URBAN FOREST PARK VISION AND PEDESTRIAN ACCESS CORRIDORS

Project No.: CED 2024.03

ALTERNATIVE ANALYSIS REPORT

Denali Consulting, LLC

PREPARED BY: Denali Consulting L.L.C.
2900 Spirit Drive,
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April 2024

DENALI CONSULTING, L.L.C.

ALTERNATIVES ANALYSIS REPORT

For Facilities and Campus Services
University of Alaska Anchorage

Urban Forest Park Vision and Pedestrian Access Corridors

Project No.: CED 2024.03

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NOTICE TO USERS

This report reflects the thinking and design decisions at the time of publication. Changes frequently occur during the evolution of the design process, so persons who may rely on the information contained in this document should check with Denali Consulting L.L.C. for the most current design. Contact the Design Project Manager, Daniel Tedrick, at datedrick@alaska.edu for this information.

PLANNING CONSISTENCY

This document has been prepared by Denali Consulting L.L.C. according to currently acceptable design standards and Federal regulations, and with the input offered by the local government and public. The department's Planning Section has reviewed and approved this report as being consistent with present community planning.

CERTIFICATION

Denali Consulting L.L.C. hereby certifies that this document was prepared in accordance with Section 520.4.1 of the current edition of the department's Highway Preconstruction Manual and CFR Title 23, Highway Section 771.111(h).

The department has considered the project's social and economic effects upon the community, its impacts on the environment and its consistency with planning goals and objectives as approved by the local community. All records are on file with Denali Consulting L.L.C. 2900 Spirit Drive, Anchorage, AK 99508.

Daniel Tedrick 4/22/24

Daniel Tedrick
Student Project Manager

Date

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EXECUTIVE SUMMARY

Denali Consulting L.L.C. developed this alternative analysis report which contains options for enhancing pedestrian accessibility in the Urban Forest Park (UFP) in Anchorage, AK. This analysis prioritized designs that met needs for connectivity, safety, environmental impact, and cost-effectiveness; while adhering to current design standards and community planning goals. This report details four alternatives, focusing on integrating new paths and sidewalks to facilitate accessibility to the UFP and connection to existing non-motorized pathways and routes. Options were developed to enhance connectivity with Goose Lake Park, the Chester Creek Trail system, as well as other surrounding non-motorized infrastructure. The No-Build Alternative maintains the status quo with minimal financial and environmental impact, but no positive impact to connectivity. The Roundabout Alternative proposes improved traffic flow and pedestrian safety with minimal wetland disruption. The Northern Lights Bridge Alternative offers an option for extensive connectivity at a higher financial and environmental cost. Lastly, the Multi-Way Alternative maximizes connectivity and strikes a balance with environmental and financial considerations.

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADT	Annual Average Daily Traffic
ATM	Alaska Traffic Manual
ATMS	Alaska Traffic Manual Supplement
BMP	Best Management Practice
CFR	Code of Federal Regulations
DEC	Alaska Department of Environmental Conservation
DOJ	Department of Justice
DOT	U.S. Department of Transportation
DOT&PF	Alaska Department of Transportation and Public Facilities
ESCP	Erosion and Sediment Control Plan
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HMA	Hot Mix Asphalt
HPCM	Alaska Highway Preconstruction Manual
LED	Light-Emitting Diode
MOA	Municipality of Anchorage
MPH	Miles per Hour
O&M	Operations and Maintenance
MUTCD	Manual on Uniform Traffic Control Devices
PROWAG	Proposed Accessibility Standards for Pedestrian Facilities in the Public Right-of-Way
RDG	Roadside Design Guide
ROW	Right of Way
RRFB	Rectangular Rapid Flashing Beacons
SWMM	Storm Water Management Model
SWPPP	Storm Water Pollution Prevention Plan

UAA	University of Alaska Anchorage
UFP	Urban Forest Park
UMED	University Medical District
U.S.	United States
USGS	United States Geological Survey

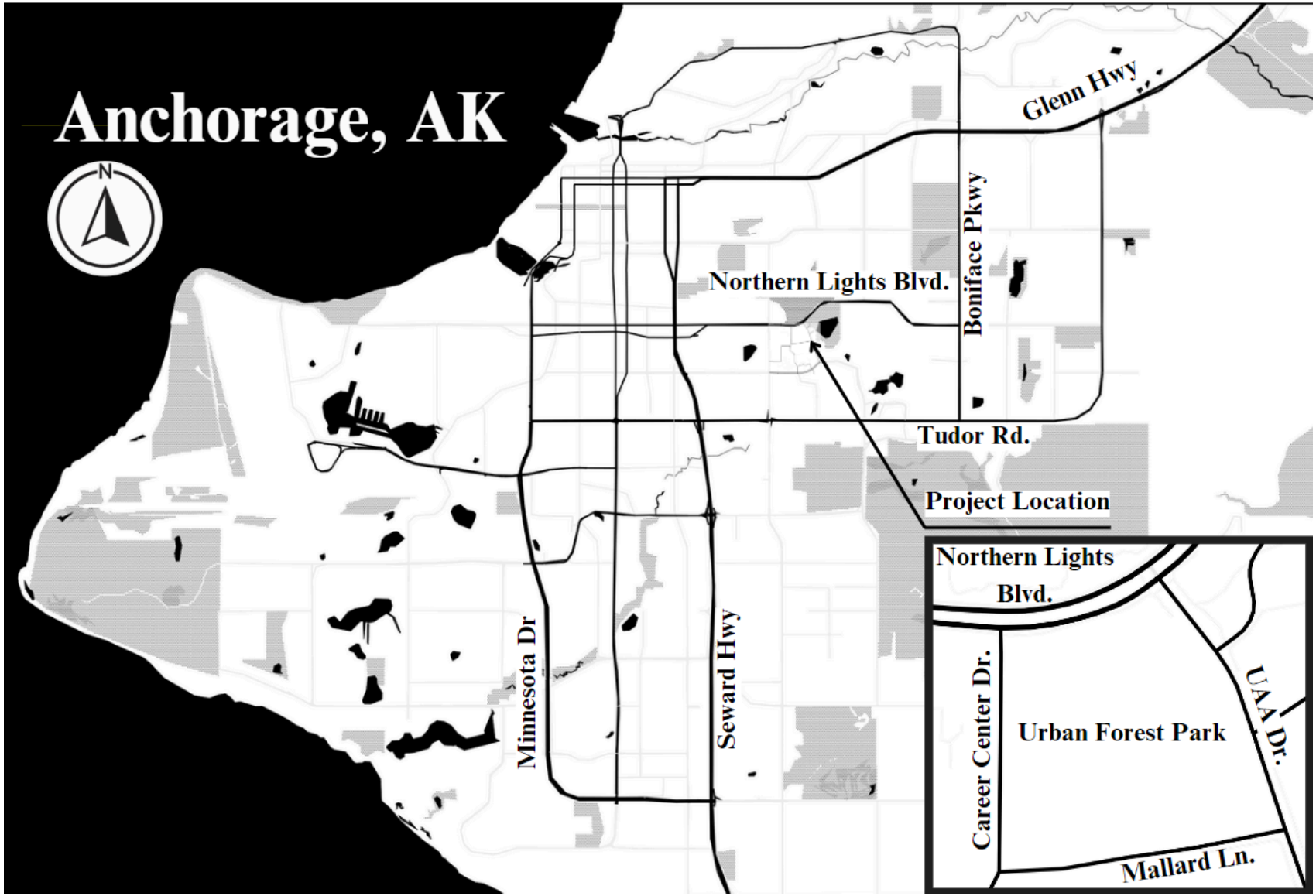


Figure 1 Location and Vicinity Map from maps.stamen.com

1.0 PROJECT DESCRIPTION

Denali Consulting L.L.C. developed this alternative analysis to support the creation of improved pedestrian transportation connections to and through the proposed project area, henceforth referred to as the Urban Forest Park (UFP). This report provides alternatives to rehabilitate the existing pedestrian access and enhance connectivity to and from existing infrastructure through the construction of new pathways and sidewalks. All alternatives were developed in conformance with the Americans with Disabilities Act (ADA).

1.1 Project Location and Description

The UFP consists of two municipal parcels and three UAA Parcels located adjacent to other University property. The UFP's location can be seen in Figure 1, Location and Vicinity Map. The UFP is located in Anchorage, AK, bounded by UAA Drive, Northern Lights Boulevard, Mallard Lane, and Career Center Drive. The project is located in Sections 28, Township 13N, Range 3W, Seward Meridian, USGS Topographical Map Seward D-7; Latitude 61.19°N, Longitude 149.82°W, within the MOA. and is adjacent to residential, commercial development, and UFP. See Figure 1 for the Project Location & Vicinity Map.

The proposed project alternatives include improving access by trail from the Chester Creek Trail System, Goose Lake Park, and UAA's Student Union. The project will study possible transportation access to and within these tracts and connections to existing non-motorized routes in the area.

1.2 Existing Facilities and Land Use

The UFP currently has extremely limited pedestrian and bicycle access due to its surrounding roads and lack of developed or maintained pathways. The site predominantly lacks pedestrian walkways, except sidewalks along Northern Lights Blvd. The land was once used for hiking and has remnants of old trails used for orienteering, surveying exercises, and cross-country skiing. The parcels are occasionally utilized for field courses, and the Arctic Orienteering Club still uses them. The existing conditions can be seen in Figure 2, with unpaved trails in pink, and paved sidewalks and pathways in green.

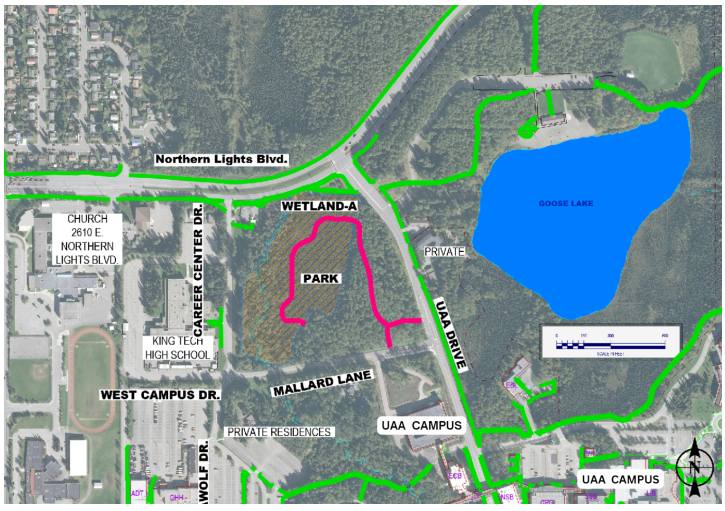


Figure 2 - Existing Conditions

1.3 Purpose and Need

This project aims to enhance pedestrian access, safety, capacity, and ADA compliance, while maintaining a long service life. The project addresses the limited access around UAA and the UMED area and improves facilities for better recreational access and use. The developed alternatives in this project will detail ways to improve the area, making these parcels accessible and create new transportation, recreational, and educational paths. The proposed modifications should improve transportation connections to serve students, staff, faculty, and others who commute to the area, or use King Tech, UAA, UMED, and the surrounding trails and recreation areas.

2.0 DESIGN STANDARDS AND GUIDELINES

Design standards and guidelines that apply to the Urban Forest Park Vision and Pedestrians Access Corridors are contained in the following publications:

Standards:

- Roadside Design Guide (RDG), 4th Edition, AASHTO, 2011.
- Alaska Highway Preconstruction Manual (HPCM), DOT&PF, 2022, as amended at the time of design approval.
- The Alaska Traffic Manual (ATM), consisting of the Manual on Uniform Traffic Control Devices (MUTCD), 2009 as amended, U.S. DOT, FHWA) and the Alaska Traffic Manual Supplement (ATMS), DOT&PF, 2016.
- ADA Standards for Transportation Facilities, DOT, 2006.
- ADA Standards for Accessible Design, DOJ, 2010.
- Guide for the Development of Bicycle Facilities, 4th Edition, AASHTO, 2012.
- Highway Capacity Manual (HCM), 5th Edition, TRB, 2010.
- Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), AASHTO, 2001.
- Design Criteria Manual (DCM), MOA, Project Management & Engineering Department, 2007 with 2018 revision.

APPENDIX A References

Guidelines:

- Proposed Accessibility Standards for Pedestrian Facilities in the Public Right-of-Way (PROWAG), U.S. Access Board, 2023.
- Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition, AASHTO, 2004.

APPENDIX B Project Design Criteria contains the project Design Criteria.

3.0 METHODOLOGY

The methodology we employed involves a comprehensive approach to developing the UFP area. The methodology used is as follows:

- Review existing master plans and studies related to the tracts of land.
- Identify existing barriers and interview clients and stakeholders to determine proposed access routes.
- Investigate the site by conducting walk audits.
- Establish design criteria based on the MOA's design criteria manual and the State of Alaska's preconstruction manual. (APPENDIX B)
- Identify critical infrastructure investments on adjacent streets to improve access to and through the tracts of land.
- Development of the alternative concepts and the development of alternatives.
- Conduct alternative analysis and alternative cost estimates.
- Develop alternative analysis reports with preliminary engineering drawings and cost estimates for the selected projects.

Analysis criteria considered can be seen in Figure 3.

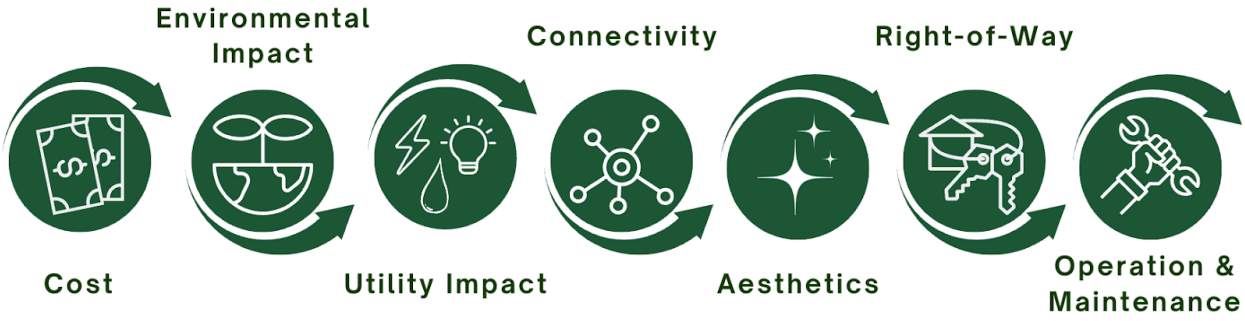


Figure 3 Analysis Criteria

4.0 DISCUSSION OF ALTERNATIVES

The following alternatives represent the best options our team reviewed throughout our analysis. The alternatives combine multiple elements that achieve desired outcomes for intended parties. Because of the nature of the scope of work, alternatives can continue to be altered further to accomplish a different combination of elements, if desired.
Our team took into consideration the following to ensure functionality as well as economic feasibility for whichever alternative is selected:

- Connectivity and Accessibility
- Environmental Impact
- Cost Effectiveness
- Safety and User Experience

A major consideration between the alternatives include wetland impact considerations. Paved or unpaved pathways have a much higher impact on wetlands than boardwalks. Wetland credits are estimated to be able to be purchased for $150,000-$200,000 per acre. The boardwalk's piles can be driven into the ground in winter, minimizing wetland impact and reducing wetland impact cost.

4.1 Alternative I: No-Build Alternative

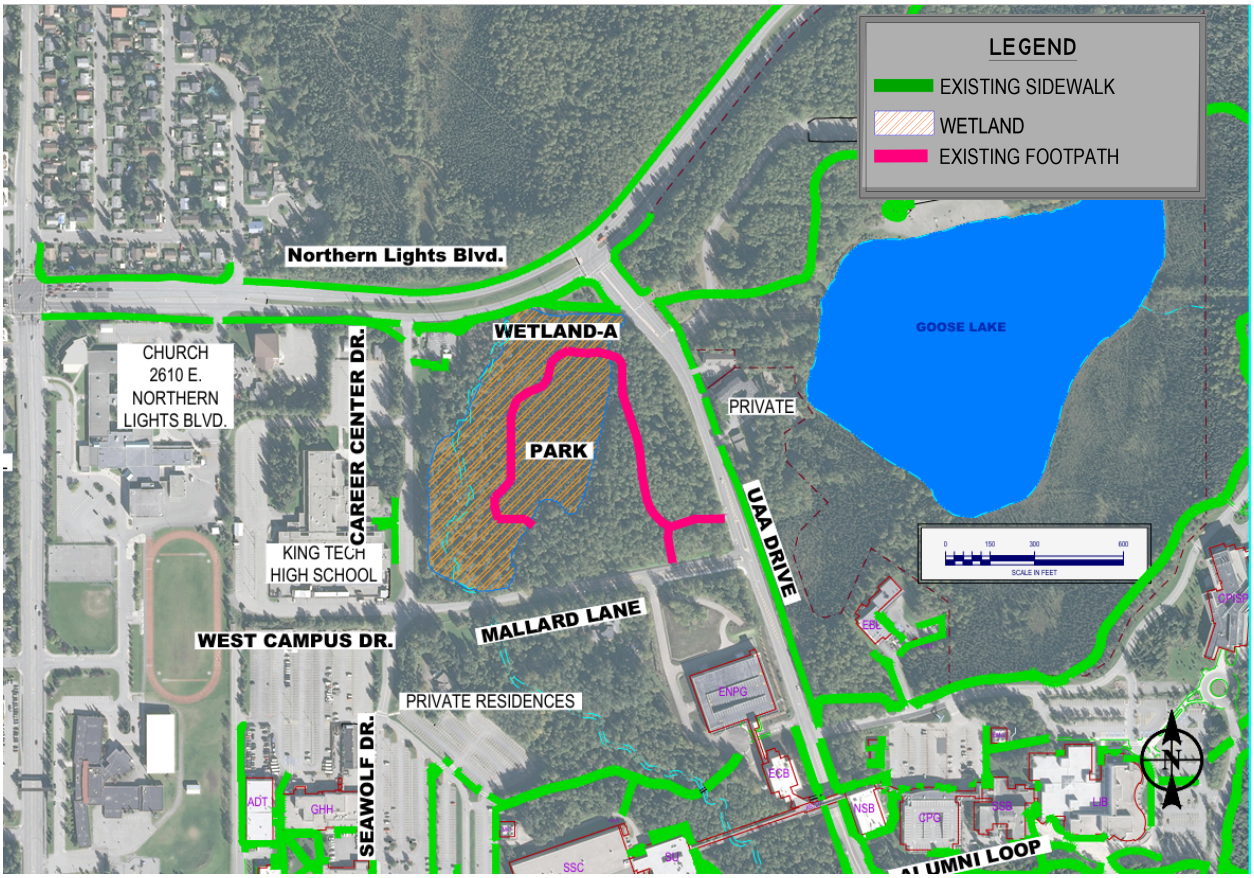


Figure 4 No-Build Alternative

The first proposed alternative is a No-Build Alternative and can be seen in Figure 4. This will leave the parcels as is, requiring no additional funding or construction. The major benefits of No-Build include leaving the existing 11 acres of type A wetlands intact and having the lowest construction and maintenance costs among all the alternatives. No improvements will be made to the parcels or the surrounding roadways and trail systems.
However, the design does not meet the project's purpose of enhancing connectivity for non-motorized users.

PROS:

- No wetland Impact
- No utility relocation
- No ROW cost
- O&M (Operations and Maintenance)
- Cost

CONS:

- Connectivity and Accessibility won't be improved

Estimated Total: **$0** (Excluding Current O&M)

4.2 Alternative II: Roundabout Alternative

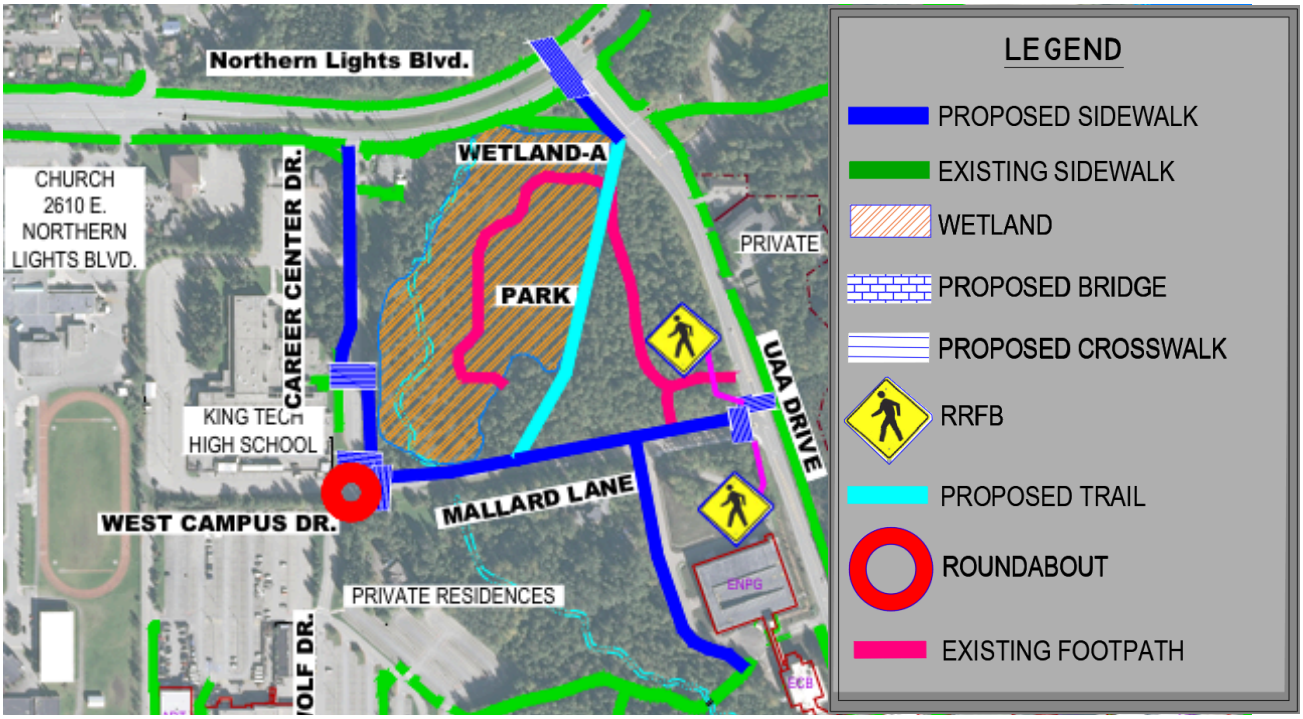


Figure 5 Roundabout Alternative

The second alternative design for the Urban Forest Park focuses on connectivity and safety for pedestrians and recreationists (Figure 5). The design proposes a comprehensive network of paths, a roundabout, and crosswalks. The design plans for a roundabout at the intersection of Career Center Drive and Mallard Lane to improve traffic flow and pedestrian safety. Thus, the roundabout is addressing the critical need for safe pedestrian access within the parcel. Locating the access point at the center of Mallard Lane ensures integration with the four roads adjacent to the UFP parcel. Among its many advantages, this alternative stands out for its minimal impact on the wetland area, preserving the ecological integrity while enhancing accessibility.

To increase driver awareness and ensure pedestrian safety at uncontrolled, marked crosswalks, we recommend a pedestrian-activated Rectangular Rapid Flashing Beacon (RRFB) and a pedestrian warning sign at the intersection between UAA Drive and Mallard Lane. The RRFB consists of two rectangular-shaped yellow indicators, each equipped with an LED array-based lighting source. When activated, RRFBs flash with an alternating high frequency to improve the visibility of pedestrians to drivers at the crossing.

The proposed pedestrian sidewalks act as clear pathways, guiding visitors to the existing Moose Loop Trail, thus improving the recreational experience. Notably, the design circumvents the need for costly infrastructure changes, such as relocating the Chugach Electric facility, thereby offering economic benefits. The introduction of a boardwalk, if desired, is poised to significantly boost connectivity for non-motorized users from nearby communities. This includes King Tech High School and the University of Alaska Anchorage, enriching the community's crossing the parcel. However, the plan includes drawbacks, with the merit of minimal impact on the wetland. The connectivity at the Career Center Drive and Northern Lights Blvd intersection may not be as enhanced as in other proposed designs, potentially

limiting the thoroughfare's overall effectiveness. Additionally, The maintenance and operation of the boardwalk, particularly for snow plowing in winter, represent ongoing financial commitments.

PROS:

- Connectivity and accessibility.
- Minimum impact on the Wetland area.
- Lower risk of vehicular accidents adjacent to the three roads.
- Path guide to the existing Moose Loop Trail and UAA Trails.
- No Relocating cost of the Chugach Electric facility

CONS:

- O&M of the boardwalk inside UFP
- Lack of connectivity at Northern Light Blvd and Career Center Dr. intersection

Trail Cost Estimate: $57,500 + Boardwalk ($560/LF)
Sidewalk and Roadway Estimate: $2,750,000
Miscellaneous:$70,000

Estimated Total: **$2,877,500 - $4,230,000**

4.3 Alternative III: Northern Lights Bridge Alternative

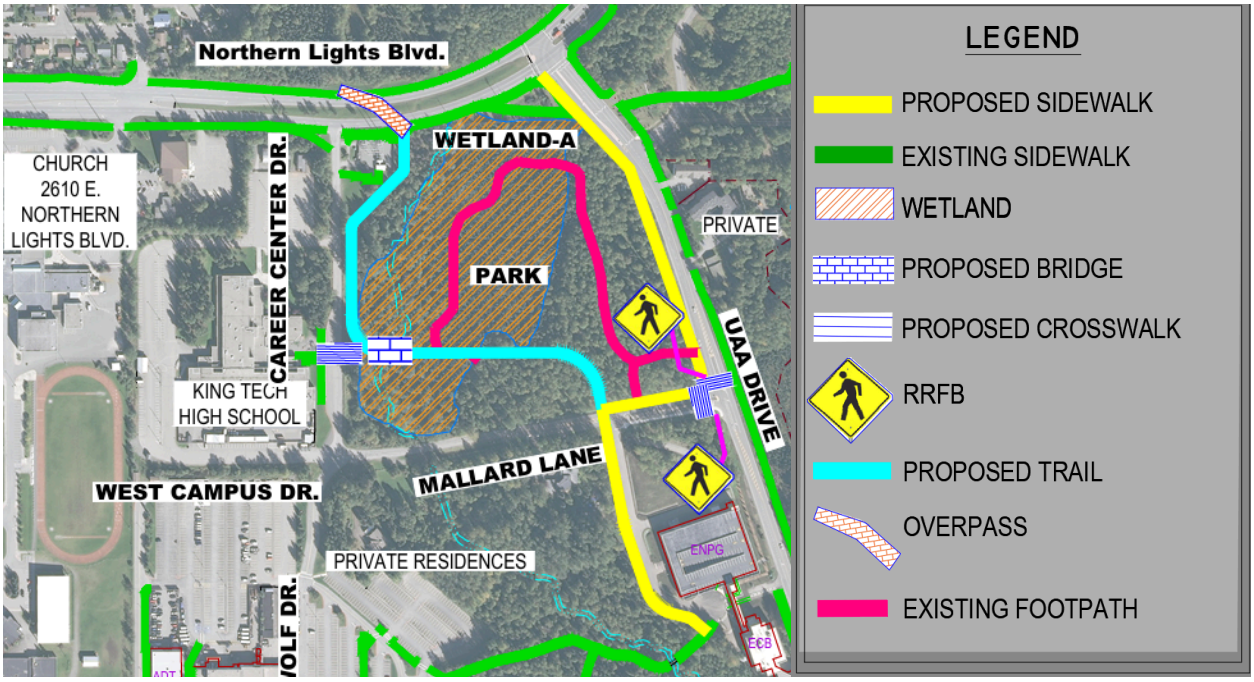


Figure 6 Northern Lights Bridge Alternative

The third alternative design for the Urban Forest Park (seen in figure 6), while sharing similarities with the second, introduces a significant addition: a bridge over Northern Lights Boulevard, enhancing the connection between the park's north side and the adjacent lands. Like the second alternative, it maintains internal access and connectivity with the surrounding trail system, featuring a bridge over Chester Creek and a trail along the wetlands within the parcel. An access point to the proposed board will be implemented in front of the most used exit of King Tech High School due to the high demand expected from the facility.

The proposed bridge over Northern Lights Boulevard offers direct access to future trail projects and the nearby community village, enhancing connectivity and accessibility throughout the area. It enables a seamless connection between the north and south trails for non-motorized users and improves pedestrian access along UAA Drive while also increasing safety by avoiding the busy intersection of Mallard Lane and Career Center Drive. However, the economic and environmental costs of the alternative design are considerable. Major utility relocations along Northern Lights Boulevard, including transmission and distribution poles and a substation, pose a significant financial burden. This is estimated to be between $80,000,000 and $120,000,000 questioning the financial feasibility of the alternative.

For sidewalk improvements along UAA Drive, affected light poles would also need to be relocated. Additionally, environmental impact is notable. The alternative includes a bridge over Chester Creek and the construction of boardwalks or trails potentially affecting the wetlands; requiring wetland credits to be obtained. Also, the potential obstruction of sightlines towards traffic lights at the intersection of Northern Lights Blvd and UAA Dr. due to the overpass further complicates this alternative.

PROS:

- Direct access to the road that connects future trail and community
- Connectivity and Accessibility to and through the parcels
- Seamless connection of non-motorized trail of the existing north and south trail
- Enhances accessibility of UAA Dr. for pedestrians
- Safety of non-motorized users by avoiding the intersection of Mallard Ln, and Career Center Dr.

CONS:

- Major utility relocation cost along the Northern Light Blvd which includes the relocation of transmission and distribution poles and substation.
- Light Poles relocation along the UAA Drive
- Wetland impact by the bridge over Chester Creek and boardwalk
- Relocating cost of the existing Chugach Electric facility
- Potential sight blocks to the traffic light at the Northern Light Blvd. and UAA Dr. due to overpass over Northern Lights Blvd.

Trail Cost Estimate: $57,500 + Boardwalk ($560/LF)
Sidewalk and Roadway Estimate: $264,000
Pedestrian Bridge: $8,500,000
Miscellaneous:$70,000
Relocation of Utilities: $80,000,000 - $120,000,000
Estimated Total: **$88,891,500 - $126,530,000**

4.4 Alternative IV: Multi-Way Alternative

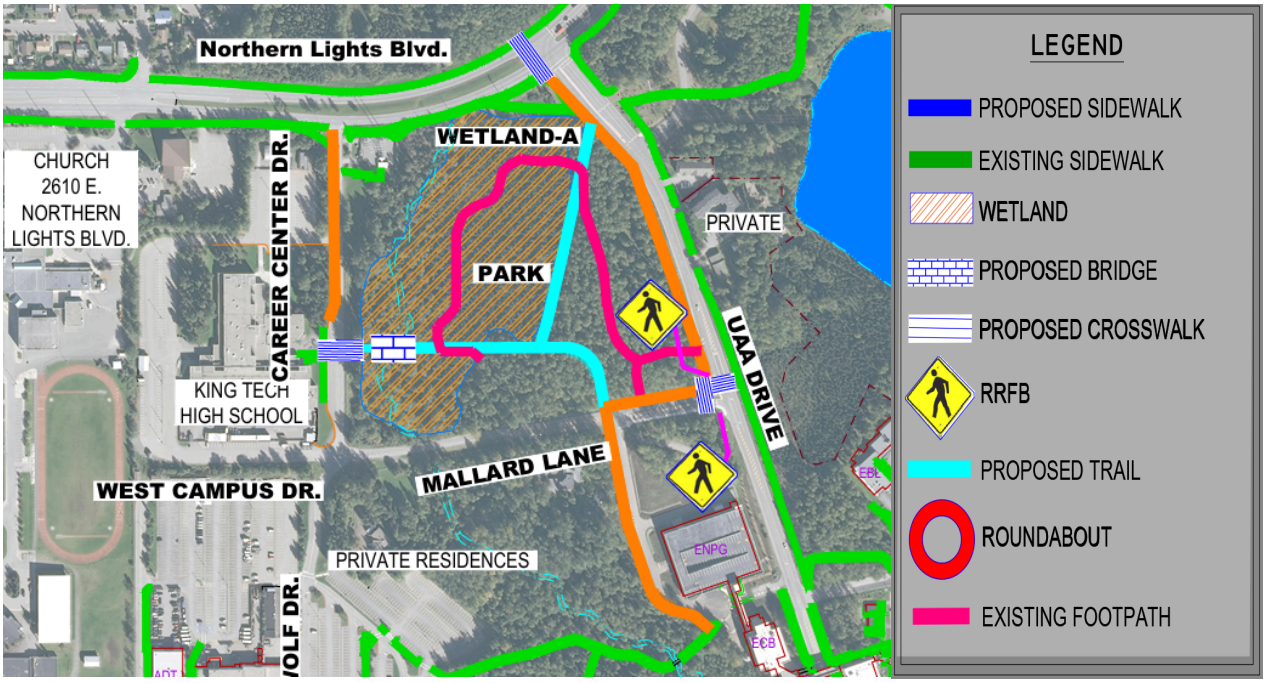


Figure 7 Multi-Way Alternative

The fourth alternative design for the Urban Forest Park is centered around maximizing connectivity and accessibility, featuring five access points to the proposed boardwalks along the parcel. The multi-way alternative can be viewed in Figure 7. A comprehensive analysis of the access points was conducted due to the expected high demand of the locations, from Career Center Drive near King Tech High School, Mallard Lane near UAA Engineering Computation Building, and another UAA Drive, providing non-motorized users with proximity to existing crosswalks.

This design stands out as it offers the highest level of connectivity, linking all adjacent roads to the parcel, thus significantly enhancing the network within the Urban Forest Park. Additionally, it prioritizes safety by creating a physical separation between the community and vehicle traffic through adjacent sidewalks, promoting a safer environment for pedestrians and cyclists alike.

However, the design comes with considerable drawbacks, primarily concerning environmental impact. The construction of a bridge over Chester Creek to connect the multi-way boardwalks will significantly affect the wetland areas. This factor was thoroughly analyzed and deemed unavoidable in achieving the desired level of connectivity. Financial implications are also notable in this alternative, with substantial costs associated with relocating lighting poles along UAA Drive to accommodate the new sidewalk implementations.

Furthermore, to enhance pedestrian experiences and safety, crosswalks are planned at the ends of each boardwalk within the UFP parcel, complemented by the installation of Rectangular Rapid Flashing Beacons (RRFB) at critical intersections like UAA Drive and Mallard Lane. While this design ensures optimal connectivity and enhances pedestrian safety and accessibility, it necessitates careful consideration of its environmental footprint and the financial investment required for its implementation.

PROS:

- Multi-Way connectivity
- The best connectivity design among other designs

CONS:

- Utility relocation cost
- Wetland Impacts

Trail Cost Estimate: $57,500 + Boardwalk ($560/LF)
Sidewalk and Roadway Estimate: $313,500
Miscellaneous:$70,000

Estimated Total: **$441,000 - $605,000**

5.0 MATERIALS AND COMPONENTS

The following materials and components are suggested for the construction of the project. These include estimates of cost per item linear foot, lump sum, or each. They may be applied to any of the alternatives.

Subgrade will consist of 36” of Material Type C. On top of this will be a 4” layer of D-1 and 2” of E-1 for the surface course.. The cost per linear foot for an unpaved trail will be $61/LF. For paved alternatives, the pavement structure will include a 2” layer of Asphalt Pathway instead of 2” of E-1, which will add $9/LF to the overall cost ($70 LF). Embankments will consist of Material Type C. Embankment costs for a typical section have been included in the $61 total per linear foot for the trail.

Boardwalks and pedestrian bridges within the UFP will be made from wood and should be prefabricated to limit impact during the construction process. Boardwalks are estimated to cost $560/LF, and the prefabricated bridge to cross Chester Creek costs approximately $50,000. Roadway paint markings should be inlaid, however sidewalk and pathway markings do not need to be inlaid.

Curb and gutter will consist of 24” Material Type A, 4” of ABC D-1, 4” of concrete, and will cost approximately $165/LF. Roundabout costs are anticipated to be $500,000 as a lump sum item. Miscellaneous elements, such as paint markings, signs, RRFBs, etc, are estimated to cost $70,000 per alternative.

A pedestrian bridge crossing Northern Lights Blvd is estimated to cost $6,000,000 for materials and labor. If relocation of utilities is required, this will add $1,000,000 to relocate each power transmission pole and $80,000,000 - $120,000,000 to relocate the existing Chugach Electric substation. These elements pertain specifically to Alternative III. Our research shows wetland credits in this area range from $150,000-$200,000 per acre impacted. The level of impact will depend on the selected alternative. Paved or unpaved pathways have a much higher impact on wetlands than boardwalks. The boardwalk’s piles can be driven in winter, minimizing wetland impact. 40% contingency is included in price estimates. Table 2 shows a breakdown of cost below, this includes materials and construction costs.

Material	Cost ($)
Material Type C (36” Depth and Embankments)	$42 / Linear Foot
D-1 (4”)	$12 / Linear Foot
E-1 (2”)	$7 / Linear Foot
Asphalt Pathway (2”)	$70 / Linear Foot
Boardwalk	$560 / Linear Foot
Pedestrian Bridge	$50,000 (Lump Sum)
Overpass Bridge	$8,500,000 (Lump Sum)
Miscellaneous (Paint Markings, RRFB, etc.)	$70,000 (Per Alternative)

Table 2 Cost of Material

6.0 TYPICAL SECTIONS

Typical sections reflect the design of the most common cross sections of each of the project's design elements.

6.1 Shared Used Sidewalk Typical Section

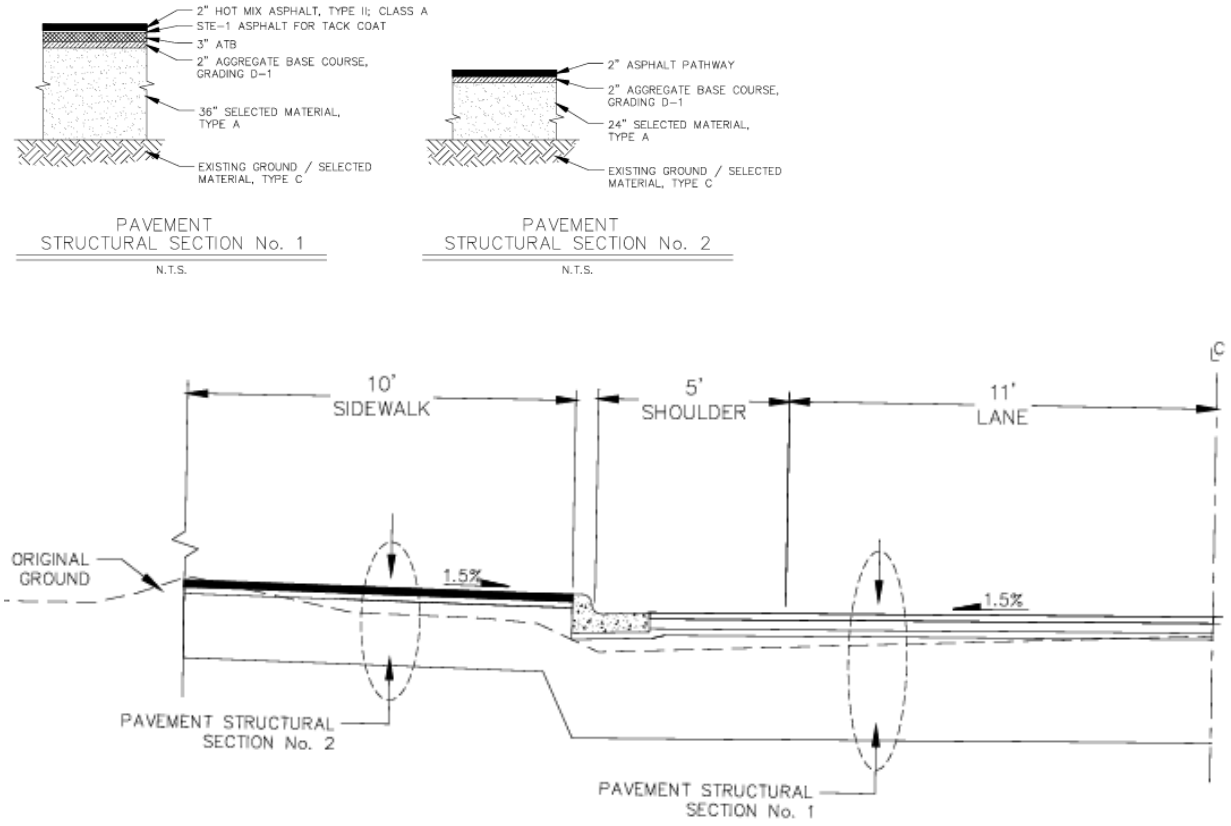


Figure 8: Shared Used Sidewalk Typical Section/ Structural sections

Figure 8 shows the typical section for a shared used sidewalk that offers a comprehensive solution for diverse transportation needs while prioritizing safety and accessibility. This typical section could be applied along the Career Center Drive, UAA Drive, and/or Mallard Lane. Stretching 10 feet wide and crafted from durable materials like asphalt or concrete, it seamlessly integrates with existing UMED sidewalks, ensuring consistency and reliability. Cross slopes gently incline at 2% towards the curb and gutter, facilitating efficient drainage and enhancing user comfort.

A clear zone 3 feet from the edge of the traveled surface or pavement should be maintained from trees, poles, walls, signs, or other potential obstructions. Embankment slopes should slope at 3:1, or flatter and not steeper than 2:1. Additionally, a minimum design speed of 20 mph should be used (AASHTO, 1999) for electric bike users to ensure pedestrian safety and a harmonious environment for all commuters. This multi-modal sidewalk embodies a commitment to inclusivity, efficiency, and safety in transportation infrastructure.

6.2 Separated Bike Lane Typical Section

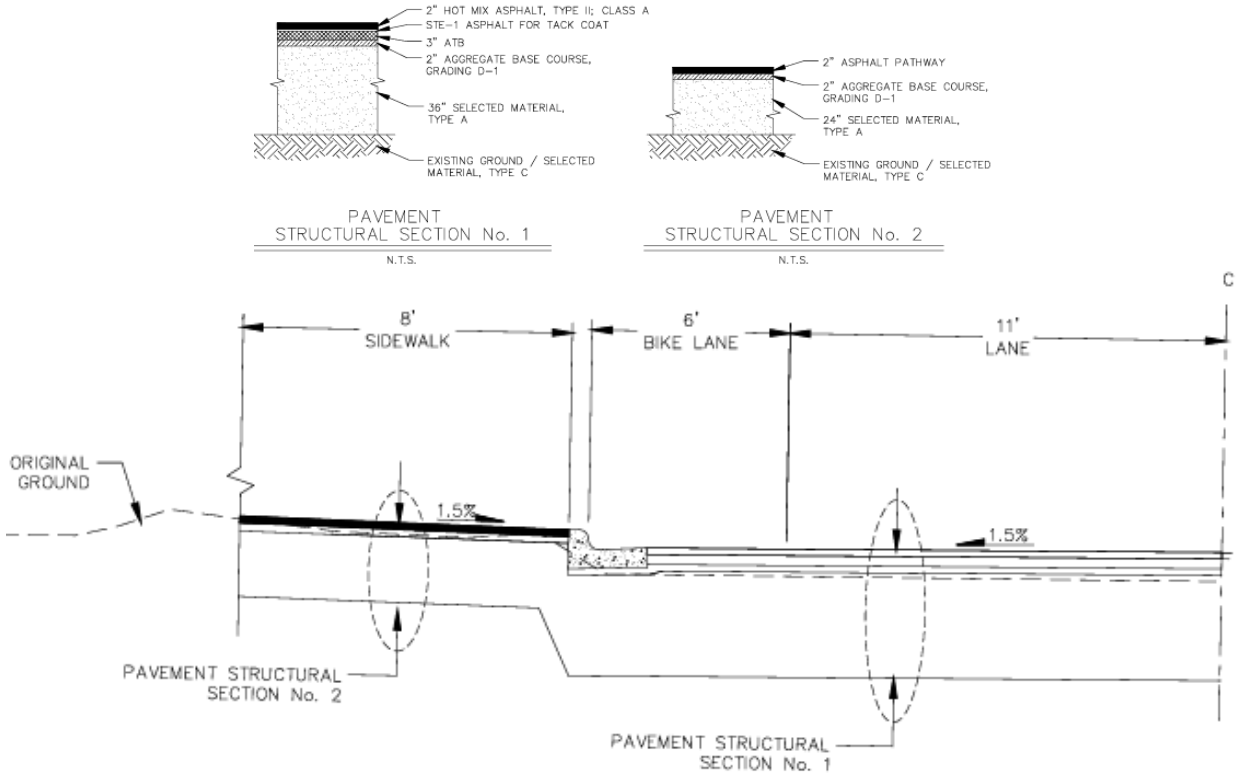


Figure 9: Separated Bike Lane with SidewalkTypical Section/ Structural Section

The separated bike lane typical section in Figure 9 is designed to quickly and safely accommodate pedestrians and cyclists and is recommended along UAA Drive and/or Career Center Drive. The six-foot bike lane is separated by a curb and gutter. The path is constructed with durable materials like concrete or asphalt to maintain consistency with other nearby pathways. A slight cross slope of 1.5% towards the curb efficiently manages drainage, while a maximum longitudinal grade of 5% ensures manageable inclines for all users.

A clear horizontal zone is three feet from the traveled surface. The embankment slopes, designed at a ratio of 3:1, contribute to the sidewalk's stability and safety. This separated bike lane and sidewalk prioritizes convenience, safety, and inclusivity for all commuters.

6.3 Developed Trail Typical Section

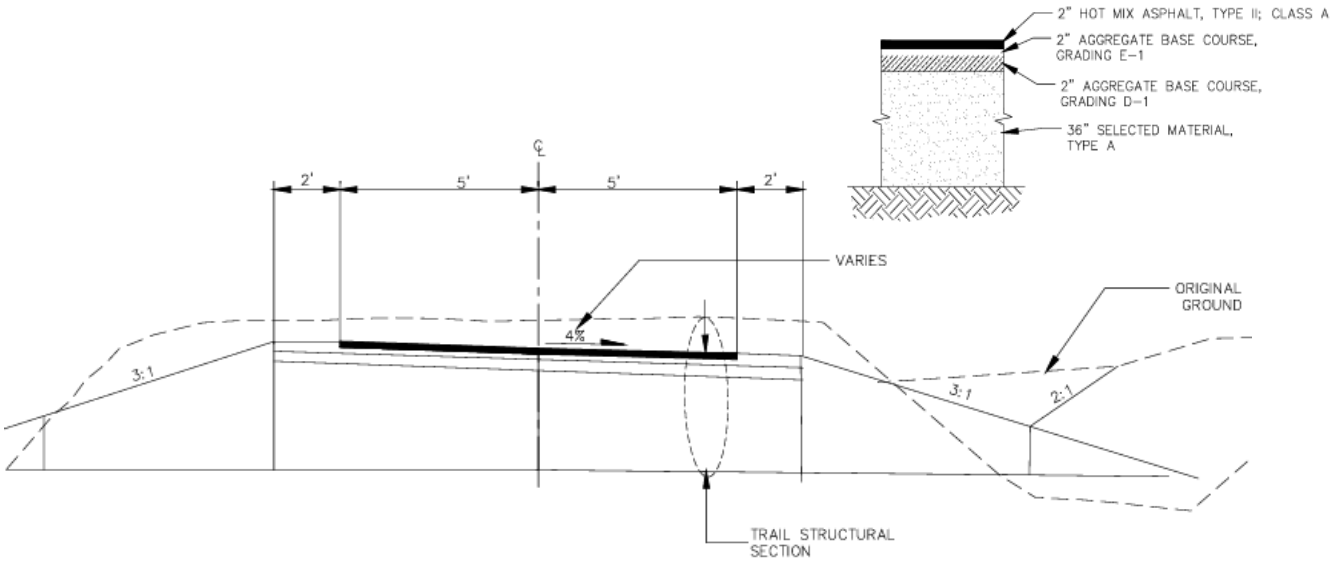


Figure 10: Developed Trail Typical Section/ Structural section

The typical section of the developed trail, seen in Figure 10, presents a well-designed pathway for recreational enthusiasts and commuters, prioritizing safety and accessibility. Consisting of two lanes, each 6 feet wide and complemented by 2-foot unpaved shoulders mirroring the surrounding trails, it ensures ample space for diverse users. Constructed with either asphalt for a smooth surface or graveled with E-1 material for a more natural feel, the trail offers versatility while maintaining durability.

Cross slopes are set at 4%, facilitating more manageable maintenance and construction processes. Adhering to ADA standards, the maximum longitudinal grade is capped at 5%, guaranteeing accessibility for all. A clear horizontal zone extending 3 feet from the traveled surface enhances safety and maneuverability. Additionally, with a vertical clearance of 10 feet and embankment slopes of 3:1, the trail provides a spacious and stable environment. Moreover, a prudent speed limit of 20 mph for electric bike users ensures pedestrian safety, fostering a harmonious and secure trail experience for all.

6.4 Boardwalk Trail Typical Section

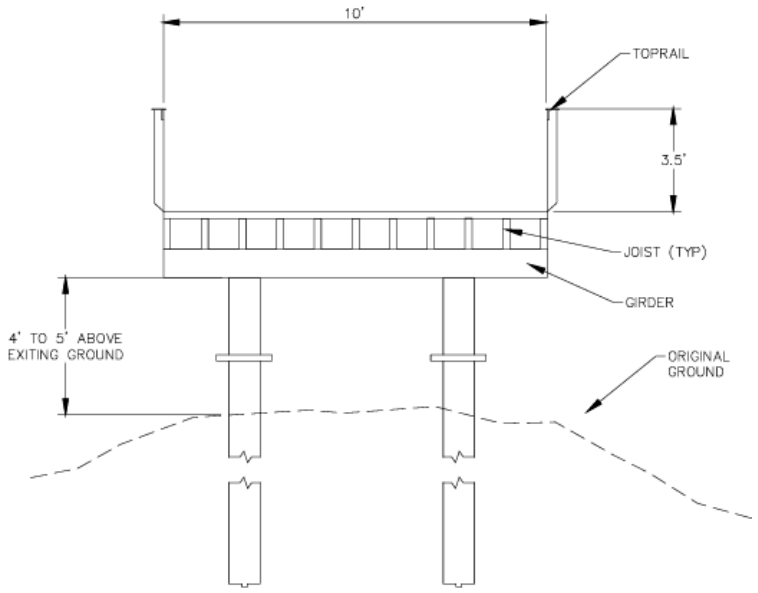


Figure 11: Boardwalk Trail Typical Section

The boardwalk trail design combines structural stability, accessibility, and environmental sensitivity. As shown in figure 11, the trail has two lanes, each 5 feet wide, and features 3.5-foot rails outside to ensure that users are safe. The trail is supported by 20-foot helical-driven piles buried below the ground and rises 4.5 to 5 feet above the ground level, providing stability and resilience. The boardwalk deck and blocking comprise the trail's surface and are durable and sustainable.

The winter construction minimizes environmental impact and mitigates temporary wetland disturbances. The trail meets ADA standards, and the maximum longitudinal grade is at most 5%, ensuring accessibility for all. A clear horizontal zone extending 3 feet from the traveled surface enhances safety. Electric bike users must have a posted speed limit of 20 mph to ensure pedestrian safety for a secure trail experience.

6.5 Roundabout Typical Section

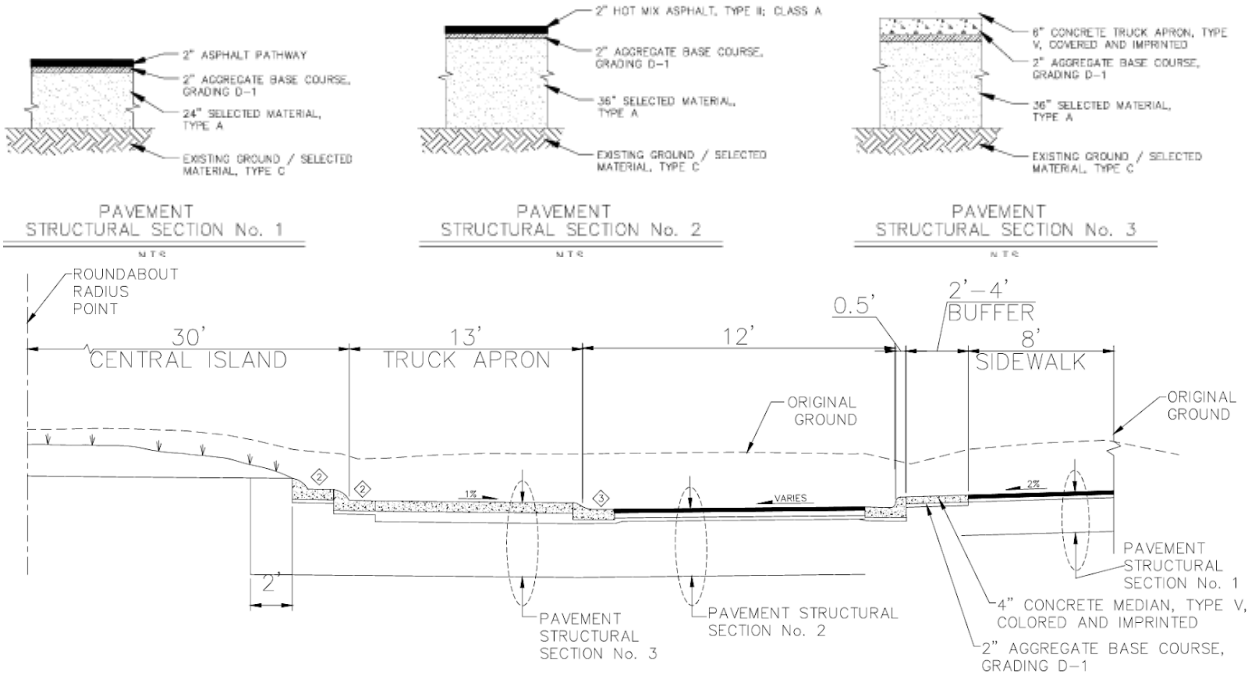


Figure 12: Roundabout Typical/ Structural sections

The typical section of the single-lane roundabout, depicted above in Figure 12, creates efficient traffic flow and pedestrian safety. With one lane spanning 14 feet and a central island extending 30 feet, the roundabout offers space for vehicles to navigate smoothly. A 13-foot truck apron accommodates larger vehicles and ensures maneuverability and safety. Varied shoulder widths range from 2 to 4 feet.

An 8-foot sidewalk runs alongside the roundabout, promoting pedestrian accessibility and comfort. With cross slopes of 1-2% strategically implemented for drainage, the roundabout maintains optimal functionality in varying weather conditions. Each of the four legs features crosswalks, prioritizing pedestrian safety and facilitating seamless movement. Furthermore, a posted speed limit of 15 mph for vehicle users ensures a secure and efficient traffic environment within the roundabout.

7.0 HORIZONTAL AND VERTICAL ALIGNMENT

Denali L.L.C. focused on the strategy to integrate new pedestrian pathways with existing trails and roadways, ensuring seamless continuity within the Urban Forest Park. Alignments that maintain the natural and existing infrastructure flow while meeting accessibility standards for all user groups were analyzed.

7.1 Horizontal Alignment

Horizontal alignment will look to tie into the existing trails and roadway corridors in the vicinity. For alternatives that plan to alter the surrounding areas, design elements will integrate seamlessly to allow for continuity within the corridors.

7.2 Vertical Alignment

All alternatives will meet a maximum % grade requirement of 5% to allow for accessibility for all user groups. The placement of a prefabricated bridge crossing Chester Creek within the parcel will span the creek and connect to either side at the finished grade.

8.0 DRAINAGE

Drainage within the project will be managed using grade slopes. The trail within the parcel will have a 4% cross slope to prevent runoff from ponding on the surface. This will apply to both paved and unpaved alternatives, allowing for ease of maintenance. Roadways will have a 1-2% cross slope starting at the crown and sloping to either side of the corridor. This will allow for sheet flowing of water. There will be no significant changes to drainage patterns in the area. New construction should tie into existing grade points. During construction, BMPs are to be used to prevent environmental impact. This will include silt fencing properly installed and straw waddles around drains. It is also recommended that rumble strips be used for vehicles entering and leaving the work site. Because of the proximity to Chester Creek and the ecosystems it connects to, managing runoff in and around the site will be crucial to limiting environmental impact as well as maintaining a safe, usable recreation area.

9.0 SOIL CONDITIONS

Reports on soil conditions were reviewed to prepare and evaluate the alternatives for this project.

The reviewed reports include:

- Soil corrosivity report of the soil along Mallard Lane from Coffman Engineers from 2012
- Soil reports and borehole logs of the soil along Mallard Lane from Dowl HKM from 2012
- Borehole logs of the soil along from Shannon and Wilson, Inc. from 2012 (Figure 13)
- Borehole logs of the soil along UAA Drive (Previously Providence Dr.) from the City of Anchorage Office of the City Engineer Soils Laboratory from 1973 (Figure 13)

In the portions of the UFP where infrastructure is planned to be constructed, it is likely that significant portions of peat may need to be removed and the void filled with Select Material C.

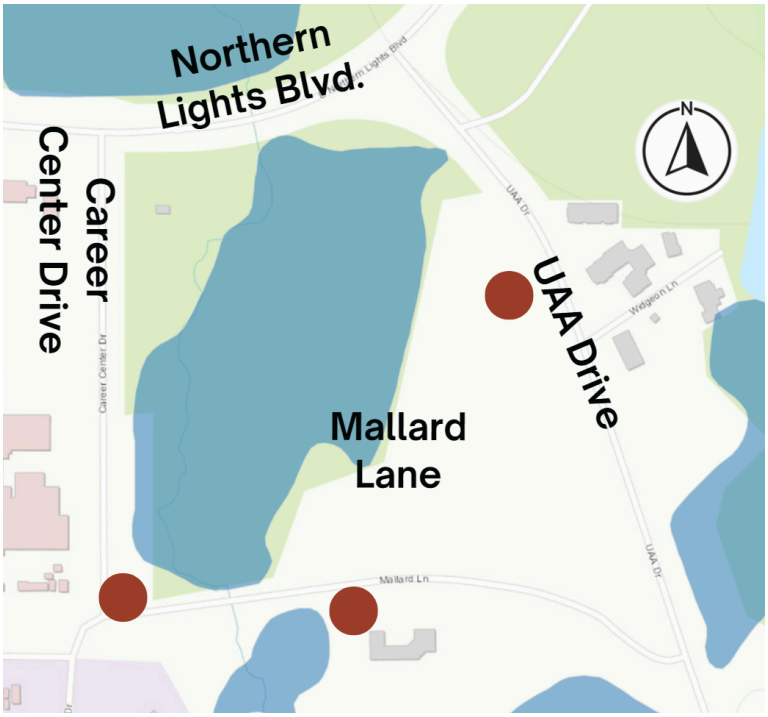


Figure 13 Borehole Locations

11 Acres of the UFB is Class A Wetland.
Some typical soil properties are as follows:

- Fill, Silty Sand with Gravel: 0' - 2.5'
- Sand With Silt and Gravel: 2.5' - 7.0'
- Groundwater Table - 7.0'

Bore logs can be viewed in Appendix C

10.0 MAINTENANCE CONSIDERATIONS

Maintenance of the UFP will need to be worked out between the UAA and the MOA. Any lighting, pathways, and sidewalks will increase maintenance efforts. The primary maintenance considerations are sidewalk and pathway upkeep, snow removal, and any lighting to be installed within the UFP.

APPENDIX A REFERENCES

- Roadside Design Guide (RDG), 4th Edition, AASHTO, 2011.
- Alaska Highway Preconstruction Manual (HPCM), DOT&PF, 2022, as amended at the time of design approval.
- The Alaska Traffic Manual (ATM), consisting of the Manual on Uniform Traffic Control Devices (MUTCD), 2009 as amended, U.S. DOT, FHWA) and the Alaska Traffic Manual Supplement (ATMS), DOT&PF, 2016.
- ADA Standards for Transportation Facilities, DOT, 2006.
- ADA Standards for Accessible Design, DOJ, 2010.
- Guide for the Development of Bicycle Facilities, 4th Edition, AASHTO, 2012.
- Highway Capacity Manual (HCM), 5th Edition, TRB, 2010.
- Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), AASHTO, 2001.
- Design Criteria Manual (DCM), MOA, Project Management & Engineering Department, 2007 with 2018 revision.
- Proposed Accessibility Standards for Pedestrian Facilities in the Public Right-of-Way (PROWAG), U.S. Access Board, 2011.
- Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition, AASHTO, 2004.
- Campus Master Plan 2022, University of Alaska Anchorage, 2022.
- Destination UMED TDM Plan & Strategy Toolkit, AMATS, 2023.

APPENDIX B PROJECT DESIGN CRITERIA

PROJECT DESIGN CRITERIA – MULTI-USE TRAIL

Urban Forest Park – CED 2024.03

CRITERIA	VALUE	SOURCE
Functional Classification	Multi-Use Unpaved Trails	DCM,
Design Year	TBD	
Design Year ADT	TBD	TBD
Surfacing, Lane Surfacing, Shoulder	Pavement Gravel	DCM,
Traveled Surface Width	8-10 feet wide	DCM, Chapter 4.2. I
Design Speed	20 mph for grades <6% 30 mph for grades >6%	DCM, Chapter 4.2. B.1
Stopping Sight Distance	136 feet (flat surfaces)	DCM, Chapter 4.2 C
Maximum Longitudinal Grade	≤ 5%	DCM, ADA
Cross Slope	1% Desirable - 2% Maximum (paved trail) 4% (gravel trails)	DCM, Chapter 4.2. F
Shoulder Width	2 foot minimum 5 foot minimum if side slopes are steeper than 3:1 (H:V)	DCM,
Shoulder Grade	3-5% (H:V)	DCM, Chapter 4. 2. G
Clear Zone	3 feet from edge of traveled surface	DCM, Chapter 4. 2. G
Bridge Clear Width	12 feet	DCM, Chapter 4. 2. G
Minimum Radius of Curvature	100 feet	DCM, Chapter 4.2. B.2 Table 4-1
Embankment Slopes	3:1 (H:V) or flatter desirable No steeper than 2:1 (H:V) with 3 foot shoulders	DCM, Chapter 4. 2. G
Vertical Clearance above Trail	10 feet	DCM, Chapter 4. 2. F
Vertical Clearance above Road	20ft-6in or 17ft-6in	DOT&PF HPCM, Tab;e 1130-1
Road Separation	N/A	N/A
Illumination	Varies	DCM,

DCM = Municipality of Anchorage Design Criteria Manual, Draft Chapter 4 (2013)
HPCM = Alaska Department of Transportation and Public Facilities, Highway Preconstruction Manual, Chapter 11 (November 2016)

Proposed By: Daniel Tedrick, Design Project Manager — 02/25/2024, Date

Recommended By: _____, MOA Project Manager — _____, Date

Table 2 Project Design Criteria

1994-104

City of Anchorage
Office of the City Engineer
Soils Laboratory

Field Auger Log

10-24-72

Contract Number
District ①

Hole Number 2

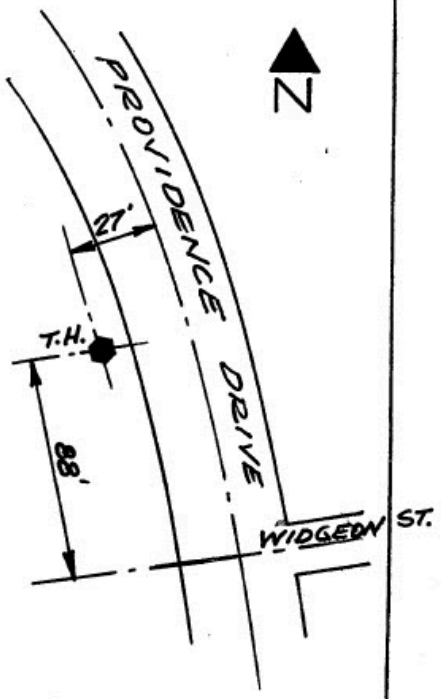
Location PROVIDENCE DRIVE

Top Elevation 2½' BELOW ℄ Rd IN DITCH LINE

w=water content
k=ccef of permeability
D_{20} = 20% Diameter
c = unit cohesion
o = ∠ of int. Friction
e = void ratio

Sample	Depth in feet	M.I.T. Classification
	1.0	MA-884 ML
	2.0	
	3.0	
	4.0	MA-885 ML
	5.0	
	6.0	
	7.0	MA-886 SM
	8.0	
	9.0	
	10	

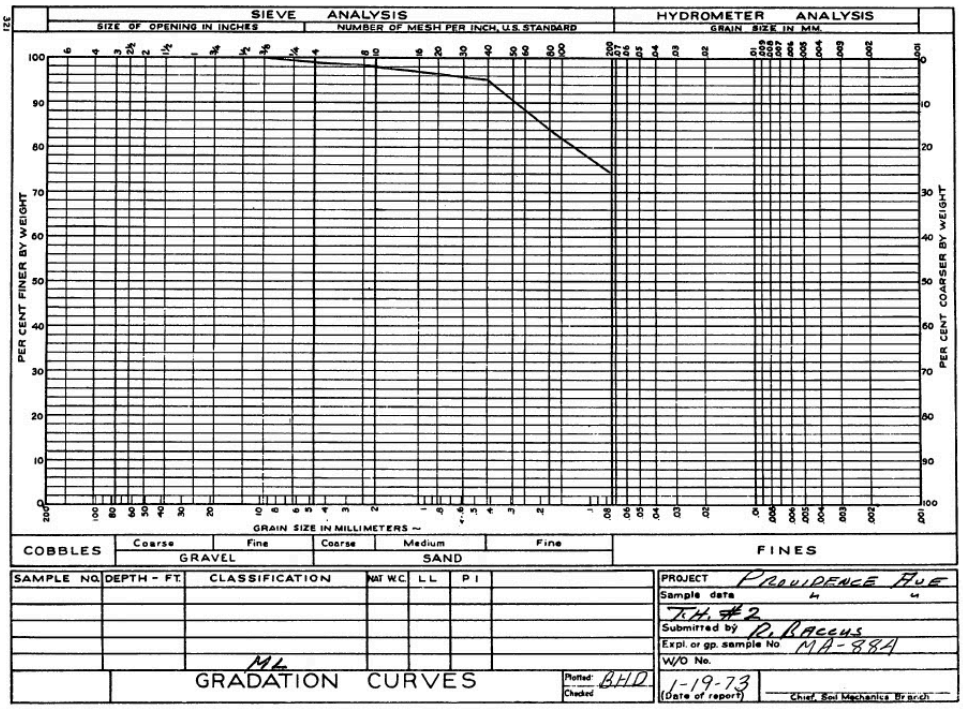
Summary of Test Results



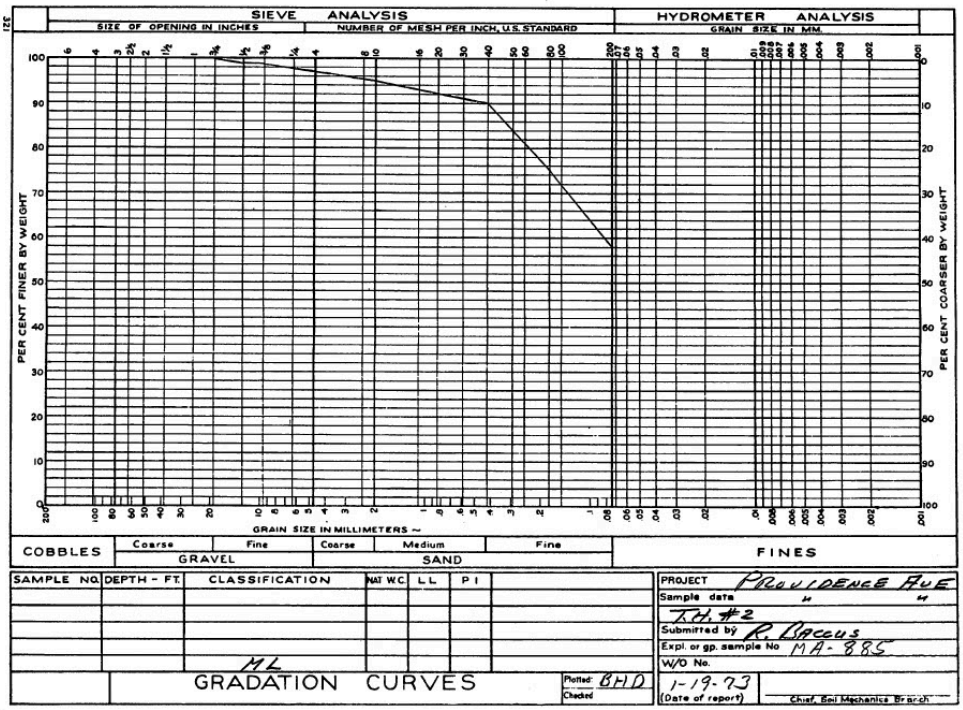
Hole Depth 7.0

page 9 of 115 pages

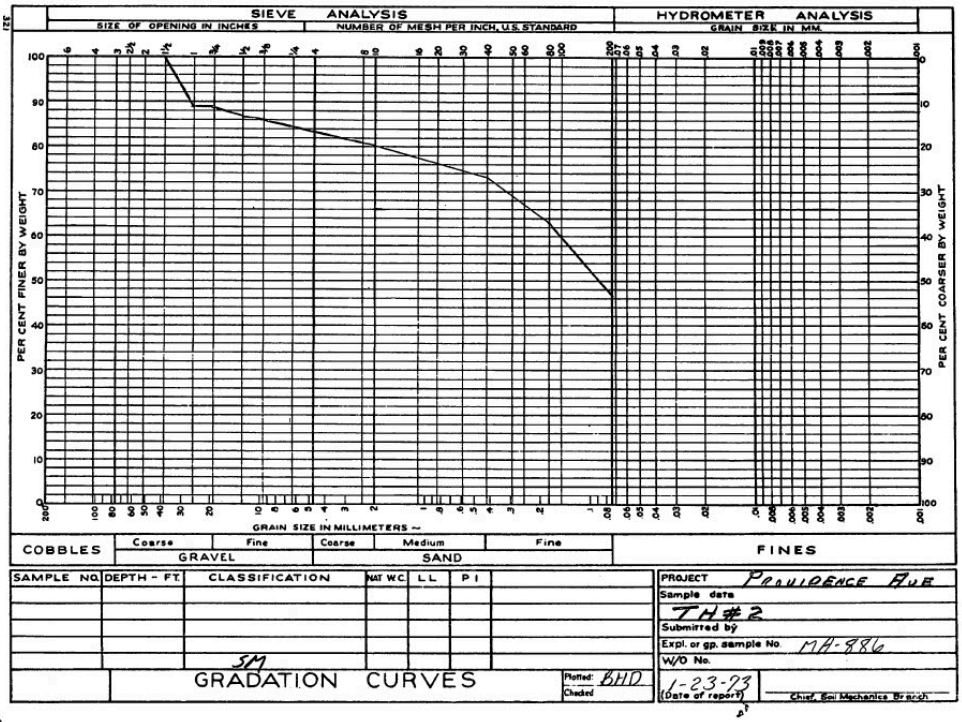
1974-104



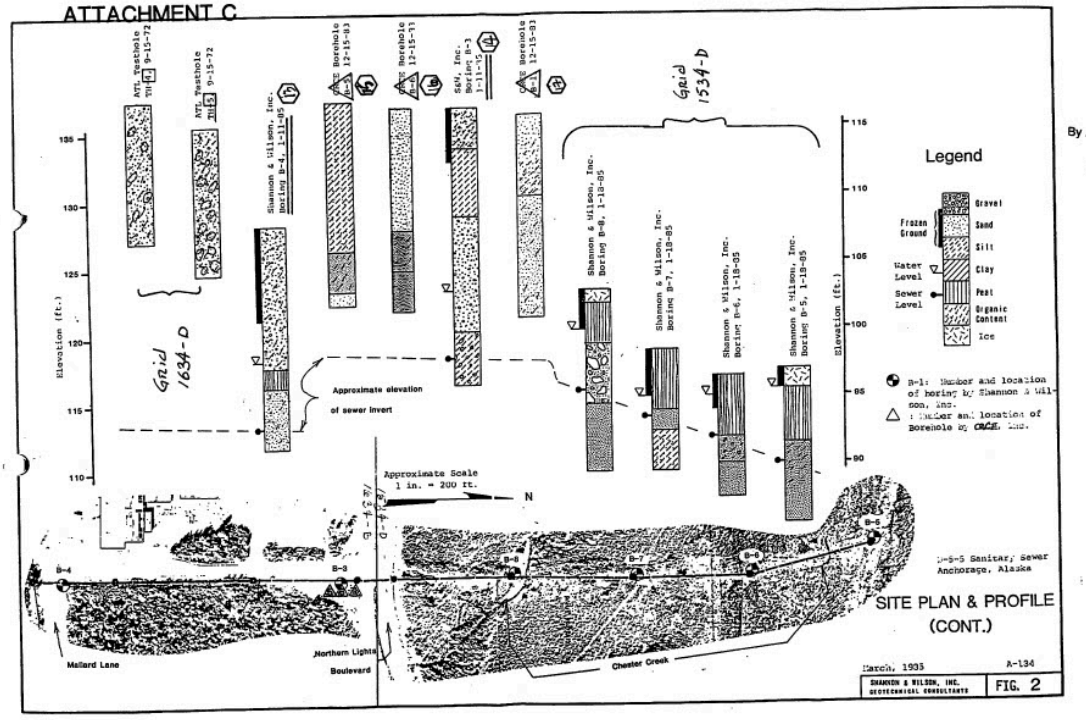
1974-104



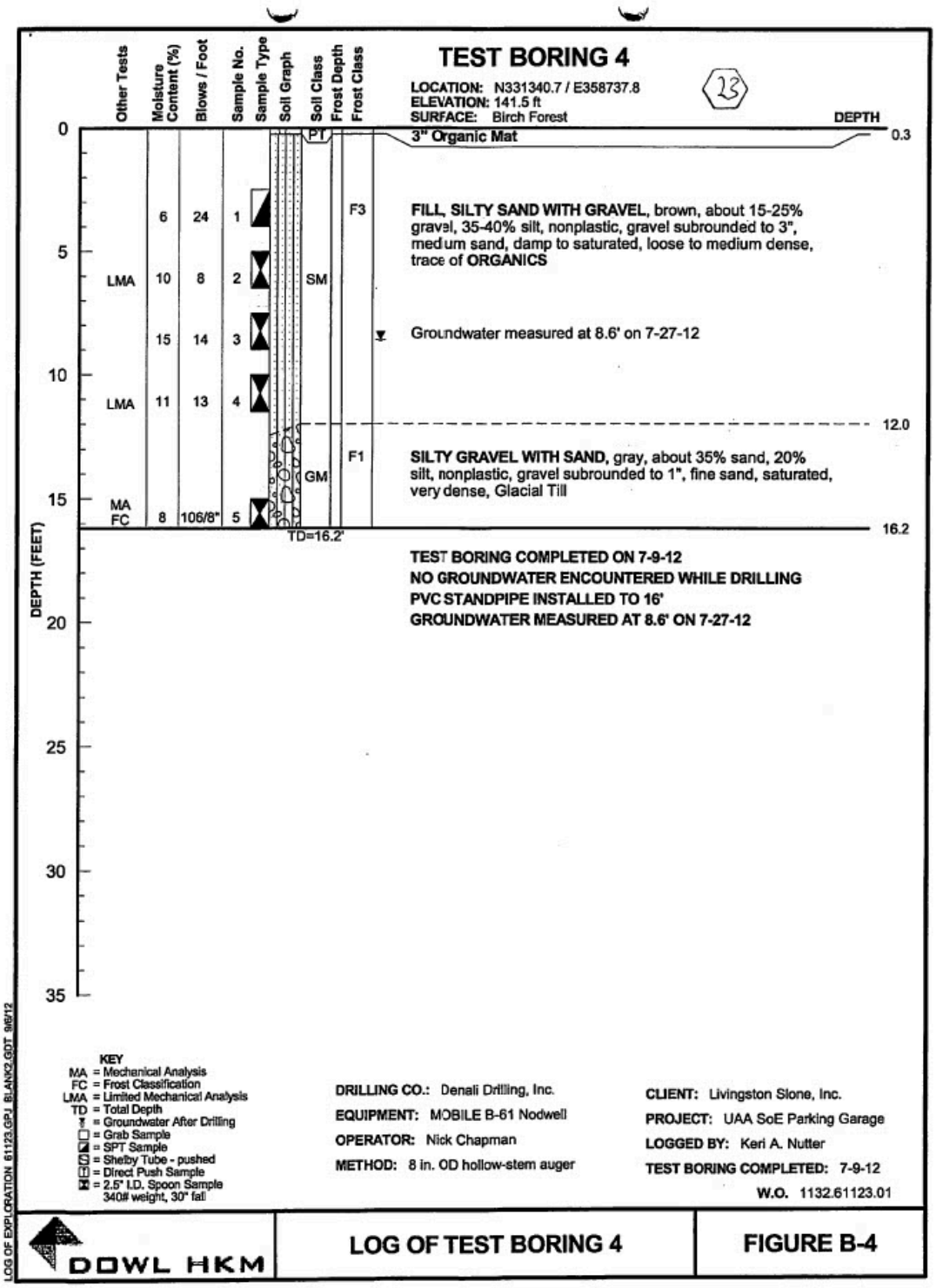
1971-1634



ATTACHMENT C



ENTERED
By
JAN 30 1987
SOILS LIBRARY
13-17


TEST BORING 4
LOCATION: N331340.7 / E358737.8
ELEVATION: 141.5 ft
SURFACE: Birch Forest
DEPTH
Other Tests
Moisture Content (%)
Blows / Foot
Sample No.
Sample Type
Soil Graph
Soil Class
Frost Depth
Frost Class
PT
3" Organic Mat
0.3
FILL, SILTY SAND WITH GRAVEL, brown, about 15-25% gravel, 35-40% silt, nonplastic, gravel subrounded to 3", medium sand, damp to saturated, loose to medium dense, trace of ORGANICS
F3
SM
LMA
6 24 1
10 8 2
15 14 3
LMA 11 13 4
Groundwater measured at 8.6' on 7-27-12
12.0
SILTY GRAVEL WITH SAND, gray, about 35% sand, 20% silt, nonplastic, gravel subrounded to 1", fine sand, saturated, very dense, Glacial Till
F1
GM
MA FC 8 106/6" 5
16.2
TD=16.2'
TEST BORING COMPLETED ON 7-9-12
NO GROUNDWATER ENCOUNTERED WHILE DRILLING
PVC STANDPIPE INSTALLED TO 16'
GROUNDWATER MEASURED AT 8.6' ON 7-27-12
DEPTH (FEET)
0 5 10 15 20 25 30 35
KEY
MA = Mechanical Analysis
FC = Frost Classification
LMA = Limited Mechanical Analysis
TD = Total Depth
= Groundwater After Drilling
= Grab Sample
= SPT Sample
= Shelby Tube - pushed
= Direct Push Sample
= 2.5" I.D. Spoon Sample 340# weight, 30" fall
DRILLING CO.: Denali Drilling, Inc.
EQUIPMENT: MOBILE B-61 Nodwell
OPERATOR: Nick Chapman
METHOD: 8 in. OD hollow-stem auger
CLIENT: Livingston Slone, Inc.
PROJECT: UAA SoE Parking Garage
LOGGED BY: Keri A. Nutter
TEST BORING COMPLETED: 7-9-12
W.O. 1132.61123.01
LOG OF EXPLORATION 61123.GPJ BLANK2.GDT 9/6/12
DOWL HKM
LOG OF TEST BORING 4
FIGURE B-4

DOWL HKM

Client: Livingston Slone, Inc.
Project: UAA SoE Parking Garage & Mallard Lane
Work Order: D61123

Location: Test Boring 4
Sample 5
Depth 15'-16.5'

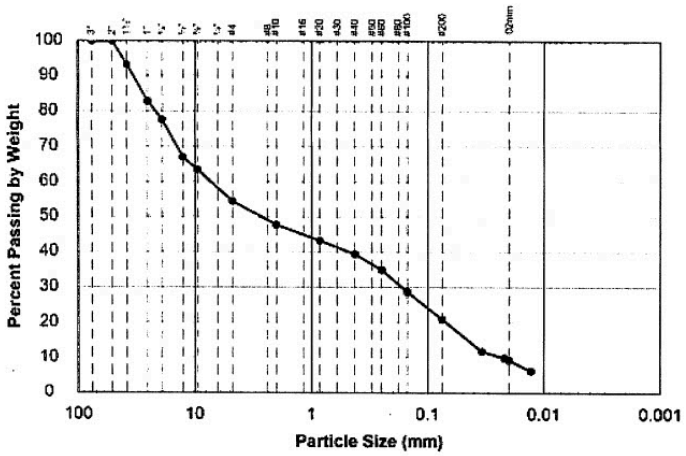
(23)

Engineering Classification: Silty Gravel with Sand, GM
Frost Classification: F1

Particle Size Distribution

ASTM D422

Lab Number	2012-1062
Received	7/12/2012
Reported	7/27/2012



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	93%	
1"	83%	
¾"	78%	
½"	67%	
⅜"	64%	
#4	54%	
Total Weight of Coarse Fraction: 1497.2g		
#10	48%	
#20	43%	
#40	39%	
#60	35%	
#100	29%	
#200	21%	
Total Weight of Fine Fraction: 438.1g		
0.02 mm	9.4%	

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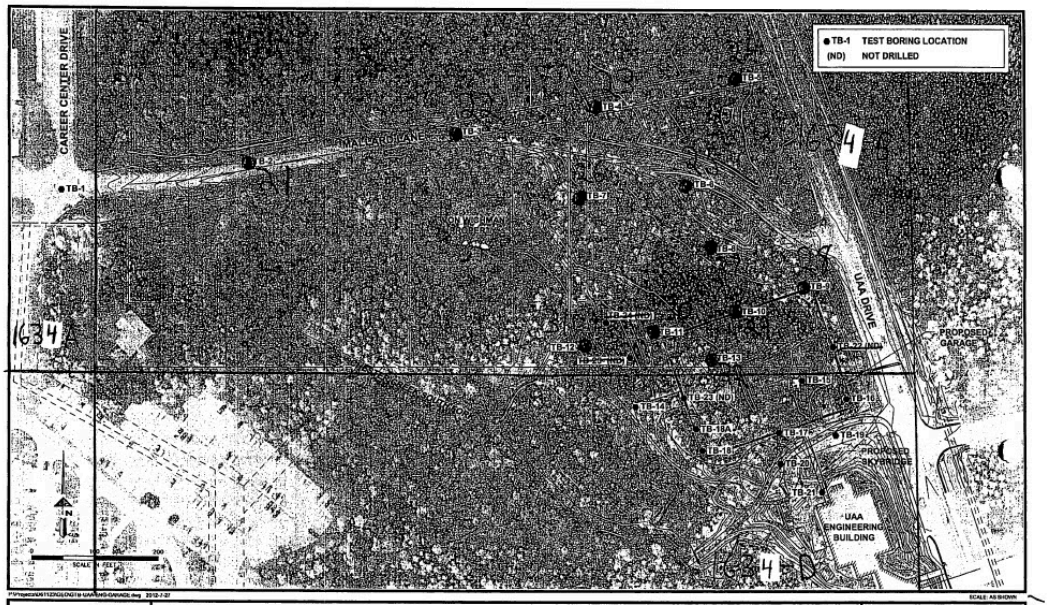
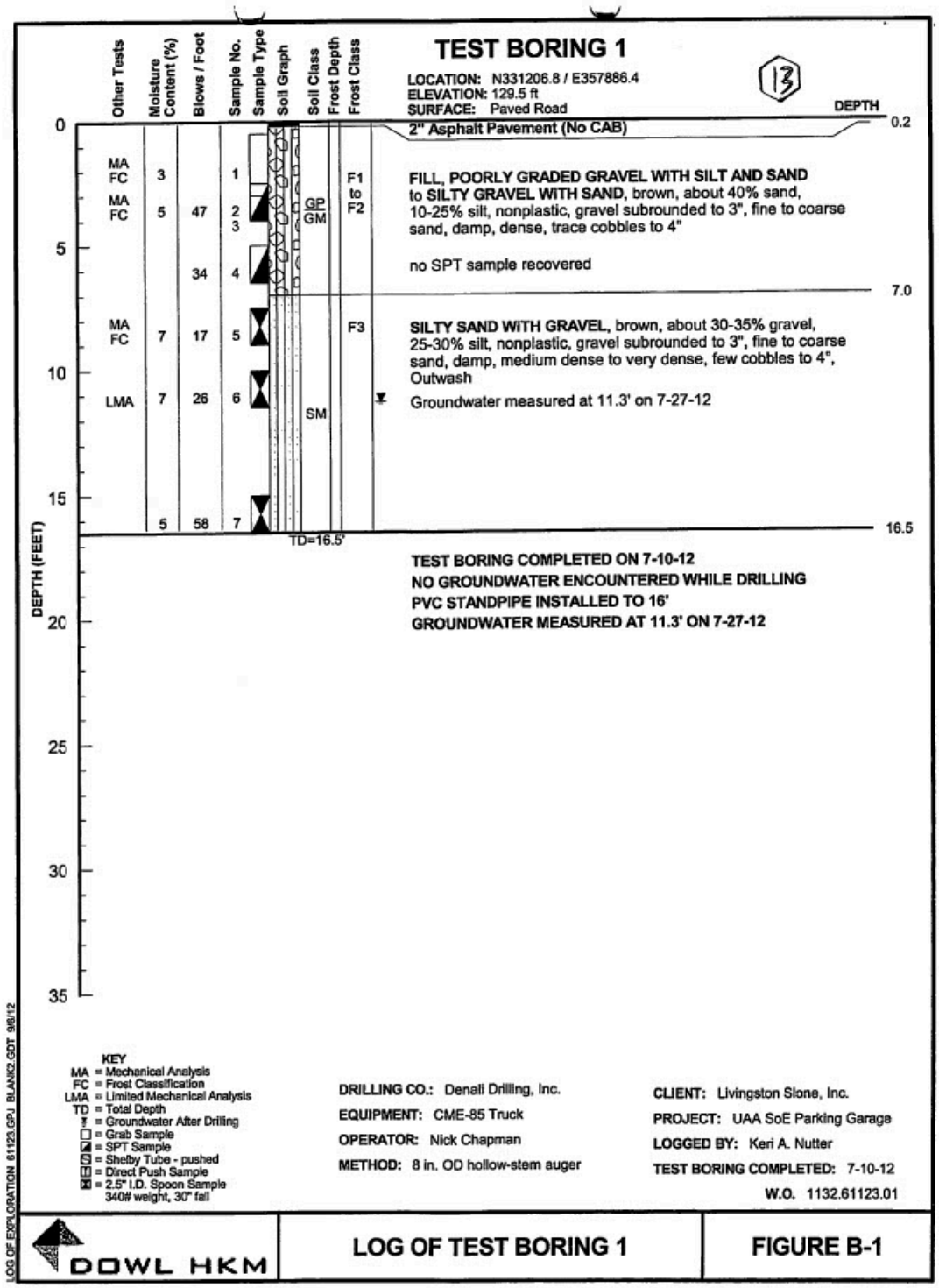


DOWL HKM

Test Boring Location Map
UAA SCHOOL of ENGINEERING
PARKING GARAGE and MALLARD LANE
Anchorage, Alaska

FIGURE A-1


TEST BORING 1
LOCATION: N331206.8 / E357886.4
ELEVATION: 129.5 ft
SURFACE: Paved Road
13
Other Tests
Moisture Content (%)
Blows / Foot
Sample No.
Sample Type
Soil Graph
Soil Class
Frost Depth
Frost Class
DEPTH
2" Asphalt Pavement (No CAB)
0.2
FILL, POORLY GRADED GRAVEL WITH SILT AND SAND to SILTY GRAVEL WITH SAND, brown, about 40% sand, 10-25% silt, nonplastic, gravel subrounded to 3", fine to coarse sand, damp, dense, trace cobbles to 4"
no SPT sample recovered
7.0
SILTY SAND WITH GRAVEL, brown, about 30-35% gravel, 25-30% silt, nonplastic, gravel subrounded to 3", fine to coarse sand, damp, medium dense to very dense, few cobbles to 4", Outwash
Groundwater measured at 11.3' on 7-27-12
16.5
TD=16.5'
TEST BORING COMPLETED ON 7-10-12
NO GROUNDWATER ENCOUNTERED WHILE DRILLING
PVC STANDPIPE INSTALLED TO 16'
GROUNDWATER MEASURED AT 11.3' ON 7-27-12
DEPTH (FEET)
KEY
MA = Mechanical Analysis
FC = Frost Classification
LMA = Limited Mechanical Analysis
TD = Total Depth
= Groundwater After Drilling
= Grab Sample
= SPT Sample
= Shelby Tube - pushed
= Direct Push Sample
= 2.5" I.D. Spoon Sample 340# weight, 30" fall
DRILLING CO.: Denali Drilling, Inc.
EQUIPMENT: CME-85 Truck
OPERATOR: Nick Chapman
METHOD: 8 in. OD hollow-stem auger
CLIENT: Livingston Slone, Inc.
PROJECT: UAA SoE Parking Garage
LOGGED BY: Keri A. Nutter
TEST BORING COMPLETED: 7-10-12
W.O. 1132.61123.01
LOG OF EXPLORATION 61123.GPJ BLANK2.GDT 9/8/12
DOWL HKM
LOG OF TEST BORING 1
FIGURE B-1

DOWL HKM

Client: Livingston Slone, Inc.
Project: UAA SoE Parking Garage & Mallard Lane
Work Order: D61123

Particle Size Distribution

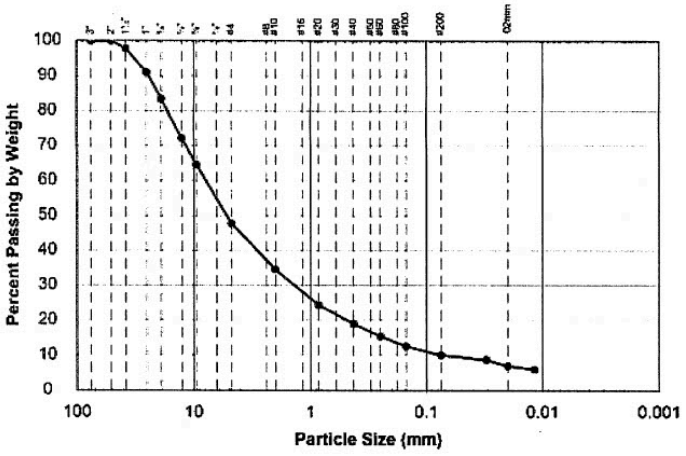
ASTM D422

Location: Test Boring 1
Sample 1
Depth 0.5'-2.5'

Lab Number	2012-1048
Received	7/12/2012
Reported	7/27/2012

Engineering Classification: Poorly Graded Gravel with Silt and Sand, GP-GM

Frost Classification: F1



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	98%	
1"	91%	
¾"	83%	
½"	72%	
⅜"	65%	
#4	48%	
Total Weight of Coarse Fraction: 24284g		
#10	35%	
#20	24%	
#40	19%	
#60	15%	
#100	13%	
#200	10.1%	
Total Weight of Fine Fraction: 468g		
0.02 mm	7%	

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DOWL HKM

Client: Livingston Slone, Inc.
Project: UAA SoE Parking Garage & Mallard Lane
Work Order: D61123

Particle Size Distribution

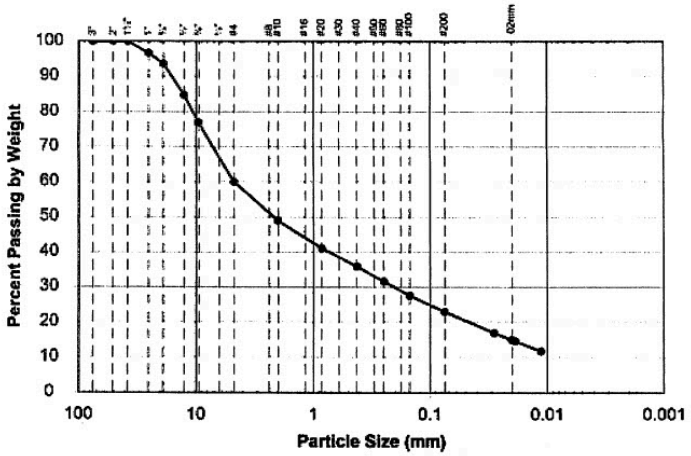
ASTM D422

Location: Test Boring 1
Sample 3
Depth 3'-4'

Lab Number	2012-1049
Received	7/12/2012
Reported	7/27/2012

Engineering Classification: Silty Gravel with Sand, GM

Frost Classification: F2



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	97%	
¾"	94%	
½"	85%	
⅜"	77%	
#4	60%	
Total Weight of Coarse Fraction: 4630.6g		
#10	49%	
#20	41%	
#40	36%	
#60	32%	
#100	28%	
#200	23%	
Total Weight of Fine Fraction: 383g		
0.02 mm	14.9%	

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DOWL HKM

Client: Livingston Slone, Inc.
Project: UAA SoE Parking Garage & Mallard Lane
Work Order: D61123

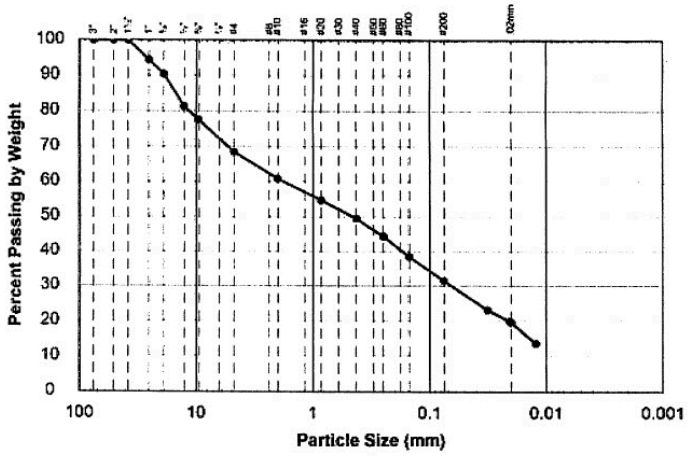
Location: Test Boring 1
Sample 5
Depth 7.5'-9'

Engineering Classification: Silty Sand with Gravel, SM
Frost Classification: F3

Particle Size Distribution

ASTM D422

Lab Number	2012-1050
Received	7/12/2012
Reported	7/27/2012



Size	Passing	Specification
3"	100%	
2"	100%	
1½"	100%	
1"	94%	
¾"	90%	
½"	81%	
⅜"	78%	
#4	68%	
Total Weight of Coarse Fraction: 1354.1g		
#10	61%	
#20	55%	
#40	49%	
#60	44%	
#100	39%	
#200	31.4%	
Total Weight of Fine Fraction: 435.1g		
0.02 mm	19.7%	

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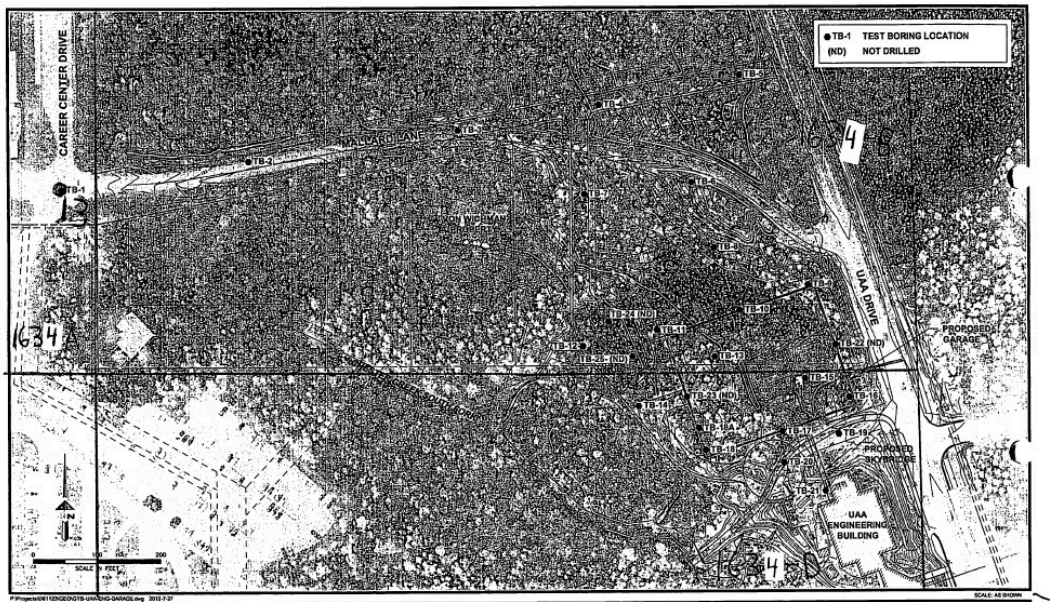
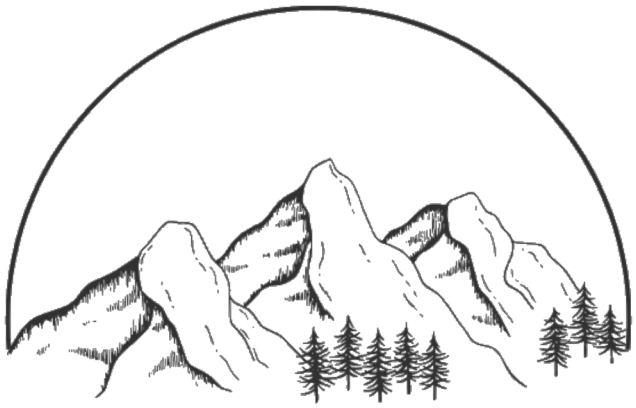


DOWL HKM

Test Boring Location Map
UAA SCHOOL of ENGINEERING
PARKING GARAGE and MALLARD LANE
Anchorage, Alaska

FIGURE A-1



Denali Consulting, LLC