

Parks Highway and Big Lake Road Intersection

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Civil Engineering
Program

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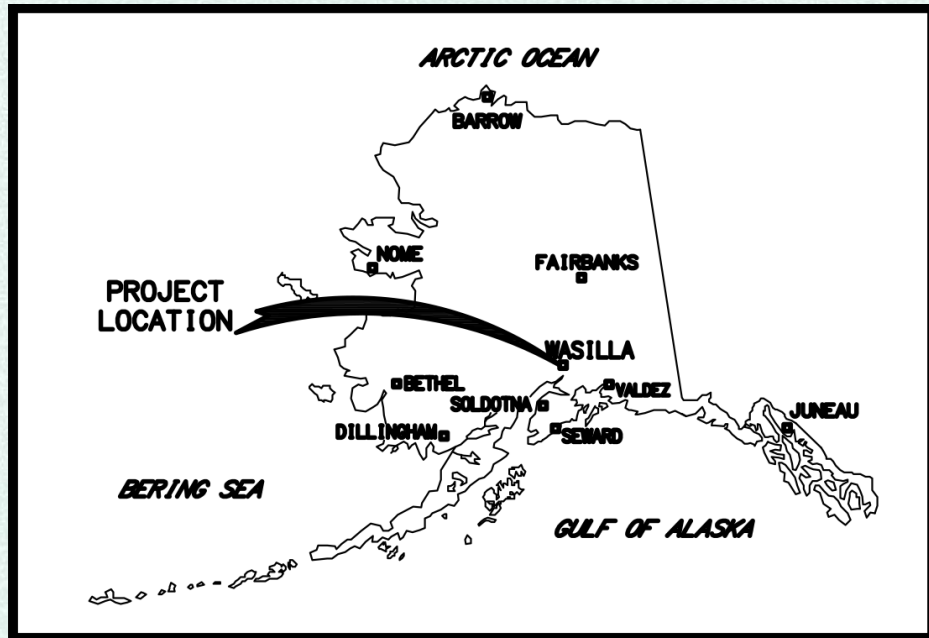
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Transportation

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Transportation

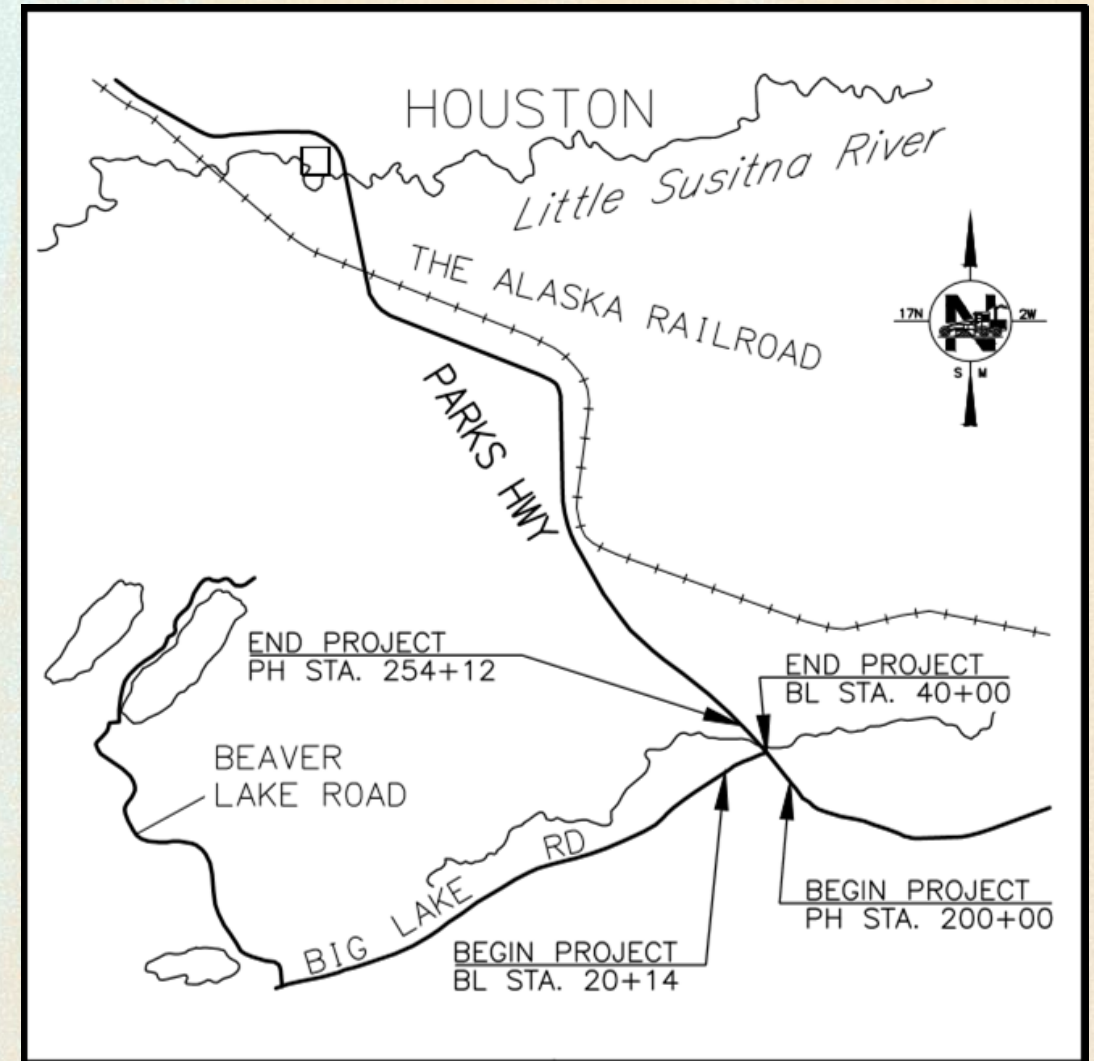
Project Vicinity



Highway Classification:

Parks Highway - Major Arterial

Big Lake Road - Minor Arterial



Existing

Big Lake and Parks Highway Intersection

- Two 12 foot lanes, one lane in each direction
- 8 foot shoulders
- 4:1 side slope
- Gravel with silt and sand

Near Little Meadow Creek

- Soft soils with groundwater near the surface
- Stress cracks observed in the existing embankment, close the to creek and correlated with the thick loose soil conditions



Aerial View of Intersection

Reason for Project

- Projected traffic volumes exceed roadway capacity
 - Current year, 2015, Annual Average Daily Traffic (AADT) 17,100
 - Future year, 2035, Annual Average Daily Traffic (AADT) 28,200
- Above-average fatal and major injury crash rate
- High number of moose-vehicle collisions

Scope of Project

- Perform traffic analysis
- Develop a design capable of handling future traffic volumes
- Address environmental commitments
 - Restore Little Meadow Creek to its historical flow
 - Create a wildlife crossing
- DSR and a 35% design planset

Traffic Analysis

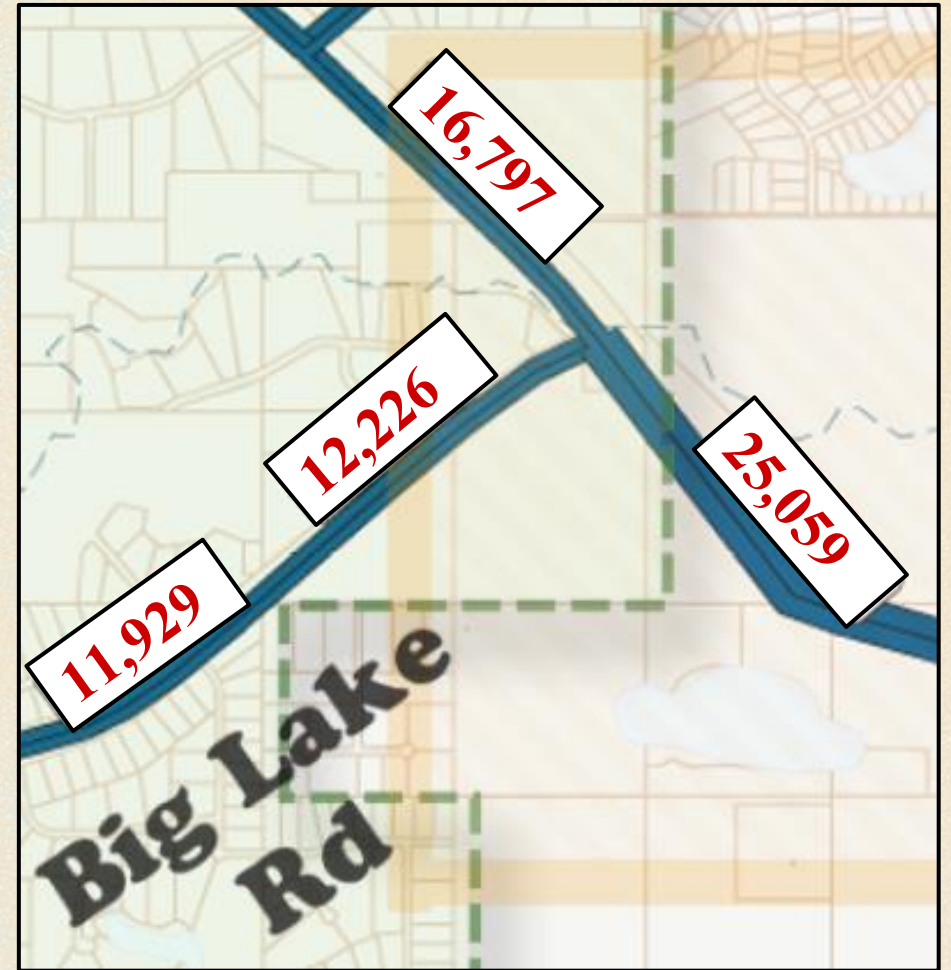
- Performed research of traffic volumes in the area using ADOT&PF Annual Traffic Report for Central Region
- Determined an annual growth rate of 1.63%
- Assumption: Growth rate constant through 2035

| Years | Big Lake Jct. Parks | % Growth |
|-------|---------------------|--------------|
| 2003 | 4140 | 14.1% |
| 2004 | 5502 | -6.4% |
| 2005 | 4836 | -2.4% |
| 2006 | 4610 | 0% |
| 2007 | 4610 | -3.7% |
| 2008 | 4278 | 0.4% |
| 2009 | 4310 | -0.1% |
| 2010 | 4300 | 9.6% |
| 2011 | 5218 | 1.8% |
| 2012 | 5410 | 3.0% |
| 2013 | 5750 | ~ |
| | <i>Average</i> | 1.63% |

Traffic Analysis

Model accounts for:

- Future traffic distribution in the Mat-Su Borough
- Land use and development
- Segment capacity and travel time
- Projects from the Long Range Transportation Plan



2035 Volume Map

Traffic Analysis

- Level of Service (LOS)
 - Length of delay experienced at an intersection
- A - C is acceptable
- F represents high congestion and low efficiency

| EXHIBIT 17-2. LEVEL-OF-SERVICE CRITERIA FOR TWSC INTERSECTIONS | |
|--|-------------------------------|
| Level of Service | Average Control Delay (s/veh) |
| A | 0–10 |
| B | > 10–15 |
| C | > 15–25 |
| D | > 25–35 |
| E | > 35–50 |
| F | > 50 |

Level of Service Delay Ranges

Highway Capacity Manual, page 17-2

Traffic Analysis

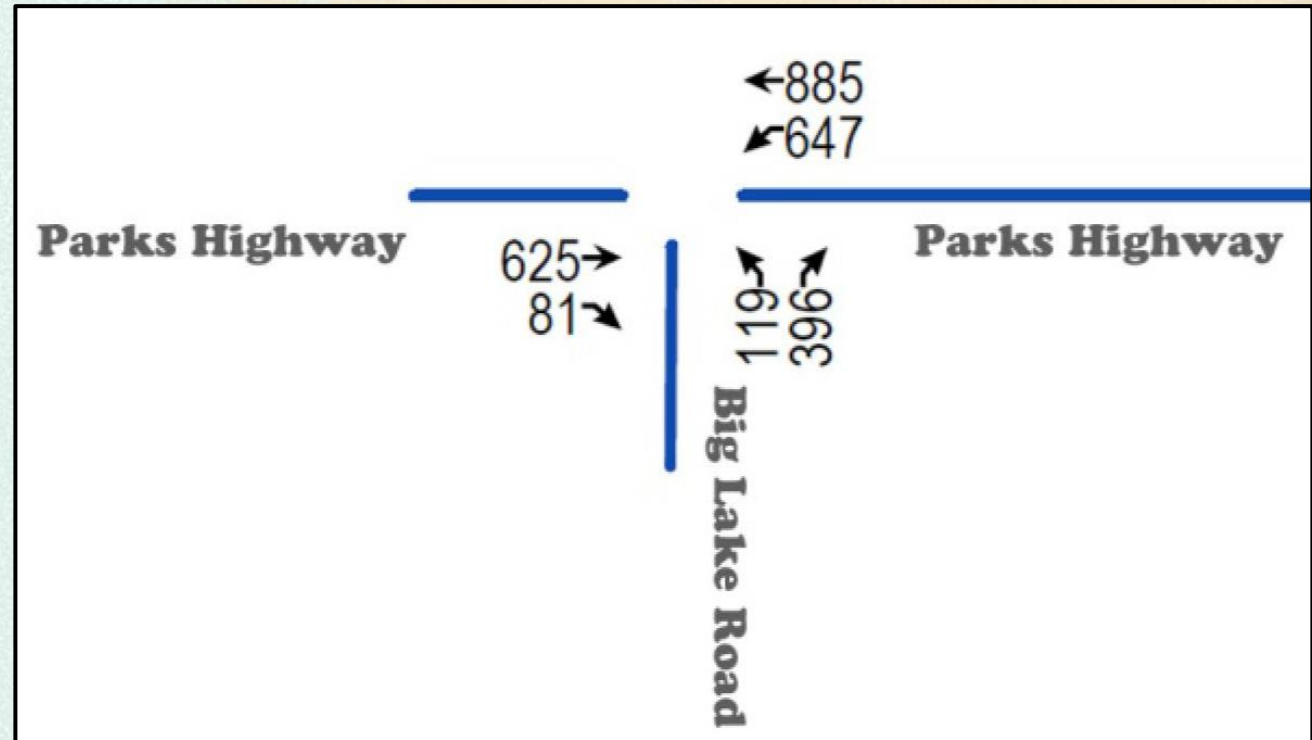
- Highway Capacity Software (HCS 2000)
- LOS of existing intersection with existing traffic volumes
- LOS of existing intersection with 2035 traffic volumes
- Delay = 282 seconds or 4.7 minutes!

| Worksheet 5 - Capacity and Level of Service | | | | | | | | |
|---|-----------|------|--------------------|----|------------|-------|------------|-------|
| | Eastbound | | Westbound | | Northbound | | Southbound | |
| | L1 | L2 | L1 | L2 | L1 | L2 | L1 | L2 |
| Flow Rate | 43 | 155 | | | 282 | 268 | 185 | 28 |
| Service Time | 4.0 | 3.2 | | | 3.7 | 3.2 | 3.6 | 2.9 |
| Utilization, x | 0.07 | 0.23 | | | 0.47 | 0.41 | 0.30 | 0.04 |
| Dep. headway, hd | 6.04 | 5.24 | | | 6.01 | 5.51 | 5.93 | 5.22 |
| Capacity | 293 | 405 | | | 532 | 518 | 435 | 278 |
| Delay | 9.50 | 9.76 | | | 13.95 | 11.99 | 11.20 | 8.14 |
| LOS | A | A | | | B | B | B | A |
| Approach: | | | | | | | | |
| Delay | | 9.70 | | | | 12.99 | | 10.80 |
| LOS | | A | | | | B | | B |
| Intersection Delay 11.83 | | | Intersection LOS B | | | | | |

| Worksheet 5 - Capacity and Level of Service | | | | | | | | |
|---|-----------|-------|--------------------|----|------------|--------|------------|--------|
| | Eastbound | | Westbound | | Northbound | | Southbound | |
| | L1 | L2 | L1 | L2 | L1 | L2 | L1 | L2 |
| Flow Rate | 125 | 416 | | | 931 | 681 | 657 | 85 |
| Service Time | 5.4 | 4.6 | | | 5.8 | 5.3 | 5.8 | 5.0 |
| Utilization, x | 0.26 | 0.77 | | | 2.10 | 1.44 | 1.47 | 0.17 |
| Dep. headway, hd | 7.45 | 6.63 | | | 8.11 | 7.60 | 8.07 | 7.35 |
| Capacity | 375 | 543 | | | 931 | 681 | 657 | 335 |
| Delay | 13.02 | 28.12 | | | 519.62 | 229.27 | 246.04 | 11.58 |
| LOS | B | D | | | F | F | F | B |
| Approach: | | | | | | | | |
| Delay | | 24.63 | | | | 396.96 | | 219.18 |
| LOS | | C | | | | F | | F |
| Intersection Delay 281.82 | | | Intersection LOS F | | | | | |

Traffic Analysis

- Projected turning movements from Kinney Engineering
- Turning movements used to determine:
 - Number of lanes
 - Length of turn pockets
 - Intersection design



2035 Projected Hourly Turning Movements
(Final Traffic Analysis Report - Kinney Engineering)

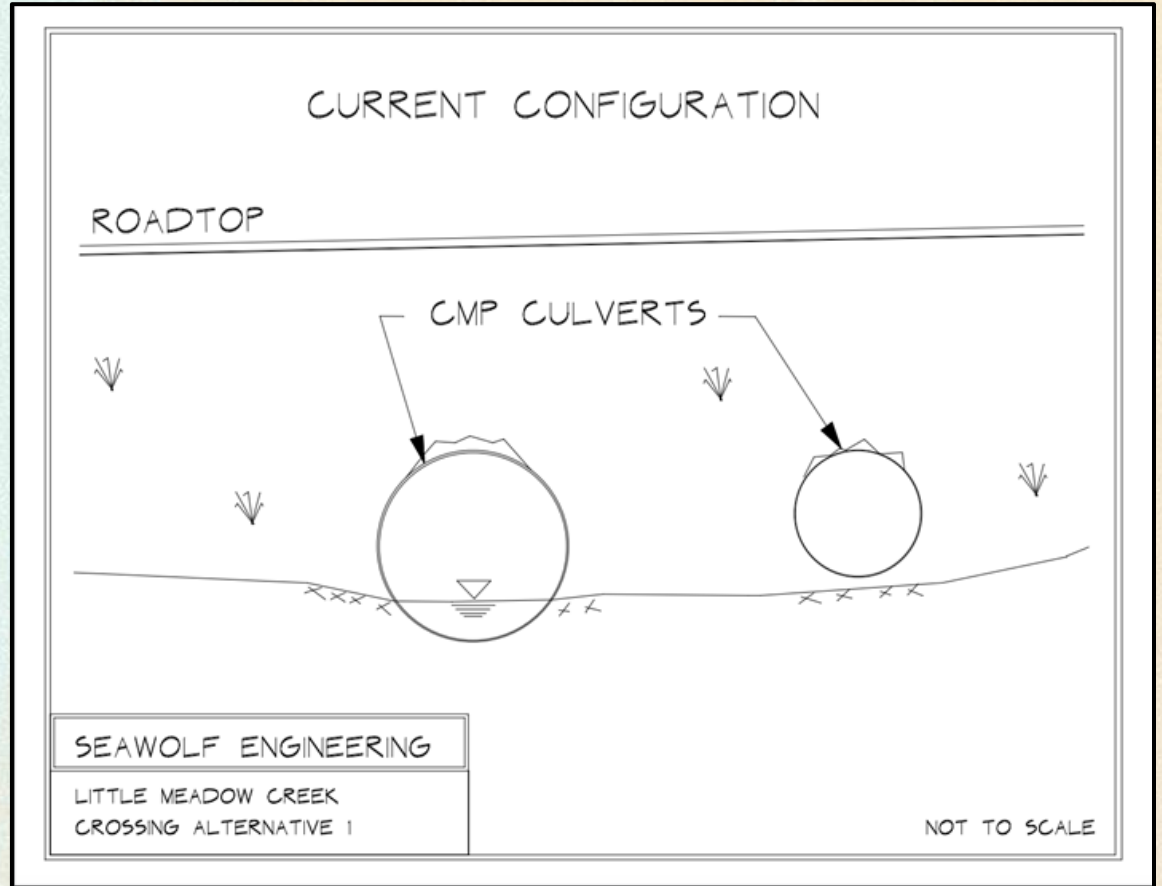
Environmental



- Considerations
 - Disturbed Wetlands
 - Little Meadow Creek
 - Bridge and wildlife crossing
 - Scour and Erosion
- Environmental Reevaluation
 - Changes in scope of project
 - Works with design changes
- Environmental and Sediment Control Plan (ESCP)

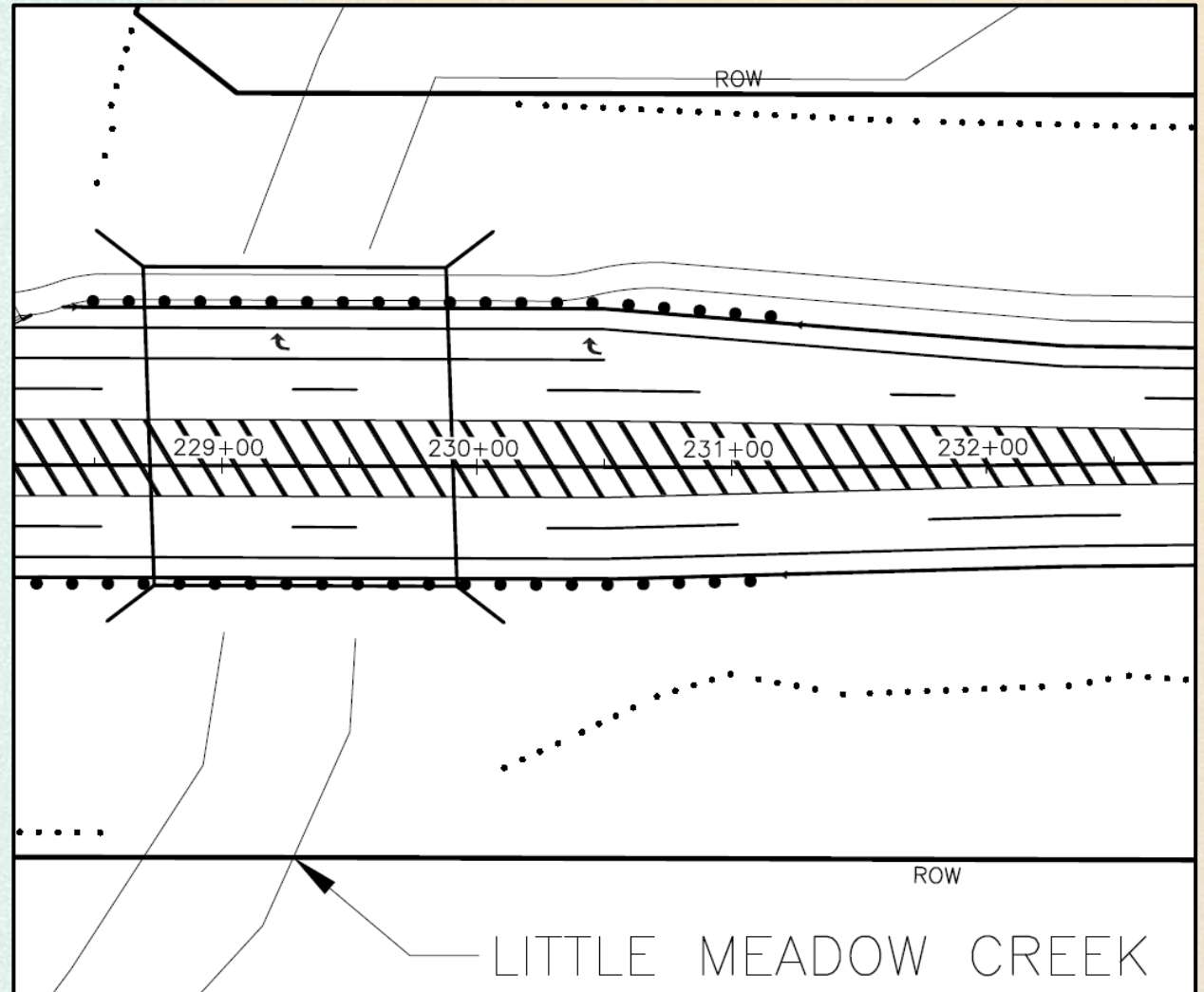
Existing

- 78" CMP culvert
- 48" overflow culvert
- Replace culverts with a bridge and wildlife crossing
- Previous environmental commitment



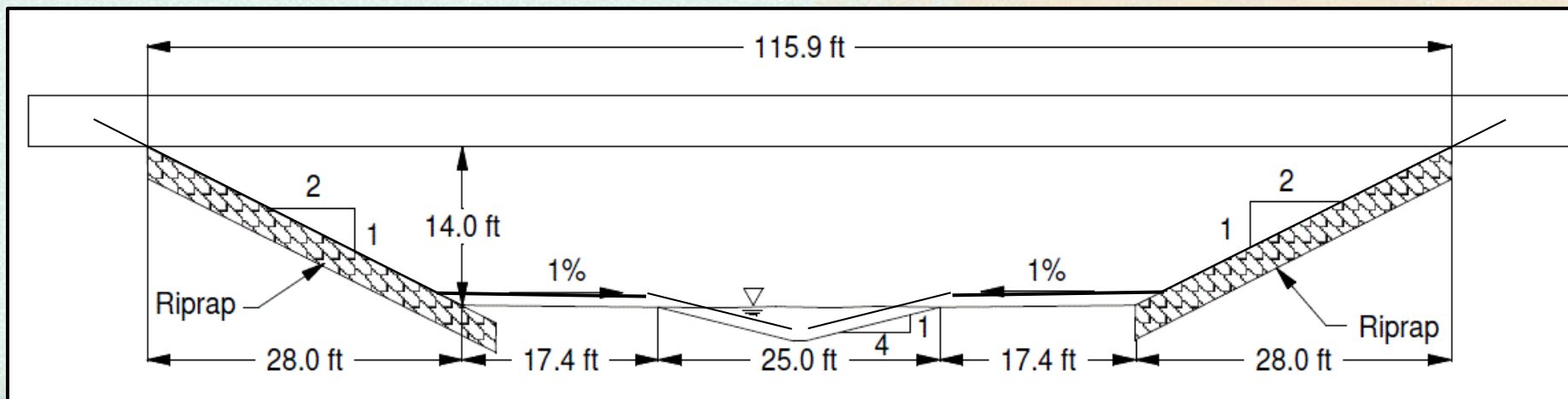
Bridge

- 115' long
- 125' wide
- 210.5' to 211.7' low chord
- 215.5' to 216.7' high chord
- Wildlife crossing underneath



Wildlife Crossing

- Animal friendly
 - Large openness factor based on crossing dimensions
- Two crossing benches
 - Allows crossing on either bank of creek
- Open flow-channel
 - Allows for more natural fish passage which mimics streambed



Permits

- U.S. Army Corps of Engineers (USACE) Section 404
- Department of Environmental Conservation (DEC) Permanent Stormwater Management Control Plan Review Checklist
- DEC Non-Domestic Wastewater Plan Review
- ADF&G Title 16 Fish Habitat

Hydrological

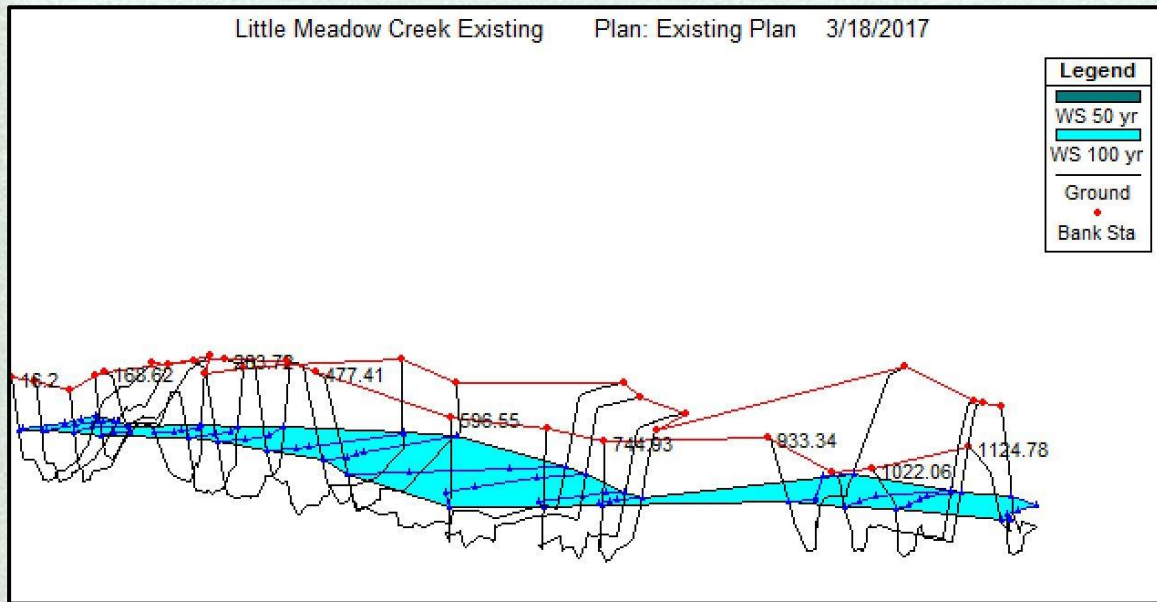
- 100 year flood event
- USGS 2016 Regression Equation
- AutoCAD to HEC-RAS Modeling

| $Q_{100} = 1.738 * A^{0.8457} * (ST + 1)^{-0.2347} * P^{1.109}$ | | | |
|---|--------------------------------|-----------------------------|---------------------------------|
| Drainage Area (sq. mi) | Mean Annual Precipitation (in) | Area of Lakes and Ponds (%) | 100-year Design Discharge (cfs) |
| 19.1 | 16.87 | 15 | 252.2 |

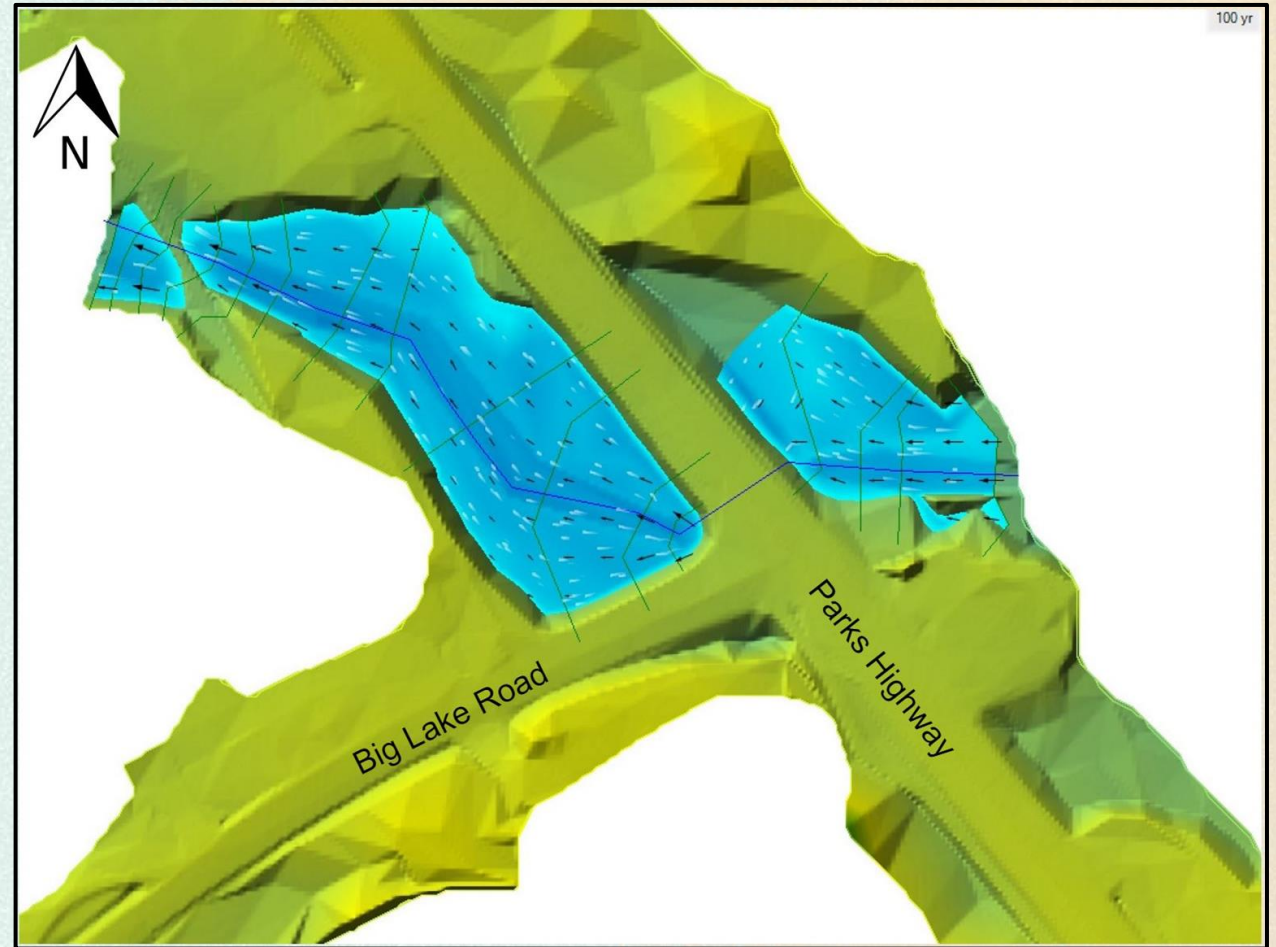
| Cross Section (River Station) | Existing Water Surface Elevation (ft) | Crossing Channel | |
|-------------------------------|---------------------------------------|---------------------------------------|--|
| | | Proposed Water Surface Elevation (ft) | Change in Water Surface Elevation (ft) |
| 16 | 200.0 | 195.96 | -4.0 |
| 15 | 200.0 | 195.96 | -4.0 |
| 14 | 200.0 | 195.96 | -4.0 |
| 13 | 200.0 | 195.96 | -4.0 |
| 12.5* | Parks Highway Culvert/Bridge | | |
| 12 | 197.2 | 195.95 | -1.3 |
| 11 | 197.2 | 195.95 | -1.3 |
| 10 | 197.2 | 195.95 | -1.3 |
| 9 | 197.2 | 195.95 | -1.3 |
| 8 | 197.2 | 195.95 | -1.3 |
| 7 | 197.2 | 195.95 | -1.3 |
| 6 | 197.2 | 195.94 | -1.3 |
| 5 | 197.2 | 195.94 | -1.3 |
| 4 | 197.2 | 195.93 | -1.3 |
| 3 | 197.2 | 195.92 | -1.3 |
| 2 | 197.2 | 195.92 | -1.3 |
| 1 | 197.2 | 195.92 | -1.3 |

Hydrological

- 100 year flood event
- Not in FEMA Floodplain



Water Surface Elevation for 100 Year Flood Event
HEC-RAS



Bridge Crossing 100 Year Flood Event Extents
HEC-RAS

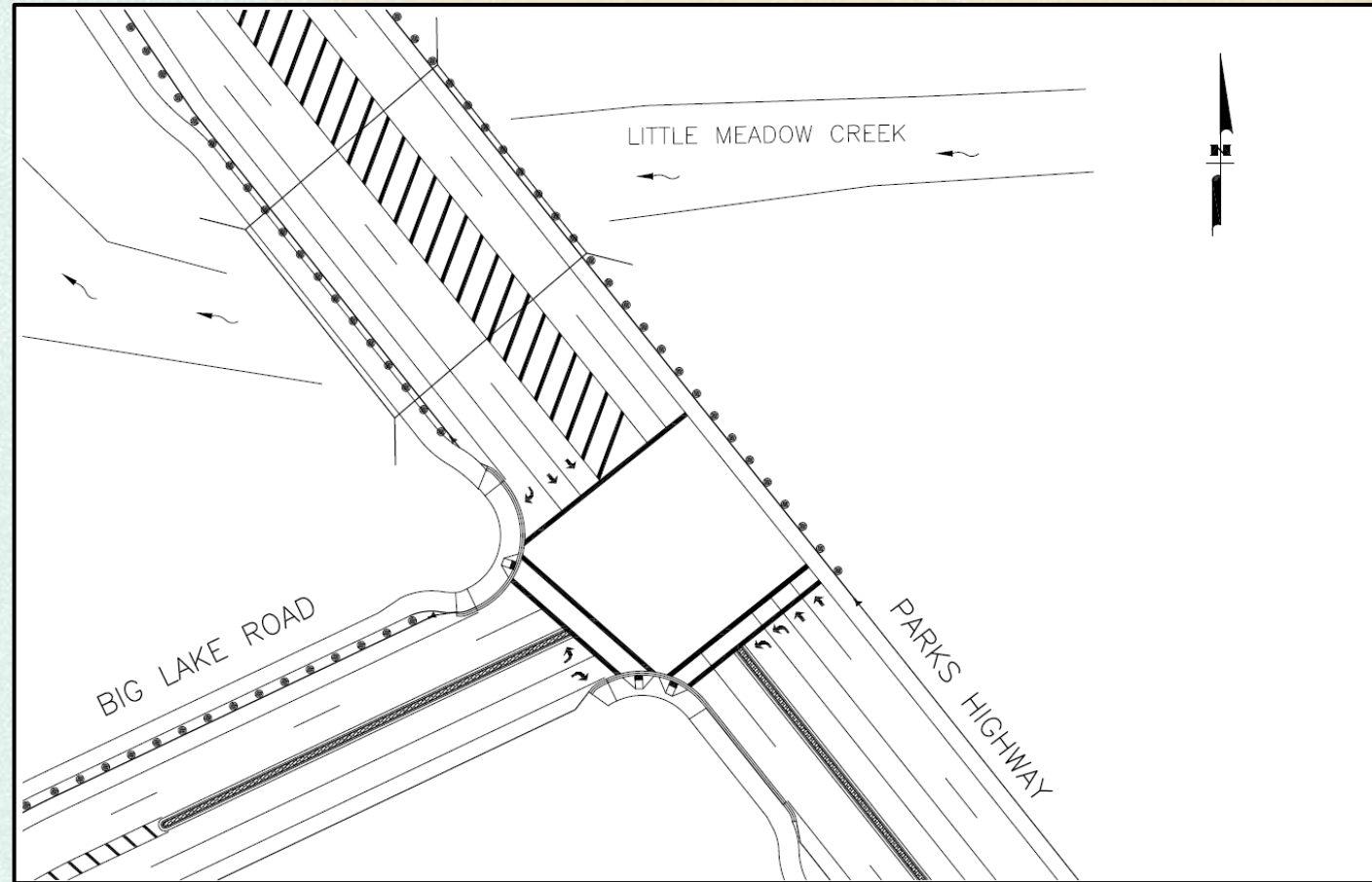
Design Criteria

- New Construction
- Design Speed: 60 mph
- Width of Traveled Way: 12 ft
- Width of Shoulders: 8 ft
- Max Allowable Grade: 3%
- Stopping Sight Distance: 570 ft

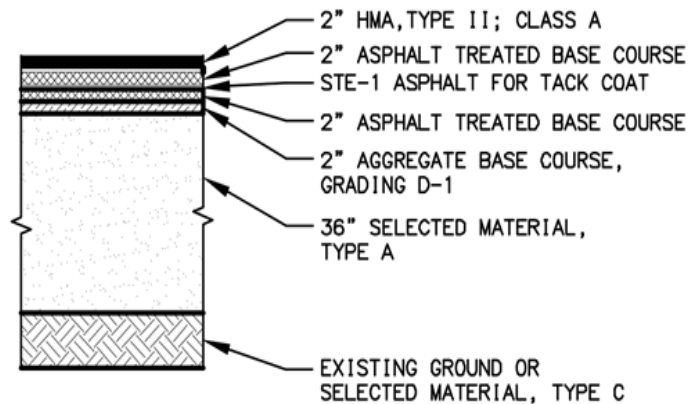
| Project Design Criteria | | | | | | | |
|--------------------------------------|----------------------------------|-------------------------------------|-------------|--------------------------|------------------------------|--------------------------|---------|
| Project Name: | | Parks Hwy and Big Lake Intersection | | | | | |
| <input checked="" type="checkbox"/> | New Construction/Reconstruction* | <input type="checkbox"/> | 3R | <input type="checkbox"/> | PM | <input type="checkbox"/> | Other: |
| Route Name: | | PARKS HWY | | <input type="checkbox"/> | NHS | <input type="checkbox"/> | Non NHS |
| Functional Classification: | | Rural Interstate | | Source/Comments | | | |
| Design Year: | 2035 | Present ADT: | 17,100 | Design Designation | | | |
| Design Year ADT: | 28,200 | Mid Design Period ADT: | 24,100 | Design Designation | | | |
| DHV: | 10% | Directional Split: | 63/37 | Design Designation | | | |
| Percent Trucks: | 6% | Equivalent Axle Loading: | 1,700,000 | Design Designation | | | |
| Pavement Design Year: | 2025 | Design Vehicle: | WB-67 | Design Designation | | | |
| Terrain: | Level | Number of Roadways: | 1 | Design Designation | | | |
| Design Speed: | 60 mph | | | Design Designation | | | |
| Width of Traveled Way: | 12 ft | | | GB 2011, pg 4-7 | | | |
| Width of Shoulders: | Outside: | 8 ft | Inside: | 4 ft | PCM, Table 1130-7 | | |
| Cross Slope: | 3% | | | PCM, pg 1130-1 | | | |
| Superelevation Rate: | 6% | | | PCM, Fig. 1120-1 | | | |
| Minimum Radius of Curvature: | 1340 ft | | | PCM, Fig. 1120-1 | | | |
| Minimum K-Value for Vertical Curves: | Sag: | 136 | Crest: | 151 | GB 2011, pg 3-155 & pg 3-161 | | |
| Maximum Allowable Grade: | 3% | | | PCM, Fig. 1120-1 | | | |
| Minimum Allowable Grade: | 0.30% | | | PCM, Fig. 1120-1 | | | |
| Stopping Sight Distance: | 570 ft | | | PCM, Fig. 1120-1 | | | |
| Lateral Offset to Obstruction: | N/A | | | PCM, Fig. 1100-3 | | | |
| Vertical Clearance: | 16.5 ft | | | PCM, Table 1130-1 | | | |
| Bridge Width: | | | | | | | |
| Bridge Structural Capacity: | | | | | | | |
| Passing Sight Distance: | 2135 ft | | | PCM Fig. 1120-1 | | | |
| Surface Treatment: | T/W: | HMA | Shoulders: | HMA | PCM, Section 1180.3. | | |
| Side Slope Ratios: | Foreslopes: | | Backslopes: | 1V:2H | PCM, Section 1130.1. | | |
| Degree of Access Control: | N/A | | | PCM, Section 1120 | | | |
| Median Treatment: | | | | | | | |
| Illumination: | | | | | | | |
| Curb Usage and Type: | | | | ASD | | | |
| Bicycle Provisions: | | | | | | | |
| Pedestrian Provisions: | | | | | | | |
| Misc. Criteria: | | | | | | | |

Proposed Intersection Design

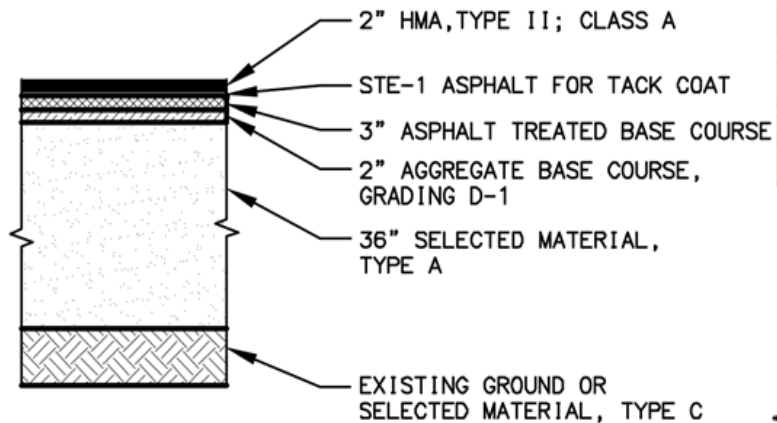
- Signalized Intersection
- Additional through and turn lanes
- Upgrade multi use pathway
- Intersection crosswalk
- Bridge over Little Meadow Creek



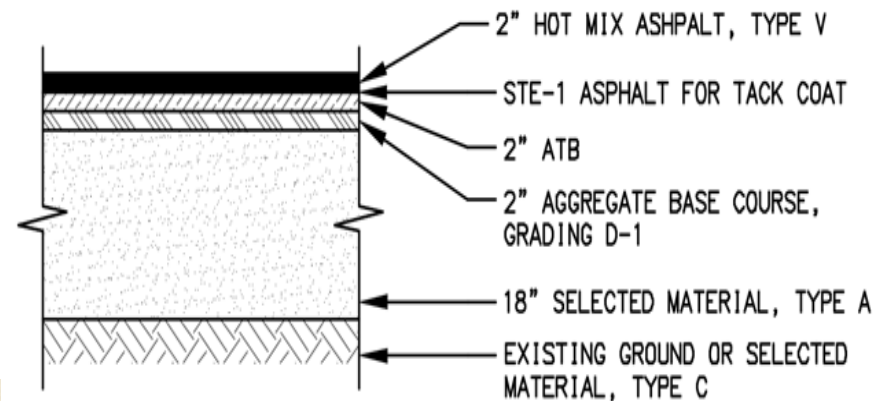
Structural Sections



STRUCTURAL SECTION 1
 PARKS HIGHWAY

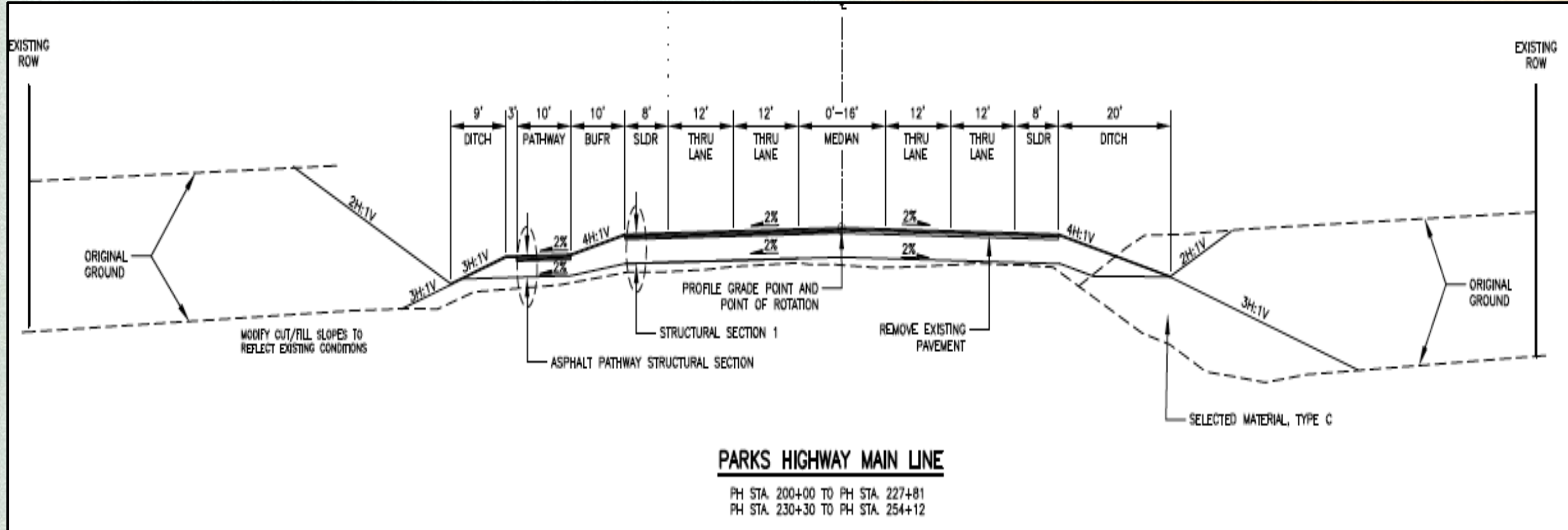


STRUCTURAL SECTION 2
 BIG LAKE ROAD

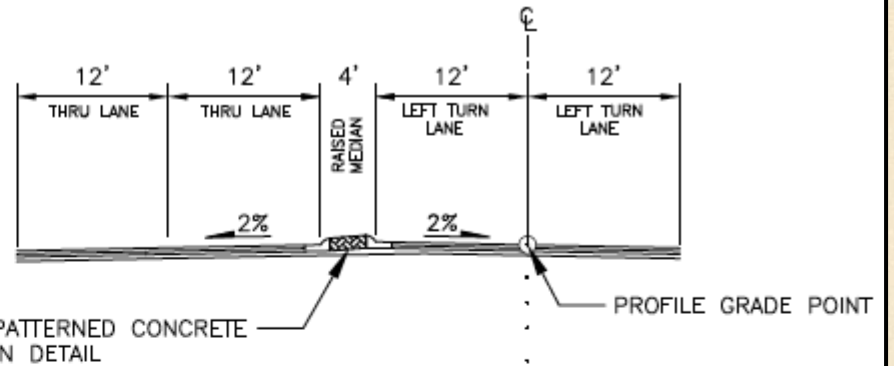


PATHWAY STRUCTURAL SECTION

Typical Section: Parks Highway

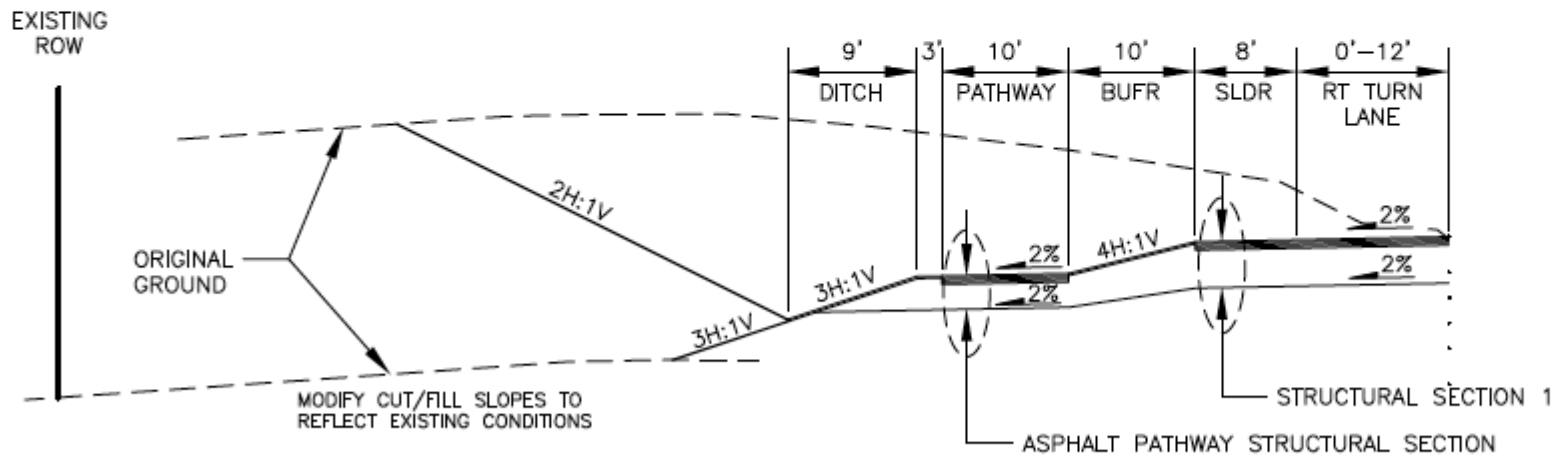


Typical Section: Parks Highway



LEFT TURN LANE

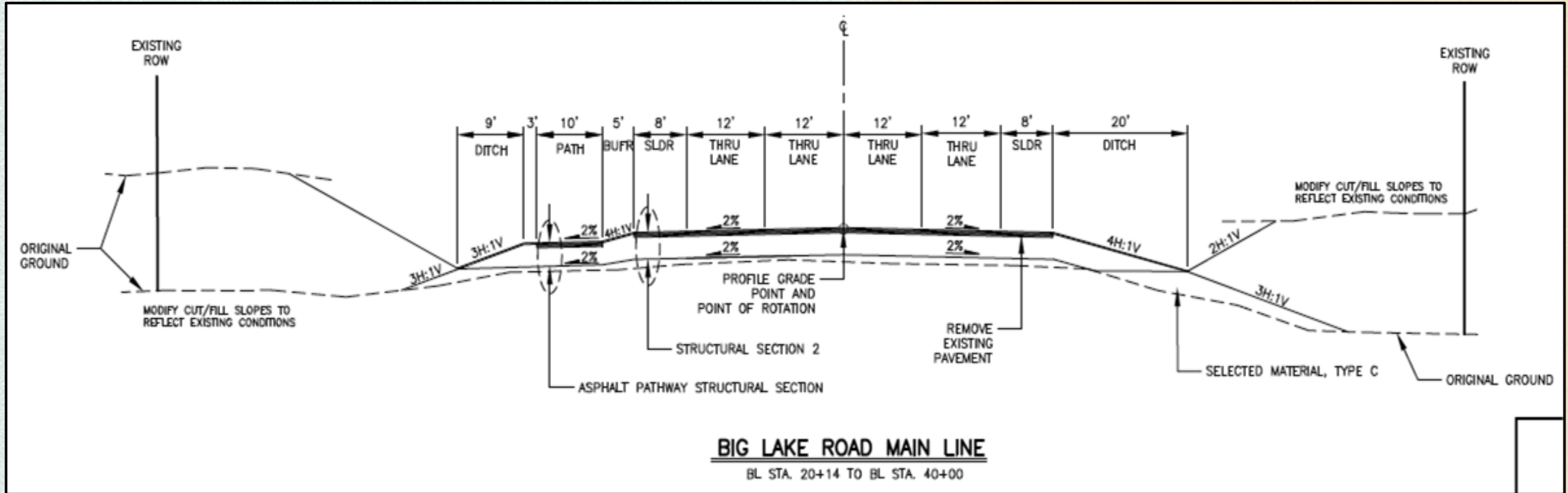
PH STA. 220+03 TO PH STA. 226+83



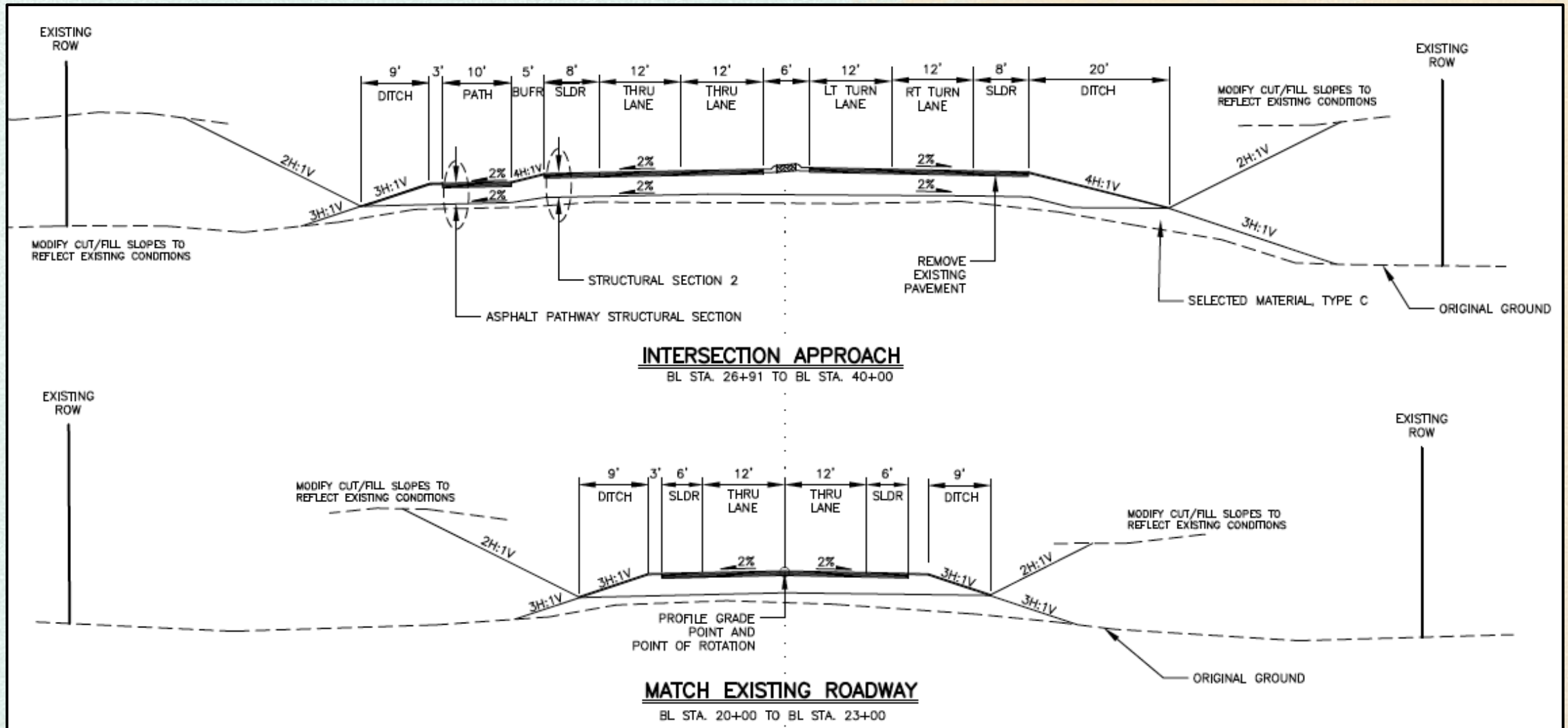
RIGHT TURN LANE

PH STA. 228+33 TO PH STA. 232+30

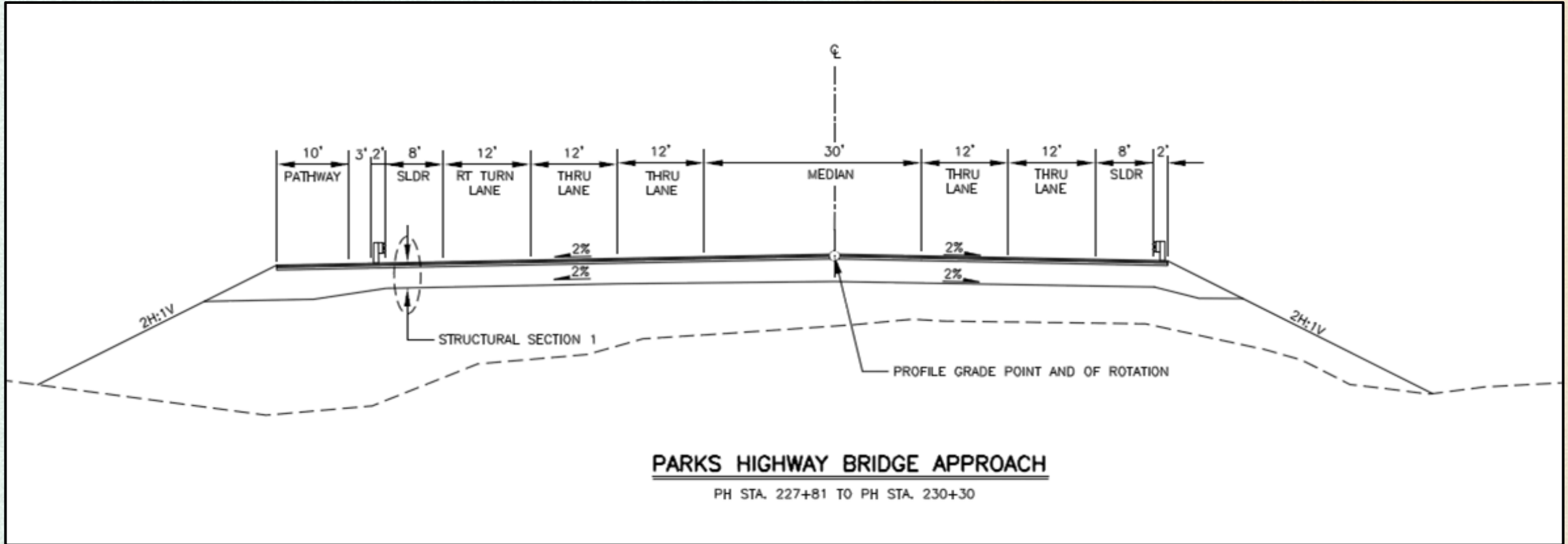
Typical Section: Big Lake Road



Typical Section: Big Lake Road

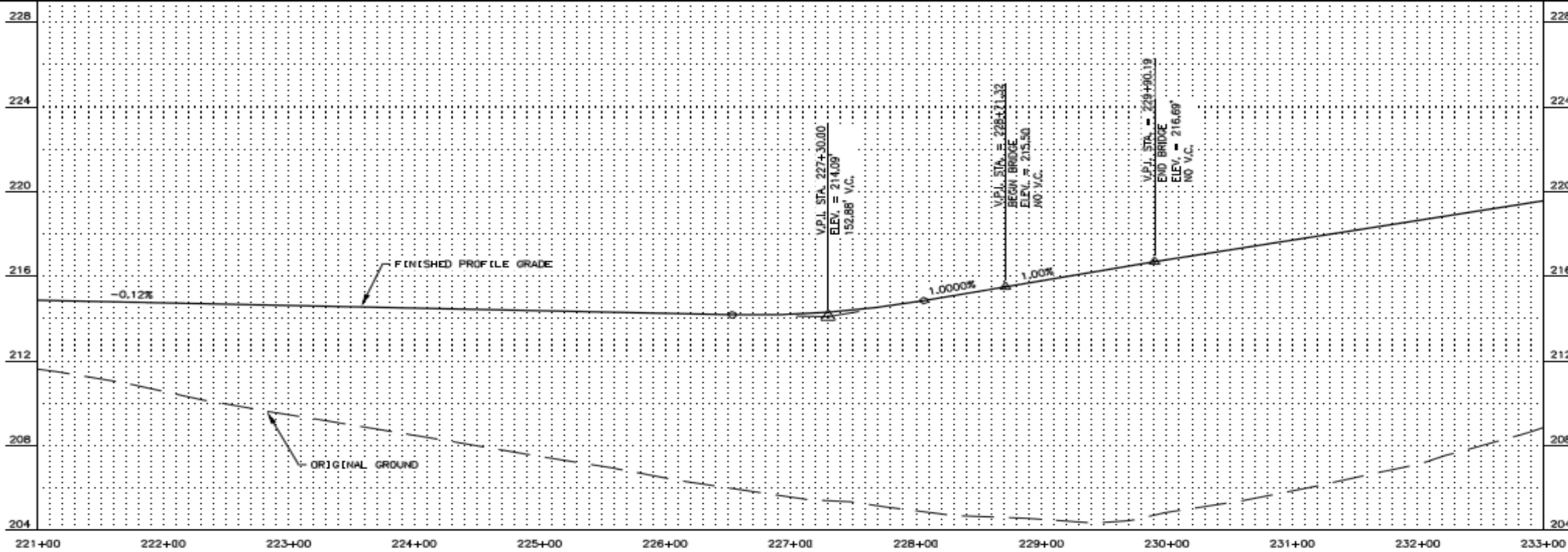
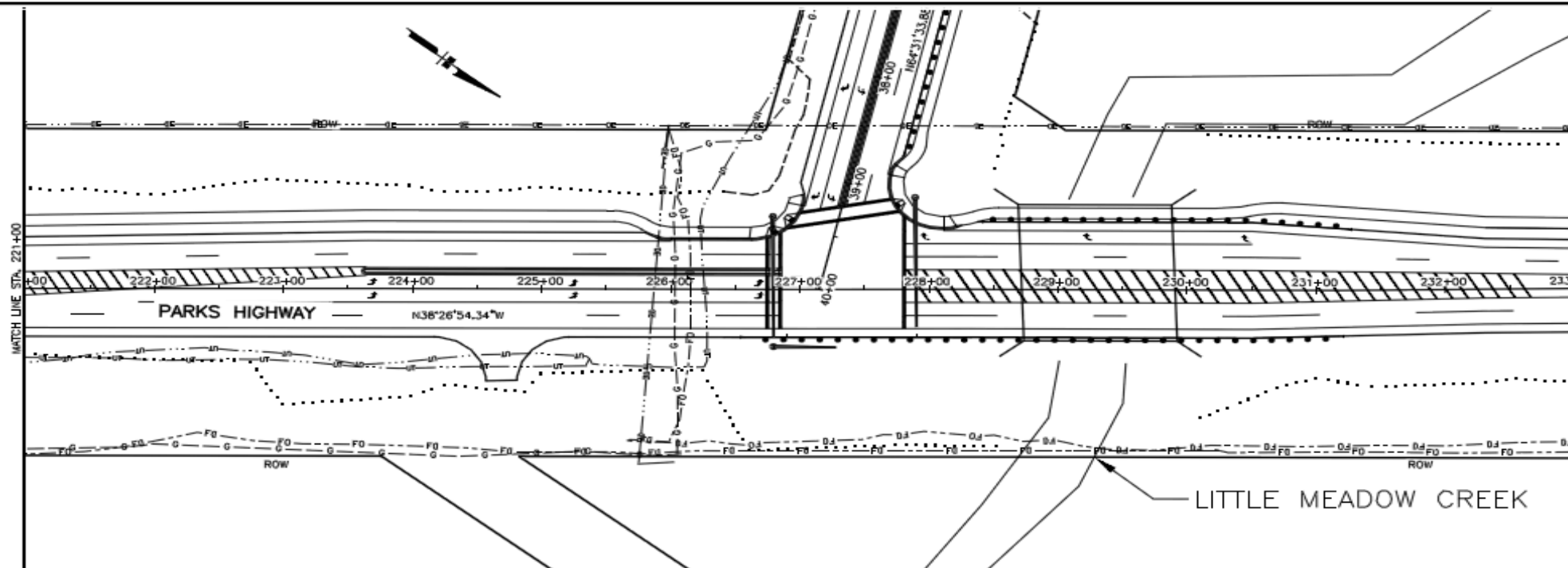


Typical Section: Bridge Approach

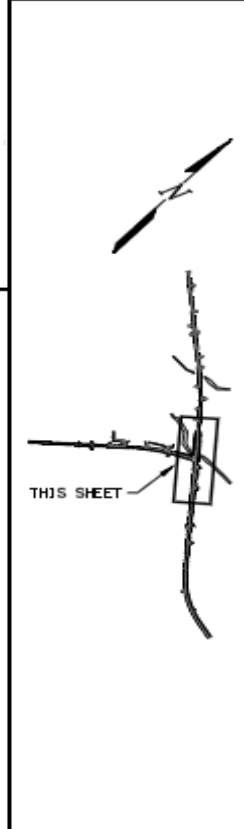


Plan and Profile

- AutoCAD plan and profile sheets for the intersection are shown on the following slides



| | |
|---------------------|--------------|
| SHEET NO. | TOTAL SHEETS |
| F3 | F7 |
| STATE | YEAR |
| ALASKA | 2017 |
| PROJECT DESIGNATION | |
| PROJECT C | |
| NO. | REVISION |
| DATE | |
| NO. | REVISION |
| DATE | |
| NO. | REVISION |
| DATE | |

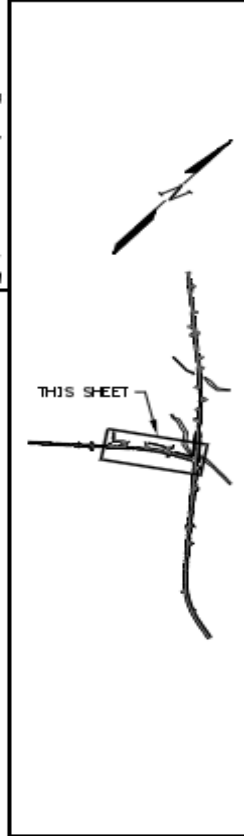
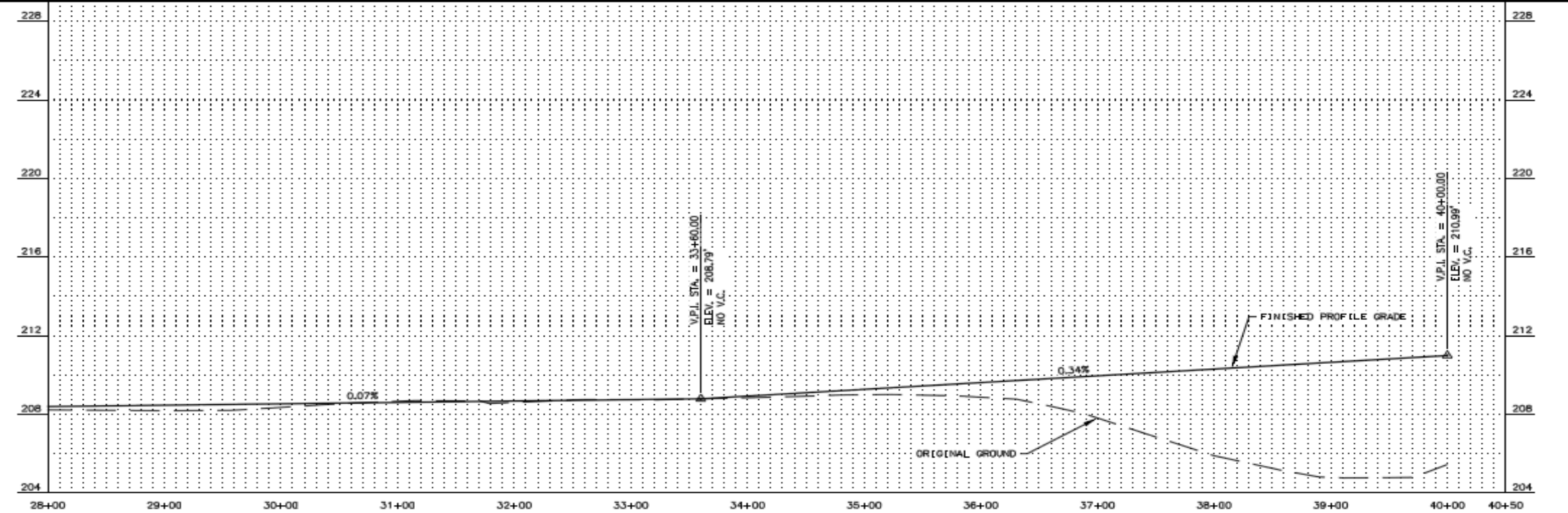
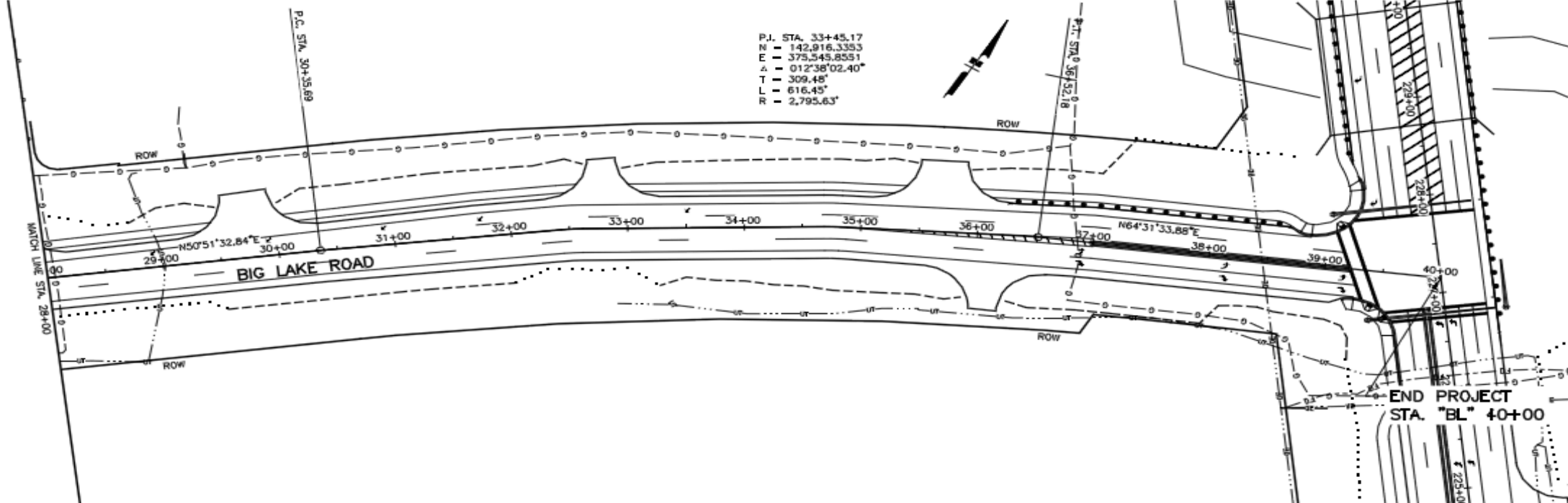


STATE OF ALASKA
 DEPARTMENT OF TRANSPORTATION
 AND PUBLIC FACILITIES
 PARKS HIGHWAY AND BIG
 LAKE ROAD INTERSECTION
 PLAN AND PROFILE
 PH STA. 231+00 TO
 PH STA. 233+00

| | |
|-----------|--------------|
| SHEET NO. | TOTAL SHEETS |
| F7 | F7 |
| STATE | YEAR |
| ALASKA | 2017 |

PROJECT DESIGNATION
PROJECT C

| NO. | REVISION |
|-----|----------|
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STATE OF ALASKA
 DEPARTMENT OF TRANSPORTATION
 AND PUBLIC FACILITIES
 PARKS HIGHWAY AND BIG
 LAKE ROAD INTERSECTION
 PLAN AND PROFILE
 BL STA. 28+00 TO
 BL STA. 40+00

Conclusion

- Our proposed design solution:
 - Increased roadway capacity to meet future traffic volume demands
 - Provides multi-use pathway facilities along roadways and through the intersection
 - Reduces the likelihood of vehicle crashes at the intersection
 - Provides a crossing under the roadway for wildlife
 - Fulfills environmental commitments
 - Restores Little Meadow Creek to its historical flow path

Acknowledgements

- Osama Abaza, UAA
 - Assistance throughout our project
- Robert DeVassie, ADOT&PF
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 - Paul Janke, ADOT&PF
 - Jake Cuifo, ADOT&PF
- Transportation
 - Jeanne Bowie, Kinney Engineering
 - Trevor Strait, HDL
 - Jeff Fuglestad, HDL
 - John Phillips, ADOT&PF

Questions or Comments?