

NW Saltzman Road Western Alignment Improvement Analysis

Prepared for Washington County Department of Land Use & Transportation

March 3, 2016

Executive Summary

Background:

In 2013, Washington County's Department of Land Use & Transportation (LUT) developed planning-level cost estimates for improvements to NW Saltzman Road to current County standards between NW Laidlaw Road and NW Bayonne Lane. LUT considered three alignment options:

- **Eastern/existing alignment:** Improve Saltzman Road on its existing alignment, which intersects NW Laidlaw Road at NW Bannister Drive; estimated cost \$6.5 million.
- **Middle alignment:** Realign Saltzman so that it would intersect NW Laidlaw Road at a private roadway, approximately 100 feet east of NW 130th Avenue; estimated cost \$15.5 million. This option was not considered feasible due to its flood plain and property impacts and its offset from 130th Avenue.
- **Western alignment:** Realign Saltzman so that it would intersect NW Laidlaw Road at NW 130th Avenue; estimated cost \$11.1 million.

Overview of Analysis:

At LUT's request, **WHPacific analyzed five design and construction options for the potential western alignment.** Cost and flood plain impact were determined to be the key evaluation criteria. Options 1 and 2 are based on recommendations from the Bethany Neighborhood Coalition (BNC), which call for the use of prefabricated bridge structures. Option 3 is a variation on Option 2, intended to minimize its flood plain impacts.

Due to the significant flood plain impacts associated with Options 1 and 2, and the high cost of Option 3, two additional bridge types were also evaluated (Options 4 and 5).

In order to provide an apples-to-apples comparison of all five options, we analyzed the full cost to construct Saltzman Road from NW Laidlaw to NW Bayonne Lane, including the various bridge options.

Options Evaluated:

The options analyzed are described as follows, along with a summary of our assessment of each. Additional information on all five options can be found in this report.

- **Option 1 – “Buried” Bridge (Precast arch culvert):**
 - **Not viable due to extensive flood plain fill.** Required mitigation would likely negate any potential cost savings over other options, and the resulting restricted Bronson Creek channel would have a high potential to not meet the 100yr flood “No-Rise” certification
 - No cost estimate was prepared for this option.
- **Option 2 – Single-span Prefabricated Steel Truss Bridge:**
 - **Not considered viable due to extensive flood plain fill.**
 - Assuming flood plain mitigation could be achieved, estimated cost is **\$12.07 million.**
- **Option 3 – Two-span Prefabricated Steel Truss Bridge:**
 - Would still require significant flood plain mitigation, but less impact than Option 2.
 - Estimated cost: **\$15.91million.**
- **Option 4 – Precast Prestressed Concrete Girder Bridge:**
 - Less flood plain fill/mitigation required.
 - Estimated cost: **\$9.11 million.**
- **Option 5 – Steel Plate Girder Bridge:**
 - Least flood plain impacts/mitigation required.
 - Estimated cost: **\$9.91 million.**

Conclusions:

1. **Options 4 and 5 are considered to be the most viable options for construction of the potential western alignment of NW Saltzman Road between NW Laidlaw Road and NW Bayonne Lane, due to their lesser flood plain impacts and lower costs.**
2. **The western alignment could potentially be constructed for less than the County’s earlier \$11.1 million planning estimate using Options 4 or 5, (precast concrete girder bridge (approx. \$9 million) or steel plate girder bridge (approx. \$10 million), respectively.**
3. **This study did not evaluate the relative costs of improving Saltzman Road on the existing alignment.**

Analysis Introduction/Background

The Bethany Neighborhood Coalition (BNC) presented information regarding two potential design and construction options for the “western alignment” of NW Saltzman Road, between NW Laidlaw Road (aligned with NW 130th Avenue) and NW Bayonne Lane, in two documents titled “Solution for Saltzman” and “At Grade vs. Buried Bridge for Saltzman Road,” both of which were provided to the Department of Land Use & Transportation (LUT). This proposed alignment is generally consistent with an alignment developed and evaluated by LUT staff in 2013, as well as an alignment developed by WHPacific in 2007 as part of a development project that had been reviewed and approved by Washington County.

This study considers the information presented in the BNC documents, as well as the costs and other factors associated with constructing improvements to NW Saltzman Road from NW Laidlaw to NW Bayonne Lane, on the “western alignment” (intersecting NW Laidlaw Road opposite NW 130th Avenue).

Summary of Bethany Neighborhood Coalition (BNC) Proposals

BNC presented LUT with two design and construction alternatives for the potential NW Saltzman Road western alignment. The following is a summary of the two options submitted by BNC, which proposed the potential use of two different Contech prefabricated bridge systems:

1. Contech BEBO Buried Bridge (Arch Culvert) System:
 - Proposed 42 feet x 34 feet (1,344sf) BEBO bridge
 - Bridge cost = \$1.67Million → (\$1,240/SF)

2. Contech US Bridge Vehicular Truss System:
 - Proposed truss bridge length is 225 feet single-span (6,075 sf)
 - Bridge cost = \$2.44 Million → (\$402/SF)
 - Roadway width of 28 feet (inadequate for required sidewalks or bike lanes)

 - Roadway width of approx. 34 feet (inadequate for required sidewalks and bike lanes)

A project cost estimate provided by BNC indicates a range from a low of \$5.9 million, stated as being based on a Contech prefab bridge estimate, to a high of \$8.1 million, stated as being based on County’s previous estimates. (Note: The County’s 2013 planning-level cost estimate for the western alignment was \$11.1 million, including \$6.0 million for a bridge.)

The bridge portion of the BNC estimate is stated as \$3.5 million. We assumed that the additional costs over the Contech bridge estimates noted above is due to the required retaining walls at each abutment that would be needed to retain the approach fill.

Overview of Proposed Roadway Improvement and Potential Impacts

Proposed Alignment:

The proposed alignment was studied by WHPacific in 2007 as part of the proposed Bauer Summit land development. For this comparison, WHPacific used the vertical and horizontal alignment from that project and developed plan and elevation sheets for the alternatives discussed below.

The preliminary roadway alignment developed in 2007 drops almost 100 feet over about 1,400 feet and includes a reversing curve in the horizontal profile to provide an optimal crossing of Bronson Creek before turning back to perpendicularly intersect NW Laidlaw Road.

Required Roadway Width/Sections:

Per County standards, the proposed alignment will require a bridge that includes two 12-foot wide vehicle lanes, two 7-foot wide bike lanes, two 6-foot wide sidewalks, and two 1-foot wide bridge rails for a total required outside-to-outside bridge deck width of 52 feet. The roadway embankment width will be an additional 2-4 feet on both sides, to account for the minimum 3-foot width of earth required behind guardrails, for a total top of embankment of 60 feet, and wider right-of-way width resulting from a 2:1 fill slope.

Utility Impacts:

Utility impacts and costs are not expected to vary significantly between the five options evaluated. Some utilities will require relocation. Although this is a new proposed roadway alignment, the utilities appear to be in the existing ROW, and thus will be relocated by the utilities at their cost.

- NW Laidlaw Rd: There is a waterline, 6 inch gas line, 24 inch storm sewer pipe, and 15 inch sanitary sewer pipe that are located down the center of NW Laidlaw Rd. These utilities would likely not be impacted by any work on the new NW Saltzman alignment.
- Field between Bronson Creek and NW Laidlaw Rd: There is an 18-inch sanitary sewer line and a gas line that cross under the proposed NW Saltzman alignment at a skew. These utilities would be impacted by any multi-span alternative, and may or may not need to be relocated. Relocation would be a project cost since they are in utility easements (outside the existing road right-of-way).
- Bronson Creek to the existing NW Saltzman Rd: As seen in the elevation views, there are many utilities and manholes that will be impacted by this alignment. There is also an existing water quality preservation and storm and surface water drainage easement to Clean Water Services.

Flood Plain and Wetland Impacts:

There are significant variations in flood plain impacts for the five options analyzed. The proposed NW Saltzman Road alignment crosses Bronson Creek, with the 100 year flood plain extending from Bronson

Creek to NW Laidlaw Rd, as shown on the plan view sheets. Although it is possible to place fill within the 100 year flood plain, the structural fill must not create a rise in the flood plain elevation. Any fill must be mitigated for by excavating elsewhere near the project location.

There are also wetlands that will be impacted at both ends of the new NW Saltzman Road alignment (see the plan view sheets).

Evaluation of Design/Construction Options and Costs

A total of five bridge design and construction options were evaluated. Cost and flood plain impact were determined to be the key evaluation criteria. Options 1 and 2 are based on the BNC recommendations for use of prefabricated bridge structures (a buried bridge/arch culvert and a single-span truss bridge). Option 3 is a two-span variation on Option 2, intended to minimize its 100 year flood plain impacts.

Options 1 and 2 have significant 100 year flood plain impacts. Option 3 has the highest cost. In order to address these concerns, two additional bridge types were also evaluated – a BT90 Precast Prestressed Girder bridge (Option 4) and a Steel Plate Girder bridge (Option 5).

The roadway alignment and profile generated in the WHPacific 2007 design were used as the basis for all options evaluated, since they matched the approximate alignment in the BNC proposal and the alignment previously evaluated by the County.

Option 1 was deemed infeasible due to its flood plain impacts, and no cost estimate was prepared. Cost estimates were prepared for Options 2 through 5. The cost estimates include all roadway improvements, including a traffic signal installation at the Laidlaw/ Saltzman intersection and reconnection back to Saltzman at the south end of the project. There are utilities impacted on the south end, but these costs will most likely be borne by the utility companies since they are in the existing right-of-way. Therefore, utility costs are not expected to differ significantly between the various options.

While not considered in this analysis, the use of retaining walls instead of fill slopes along the roadway would reduce the flood plain impact volumes for all five options. This is a refinement that was not developed as part of this study.

A table summarizing the cost of each alternative is provided in Appendix A.

Option 1 – “Buried” Contech BEBO Bridge (not feasible; no cost estimate prepared)

This option would require approximately 6,400 CY (cubic yards) of fill in the 100 year flood plain, which was determined to be a fatal flaw. The reduced construction cost for the bridge in all likelihood would not offset the additional cost of the ROW required to mitigate the extensive 100 year flood plain impact. As a result, no cost estimate was prepared for this alternative.

Option 2 – Single-span Contech Prefabricated Bridge (\$12.07 million)

BNC proposed a truss option with a 27-foot wide by 225-foot long bridge span. As noted previously, that bridge width would not allow for the required 52-foot wide bridge section. The Contech representative was contacted. It was determined that their US Bridge truss system was the only viable option to meet the required bridge width and vehicle loading requirements. The Contech truss bridge in a 170-foot long span configuration was chosen due to the horizontal curve and 52-foot minimum bridge width.

- A. Bridge Cost Assumptions: The bridge construction cost for this alternative is based on a \$402/SF cost as per the provided Contech study.
- B. Flood plain: The estimated 100 year flood impact is 4,200 CY that must be mitigated for near the project. This will be challenging in that it would require acquisition and grading of over one acre of developable land adjacent to Bronson Creek. As a result of the required mitigation volume, the single-span option may not be viable.

Option 3 – Two-span Prefabricated Contech Bridge (\$15.91 million)

To mitigate the flood plain impacts of the single-span design considered in Option 2, a two-span Contech US Bridge truss system was also considered. The resulting bridge was 340 feet in length (two spans of 170 feet each).

- A. Bridge Cost Assumptions: The bridge construction cost for this alternative is based on a \$402/SF cost as per the provided Contech study. This is the highest-cost option evaluated.
- B. Flood plain: The estimated 100 year flood impact is 1,700 CY that must be mitigated for near the project. This will be challenging in that it would require acquisition and grading of approximately 0.4 acres or more of developable land adjacent to Bronson Creek.

Option 4 – Two-span BT90 Precast Prestressed Girder Bridge (\$9.11 million)

Per the ODOT Bridge Design and Drafting Manual, the BT90 is limited to 180-foot spans. Thus, a 360-foot bridge (two spans of 180 feet) was evaluated.

- A. Bridge Cost Assumptions: The proposed bridge construction cost for this alternative is based on a \$140/SF cost as per ODOT cost data (2010 – 2014).
- B. Flood plain: The estimated 100 year flood impact is 1,400 CY that must be mitigated for near the project. This will be challenging in that it would require acquisition and grading of approximately 0.4 acres or more of developable land adjacent to Bronson Creek.

Option 5 – Two-span Steel Plate Girder Bridge (\$9.91 million)

Using steel allows for longer spans and girders that can follow the reverse curvature of the road. Although longer spans are possible, the structure depth and the available depth near NW Laidlaw Rd limited the bridge to 400 feet (two spans of 200 feet). If the bridge end was pushed up the hill, then a

longer bridge would be possible. A 500-foot bridge (2 spans of 250 feet) could be a possibility, but was not studied. The bridge is assumed to have an 8-inch deck.

- A. Bridge Cost Assumptions: The proposed bridge construction cost for this alternative is based on a \$160/SF cost as per ODOT cost data (2010 – 2014).
- B. Flood plain: The estimated 100 year flood impact is 800 CY that must be mitigated for near the project. This will be challenging in that it would require acquisition and grading of 0.3 acres or more of developable land adjacent to Bronson Creek.

Appendix A

NW Saltzman Road Western Alignment Cost Estimates and Pros-Cons

March 3, 2016

Cost Estimates

Cost in \$ Millions

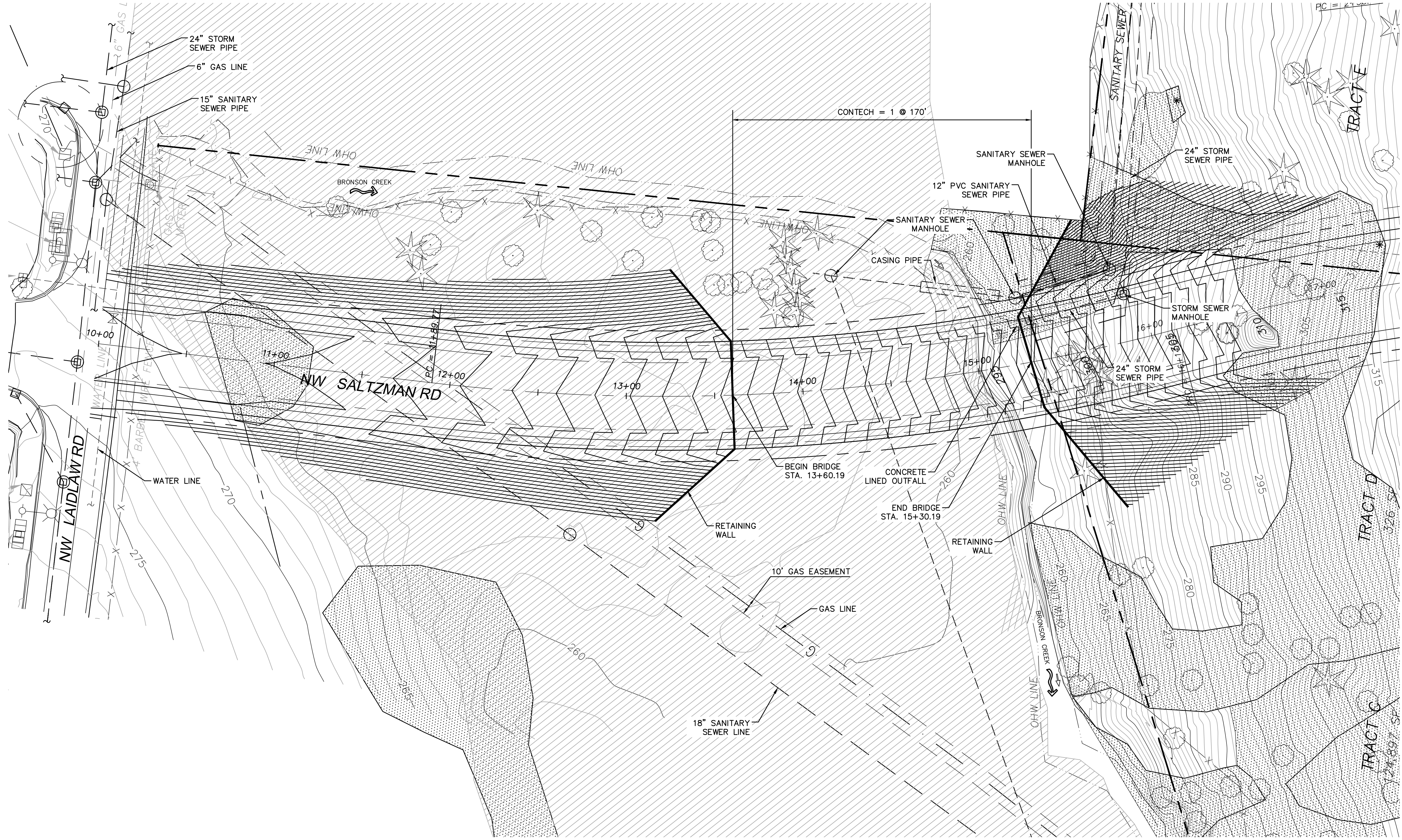
Cost Element	OPTION 1: 42ft Buried Bridge: CONTECH BEBO Precast Arch	OPTION 2: 170ft Single Span: CONTECH Vehicular Truss Bridge	OPTION 3: 340ft (2-170ft) Two Span: CONTECH Vehicular Truss Bridge	OPTION 4: 360ft (2-180ft) Two Span: BT90 Prestressed Girder Bridge	OPTION 5: 400ft (2-200ft) Two Span: Steel Plate Girder Bridge
Roadway		\$3.15	\$2.80	\$2.75	\$2.63
Bridge		\$3.60	\$7.10	\$2.60	\$3.30
Retaining Wall		\$0.39	\$0.31	\$0.31	\$0.30
30% Construction Contingency		\$2.14	\$3.06	\$1.70	\$1.87
Construction Subtotal		\$9.28	\$13.27	\$7.36	\$8.10
Roadway ROW		\$0.40	\$0.40	\$0.40	\$0.40
Flood Plain Mitigation ROW		\$1.00	\$0.25	\$0.25	\$0.20
Engineering (15% of const.)		\$1.39	\$1.99	\$1.10	\$1.21
Total Estimated Cost	Not Completed	\$12.07	\$15.91	\$9.11	\$9.91

Estimated Flood Plain Mitigation	6400 cy	4200 cy	1700 cy	1400 cy	800 cy

Pros-Cons

Pros		<ul style="list-style-type: none"> * Fast Construction due to prefabricated members (ABC) 	<ul style="list-style-type: none"> * Fast Construction due to prefabricated members (ABC) * Truss provides Historical Aesthetic Look 	<ul style="list-style-type: none"> * Low Bridge Cost * Typical Washington County Bridge Type * Widenable 	<ul style="list-style-type: none"> * Easily accommodates horizontal reversing curves * Long Spans * Widenable * Lowest required Flood Mitigation
Cons	<ul style="list-style-type: none"> * Permit approval concerns due to large Flood Plain Mitigation Impacts * High Potential to not meet the 100yr "No-Rise" Certification due to restricted Bronson Creek channel 	<ul style="list-style-type: none"> * Permit approval concerns due to large Flood Plain Mitigation Impacts * Non typical Aesthetics * Not widenable 	<ul style="list-style-type: none"> * High Construction Cost * Not ideal for use within a reversing curve due to chorded truss section requiring a wider width than the roadway requires. * Not widenable 	<ul style="list-style-type: none"> * Not ideal for use within a reversing curve due to the potential for large overhangs and chorded girders * Heavy Construction Load 	<ul style="list-style-type: none"> * Not a Typical Washington County Bridge Type

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- F.E.M.A. 100 YEAR FLOOD PLAIN

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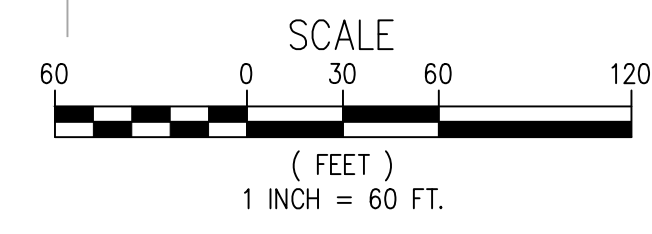
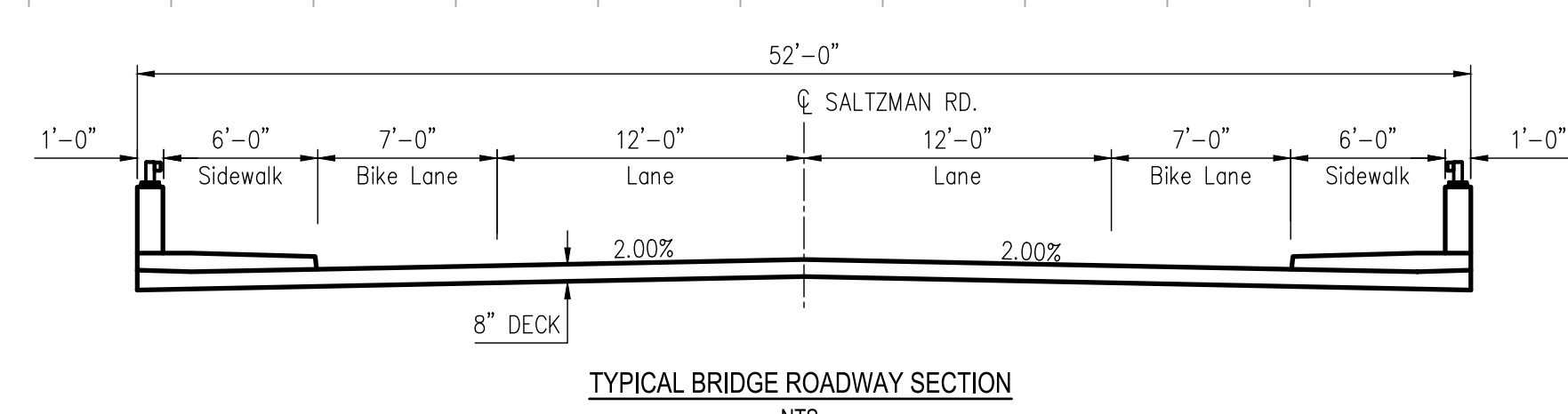
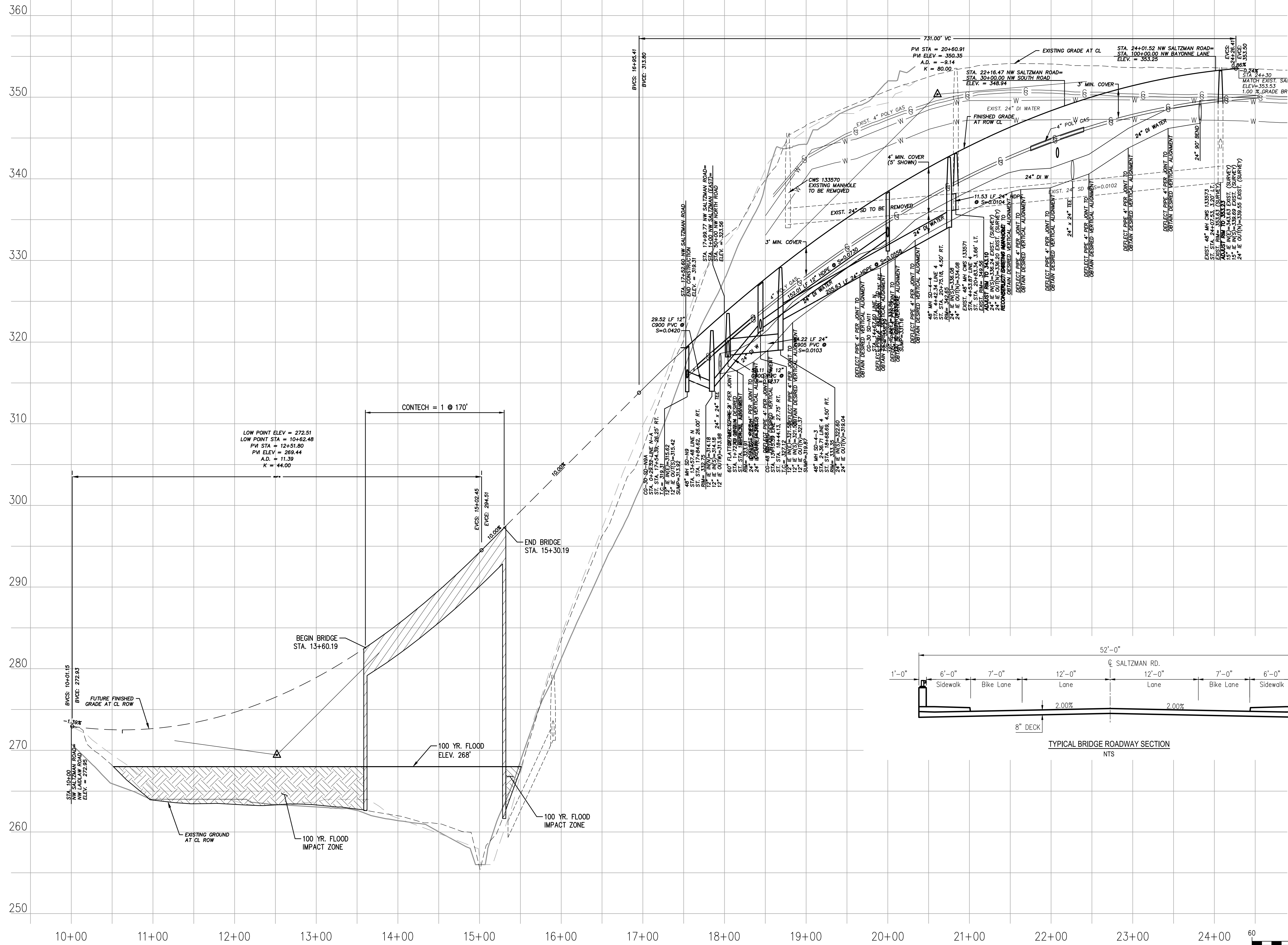
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PLAN VIEW
170'-0" CONTECH VEHICULAR TRUSS BRIDGE
NW SALTZMAN RD.
IMPROVEMENT STUDY

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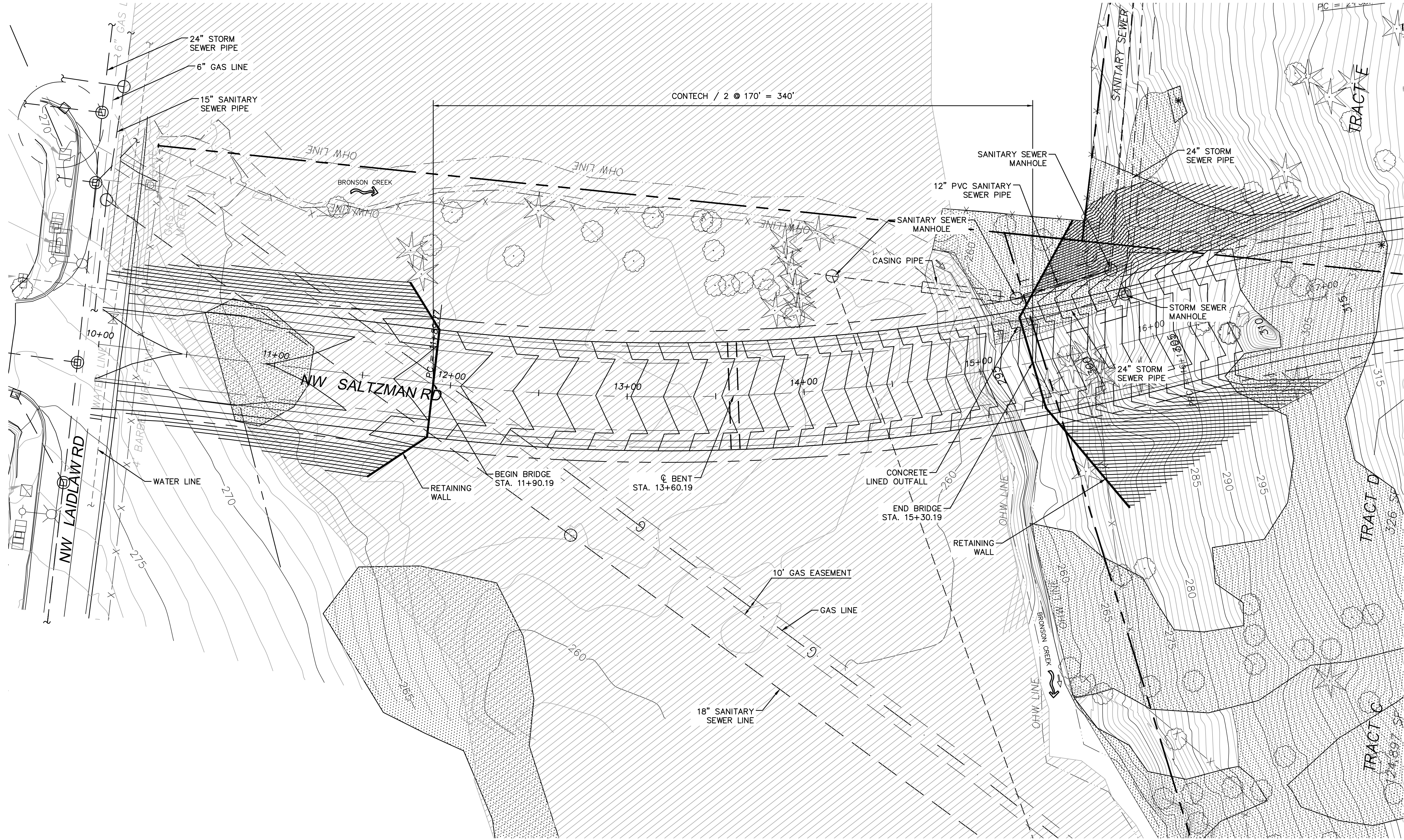
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ELEVATION VIEW
170'-0" CONTECH VEHICULAR TRUSS BRIDGE
NW SALTZMAN RD.
IMPROVEMENT STUDY

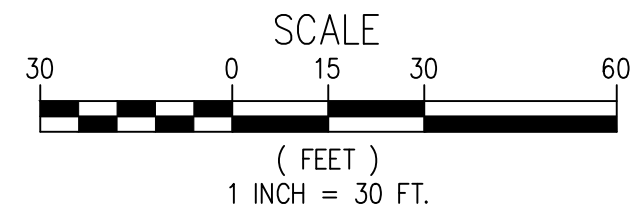
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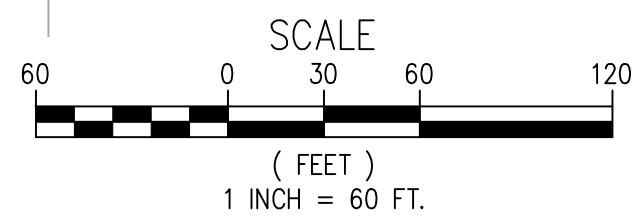
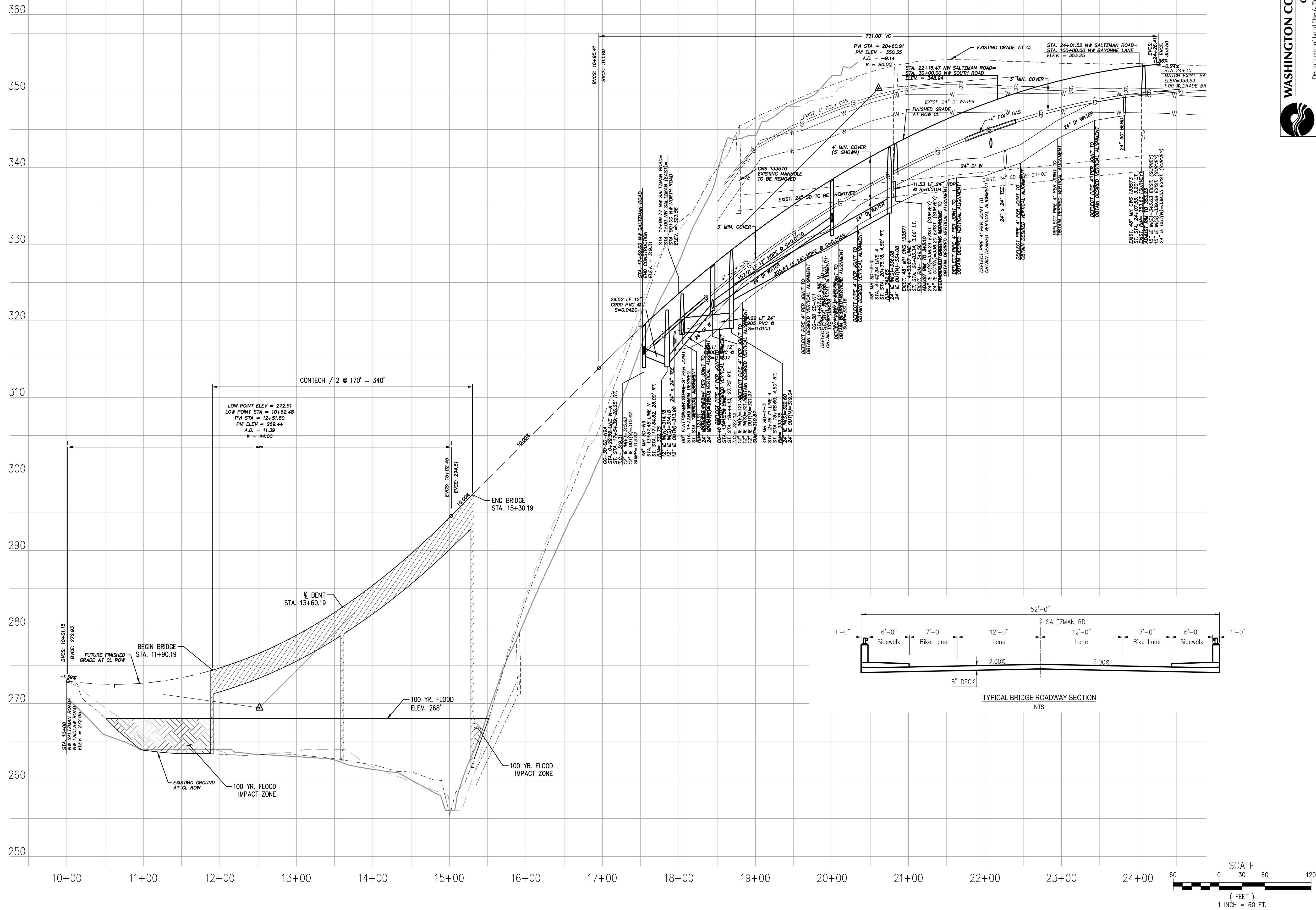
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PLAN VIEW 340'-0" (170', 170')
CONTECH VEHICULAR TRUSS BRIDGE
NW SALTZMAN RD.
IMPROVEMENT STUDY

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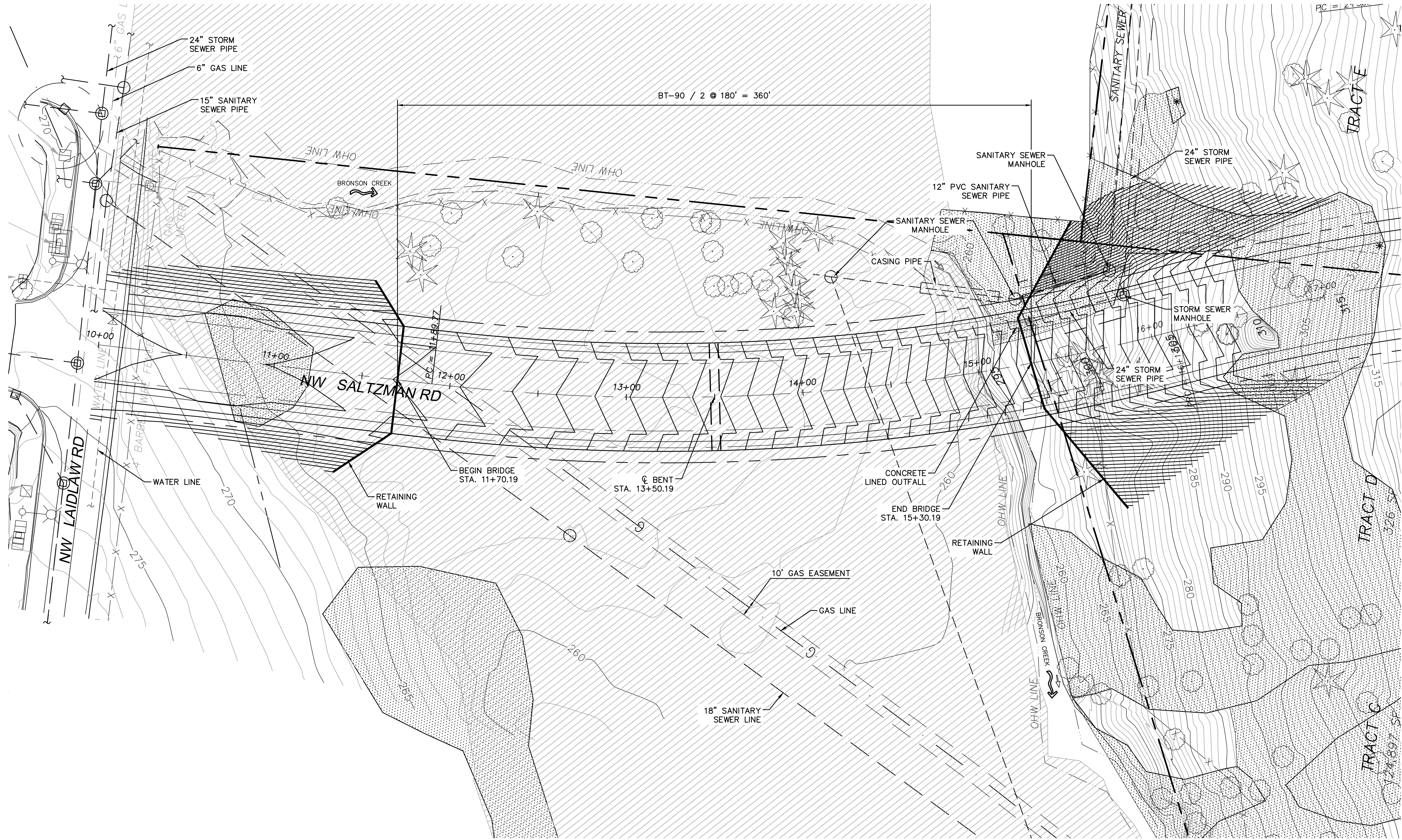
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ELEVATION VIEW 340'-0" (170', 170')
CONTECH VEHICULAR TRUSS BRIDGE
NW SALTZMAN RD.
IMPROVEMENT STUDY

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LEGEND

- WETLAND
- F.E.M.A. 100 YEAR FLOOD PLAIN

SCALE
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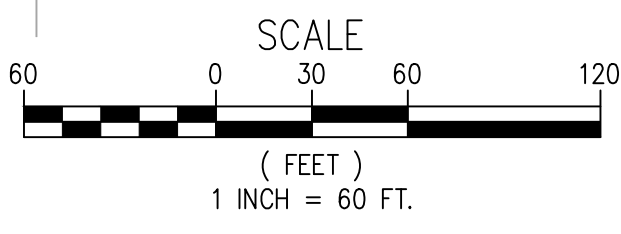
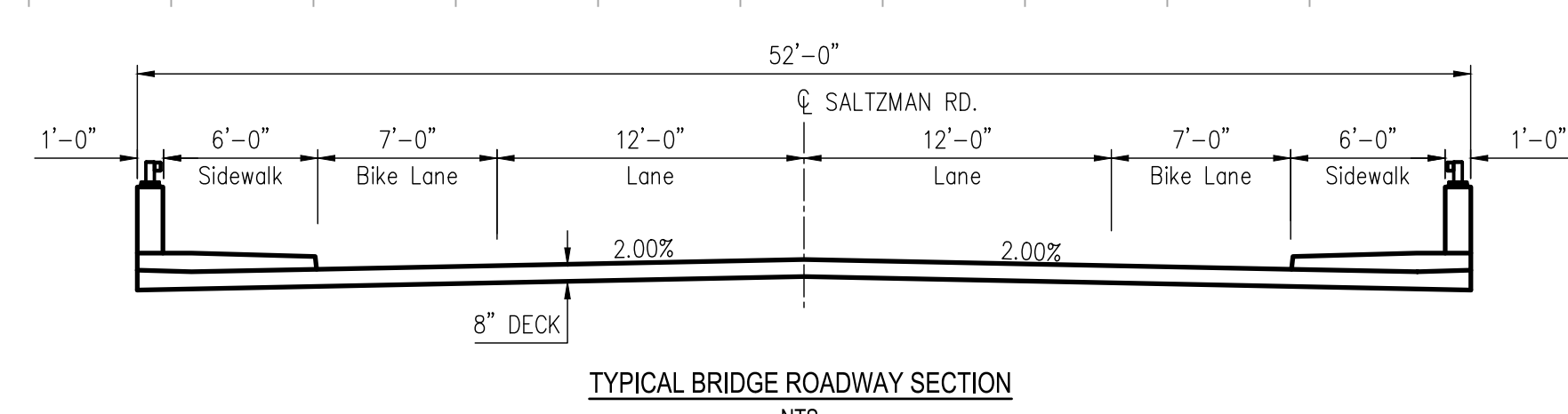
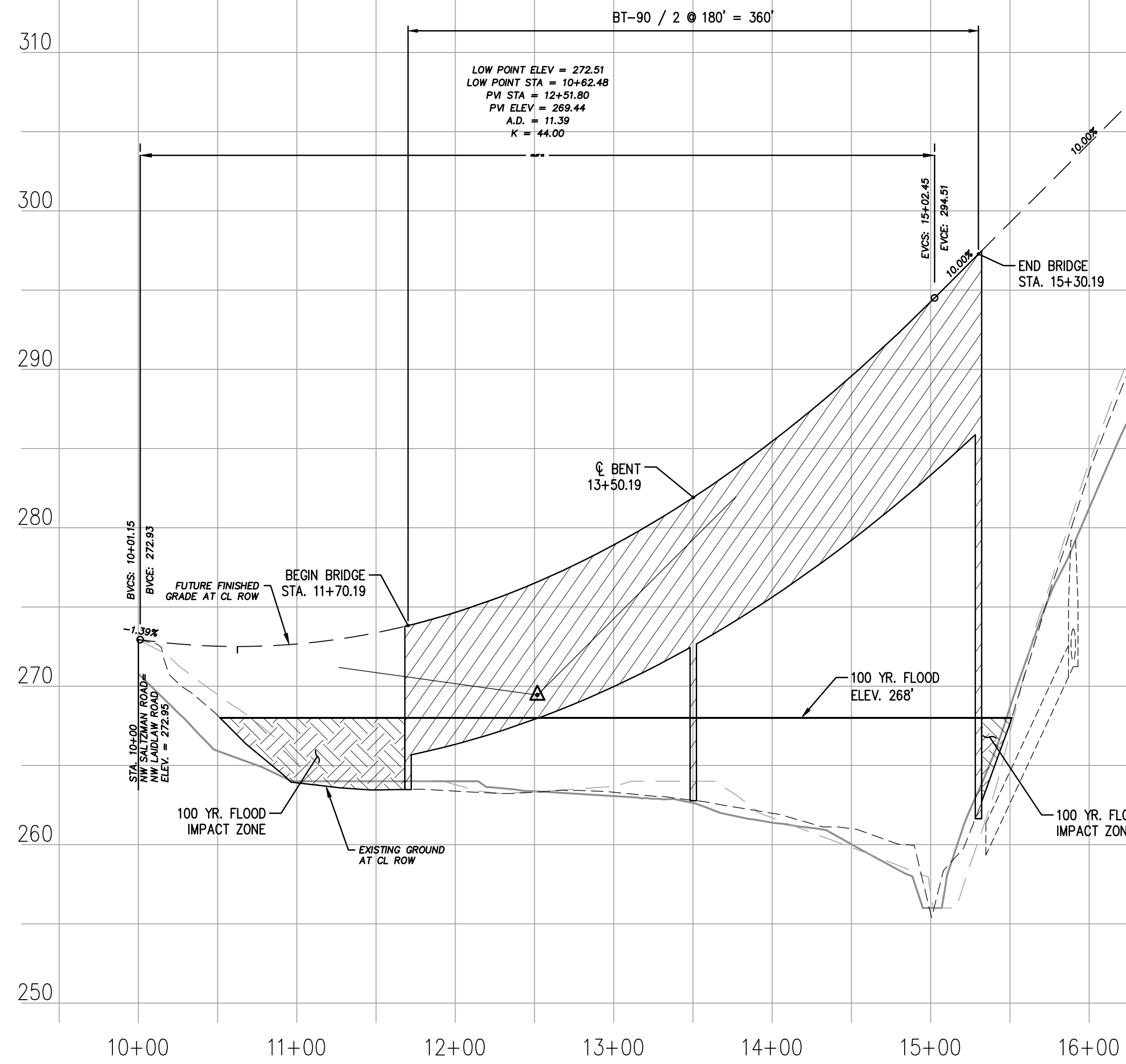
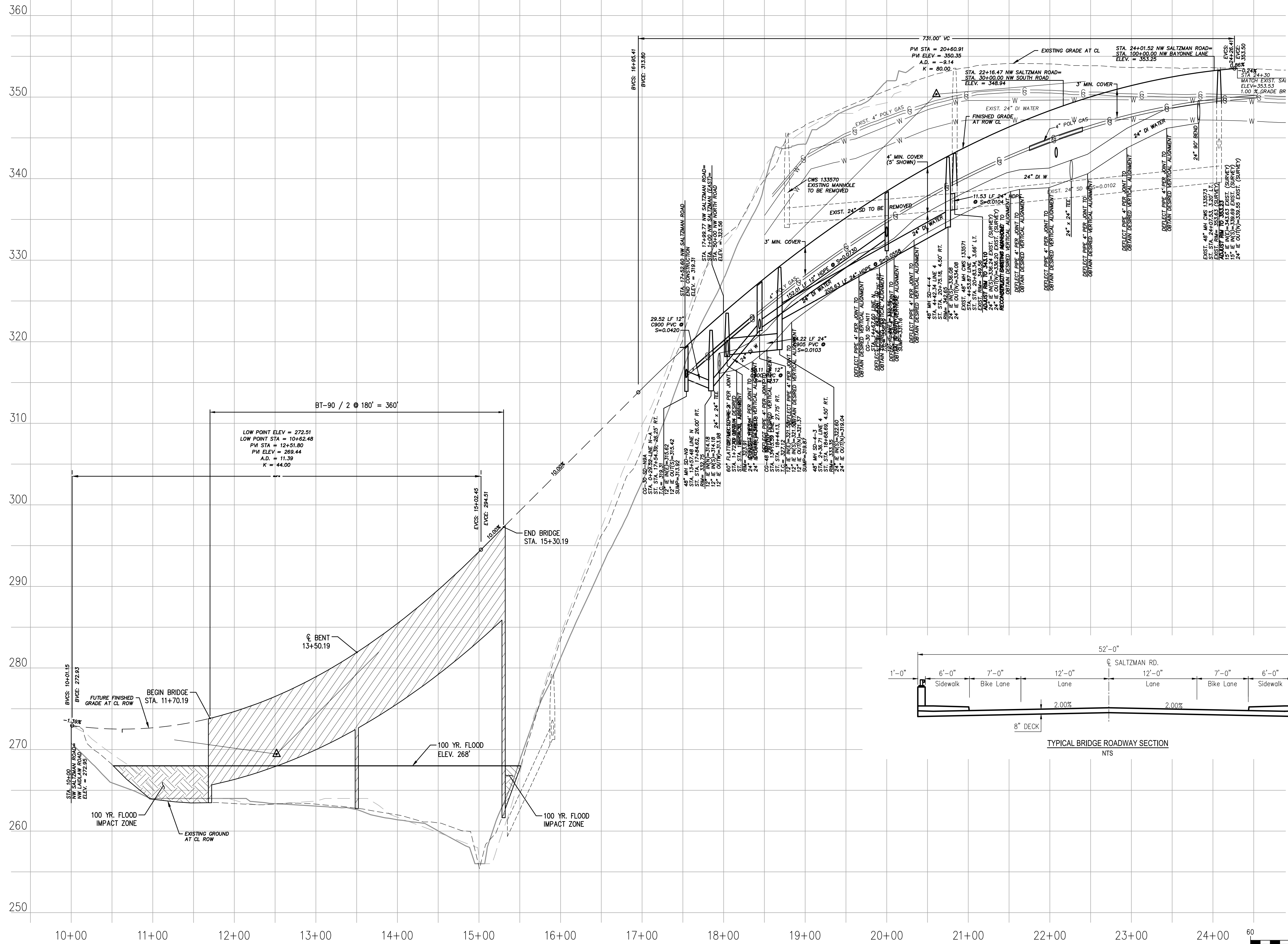
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PLAN VIEW 360'-0" (180', 180')
PS PC CONCRETE BT90 BRIDGE
NW SALTZMAN RD.
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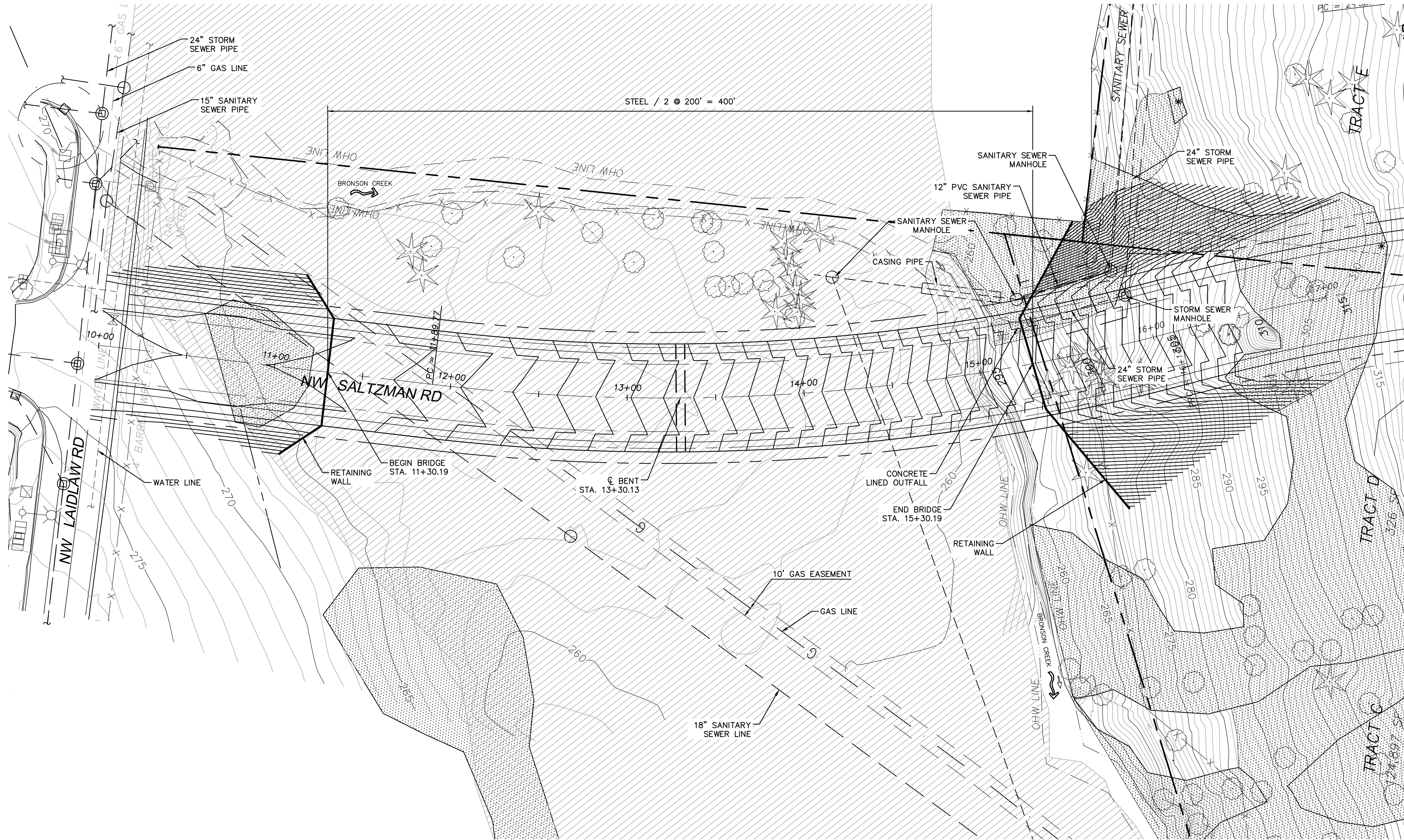
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ELEVATION VIEW 360'-0" (180', 180')
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 NW SALTZMAN RD.
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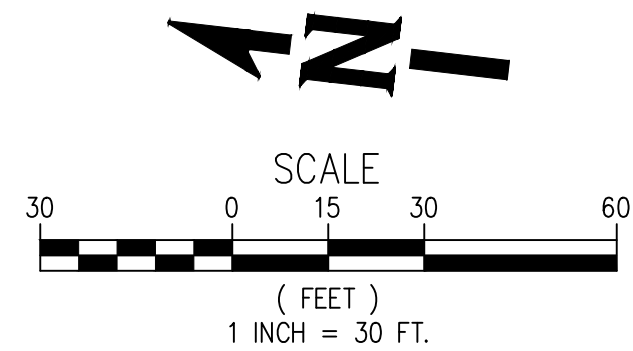
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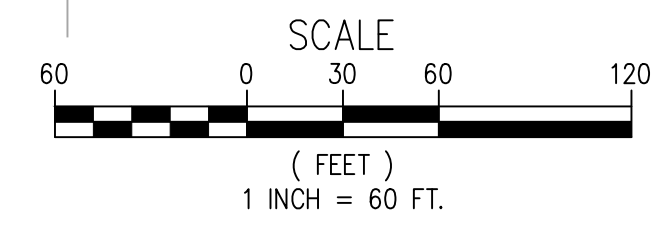
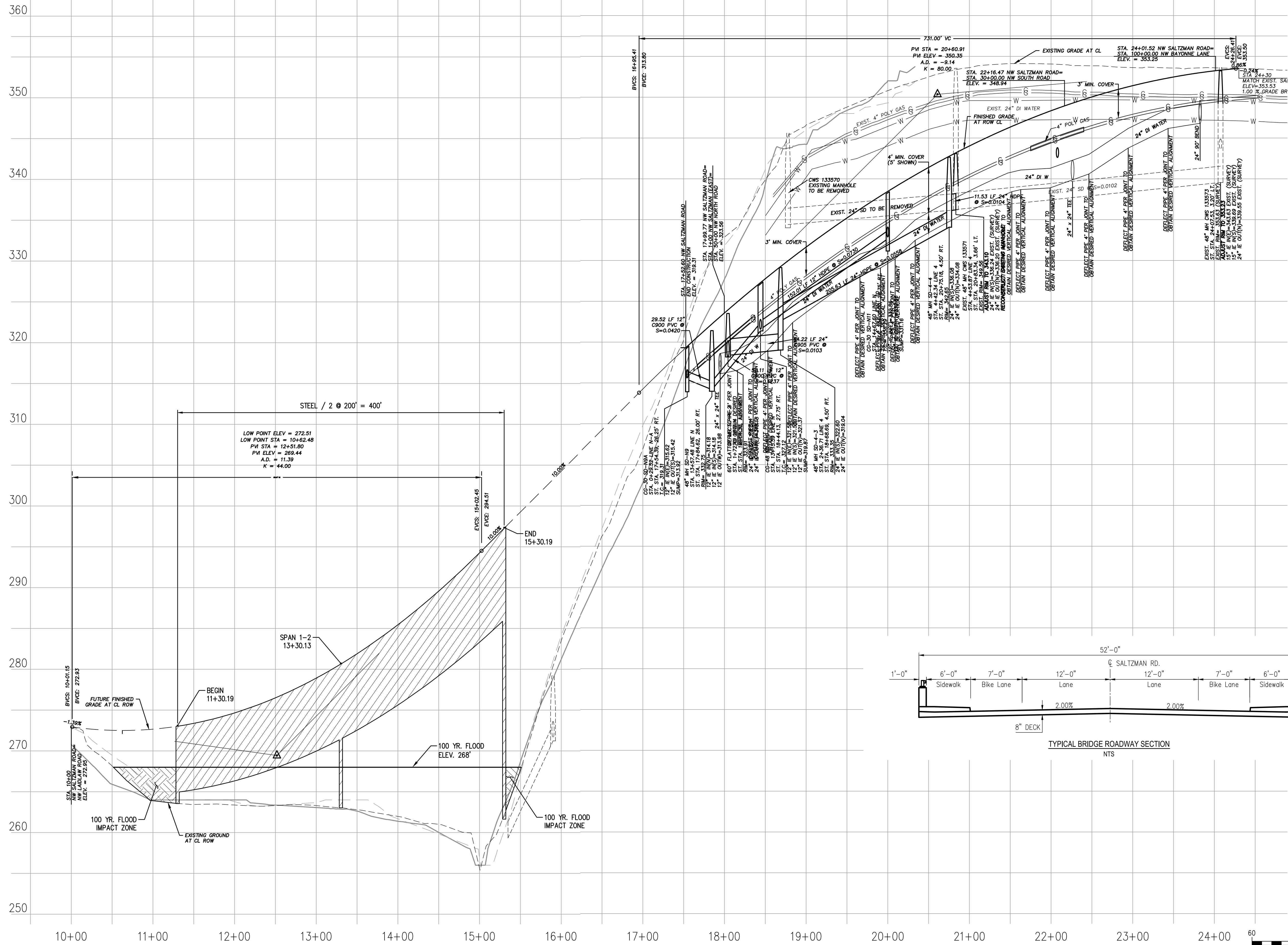


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STEEL PLATE GIRDER BRIDGE
 NW SALTZMAN RD.
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ELEVATION VIEW 400'-0" (200', 200')
STEEL PLATE GIRDER BRIDGE
NW SALTZMAN RD.
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