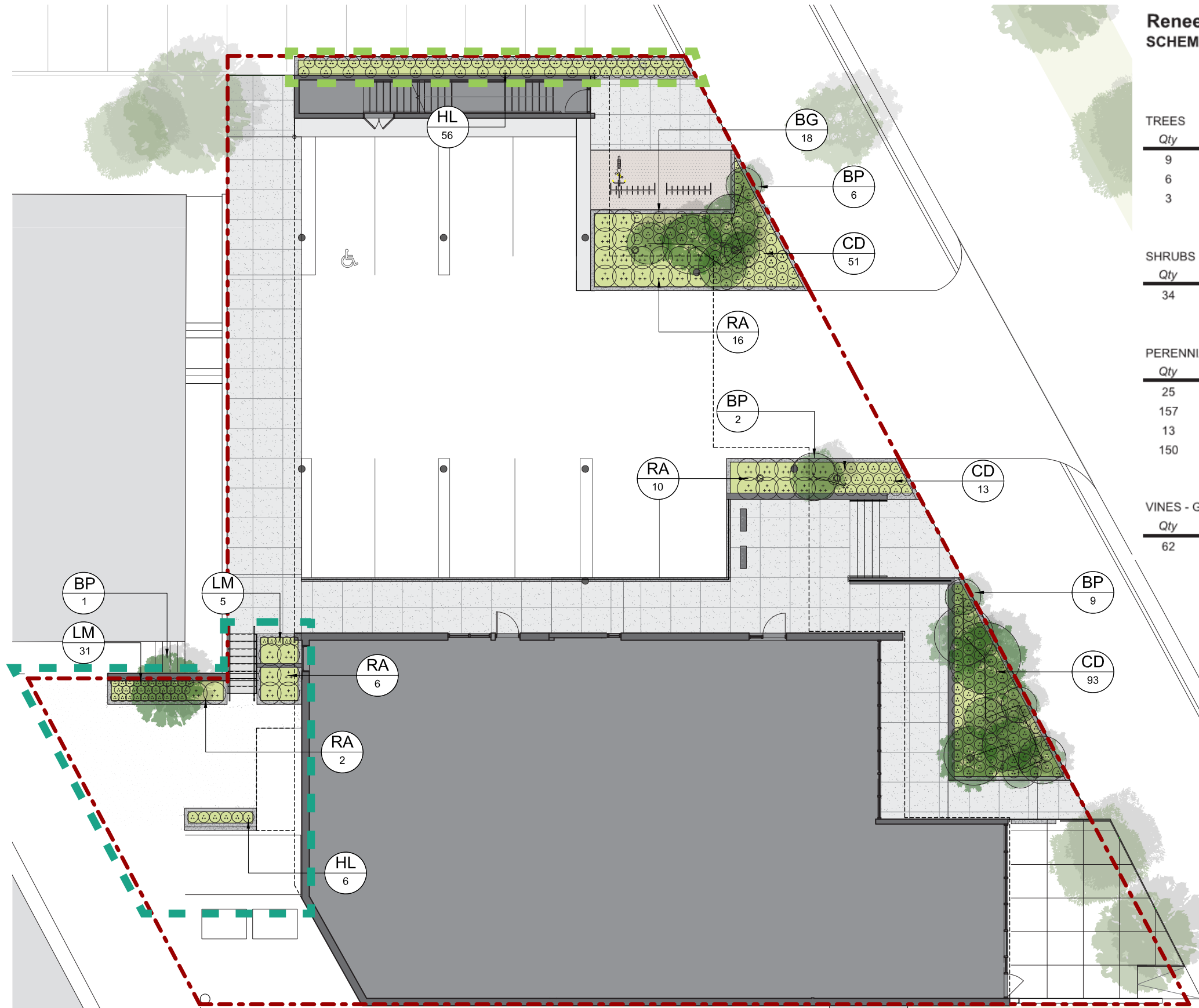
PERENNIALS, GRASSES AND BULBS

Qty	Abbr	Botanical name	Common name	Size
25	BG	BOUTELOUA GRACILIS	BLUE GRAMA	1 gal
157	CD	CAREX DIVULSA	GRASSLAND SEDGE	1 gal
150	NMH	NARCISSUS 'MOUNT HOOD'	MOUNT HOOD NARCISSUS	8/+ cm



SITE AND LANDSCAPE DETAILS

PLANTING - ALTERNATES



Renee Crown Wellness Institute SCHEMATIC PLANTING SCHEDULE - WITH ADD ALTERNATES

TREES

Qty	Abbr	Botanical name	Common name	Size
9	BP-A	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	10' - 12' Ht
6	BP-B	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	12' - 15' Ht
3	BP-C	BETULA POPULIFOLIA 'WHITESPIRE'	WHITESPIRE GREY BIRCH	15' - 20' Ht

SHRUBS

Qty	Abbr	Botanical name	Common name	Size
34	RA	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	15" - 18" Ht

PERENNIALS, GRASSES AND BULBS

Qty	Abbr	Botanical name	Common name	Size
25	BG	BOUTELOUA GRACILIS	BLUE GRAMA	1 gal
157	CD	CAREX DIVULSA	GRASSLAND SEDGE	1 gal
13	LM	LIRIOPE MUSCARI	LILYTURF	2 1/4" pot
150	NMH	NARCISSUS 'MOUNT HOOD'	MOUNT HOOD NARCISSUS	8/+ cm

VINES - GREEN WALL (ADD ALTERNATE 1)

Qty	Abbr	Type	Common name	Size
62	HL	HUMULUS LUPULUS	COMMON HOP	2 1/4" pot

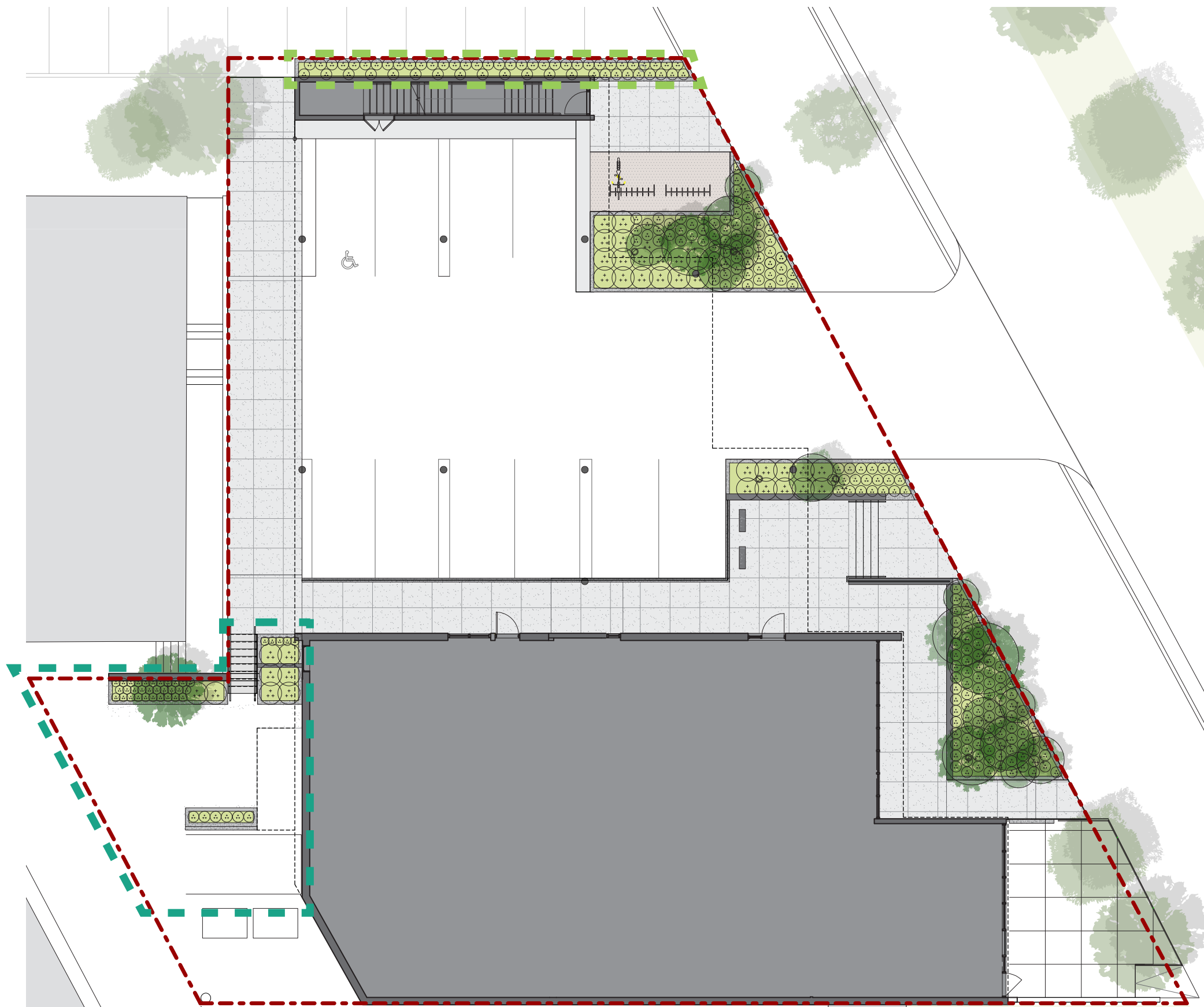
ADD ALTERNATES

- 1 NORTH GREEN WALL
- 2 ALLEY PLAZA

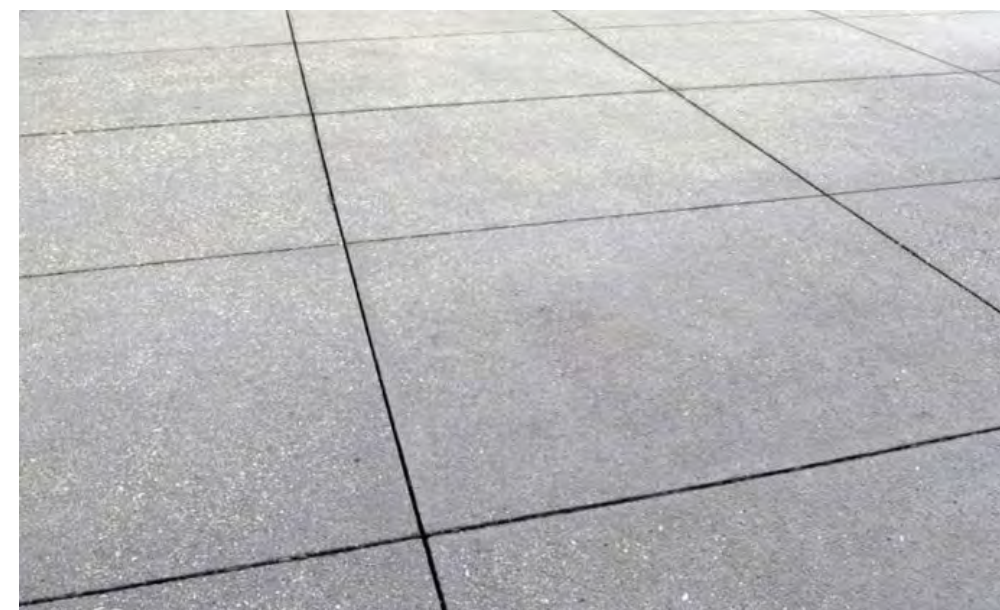


SITE AND LANDSCAPE DETAILS

PAVING



EXISTING PAVING (ALLEY)



NEW CONCRETE PAVING

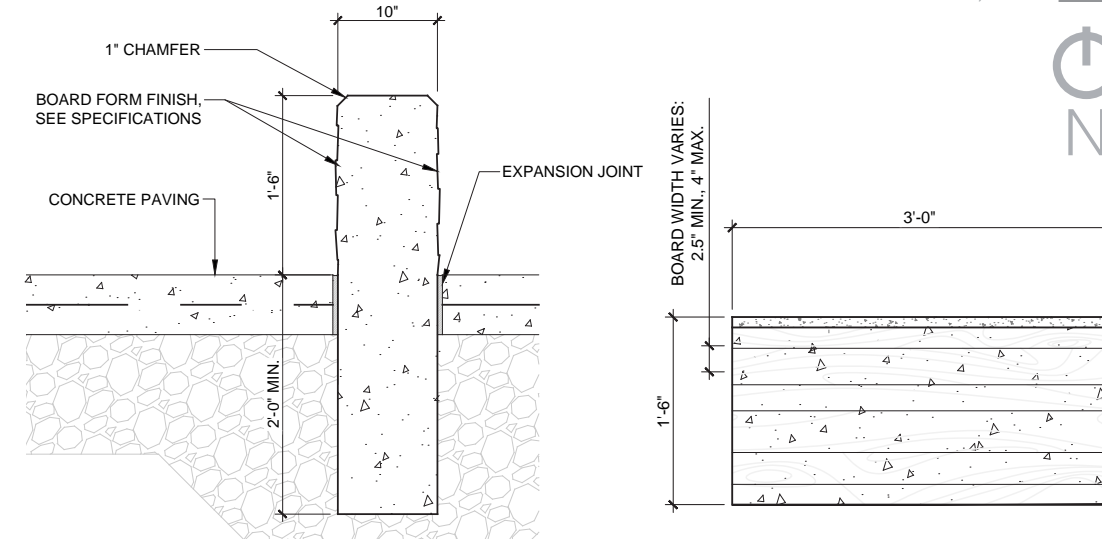
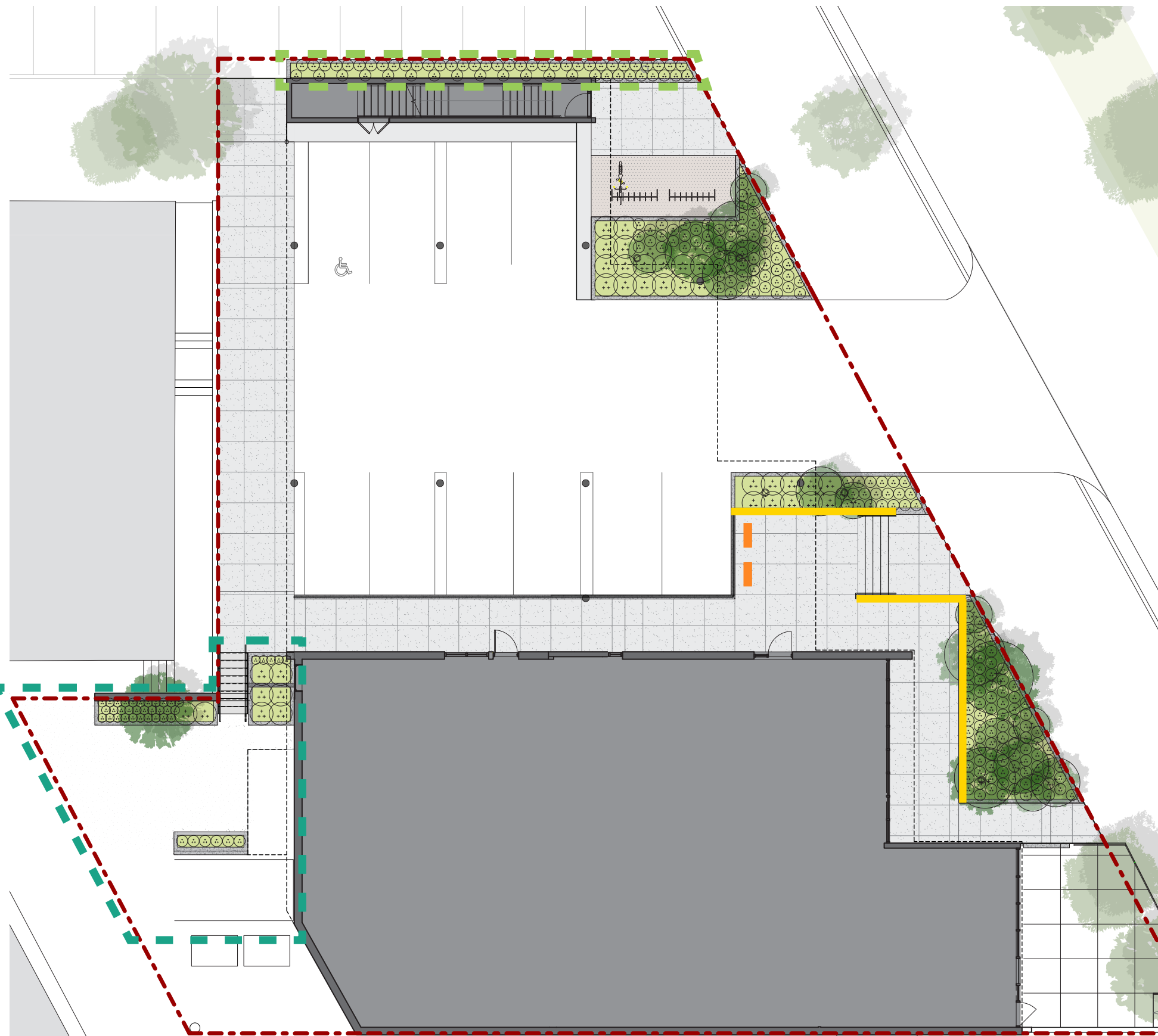
ADD ALTERNATES

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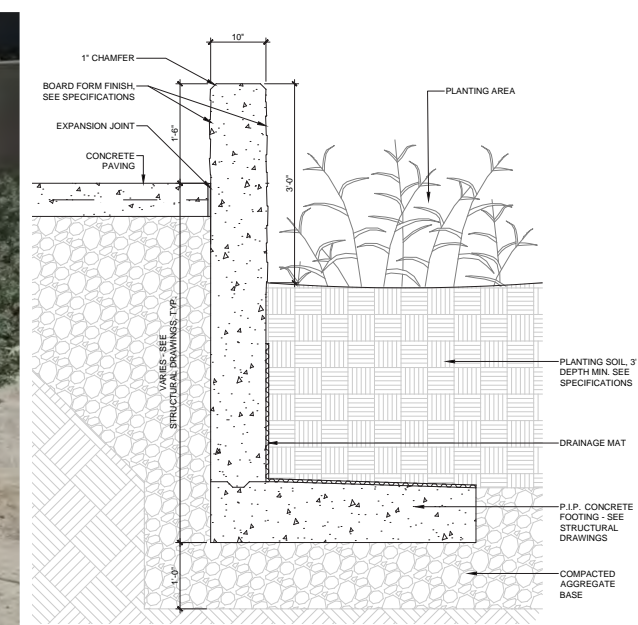
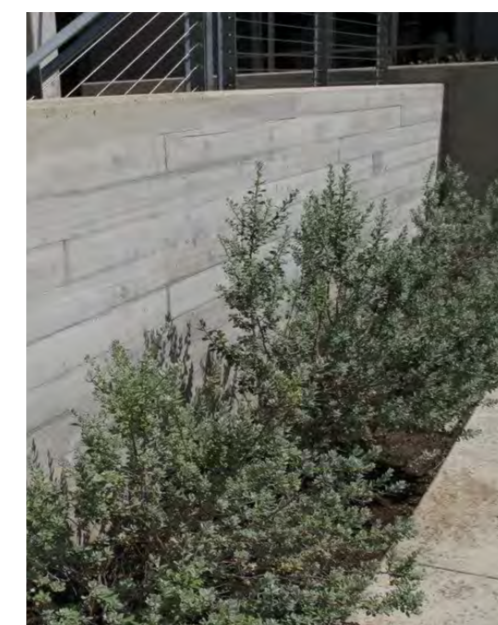


SITE AND LANDSCAPE DETAILS

SITE WALLS



BOARD FORM CONCRETE BENCH



BOARD FORM CONCRETE SITE WALL

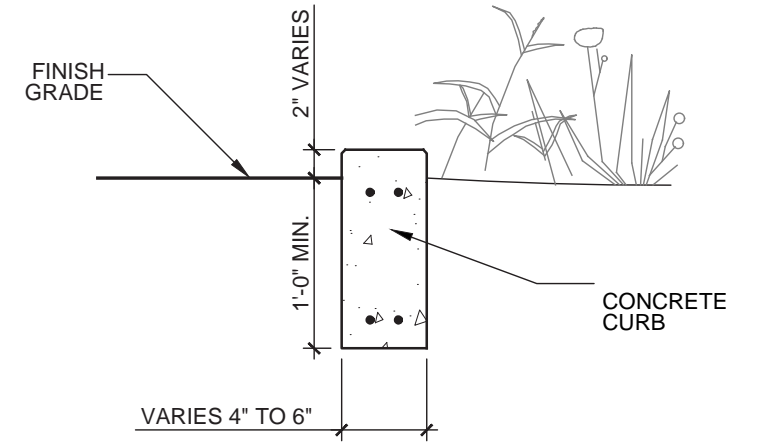
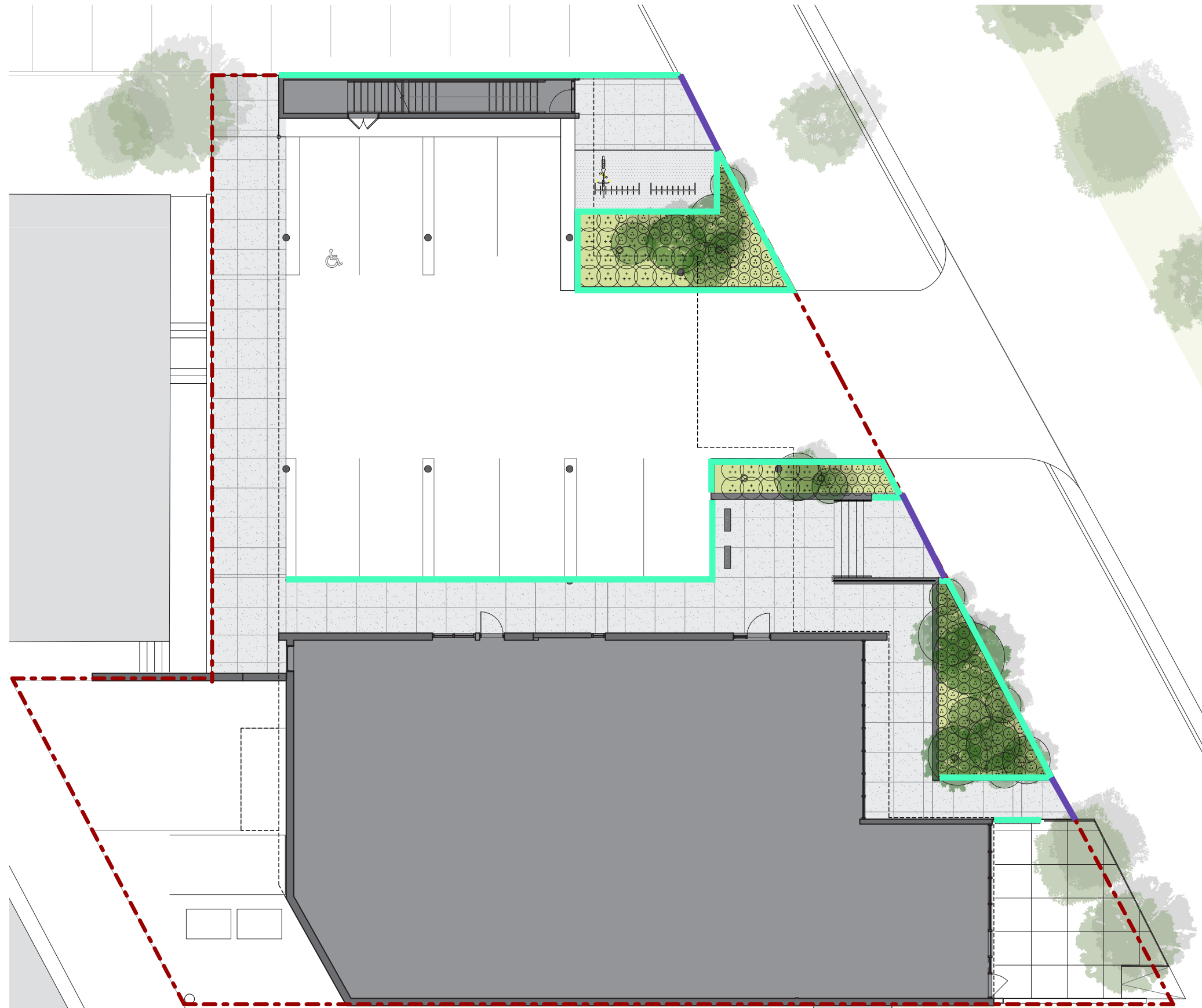
ADD ALTERNATES

- 1 NORTH GREEN WALL
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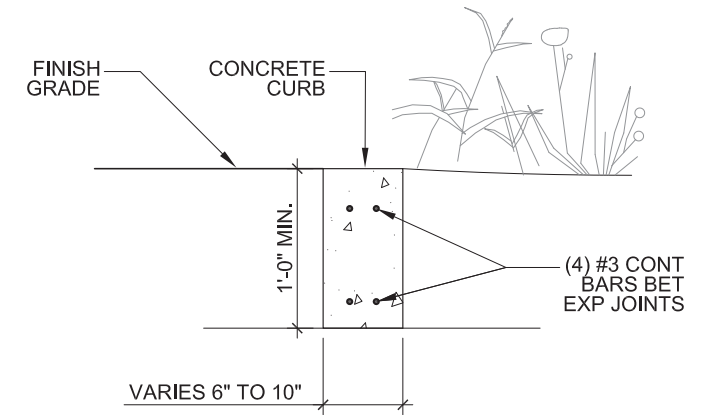
SITE AND LANDSCAPE DETAILS

CURBS - BASE BID



- NOTE:**
1. FOR FLUSH CONDITIONS ELIMINATE 2" REVEAL
 2. EXPANSION JOINTS SPACES MAX 20'-0" CENTER TO CENTER.

CONCRETE CURB



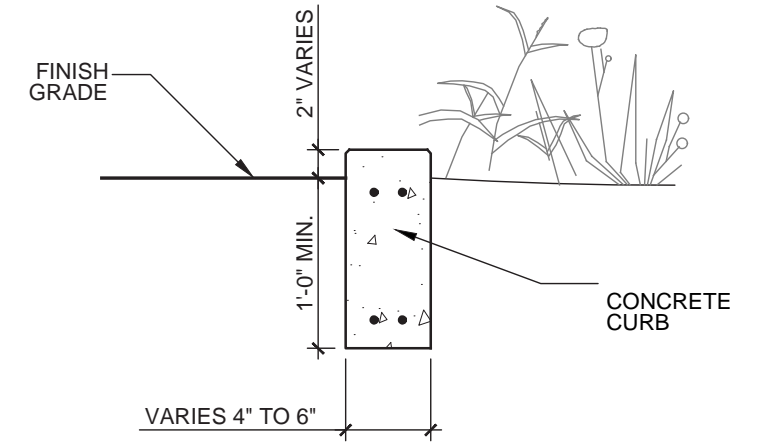
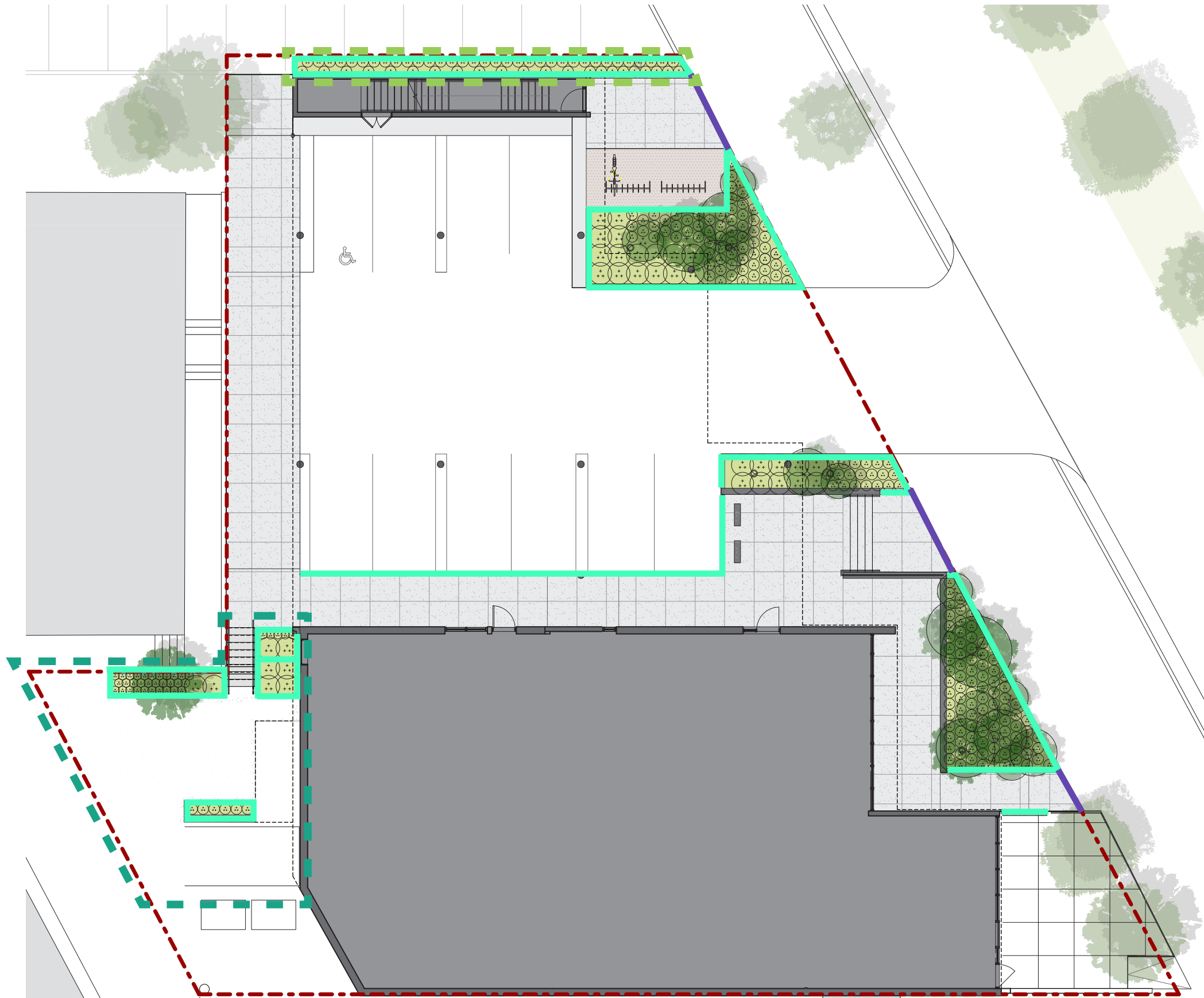
- NOTE:**
1. FOR FLUSH CONDITIONS ELIMINATE 2" REVEAL
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FLUSH CONCRETE CURB



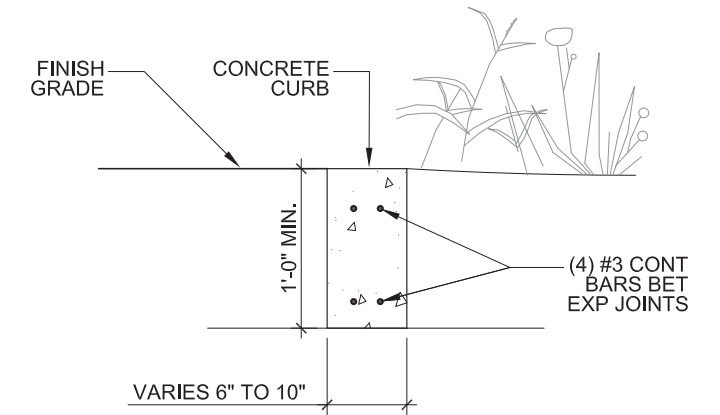
SITE AND LANDSCAPE DETAILS

CURBS - ALTERNATES



- NOTE:
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CONCRETE CURB



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FLUSH CONCRETE CURB

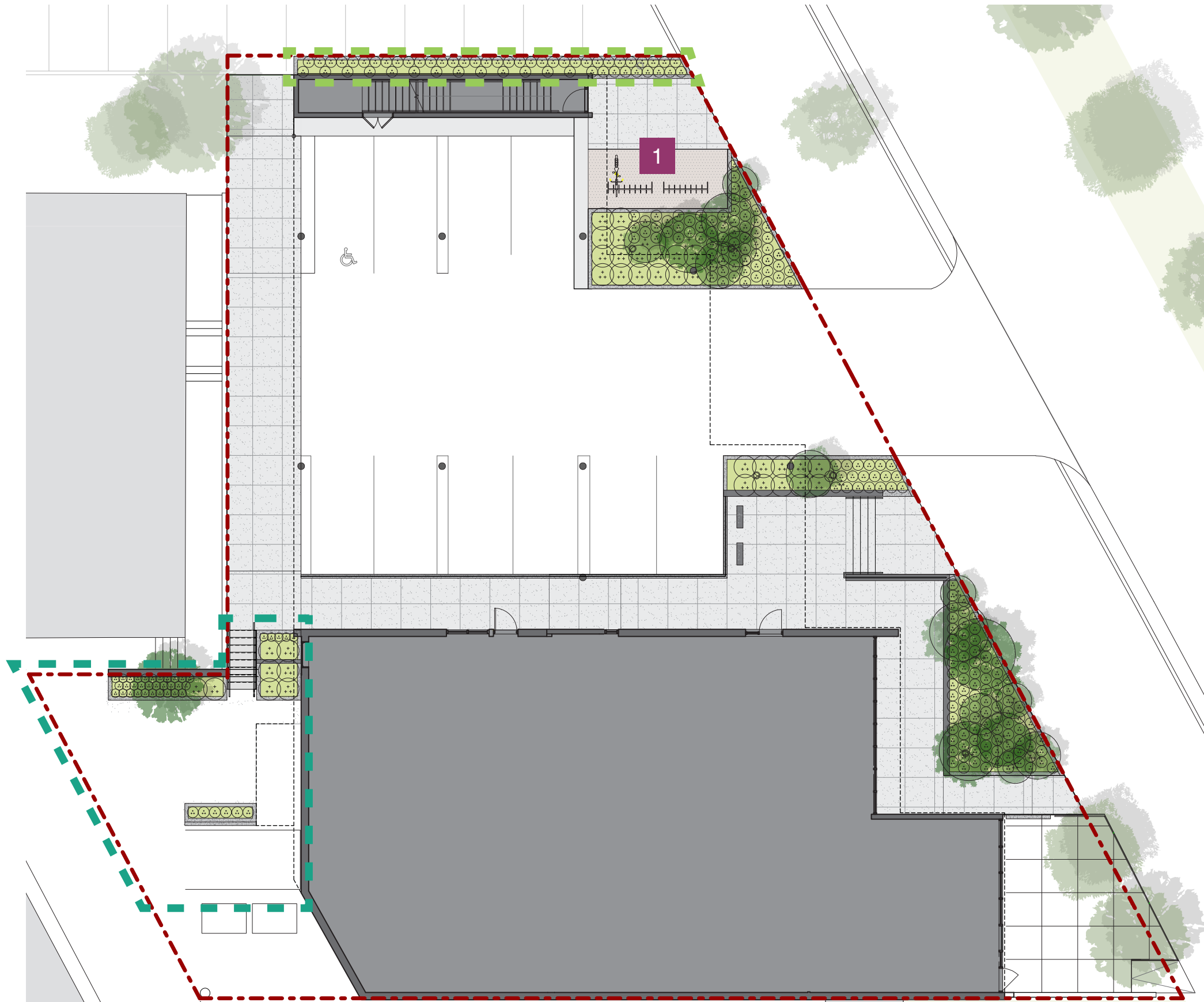
ADD ALTERNATES

- 1 NORTH GREEN WALL
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SITE AND LANDSCAPE DETAILS

SITE FURNISHINGS



1 BIKE RACKS
CU STANDARD - CORA EXPO W SERIES #7510

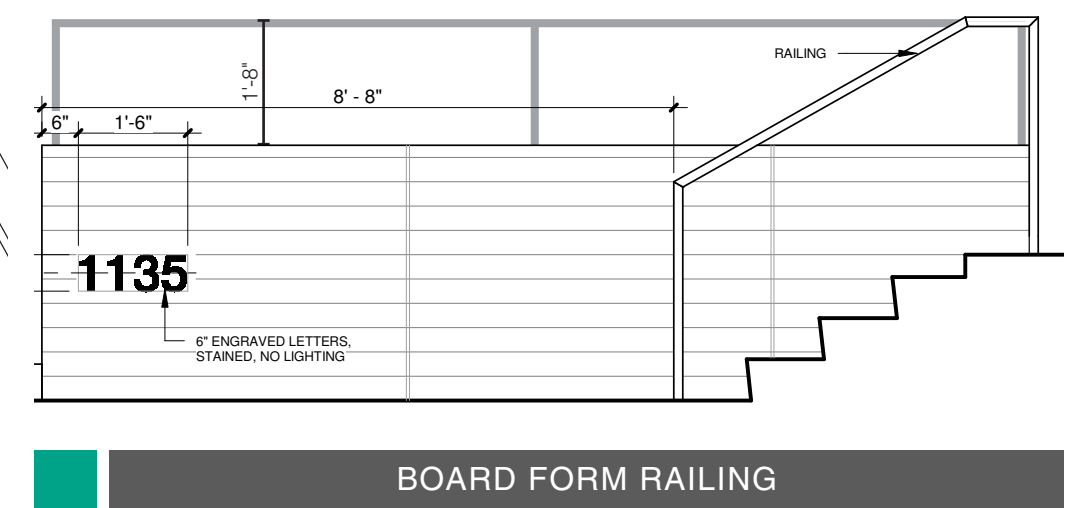
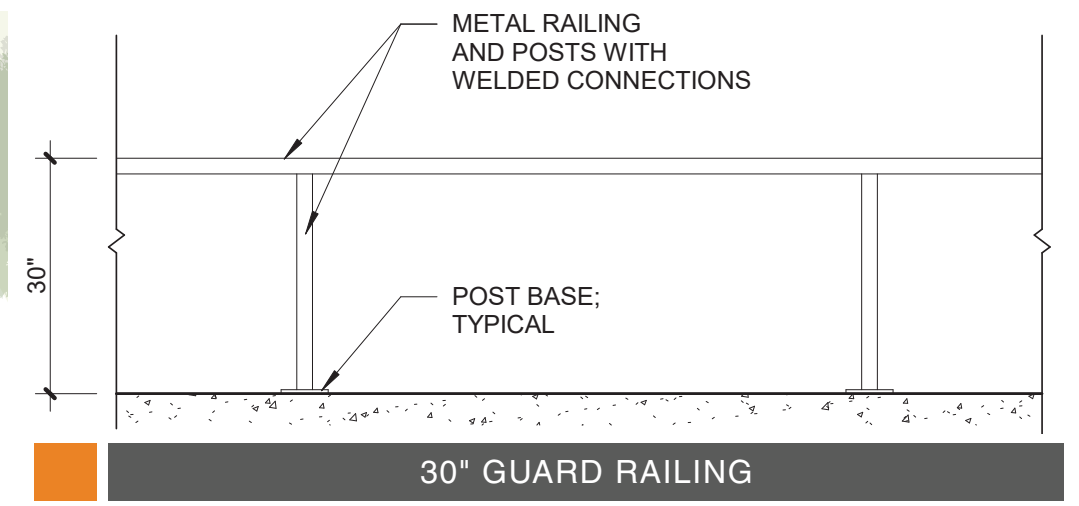
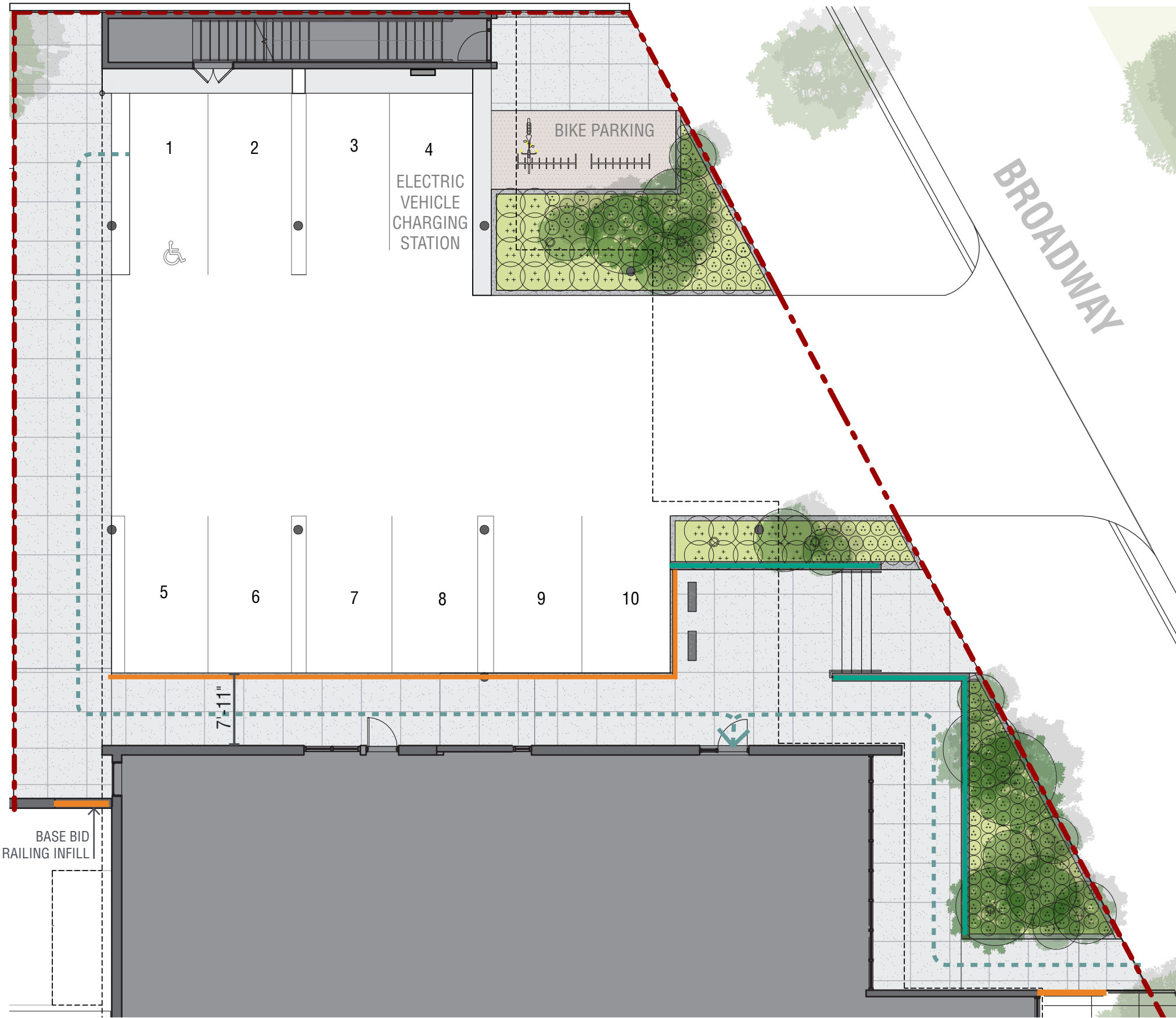
ADD ALTERNATES

- 1** NORTH GREEN WALL
- 2** ALLEY PLAZA



SITE AND LANDSCAPE DETAILS

PARKING AREA





SITE LIGHTING

LIGHTING PLAN + PHOTOMETRIC



FIXTURE SCHEDULE

KEY	LAMP(S)	DESCRIPTION	FINISH	VOLT	MOUNTING	MFR	CAT. NO.
H	20W/2244lm LED 3000K	LED EXTERIOR AREA LIGHT WITH TYPE III DIST AND INTEGRAL DRIVER	DARK BRONZE	120	WALL	LITHONIA	WSR-LED-P1-40K-SR3-MVOLT-DDBXD
K	20.4W/2052lm LED 4000K	4' LED EXTERIOR FIXTURE WITH CLEAR GLASS LENS AND INTEGRAL 0-10V DIMMING DRIVER	WHITE	120	RECESSED	SELUX	L125R1-1B20-40-L1-VERIFY-04-WH-UNV-DIM



WSR LED

Architectural Wall Sconce



Inverted available with WLU option only.

SIGNAGE LIGHTING

H LED EXTERIOR SCONCE

LITHONIA

M125
LED Direct

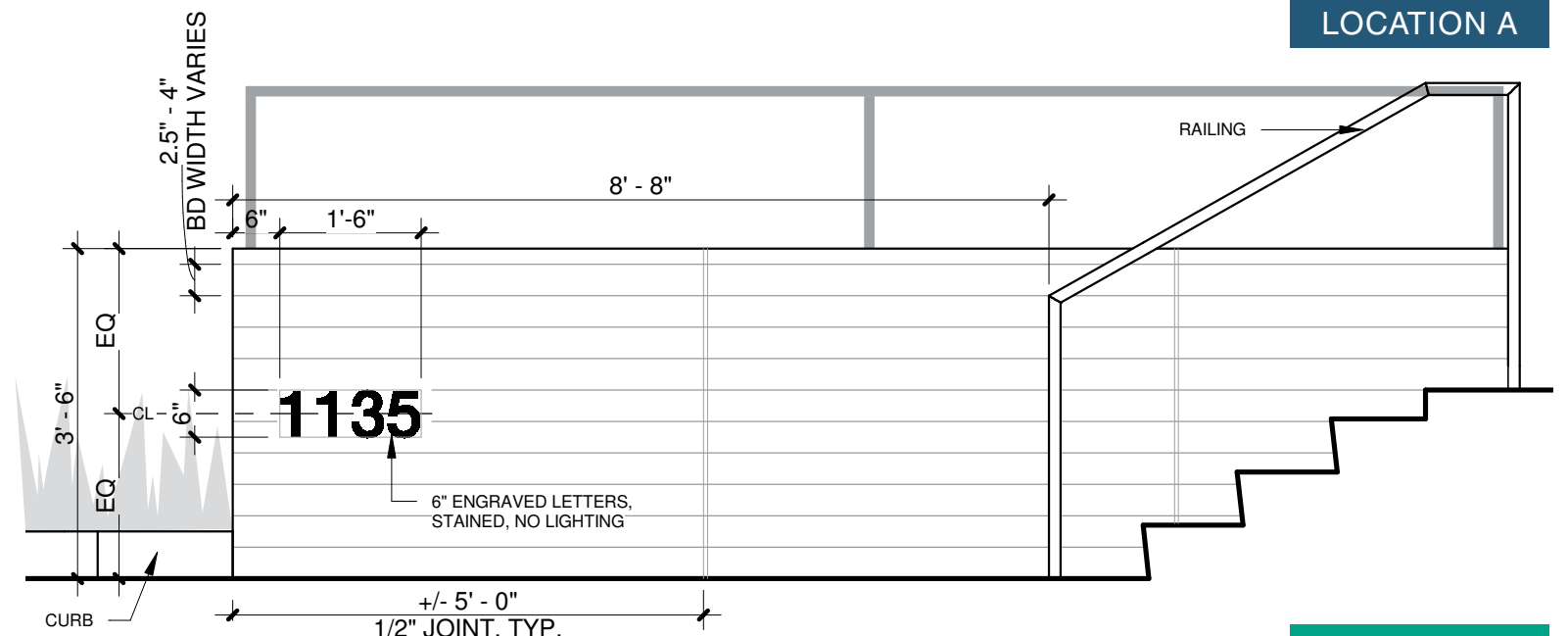
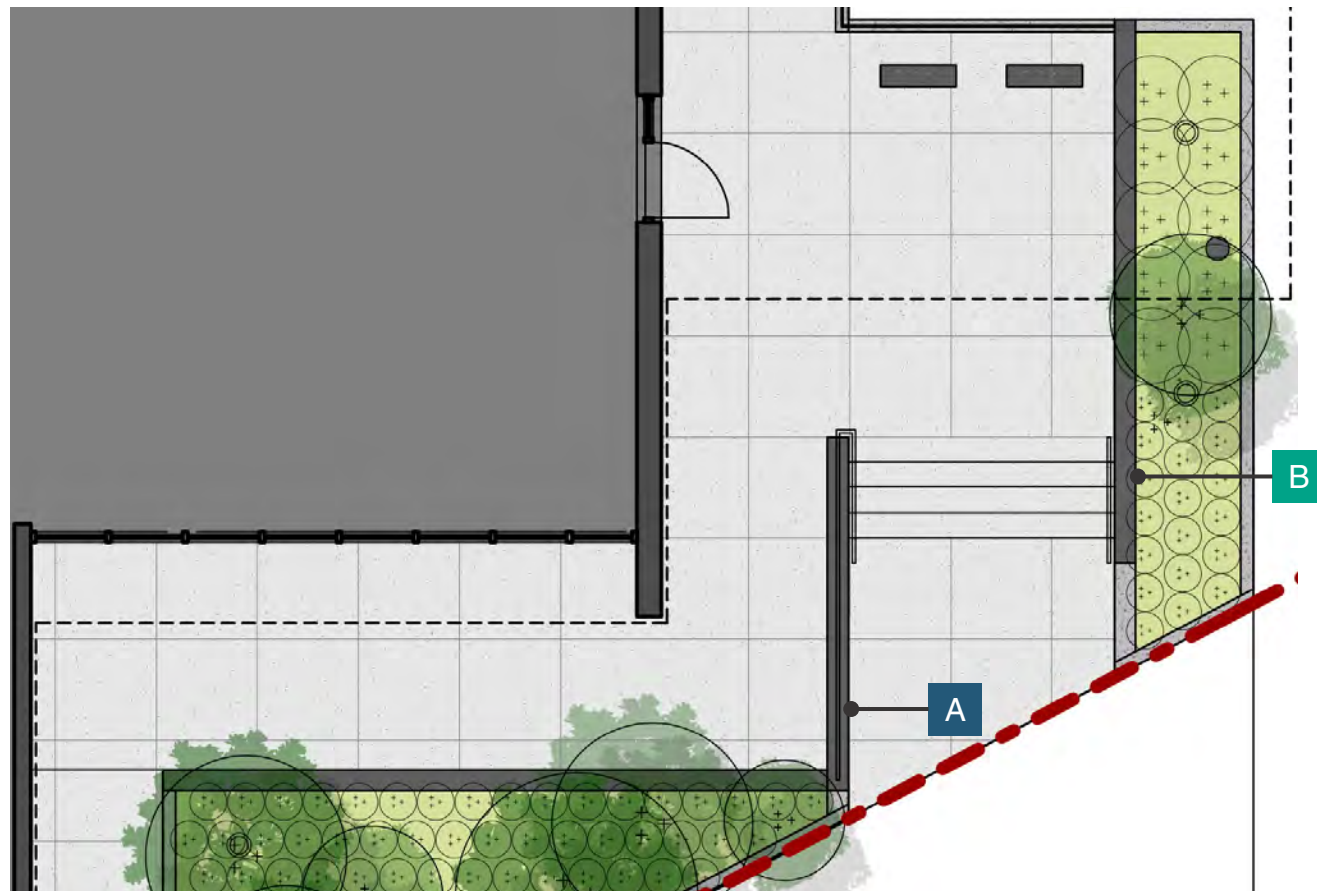


K RECESSED LINEAR LED

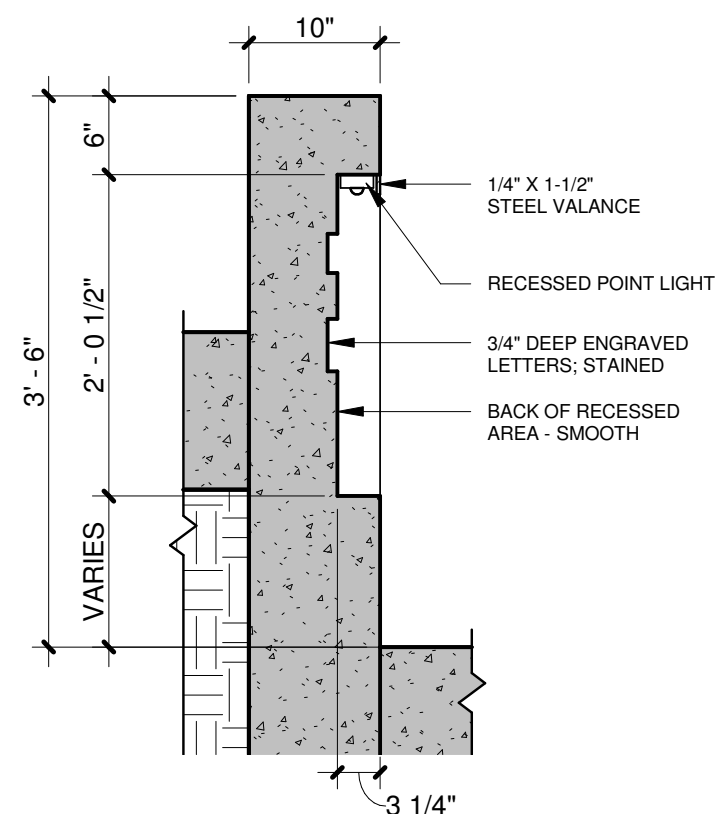
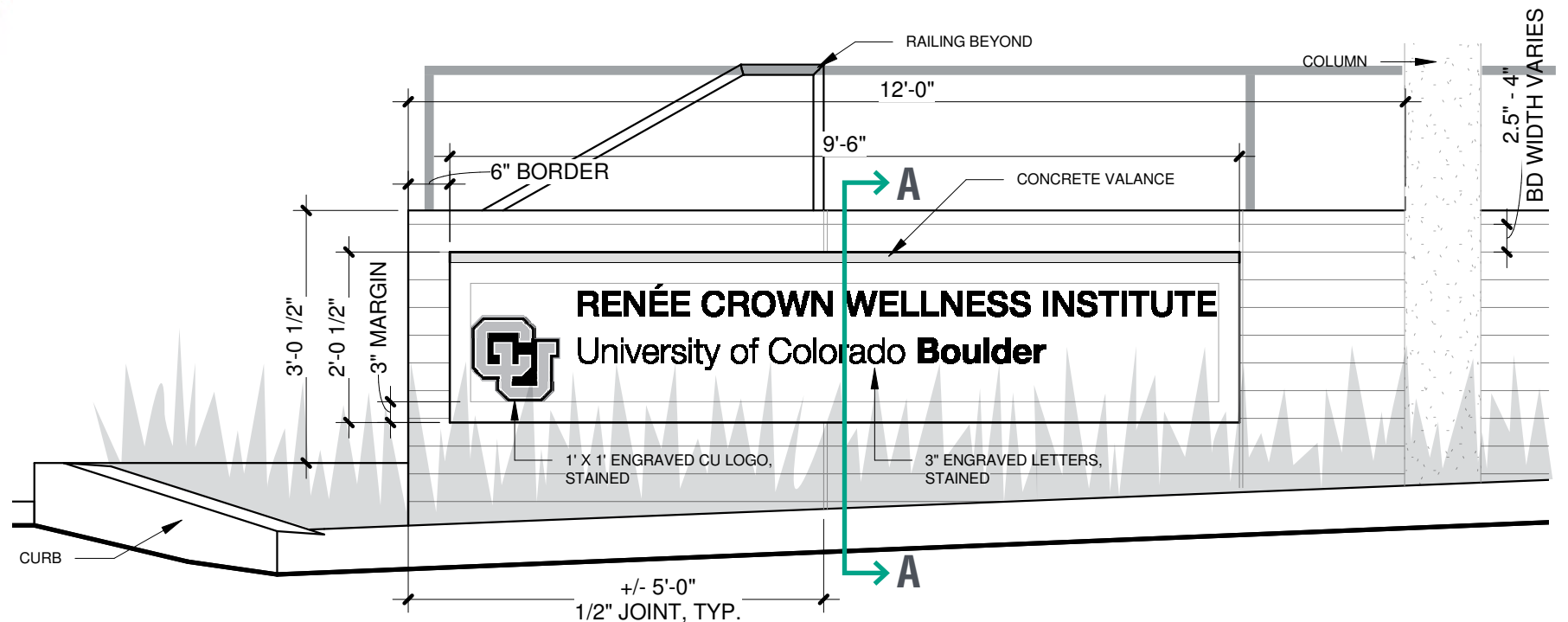
LITHONIA

SITE SIGNAGE

LOCATION A



LOCATION B



SECTION A-A : ENGRAVED CONCRETE DETAIL

CAMPUS PRECEDENT



BUILDING DESIGN

EXISTING PHOTOS

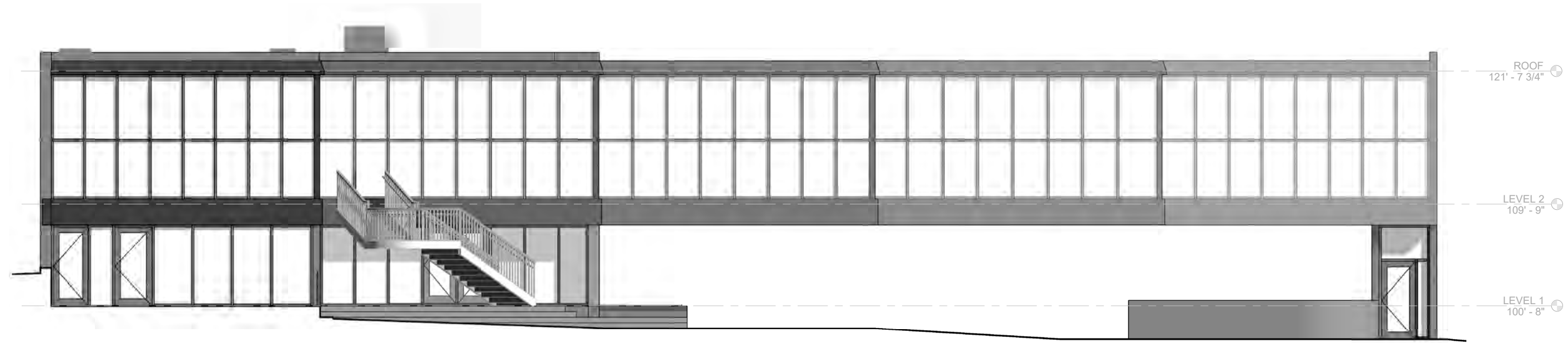


BUILDING DESIGN

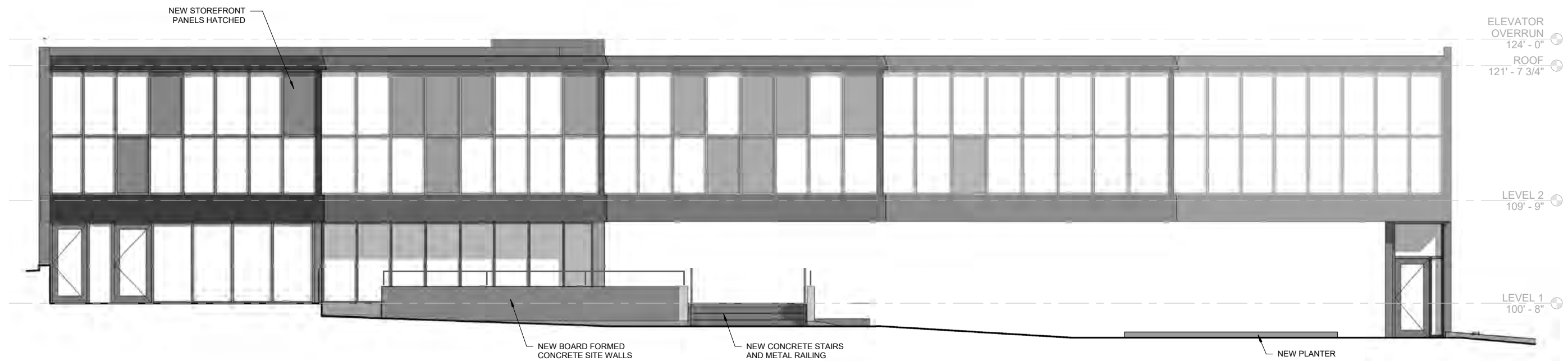
EXISTING PHOTOS



BUILDING DESIGN ELEVATIONS

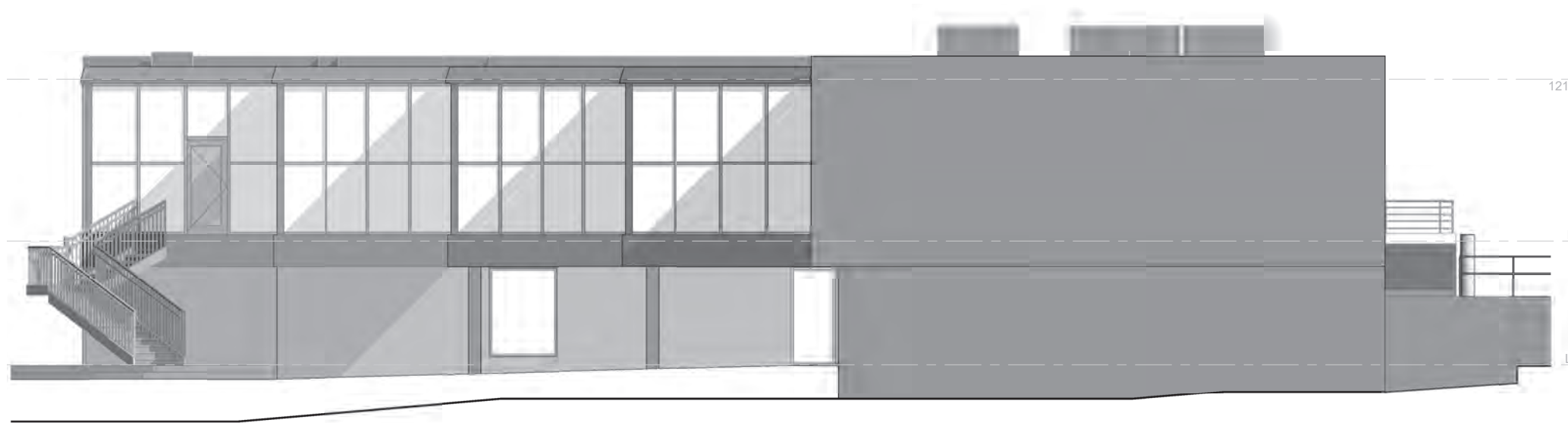


EXISTING EAST ELEVATION (BROADWAY)

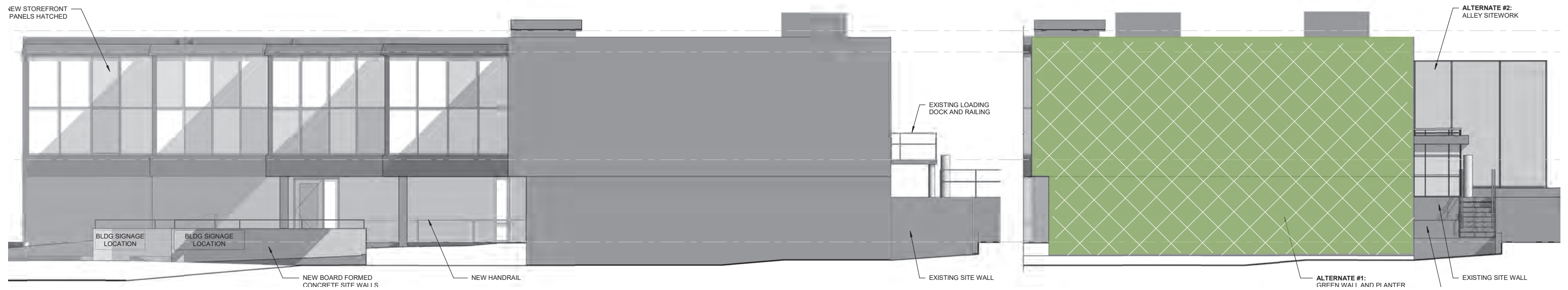


PROPOSED EAST ELEVATION (BROADWAY)

BUILDING DESIGN ELEVATIONS



EXISTING NORTH ELEVATION

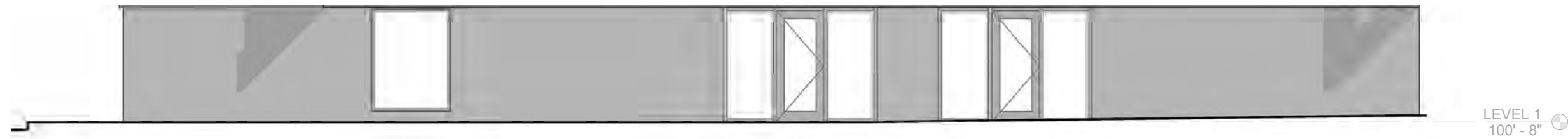


PROPOSED BASE BID NORTH ELEVATION

PROPOSED ALTERNATES NORTH ELEVATION

BUILDING DESIGN

ELEVATIONS

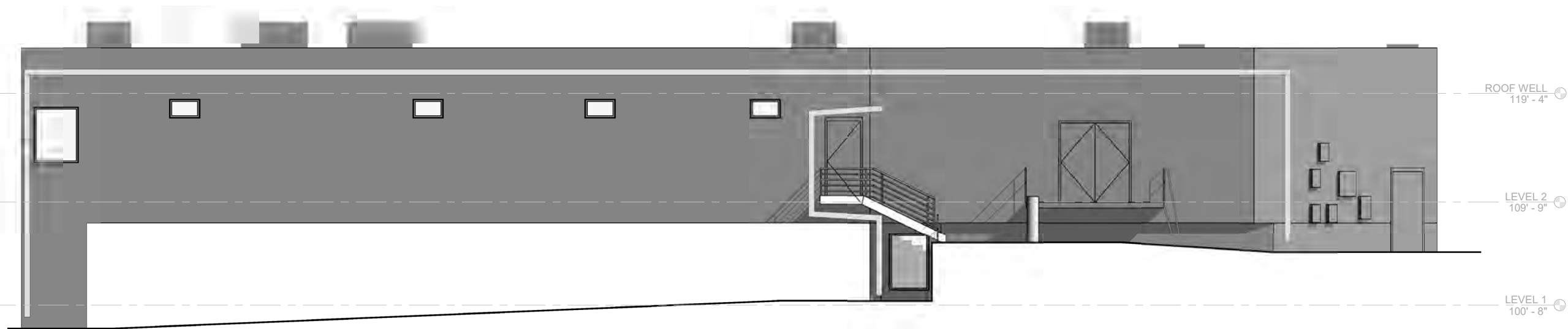


EXISTING PARTIAL NORTH ELEVATION

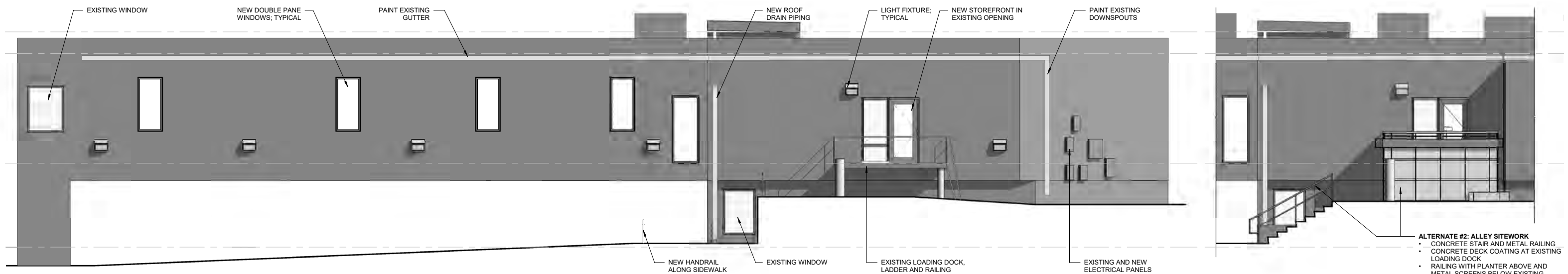


PROPOSED PARTIAL NORTH ELEVATION

BUILDING DESIGN ELEVATIONS



EXISTING WEST ELEVATION



PROPOSED BASE BID WEST ELEVATION

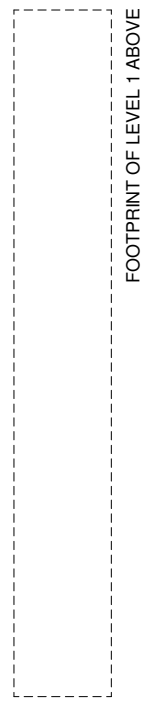
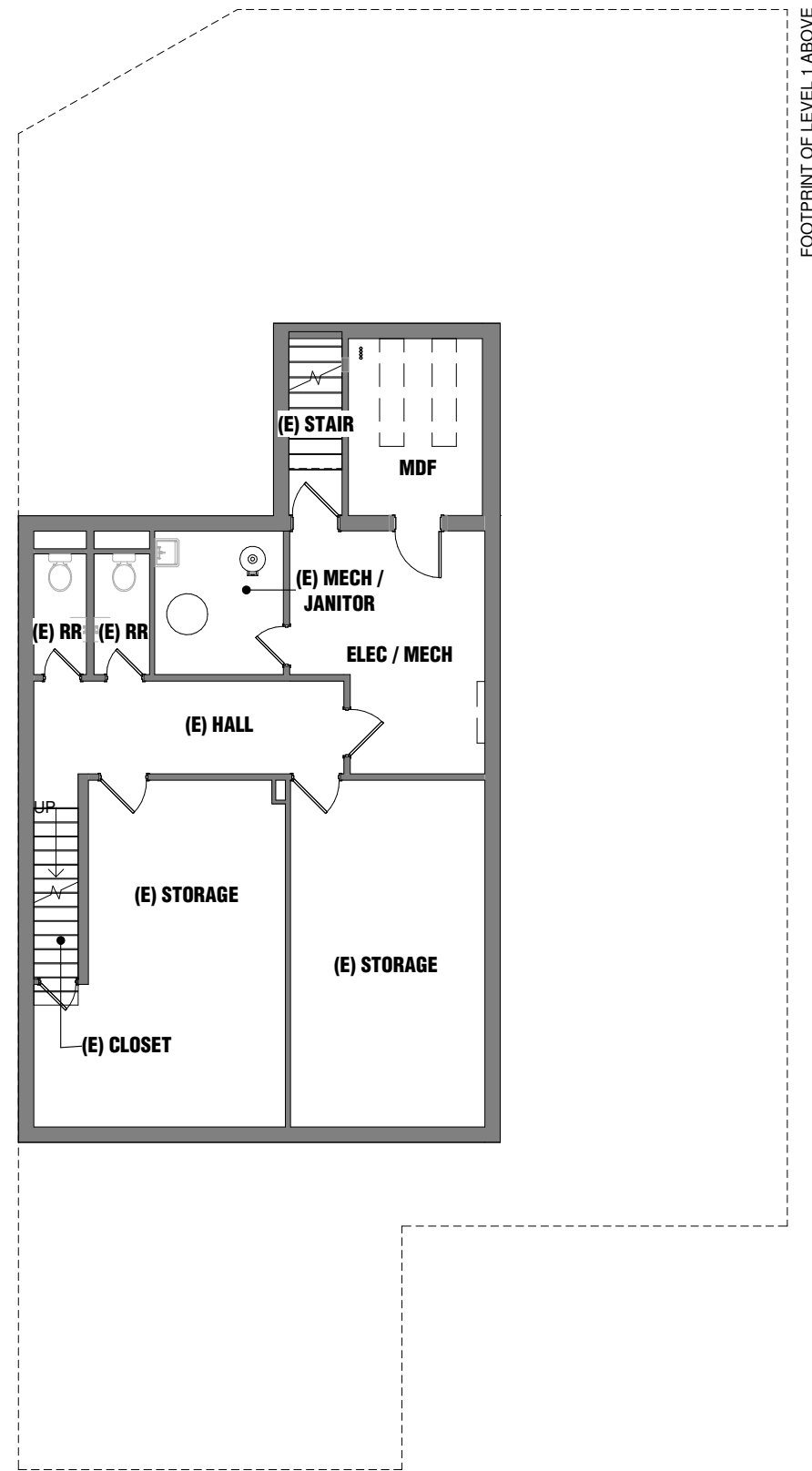
PROPOSED ALTERNATES WEST ELEVATION

- ALTERNATE #2: ALLEY SITINGWORK**
- CONCRETE STAIR AND METAL RAILING
 - CONCRETE DECK COATING AT EXISTING LOADING DOCK
 - RAILING WITH PLANTER ABOVE AND METAL SCREENS BELOW EXISTING LOADING DOCK
 - 15'x15' METAL SCREEN WALL ALONG FACILITIES PARKING SPACE
 - PLANTERS ADJACENT TO STAIR AND LEVEL 2 BALCONY



FLOOR PLANS

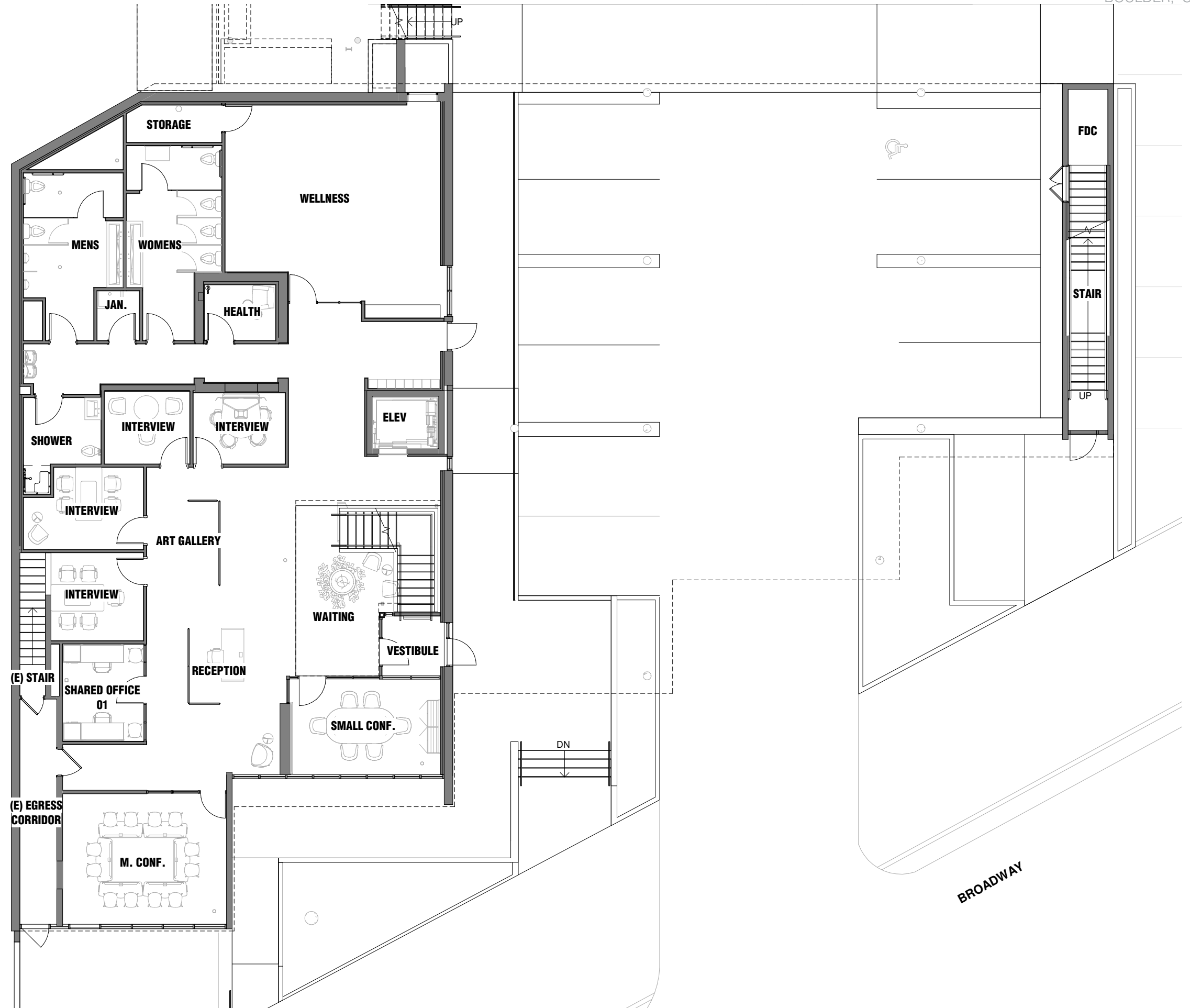
BASEMENT





FLOOR PLANS

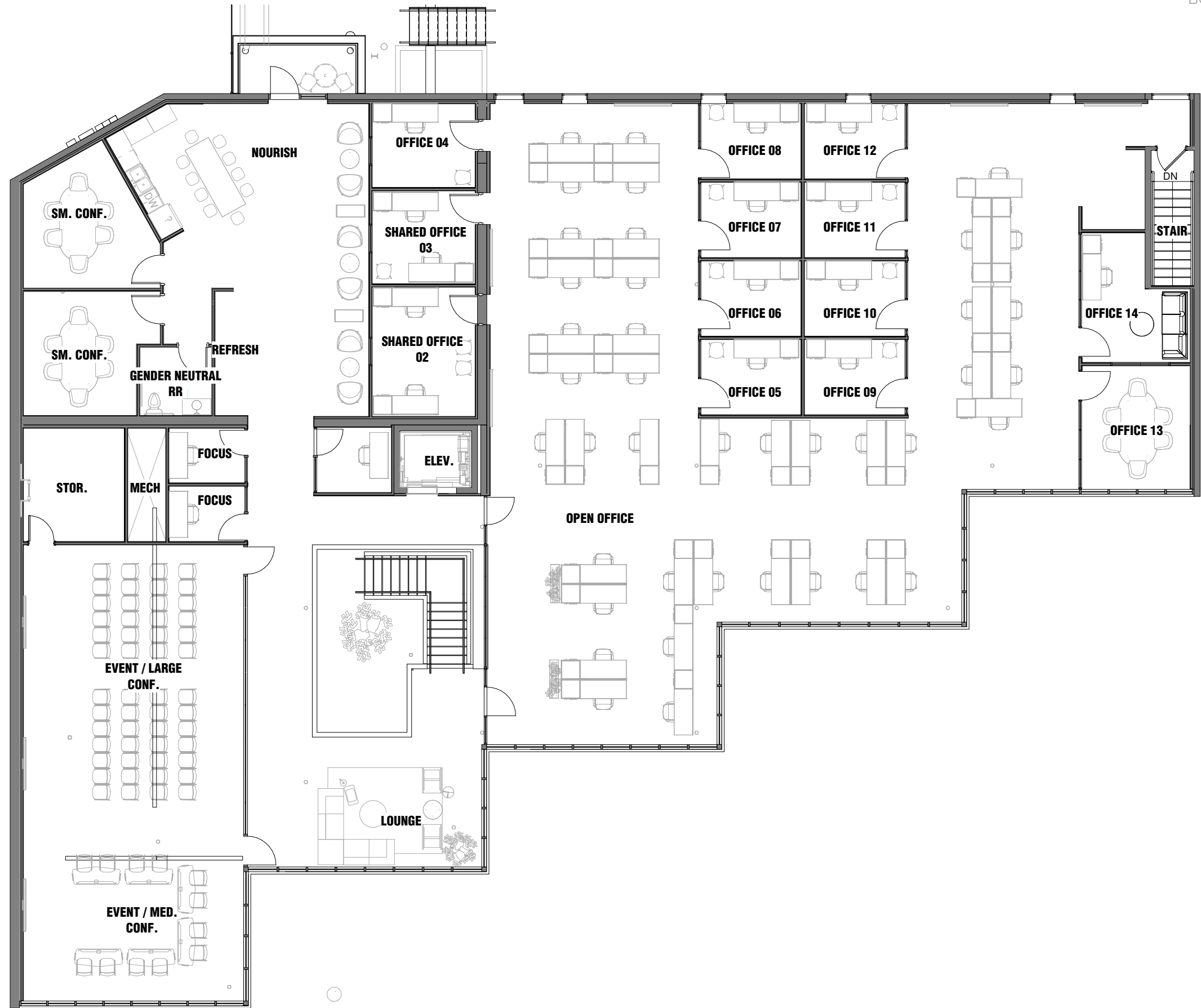
LEVEL 1



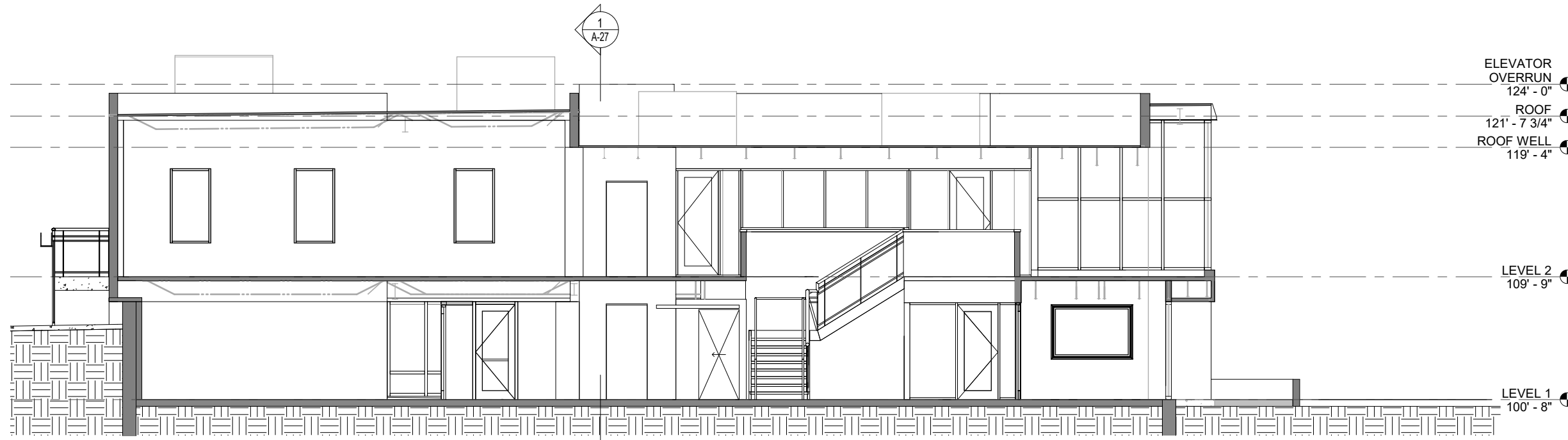


FLOOR PLANS

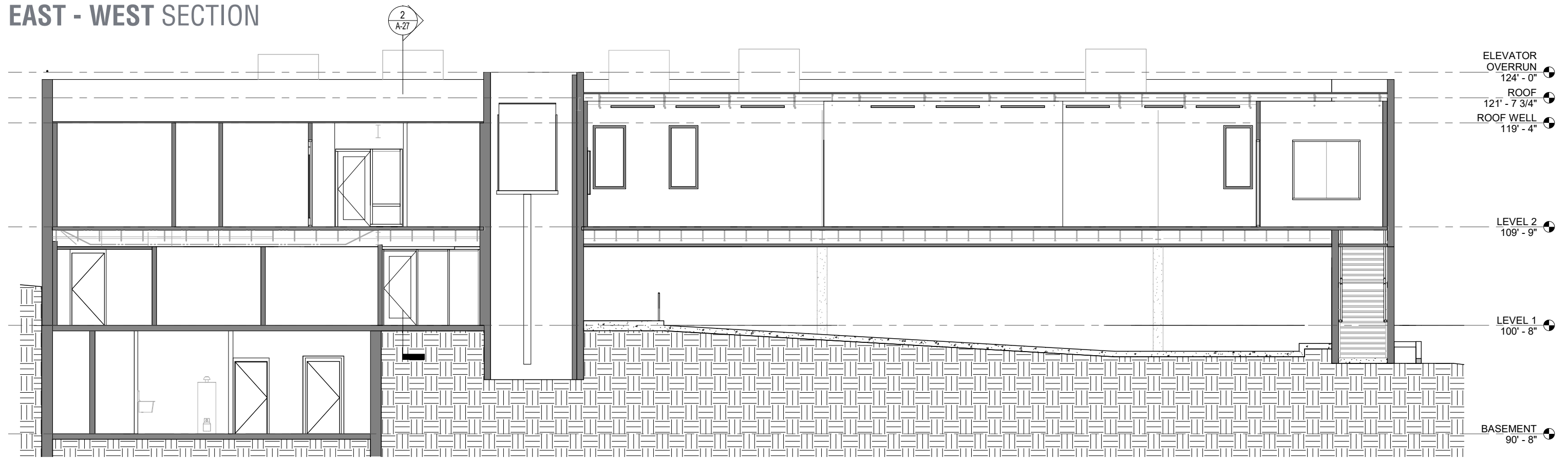
LEVEL 2



BUILDING DESIGN SECTIONS



EAST - WEST SECTION



NORTH - SOUTH SECTION

SUSTAINABILITY

LEED SCORECARD

The LEED Scorecard reflects the opportunities for the Renee Crown Wellness Institute renovation to achieve LEED Gold. For each credit, sustainability objectives have been aligned with CU's goals for academically sound, environmentally and financially responsible project development. With a goal of LEED Gold Certification, the current "YES" point total is solidly at Silver. The project is tracking ten "strong maybe" points substantiating the Gold Certification goal. By continuing to carefully analyze details, such as water flush and flow fixture selection, these strong maybe points represent opportunities to deliver a LEED Gold project.

LEED v4 for BD+C: New Construction and Major Renovation Project Scorecard

Y	M	N	Integrative Process		1
1	0	0	Credit	Integrative Process	1

Y	M	N	Location and Transportation		16
0	0	16	Credit	LEED for Neighborhood Development Location	16
1	0	0	Credit	Sensitive Land Protection	1
0	0	2	Credit	High Priority Site	2
5	0	0	Credit	Surrounding Density and Diverse Uses	5
5	0	0	Credit	Access to Quality Transit	5
1	0	0	Credit	Bicycle Facilities	1
1	0	0	Credit	Reduced Parking Footprint	1
1	0	0	Credit	Green Vehicles	1
14	0	2			

Y	M	N	Sustainable Sites		10
Y	0	0	Prereq	Construction Activity Pollution Prevention	Required
1	0	0	Credit	Site Assessment	1
0	0	2	Credit	Site Development - Protect or Restore Habitat	2
0	0	1	Credit	Open Space	1
0	0	3	Credit	Rainwater Management	3
2	0	0	Credit	Heat Island Reduction	2
1	0	0	Credit	Light Pollution Reduction	1
4	0	6			

Y	M	N	Water Efficiency		11
Y	0	0	Prereq	Outdoor Water Use Reduction (p)	Required
Y	0	0	Prereq	Indoor Water Use Reduction (p)	Required
Y	0	0	Prereq	Building-Level Water Metering	Required
1	0	1	Credit	Outdoor Water Use Reduction (c)	2
3	3	0	Credit	Indoor Water Use Reduction (c) - TBD	6
0	0	2	Credit	Cooling Tower Water Use	2
0	1	0	Credit	Water Metering	1
4	4	3			

Y	M	N	Energy and Atmosphere		33
Y	0	0	Prereq	Fundamental Commissioning & Verification	Required
Y	0	0	Prereq	Minimum Energy Performance	Required
Y	0	0	Prereq	Building-Level Energy Metering	Required
Y	0	0	Prereq	Fundamental Refrigerant Management	Required
6	0	0	Credit	Enhanced Commissioning	6
4	9	5	Credit	Optimize Energy Performance - TBD	18
0	0	1	Credit	Advanced Energy Metering	1
0	0	2	Credit	Demand Response	2
0	3	0	Credit	Renewable Energy Production	3
0	1	0	Credit	Enhanced Refrigerant Management	1
0	2	0	Credit	Green Power and Carbon Offsets	2
10	15	8			

CU Renee Crown Wellness Renovation 4/1/2020



Y	M	N	Materials and Resources		13
Y	0	0	Prereq	Storage and Collection of Recyclables	Required
Y	0	0	Prereq	Construction & Demolition Waste Management Planning	Required
0	4	1	Credit	Building Life-Cycle Impact Reduction	5
1	1	0	Credit	Building Product Disclosure & Optimization - Environmental Product Declarations	2
1	1	0	Credit	Building Product Disclosure & Optimization - Sourcing of Raw Materials	2
1	1	0	Credit	Building Product Disclosure & Optimization - Material Ingredients	2
2	0	0	Credit	Construction & Demolition Waste Management	2
5	7	1			

Y	M	N	Indoor Environmental Quality		16
Y	0	0	Prereq	Minimum Indoor Air Quality Performance	Required
Y	0	0	Prereq	Environmental Tobacco Smoke Control	Required
2	0	0	Credit	Enhanced Indoor Air Quality Strategies	2
3	0	0	Credit	Low Emitting Materials	3
1	0	0	Credit	Construction Indoor Air Quality Management Plan	1
1	1	0	Credit	Indoor Air Quality Assessment	2
0	1	0	Credit	Thermal Comfort	1
1	1	0	Credit	Interior Lighting	2
0	0	3	Credit	Daylight	3
1	0	0	Credit	Quality Views	1
0	0	1	Credit	Acoustic Performance	1
9	3	4			

Y	M	N	Innovation		6
1	0	0	Credit	Innovation in Design, Education and Outreach	1
1	0	0	Credit	Innovation in Design, Occupant Comfort Survey	1
1	0	0	Credit	Exemplary Performance, EPDs	1
1	0	0	Credit	Innovation in Design, LEED O+M Starter kit	1
1	0	0	Credit	Innovation in Design, Pilot	1
1	0	0	Credit	LEED Accredited Professional	1
6	0	0			

Y	M	N	Regional Priority		4
0	1	0	Credit	Regional Priority Credit 1, Access to Quality Transit, 5 points	1
0	1	0	Credit	Regional Priority Credit 2, High Priority Site (2pts)	1
1	0	0	Credit	Regional Priority Credit 3, Rainwater Management (2pts)	1
1	0	0	Credit	Regional Priority Credit 4, Outdoor Water Use, 2 points	1
2	2	0			

55	31	24	TOTALS	Possible Points:	110
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Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

SUSTAINABILITY

HIGHLIGHTS

INTEGRATIVE PROCESS

- In the early stages of design, the team explored a variety of HVAC systems and envelope improvement strategies, to seek those most appropriate for this project.

LOCATION AND TRANSPORTATION

- By repurposing an existing building, the project will achieve the sensitive land protection credit.
- The University Hill site next to campus achieves the objectives for development density, community connectivity, and quality transit. The project is consistent with the campus's efforts to encourage public transit through pedestrian and bike paths, bike racks, limiting parking, and providing shower facilities.

SUSTAINABLE SITES

- Site strategies include reduction of existing hardscape and replacement with native, drought tolerant landscape.
- Exterior lighting fixtures will comply with backlight, uplight and glare ratings and limit light trespass outside the property boundary, unless required for safety.

WATER EFFICIENCY

- Site irrigation will be limited to drip, and water demand will be reduced through the use of native or adapted plant species.
- High efficiency flow and flush fixtures will be installed to maximize indoor water use reductions.

ENERGY AND ATMOSPHERE

- Envelope improvements and mechanical system selection were carefully considered to maximize energy savings within the project parameters.
- Rooftop has been analyzed for renewable energy potential.

SUSTAINABILITY

HIGHLIGHTS

MATERIALS AND RESOURCES

- Materials that carry environmental product disclosures (EPD's) will be prioritized for use on this project.
- Materials that are sourced regionally, and those with high levels of recycled content and/or FSC wood will be given preference.
- Construction and demolition waste management will be required, with the goal of diverting at least 75% of construction waste from the landfill.

INDOOR ENVIRONMENTAL QUALITY

- Entryway systems will be employed to limit indoor contaminants, air handling units will be equipped with MERV-13 filters.
- Paints, coatings, adhesives, sealants, composite wood, insulation and flooring will all be specified as low emitting, and will meet the California Department of Public Health Standard method V1.1 2010.
- A construction indoor air quality plan will be established to ensure SMACNA guidelines are followed and absorptive materials are protected.
- The plan has been developed with priority given to promoting a connection to the outdoors through views and daylight.

WELL BUILDING

- Biophilic design in the textures and patterns of finishes as well as the use of indoor plants and strategic layout of offices and workstations to maintain views and daylight.
- Promote social equity by preserving culture, history and welcoming diversity.
- Kitchen to promote access to healthy foods and to include food preparation as part of events and gatherings.
- Open central stairway to promote exercise and social interaction in the workplace.
- Alley balcony to allow for occupant connection to the outdoors without impacts of noise from Broadway.

SUSTAINABILITY

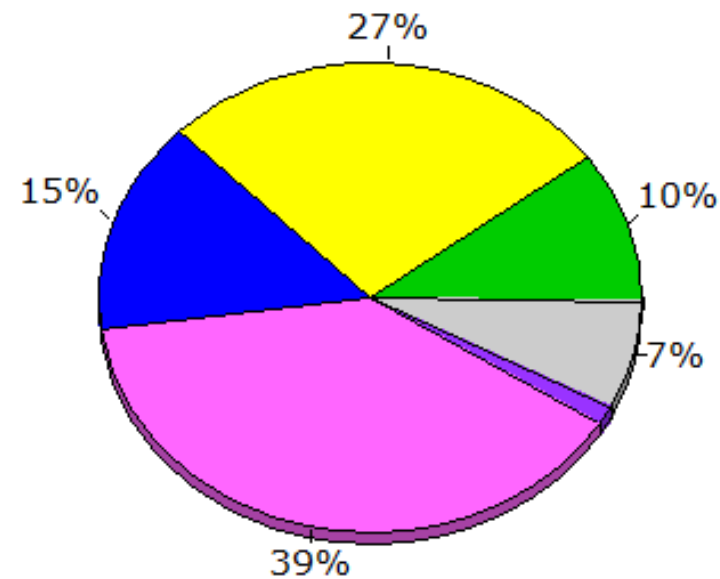
BASELINE ENERGY USE

CURRENT BUILDING ENERGY USE:
67.2 KBTU/SF/YR

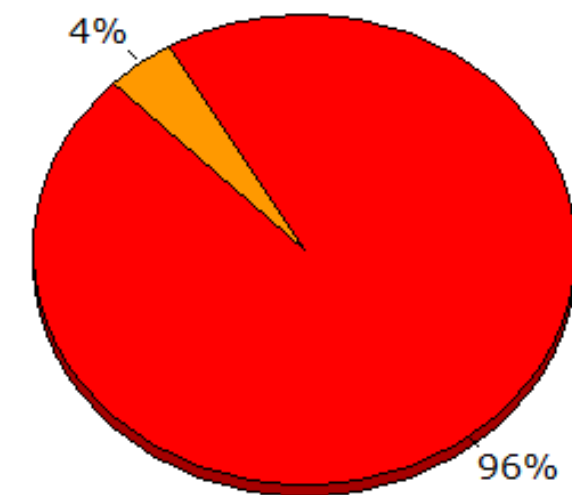
Annual Energy Consumption by Enduse

	Electricity kWh (x000)	Natural Gas MBtu	Steam Btu	Chilled Water Btu
Space Cool	17.46	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	-	447.47	-	-
HP Supp.	-	-	-	-
Hot Water	-	19.95	-	-
Vent. Fans	45.86	-	-	-
Pumps & Aux.	1.57	-	-	-
Ext. Usage	8.76	-	-	-
Misc. Equip.	12.31	-	-	-
Task Lights	-	-	-	-
Area Lights	32.48	-	-	-
Total	118.43	467.42	-	-

-  Area Lighting
-  Exterior Usage
-  Water Heating
-  Refrigeration
-  Task Lighting
-  Pumps & Aux.
-  Ht Pump Supp.
-  Heat Rejection
-  Misc. Equipment
-  Ventilation Fans
-  Space Heating
-  Space Cooling



Electricity



Natural Gas

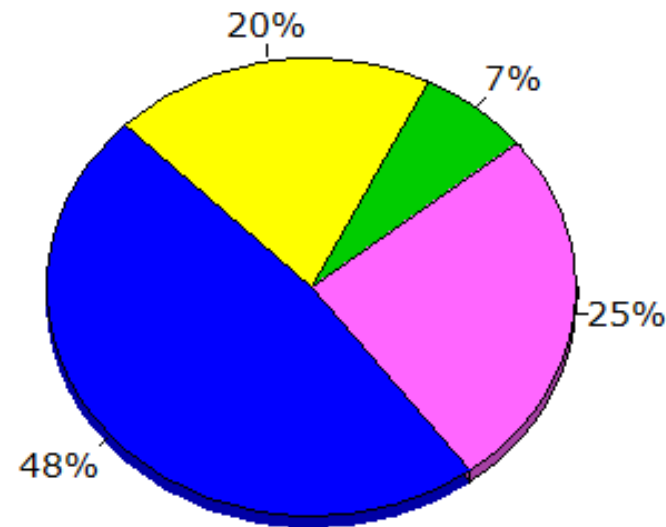
SUSTAINABILITY

BASELINE ENERGY PEAK DEMAND

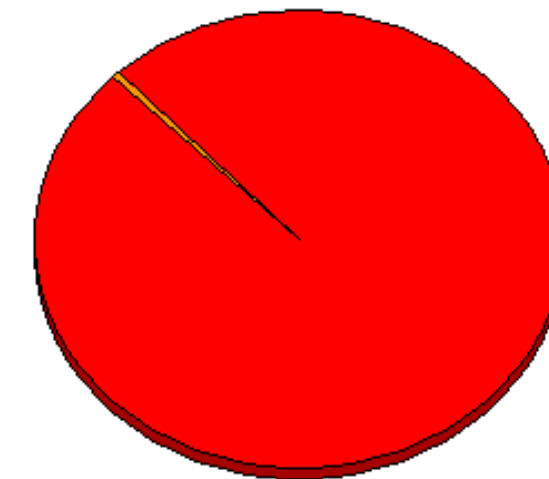
Annual Peak Demand by Enduse

	Electricity kW	Natural Gas Btu/h (x000)	Steam Btu/h	Chilled Water Btu/h
Space Cool	23.62	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	-	806.77	-	-
HP Supp.	-	-	-	-
Hot Water	-	4.28	-	-
Vent. Fans	12.62	-	-	-
Pumps & Aux.	-	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	3.41	-	-	-
Task Lights	-	-	-	-
Area Lights	9.87	-	-	-
Total	49.51	811.05	-	-

-  Area Lighting
-  Exterior Usage
-  Water Heating
-  Refrigeration
-  Task Lighting
-  Pumps & Aux.
-  Ht Pump Supp.
-  Heat Rejection
-  Misc. Equipment
-  Ventilation Fans
-  Space Heating
-  Space Cooling



Electricity



Natural Gas

SUSTAINABILITY

ENERGY CONSERVATION MEASURES CONSIDERED

Building System	ECM Name	Description	Total Annual Energy Cost (\$)	Electric Energy Savings (kWh)	Natural Gas Savings (Therms)	Peak Demand Savings (kW)	Annual Energy Cost savings (\$)
	Baseline	Existing building calibrated to 2019 utility data	\$17,239	-	-	-	-
Windows	1-Add Film to Windows	3M neutral 35 film applied to storefront windows facing Broadway	\$16,765	5,476	-199	2	\$474
	2-Replace Windows	Storefront system along Broadway: Kawneer Trifab VersaGlaze 451T with PPG solarban 70XL glazing	\$15,653	15,392	86	5	\$1,586
Exterior Walls	3-Add Batt Insulation	Batt in cavity (R13) + CI Batt (R5)	\$16,830	739	545	1	\$409
	4-Add 2" Helok CI, no BATT	Helock CI 2" (R13), empty cavity Heatlok Eco: https://www.demilec.com/products/closed-cell-insulation/heatlok-eco	\$16,746	1,377	668	1	\$493
	5-Add 2" Helok CI w/ BATT	Helock CI 2" (R13), w/Batt in Cavity (R13) Heatlok Eco: https://www.demilec.com/products/closed-cell-insulation/heatlok-eco	\$16,747	1,347	708	1	\$492
Floor	6-Increase Floor Insulation	15" Cavity with 8" of Batt that's falling down in spots. Fill remainder of cavity with 7" of cellulose	\$17,058	536	282	1	\$181
	7-Insulate cantilever	Assumed 3" spray foam	\$17,234	-227	39	0	\$5
Envelope Tightness	8-Reduce infiltration	This is taking into account adding spray foam to exterior walls, fixing floor cavity and replacing windows.	\$17,021	1,253	220	1	\$218
HVAC System	9-Ten (10) New RTU/FCUs	Package SZ VAV, with OA Econ's, DX, Gas Fired	\$14,599	20,300	94	9	\$2,640

OCCUPANT COMFORT IS A PRIMARY CONSIDERATION IN CONSIDERING ENVELOPE IMPROVEMENTS. THE ADDITION OF INSULATION ON PERIMETER WALLS, OR BELOW THE FLOOR, ALONG WITH ENVELOPE INFILTRATION MITIGATION MAY NOT PROVIDE A SIGNIFICANT ROI WITH REGARDS TO ENERGY USE REDUCTION, BUT WILL IMPROVE THE COMFORT OF BUILDING OCCUPANTS, WHICH IS EQUALLY IMPORTANT.

SUSTAINABILITY

HVAC SYSTEMS EXPLORED

System option	Description	PRO	CON
Cost Baseline	replace only RTU's at end of service life	minimal investment	existing units inefficient constant volume units capacities don't match design loads limited zone control maintenance concerns
Distributed RTU's	replace all units with energy efficient VAV units, 1 unit per zone	zone control at unit optimizes occupant comfort multiple, smaller units reduces point loads on structure variable air volume increases energy efficiency smaller duct mains to coordinate with existing structure	multiple units require more maintenance
Consolidated RTU	consolidate to 2 AHU's with VAV boxes and electric reheat	good zone control via VAV boxes could be implemented with energy recovery	fewer units results in greater pont loads on structure larger duct mains will challenge headroom with structure electric reheat voids LEED energy prereq
Consolidated RTU with hydronic heat	consolidate to 2 AHU's with VAV boxes and boiler for hydronic reheat	good zone control via VAV boxes hydronic reheat reduces energy use	fewer units results in greater pont loads on structure larger duct mains will challenge headroom with structure no space in building for boiler or flue
VRF system	outdoor compressor, DOAS for ventialtion,fan coil boxes	low profile system works well with structure clearances lighter weight, fewer and smaller rooftop units good zone control	limited site area for compressor, maintenance concerns compressor and fan box noise

IN ADDITION TO ENERGY USAGE, EXISTING BUIDING CONSTRAINTS ALSO PLAY A MAJOR FACTOR IN THE SELECTION OF THE HVAC SYSTEM. CONSIDERATION IS GIVEN TO SYSTEM WEIGHT AND DUCT SIZE FOR COORDINATION WITH EXISTING STRUCTURE, AS WELL AS OCCUPANT COMFORT AND MAINTENANCE. THE VRF SYSTEM IS RECOMMENDED FOR THIS PROEJCT BECAUSE IT PROVIDES A GOOD BALANCE OF ENERGY EFFICIENCY IN A COMPACT, AFFORDABLE SYSTEM THAT HAS GOOD ZONE CONTROL FOR OCCUPANT COMFORT.

SUSTAINABILITY

PROPOSED ECM PACKAGE AND HVAC SYSTEM

Selected ECM's	Description	existing	proposed
Add Film to storefront windows	3M neutral 35 film applied to storefront windows facing Broadway		SHGC= .44
Replace punched windows	replace all punched window openings with new glass and frames	U=.5*	U=.38
Add 2" spray foam continuous insulation at perimeter walls	Helock CI 2" (R13), empty cavity Heatlok Eco: https://www.demilec.com/products/closed-cell-insulation/heatlok-eco	U=.249	Effective U=.05
Insulate cantilever	3" spray foam		reduces thermal loss and infiltration
Envelope infiltration mitigation	added spray foam to exterior walls, addressing floor cavity and replacing or sealing windows.		reduces thermal losses and infiltration
Variable refrigerant HVAC system	2 condensing units and DOAS system, electrical system with energy recovery		
ALTERNATE: Increase Floor Insulation	15" Cavity with 8" of Batt that's falling down in spots. Fill remainder of cavity with 7" of cellulose	U=.0625*	U=.037

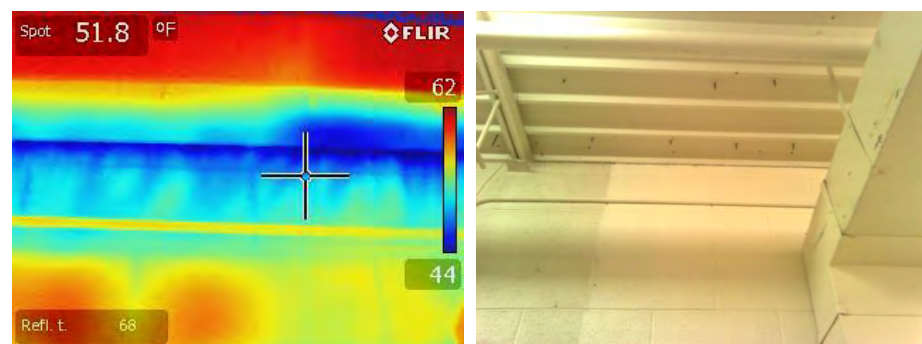
*assumed properties of existing conditions

ENERGY MODELING FOR THE VRF SYSTEM IS CURRENTLY UNDERWAY, BUT BASED ON THE DISTRIBUTED RTU SYSTEM STRATEGY OUTLINED ON THE PRIOR PAGE, ALONG WITH THE ENERGY CONSERVATION MEASURES OUTLINED ABOVE, WE PROJECTED AN EUI OF 61.5 KBTU/SF/YR AND AN ANNUAL ENERGY COST OF \$16,139 FOR A SAVINGS OF \$1,100 BELOW THE BASELINE IN A BUILDING THAT IS PROJECTED TO BE MORE COMFORTABLE FOR ITS OCCUPANTS. IT IS IMPORTANT TO NOTE THAT THE SYSTEM CAPACITY HAS INCREASED TO MEET THE ANTICIPATED DEMAND, WHILE STILL DECREASING ENERGY USAGE OF THE BUILDING OVERALL. WHILE THERE IS SOME SYNERGY BETWEEN THE DIFFERENT ECM'S PROPOSED, BECAUSE WE ARE USING PACKAGED MECHANICAL SYSTEMS THAT COME IN SET CAPACITIES, THE ENERGY SAVINGS FROM THE ECM'S IS NOT SIGNIFICANT ENOUGH TO REDUCE THE SIZE OF THE PORPOSED HVAC SYSTEM OR ITS COMPONENTS.



SUSTAINABILITY

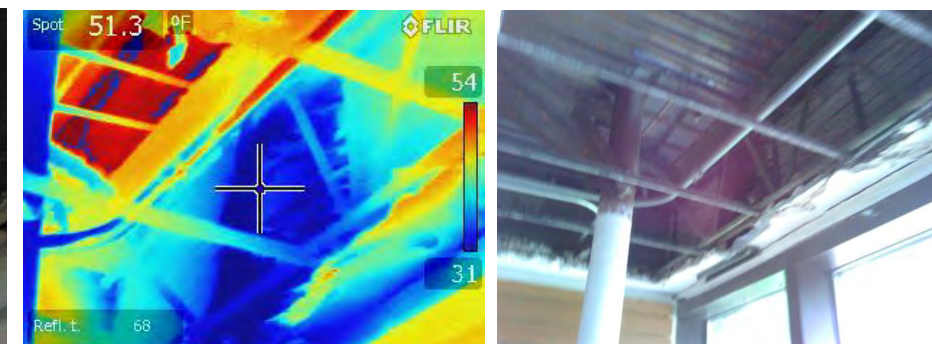
ENVELOPE IMPROVEMENTS



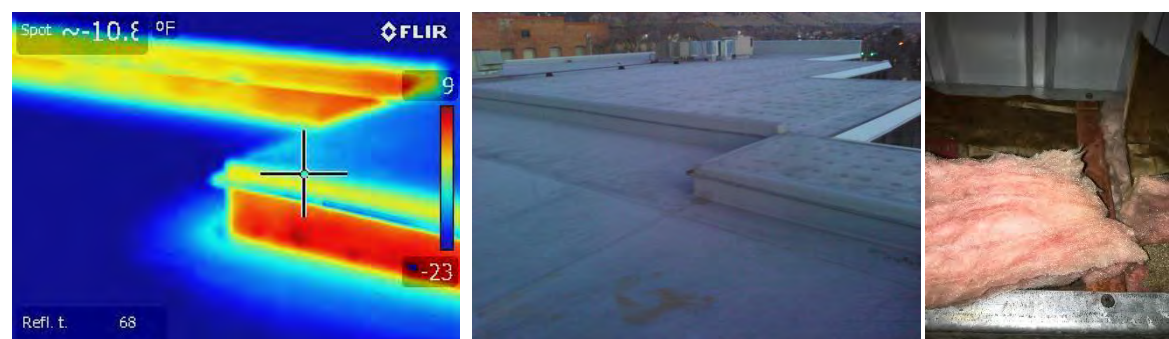
The wispy blue shows air leakage from the CMU wall to roof connection



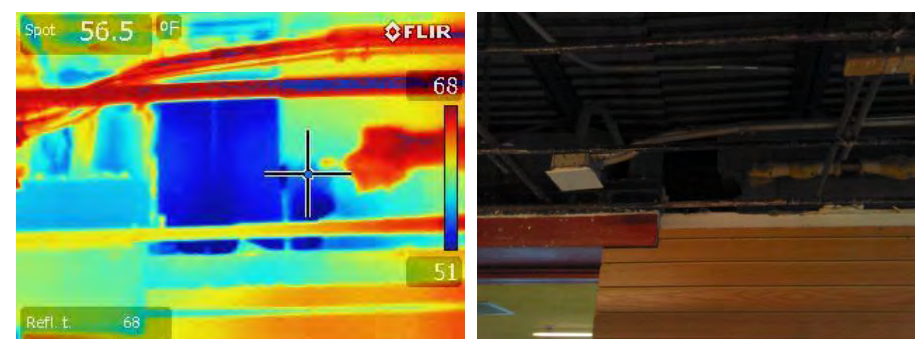
Cold spots indicated by the blue color. There are several holes that penetrate the wall and go through the space above the parking spots



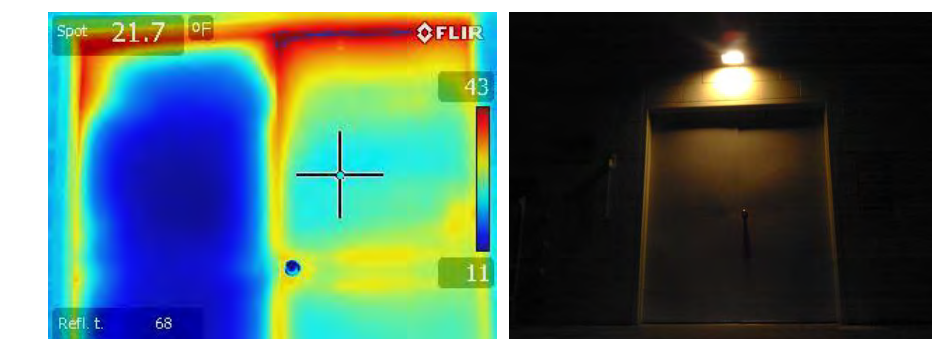
Cold spots indicated by the blue color. There are several areas that are open to the uninsulated soffit in the front of the building.



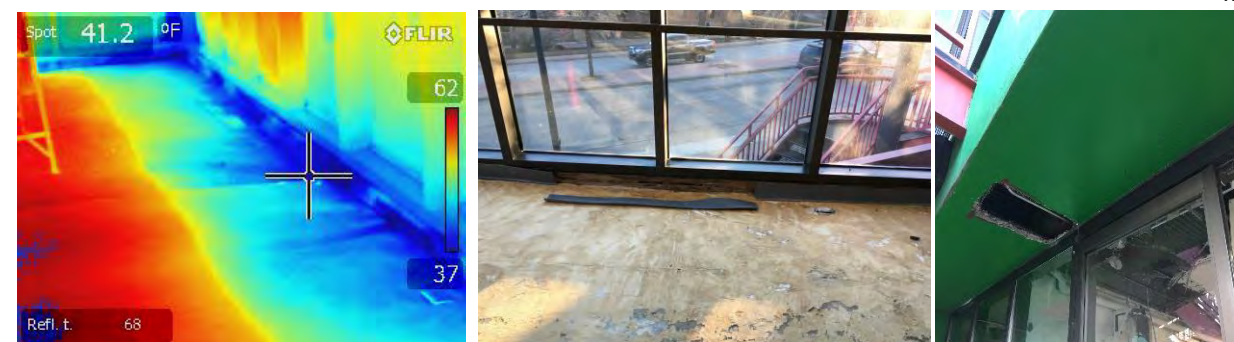
Heat loss is indicated by the red color. Insulation has been compromised over the years.



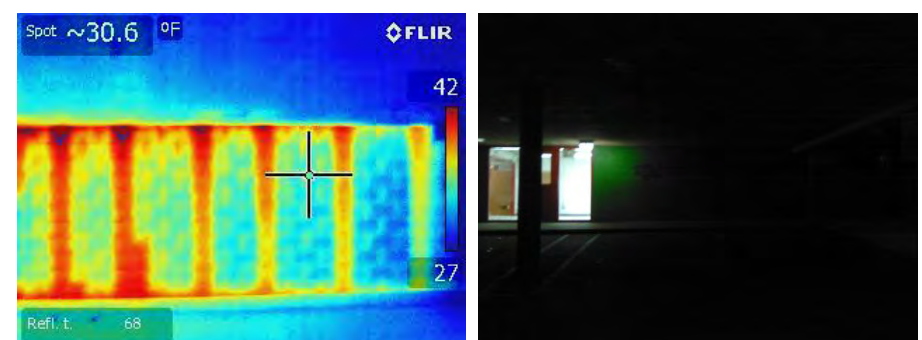
Cold spots indicated by the blue color. There are several holes that penetrate the wall and go through the space



Heat loss is shown by the red color at the top of the door. This is possibly due to a bad seal.



Thermal bridging is shown by the yellow line. From the yellow line to the windows shows a lot colder of a floor due to the uninsulated soffit directly underneath it. The blue wispy color shows air leakage.



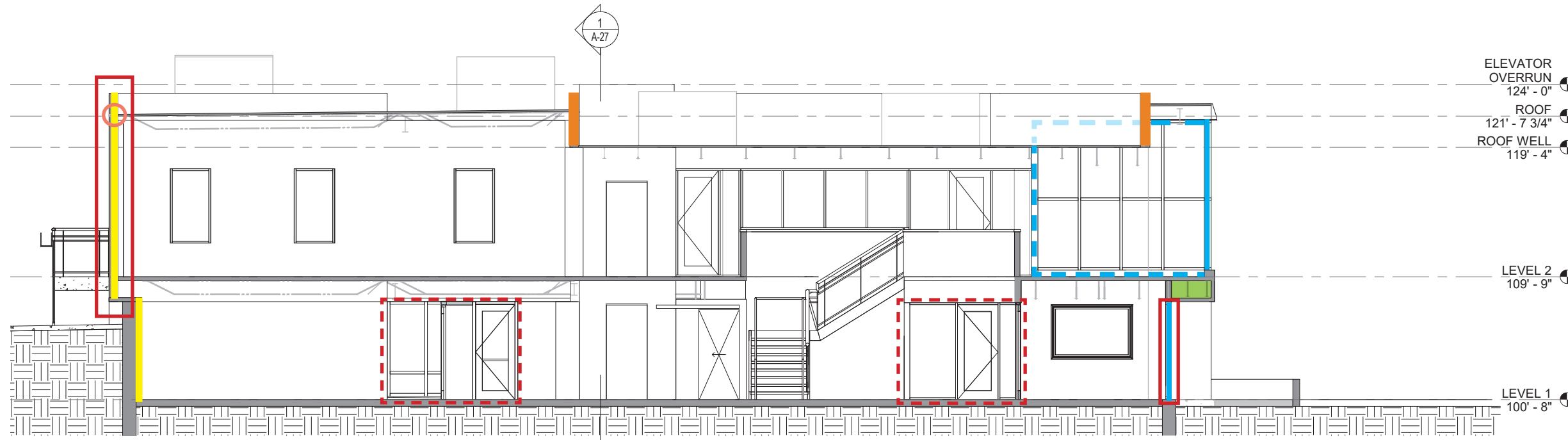
Thermal bridging is shown by the red and yellow lines, caused by grout/reinforcement within the CMU

RECOMMENDATIONS

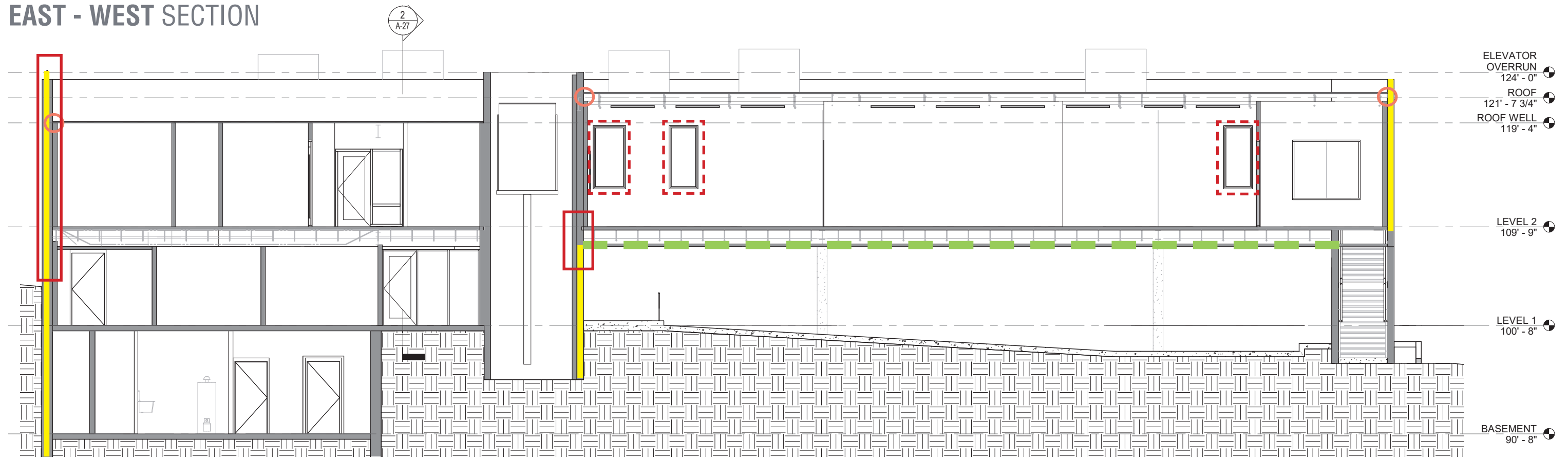
- SEAL ROOF TO WALL CONNECTION WITH SPRAY FOAM INSULATION
- REPLACE BATT INSULATION IN VERTICAL WALL AT ROOF ELEVATION CHANGES
- CAULK LOWER WALL BEHIND BASEBOARD WINDOWS
- CAULK GAPS IN MULLIONS IN STOREFRONT ALONG BROADWAY
- SEAL CRACKS IN CMU WALLS, APPLY SPRAY FOAM INSULATION AND FURRING
- SEAL ALL EXTERIOR WALL PENETRATIONS AND SEAMS
- SEAL ALL PENETRATIONS FROM EXTERIOR OF BUILDING INTO CAVITY ABOVE PARKING AREA
- FILL CAVITY AT BROADWAY ENTRANCE CANTILEVER WITH SPRAY FOAM

SUSTAINABILITY ENVELOPE IMPROVEMENTS

- SEAL ROOF TO WALL CONNECTION
- CAULK GAPS IN STOREFRONT
- SEAL & WEATHERPROOF EXT PENETRATIONS
- REPLACE BATT INSULATION
- SEAL, INSULATE & FUR CMU WALLS
- INSULATE CANTILEVER



EAST - WEST SECTION



NORTH - SOUTH SECTION

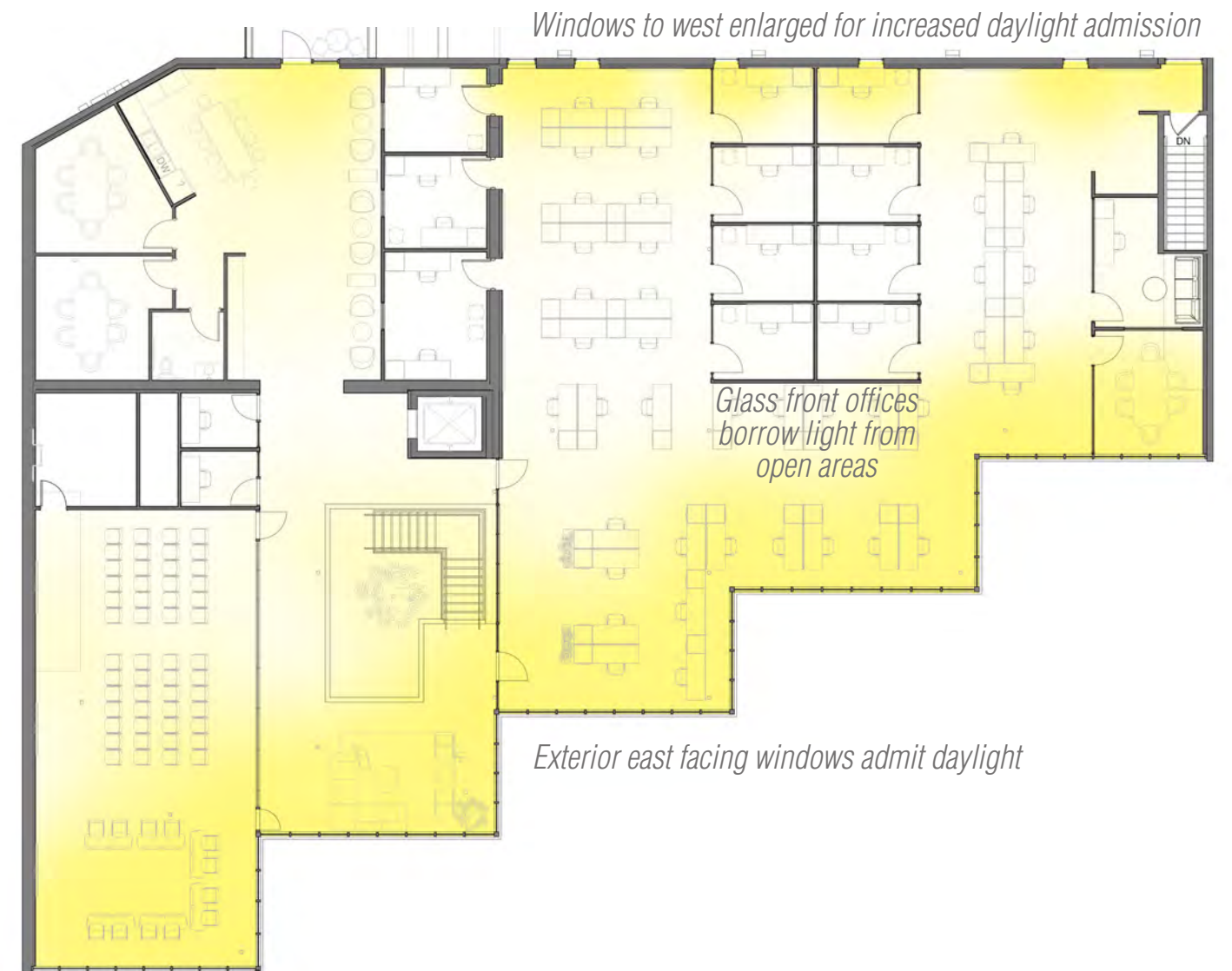
SUSTAINABILITY

LIGHTING STRATEGY

LEVEL 1 NATURAL LIGHT PENETRATION



LEVEL 2 NATURAL LIGHT PENETRATION

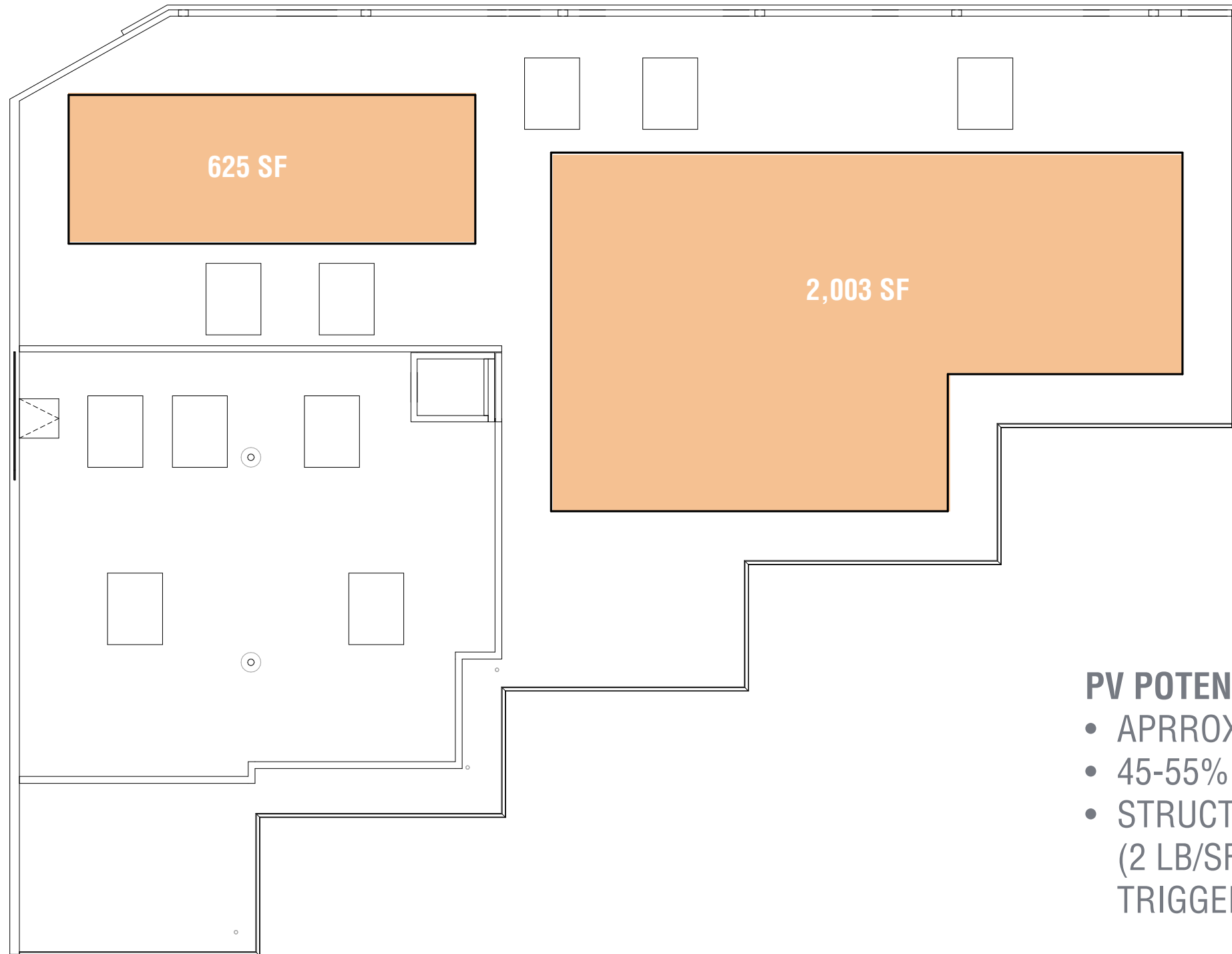


DAYLIGHTING STRATEGIES

- FILM APPLIED TO STOREFRONT GLAZING TO REDUCE GLARE AND SOLAR HEAT GAIN WHILE ADMITTING NATURAL LIGHT
- WEST FACING WINDOWS ENLARGED TO ADMIT MORE NATURAL LIGHT
- GLASS DOOR TO WEST FROM NOURISH SPACE TO ADMIT DAYLIGHT

SUSTAINABILITY

HIGH PERFORMANCE SYSTEMS



PV POTENTIAL

- APPROXIMATELY 50,000 KWH/YR
- 45-55% OF BUILDING LOAD
- STRUCTURAL LIMITATIONS WILL ALLOW UP TO 5% (2 LB/SF) ADDITIONAL ROOF LOADING WITHOUT TRIGGERING FURTHER ANALYSIS AND UPGRADES

ROOF PV OPPORTUNITIES

SUSTAINABILITY

HIGH PERFORMANCE SYSTEMS

Location and Station Identification

Requested Location	1135 broadway, boulder, co
Weather Data Source	Lat, Lon: 40.01, -105.26 0.8 mi
Latitude	40.01° N
Longitude	105.26° W

PV System Specifications *(Residential)*

DC System Size	36.2 kW
Module Type	Standard
Array Type	Fixed (open rack)
Array Tilt	20°
Array Azimuth	180°
System Losses	14.08%
Inverter Efficiency	96%
DC to AC Size Ratio	1.2

Economics

Average Retail Electricity Rate	0.111 \$/kWh
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Performance Metrics

Capacity Factor	16.8%
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RESULTS

53,374 kWh/Year*

System output may range from 49,579 to 54,949 kWh per year near this location.
Click [HERE](#) for more information.

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)	Value (\$)
January	3.72	3,517	389
February	4.55	3,820	422
March	5.52	5,067	560
April	5.77	4,876	539
May	6.11	5,237	579
June	6.61	5,244	579
July	6.30	5,157	570
August	5.82	4,840	535
September	5.71	4,587	507
October	4.75	4,141	458
November	4.06	3,618	400
December	3.49	3,270	361
Annual	5.20	53,374	\$ 5,899

ROOF PV OPPORTUNITIES

