Dover Community Trail, Phase IV
Engineering Study

City of Dover, New Hampshire

22 Central Avenue,
Dover, NH 03820

April 30, 2024

50 Commercial Street, Suite 2S
Manchester, NH 03101

Project No. 20170299.00

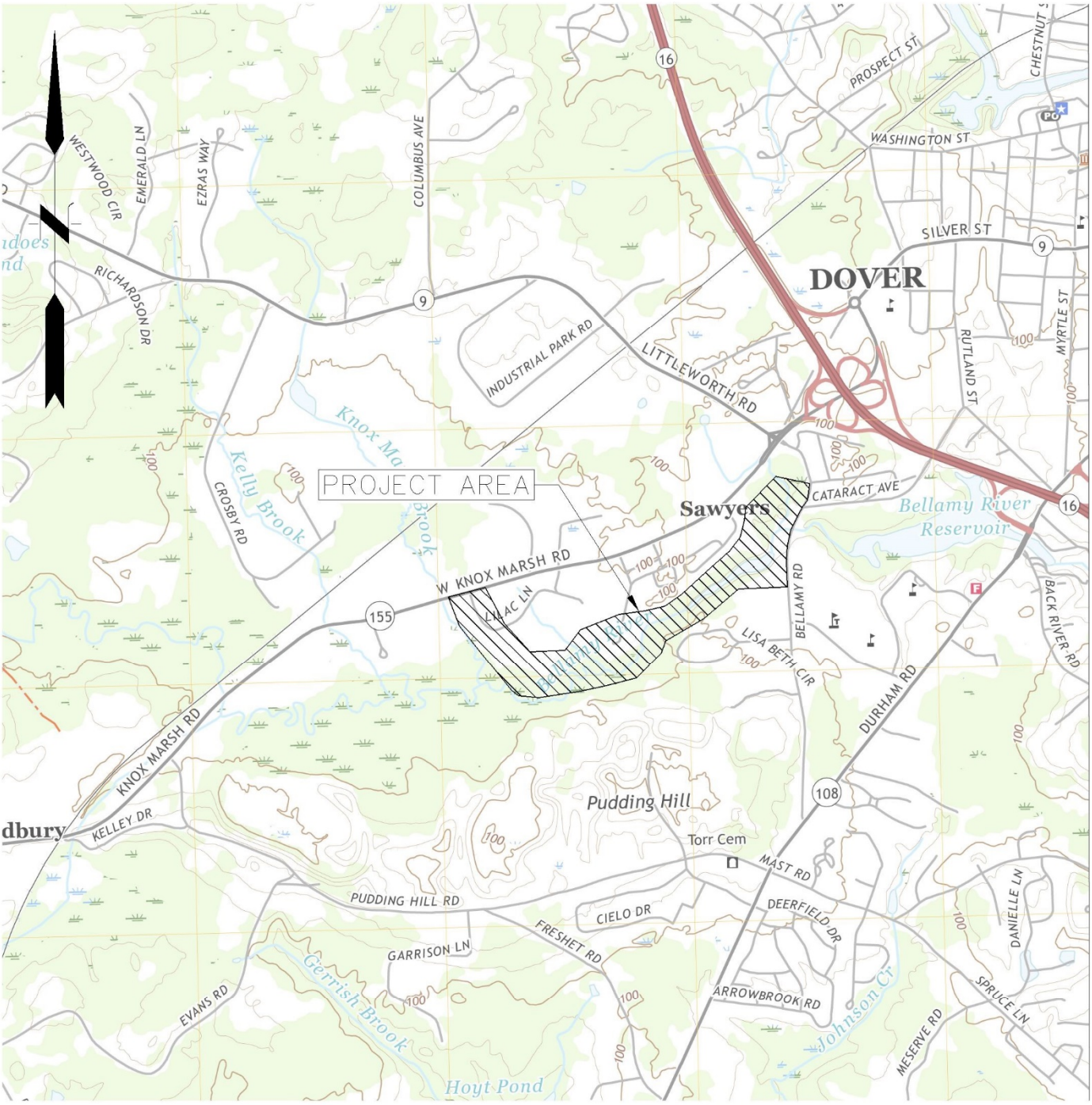
FUSS & O'NEILL

Table of Contents

Dover Community Trail, Phase IV Engineering Study
City of Dover

Table of Contents

Engineering Study
City of Dover



2,000 0 1,000 2,000 4,000

(IN FEET)

1 inch = 2,000ft.

FUSS & O'NEILL

1 Executive Summary

As The City of Dover continues to grow, effort is being made by community members, local committees, and City staff to make multiple modes of transportation within the City available and easily accessible by the widest cross-section of the population possible. The Community Trail network is both recreational and a means of connecting people within Dover to the places they want to go via an active transportation corridor.

This project comprises Phase IV of the Dover Community Trail. The City's vision for this trail is "a community trail utilized for exercise and enjoyment, which will also promote "green" transportation by providing an attractive option for those traveling in the City of Dover." Phase IV of this trail extends from Knox Marsh Road (NH 155) down Lilac Lane and then transitions to a compacted gravel trail as it winds around forested wetlands on private properties and continues through Bellamy Park until the trail outlets on Bellamy Road across from Dover High School. Currently this section of the Dover Community Trail will not connect to existing sections of the trail but will connect to planned future phases of the trail.

This project is funded through a Transportation Alternatives Program (TAP) grant and managed by City of Dover staff and overseen by the New Hampshire Department of Transportation's (NHDOT) Local Public Agency program.

2 Purpose and Need Statement

The purpose of the project is to construct a trail linking NH 155 through Bellamy Park to near Dover High School. The trail will fulfill the need to provide a safe, delineated, and accessible route for:

- Bicyclists and pedestrians to travel between NH 155 and Bellamy Road, with direct access to recreation at Bellamy Park;
- Students to travel from residential neighborhoods to Dover High School;
- Future connectivity to other segments of the Dover Community Trail.

3 Existing Conditions

The existing site of the project consists of three area types: developed multi-family residential, forested river corridor, and public park. The trailhead is proposed to start on NH 155 at the intersection with Lilac Lane. Lilac Lane is a 24-foot-wide private roadway with a 5-foot paved sidewalk adjacent to curb on the south side of the roadway. The sidewalk on Lilac Lane connects to the sidewalk on the south side of Knox Marsh Road. Several businesses and a residential development called Lilac Garden have frontage on Lilac Lane. To the west of the Lilac Garden property is a cleared easement for electric transmission lines owned and maintained by Eversource and further west of that is Bellamy Knox Self Storage. Knox Marsh Brook and a large low-lying wetland system are located to the south of Lilac Garden. To the east of the Lilac Garden properties is the Huntington Exchange properties, which is another multi-family residential development previously called the White Cliffs of Dover. The existing trails connect directly to the parking lot at the east end of Karolina Drive on the Huntington Exchange property.

Bellamy Park abuts the Huntington Exchange property to the east and includes programmed spaces such as a forested public park with existing walking trails, a disc golf course, parking lots, and a large athletic field. The disc golf course consumes most of the space on the north side of the Bellamy River from the Huntington Exchange property line to NH 155. The Bellamy River bisects the park and has a bridge from the north parking lot to the golf course which is currently not ADA accessible due to multiple steps and steep incline on the north side of the river. The disc golf course is very active and pedestrians must be mindful of flying discs when walking near the course. The disc golf course also has a supply store on site with a small parking lot and access road in from NH 155 and Bellamy Road. The southern bank of the Bellamy River, to the northwest of the athletic fields on the Bellamy Park parcel, is an alternative location for the proposed trail. This area is forested with minimal understory, similar to the disc golf course terrain. There are portions of existing trails, which consist of compacted native material with 5-to-6-foot widths with many protruding roots, but minimal brush and understory. This side of the river is much more consistent in grade and is at a higher elevation than the north bank. The existing trails end at the large parking lot for Bellamy Park and the adjacent athletic fields. Along Bellamy Road between the parking lot and the crosswalk to Dover High School there is an existing concrete sidewalk that is set back from the edge of the road with a grassed buffer.

4 Local Concerns Meeting

Fuss & O'Neill held a Local Concerns Meeting at the Dover Planning Board meeting on June 27, 2023 to solicit feedback from the public and Planning Board. At the meeting Fuss & O'Neill presented two trail alignment options through Bellamy Park; the first alignment through the disc golf course in Bellamy Park and then a second alignment along the southern bank of the Bellamy River with a bridge crossing.

The comments received from the Planning Board and public included:

i. The City prefers use of steel or concrete for the bridge structure. The City has had issues with wooden bridges in the past.
ii. Concern was expressed about the trail ending at NH 155 with no immediate plans to connect to other off-road facilities for bicycles.
iii. There was support for inclusion of a parking area at the NH 155/Lilac Lane end of the trail.
iv. Both the Planning Board and public agreed that it would be preferred to avoid the disc golf course and office for trail alignment.

5 Design Criteria (Trail)

The design criteria for the trail is based mainly on the *Guide for the Development of Bicycle Facilities*, 4th ed. (2012) by AASHTO (GBF) and the US Access Board's Outdoor Developed Areas (2014) (ODA).

Criteria	Standard	Proposed Design	Reference
Design Speed (mph)	12-30	16	AASHTO GBF-4, p. 5-12 & 5-13
Trail Width	10' -14'	10'	AASHTO GBF-4, p. 5-3
Shoulder Width	2' - 5'	2'	AASHTO GBF-4, p. 5-5
Min Vertical Clearance	8'-10'	10'	AASHTO GBF-4, p. 5-6
Cross Slope	≤5%	4%	US Access Board ODA, p. 26

Criteria	Standard	Proposed Design	Reference
Shoulder Slope*	6:1	6:1	AASHTO GBF-4, p. 5-5
R_{min} (ft)	47	47	AASHTO GBF-4, p. 5-14
Min Stopping Sight Distance (SSD) Ascend	100	100	AASHTO GBF-4, p. 5-18
Min Stopping Sight Distance (SSD) Descend	135	135	AASHTO GBF-4, p. 5-19
Max Grade	5%	5%	US Access Board ODA, p. 24
Min Length of Crest Curve			AASHTO GBF-4, p. 5-21
Horizontal Clearance	2'	2'	AASHTO GBF-4, p. 5-5
Max Recoverable Slope	6:1	6:1	AASHTO GBF-4, p. 5-5

Other design references include:

- NHDOT Highway Design Manual
- NHDOT Standard Specifications for Road and Bridge Construction, 2016
- Public Right-of-Way Accessibility Guidelines (PROWAG), 2023
- Roadside Design Guide, AASHTO 2011

6 Alternatives Analysis/Proposed Layout

Two trail alternatives were considered to satisfy the purpose and need for this project. The two alternatives have similar alignments from Lilac Lane at NH 155, through the Eversource easement area and private properties to the edge of the Bellamy Park property. The plans showing the alignment of each alternatives is provide in Appendix A. An Engineer's Opinion of Construction Costs for each alternative is provided in Appendix B and summarized in Section 13 below.

6.1 Alternative 1

Alternative 1 begins at the intersection of Lilac Lane and NH 155 and would route trail users along the existing 5-foot-wide bituminous sidewalk on the south side of Lilac Lane. Bicycle users would be directed to utilize Lilac Lane with shared use lane markings (sharrows).

At the first curve in Lilac Lane, the trail would leave the road and enter the Eversource electric transmission easement, where the trail will continue as a compacted gravel off-road trail that travels southeast within the power easement area and parallel to the Lilac Garden Apartment development. The off-road portion of the trail will be a 10-foot-wide compacted gravel trail with a typical 4% cross slope and 5% maximum longitudinal slope. The trail will also be constructed mostly in fill materials to avoid excavating native soils that may be culturally sensitive, wherever possible.

The proposed trail will stay close to the edge of development for the Lilac Garden Apartments and Huntington Exchange Apartments to minimize impacts to the wetlands and the volume of cut and full required to construct the trail. A wooded or grassed buffer will be maintained between the edge of pavement within each apartment development and the trail shoulder. Alternative 1 has direct impacts to the wetlands between building clusters within the Lilac Garden Apartment development.

The trail will continue northeast and crosses an unnamed perennial stream with a defined channel. A precast, concrete box culvert is proposed at this crossing location to provide adequate bankfull width, and other criteria associated with a new stream crossing over a tier 1 stream from the Env-Wt 900 Stream Crossings regulations. All proposed stream crossings would meet the required local and state design standards. After the stream crossing at the perennial stream, the trail will turn southeast to stay within the wooded area located to the south of the Lilac Garden Apartments. Another intermittent stream is located within the wooded buffer between the Lilac Garden Apartments to the west and Huntington Exchange Apartments to the east. The trail will cross this intermittent stream utilizing another precast, concrete box culvert to convey flow from the intermittent stream under the trail.

The trail will continue southeast and then east along the edge of the Huntington Exchange's parking lots maintaining a buffer between the trail shoulder and the edge of pavement. Alternative 1 provides a larger buffer between the trail and parking lot, but results in direct wetland impacts at this location. Before reaching the most easterly buildings nearest the river within the Huntington Exchange development, the trail turns to extend parallel to the Bellamy River and maintains a minimum 75-foot wooded buffer to the river.

The disc golf course utilizes much of the Bellamy Park parcel on the north side of the river where Alternative 1 is proposed along the Bellamy River's northern bank. The trail would curve around natural features such as knolls and around the tee off disc golf platforms to develop a gradual trail meeting ADA criteria. Once the proposed trail reaches the clearing limit within Bellamy Park it would turn north and navigate around a disc golf store within the park called Breaking Chains Disc Golf Supplies. The trail would then route around the edge the store's parking lot and follow the existing gravel access road north. The trail then curves east and follow an existing secondary entrance to the store from Bellamy Road. The trail would end at a crosswalk at the intersection of Bellamy Road and Cataract Avenue. There is an existing bituminous sidewalk with granite curb along the east side of Bellamy Road, which would allow pedestrians to walk to the Dover High School, while bicyclists would need to share travel lanes with vehicles between the end of the trail and the high school because Bellamy Road does not have sufficiently wide shoulders for bicycle use. The total off-road length of Alignment 1 is approximately 1.12 miles.

6.2 Alternative 2

Alternative 2 also begins at the intersection of NH 155 and Lilac Lane. Pedestrian trail users would travel on the existing 5-foot-wide bituminous sidewalk on the south side of Lilac Lane. Bicycle users would be directed to utilize Lilac Lane with shared use lane markings (sharrows).

At the first curve in Lilac Lane, the trail would leave the road and enter the Eversource electric transmission easement, where the trail will continue as a compacted gravel off-road trail that travels southeast within the power easement area and parallel to the Lilac Garden Apartment development. The off-road portion of the trail will be a 10-foot-wide compacted gravel trail with a typical 4% cross slope and 5% maximum longitudinal slope. The trail will also be constructed mostly in fill materials to avoid excavating native soils that may be culturally sensitive, wherever possible.

Alternative 2 includes construction of a small paved parking lot for seven vehicles, which includes one ADA accessible space. The parking lot would be buffered from the trail and connected with a gravel path. Small amenities such as benches, bike rack, trail head kiosk, and a bike repair station may be provided at this parking lot to support trail users. An access driveway to the parking lot would be provided from Lilac Lane and the parking lot would be located within the Eversource electric transmission easement, but avoids any impacts to the poles and guy wires.

The proposed trail will stay close to the edge of development for the Lilac Garden Apartments and Huntington Exchange Apartments to minimize impacts to the wetlands and the volume of cut and full required to construct the trail. A wooded or grassed buffer will be maintained between the edge of pavement within each apartment development and the trail shoulder. Alternative 2 avoids wetland impacts and will cross an existing berm between a detention basin and the wetland system. The berm will be modified to accommodate the trail width, shoulders, and safety railing. A pipe extension to the existing outfall pipe from the detention basin may be required and surveyed topographic data would be needed to make that determination.

The trail would continue northeast and crosses an unnamed perennial stream with a defined channel. A precast concrete box culvert is proposed at this crossing location to provide adequate bankfull width, and other criteria associated with a new stream crossing over a tier 1 stream from the Env-Wt 900 Stream Crossings regulations. All proposed stream crossings will meet the required local and state design standards. After the stream crossing at the perennial stream, the trail will turn southeast to stay within the wooded area located to the south of the Lilac Garden Apartments. Another intermittent stream is located within the wooded buffer between the Lilac Garden Apartment to the west and Huntington Exchange Apartments to the east. The trail will cross this intermittent stream utilizing another precast concrete box culvert to convey flow from the intermittent stream under the trail.

The trail will continue southeast and then east along the edge of the Huntington Exchange's parking lots maintaining a buffer between the trail shoulder and the edge of pavement. Alternative 2 proposes to use tall curb to reduce grading impacts to the Huntington Exchange Apartment's parking lot because it is located closer to the development to minimize wetland impacts. Landscape screening is proposed for Alternative 2 where an existing wooded buffer cannot be maintained. Before reaching the most easterly buildings nearest the river within the Huntington Exchange development, the trail turns to run parallel to the Bellamy River and maintains a minimum 75-foot wooded buffer.

Alternative 2 would cross the Bellamy Park property line and swing to the northeast to start the approach to the proposed pedestrian bridge across the Bellamy River. The proposed pedestrian bridge will span approximately 105 feet in the southeasterly direction to convey trail users to the southern bank and away from the existing disc golf course. More information regarding the proposed pedestrian bridge is included in Section 7 below and in the Type, Span and Location (TSL) Study Report, prepared by Fuss & O'Neill dated October 26, 2023.

When the trail reaches the southern bank of the Bellamy River, it would turn east and continue parallel to the river until reaching the large parking lot for Bellamy Park and the athletic fields. The trail would maintain a landscape buffer between the trail shoulder and the edge of pavement for snow storage and the fence would be relocated to the southern side of the trail. The trail would curve at the existing fields northeast corner to run parallel to Bellamy Road and the trail would end at the existing crosswalk across

Bellamy Road to Dover High School. The total off-road length of Alternative 2 is approximately 1.04 miles including the pedestrian bridge.

6.3 No Build Alternative

This alternative includes no improvements to construct Phase IV of the community trail extension. While this alternative has no cost or impacts, it does not meet any part of the Purpose and Need for the project. In addition, not constructing this phase of the community trail will prevent the next step in the realization of a fully integrated trail system connecting Dover to other regional and state-wide trails. If constructed, this project would improve community connections and prime the City for even greater accessibility, recreation and commerce in the future. The No-Build Alternative denies the City that opportunity.

7 Hydrologic/Hydraulic Studies

Alternative 2 proposes to construct a pedestrian bridge across the Bellamy River on the Bellamy Park property. The bridge would be sited at the top of the channel banks in order to avoid any hydraulic impacts. Based on information from the City of Dover, the proposed pedestrian bridge will be significantly higher than known flood elevations, therefore no hydrologic/hydraulic analyses will be needed for this crossing. As mentioned above in the trail overview, both alternatives are aligned from the trailhead at NH 155 to the Bellamy Park property. There are two crossings that require box culverts that are included in both alternatives. Based on USGS StreamStats, both the intermittent and perennial stream crossings would be categorized as tier 1 stream crossing because the contributing drainage areas are less than 200 acres. Both box culvert crossings will be designed in accordance with Env-Wt 900 Stream Crossings regulations. During the preliminary design phase a more detailed hydrologic and hydraulic assessment of these two crossings will be required to permit the design with the state.

Both alternatives would exceed 100,000 square feet of disturbance, which would require a New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AoT) permit. The project will also be required to follow the City's Stormwater and MS4 Permit requirements for treating and conveying runoff generated from the trail. Compacted gravel is considered an impervious cover by the City of Dover per their Site Plan Regulations. Dover's Site Plan Regulations require peak runoff rates from the post-development condition to not exceed pre-development conditions up to the 50-year, 24-hours storm event and to treat runoff from impervious surfaces for 80% removal of total suspended solid (TSS) and 50% of total nitrogen and total phosphorous. Stormwater management BMPs will be sited on the upland side of the trail to mitigate upland runoff from washing over the trail and to capture and treat runoff generated from the trail. Proposed BMPs for stormwater treatment and pretreatment will include linear infiltration and filtration practices such as infiltration trenches, linear bioretention swales, vegetated buffers, and filter strips. Conveyance pipes, which will be designed to safely convey the 10-year, 24-hour storm event per Dover Site Plan Regulations, will be installed along the trail to discharge upland runoff and treated runoff from the proposed BMPs. There are ten conveyances pipes shown on the Alternative 2 plans, which were located at locations of known concentrated flow area based on the available topography. These pipes have not been hydraulically assessed at this stage of development, but are assumed to be 18-inch or 24-inch pipes. The disturbance impacts associated with constructing the proposed BMPs are not shown on the concept plans and will be incorporated in the next design phase.

8 Environmental and Cultural Review Documentation

The project was reviewed for potential natural resource impacts. The proposed work largely takes place within undeveloped areas of a public park and private property, including a river crossing. It is anticipated that some impacts to wetlands will be unavoidable and that a New Hampshire Department of Environmental Services (NHDES) Wetlands Permit will be necessary. In addition, a Shoreland Permit will also be required for the Bellamy River crossing.

Fuss & O'Neill reached out to multiple environmental and cultural stakeholders and agencies in July 2023 to solicit information about the project area and alert them to the preliminary project plan, which includes the following:

- City of Dover: Mayor, Planning Board, City Engineer, City Manager, Community Services Director, Conservation Commission, Fire Department, Heritage Commission, Recreation Division, Police Department
- NHDOT Bureau of Environment, Wetlands Program
- NHDOT Bureau of Environment, Plants & Wildlife Program
- NHDOT Bureau of Environment, Cultural Resource Program
- New Hampshire Department of Environmental Services, Environmental Justice
- NH Office of Strategic Initiatives, Floodplain Management Program
- NH Office of Strategic Initiatives, Conservation Land Stewardship Program
- NH Natural Heritage Bureau
- NH Fish & Game
- NH Department of Historical Resources
- NH Department of Environmental Services
- Federal Highway Administration, NH Division
- Land & Community Heritage Investment Program
- NH Department of Resources and Economic Development, Land & Water Conservation Fund

The questions within the 22 letters sent out varied based on the purview of the recipients. Five written responses were received from the environmental and cultural stakeholders and agencies and a virtual meeting on August 22, 2023 was held with the City of Dover's Planning Department, to go over their high-level project concerns. Appendix C contains a table with the summary of responses we received from environmental and cultural stakeholders and agencies.

Beyond performing a desktop analysis of the site and reviewing feedback from stakeholders and agencies, a Phase 1A archeological assessment was performed by Independent Archeological Consulting, LLC (IAC) and a project wetland delineation by Gove Environmental Services, Inc. (Gove) were conducted. The Phase 1A Archeological Sensitivity Assessment is provided in Appendix D. The wetland delineation was surveyed and the wetland flag locations are displayed on the Concept Plans provided in Appendix A.

9 Structural Studies and Recommendations

A 105-foot pedestrian bridge spanning the Bellamy River is included in Alternative 2. Fuss & O'Neill prepared as Type, Span, & Location (TSL) Study Report, provided in Appendix E. The Study Report was submitted to the City of Dover and NHDOT on October 26, 2023 for review. The Executive Summary from the TSL Study Report is provided here:

Executive Summary

- The bridge will connect the proposed Dover Community Trail, Phase IV across the Bellamy River.
- A prefabricated steel through truss with a wood deck is recommended.
- Concrete abutments bearing on structural fill or bedrock is recommended.

Refer to the TSL Study for more information on the superstructure alternatives considered, geotechnical findings, abutment type, constructability concerns, and preliminary opinion of cost. The TSL Study also has plan view, elevation view, and details of the proposed bridge.

10 Right-of-Way and Property Impacts

Both trail alternatives impact the same six properties between NH 155 and Bellamy Road. The City owns the Bellamy Park parcel and is responsible for the Bellamy Road right-of-way, which will be impacted during the construction of either trail alternative. The five privately owned parcels include four properties (Map H0041, Lot P, Map H0041, Lot Q, Map H0041, Lot T, and Map H0041, Lot S) within the Huntington Exchange Development and one property Map H0035, Lot D that contains the Lilac Garden Apartments. The Lilac Garden Apartments have an existing easement with Eversource which will also be impacted during construction of the trail.

As mentioned above, the proposed trail will provide additional amenity space to the residents at these apartment complexes and the property owners are aware and in favor of developing this section of the Dover Community Trail. Temporary and permanent easements for each parcel will be coordinated through the City with each property owner during final design of the project. Approximate impacts to each property are provided as slope lines, or extents of disturbance, on the Alternative 2 concept plan and would be similar for Alternative 1. The permanent easement areas on the private properties would include the trail, shoulder, physical barriers like fencing, screening elements including landscaping, proposed stormwater BMPs, box culverts, and conveyance pipes. The pedestrian bridge and temporary impacts associated with constructing the bridge are anticipated to be contained on the Bellamy Park property, besides some temporary impacts and access from a parcel within the Huntington Exchange development identified as Map H0041, Lot P.

11 Utilities

The Eversource easement runs north-south through the Lilac Garden Apartments parcel. The trail alignments avoid impacts to the utility poles. The partial site survey identified a drainage pipe south of the Huntington Exchange Apartments, which is unimpacted from the development of either alternative. There are no other known utilities that would be impacted for the off-road portions of the proposed

trail mainly because the trail will be constructed in fill to avoid impacting the native soils with potentially culturally sensitive artifacts.

If Alternative 2 is selected, the trail will impact a catch basin along the sidewalk on Bellamy Road, which will be removed or relocated. There is an existing utility pole with multiple guy wires located where the trail will turn to follow Bellamy Road. The trail layout is intended to avoid impacts to this pole. No other utilities along Bellamy Road are anticipated to be impacted by either alternative.

12 Wetland Impacts

Both alternatives have wetland and shoreland impacts associated with their development. These impacts will include the construction of the rail trail, clearing of brush and trees, and installation of drainage features. The bridge construction will likely have shoreland impacts, but no direct wetland impacts. The wetland impacts are more significant for Alternative 1 near the unnamed intermittent stream and unnamed perennial stream than Alternative 2's alignment. For either alternative, a New Hampshire Department of Environmental Services (NHDES) Wetlands Permit and Shoreland Permit will be required for this work.

13 Engineer's Opinion of Construction Cost

An opinion of construction costs was calculated for each alternative:

Alternative 1: $1,991,200.00

Alternative 2: $2,512,125.00

No Build Alternative: $0

The estimates are based on NHDOT average unit prices and bid prices from recently completed projects. The full preliminary opinion of construction cost estimate for each alternative is provided in Appendix B.

14 Public Presentation

Through the continued support of the community, correspondence with the City, and input from the Local Concerns Public Meeting, the City Planning staff will provide confirmation of their preferred project alternative.

A Preferred Alternative Meeting will be scheduled with the City to present the proposed project alternative to the Planning Board members and public. Feedback from this meeting will be the deciding criteria for how to move the project forward, as well as securing funding.

If funding is secured, this project will continue into the preliminary design phase through the NHDOT LPA program. The project schedule will be determined by the City for design and permitting,

advertisement for bid, and construction based on funding. The bridge would be a long lead time item that would impact the schedule, if Alternative 2 is selected as the preferred alignment.

15 Recommendations

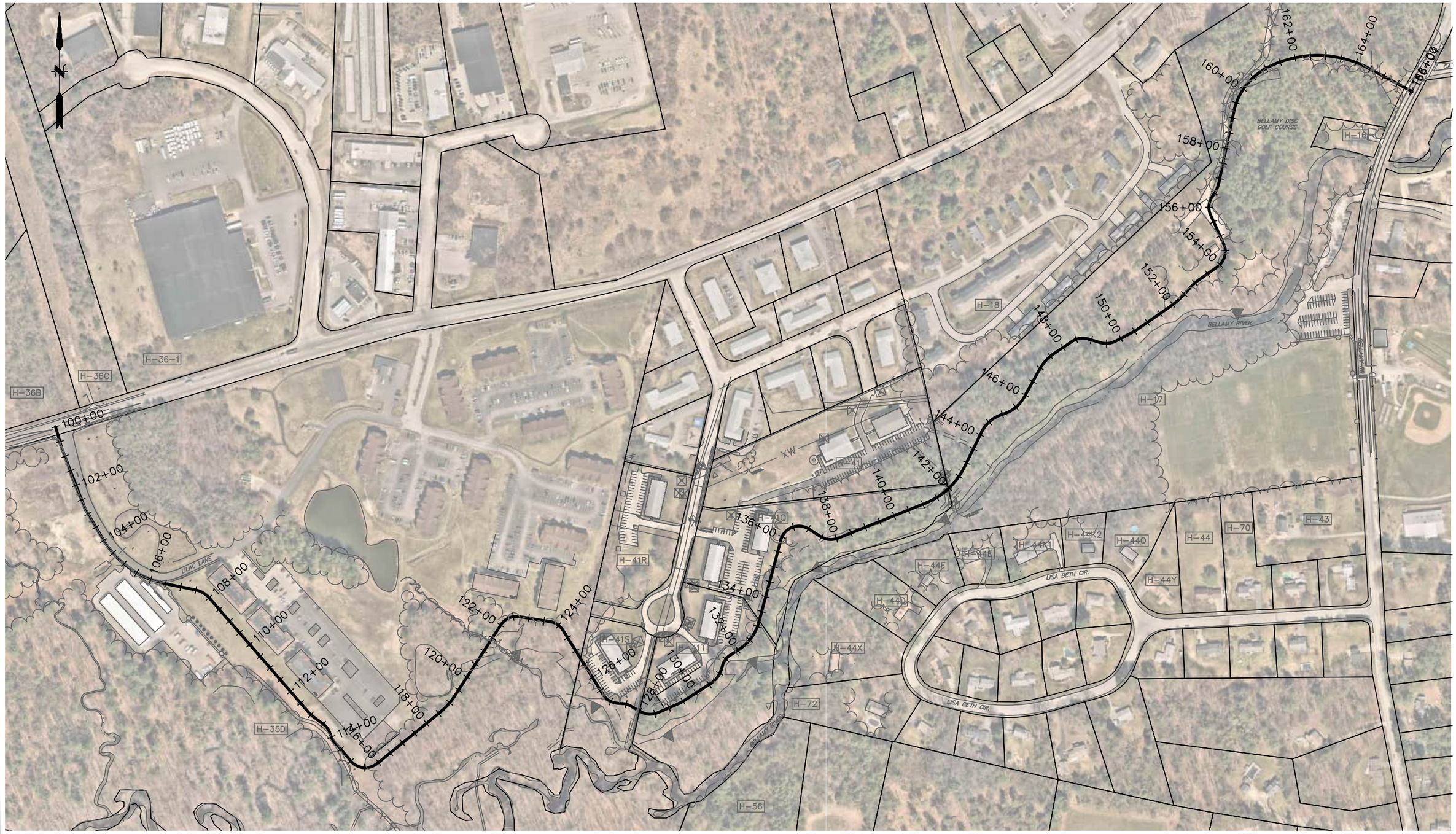
Alternative 1 follows the original concept of the trail, which winds through Bellamy Park, including where the disc golf course is located. Alternative 2 was later identified to address concerns related to the disc golf course conflict with Alternative 1 and provide better access to an underutilized section of Bellamy Park on the south side of the river.

Fuss & O'Neill has assessed multiple factors for developing the trail to recommend the best route for the City of Dover to pursue which include capital construction costs, long term operations and maintenance costs, environmental impacts, environmental permitting requirements, constructability, and trail user safety. More clearing would be required for Alternative 2 to transport and install the proposed pedestrian bridge. The existing footpaths through the woods on the southern side of the Bellamy River are less defined than the well-traveled paths through the disc golf course on the northern bank. There is also a greater concern about maintaining a buffer between the single-family residences on Lisa Beth Circle on the southern bank rather than buffer the trail from multi-unit apartments on the northern bank. The trail would be highlighted as an amenity to the multiple apartment complexes it passes by and provides more open recreational space to those residential communities. Both alternative's plans show path connections to the community trail from abutting residential developments. Landscape screening is proposed for Alternative 2 where the trail is clearing an existing wooded area adjacent to the apartment complexes' parking lots. The overriding concern with Alternative 1 is the safety of trail users when navigating through the disc golf course area, with a notable but less significant concern for the safety of bicyclists on Bellamy Road. There are minimal ways to improve safety of trail users from flying discs without creating physical barriers that would cut off their connection with the natural environment around them. Providing a safer and more remote trail along the southern bank of the Bellamy River would allow users a new perspective of the river and maximize the use of the forested park parcel.

Based on safety for trail users, Fuss & O'Neill recommends Alternative 2 be selected as the preferred alternatives for Phase IV of the Dover Community Trail. The disc golf course poses a significant risk for trail users safety and avoiding the course by routing riders and pedestrians along the southern bank of the Bellamy River provides access to an underutilized section of the park.

Appendix A

Conceptual Plans



File Path: J:\DWG\P20170299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CR-100 Plotted: Mon, April 29, 2024 - 12:57 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 ☆ TOWN SETTLED 1623 ☆

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 300'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88

300 150 0 300
GRAPHIC SCALE

CITY OF DOVER

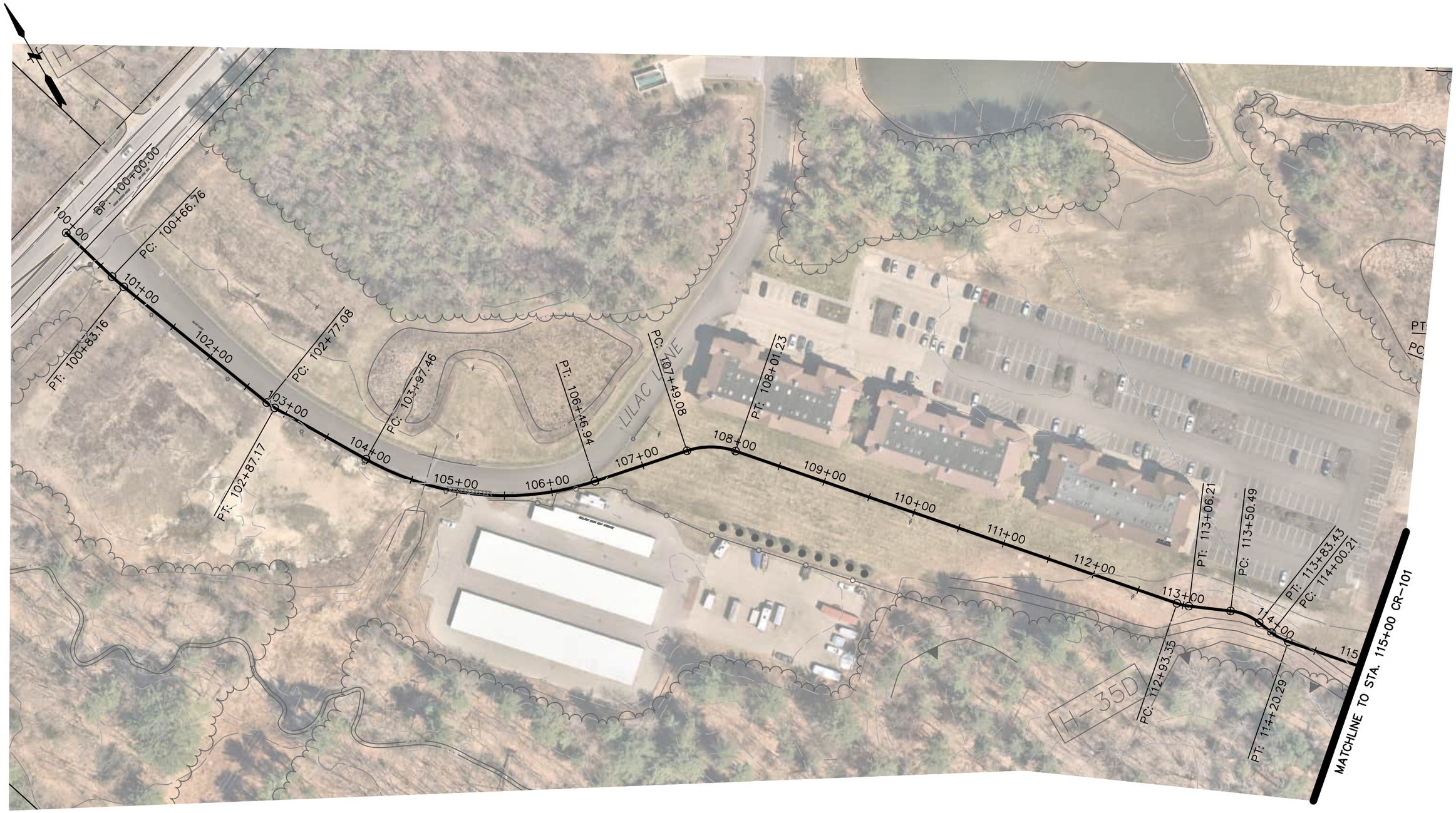
ALIGNMENT ALTERNATIVE 1 OVERVIEW PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-100



File Path: J:\DWG\P20170299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CR-101 Plotted: Mon, April 29, 2024 - 12:57 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ----
LAYER STATE:
MS VIEW:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 — TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

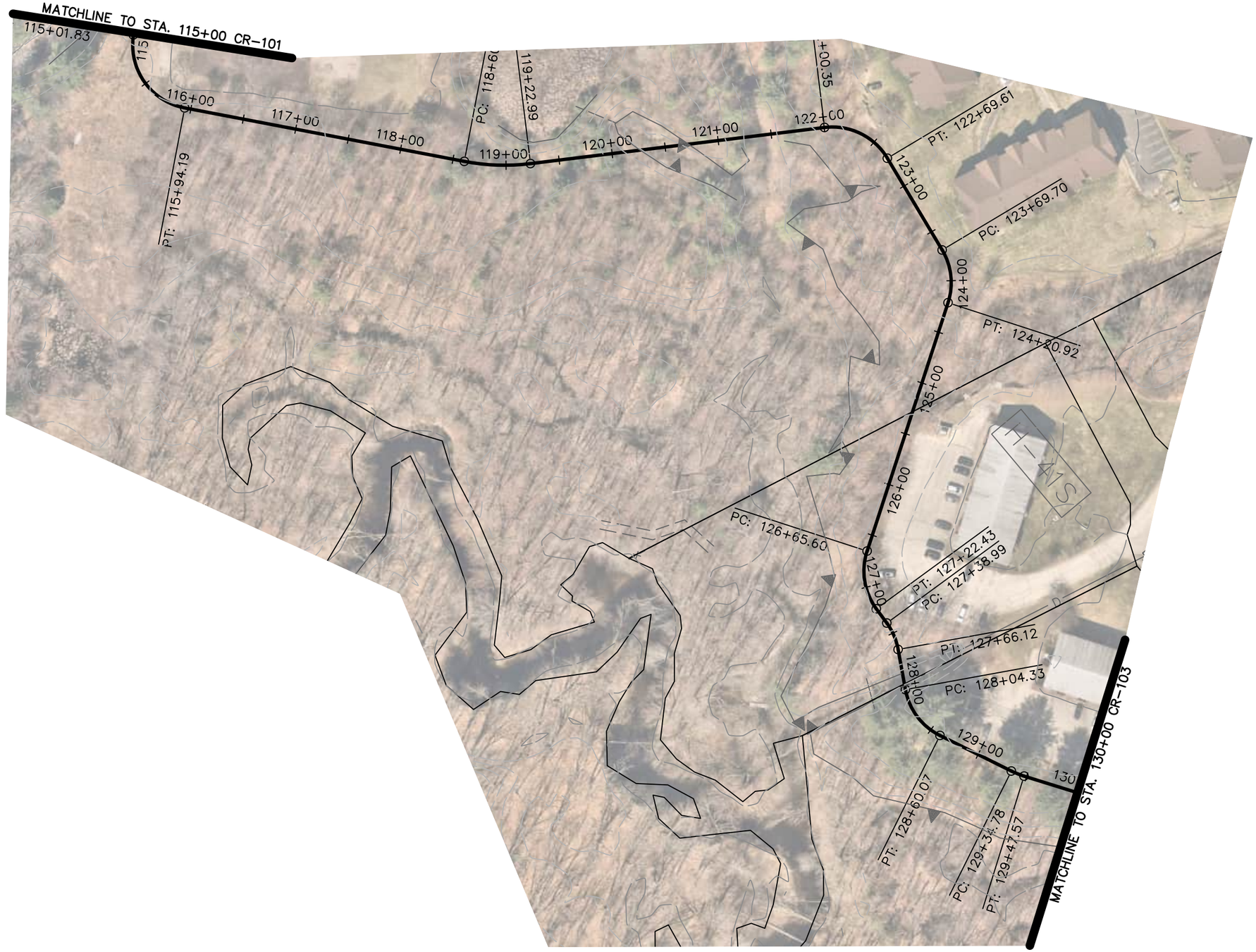
ALIGNMENT ALTERNATIVE 1 GENERAL PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-101



File Path: J:\DWG\P20170299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CR-102 Plotted: Mon, April 29, 2024 - 12:57 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ----
MS VIEW: LAYER STATE:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 1 GENERAL PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-102

File Path: J:\DWG\P2017\0299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CR-103 Plotted: Mon, April 29, 2024 - 12:57 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ----
LAYER STATE:
MS VIEW:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 A TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

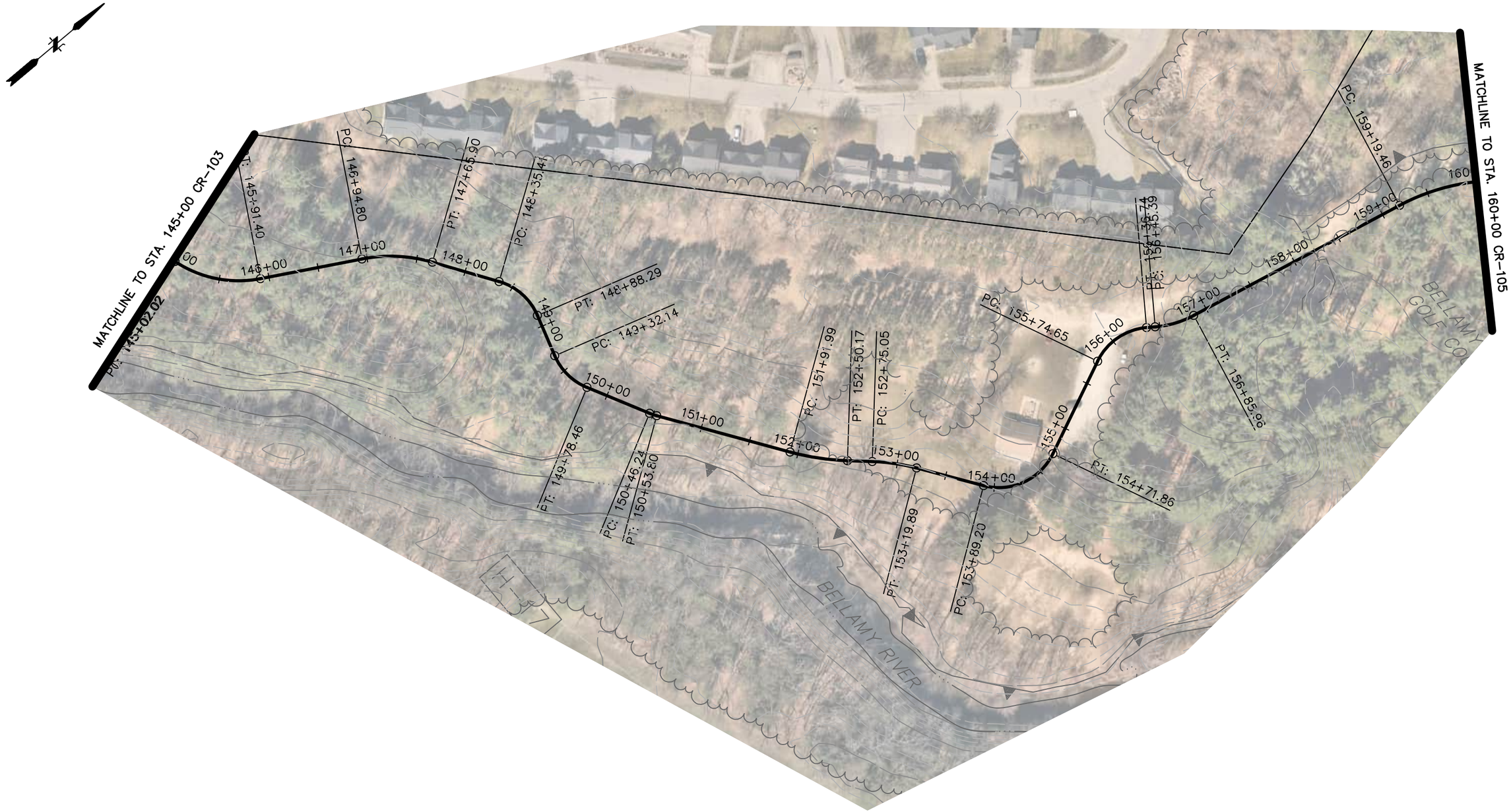
ALIGNMENT ALTERNATIVE 1
GENERAL PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-103



File Path: J:\DWG\P2017\0299\000\Civil\Plan\working\20170299_Alignment01_2009l4.dwg Layout: CR-104 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

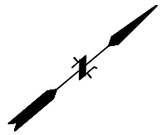
ALIGNMENT ALTERNATIVE 1 GENERAL PLAN

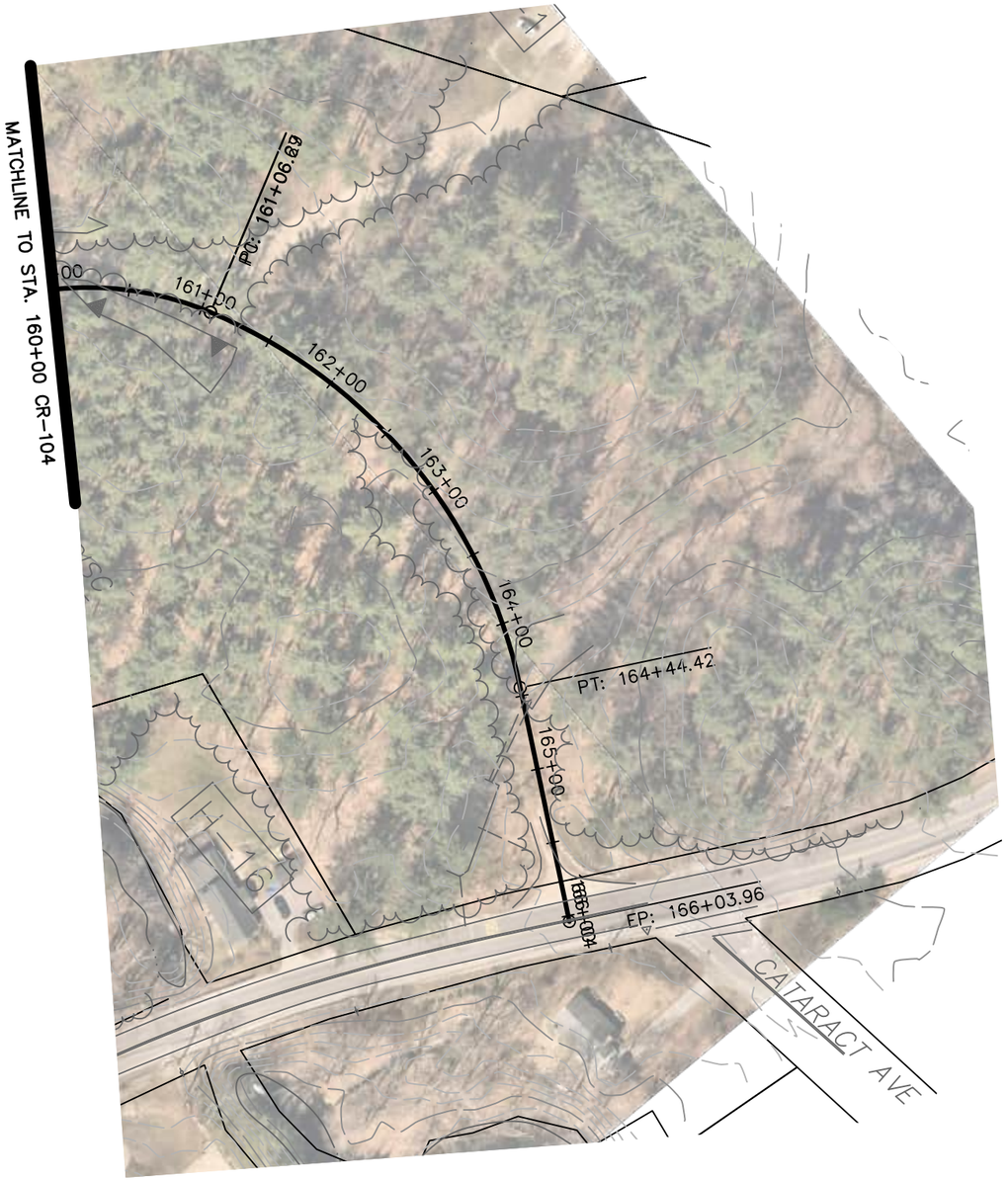
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-104





File Path: J:\DWG\P2017\0299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CR-105 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

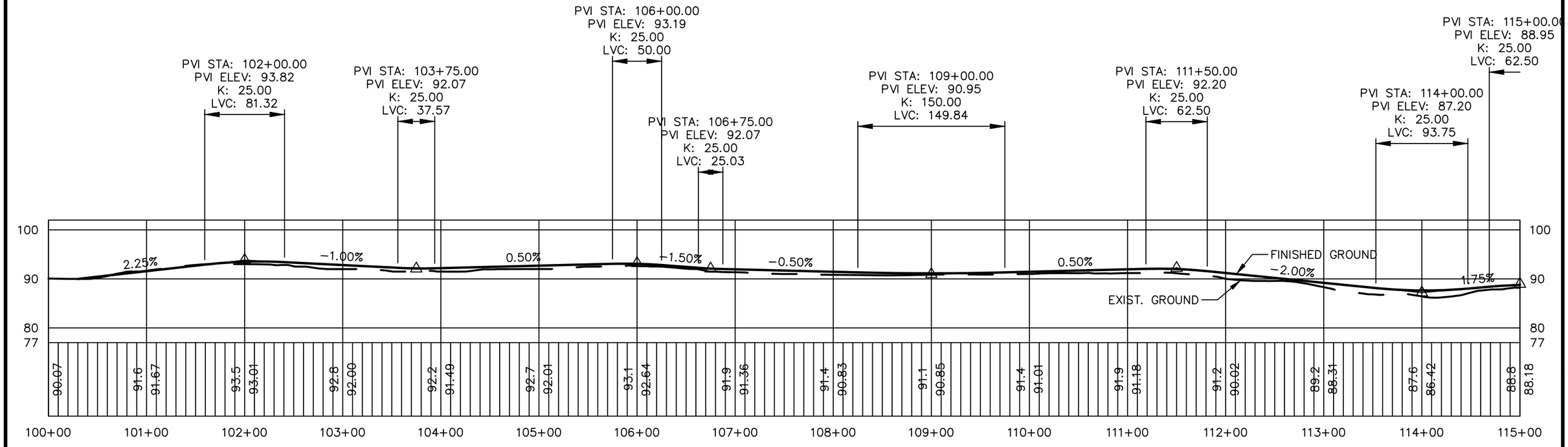
ALIGNMENT ALTERNATIVE 1 GENERAL PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-105



PROFILE STA 100+00 – 115+00
SCALE: H: 1"=100'
V: 1"=20'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

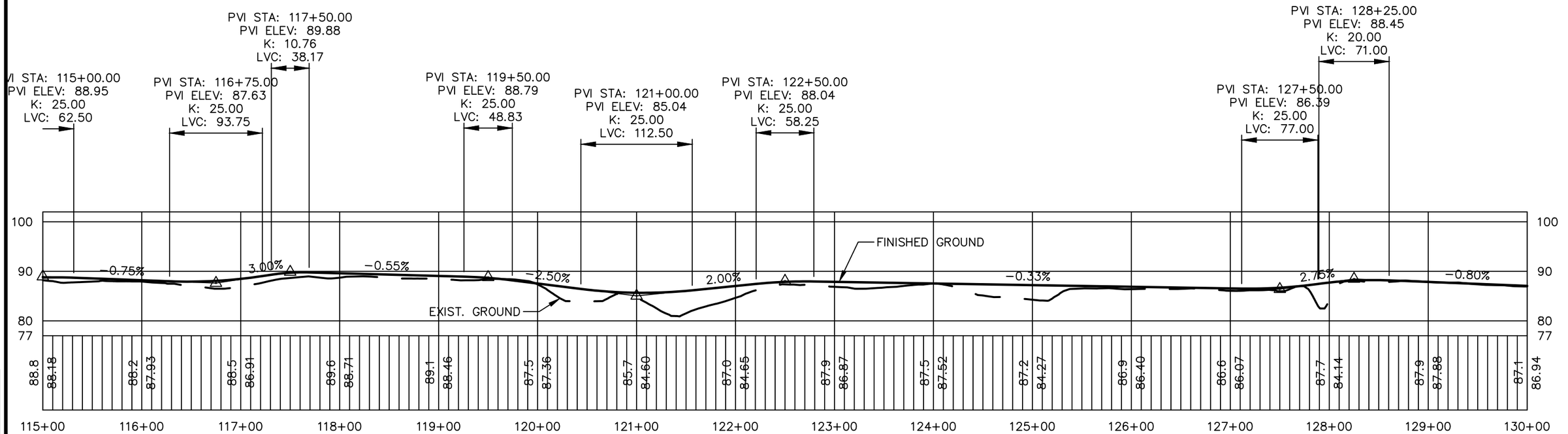
SCALE:
HORZ.: 1" = 100'
VERT.: 1" = 20'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER
ALIGNMENT ALTERNATIVE 1
PROFILE
DOVER COMMUNITY TRAIL
PHASE IV
DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-101

File Path: J:\DWG\P20170299000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CP-101 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



PROFILE STA 115+00 – 130+00
SCALE: H:1"=100'
V:1"=20'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

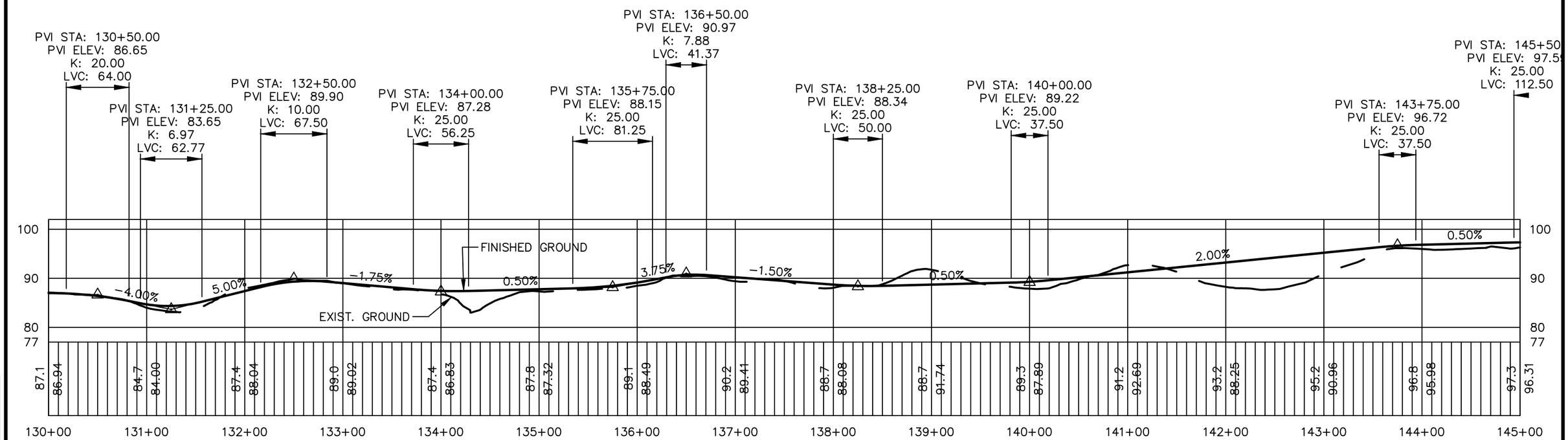
SCALE:
HORZ.: 1" = 100'
VERT.: 1" = 20'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER
ALIGNMENT ALTERNATIVE 1
PROFILE
DOVER COMMUNITY TRAIL
PHASE IV
DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-102

File Path: J:\DWG\P2017\02999\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CP-102 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:



PROFILE STA 130+00 – 145+00
SCALE: H: 1"=100'
V: 1"=20'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.: 1" = 20'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88

100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 1
PROFILE

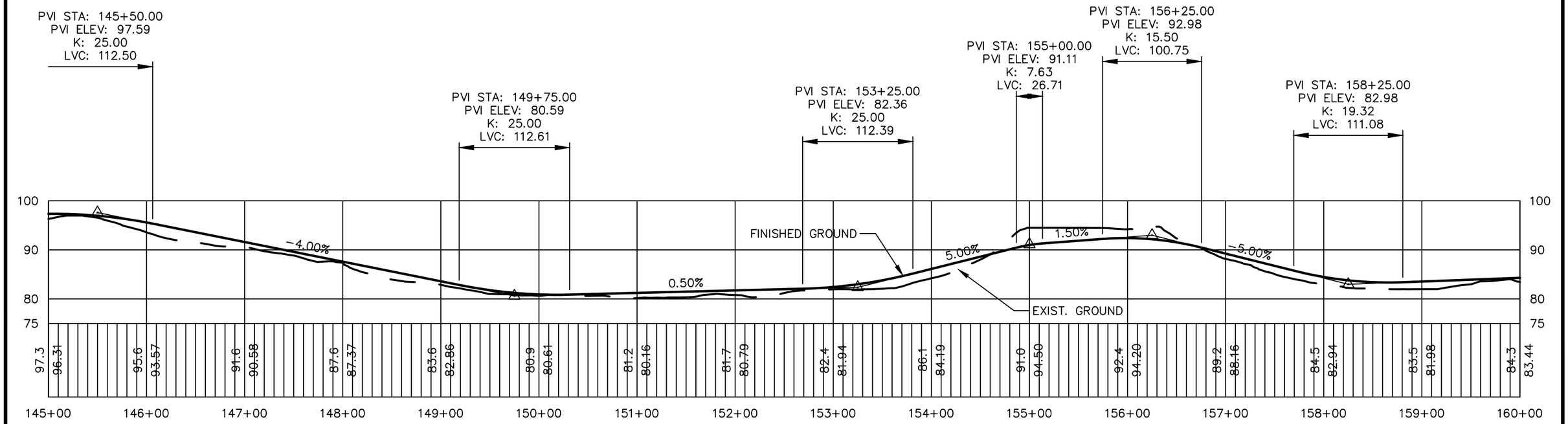
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-103

File Path: J:\DWG\P2017\0299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CP-103 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:



PROFILE STA 145+00 – 160+00
SCALE: H:1"=100'
V:1"=20'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:	
HORZ.:	1" = 100'
VERT.:	1" = 20'
DATUM:	
HORZ.:	NAD83 (2011)
VERT.:	NAVD88

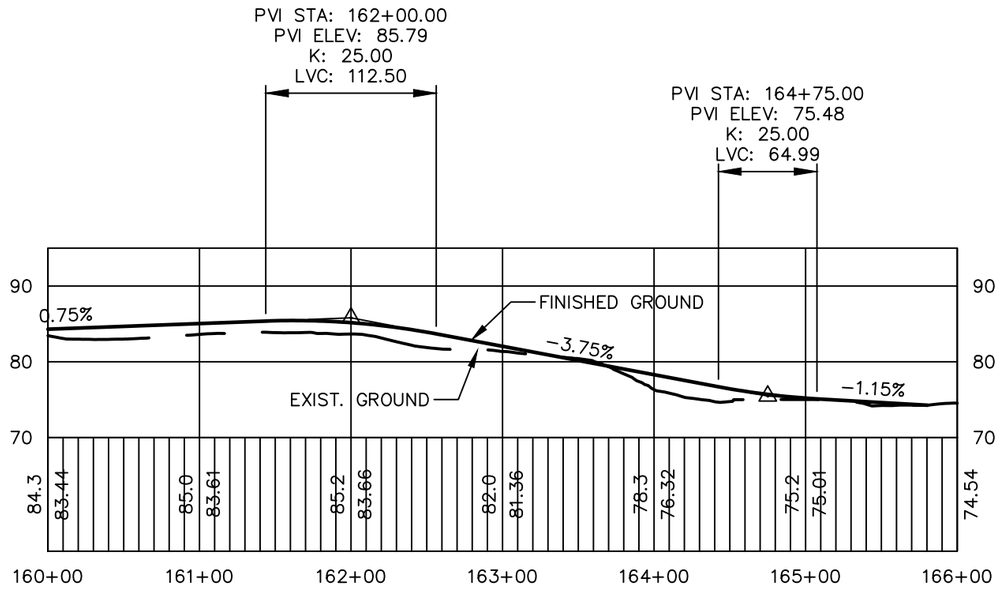
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER
ALIGNMENT ALTERNATIVE 1
PROFILE
DOVER COMMUNITY TRAIL
PHASE IV
DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-104

File Path: J:\DWG\P2017\0299\000\Civil\Plan\working\20170299_Alignment01_200914.dwg Layout: CP-104 Plotted: Mon. April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:



PROFILE STA 160+00 – 166+00

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 – TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 100'
VERT.: 1" = 20'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
100 50 0 100
GRAPHIC SCALE

CITY OF DOVER

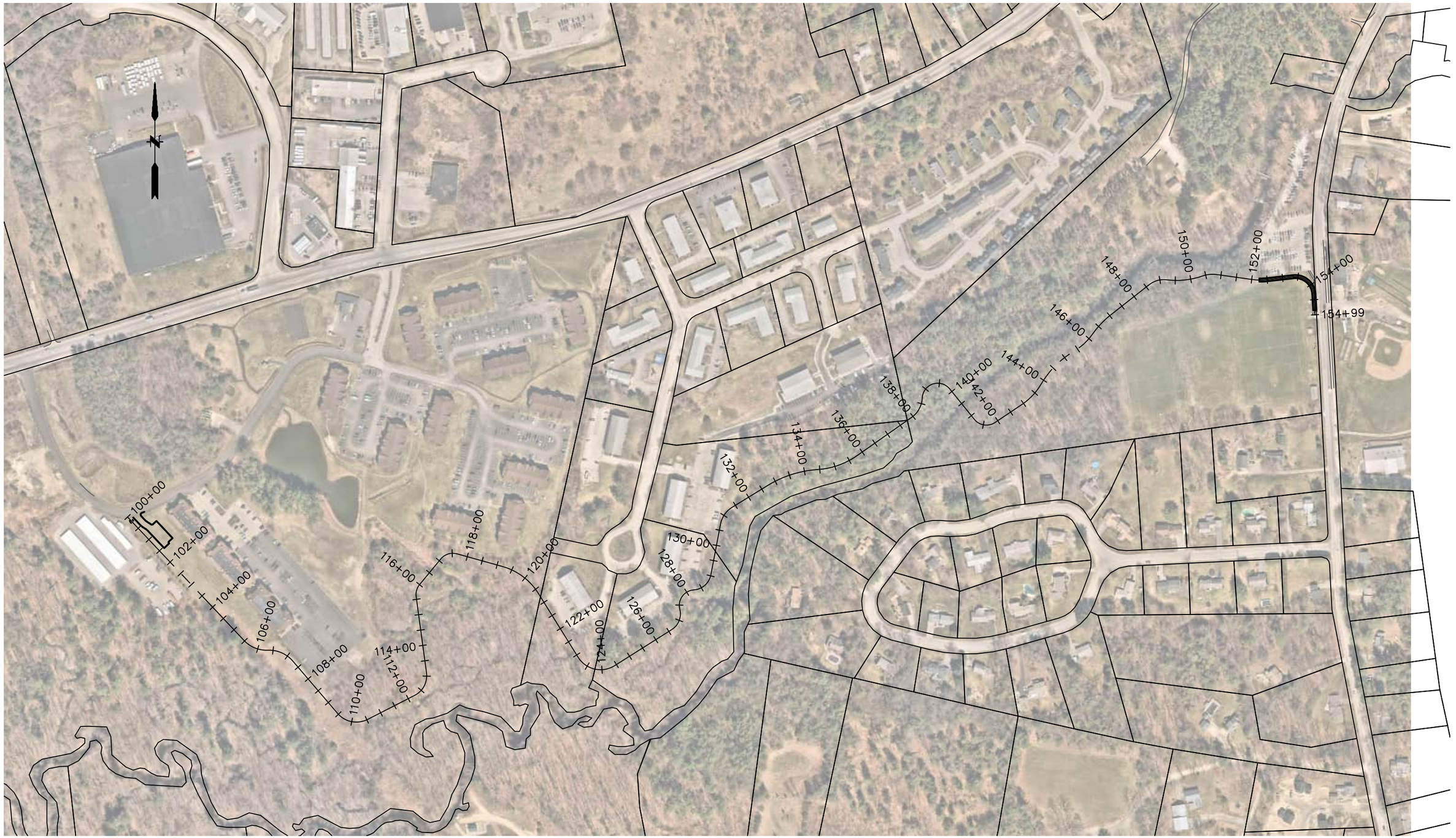
ALIGNMENT ALTERNATIVE 1
PROFILE

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-105



File Path: J:\DWG\P20170299000\Civil\Plan\20170299 - HPN.dwg Layout: CR-200 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:	
HORZ.:	1" = 300'
VERT.:	
DATUM:	
HORZ.:	NAD83 (2011)
VERT.:	NAVD88

300 150 0 300
GRAPHIC SCALE

CITY OF DOVER

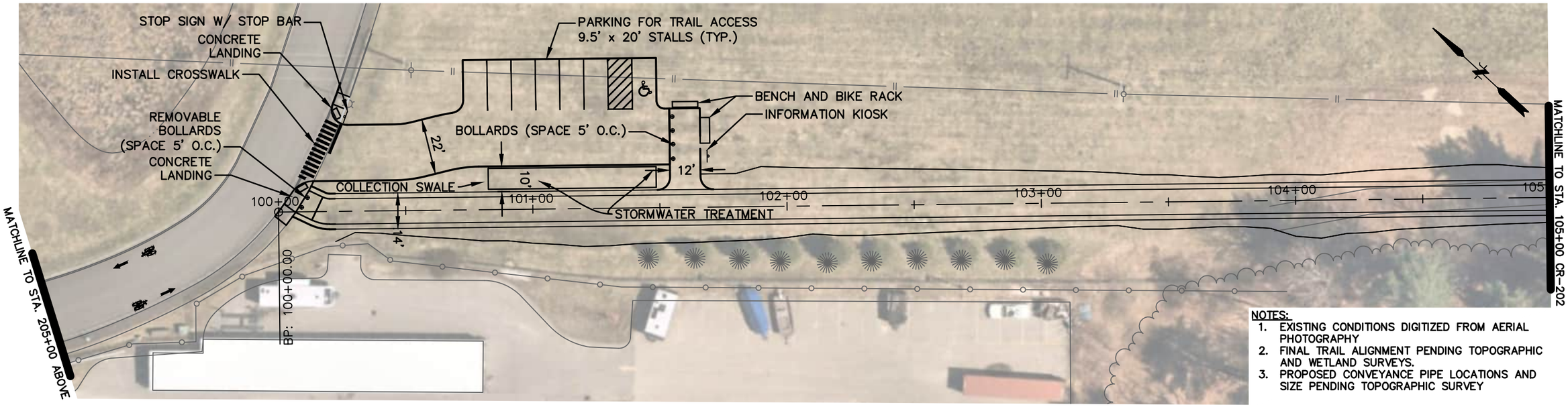
ALIGNMENT ALTERNATIVE 2 OVERVIEW PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-200



NOTES:
1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
GENERAL PLAN

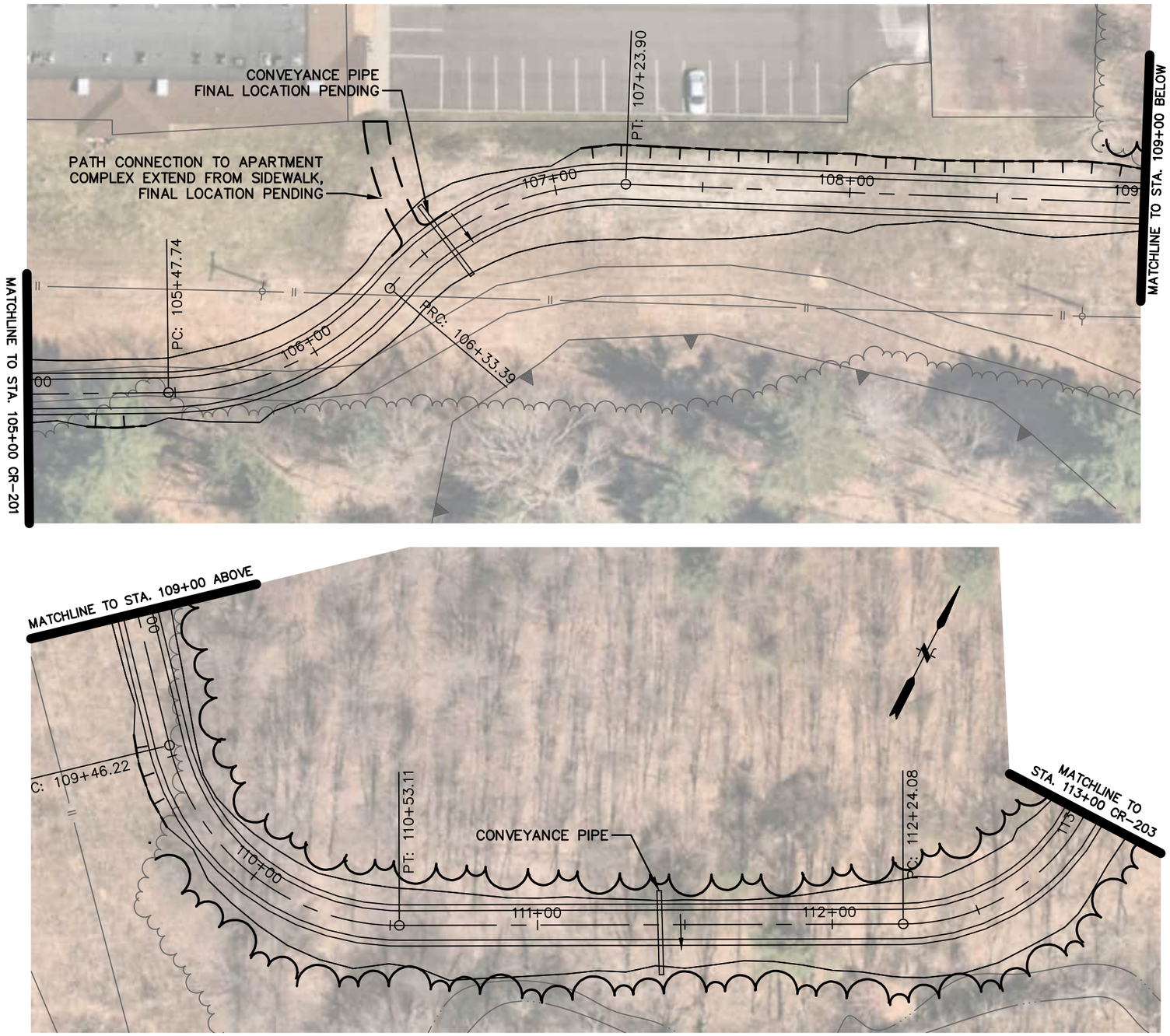
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-201

File Path: J:\DWG\P20170299\000\Civil\Plan\20170299 - HPN.dwg Layout: CR-201 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



NOTES:
1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
GENERAL PLAN

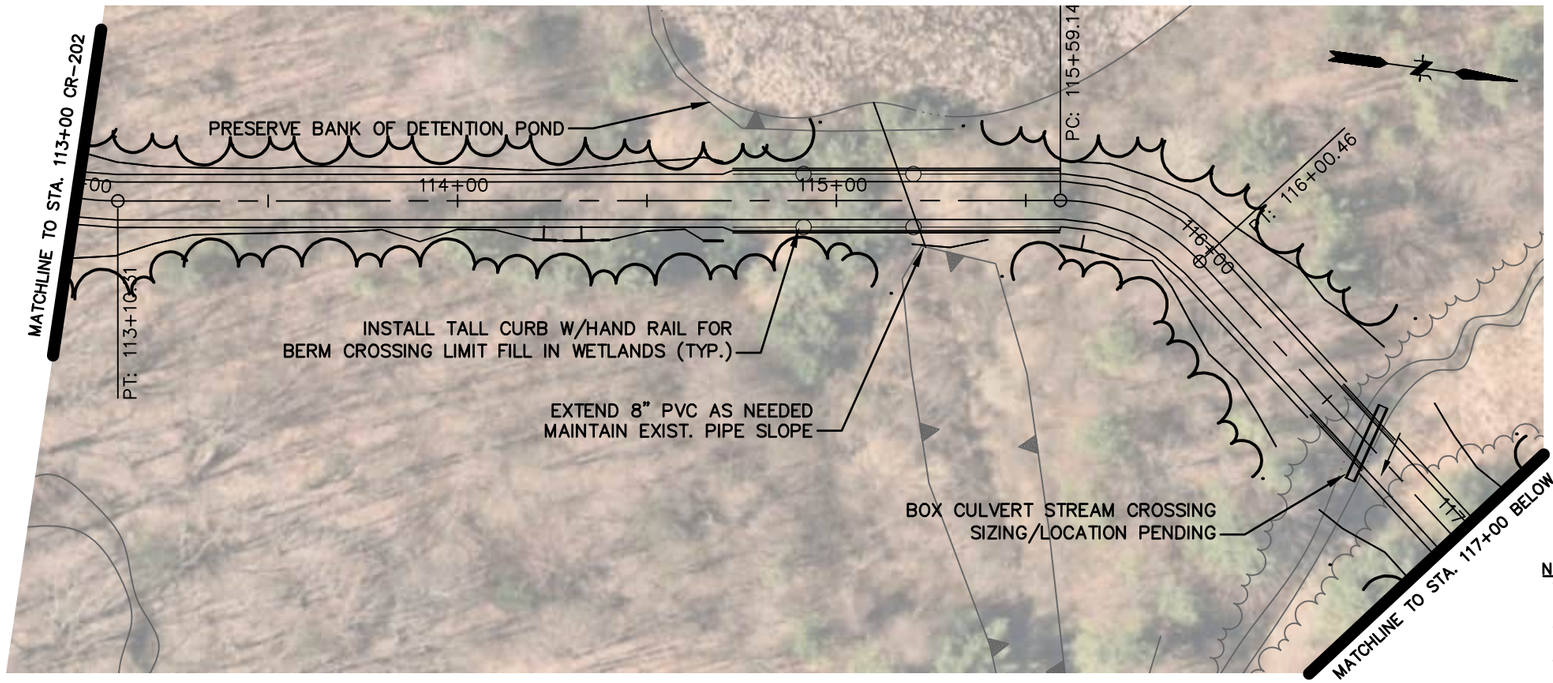
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

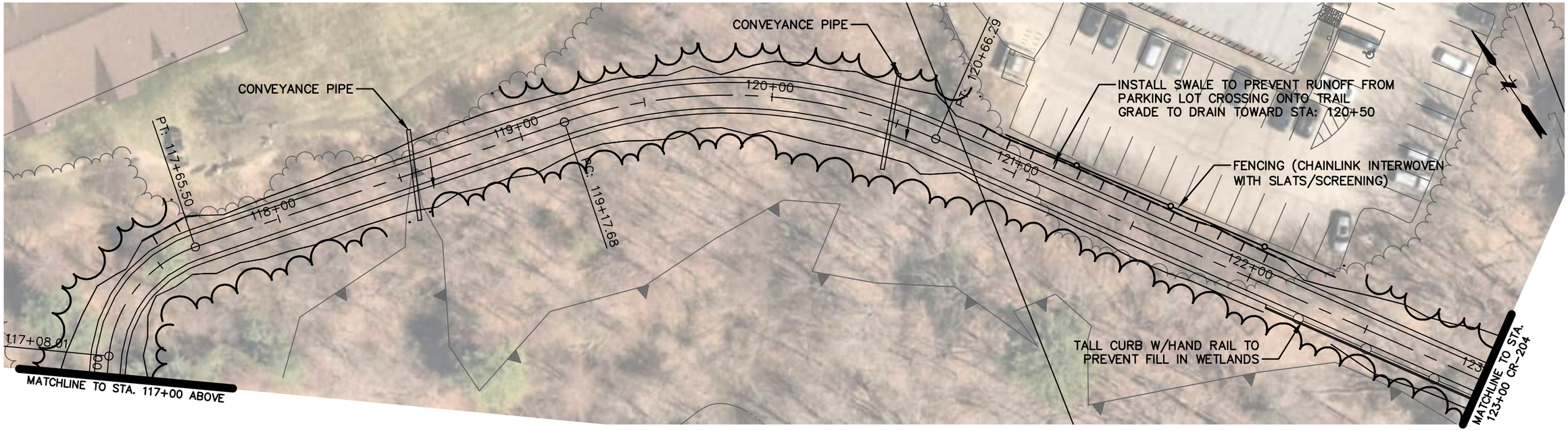
CR-202

File Path: J:\DWG\P20170299\000\Civil\Plan\20170299 - HPN.dwg Layout: CR-202 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



NOTES:

1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED BOX CULVERT AND CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY



No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
GENERAL PLAN

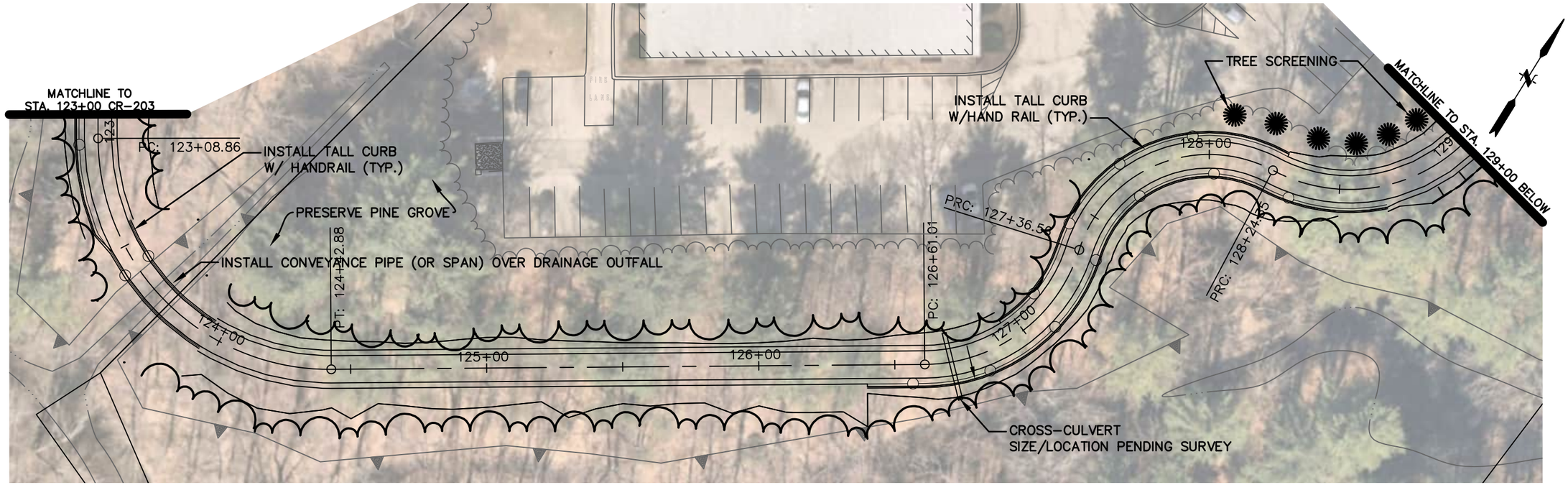
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

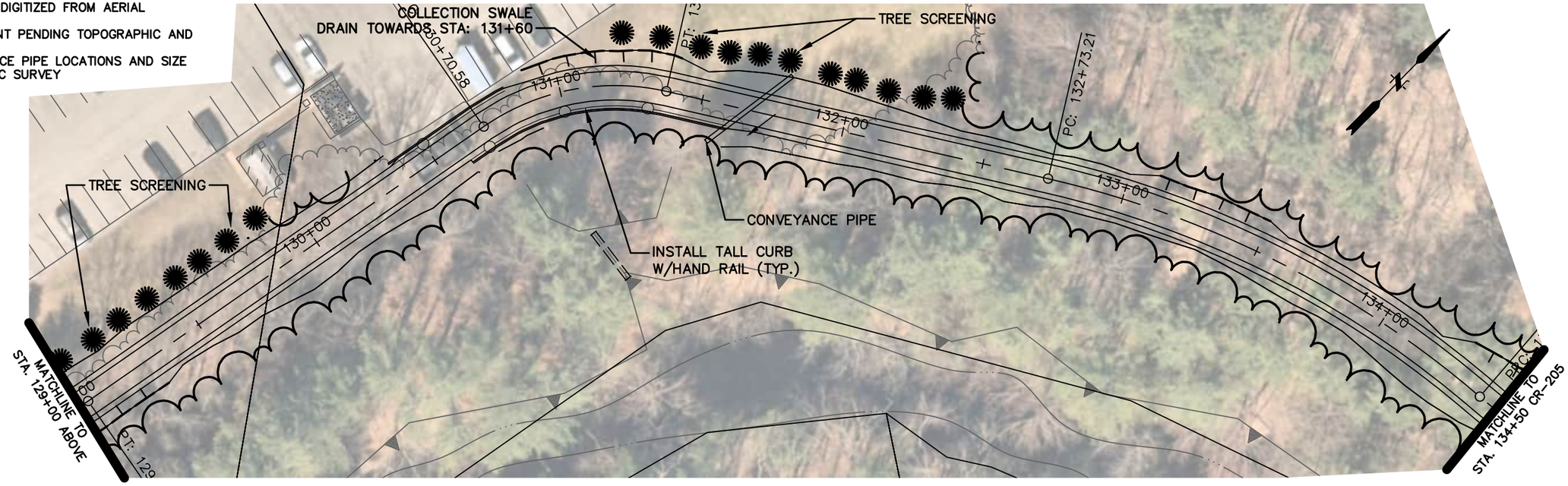
CR-203

File Path: J:\DWG\P2017\0299\000\Civil\Plan\20170299 - HPN.dwg Layout: CR-203 Plotted: Mon, April 29, 2024 - 12:58 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



NOTES:

1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY



No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 10 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2 GENERAL PLAN

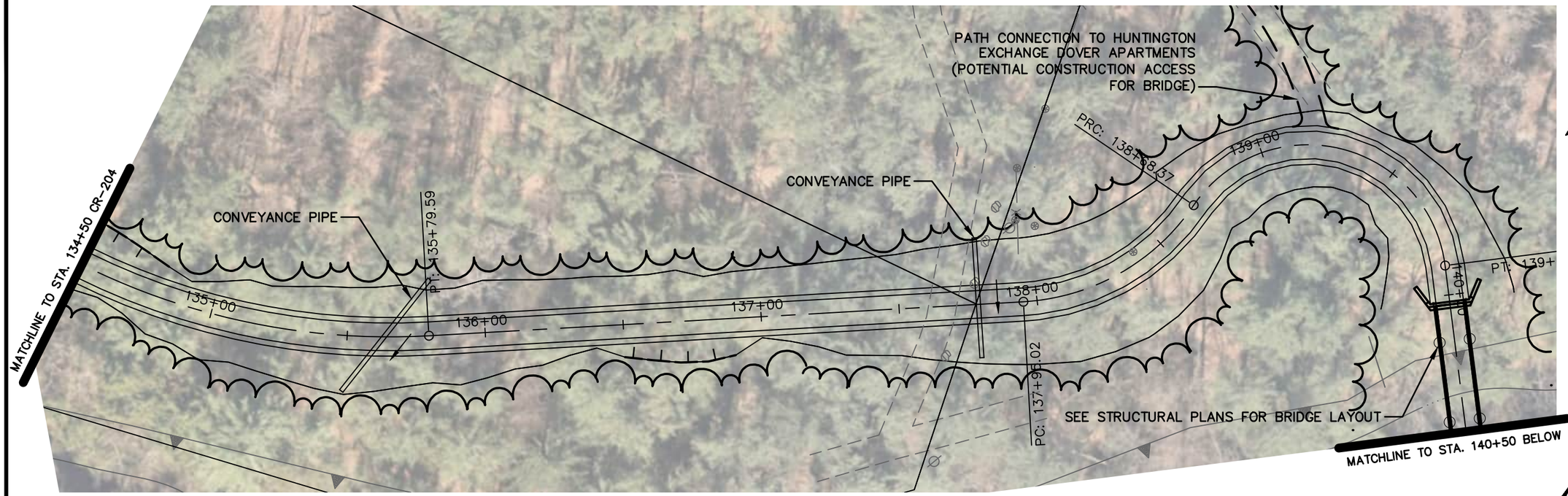
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-204

File Path: J:\DWG\P20170299\000\Civil\Plan\20170299 - HPN.dwg Layout: CR-204 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



NOTES:
1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:	
HORZ.:	1" = 40'
VERT.:	
DATUM:	
HORZ.:	NAD83 (2011)
VERT.:	NAVD88

40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
GENERAL PLAN

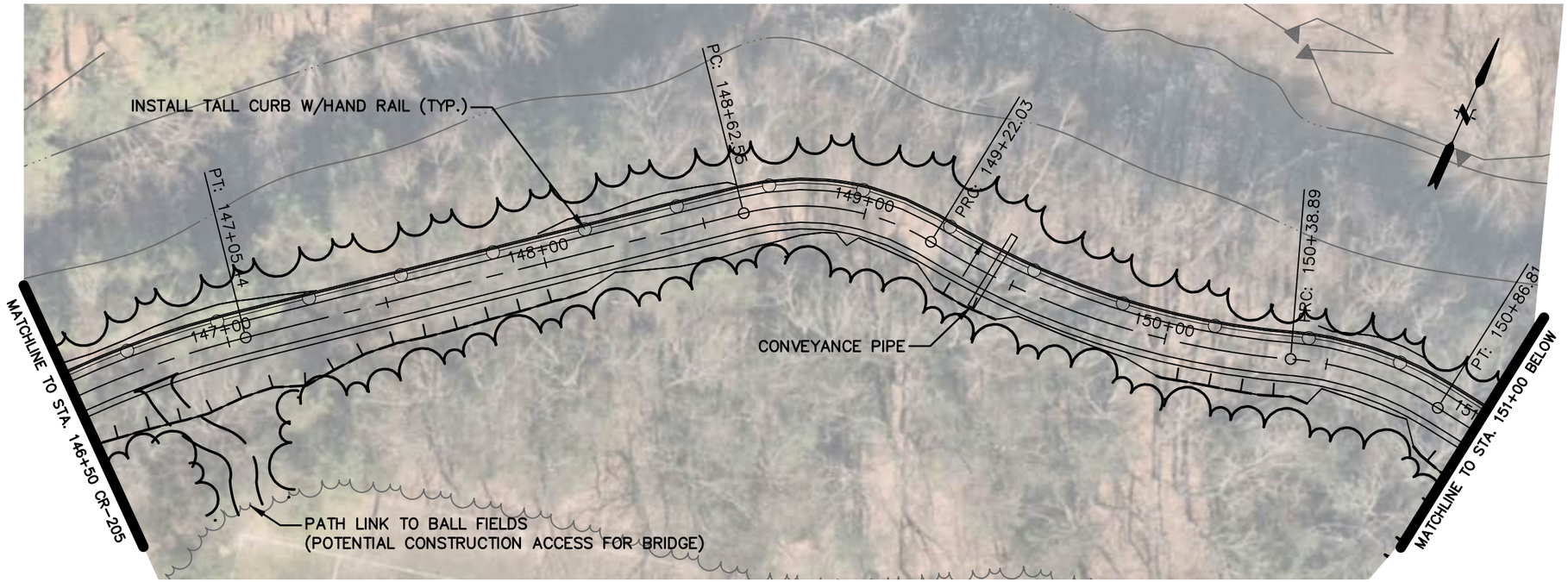
DOVER COMMUNITY TRAIL
PHASE IV

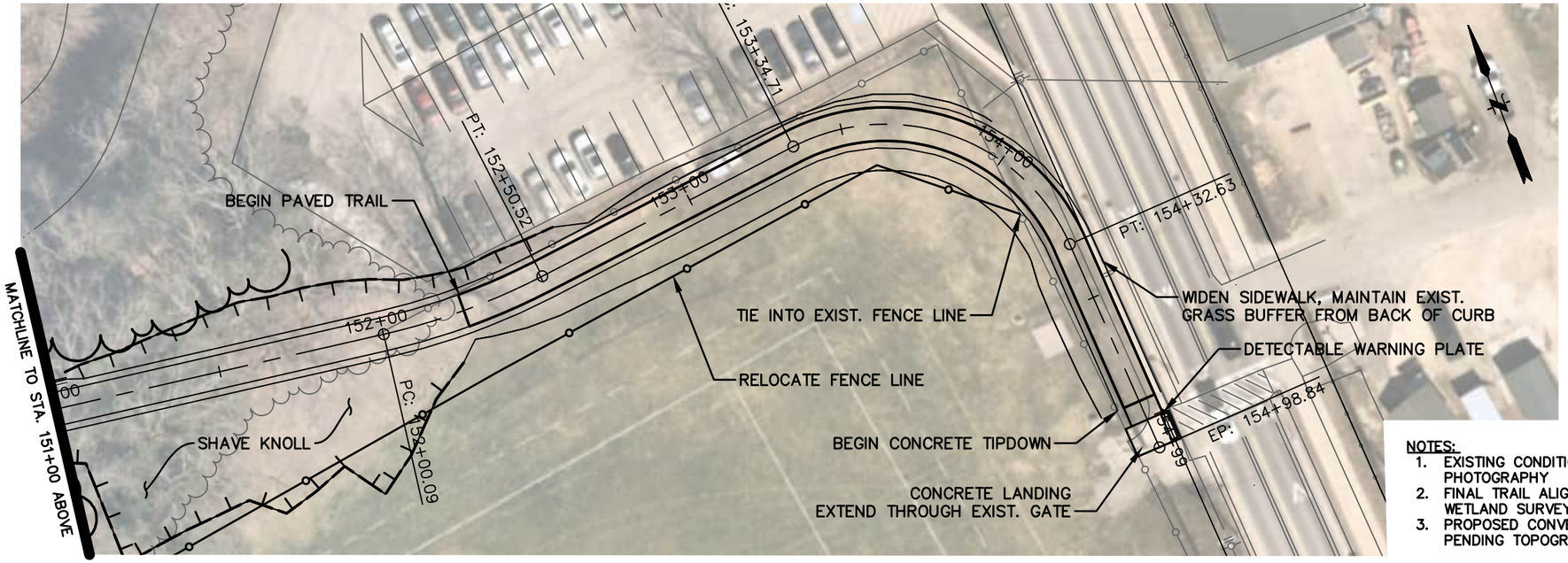
DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-205

File Path: J:\DWG\P20170299000\Civil\Plan\20170299 - HPN.dwg Layout: CR-205 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:





NOTES:
1. EXISTING CONDITIONS DIGITIZED FROM AERIAL PHOTOGRAPHY
2. FINAL TRAIL ALIGNMENT PENDING TOPOGRAPHIC AND WETLAND SURVEYS.
3. PROPOSED CONVEYANCE PIPE LOCATIONS AND SIZE PENDING TOPOGRAPHIC SURVEY

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2 GENERAL PLAN

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CR-206

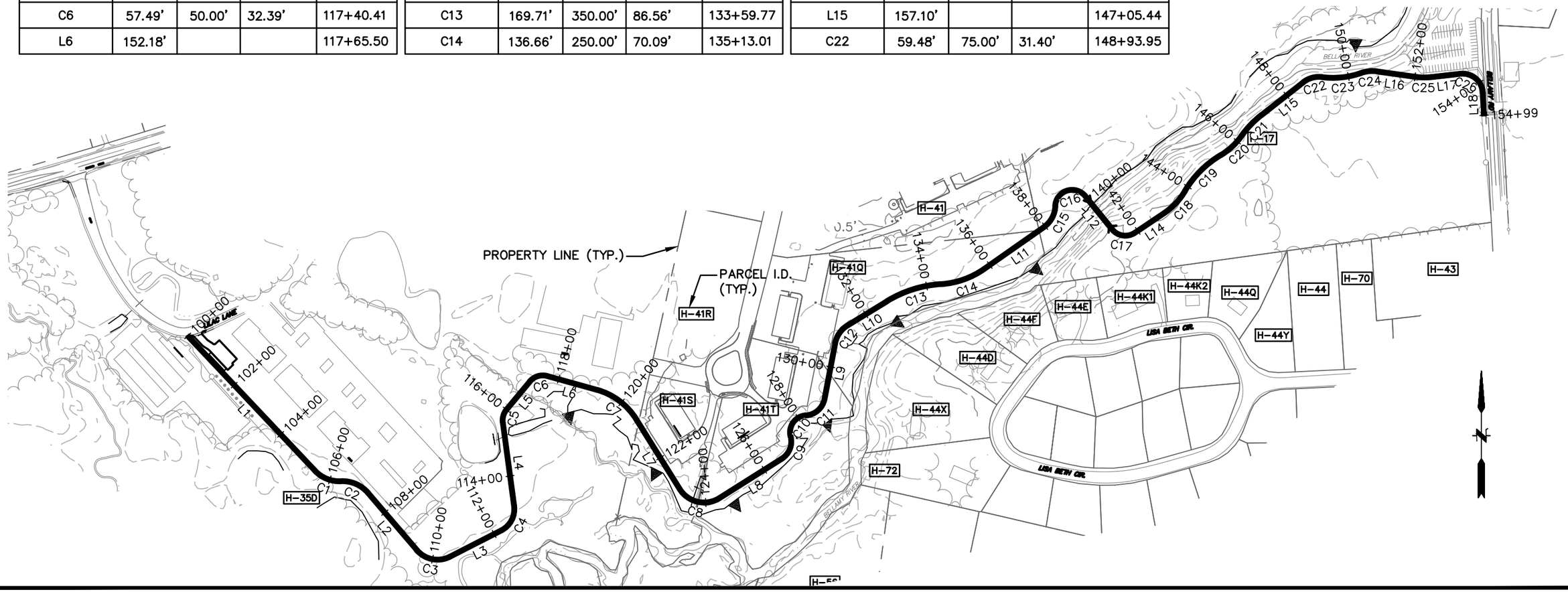
File Path: J:\DWG\P2017\0299\000\Civil\Plan\20170299 - HPN.dwg Layout: CR-206 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:

ALIGNMENT LINE AND CURVE DATA ALTERNATIVE 2				
SEGMENT #	LENGTH	RADIUS	TANGENT	STATION
L1	547.74'			100+00.00
C1	85.65'	100.00'	45.65'	105+93.39
C2	90.52'	100.00'	48.62'	106+82.01
L2	222.31'			107+23.90
C3	106.89'	80.00'	63.13'	110+09.35
L3	170.97'			110+53.11
C4	86.23'	70.00'	49.55'	112+73.62
L4	248.83'			113+10.31
C5	41.32'	50.00'	21.92'	115+81.07
L5	107.55'			116+00.46
C6	57.49'	50.00'	32.39'	117+40.41
L6	152.18'			117+65.50

ALIGNMENT LINE AND CURVE DATA ALTERNATIVE 2				
SEGMENT #	LENGTH	RADIUS	TANGENT	STATION
C7	148.61'	200.00'	77.92'	119+95.60
L7	242.57'			120+66.29
C8	134.03'	85.00'	85.51'	123+94.37
L8	218.12'			124+42.88
C9	75.55'	60.00'	43.71'	127+04.72
C10	87.79'	50.00'	60.22'	127+96.78
C11	78.94'	60.00'	46.36'	128+70.71
L9	167.29'			129+03.29
C12	66.55'	80.00'	35.34'	131+05.92
L10	136.08'			131+37.14
C13	169.71'	350.00'	86.56'	133+59.77
C14	136.66'	250.00'	70.09'	135+13.01

ALIGNMENT LINE AND CURVE DATA ALTERNATIVE 2				
SEGMENT #	LENGTH	RADIUS	TANGENT	STATION
L11	215.43'			135+79.59
C15	73.35'	80.00'	39.48'	138+34.50
L12	126.24'			139+89.31
C16	120.94'	50.00'	132.26'	140+00.63
C17	74.05'	50.00'	45.70'	141+61.25
L14	105.16'			141+89.59
C18	89.73'	200.00'	45.63'	143+40.39
C19	151.02'	300.00'	77.14'	144+61.64
C20	83.47'	200.00'	42.35'	145+77.86
C21	86.47'	300.00'	43.54'	146+62.51
L15	157.10'			147+05.44
C22	59.48'	75.00'	31.40'	148+93.95

ALIGNMENT LINE AND CURVE DATA ALTERNATIVE 2				
SEGMENT #	LENGTH	RADIUS	TANGENT	STATION
C23	116.86'	250.00'	59.52'	149+81.54
C24	47.92'	100.00'	24.43'	150+63.32
L16	113.28'			150+86.81
C25	50.43'	200.00'	25.35'	152+25.44
L17	84.19'			152+50.52
C26	97.92'	60.00'	63.79'	153+98.50
L18	66.20'			154+32.63



No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 300'
VERT.:
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
300 150 0 300
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
SEGMENT TABLE

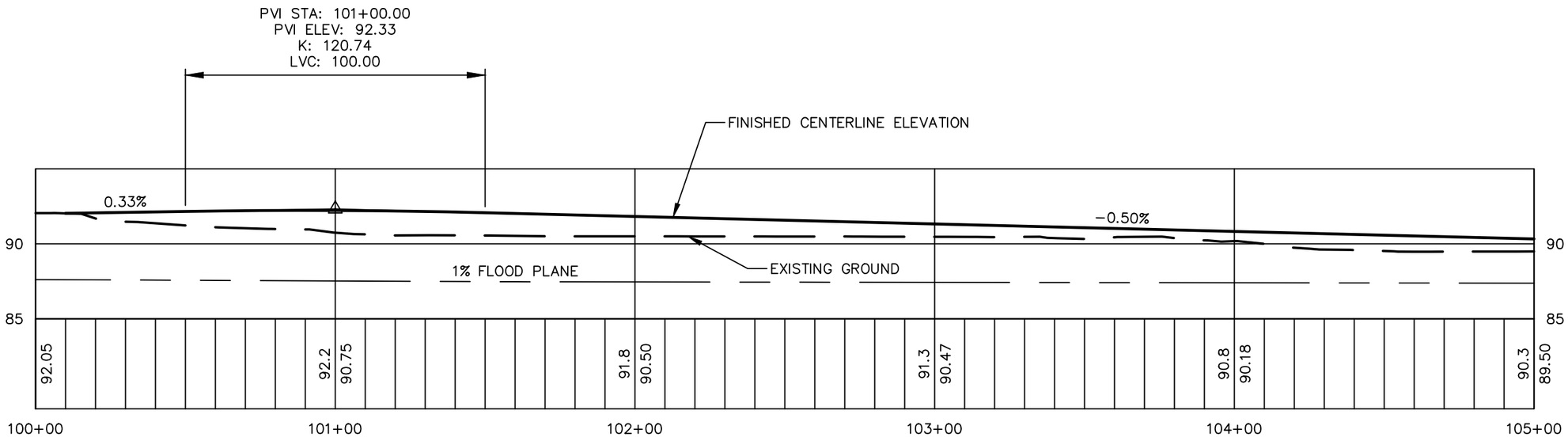
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CT-201

File Path: J:\DWG\P20170299000\Civil\Plan\20170299 - PROF.dwg Layout: CT-201 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



PROFILE STA 100+00 – 105+00

SCALE: H: 1"=40'

V: 1"=8'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
PROFILE

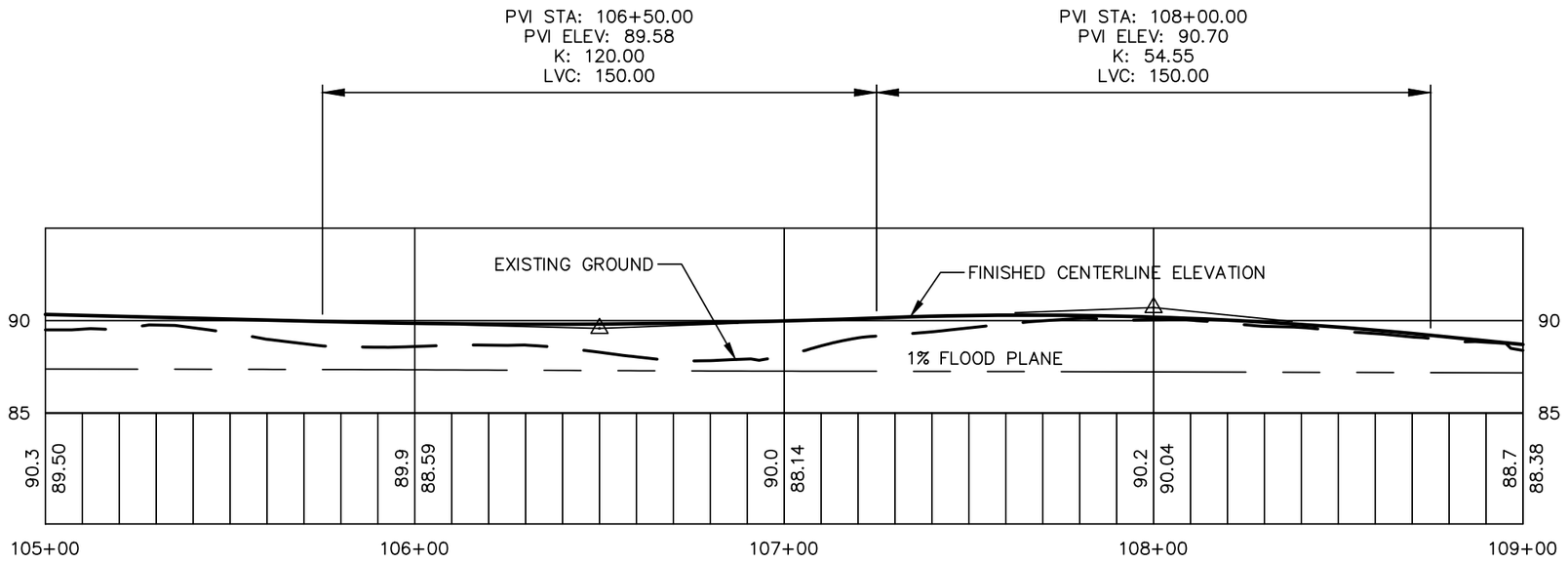
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-201

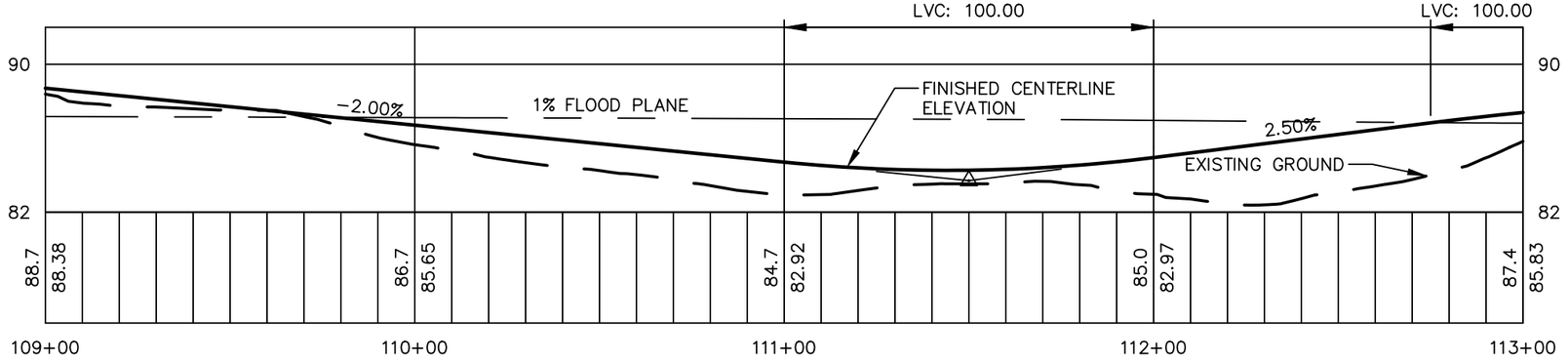
File Path: J:\DWG\P2017\0299\000\Civil\Plan\20170299 - PROF.dwg Layout: CP-201 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



PROFILE STA 105+00 – 109+00

SCALE: H: 1"=40'

V: 1"=8'



PROFILE STA 109+00 – 113+00

SCALE: H: 1"=40'

V: 1"=8'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 – TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

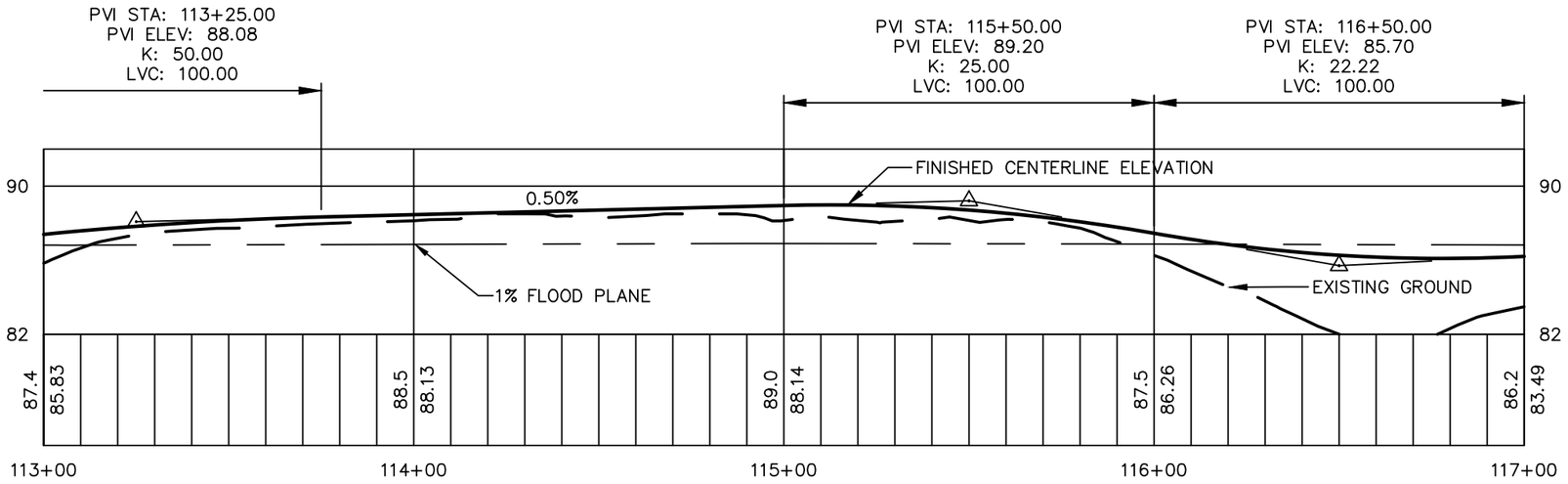
ALIGNMENT ALTERNATIVE 2
PROFILE

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

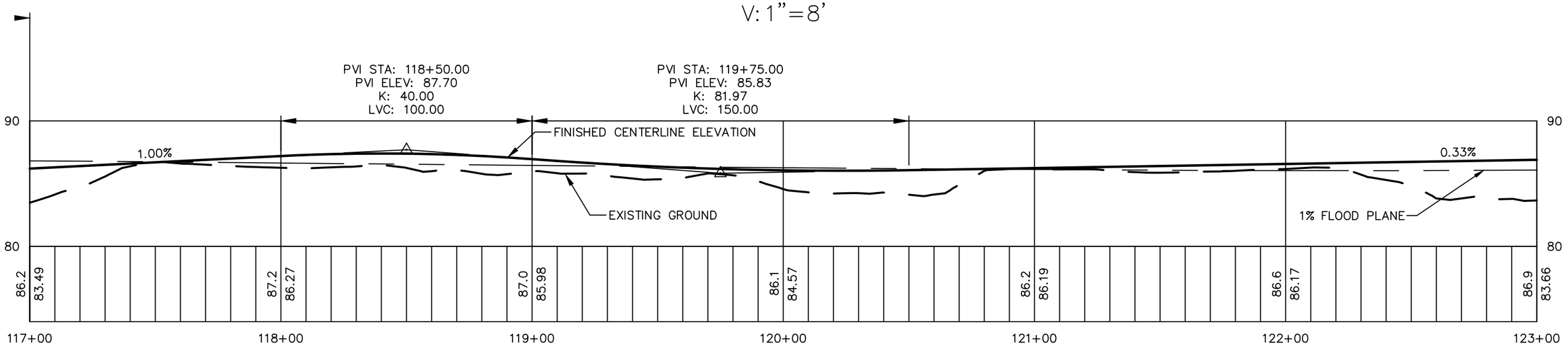
CP-202



PROFILE STA 113+00 – 117+00

SCALE: H: 1"=40'

V: 1"=8'



PROFILE STA 117+00 – 123+00

SCALE: H: 1"=40'

V: 1"=8'

File Path: J:\DWG\P2017\0299\000\Civil\Plan\20170299 - PROF.dwg Layout: CP-203 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 – TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:	
	HORZ.: 1" = 40'
	VERT.: 1" = 8'
DATUM:	
	HORZ.: NAD83 (2011)
	VERT.: NAVD88

40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

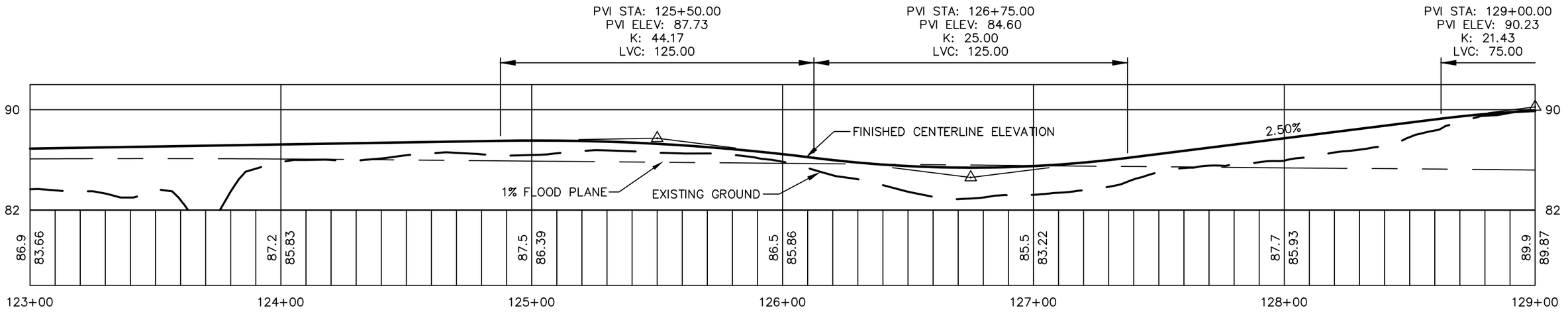
ALIGNMENT ALTERNATIVE 2
PROFILE

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

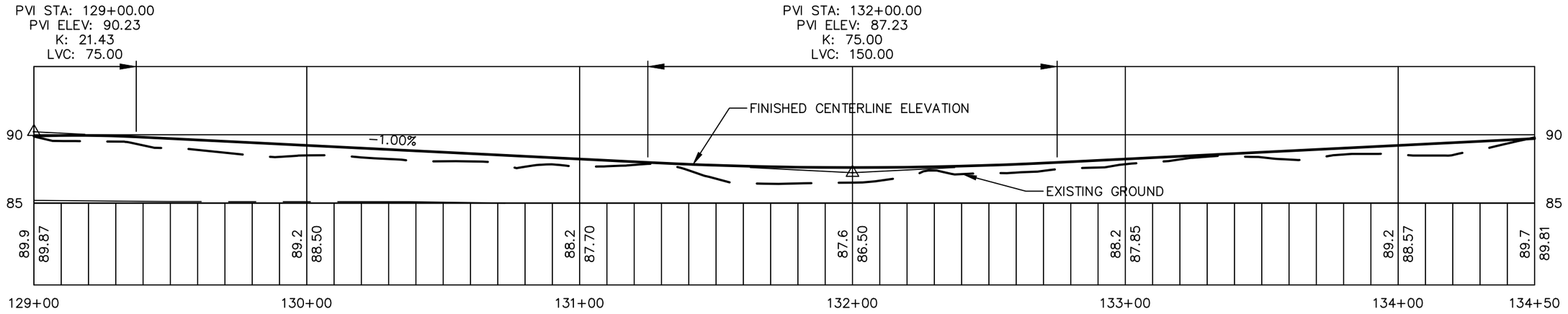
CP-203



PROFILE STA 123+00 – 129+00

SCALE: H:1"=40'

V:1"=8'



PROFILE STA 129+00 – 134+50

SCALE: H:1"=40'

V:1"=8'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 – TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

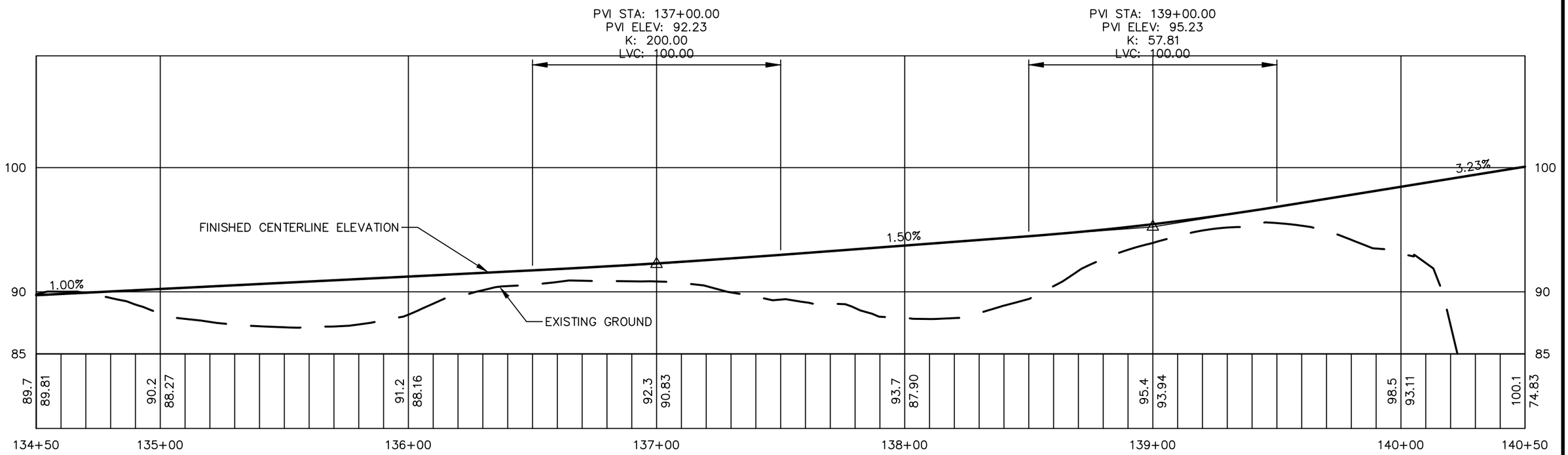
ALIGNMENT ALTERNATIVE 2
PROFILE

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-204



PROFILE STA 134+50 – 140+50

SCALE: H: 1"=40'
V: 1"=8'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

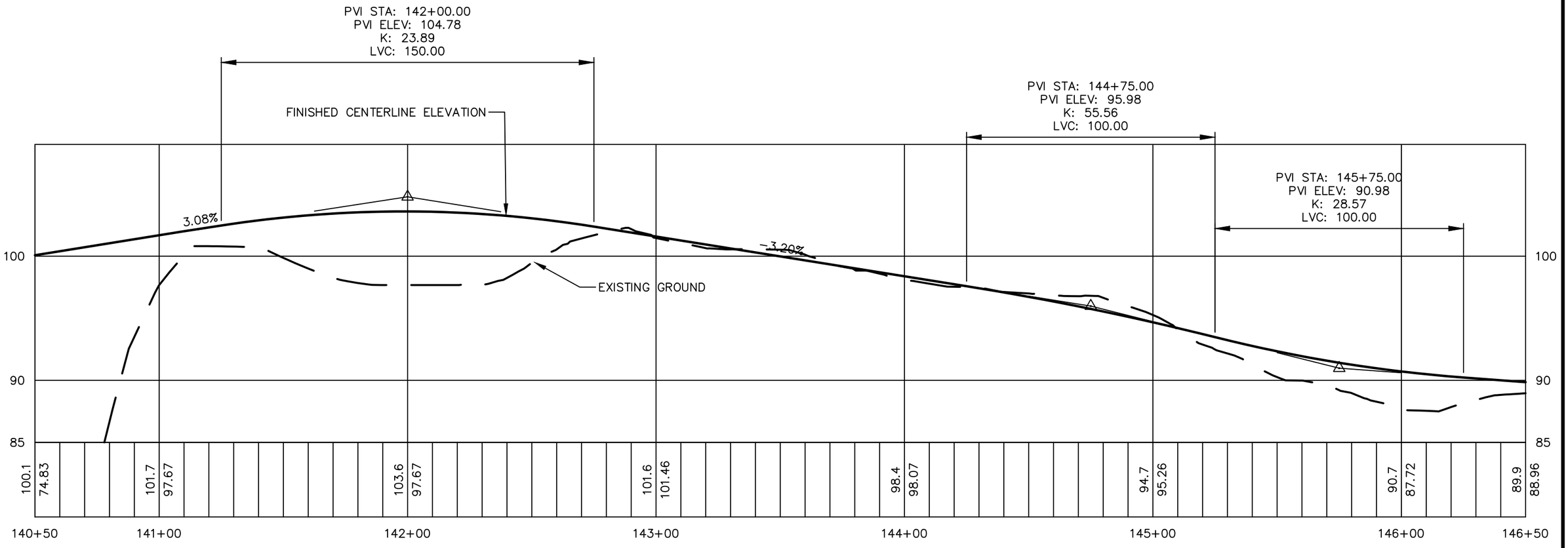
SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER
ALIGNMENT ALTERNATIVE 2
PROFILE
DOVER COMMUNITY TRAIL
PHASE IV
DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CP-205

File Path: J:\DWG\P20170299000\Civil\Plan\20170299 - PROF.dwg Layout: CP-205 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:



PROFILE STA 140+50 – 146+50

SCALE: H: 1"=40'

V: 1"=8'

File Path: J:\DWG\P20170299\000\Civil\Plan\20170299 - PROF.dwg Layout: CP-206 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
LAYER STATE:
MS VIEW:

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER, INC. 1855 – TOWN SETTLED 1623

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

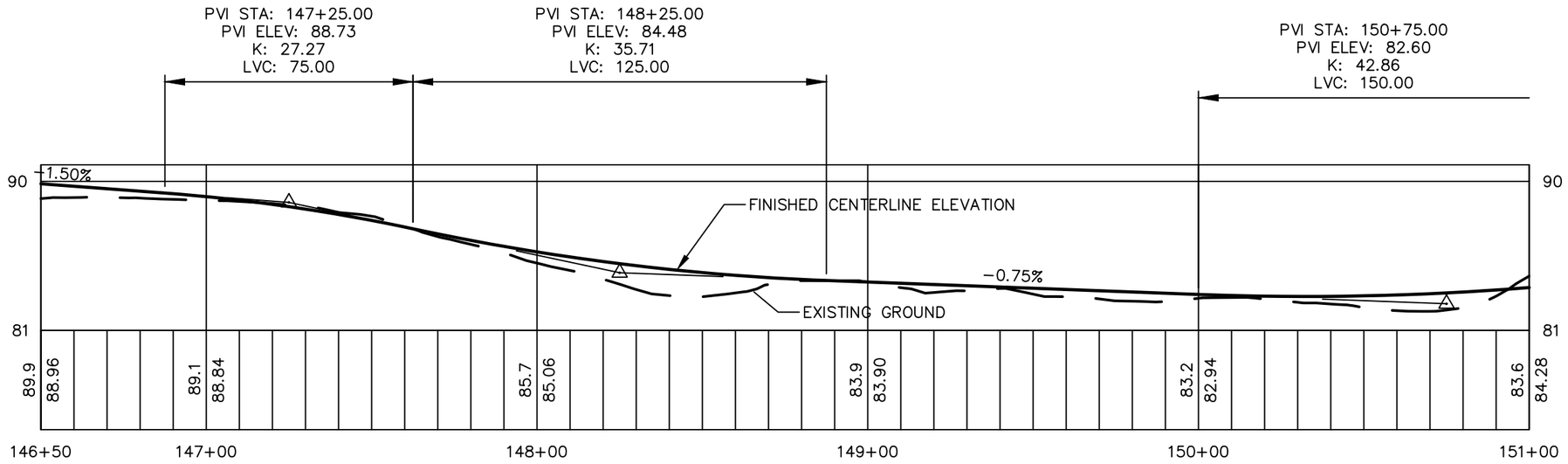
ALIGNMENT ALTERNATIVE 2
PROFILE

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

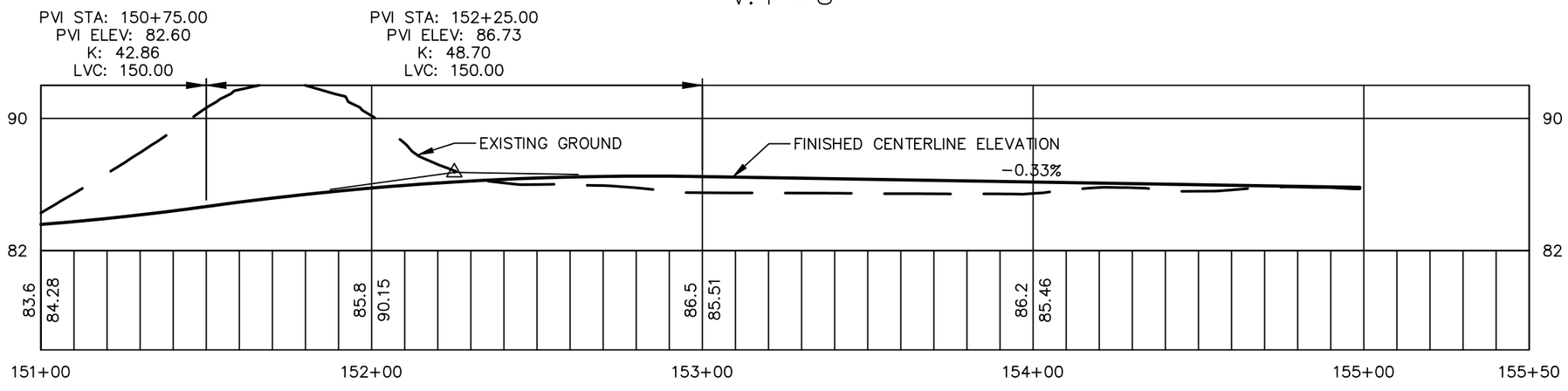
CP-206



PROFILE STA 146+50 – 151+00

SCALE: H: 1"=40'

V: 1"=8'



PROFILE STA 151+00 – 155+50

SCALE: H: 1"=40'

V: 1"=8'

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

FUSS&O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

SCALE:
HORZ.: 1" = 40'
VERT.: 1" = 8'
DATUM:
HORZ.: NAD83 (2011)
VERT.: NAVD88
40 20 0 40
GRAPHIC SCALE

CITY OF DOVER

ALIGNMENT ALTERNATIVE 2
PROFILE

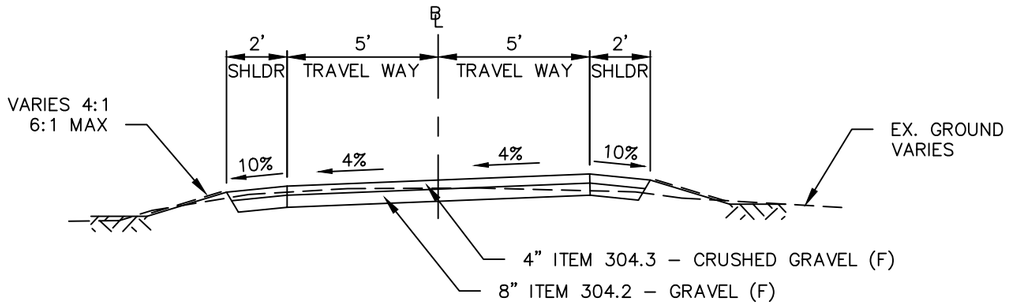
DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

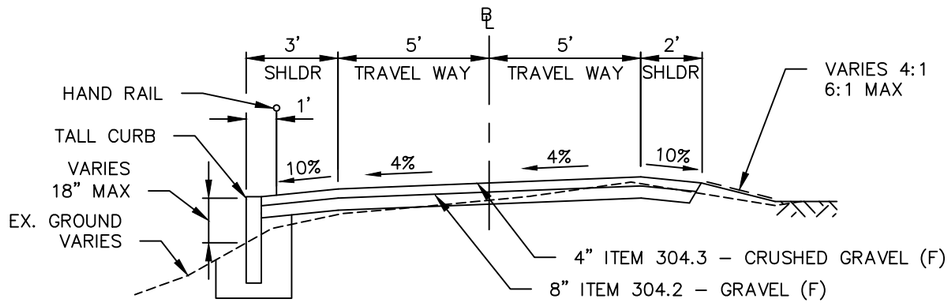
CP-207

File Path: J:\DWG\P2017\0299\000\Civil\Plan\20170299 - PROF.dwg Layout: CP-207 Plotted: Mon, April 29, 2024 - 12:59 PM User: jhavey
Plotter: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 CTB File: ---
MS VIEW: LAYER STATE:



GRAVEL TRAIL TYPICAL SECTION

N.T.S.



TALL CURB WITH HANDRAIL TYPICAL SECTION

N.T.S.

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

CITY OF DOVER INC. 1855 TOWN SETTLED 1623

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

CITY OF DOVER

TYPICAL SECTIONS

DOVER COMMUNITY TRAIL
PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: APRIL, 2024

CD-301

Appendix B

Engineer's Opinion of Construction Costs

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

Alignment Alternative 1

ENGINEERING STUDY ENGINEER'S ESTIMATE OF PROBABLE COST

Town of:	DOVER			Federal No.	N/A
County:	STRAFFORD			State No.	42709
Project No.	0			FO No.	20170299
Name of Road:	Dover Community Trail	Calc:	JWH	Date:	4/9/2024
Type:	Active Transportation Corridor	Check:	AWJ	Date:	4/24/2024

ITEM NO.		ITEM DESCRIPTION	UNIT	PRICE	TOTAL QUANTITY	ESTIMATED COST
201.1		CLEARING AND GRUBBING (F)	A	$ 20,000.00	4.8	$ 96,000.00
203.1		COMMON EXCAVATION	CY	$ 40.00	2,205.0	$ 88,200.00
203.6		EMBANKMENT-IN-PLACE (F)	CY	$ 25.00	3,952.0	$ 98,800.00
304.2		GRAVEL (F)	CY	$ 40.00	2,285.0	$ 91,400.00
304.3		CRUSHED GRAVEL (F)	CY	$ 45.00	1,291.0	$ 58,095.00
403.11023		HBP-3/4" BINDER MIX, MACHINE METHOD	TON	$ 125.00	100.0	$ 12,500.00
403.11043		HBP-1/2" SURFACE MIX, MACHINE METHOD	TON	$ 150.00	50.0	$ 7,500.00
550.3		STEEL BOLLARD (REMOVABLE)	EA	$ 300.00	6.0	$ 1,800.00
606.6311		SAFETY RAIL, W/GUARD, STEEL	LF	$ 50.00	1,667.0	$ 83,350.00
607.350		CHAIN LINK FENCE WITH VINYL COATED STEEL FABRIC, 5' HIGH	LF	$ 60.00	511.0	$ 30,660.00
608.12		2" BITUMINOUS SIDEWALK (F)	SY	$ 35.00	323.0	$ 11,305.00
608.36		6" REINFORCED CONCRETE SIDEWALK (F)	SY	$ 100.00	50.0	$ 5,000.00
608.54		DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	5.0	$ 2,500.00
609.01		STRAIGHT GRANITE CURB	LF	$ 65.00	1,667.0	$ 108,355.00
529.002		PRECAST CONCRETE BOX CULVERT (BRIDGE)	U	$ 210,000.00	2.0	$ 420,000.00
619.1		MAINTENANCE OF TRAFFIC	U	$ 25,000.00	1.0	$ 30,060.00
646.3		TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	A	$ 10,000.00	2.0	$ 20,000.00
650.2		LANDSCAPING	U	$ 10,000.00	1.0	$ 10,000.00
699		MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 40,000.00	1.1	$ 44,000.00
1050		WAYFINDING KIOSK	U	$ 6,400.00	2.0	$ 12,800.00

Subtotal Roadway Items:	**$ 1,202,300.00**
15% Drainage and Stormwater Contingency	**$ 180,300.00**
15% Roadway Contingency:	**$ 180,300.00**

Note: Quantities calculated based on percentage of Alignment Alternative 2

Subtotal Roadway:	**$ 1,592,960.00**
Total Construction Costs:	**$ 1,592,960.00**
Preliminary Engineering (10%):	**$ 159,296.00**
Right of Way:	**TBD**
Construction Engineering (15% of Construction):	**$ 238,944.00**
Alignment Alternative 1 Project Total:	**$ 1,991,200.00**

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

Alignment Alternative 2

ENGINEERING STUDY ENGINEER'S ESTIMATE OF PROBABLE COST

Town of:	DOVER			Federal No.	N/A
County:	STRAFFORD			State No.	42709
Project No.	0			FO No.	20170299
Name of Road:	Dover Community Trail	Calc:	JWH	Date:	4/9/2024
Type:	Active Transportation Corridor	Check:	AWJ	Date:	4/24/2024

ITEM NO.		ITEM DESCRIPTION	UNIT	PRICE	TOTAL QUANTITY	TOTAL COST
201.1		CLEARING AND GRUBBING (F)	A	$ 20,000.00	4.5	$ 90,000.00
203.1		COMMON EXCAVATION	CY	$ 40.00	2,050.0	$ 82,000.00
203.6		EMBANKMENT-IN-PLACE (F)	CY	$ 25.00	3,675.0	$ 91,875.00
304.2		GRAVEL (F)	CY	$ 40.00	2,125.0	$ 85,000.00
304.3		CRUSHED GRAVEL (F)	CY	$ 45.00	1,200.0	$ 54,000.00
403.11023		HBP-3/4" BINDER MIX, MACHINE METHOD	TON	$ 125.00	100.0	$ 12,500.00
403.11043		HBP-1/2" SURFACE MIX, MACHINE METHOD	TON	$ 150.00	50.0	$ 7,500.00
550.3		STEEL BOLLARD (REMOVABLE)	EA	$ 300.00	6.0	$ 1,800.00
606.6311		SAFETY RAIL, W/GUARD, STEEL	LF	$ 50.00	1,550.0	$ 77,500.00
607.350		CHAIN LINK FENCE WITH VINYL COATED STEEL FABRIC, 5' HIGH	LF	$ 60.00	475.0	$ 28,500.00
608.12		2" BITUMINOUS SIDEWALK (F)	SY	$ 35.00	300.0	$ 10,500.00
608.36		6" REINFORCED CONCRETE SIDEWALK (F)	SY	$ 100.00	50.0	$ 5,000.00
608.54		DETECTABLE WARNING DEVICES, CAST IRON	SY	$ 500.00	5.0	$ 2,500.00
609.01		STRAIGHT GRANITE CURB	LF	$ 65.00	1,550.0	$ 100,750.00
529.002		PRECAST CONCRETE BOX CULVERT (BRIDGE)	U	$ 210,000.00	2.0	$ 420,000.00
619.1		MAINTENANCE OF TRAFFIC	U	$ 25,000.00	1.0	$ 25,000.00
646.3		TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	A	$ 10,000.00	1.8	$ 17,500.00
650.2		LANDSCAPING	U	$ 10,000.00	1.0	$ 10,000.00
699		MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	$ 40,000.00	1.0	$ 40,000.00
1050		WAYFINDING KIOSK	U	$ 6,400.00	2.0	$ 12,800.00

Subtotal Roadway Items:	**$ 1,149,700.00**
15% Drainage and Stormwater Contingency	**$ 172,500.00**
15% Roadway Contingency:	**$ 172,500.00**
Subtotal Roadway:	**$ 1,519,700.00**
Subtotal Bridge:	**$ 490,000.00**
Total Construction Costs:	**$ 2,009,700.00**
Preliminary Engineering (10%):	**$ 200,970.00**
Right of Way:	**TBD**
Construction Engineering (15% of Construction):	**$ 301,455.00**
Alignment Alternative 2 Project Total:	**$ 2,512,125.00**

Appendix C

Environmental and Cultural Stakeholder and Agency Responses

Environmental and Cultural Stakeholders & Agency	Date of Response	Response to Intial Contact Letter
NH Office of Strategic Initiatives Floodplain Management Program Contact: Katie Paight Principal Planner kathryn.o.paight@livefree.nh.gov Office of Planning and Development Department of Business and Economic Affairs 100 North Main Street, Suite 100 Concord, NH 03301 (603) 271-1755	27-Jul-23	Our office does not have a list of priority mitigation efforts. We do provide flood mitigation and resiliency resources on our website. It appears that portions of the project area are located in Special Flood Hazard Area (SFHA) Zone AE with a regulatory floodway in the City of Dover. Requirements for development in Zone AE with a regulatory floodway have been provided. Our office does not have any environmental concerns at this point besides SFHA development requirements. Trails are acceptable use within SFHA. As these areas are subject to the 100-year storm and beyond, construction methods that withstand flooding conditions should be considered. As the City of Dover is a participant of the National Flood Insurance Program (NFIP), any development occurring in a SFHA should meet at least the minimum NFIP requirements contained in the community's floodplain regulations, 44 CFR, and the requirements in the flood provisions of the State Building Code. Development is defined under the NFIP as "any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials." For development occurring in Zone AE within a regulatory floodway, the following NFIP requirement would apply: Along watercourses with a designated Regulatory Floodway no encroachments, including fill, new construction, substantial improvements, and other development are allowed within the floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practices that the proposed encroachment would not result in any increase in flood levels within the community during the base flood discharge. Therefore any encroachment, fill placement, or other development activity proposed within the floodway may require hydrologic and hydraulic analyses to determine if the work will cause an increase in the base flood elevation. If any increase in the base flood elevation is anticipated, coordination with FEMA through the Conditional Letter of Map Revision (CLOMR) process is required prior to the start of the project.
NH Department of Resource and Economic Development **NH Natural Heritage Bureau** Contact: Maddie Severance Assistant Ecological Information Specialist nhbreview@dncr.nh.gov New Hampshire Natural Heritage Bureau Division of Forests & Lands NH Dept. of Natural & Cultural Resources 172 Pembroke Rd Concord, NH 03301 (603)-271-0687 (office)	10-Jul-23	Looking at your list of questions, NHB can only comment on the presence of rare species and exemplary natural communities in the proposed project area (item #3). In order to request rare species information please submit a project on the DataCheck Tool found here: NHB DataCheck Tool (state.nh.us). Once the project is submitted on the DataCheck Tool we can review the project along with NH Fish and Game to determine if we have any concerns and provide recommendations.
	25-Mar-24	I'm reaching out regarding your last correspondence that we have for your NHB23-2081 Dover Community Trail project. It does seem that your project requires a Fis 1004 consultation request. The requirements can be found here: https://gencourt.state.nh.us/rules/state_agencies/fis1000.html. For a more user-friendly version, we have an unofficial checklist that you can refer to on our homepage: Environmental Review | State of New Hampshire Fish and Game (nh.gov). If you require anything in the meantime, please reach out to me and I'll do my best to help you.
NH Fish & Game Contact: Kevin Newton Wildlife Biologist Kevin.M.Newton@wildlife.nh.gov NH Fish and Game Department Wildlife Division 11 Hazen Drive, Concord NH 03301 (603) 271- 5860	11-Jul-23	We received your letter regarding the Dover Community Trail (Phase IV) (NHDOT Project No. 41373 and Fuss & O'Neill Reference No. 20170299.000). Would you be able to send us electronic versions of the letter and map you submitted? If you have a kmz or kml of the planned trail footprint, please share that as well. In order to better address your questions regarding mitigation efforts at this site, we will require you to submit an NHB Data Check letter. This will help us determine the potential impact to threatened and endangered species in the area and consider possible mitigation options.
	9-Nov-23	Thank you for providing the NHB letter as Kim requested. Since this project requires a NHDES Shoreland Standard permit and NHDES wetland standard dredge and fill, it will require consultation under FIS1004.03. Please refer to our submittal requirements which can be found at CHAPTER Fis 1000 CONSERVATION OF ENDANGERED SPECIES (state.nh.us) . Please include the NHB letter in the subject line once consultation materials are provided.

New Hampshire Department of Environmental Services **Environmental Justice** Contact: Vincent Perelli Administrator of the Planning, Prevention & Assistance Unit vincent.r.perelli@des.nh.gov NH Department of Environmental Services Office of the Commissioner 29 Hazen Drive/P.O. Box 95 Concord, NH 03302-0095 (603) 271-8989	12-Jul-23	Thank you for your letter of July 7th regarding the Dover Community Trail Project. In reference to a preferred mitigation efforts list, the NH Department of Environmental Services (NHDES) does not have such a list. Looking at several of your other questions, they would involve research using resources available to you such as NHDES's OneStop Database. We will be happy to set up a pre-application meeting but would suggest that having a proposal to review and discuss would be important to properly address your questions and to discuss other available resources for some of your specific questions. Once you have an initial proposal/design prepared, you may use the form on our website at NH Online Forms System - Pre-Application Meeting Request. Version 3.13 to schedule a pre-application meeting. We look forward to discussing the project with you and your colleagues.

Appendix B

Phase IA Archeological Sensitivity Assessment

PHASE IA ARCHAEOLOGICAL SENSITIVITY ASSESSMENT
DOVER COMMUNITY TRAIL EXPANSION PROJECT
DOVER (STRAFFORD COUNTY), NEW HAMPSHIRE
ADDENDUM 1: TRAIL ALIGNMENT ALTERNATIVE

Submitted to
Fuss & O'Neill
50 Commercial Street, Unit 2S
Manchester, NH 03101

Prepared by
Jacob Tumelaire, MA, RPA and
Jessica Cofelice, MA, RPA

IAC
INDEPENDENT
ARCHAEOLOGICAL
CONSULTING, LLC

www.iac-llc.net
34 Dover Point Road, Suite 300
Dover, NH 03820

IAC Report No. 1491
February 27, 2024

THIS REPORT CONTAINS CONFIDENTIAL INFORMATION
NOT FOR PUBLIC DISTRIBUTION

PROJECT SUMMARY

Project Name:	Dover Community Trail Expansion Transportation Alternatives Program
Type of Survey:	Phase IA Archaeological Sensitivity Assessment
Client:	Fuss & O'Neill
Sponsor Agency:	Federal Highway Administration (FHWA)
Location:	Dover (Strafford County), New Hampshire
Project Area Size:	total linear trail length of roughly 395 m (1,296 ft)
Expected Impacts:	Project impacts include the construction of a pedestrian and bicycle trail to extend from Bellamy Park in Dover, along the Bellamy River, and terminating at Rte. 155/Knox Marsh Road. Extant trails along much of the proposed route will require expansion or improvement, and new trail segments will be constructed where the proposed route does not follow existing paths. The project remains in the design stage and engineers have yet to determine the methods of expansion or construction. Potential measures could include topsoil removal and filling, or surface fill deposits to prevent disturbance to natural soils. **The 2023 Phase IA assessment included an alternative trail alignment along the southern bank of the Bellamy River in an area outside of the 2020 Phase IA survey area.**
Dates of Fieldwork:	NHDHR Site File Search: January 18, 2023 Field Inspection: January 19, 2023
Sites Registered:	none
Findings:	IAC identified virtually the entire trail alignment as sensitive for Pre-Contact Native American cultural deposits, designated as Sensitive Area 3 (SA-3) with SAs 1 and 2 delineated during the 2020 assessment. The trail crosses a series of level terraces of well-drained sandy soil overlooking the resource base and travel corridor of the Bellamy River, prime locations for site types from ephemeral activity loci to long-term occupations. Nineteenth-century maps showed one Post-Contact resource near the alignment's eastern terminus at Bellamy Road, however, the resource is likely beneath the extant parking area and archaeologists found no Euroamerican features during the survey. Nevertheless, SA-3 is also designated as sensitive for Post-Contact resources given documentary evidence for multiple early Euroamerican occupations that predate the nineteenth-century maps. Research suggests that by the 1650s, as many as four homesteads had been established along this stretch of the Bellamy River. Such pre-1800 resources could have no visible indications of their presence on the modern landscape, but informative artifact deposits or features could remain buried along the proposed trail route. Finally, the extant trail is simply a compressed footpath and therefore intact Pre-Contact or Post-Contact archaeological deposits could exist both beyond and below the current trail limits.

Recommendations: Should final design plans require ground disturbance to construct the trail, IAC recommends a Phase IB Intensive Archaeological Investigation of the impact areas prior to construction to confirm the presence or absence of Pre-Contact and/or Post-Contact archaeological deposits. Phase IB testing along the full alternative alignment would require approximately 40 shovel test pits.

Should engineers devise a technique to avoid ground disturbance, IAC recommends no further archaeological survey for the project. Although filling and subsequent use can pose a compression hazard to buried cultural deposits, the proposed trail will be for pedestrians and bicyclists only. Such land use is unlikely to negatively affect archaeological deposits beneath the fill and will likely provide additional protection for potential archaeological resources located beneath the existing and often-used trail. Finally, IAC also recommends a review of final impacts, e.g. staging areas or stockpile locations, to establish the need for Phase IB testing at these locations.

No. of pages: 20
No. of Maps: 4
No. of Figures: 11

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

This Page Intentionally Left Blank.

INTRODUCTION

Independent Archaeological Consulting, LLC (IAC) completed a second Phase IA Archaeological Sensitivity Assessment for the Dover Community Trail Expansion Transportation Alternatives Program (Dover TAP) project in Dover (Strafford County), New Hampshire in the winter of 2023, facilitated by unseasonably warm weather and absent snow cover (Figure 1). Proposed impacts include the construction of a pedestrian and bicycle trail to extend west from Bellamy Park along the Bellamy River to terminate at Rte. 155/Knox Marsh Road at the Lilac Lane intersection (Figure 2). Extant trails along much of the proposed route will require expansion or improvement, while new trail segments will be constructed where the proposed route does not follow existing paths. The project remains in the design stage and engineers have yet to determine the methods of expansion or construction. Potential measures could include topsoil removal and filling, or surface fill deposits to prevent disturbance to natural soils. IAC completed a Phase IA assessment in 2020 that included a 1.9 km (1.2 mi) proposed alignment along the north bank of the Bellamy River. **The 2023 survey area included a 395-m (1,296-ft) alternative trail alignment along the southern riverbank in an area beyond the 2020 survey limits (see Figure 1).** IAC's 2020 report includes chapters devoted to the local Native American and Euroamerican cultural contexts, and the information is therefore excluded from this addendum report for brevity.

The objective of the Phase IA assessment is to evaluate the archaeological sensitivity, i.e. potential, for both Pre-Contact Native American and/or Post-Contact Euroamerican cultural resources within the project area. IAC completed the assessment through a review of known archaeological resources inventoried on the New Hampshire Division of Historic Resources (NHDHR) online site file database EMMIT; desktop analysis of topography, soils and proximal natural resources; cartographic overlays of the project area onto historic maps and past aerial images of Dover; a review of secondary historic resources; and finally, a walkover inspection of the project area. The work is authorized under Section 106 of the Historic Preservation Act of 1966 (P.L. 89-665), as amended, and as implemented by regulations of the Advisory Council of Historic Preservation (36 CFR Part 800).

The distribution of known Pre-Contact archaeological sites in New Hampshire indicates the cooccurrence of several variables at most Native American occupation or activity sites, including level terrain, well drained soils, good vantage over the surrounding countryside, and access to natural resources such as water, stone tool raw material, clay for pottery, and floral or faunal consumables. The Dover TAP alternative trail alignment stretches along the southern bank of the Bellamy River, a primary resource base and travel route for both Native American and Euroamerican groups. In addition to a potential for Native American cultural deposits, map review revealed Euroamerican resources documented near the trail alignment's eastern end. The Walling (1858) map shows a single resource south of the river and west of Bellamy Road. The resource's label is illegible on the Walling (1858) map but the Hurd (1892) map shows the same resource as one of several homes owned by C.H. Sawyer.

IAC identified virtually the entire alternative trail alignment as sensitive for Pre-Contact Native American cultural deposits, designated as Sensitive Area 3 (SA-3), with SAs 1 and 2 delineated during the initial 2020 assessment. The proposed trail crosses a series of level terraces of well-drained sandy soil overlooking the resource base and travel corridor of the Bellamy River. Landforms along the alternative alignment could support Pre-Contact site types from ephemeral resource-extraction activity sites to longer-term habitations. Archaeologists observed no evidence of surficial Euroamerican features during the walkover survey – the resource shown on the Walling (1858) and Hurd (1892) maps is likely beneath the existing parking area – however, SA-3 is also designated as sensitive for Post-Contact resources given documentary evidence for multiple early Euroamerican occupations that predate the nineteenth-century maps. Research suggests by the 1650s, as many as four homesteads had been established along this stretch of the Bellamy River. Often constructed without the substantial stone foundations common to later Euroamerican homes, pre-1800 resources could have no visible indications of their presence on the modern landscape. Nonetheless,

informative early Euroamerican artifact deposits or features could remain buried along the proposed trail route and therefore IAC also designated SA-3 as sensitive for Post-Contact archaeological resources. In addition, the extant trail is simply a compressed footpath and therefore intact Pre-Contact or Post-Contact archaeological deposits could exist both beyond and *below* the current trail limits.

Should final design plans require ground disturbance to construct the trail, IAC recommends a Phase IB Intensive Archaeological Investigation of the impact areas prior to construction to confirm the presence or absence of Pre-Contact archaeological deposits. Phase IB testing along the full alternative alignment would require approximately 40 shovel test pits. Alternatively, should engineers devise a technique to avoid ground disturbance, IAC recommends no further archaeological survey for the project. Although filling and subsequent use can pose a compression hazard to buried cultural deposits, the proposed trail will be for pedestrians and bicyclists only. Such land use is unlikely to negatively affect archaeological deposits beneath the fill and will likely provide additional protection for potential archaeological resources located beneath the existing and often-used trail. Finally, IAC also recommends a review of final impacts, e.g. staging areas or stockpile locations, to establish the need for Phase IB testing at these locations.

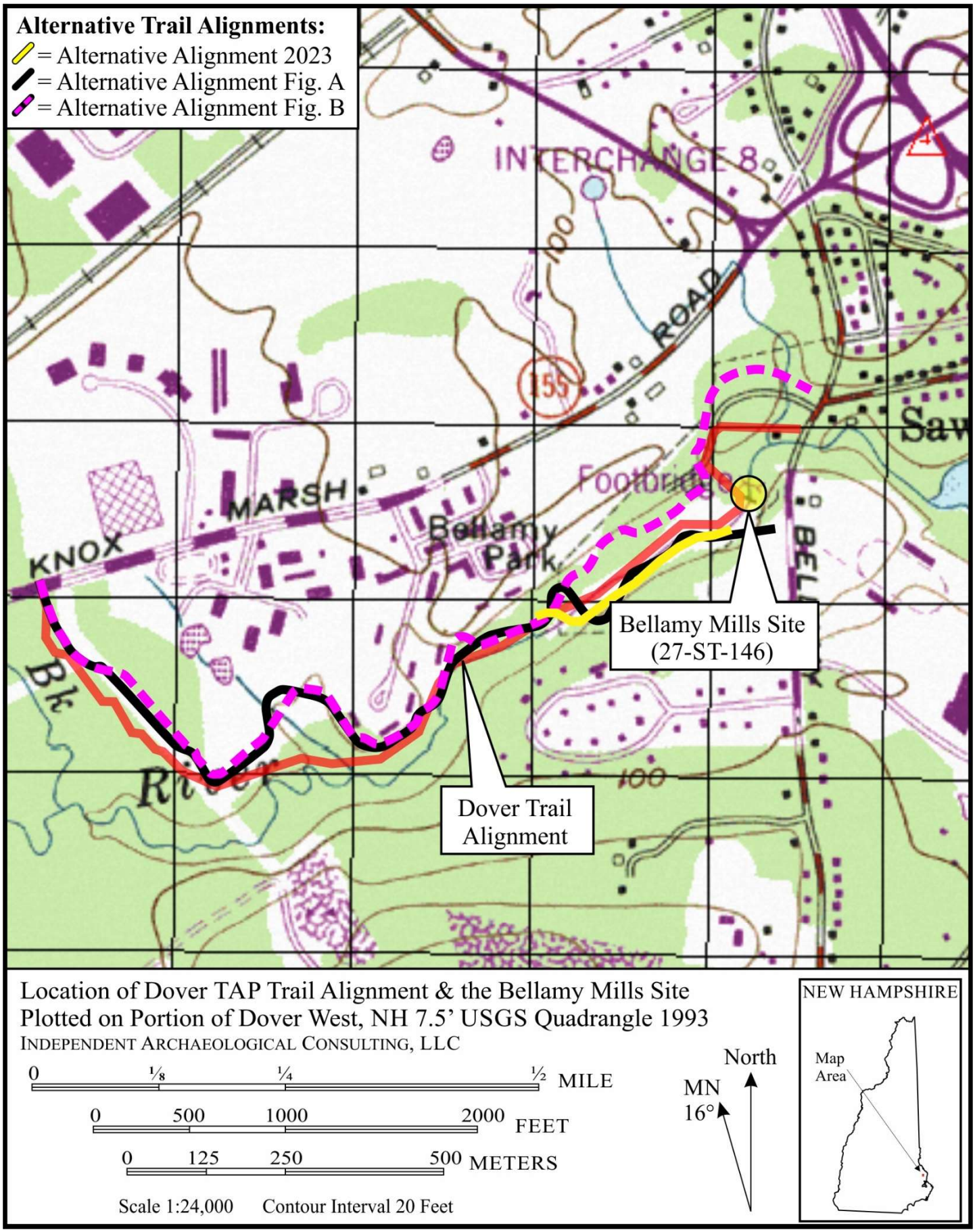


Figure 1. Dover TAP project original and alternative trail alignments in Dover, New Hampshire (after USGS 1993).

PROJECT LOCATION

The town of Dover (Strafford County) is located in a 30-mile strip of land at the southeastern portion of New Hampshire designated as the Seaboard Lowland physiographic region. The Seaboard Lowland was submerged beneath the Atlantic Ocean during the waning stages of the last Ice Age and eroded by wave action for millennia. The result is relatively little topographic relief and low elevations that range from sea level to just 150 m (500 ft) above mean sea level (AMSL), with an average elevation of just 30 m (100 ft) AMSL. Following the retreat and melting of the great ice masses, the ice-depressed land rebounded, and sea levels rose nearly to pre-glacial levels (Van Diver 1987:18).

The Seaboard Lowland lay within the Piscataqua River watershed that drains roughly 8% of New Hampshire's total area (Potter 1994:10). In addition to the Bellamy River along the proposed trail alignment, other primary waterways of the Piscataqua River drainage include the Cocheco, Isinglass, Lamprey, Oyster, Squamscott, Exeter and Piscassic Rivers. Smaller waterways near the current project area include Knox Marsh Brook that meets the Bellamy River at a confluence just southwest of the proposed trail. The Piscataqua River watershed terminates at the Great Bay Estuary, a resource-rich ecosystem where tidally driven seawater meets the fresh water of the Piscataqua River drainage (NHDES 2019). The drainage system provided access to a wealth of floral and faunal consumables as well as a transportation corridor for both Pre-Contact and Post-Contact peoples to travel between the coast and interior forests using the network of the Piscataqua and its tributaries, including the Bellamy River.

The Dover TAP alternative trail alignment stretches along the southern bank of the Bellamy River, beginning at Bellamy Park and extending generally west for 395 m (1,296 ft) to a point where it crosses the river and connects to the original trail alignment subject to Phase IA assessment in 2020. The alternative trail crosses undeveloped wooded landforms with evidence of past disturbance limited to the existing trail visible as a compressed footpath (Figures 2-5).

A generalized bedrock map of New Hampshire indicates that the Dover TAP project is located in an area of Eliot Formation Silurian to Ordovician metasedimentary and metavolcanics rocks, including phyllite, calcareous quartzite, quartz-mica schist and well-bedded calc-silicate (USGS 1997). The alternative trail will cross landforms of three distinct soil units as shown in Table 1, dominated by sandy loams with a small pocket of silt loam where the trail crosses the Bellamy River channel (USDA 2019).

Table 1. Soil units along the alternative trail alignment.

Soil Unit	**Slope Range in APE**
Charlton fine sandy loam	3-8%
Suffield silt loam	8-15%
Windsor loamy fine sand	0-8%

Figure 2. Eastern end of alternative trail alignment at the extant parking area, view west.

Figure 3. An example of the level terraces along the alternative trail alignment, view west.

Figure 4. View northwest of the Bellamy River from the alternative trail alignment.

Figure 5. An example of ground conditions along the existing trail, view west.

POST-CONTACT EUROAMERICAN ARCHAEOLOGICAL RESOURCES

The full Post-Contact Euroamerican cultural context is not repeated here, but it is worth noting that research suggests by the 1650s, at least four homesteads had been established along the stretch of the Bellamy River between "Nocks Marsh Road" and Mast Road (Thompson, 1892). These ephemeral homestead sites likely consisted of small, sill-on-grade houses, which did not persist into the eighteenth-century. Unlike the later, eighteenth- and nineteenth century homes, which are shown clustered along the roadways on the Walling (1858) and Hurd (1892) maps, the seventeenth-century dwellings are more likely to be closer to the river, as they pre-dated the roadways. During the 2022 walkover survey, Archaeologists observed no evidence of surficial Euroamerican features along the alternative alignment. Due to the ephemeral nature of seventeenth-century homestead sites, portions of the proposed trail alignment are assessed as sensitive for seventeenth-century resources.

Figures 6 and 7 show the alternative trail alignment overlaid on the Walling (1858) and Hurd (1892) maps along with the 2020 survey area. Both maps show resources flanking the northern and southern shorelines of the Bellamy River, just west of Bellamy Road. The southern resource, closest to the new proposed trail alignment, is present on the 1858 map, however the label illegible (Figure 6). By 1892, when cartographers drafted the Hurd map, the resource is attributed to C.H. Sawyer (Figure 7). The nineteenth-century map overlays suggest any remnants of the C.H. Sawyer homestead are likely located beneath the current Bellamy Park Disc Golf parking area.

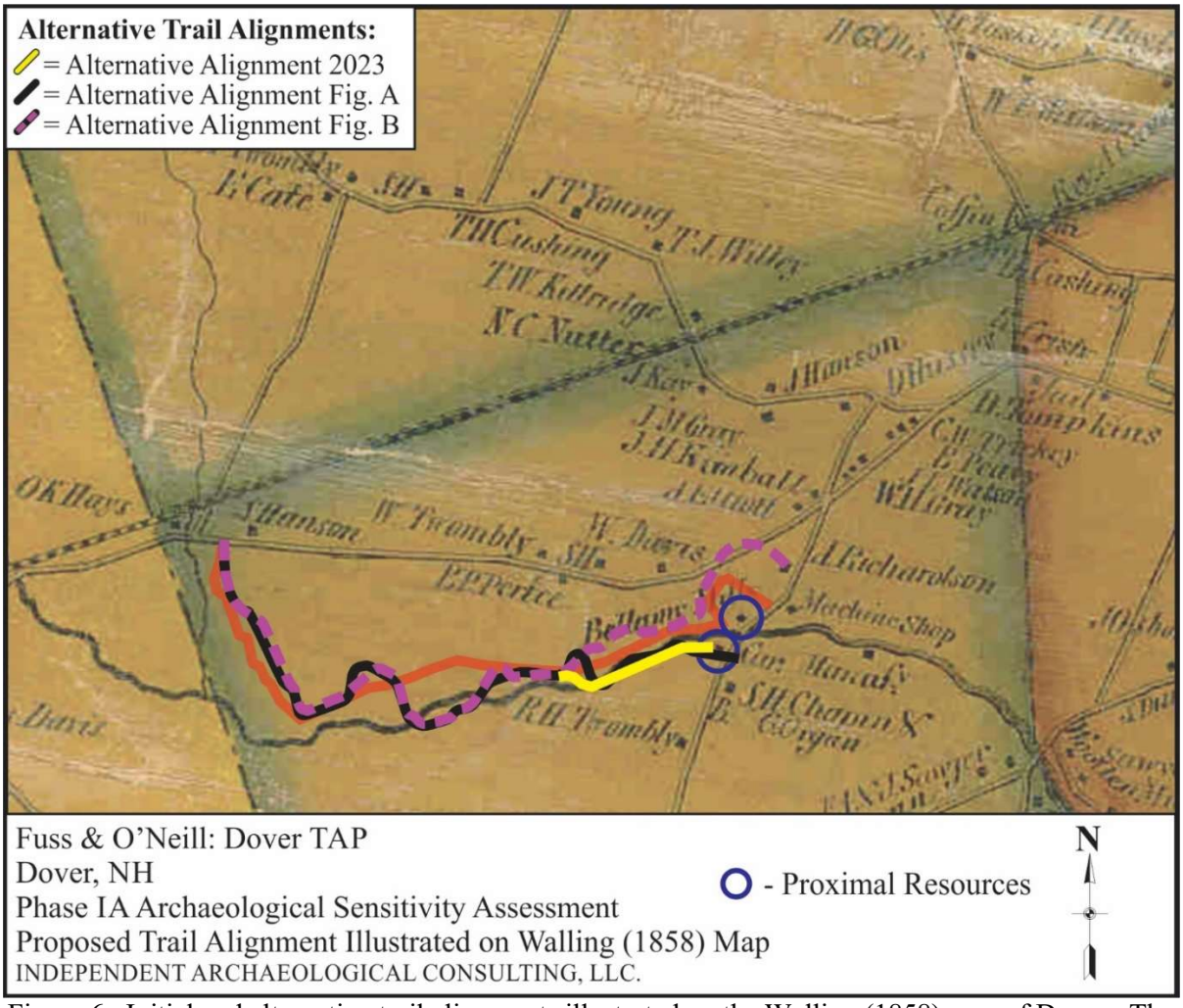


Figure 6. Initial and alternative trail alignments illustrated on the Walling (1858) map of Dover. The blue circle highlights the proximal Post-Contact resources.

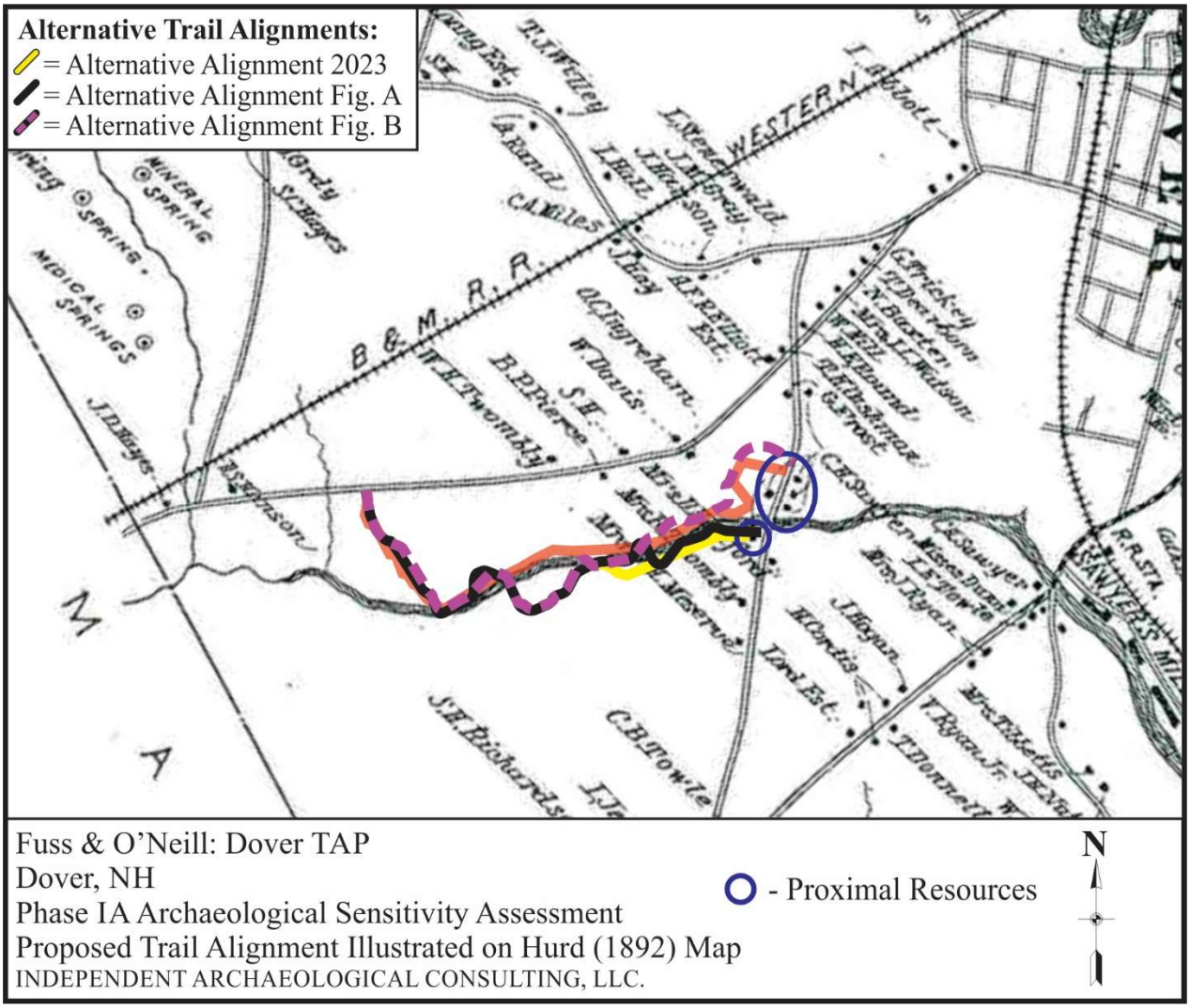


Figure 7. Initial and alternative trail alignments illustrated on the Hurd (1892) map of Dover. The blue circle highlights the various homes owned by C.H. Sawyer, including one south of the river.

PHASE IA ARCHAEOLOGICAL SENSITIVITY ASSESSMENT METHODS AND RESULTS

The Phase IA sensitivity assessment includes several components to establish the archaeological sensitivity of a project area, which may be described as the likelihood or *potential* for Pre-Contact Native American or Post-Contact Euroamerican archaeological resources. To evaluate the potential for Pre-Contact cultural deposits, IAC analyzes several sources of data: soil information, topography, proximity to water or other resources (e.g., tool stone or clay for pottery), data from the distribution of known Pre-Contact sites, background research, and a walkover inspection. The Euroamerican sensitivity assessment involves these same steps but also includes a detailed review of nineteenth-century cartographic resources (Hurd 1892; Walling 1858), documentary evidence, historic USGS quadrangle maps, and available aerial images to identify documented Post-Contact residential or commercial sites within the survey limits.

The distribution of known Pre-Contact archaeological sites in New Hampshire indicates several criteria common to Native American occupation or activity sites, including level terrain, well drained soils, good vantage of the surrounding landscape, and access to water or other natural resources such as stone-tool raw material or clay beds for pottery production. The Dover TAP alternative trail alignment crosses a series of level terraces along the southern bank of the Bellamy River. In addition to a wealth of floral and faunal consumables, the Bellamy River provided navigable access to the major regional Native American travel corridor of the Piscataqua River tributary system. Native American groups could follow the river inland to the west or east to the Little Bay, Great Bay and eventually the Atlantic Ocean, providing access to resource-rich forest, riverine, estuarine and marine ecosystems. Considering topography, soils and general environmental conditions, the initial stages of the sensitivity assessment suggested a high potential for Pre-Contact cultural deposits along the alternative alignment.

Jacob Tumelaire served as Principal Investigator for the 2023 assessment and conducted the Phase IA walkover survey on January 19, 2023, aided by Project Archaeologist Shannon Mascarenhas. Unseasonable warm weather and virtually nonexistent snow cover provided excellent visibility along the full survey area extent. Archaeologists documented the inspection results with photographs, detailed notes and GPS data collected using a Trimble® Geo7X handheld GPS receiver. The field inspection is a vital step in the Phase IA survey that allows archaeologists to refine the results of the initial desktop assessment according to real-world ground conditions and the extent of Post-Contact development.

Results of Archaeological Sensitivity Assessment

The 2023 Phase IA assessment resulted in the delineation of Sensitive Area 3 (SA-3), an area of Pre-Contact and Post-Contact archaeological sensitivity that encompasses the full extent of the alternative trail alignment (Figure 8). The alternative trail extends across a series of level terraces that form the southern bank of the Bellamy River (Figures 9-12). Native Americans camped atop the riverside landforms had direct access to a variety of floral and faunal consumables as well as to the river itself that provided a navigable route inland to the west or east towards New Hampshire's coastline. Given the topography and proximal resource bases, potential site types along the alternative alignment could range from ephemeral resource-extraction activity loci to long-term occupation sites.

Although archaeologists observed no evidence of surficial Euroamerican features during the walkover survey, with the resource shown on the Walling (1858) and Hurd (1892) maps likely beneath the existing parking area (Figure 13), IAC nonetheless designated SA-3 as also sensitive for Post-Contact Euroamerican resources. Background research indicates the presence of multiple early Euroamerican occupations that predate the nineteenth-century maps, with as many as four homesteads established along the Bellamy River by the 1650s. Often constructed without the substantial stone foundations common to later Euroamerican homes, these pre-1800 resources could have no visible indications of their presence on the modern

landscape. Nonetheless, informative early Euroamerican artifact deposits or features could remain buried along the proposed trail route and therefore IAC also designated SA-3 as sensitive for Post-Contact archaeological resources.

As previously mentioned, the existing trail is visible as a compressed footpath worn into the soil with no significant ground disturbance associated with its construction or use. Considering the minimal impact of the extant trail, intact Pre-Contact or Post-Contact cultural deposits could be preserved beneath the trail in addition to beyond its horizontal limits (Figure 14).

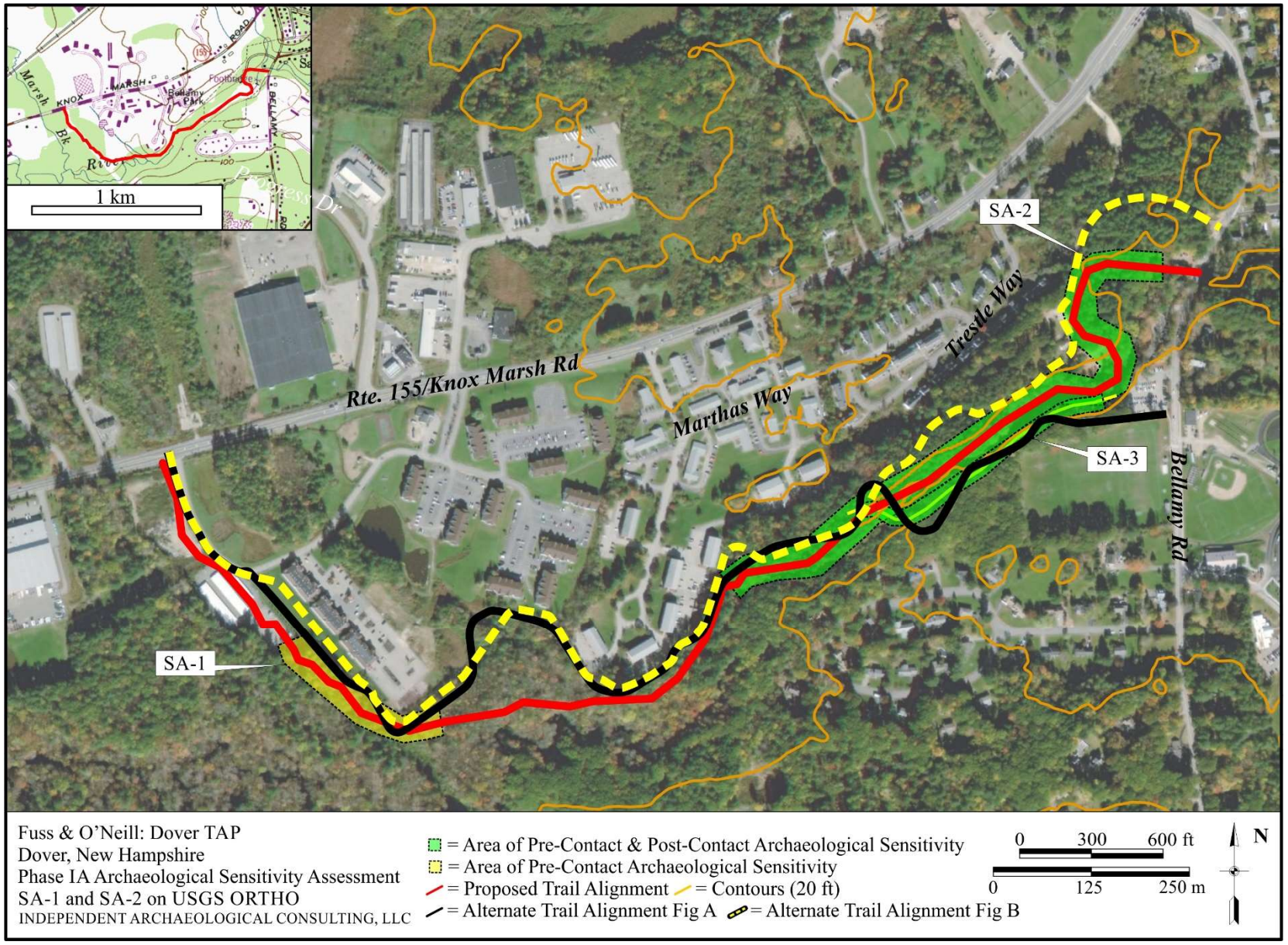


Figure 8. Archaeologically sensitive areas (SAs) identified along the original and alternative trail alignments.

Figure 9. View northeast of the Bellamy River from the alternative trail alignment.

Figure 10. An example of the highly sensitive riverside landforms within the survey area around the extant trail (dashed line), view west.

Figure 11. An example of the broad, level riverside landforms along the alternative trail alignment, view southwest.

Figure 12. An example of the level riverside terraces along the alternative trail alignment, view west.

Figure 13. Bellamy Park Disc Golf parking area at the eastern trail terminus that likely covers any remnants of the nineteenth-century home shown in this approximate area.

Figure 14. Typical conditions along the existing trail (outlined), view west.

CONCLUSIONS AND RECOMMENDATIONS

IAC completed a Phase IA Archaeological Sensitivity Assessment for the Dover TAP project alternative trail alignment in Dover (Strafford County), New Hampshire in the winter of 2023. Project plans include the construction of a new pedestrian and bicycle trail to extend from Bellamy Park along Bellamy Road to its western terminus near the intersection of Rte. 155/Knox Marsh Road and Lilac Lane. IAC completed a Phase IA assessment of the original 1.9-km (1.2-mi) proposed alignment on the northern bank of the Bellamy River in 2020 and the 2023 survey encompassed a proposed alternative trail alignment on the southern riverbank (see Figure 1). The project remains in the preliminary design stage with no established methods of expansion/improvement or construction. Potential measures could include topsoil removal and filling, or surface fill deposits to prevent disturbance to natural soils.

The Dover TAP alternative trail alignment stretches along the southern bank of the Bellamy River, crossing numerous level landforms with ready access to the resource base and travel corridor of the river and the larger Piscataqua River watershed. The initial stages of the assessment suggested that significant portions of the project area are sensitive for Pre-Contact cultural deposits based on topography, soils, vantage, and proximity to the waterway. Background research also revealed the presence of a nineteenth-century Euroamerican resource near the alignment's eastern end, with an illegible label in 1858 and the associated with C.H. Sawyer in 1892. In addition to these nineteenth-century resources, IAC's research suggests that by the 1650s, as many as four homesteads had been established along the Bellamy River in and near the alternative trail alignment.

IAC identified virtually the entire alternative trail alignment as sensitive for Pre-Contact Native American cultural deposits, designated as Sensitive Area 3 (SA-3), with SAs 1 and 2 delineated during the initial 2020 assessment. The proposed trail crosses a series of level terraces of well-drained sandy soil overlooking the resource base and travel corridor of the Bellamy River. Landforms along the alternative alignment could support Pre-Contact site types from short-term activity sites to camps inhabited for multiple days. Archaeologists observed no evidence of Euroamerican features during the walkover survey – the resource shown on the Walling (1858) and Hurd (1892) maps is likely beneath the existing parking area – but nonetheless designated SA-3 as also sensitive for Post-Contact resources given documentary evidence for multiple early Euroamerican occupations that predate the nineteenth-century maps. Often constructed without the stone foundation elements common to Post-Contact homes built in the 1800s, pre-1800 resources could have no visible indications of their presence on the modern landscape. Nonetheless, informative early Euroamerican artifact deposits or features could remain buried along the proposed trail route. In addition, the extant trail is simply a compressed footpath and therefore intact Pre-Contact or Post-Contact archaeological deposits could exist both beyond and *below* the current trail limits.

IAC recommends a Phase IB Intensive Archaeological Investigation to confirm the presence or absence of Native American and/or Euroamerican cultural deposits prior to any ground disturbance associated with trail construction or expansion/improvement within SA-3. A Phase IB investigation along the full alternative trail alignment in SA-3 would require a total of approximately 40 shovel test pits. Should engineers devise methods to avoid ground disturbance during trail expansion or construction – such as filling atop the modern ground surface with no preceding excavation or ground disturbance – then IAC recommends no further archaeological survey for the Dover TAP alternative alignment. Filling and subsequent land use can pose a compression hazard to buried archaeological resources, however, the proposed trail will **only** be used for pedestrian and bicycle traffic. Foot and bicycle traffic pose a minimal threat to potential buried cultural resources and is unlikely to negatively affect archaeological deposits beneath the fill. Not only will fill deposits pose less of a threat than the current trail use as a foot-worn path atop the natural ground surface, but the fill may also provide additional protection for any undocumented archaeological resources located beneath the trail. **Finally, IAC recommends a review of final impacts, e.g. staging areas or stockpile locations, to establish the need for Phase IB testing at these locations**.

REFERENCES CITED

Hurd, D. H.
1892 *Town and City Atlas of the State of New Hampshire*. D. H. Hurd, Boston.

New Hampshire Department of Environmental Services
2019 Generalized Bedrock Geologic Map of New Hampshire. Electronic document, http://des.nh.gov/organization/commissioner/pip/publications/geologic/index.htm. Accessed February 5, 2019.

Potter, Jane
1994 New Hampshire's Landscape and Environment. *The New Hampshire Archeologist* 33/34(1): 9-19.

Thompson, Mary P.
1892 *Landmarks of Ancient Dover, New Hampshire.* Durham Historic Association, Durham, New Hampshire.

United States Department of Agriculture
2019 Natural Resources Conservation Service Web Soil Survey. Electronic document, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed February 5, 2019

USGS
1993 *Dover West New Hampshire, Quadrangle Map*. 7.5 minute series. U. S. Geological Survey, Washington D. C.
1997 *Bedrock Geologic Map of New Hampshire.* U. S. Geological Survey, Reston, Virginia.

Van Diver, Bradford B.
1987 *Roadside Geology of Vermont and New Hampshire*. Mountain Press Publishing Company, Missoula.

Walling, H. F.
1858 *Merrimack County, New Hampshire*. Smith & Peavey, Boston and New York.

Appendix E

Type, Span, and Location Study Letter

FUSS & O'NEILL

October 26, 2023

Donna Benton
City Planner
City of Dover, New Hampshire
288 Central Avenue, 2nd Floor
Dover, New Hampshire 03820

Re: Dover Community Trail Phase IV
Type, Span, and Location Study
Fuss & O'Neill Reference No. 20170299.001

Dear Ms. Benton:

Fuss & O'Neill is pleased to provide the following Type, Span and Location Study (TSL) Report for the construction alternative for the pedestrian crossing of the Bellamy River for the Dover Community Trail, Phase IV project. This report summarizes the layout and superstructure type, and evaluates the substructure types for the proposed bridge.

Executive Summary

- The bridge will connect the proposed Dover Community Trail, Phase IV across the Bellamy River.
- A prefabricated steel through truss with a wood deck is recommended.
- Concrete abutments bearing on structural fill or bedrock is recommended.

Existing Condition

The proposed Dover Community Trail, Phase IV project will follow an existing non-delineated trail system along the northern side of the Bellamy River. A bridge structure is proposed to gain access to the southern side of the river. There once was a structure at the proposed location, evident by two old masonry abutments on either side of the river. The abutments are located along the river banks right against the water line. Based on the survey information, the grade at the face of the old abutments is 76-feet with a top of abutment elevation of 82-feet.

Proposed Trail Alignment, Profile, and Typical Section

The trail alignment and profile have not yet been fully developed; additional information regarding the design of these components will be included in the engineering study. It is expected the horizontal alignment will match into the selected bridge layout and the profile will be a tangent across the length of the bridge of approximately 3%. The trail approach will be 10 feet wide with 2-foot shoulders on either side for a total width of 14 feet. The bridge will have a curb-to-curb width of 10 feet to match the approach trail width. The slopes coming off the approach trail section will be 4:1. A 2:1 maximum slope will be used in front of the abutments and wingwalls.

Gateway Building
50 Commercial St.
Manchester, NH
03101
t 603.668.8223
800.286.2469
f 860.533.5143

www.fando.com

Connecticut
Maine
Massachusetts
New Hampshire
New York
Rhode Island
Vermont

Bridge Superstructure Type

Based on previous information from the City of Dover, the preferred bridge type is a prefabricated steel truss system. This system will be designed, fabricated, and delivered by a truss manufacturer. The system can be erected quickly since it will come in two pre-constructed pieces which reduces the construction time in comparison to other structure types. Also, the pedestrian truss systems are found to be more aesthetically pleasing compared to the traditional deck-beam structures. We agree that a prefabricated truss is the appropriate bridge type for this location.

Proposed Bridge Layout

Two bridge length/layout options were evaluated, a 120-foot bridge and a 105-foot bridge. For each option, the proposed abutments will be placed at the top of the channel banks in order to avoid any hydraulic impacts. Based on information from the City of Dover, the bridge will be significantly higher than known flood elevations, therefore no hydrologic/hydraulic analyses will be needed. The layout of each option is discussed below.

Option 1 – 120-foot Bridge

This layout option consists of a 120-foot truss structure, with the abutments located within the flattest areas on either side of the Bellamy River in an effort to reduce the slope impacts of the trail approach and wingwalls. This resulted in the structure crossing the river at an approximate angle of 80 degrees, requiring the bridge length to be 120 feet.

This layout option is expected to result in more overall project impacts and construction cost; therefore, this option is not recommended.

Option 2 – 105-foot Bridge

To reduce the impacts, a shorter span length with a more direct intersection with the original Dover Community Trail alignment was evaluated. This layout option consists of a 105-foot truss structure, with the abutments located to set the bridge perpendicular to both the river and the original Dover Community Trail alignment.

This is the recommended option as it will have a shorter span length which will result in fewer impacts to the area and will be more cost effective.

Geotechnical

S.W. Cole completed borings at the approximate proposed abutment locations on either side of the Bellamy River. A Geotechnical Report was prepared and summarizes the findings of the subsurface explorations and the geotechnical recommendations. The borings indicate that the approximate bedrock elevations are 83 feet and 93 feet for Abutments A and B, respectively. Both borings consist of glacial till and fine sand from existing ground to the bedrock elevation of 82 feet for

Abutment A and 93 feet for Abutment B. The bedrock is classified as hard and slightly weathered. Please see the Geotechnical Report for additional information.

Abutment Type

Based on the shallow depth to bedrock and the high blow counts of the existing glacial till layers, integral abutments and abutments on piles were determined to not be viable; therefore, standard cantilever abutments with spread footings, supported on glacial till or bedrock are recommended.

The proposed finished grade elevations in front of the abutments will be 93 feet and 96.5 feet for Abutments A and B, respectively. Per the Geotechnical Report, the bottom of a footing founded on soil should be 4.5 feet below grade.

The proposed bottom of footing elevation of abutment A is 88.5 feet. This places the footing approximately 6.5 feet above bedrock and within the glacial till layer. The glacial till is adequate to support the footing, therefore it is recommended the abutment A footing be founded on soil in lieu of over-excavating to the bedrock surface.

At abutment B, bedrock is shallower and was encountered at elevation 93 feet; only 3.5 feet below the proposed grade. Therefore, it is recommended the abutment B footing be founded on bedrock.

Constructability

The access to the proposed construction site is limited. The abutments are located on the banks on either side of the Bellamy River which are wooded and have no access road. To construct the proposed structure, access has to be created to allow large machinery and trucks to get to the site. For example, the prefabricated truss will be delivered to the site in two pieces. Each piece will be 55 feet long and weigh approximately 26,000 pounds. The trucks will need to be able to drive up to the abutment locations and get back out. Because of the large weight for each piece, a crane will need to be located at each abutment to erect the structure.

The proposed approach trail width is 14 feet, which should be sufficient to allow access for equipment and materials to be delivered to the bridge location. It is anticipated that staging areas for the bridge construction will require additional clearing beyond what is needed for the proposed work. These potential areas can be further evaluated during the preliminary design.

Cost Estimate

A preliminary cost estimate, for the bridge only, has been prepared using standard NHDOT items. The quantities were estimated using the conceptual plans. The estimate was developed using current construction costs with adjust for future inflation; unit prices were based on recently bid, similar type, projects along with an estimate for the truss system provided by the manufacturer.

105-Foot Steel Truss Structure

Base Bridge Items:	$	490,000
Mobilization (10%):	$	50,000
Engineering & Permitting (10%)	$	55,000
Construction Engineering (15%)	$	80,000
GRAND TOTAL	**$**	**675,000**

Recommendations

The recommended bridge type is a 105-foot, simple-span, prefabricated steel truss with wood plank deck supported on cantilever abutments with spread footings on soil (Abutment A) and on bedrock (Abutment B).

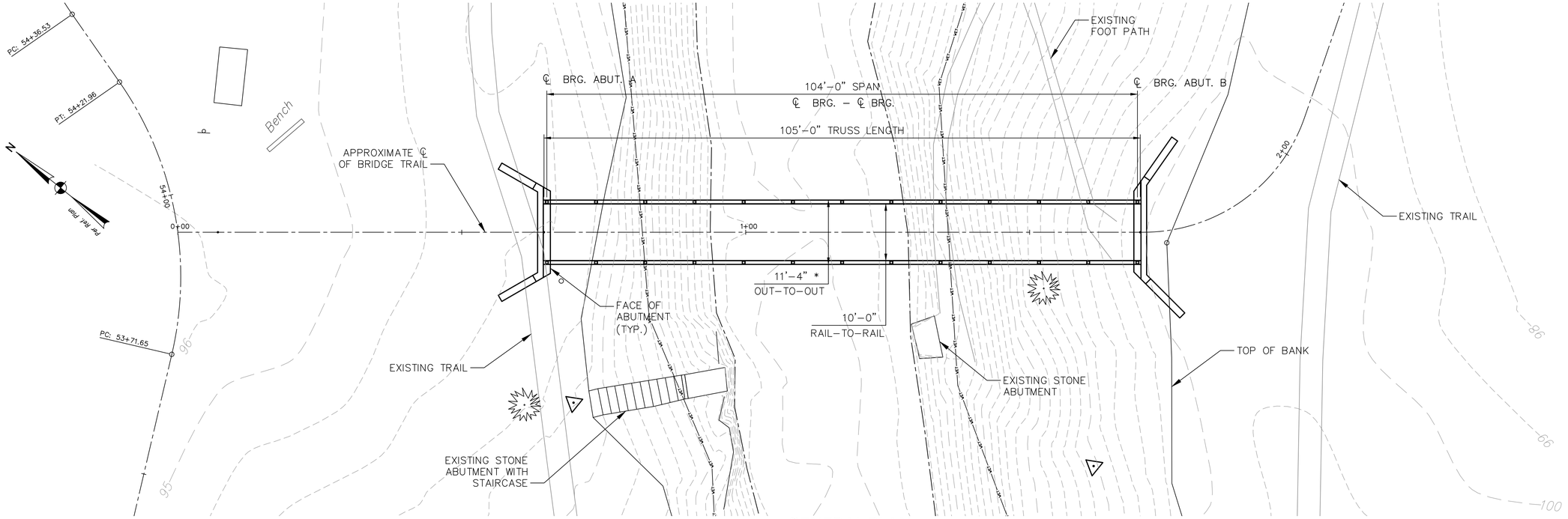
Please contact me if you have questions, comments, or require any additional information.

Sincerely,

Jaime French

Jaime French, PE
Associate | Transportation Department Manager

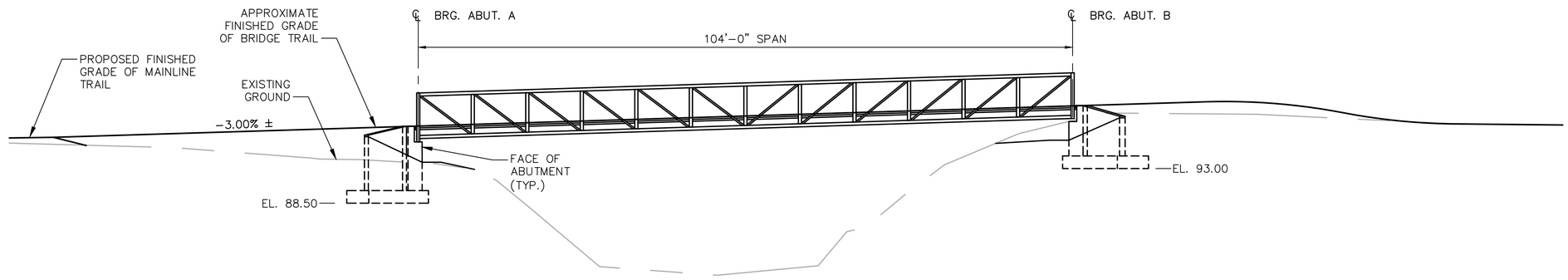
Enclosures



GENERAL PLAN

SCALE: 1" = 10'-0"

* STEEL TRUSS DIMENSIONS MAY VARY DEPENDING ON SPECFIC TRUSS SYSTEM USED



ELEVATION

SCALE: 1" = 10'-0"

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

SEAL

SCALE:
HORZ.: 1" = 10'-0"
VERT.: AS NOTED
DATUM:
HORZ.: NAD83
VERT.: NGVD29
10 5 0 10
GRAPHIC SCALE

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

CITY OF DOVER

GENERAL PLAN & PROFILE

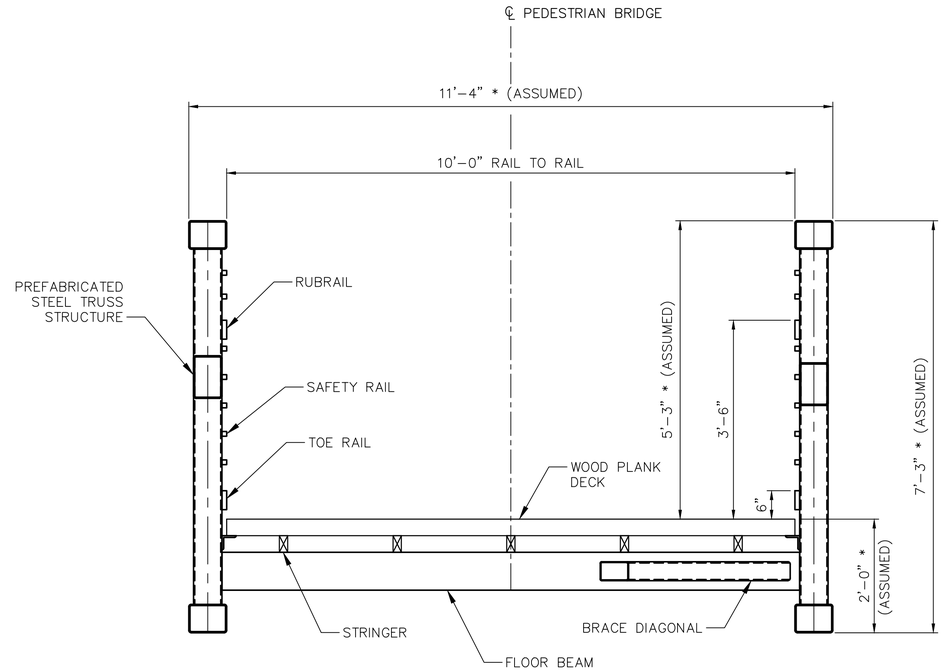
DOVER COMMUNITY TRAIL, PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.000
DATE: 10/09/2023

STR-01

File: J:\DWG\P20170299\000\Civil\Plan\20170299_Genplan.dwg Layout: 22X34-L Plotted: 2023-10-24 9:22 AM Saved: 2023-10-24 9:21 AM User: MWSmith
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
LAYER STATE:
MS VIEW:



* STEEL TRUSS DIMENSIONS MAY VARY DEPENDING ON SPECIFIC TRUSS SYSTEM USED.

TYPICAL DECK SECTION

SCALE: ¾" = 1'–0"

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SEAL

SEAL

SCALE:
HORZ.: AS NOTED
VERT.: AS NOTED
DATUM:
HORZ.:
VERT.:
?? ?? 0 ??
GRAPHIC SCALE

FUSS & O'NEILL
50 COMMERCIAL STREET
MANCHESTER, NEW HAMPSHIRE 03101
603.668.8223
www.fando.com

CITY OF DOVER

TYPICAL SECTIONS

DOVER COMMUNITY TRAIL, PHASE IV

DOVER NEW HAMPSHIRE

PROJ. No.: 20170299.001
DATE: 11/09/2023

STR-02