

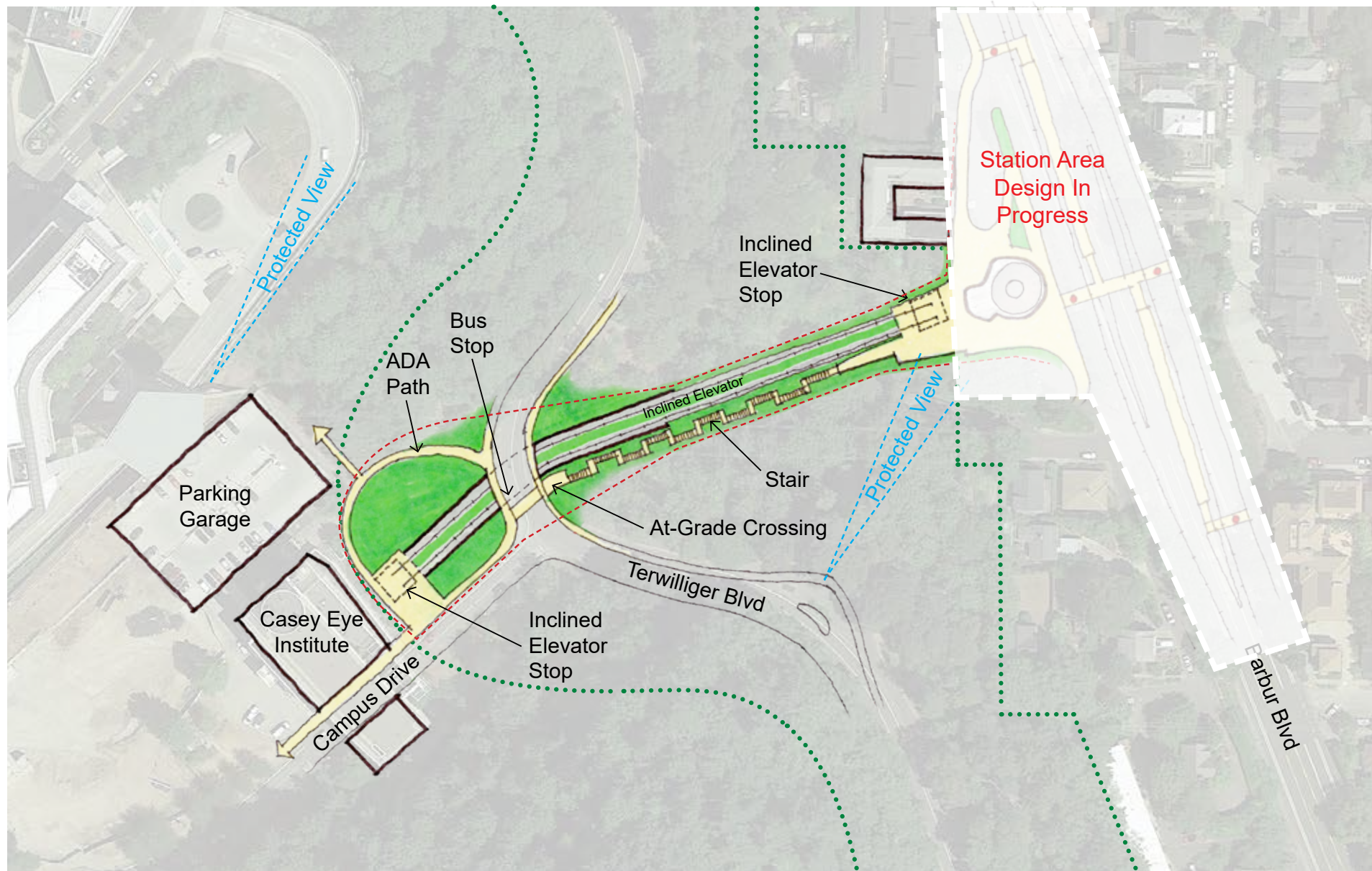
APRIL 10, 2019

Marquam Hill Connector

Options & Draft Evaluation

Green Ribbon Committee

Option 1: Inclined Elevators

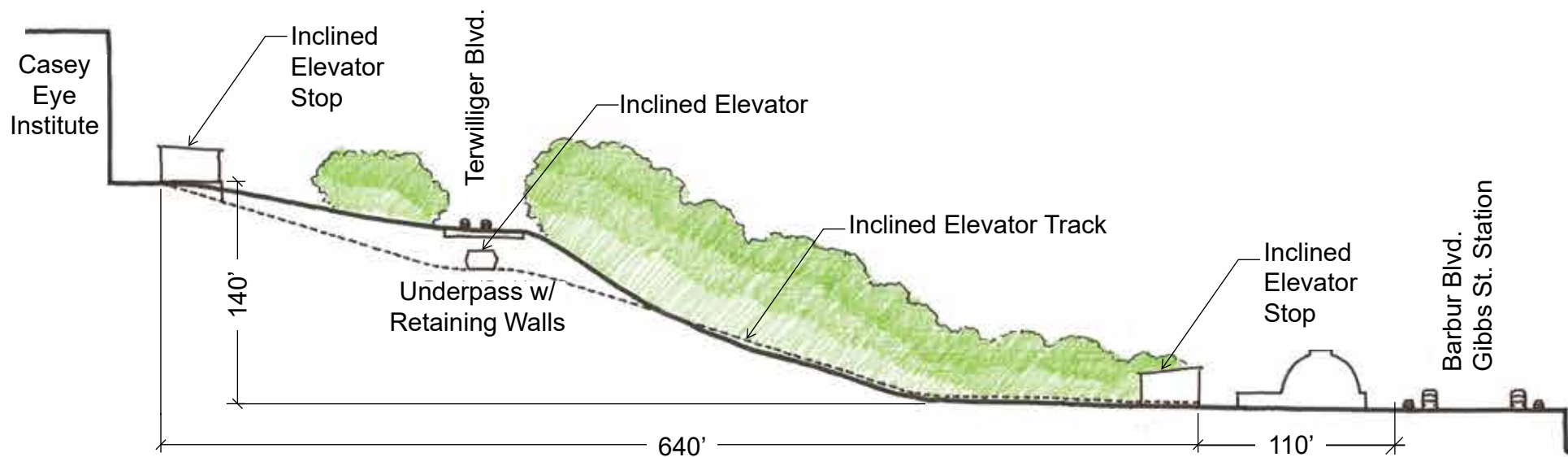
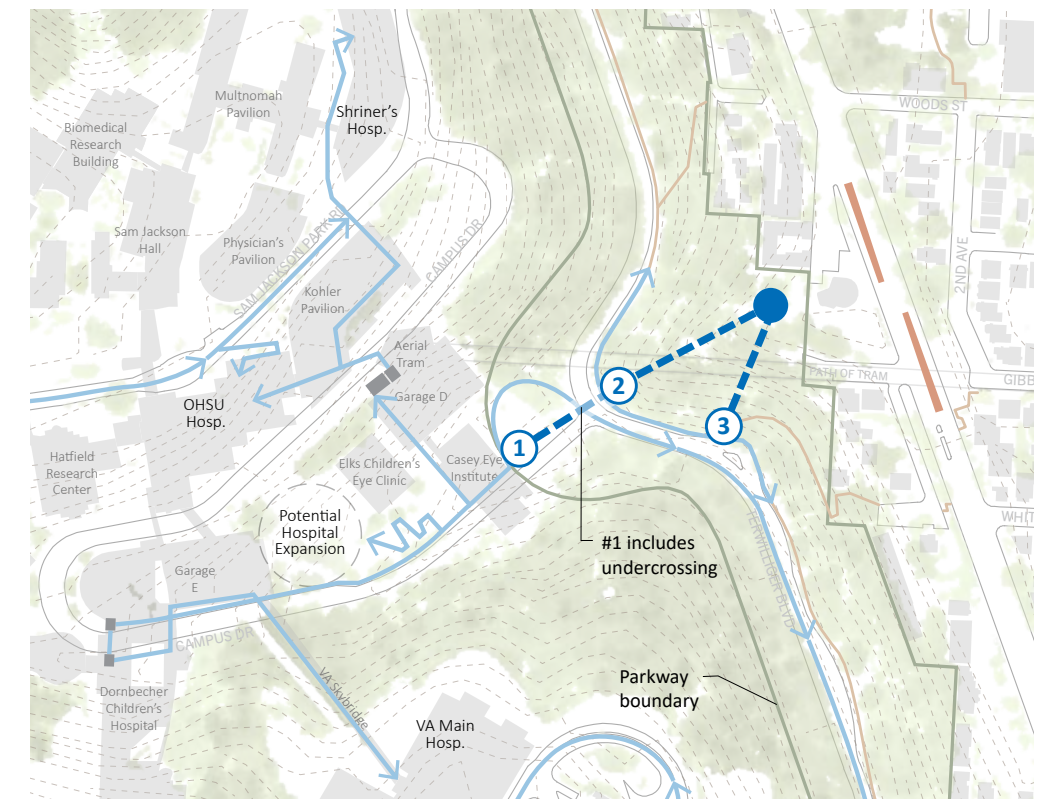


Estimated Average Travel Time from Gibbs Station during AM Peak (Minutes)

| Destination: | Ambulatory Person | Person using Manual Wheelchair |
|----------------------------|-------------------|--------------------------------|
| OHSU Hospital | 11 | 14 |
| VA Medical Center Hospital | 12* | 14* |
| Shriners Hospital | 14 | 22* |
| OHSU Hospital Expansion | 6 | 11 |

* Includes bus trip

Other Potential Alignments

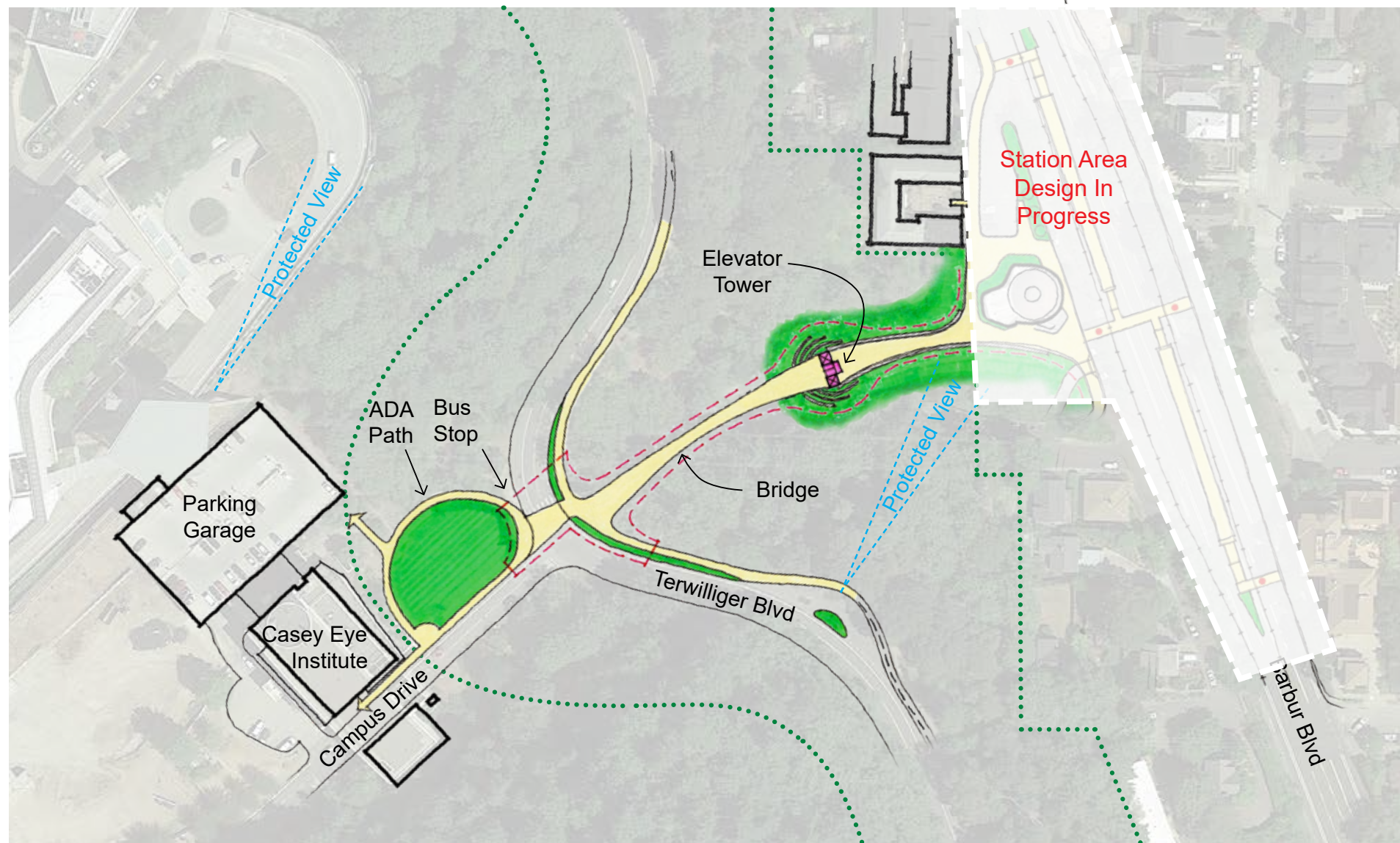


Option 1 Draft Evaluation

| Category | Draft Evaluation | Opportunities | Challenges | Additional Notes |
|---------------------|------------------|--|--|---|
| Access | | <ul style="list-style-type: none"> • Direct access to OHSU lower campus • Direct access to recreational destinations • Connection to bus, shortens time to VA Hospital • Weather protection provided in inclined elevator cabins & at stops • Overcomes vertical & horizontal distances, minimizes physical effort to cross Parkway | <ul style="list-style-type: none"> • Indirect access to OHSU upper/east campus, may require additional improvements • Physical effort for connections uphill from landing at edge of Parkway | <ul style="list-style-type: none"> • From landing point, destinations may be uphill to OHSU lower & upper campuses, or downhill to Parkway & bus stop |
| Safety | | <ul style="list-style-type: none"> • Users are highly visible from surroundings with limited areas of seclusion or isolation • Sized for pedestrian volumes at peak times* • Relatively easy to monitor & secure | <ul style="list-style-type: none"> • Safety considerations for at-grade crossing at Terwilliger for stair users | <ul style="list-style-type: none"> • Assumes 2 inclined elevators (40 people/car), independently operating |
| Context | | <ul style="list-style-type: none"> • Protects existing properties • Protects existing viewpoints | <ul style="list-style-type: none"> • Mechanical & boarding structures will be visible within surroundings • Changes the use of the park land in trackway footprint • May impact existing utilities, depending on alignment | <ul style="list-style-type: none"> • Other potential alignments have different visual impacts |
| Environmental | | <ul style="list-style-type: none"> • Relatively small construction footprint outside of trackway | <ul style="list-style-type: none"> • Clearing for trackway causes permanent tree impacts • Disruption to Terwilliger Blvd during construction of undercrossing • Security lighting & fencing may impact wildlife | <ul style="list-style-type: none"> • Construction footprint 50-60ft (includes 20-30ft trackway & 10-12ft stairway) • Other potential alignments do not include undercrossing at Terwilliger |
| Operational | | <ul style="list-style-type: none"> • Buildable with durable & resilient materials* • Redundancy with multiple elevators & stairs* • Elevators operate independently • May be expanded with future growth with proper planning | <ul style="list-style-type: none"> • Maintenance of incline track & traction system • Elevators will have maintenance/out of service time that temporarily impairs capacity* • May require an attendant • May have limited hours • May require a user fee | <ul style="list-style-type: none"> • No precedent for this system in Portland, many operational issues require further study • There are autonomous & staffed examples worldwide |
| Budget/ Schedule | | <ul style="list-style-type: none"> • May be attainable within project budget, would benefit from funding partnerships • Relatively straight forward construction type | <ul style="list-style-type: none"> • Risks associated with a system/technology that has no precedent in the TriMet system | <ul style="list-style-type: none"> • Approximate capital cost: \$35-45 million |
| Experience | | <ul style="list-style-type: none"> • Unique new transit system for Portland, likely to be an attraction • Inclined elevator/funicular interpretive opportunity • Includes stairway to allow for choice of access and experience | <ul style="list-style-type: none"> • Unfamiliar mode for many people, will require user orientation | |

* Typical of all options

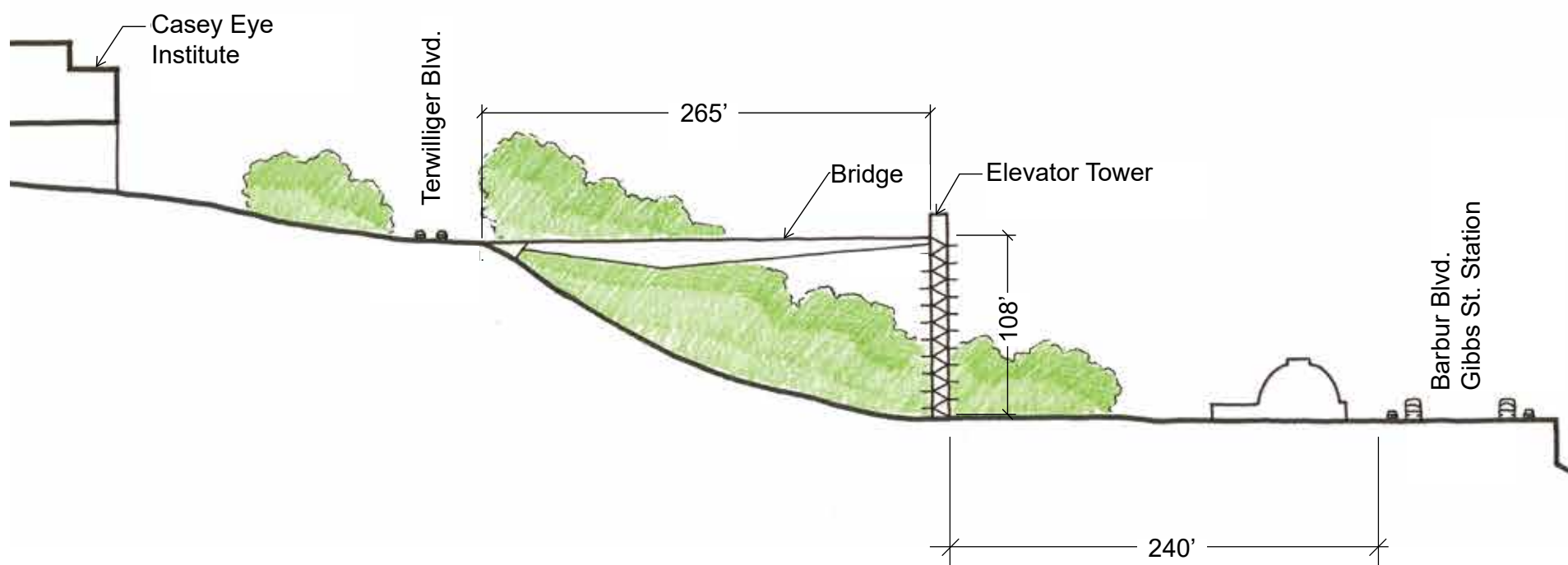
Option 2: Bridge + Elevators



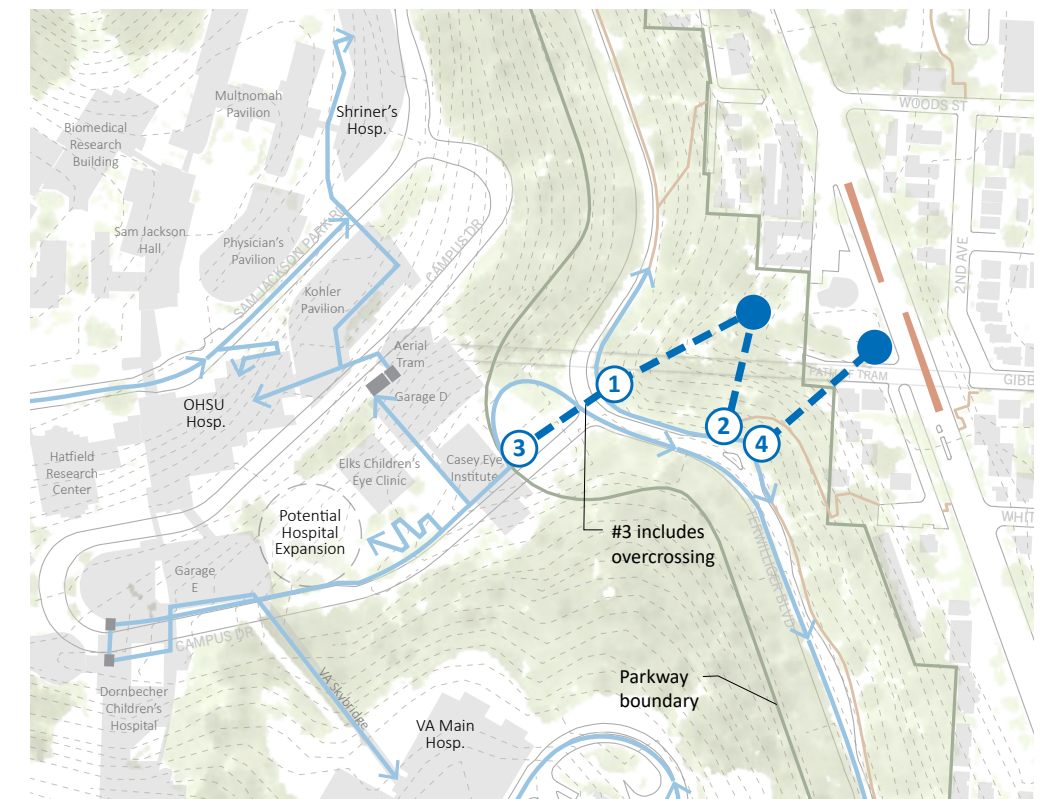
Estimated Average Travel Time from Gibbs Station during AM Peak (Minutes)

| Destination: | Ambulatory Person | Person using Manual Wheelchair |
|----------------------------|-------------------|--------------------------------|
| OHSU Hospital | 12 | 21* |
| VA Medical Center Hospital | 11* | 14* |
| Shriners Hospital | 14 | 22* |
| OHSU Hospital Expansion | 7 | 15 |







* Includes bus trip



Other Potential Alignments

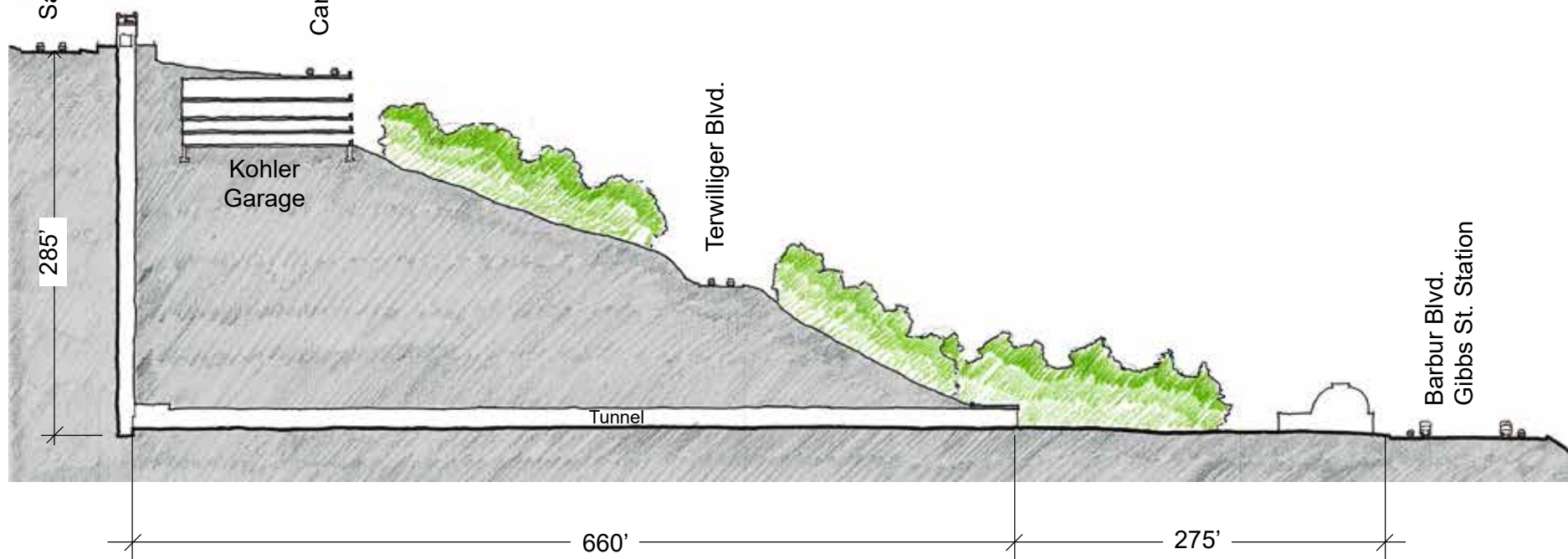
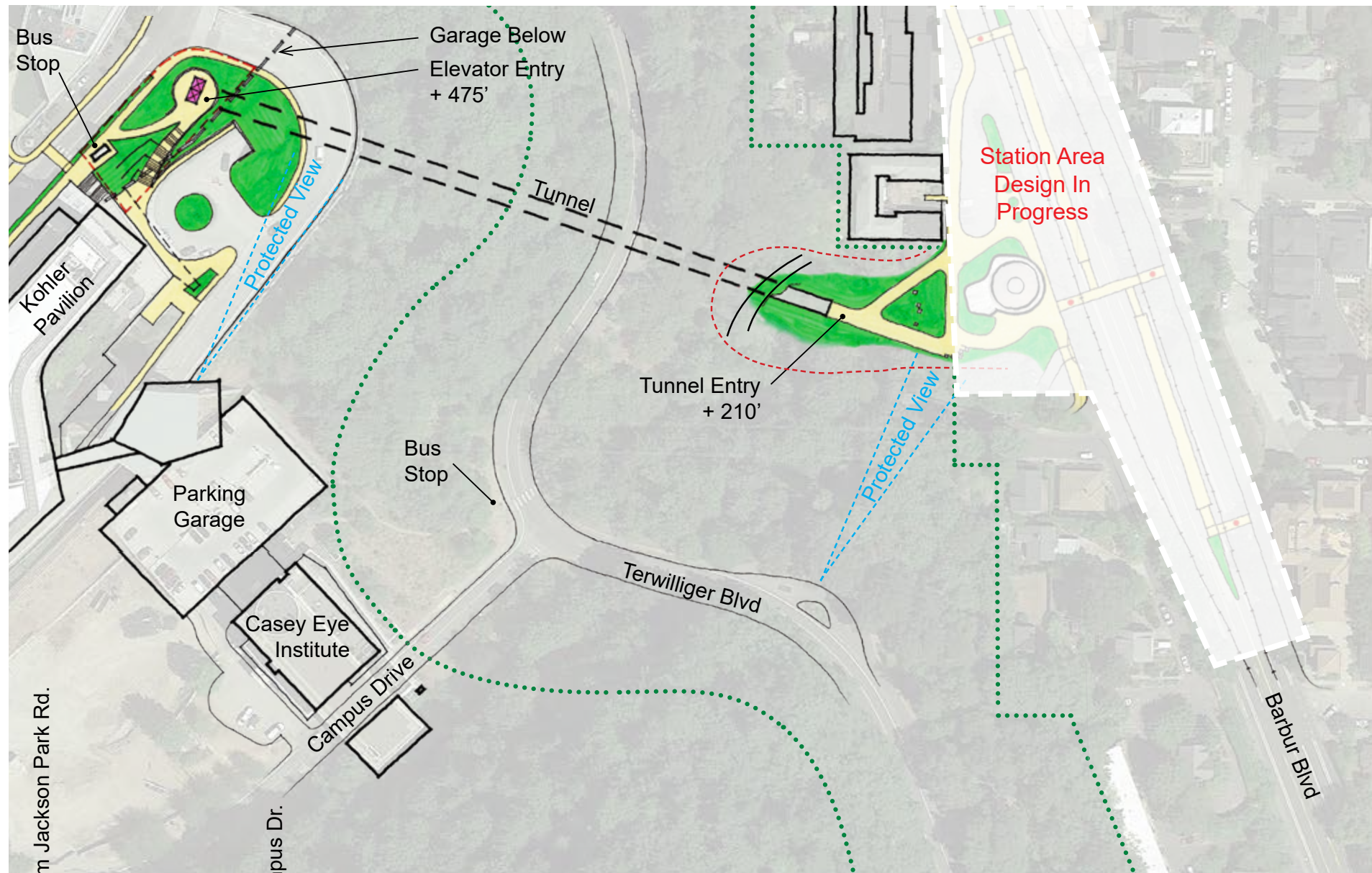


Option 2 Draft Evaluation

| Category | Draft Evaluation | Opportunities | Challenges | Additional Notes |
|---------------------|---|---|--|---|
| Access |  | <ul style="list-style-type: none"> Direct access to OHSU lower campus Direct access to recreational destinations Bus route shortens time to VA Hospital | <ul style="list-style-type: none"> Indirect access to OHSU upper/east campus, may require additional improvements Physical effort for connections uphill from landing Weather protection not inherent to type, may be added | <ul style="list-style-type: none"> From Terwilliger, destinations may be uphill to OHSU lower & upper campuses, or accessible via bus stop |
| Safety |  | <ul style="list-style-type: none"> Users are highly visible from surroundings with limited areas of seclusion or isolation Sized for pedestrian volumes at peak times* Relatively easy to monitor & secure | <ul style="list-style-type: none"> Safety considerations for at-grade crossing at Terwilliger | <ul style="list-style-type: none"> Assumes 2 elevators (39 people/car), high speed, similar to Washington Park MAX station elevators |
| Context |  | <ul style="list-style-type: none"> Protects existing properties Protects existing viewpoints Flexibility in alignment to respond to context | <ul style="list-style-type: none"> Bridge & elevator structures likely visible from surrounding views May impact the use of the park land in bridge footprint May impact existing utilities, depending on alignment | <ul style="list-style-type: none"> Visibility of structure can vary with alignment, placement is constrained by protected view points |
| Environmental |  | <ul style="list-style-type: none"> Opportunity for replanting/habitat restoration post-construction (permanent footprint is smaller than construction footprint) Relatively low disruption to surroundings during construction | <ul style="list-style-type: none"> Construction footprint will include tree impacts Security lighting may impact wildlife | <ul style="list-style-type: none"> Construction footprint 40-50ft along bridge alignment, including access road during construction |
| Operational |  | <ul style="list-style-type: none"> Buildable with durable & resilient materials* Redundancy with multiple elevators & stairs* May be expanded with future growth with proper planning Relatively simple & predictable maintenance Likely to operate 24/7 Likely to be free to use | <ul style="list-style-type: none"> Elevators will have maintenance/out of service time that temporarily impairs capacity* Addition of supplemental shuttle service at Terwilliger would increase operations costs | <ul style="list-style-type: none"> Current precedents in Portland are free to use & operate 24/7 |
| Budget/ Schedule |  | <ul style="list-style-type: none"> May be attainable within project budget, would benefit from funding partnerships Relatively easy construction type Relatively low risk, familiar construction method & equipment | | <ul style="list-style-type: none"> Approximate capital cost: \$15-25 million |
| Experience |  | <ul style="list-style-type: none"> Canopy walk & views may be an attraction Unique bridge design opportunity & context for Portland Terwilliger Parkway interpretive opportunity | | |

* Typical of all options

Option 3: Tunnel + Elevators

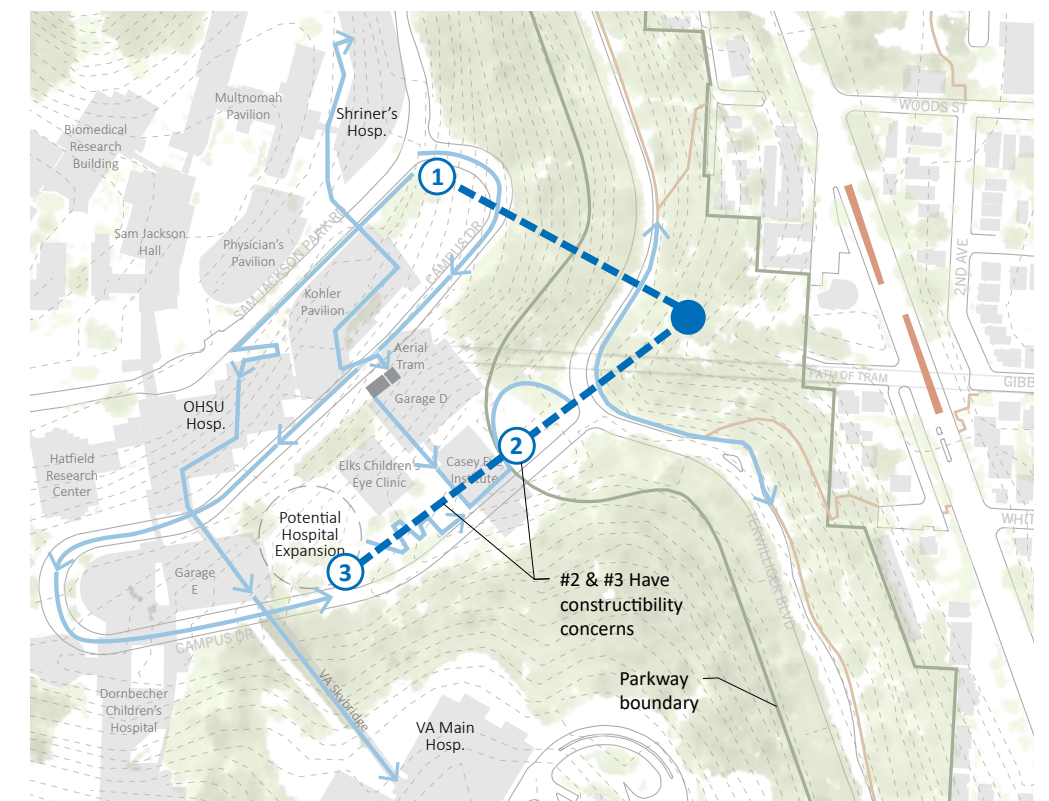


Estimated Average Travel Time from Gibbs Station during AM Peak (Minutes)

| Destination: | Ambulatory Person | Person using Manual Wheelchair |
|----------------------------|-------------------|--------------------------------|
| OHSU Hospital | 9 | 17 |
| VA Medical Center Hospital | 13 | 26 |
| Shriners Hospital | 7 | 14 |
| OHSU Hospital Expansion | 11* | 16* |

* Includes bus trip

Other Potential Alignments



Option 3 Draft Evaluation

| Category | Draft Evaluation | Opportunities | Challenges | Additional Notes |
|---------------------|------------------|---|---|---|
| Access | | <ul style="list-style-type: none"> Direct access to OHSU upper/east campus Weather protection is inherent | <ul style="list-style-type: none"> Indirect access to OHSU lower campus & VA Hospital, may require additional improvements Indirect access to recreational destinations Physical effort for long walk underground (660 ft/3+ city blocks), moving walkway may be incorporated | <ul style="list-style-type: none"> From elevator shaft, destinations may be along Sam Jackson Park Rd to upper campus, or downhill to lower campus & Parkway |
| Safety | | <ul style="list-style-type: none"> Minimizes conflicts among modes Sized for pedestrian volumes at peak times* | <ul style="list-style-type: none"> Users have low visibility from surrounding area Will require monitoring equipment and/or staff for security | <ul style="list-style-type: none"> Assumes 2 elevators (39 people/car), high speed, similar to Washington Park MAX station elevators |
| Context | | <ul style="list-style-type: none"> Protects existing properties Protects existing viewpoints Minimizes visual impacts on surroundings Maintains use & identity of Terwilliger Parkway | | <ul style="list-style-type: none"> Tunnel portal & elevator are visible structures, presence may be minimized depending on alignment |
| Environmental | | <ul style="list-style-type: none"> Tree impacts limited to portal & shaft construction areas Construction footprint isolated to portal & shaft construction areas | <ul style="list-style-type: none"> Drainage from tunnel will need to be managed Monitoring for noise & vibration impacts to surroundings necessary during construction Debris hauling will impact adjacent roadways during construction | <ul style="list-style-type: none"> Construction constraints may limit elevator shaft location options to area NE of Kohler Pavilion |
| Operational | | <ul style="list-style-type: none"> Buildable with durable & resilient materials* Redundancy with multiple elevators & stairs* | <ul style="list-style-type: none"> Maintenance of tunnel liner, drainage & ventilations systems Elevators will have maintenance/out of service time that temporarily impairs capacity* Relatively difficult to expand with future growth May require an attendant May have limited hours May require a user fee | <ul style="list-style-type: none"> No precedent for a pedestrian tunnel of this scale in Portland, operational issues require further study |
| Budget/ Schedule | | | <ul style="list-style-type: none"> Very high cost Very high risk of cost & schedule overruns Difficult construction type Requires funding partnerships | <ul style="list-style-type: none"> Approximate capital cost: \$55-125 million |
| Experience | | <ul style="list-style-type: none"> Geologic/historic interpretive opportunity | <ul style="list-style-type: none"> Difficult to overcome underground experience Less likely to be a local attraction No interaction with Parkway | |

* Typical of all options