



# Traffic Noise Analysis Technical Report

## Interstate 35 Capital Express South From US 290W/SH 71 to SH 45SE Travis and Hays Counties, Texas

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March 2021

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9 2019, and executed by FHWA and TxDOT.

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## List of Acronyms

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dB(A)	A-weighted decibels
FM	farm to market
FHWA	Federal Highway Administration
$L_e$ (h)	hourly equivalent noise levels
mph	miles per hour
NAC	Noise Abatement Criteria
NB	northbound
ROW	right-of-way
SB	southbound
SH	state highway
TxDOT	Texas Department of Transportation

## 1. Project Overview

The Texas Department of Transportation is proposing improvements to I-35 from US 290 West/State Highway (SH) 71 (SH 71) to SH 45 southeast (SE) in Travis County, with a transition area extending to Main Street in Buda, Hays County. A detailed project description and location map is available in ECOS under PROJECT.

## 2. Traffic Noise Analysis

### 2.1 Traffic Noise Overview

A traffic noise analysis was conducted in accordance with TxDOT's (Federal Highway Administration [FHWA] approved) 2011 *Guidelines for Analysis and Abatement of Roadway Traffic Noise*. These guidelines apply to all state-funded Type I roadway projects, federal and federal aid on new location or include the physical alteration of an existing roadway.

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "db. l"

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

The traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC) for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur (Table 1).

**Table 1: Noise Abatement Criteria**

Activity Category	FHWA (dB(A) Leq)	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (exterior)	Residential
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools and television studios
E	72 (exterior)	Hotels, motels, offices, restaurants/bars and other developed lands, properties or activities not included in A–D or F
F	--	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing
G	--	Undeveloped lands that are not permitted

Source: TxDOT (2011)

A traffic noise impact occurs when either the absolute or relative criterion is met:

**Absolute criterion**—The predicted traffic noise level at a receiver approaches, equals, or exceeds the NAC. "Approach" is defined as 1 dB(A) (A-weighted decibels) below the NAC. For example, a traffic noise impact would occur at a Category B residence if the traffic noise level is predicted to be 66 dB(A) or above.

**Relative criterion**—The predicted noise level substantially exceeds the existing traffic noise level at a receiver even though the predicted traffic noise level does not approach, equal, or exceed the NAC. "Substantially exceeds" is defined as an increase of more than 10 dB(A). For example, a traffic noise impact would occur at a Category B residence if the existing level is 54 dB(A) and the predicted level is 65 dB(A). This traffic noise level does not exceed the NAC, but it is more than 10 dB(A) greater than it had been.

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

## 2.2 Results of Traffic Noise Analysis

The FHWA traffic noise modeling software (TNM 2.5) was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type and speed of vehicles; highway alignment and grade; cuts, fills and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Existing and predicted traffic noise levels were modeled at 57 receiver locations (**Table 2** and **Traffic Noise Receiver Locations** in **Appendix A**) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

*Table 2: Traffic Noise Receivers*

	Representative Receiver	NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-1	La Quinta Hotel Pool	E	72	65	65	0	No
R-2	Candlewood Suites Hotel Patio	E	72	65	66	+1	No
R-3	Omni Hotel Pool with 5-foot stone wall	E	72	67	68	+1	No
R-4	Ramada Hotel Pool	E	72	66	67	+1	No
R-5	Hideaway Restaurant Outdoor Seating	E	72	67	68	+1	No
R-6	Marriott Restaurant Outdoor Dining Area	E	72	64	64	0	No
R-7	Springhill Suites Outdoor Seating/Patio	E	72	70	71	+1	Yes
R-8	Courtyard Marriott Hotel Balconies	E	72	67	68	+1	No
R-9	Residence Inn Pool/Tennis Courts	E	72	69	69	0	No
R-10	Red Roof Inn Hotel pool	E	72	65	66	+1	No
R-11	Comfort Suites Hotel Pool	E	72	69	70	+1	No
R-12	KIPP Austin School	D	52	35	37	+2	No
R-13	Recreation Field	C	67	69	71	+2	Yes
R-14	Stassen woods Apartments	B	67	67	67	0	Yes
R-15	School-Wayside: REAL Learning Academy	D	52	33	35	+2	No
R-16	Applebee's Outdoor Seating Area	E	72	66	67	+1	No

Representative Receiver		NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-17	Taco Cabana Outdoor Seating Area	E	72	68	69	+1	No
R-18	Apartment at South Point Pool	C	67	66	66	0	Yes
R-19	Oak Meadow Baptist Church Playground	C	67	64	65	+1	No
R-20	Austin Lone Star RV Resort Pool	C	67	73	74	+1	Yes
R-21	RV	B	67	66	68	+2	Yes
R-22	Ladera Apartment Balconies	B	67	69	69	0	Yes
R-23	Ladera Apartment Balconies	B	67	68	69	+1	Yes
R-24	Waters at Bluff Springs Apartment Balconies	C	67	63	65	+2	No
R-25	Waters at Bluff Springs Apartment Pool	B	67	62	64	+2	No
R-26	Valor School Playground	C	67	69	70	+1	Yes
R-27	Valor Charter School	D	52	43	44	+1	No
R-28	Lenox Soco Apartment Pool	C	67	63	64	+1	No
R-29	Ethos Apartments Pool	C	67	62	62	0	No
R-30	Ethos Apartment Balconies	B	67	64	64	0	No
R-31	Griffis Southpark Apartment Pool	C	67	65	68	+3	Yes
R-32	Griffis Southpark Apartment Balconies	B	67	67	70	+3	Yes
R-33	Don Darios Restaurant Outdoor Seating	E	72	70	73	+3	Yes
R-34	Starbucks Outdoor Seating	E	72	70	72	+2	Yes
R-35	Southpark Crossing Apartment Pool	C	67	64	66	+2	Yes
R-36	Southpark Crossing Apartment Balconies	B	67	64	65	+1	No
R-37	Single Family Houses (12)	B	67	64	67	+3	Yes
R-38	BreWingz on the Fly Restaurant Outdoor Seating Area	E	72	63	67	+4	No
R-39	First Class Child Development Center Playground	C	67	60	63	+3	No
R-40	Bridges at Asher Apartment Balconies	B	67	69	72	+3	Yes
R-41	Lenox Springs II Apartment Balconies	B	67	65	66	+1	Yes

	Representative Receiver	NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-42	Lenox Springs Apartment Balconies	B	67	61	64	+3	No
R-43	Bridges at Asher Apartment Balconies	B	67	69	71	+2	Yes
R-44	Lenox Springs Apartments Balconies	B	67	63	66	+3	Yes
R-45	Single Family Residence Front Porch	B	67	70	73	+3	Yes
R-46	Onion Creek Apartment Balconies	C	67	66	69	+3	Yes
R-47	Farmhouse Apartments Pool	B	67	67	70	+3	Yes
R-48	Crown Colony Patios	B	67	67	70	+3	Yes
R-49	Multifamily Backyard	B	67	65	68	+3	Yes
R-50	Outdoor Seating Restaurant Craig O's	E	72	64	67	+3	No
R-51	Colonial Grand at Onion Creek Apartment Balconies	B	67	63	67	+4	Yes
R-52	Condo Pool	C	67	64	66	+2	Yes
R-53	Mansions at Onion Creek Apartment Balconies	C	67	67	72	+5	Yes
R-54	St. Alban's Church Playground	B	67	71	73	+2	Yes
R-55	Park at Estancia Apartment Balconies	B	67	66	67	+1	Yes
R-56	Estancia Villas Apartments Pool	B	67	56	56	0	No
R-57	Estancia Villas Apartment Balconies	C	67	68	67	-1	Yes

As indicated in **Table 2**, the proposed project would result in a traffic noise impact at thirty out of 57 receivers. Receiver R-57 shows a reduction in predicted noise levels and this is likely because of the removal of an exit ramp from the I-35 SB mainlanes to the I-35 SB frontage road north of FM 1327 as well as a shift of the I-35 SB mainlanes to the east shifting traffic further away from the receiver.

The following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone and the construction of traffic noise barriers.

## 2.3 Discussion of Noise Abatement Measures

Before a noise abatement measure can be proposed for the project, it must be both feasible and reasonable. To be feasible, the abatement measure must be able to reduce the noise level by at

least 5 dB(A) at greater than 50 percent of impacted first-row receivers. To be reasonable, the abatement measure must not exceed the cost-effectiveness criterion of \$25,000 for each receiver that would benefit by a reduction of at least 5 dB(A) and the abatement measure must be able to reduce the noise level at (a minimum) of one impacted, first row receiver by at least 7 dB(A) in the predicted noise level (noise reduction goal).

The following traffic noise abatement measures were considered: acquisition of undeveloped property to act as a buffer zone, alteration of horizontal and/or vertical alignments, traffic management, and the construction of traffic noise barriers. Each of these measures is discussed below.

Buffer zone: The acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and therefore is not feasible.

Alteration of horizontal and/or vertical alignments: Any alteration of the existing alignment would displace existing businesses and residences, require additional ROW and not be cost effective/reasonable.

Traffic management: Control devices could be used to reduce the speed of the traffic; however, the minor benefit of 1 dB(A) per 5 miles per hour (mph) reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on interstate and state highways.

Noise barriers: This traffic noise abatement measure is the most commonly used. Traffic noise barriers were evaluated for each of the impacted receiver locations shown in **Table 2**. Traffic noise barriers would not be feasible and reasonable for the following impacted receivers and, therefore, are not proposed for incorporation into the project:

R-7: The receiver represents an outdoor seating area at the Springhill Suites Hotel. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (191') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 3 dB(A) reduction for R-7. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-13: This receiver represents a recreation field at KIPP Austin School. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (276') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 2 dB(A) reduction for R-13. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design

goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-14: This receiver represents 15 impacted receptors in the Stassney Woods Apartment complex. A continuous 413' noise barrier up to 22 feet in height, placed along the ROW would not be sufficient to benefit a majority of the impacted receptors or meet the 7 dB(A) noise reduction design goal. Therefore, a noise barrier is not proposed for this location.

R-18: This receiver represents the pool in the Apartments at South Point. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the SB I-35 frontage road.

R-20 and R-21: These receivers represent a pool and RV at the Austin Lone Star RV Resort. In order to maintain access to the driveway located off the I-35 NB frontage road, a 120' traffic noise barrier up to 22 feet tall was modeled along the ROW on the north side of the driveway adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 5 dB(A) reduction for R-20 and a 1dB(A) reduction for R-21. Therefore, a traffic noise barrier would not achieve the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-22 and R-23: These receivers represent 34 impacted receptors at the Ladera Apartment Complex. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (1,090') adjacent to the SB I-35 frontage road. A continuous noise barrier would restrict access to these apartments and as such, the noise barrier was split into three segments. Gaps in the noise barrier would satisfy access requirements, but the resulting non-continuous wall segments would not be sufficient to achieve the minimum, feasible reduction of 5 dB(A) for a majority of impacted receptors or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-26: This receiver represents the playground at the Valor school. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (412') adjacent to the SB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in less than a 1 dB(A) reduction for R-26. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-31 and R-32: These receivers represent the pool at Griffis South Apartment Complex and eight apartment balconies. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (1,577') adjacent to the SB I-35 frontage road. This barrier was divided into two segments to maintain existing access; this gap greatly reduces the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible

noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-33: This receiver represents an outdoor seating area at Don Darios Restaurant. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (207') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 3 dB(A) reduction for R-33. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-34: This receiver represents an outdoor dining area at a Starbucks. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (231') adjacent to the SB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 5 dB(A) reduction for R-34. Therefore, a traffic noise barrier would not achieve the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-35: This receiver represents the pool at the Southpark Apartment Complex. The receiver does not represent any additional apartment units as a separate representative receiver, R-36, was modeled for the apartment balconies. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (250') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 2 dB(A) reduction for R-35. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-37: This receiver represents seven impacted single-family residences with backyards facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (832') adjacent to I-35 SB frontage road. There is a single-story shopping center located in between the frontage road and the residences, which acts as an existing noise barrier. The construction of a traffic noise barrier in between the frontage road and the shopping center could potentially increase the traffic noise levels for the residences due to the reflection of the sound between the wall and the shopping center. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-41: This receiver represents the Lenox Springs II Apartment complex, which is currently under construction. A traffic noise barrier up to 22 feet tall was modeled for the full length of available

ROW (382') adjacent to the I-35 SB frontage road. This barrier was divided into two segments to maintain existing access; this gap greatly reduces the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-44: This receiver represents 17 balconies at the Lenox Springs Apartment complex. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (576') adjacent to I-35 NB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-45: This receiver represents the front porch of a single-family residence. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the SB I-35 frontage road.

R-46: This receiver represents six impacted receptors in the Onion Creek Apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (410') adjacent to the NB I-35 frontage road. There is an existing 6 foot tall stone wall located just outside the proposed ROW between the frontage road and the apartment complex. This reduces the effectiveness of the barrier due to the reflection of the sound between the existing wall and the barrier and requires a taller barrier to achieve noise reductions. The model concluded that a traffic noise barrier would achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers and meet the noise reduction design goal of 7 dB(A) at any impacted first row receiver. However, the cost of the noise barrier exceeded the cost-effectiveness criterion of \$25,000 for each benefited receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-47: This receiver represents the pool at the Farmhouse Apartment complex, which represents 42 apartment units facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (341') adjacent to I-35 NB frontage road. The model concluded that a 22-foot-tall barrier would result in a 3 dB(A) reduction for R-47. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or at least a 7 dB(A) reduction at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-48: This receiver represents condominium patios. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the NB I-35 frontage road.

R-49: This receiver represents 11 impacted receptors for multifamily residences with backyards facing I-35). A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (812') adjacent to I-35. This barrier was divided into three segments to maintain existing access and allow space for the shared use path; these gaps greatly reduce the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-51: This receiver represents 20 impacted receptors in the Colonial Grand at Onion Creek Apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (351') adjacent to I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-52: This receiver represents a pool at a condominium complex, representing four condominiums facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (202') adjacent to I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-53: These receivers represent 287 impacted receptors at the newly constructed Mansions at Onion Creek Apartment Complex. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (2,646') adjacent to I-35. This barrier was divided into three segments to maintain existing access, these gaps greatly reduce the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers, but it does meet the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-54: This receiver represents a playground at St. Albans Church. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (512') adjacent to the I-35 frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-57: This receiver represents 26 impacted receptors at the Estancia Villas apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of

available ROW (370') adjacent to the I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers, but it does meet the noise reduction design goal of 7 dB(A) at one impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

## 2.4 Proposed Noise Barriers

Noise barriers would be feasible and reasonable based on TxDOT's *Guidelines for Analysis and Abatement of Roadway Traffic Noise* for the following impacted receptors, and therefore, are proposed for incorporation into the project (**Table 3**).

R-40: This receiver represents an apartment complex with 13 first floor patio spaces and 18 2<sup>nd</sup> and 3<sup>rd</sup> floor balcony spaces. 41 of the first-row receptors had predicted traffic noise impacts. Based on preliminary calculations, a traffic noise barrier along the ROW of R-40 that is 20 feet tall and 594 feet long met the 7 dB(A) noise reduction design goal at 20 impacted, first row receptors and the 5 dB(A) reduction at greater than 80 percent of impacted first row receptors without surpassing the cost effectiveness factor, thereby making it both feasible and reasonable.

R-43: This receiver represents an apartment complex with five first floor patio spaces, 16 2<sup>nd</sup> floor balcony spaces, and 4 3<sup>rd</sup> floor balcony spaces. All 25 of the first-row receptors had predicted traffic noise impacts. A traffic noise barrier along the ROW of R-43 that is 16 feet tall and 1,017 feet long met the 7 dB(A) noise reduction design goal at eight impacted, first row receivers and the 5 dB(A) reduction at 60 percent of impacted first row receivers without surpassing the cost effectiveness factor, thereby making it both feasible and reasonable.

R-55: This receiver represents an apartment complex with 12 first floor patio spaces, 22 second floor balcony spaces and 22 third floor balcony spaces. 53 of the first-row receptors had predicted traffic noise impacts. A traffic noise barrier along the ROW of R-55 that varies between 20 and 22 feet tall and 931 feet long met the 7 dB(A) noise reduction design goal at ten impacted, first row receivers and the 5 dB(A) reduction at 51 percent of impacted first row receivers without surpassing the cost effectiveness factor, thereby making it both feasible and reasonable.

The traffic noise barrier proposal for R-40, R-43 and R-55 can be seen in **Table 3** and **Traffic Noise Receiver Locations** in **Appendix A**.

*Table 3: Noise Barrier Proposal (preliminary)*

Barrier	Representative Receivers	Total # Benefitted	Barrier Length (ft)	Barrier Height (ft)	Total Cost	Cost per Benefitted Receiver
1	R-40	33	594	20	\$213,970	\$6,484
2	R-43	15	1,017	16	\$292,930	\$19,529
4	R-55	27	931	20-22	\$360,433	\$13,349

Some land use activity areas in various locations throughout the length of the proposed project are currently Category G, undeveloped lands that are not permitted. Also, no new development is currently planned, designed or programmed in this area. There is no NAC for undeveloped land; however, to avoid noise impacts that may result from future development of properties adjacent to the project, local officials responsible for land use control programs must ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2040) noise impact contours (**Table 4**).

*Table 4: Traffic Noise Contours*

Undeveloped Area	Land Use	Impact Contour	Distance from ROW
I-35 east side, south of Onion Creek Parkway	NAC B and C	66 dB(A)	450 feet from ROW
I-35 east side, south of south of Onion Creek Parkway	NAC E	71 dB(A)	120 feet from ROW

Noise associated with the construction of the proposed project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is not expected. Provisions would be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

A copy of this traffic noise analysis will be made available to local officials. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the proposed project.

### 3. References

Federal Highway Administration (FHWA). 2004. FHWA Traffic Noise Model (computer software). Version 2.5.

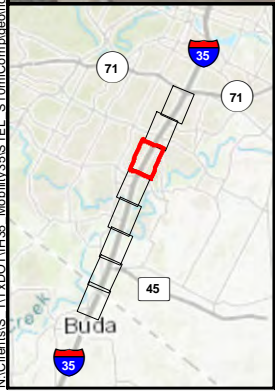
Texas Department of Transportation (TxDOT). 2011. Guidelines for Analysis and Abatement of Roadway Traffic Noise. April 2011. <http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/730-02-gui.pdf> (accessed June 10, 2019).








# *Appendix A*

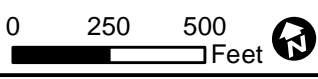
## *Figures*









-  Impacted Traffic Noise Receiver  
 Non-Impacted Traffic Noise Receiver  
 Benefited Traffic Noise Receiver  
 Proposed Traffic Noise Barrier  
 Existing ROW  
 Proposed ROW
- 0 250 500 Feet
 
- Google, TNRIS. Texas Google Imagery Service. 2018. 1:6,000; generated by Atkins; using ArcMap.  
 <<https://tnris.org/texas-google-imagery/>> (10 March 2021); TPWD (2013)



 **mability**  
CAPITAL AREA

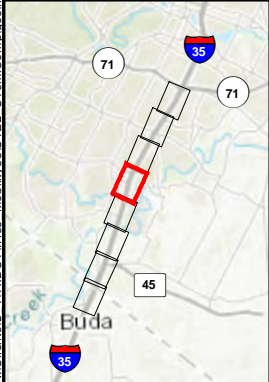


**Traffic Noise Receiver Locations**

**Capital Express South**  
**US 290W/SH 71 to Main Street, Buda**

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AUSTIN, TRAVIS COUNTY, TEXAS  
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● Impacted Traffic Noise Receiver  
● Non-Impacted Traffic Noise Receiver  
● Benefited Traffic Noise Receiver  
— Proposed Traffic Noise Barrier  
— Existing ROW  
— Proposed ROW

0 250 500 Feet

Google, TNRS. Texas Google Imagery Service. 2018. 1:6,000; generated by Atkins; using ArcMap.  
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**mobility** 35  
CAPITAL AREA

Traffic Noise Receiver Locations

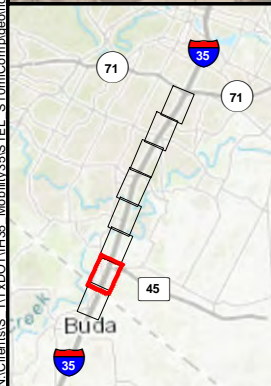
**Capital Express South**  
**US 290W/SH 71 to Main Street, Buda**








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-  Impacted Traffic Noise Receiver  
 Non-Impacted Traffic Noise Receiver  
 Benefited Traffic Noise Receiver  
 Proposed Traffic Noise Barrier  
 Existing ROW  
 Proposed ROW
- 0 250 500 Feet
 
- Google, TNRIS. Texas Google Imagery Service. 2018. 1:6,000; generated by Atkins; using ArcMap.  
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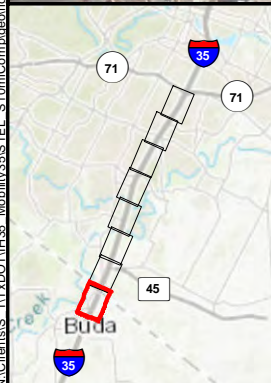
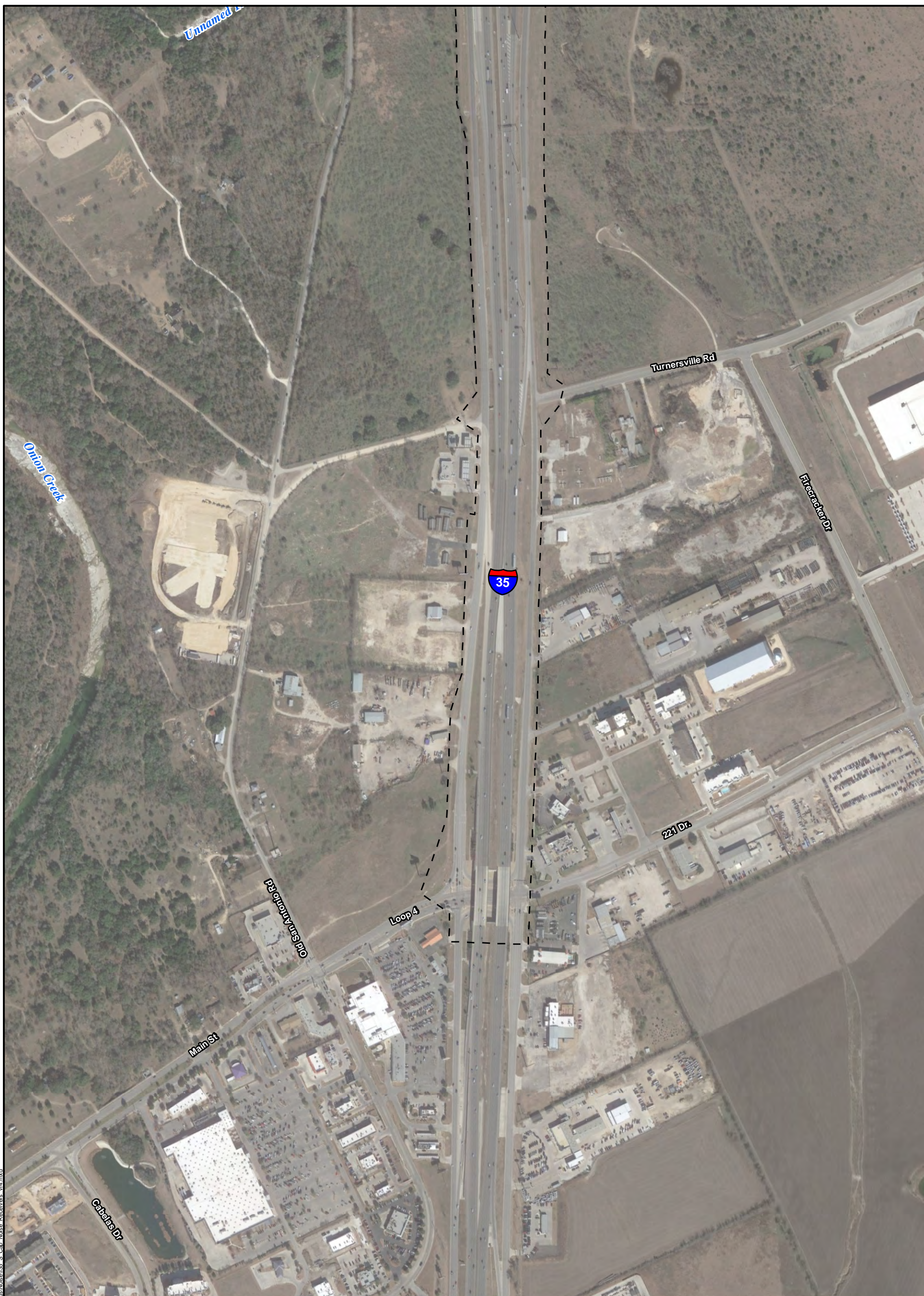








**Traffic Noise Receiver Locations**

**Capital Express South**  
**US 290W/SH 71 to Main Street, Buda**

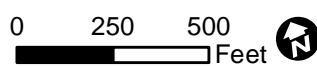
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-  Impacted Traffic Noise Receiver
-  Non-Impacted Traffic Noise Receiver
-  Benefited Traffic Noise Receiver
-  Proposed Traffic Noise Barrier
-  Existing ROW
-  Proposed ROW

Google, TNRIS. Texas Google Imagery Service. 2018. 1:6,000; generated by Atkins; using ArcMap. < <https://tnris.org/texas-google-imagery/> > (10 March 2021); TPWD (2013)



Traffic Noise Receiver Locations

**Capital Express South  
US 290W/SH 71 to Main Street, Buda**

AUSTIN, TRAVIS COUNTY, TEXAS  
CSJs 0015-13-077. 0016-01-113

**Updates since the April 2021 Public Hearing.**



# Traffic Noise Analysis Technical Report

## Interstate 35 Capital Express South From US 290W/SH 71 to SH 45SE Travis and Hays Counties, Texas

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CSJ: 0016-01-113, 0015-13-077

July 2021

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried-out by TxDOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 9 2019, and executed by FHWA and TxDOT.

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## List of Acronyms

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dB(A)	A-weighted decibels
FM	farm to market
FHWA	Federal Highway Administration
L <sub>e</sub> (h)	hourly equivalent noise levels
mph	miles per hour
NAC	Noise Abatement Criteria
NB	Northbound
PS&E	Plans Specifications and Estimates
ROW	right-of-way
SB	southbound
SH	state highway
TxDOT	Texas Department of Transportation

## 1. Project Overview

The Texas Department of Transportation is proposing improvements to I-35 from US 290 West/State Highway (SH) 71 (SH 71) to SH 45 southeast (SE) in Travis County, with a transition area extending to Main Street in Buda, Hays County. A detailed project description and location map is available in ECOS under PROJECT.

## 2. Traffic Noise Analysis

### 2.1 Traffic Noise Overview

A traffic noise analysis was conducted in accordance with TxDOT's (Federal Highway Administration [FHWA] approved) 2011 *Guidelines for Analysis and Abatement of Roadway Traffic Noise*. These guidelines apply to all state-funded Type I roadway projects, federal and federal aid on new location or include the physical alteration of an existing roadway.

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust. It is commonly measured in decibels and is expressed as "db. l"

Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)."

Also, because traffic sound levels are never constant due to the changing number, type and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq."

The traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

The FHWA has established the following Noise Abatement Criteria (NAC) for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur (Table 1).

**Table 1: Noise Abatement Criteria**

Activity Category	FHWA (dB(A) Leq)	Description of Land Use Activity Areas
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 (exterior)	Residential
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools and television studios
E	72 (exterior)	Hotels, motels, offices, restaurants/bars and other developed lands, properties or activities not included in A–D or F
F	--	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing
G	--	Undeveloped lands that are not permitted

Source: TxDOT (2011)

A traffic noise impact occurs when either the absolute or relative criterion is met:

**Absolute criterion**—The predicted traffic noise level at a receiver approaches, equals, or exceeds the NAC. "Approach" is defined as 1 dB(A) (A-weighted decibels) below the NAC. For example, a traffic noise impact would occur at a Category B residence if the traffic noise level is predicted to be 66 dB(A) or above.

**Relative criterion**—The predicted noise level substantially exceeds the existing traffic noise level at a receiver even though the predicted traffic noise level does not approach, equal, or exceed the NAC. "Substantially exceeds" is defined as an increase of more than 10 dB(A). For example, a traffic noise impact would occur at a Category B residence if the existing level is 54 dB(A) and the predicted level is 65 dB(A). This traffic noise level does not exceed the NAC, but it is more than 10 dB(A) greater than it had been.

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area.

## 2.2 Results of Traffic Noise Analysis

The FHWA traffic noise modeling software (TNM 2.5) was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type and speed of vehicles; highway alignment and grade; cuts, fills and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Existing and predicted traffic noise levels were modeled at 57 receiver locations (**Table 2** and **Traffic Noise Receiver Locations** in **Appendix A**) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement.

*Table 2: Traffic Noise Receivers*

	Representative Receiver	NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-1	La Quinta Hotel Pool	E	72	65	65	0	No
R-2	Candlewood Suites Hotel Patio	E	72	65	66	+1	No
R-3	Omni Hotel Pool with 5-foot stone wall	E	72	67	68	+1	No
R-4	Ramada Hotel Pool	E	72	66	67	+1	No
R-5	Hideaway Restaurant Outdoor Seating	E	72	67	68	+1	No
R-6	Marriott Restaurant Outdoor Dining Area	E	72	64	64	0	No
R-7	Springhill Suites Outdoor Seating/Patio	E	72	70	71	+1	Yes
R-8	Courtyard Marriott Hotel Balconies	E	72	67	68	+1	No
R-9	Residence Inn Pool/Tennis Courts	E	72	69	69	0	No
R-10	Red Roof Inn Hotel pool	E	72	65	66	+1	No
R-11	Comfort Suites Hotel Pool	E	72	69	70	+1	No
R-12	KIPP Austin School	D	52	35	37	+2	No
R-13	Recreation Field	C	67	69	71	+2	Yes
R-14	Stassen woods Apartments	B	67	67	67	0	Yes
R-15	School-Wayside: REAL Learning Academy	D	52	33	35	+2	No
R-16	Applebee's Outdoor Seating Area	E	72	66	67	+1	No

Representative Receiver		NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-17	Taco Cabana Outdoor Seating Area	E	72	68	69	+1	No
R-18	Apartment at South Point Pool	C	67	66	66	0	Yes
R-19	Oak Meadow Baptist Church Playground	C	67	64	65	+1	No
R-20	Austin Lone Star RV Resort Pool	C	67	73	74	+1	Yes
R-21	RV	B	67	66	68	+2	Yes
R-22	Ladera Apartment Balconies	B	67	69	69	0	Yes
R-23	Ladera Apartment Balconies	B	67	68	69	+1	Yes
R-24	Waters at Bluff Springs Apartment Balconies	C	67	63	65	+2	No
R-25	Waters at Bluff Springs Apartment Pool	B	67	62	64	+2	No
R-26	Valor School Playground	C	67	69	70	+1	Yes
R-27	Valor Charter School	D	52	43	44	+1	No
R-28	Lenox Soco Apartment Pool	C	67	63	64	+1	No
R-29	Ethos Apartments Pool	C	67	62	62	0	No
R-30	Ethos Apartment Balconies	B	67	64	64	0	No
R-31	Griffis Southpark Apartment Pool	C	67	65	68	+3	Yes
R-32	Griffis Southpark Apartment Balconies	B	67	67	70	+3	Yes
R-33	Don Darios Restaurant Outdoor Seating	E	72	70	73	+3	Yes
R-34	Starbucks Outdoor Seating	E	72	70	72	+2	Yes
R-35	Southpark Crossing Apartment Pool	C	67	64	66	+2	Yes
R-36	Southpark Crossing Apartment Balconies	B	67	64	65	+1	No
R-37	Single Family Houses (12)	B	67	64	67	+3	Yes
R-38	BreWingz on the Fly Restaurant Outdoor Seating Area	E	72	63	67	+4	No
R-39	First Class Child Development Center Playground	C	67	60	63	+3	No
R-40	Bridges at Asher Apartment Balconies	B	67	69	72	+3	Yes
R-41	Lenox Springs II Apartment Balconies	B	67	65	66	+1	Yes

	Representative Receiver	NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
R-42	Lenox Springs Apartment Balconies	B	67	61	64	+3	No
R-43	Bridges at Asher Apartment Balconies	B	67	69	71	+2	Yes
R-44	Lenox Springs Apartments Balconies	B	67	63	66	+3	Yes
R-45	Single Family Residence Front Porch	B	67	70	73	+3	Yes
R-46	Onion Creek Apartment Balconies	C	67	66	69	+3	Yes
R-47	Farmhouse Apartments Pool	B	67	67	70	+3	Yes
R-48	Crown Colony Patios	B	67	67	70	+3	Yes
R-49	Multifamily Backyard	B	67	65	68	+3	Yes
R-50	Outdoor Seating Restaurant Craig O's	E	72	64	67	+3	No
R-51	Colonial Grand at Onion Creek Apartment Balconies	B	67	63	67	+4	Yes
R-52	Condo Pool	C	67	64	66	+2	Yes
R-53	Mansions at Onion Creek Apartment Balconies	C	67	67	72	+5	Yes
R-54	St. Alban's Church Playground	B	67	71	73	+2	Yes
R-55	Park at Estancia Apartment Balconies	B	67	66	67	+1	Yes
R-56	Estancia Villas Apartments Pool	B	67	56	56	0	No
R-57	Estancia Villas Apartment Balconies	C	67	68	67	-1	Yes

As indicated in **Table 2**, the proposed project would result in a traffic noise impact at thirty out of 57 receivers. Receiver R-57 shows a reduction in predicted noise levels and this is likely because of the removal of an exit ramp from the I-35 SB mainlanes to the I-35 SB frontage road north of FM 1327 as well as a shift of the I-35 SB mainlanes to the east shifting traffic further away from the receiver.

The following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone and the construction of traffic noise barriers.

## 2.3 Discussion of Noise Abatement Measures

Before a noise abatement measure can be proposed for the project, it must be both feasible and reasonable. To be feasible, the abatement measure must be able to reduce the noise level by at

least 5 dB(A) at greater than 50 percent of impacted first-row receivers. To be reasonable, the abatement measure must not exceed the cost-effectiveness criterion of \$25,000 for each receiver that would benefit by a reduction of at least 5 dB(A) and the abatement measure must be able to reduce the noise level at (a minimum) of one impacted, first row receiver by at least 7 dB(A) in the predicted noise level (noise reduction goal).

The following traffic noise abatement measures were considered: acquisition of undeveloped property to act as a buffer zone, alteration of horizontal and/or vertical alignments, traffic management, and the construction of traffic noise barriers. Each of these measures is discussed below.

Buffer zone: The acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and therefore is not feasible.

Alteration of horizontal and/or vertical alignments: Any alteration of the existing alignment would displace existing businesses and residences, require additional ROW and not be cost effective/reasonable.

Traffic management: Control devices could be used to reduce the speed of the traffic; however, the minor benefit of 1 dB(A) per 5 miles per hour (mph) reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on interstate and state highways.

Noise barriers: This traffic noise abatement measure is the most commonly used. Traffic noise barriers were evaluated for each of the impacted receiver locations shown in **Table 2**. Traffic noise barriers would not be feasible and reasonable for the following impacted receivers and, therefore, are not proposed for incorporation into the project:

R-7: The receiver represents an outdoor seating area at the Springhill Suites Hotel. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (191') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 3 dB(A) reduction for R-7. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-13: This receiver represents a recreation field at KIPP Austin School. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (276') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 2 dB(A) reduction for R-13. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design

goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-14: This receiver represents 15 impacted receptors in the Stassney Woods Apartment complex. A continuous 413' noise barrier up to 22 feet in height, placed along the ROW would not be sufficient to benefit a majority of the impacted receptors or meet the 7 dB(A) noise reduction design goal. Therefore, a noise barrier is not proposed for this location.

R-18: This receiver represents the pool in the Apartments at South Point. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the SB I-35 frontage road.

R-20 and R-21: These receivers represent a pool and RV at the Austin Lone Star RV Resort. In order to maintain access to the driveway located off the I-35 NB frontage road, a 120' traffic noise barrier up to 22 feet tall was modeled along the ROW on the north side of the driveway adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would only result in a 5 dB(A) reduction for R-20 and a 1dB(A) reduction for R-21. Therefore, a traffic noise barrier would not achieve the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-22 and R-23: These receivers represent 34 impacted receptors at the Ladera Apartment Complex. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (1,090') adjacent to the SB I-35 frontage road. A continuous noise barrier would restrict access to these apartments and as such, the noise barrier was split into three segments. Gaps in the noise barrier would satisfy access requirements, but the resulting non-continuous wall segments would not be sufficient to achieve the minimum, feasible reduction of 5 dB(A) for a majority of impacted receptors or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-26: This receiver represents the playground at the Valor school. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (412') adjacent to the SB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in less than a 1 dB(A) reduction for R-26. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-31 and R-32: These receivers represent the pool at Griffis South Apartment Complex and eight apartment balconies. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (1,577') adjacent to the SB I-35 frontage road. This barrier was divided into two segments to maintain existing access; this gap greatly reduces the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible

noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-33: This receiver represents an outdoor seating area at Don Darios Restaurant. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (207') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 3 dB(A) reduction for R-33. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-34: This receiver represents an outdoor dining area at a Starbucks. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (231') adjacent to the SB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 5 dB(A) reduction for R-34. Therefore, a traffic noise barrier would not achieve the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-35: This receiver represents the pool at the Southpark Apartment Complex. The receiver does not represent any additional apartment units as a separate representative receiver, R-36, was modeled for the apartment balconies. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (250') adjacent to the NB I-35 frontage road. The model concluded that a 22-foot-tall barrier would result in a 2 dB(A) reduction for R-35. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-37: This receiver represents seven impacted single-family residences with backyards facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (832') adjacent to I-35 SB frontage road. There is a single-story shopping center located in between the frontage road and the residences, which acts as an existing noise barrier. The construction of a traffic noise barrier in between the frontage road and the shopping center could potentially increase the traffic noise levels for the residences due to the reflection of the sound between the wall and the shopping center. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-41: This receiver represents the Lenox Springs II Apartment complex, which is currently under construction. A traffic noise barrier up to 22 feet tall was modeled for the full length of available

ROW (382') adjacent to the I-35 SB frontage road. This barrier was divided into two segments to maintain existing access; this gap greatly reduces the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-44: This receiver represents 17 balconies at the Lenox Springs Apartment complex. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (576') adjacent to I-35 NB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-45: This receiver represents the front porch of a single-family residence. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the SB I-35 frontage road.

R-46: This receiver represents six impacted receptors in the Onion Creek Apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled along the available ROW (410') adjacent to the NB I-35 frontage road. There is an existing 6 foot tall stone wall located just outside the proposed ROW between the frontage road and the apartment complex. This reduces the effectiveness of the barrier due to the reflection of the sound between the existing wall and the barrier and requires a taller barrier to achieve noise reductions. The model concluded that a traffic noise barrier would achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers and meet the noise reduction design goal of 7 dB(A) at any impacted first row receiver. However, the cost of the noise barrier exceeded the cost-effectiveness criterion of \$25,000 for each benefited receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-47: This receiver represents the pool at the Farmhouse Apartment complex, which represents 42 apartment units facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (341') adjacent to I-35 NB frontage road. The model concluded that a 22-foot-tall barrier would result in a 3 dB(A) reduction for R-47. Therefore, a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or at least a 7 dB(A) reduction at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-48: This receiver represents condominium patios. A barrier at this location was not analyzed because the barrier would block access to the driveway located off of the NB I-35 frontage road.

R-49: This receiver represents 11 impacted receptors for multifamily residences with backyards facing I-35). A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (812') adjacent to I-35. This barrier was divided into three segments to maintain existing access and allow space for the shared use path; these gaps greatly reduce the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-51: This receiver represents 20 impacted receptors in the Colonial Grand at Onion Creek Apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (351') adjacent to I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-52: This receiver represents a pool at a condominium complex, representing four condominiums facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (202') adjacent to I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-53: These receivers represent 287 impacted receptors at the newly constructed Mansions at Onion Creek Apartment Complex. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (2,646') adjacent to I-35. This barrier was divided into three segments to maintain existing access, these gaps greatly reduce the efficiency of the barrier structure. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers, but it does meet the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-54: This receiver represents a playground at St. Albans Church. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (512') adjacent to the I-35 frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

R-55: This receiver represents an apartment complex with 12 first floor patio spaces, 22 second floor balcony spaces and 22 third floor balcony spaces. 53 of the first-row receptors had predicted traffic

noise impacts. A traffic noise barrier along the ROW of R-55 that varies between 20 and 22 feet tall and 931 feet long met the 7 dB(A) noise reduction design goal at ten impacted, first row receivers and the 5 dB(A) reduction at 51 percent of impacted first row receivers without surpassing the cost effectiveness factor. However, during the Noise Barrier Constructability Assessment (**Appendix B**), performed as part of Plans, Specifications and Estimates (PS&E), conflicts with utilities were identified, which increased the cost of the barrier. The cost increase caused the barrier to exceed the cost effectiveness factor and become unreasonable and therefore, this barrier is not proposed for incorporation into the proposed project.

R-57: This receiver represents 26 impacted receptors at the Estancia Villas apartment complex with balconies facing I-35. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (370') adjacent to the I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers, but it does meet the noise reduction design goal of 7 dB(A) at one impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

## 2.4 Proposed Noise Barriers

Noise barriers would be feasible and reasonable based on TxDOT's *Guidelines for Analysis and Abatement of Roadway Traffic Noise* for the following impacted receptors, and therefore, are proposed for incorporation into the project (**Table 3**). A Traffic Noise Barrier Constructability Assessment (**Appendix B**) was prepared as part of PS&E development that further evaluates proposed noise barriers for R-40 and R-43. The proposed noise barrier discussions below have been updated to reflect the alternate barrier constructability assessment results.

R-40: This receiver represents an apartment complex with 13 first floor patio spaces and 18 2<sup>nd</sup> and 3<sup>rd</sup> floor balcony spaces. 41 of the first-row receptors had predicted traffic noise impacts. Based on preliminary calculations, a traffic noise barrier along the ROW of R-40 that is 22 feet tall and 594 feet long met the 7 dB(A) noise reduction design goal at 20 impacted, first row receptors and the 5 dB(A) reduction at greater than 80 percent of impacted first row receptors without surpassing the cost effectiveness factor, thereby making it both feasible and reasonable.

R-43: This receiver represents an apartment complex with five first floor patio spaces, 16 2<sup>nd</sup> floor balcony spaces, and 4 3<sup>rd</sup> floor balcony spaces. All 25 of the first-row receptors had predicted traffic noise impacts. A traffic noise barrier along the ROW of R-43 that is 12 feet tall and 1,016 feet long met the 7 dB(A) noise reduction design goal at eight impacted, first row receivers and the 5 dB(A) reduction at 60 percent of impacted first row receivers without surpassing the cost effectiveness factor, thereby making it both feasible and reasonable.

The preliminary traffic noise barrier proposal for R-40 and R-43 can be seen in **Table 3** and **Traffic Noise Receiver Locations** in **Appendix A**. The updated barrier proposal can be found in the **Noise Barrier Constructability Assessment** in **Appendix B**.

*Table 3: Noise Barrier Proposal (preliminary)*

Barrier	Representative Receivers	Total # Benefited	Barrier Length (ft)	Barrier Height (ft)	Total Cost	Cost per Benefitted Receiver
1	R-40	28	594	22	\$561,429	\$20,051
2	R-43	13	1,016	12	\$1,247,246	\$95,942

Some land use activity areas in various locations throughout the length of the proposed project are currently Category G, undeveloped lands that are not permitted. Also, no new development is currently planned, designed or programmed in this area. There is no NAC for undeveloped land; however, to avoid noise impacts that may result from future development of properties adjacent to the project, local officials responsible for land use control programs must ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2040) noise impact contours (**Table 4**).

*Table 4: Traffic Noise Contours*

Undeveloped Area	Land Use	Impact Contour	Distance from ROW
I-35 east side, south of Onion Creek Parkway	NAC B and C	66 dB(A)	450 feet from ROW
I-35 east side, south of south of Onion Creek Parkway	NAC E	71 dB(A)	120 feet from ROW

Noise associated with the construction of the proposed project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is not expected. Provisions would be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

A copy of this traffic noise analysis will be made available to local officials. On the date of approval of this document (Date of Public Knowledge), FHWA and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the proposed project.

### 3. Addendum

New development along the corridor was captured through a permit search and verified in a field visit conducted on June 4, 2021. Four additional receivers were identified and existing and predicted traffic noise levels were calculated using TNM2.5 (**Table 5**).

*Table 5: Permitted Traffic Noise Receivers*

Representative Receiver		NAC Category	NAC Level	Existing 2018	Predicted 2038	Change (±)	Noise Impact
Permit 1	Aloft hotel pool	E	72	66	66	0	No
Permit 2 (Permit 3 in model)	Condos	B	67	62	62	0	No
Permit 3 (Permit 4 in model)	Water Oak Apartment Balconies	B	67	69	70	+1	Yes
Permit 4 (Permit 5 in model)	View at Estancia Apartment Balconies	B	67	70	70	0	Yes

As indicated in **Table 5**, the proposed project would result in a traffic noise impact at two out of the four new receivers identified.

Traffic noise barriers were evaluated for each of the impacted receiver locations shown in **Table 5**. Traffic noise barriers would not be feasible and reasonable for the following impacted receivers and, therefore, are not proposed for incorporation into the project:

Permit 3: This receiver represents 17 impacted receptors at the Water Oak Apartment complex, which is currently under construction. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (619') adjacent to the I-35 NB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers or the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

Permit 4: This receiver represents 65 impacted receptors at the View at Estancia Apartment complex, which is permitted for construction. A traffic noise barrier up to 22 feet tall was modeled for the full length of available ROW (1,076') adjacent to the I-35 SB frontage road. The model concluded that a traffic noise barrier would not achieve the minimum feasible noise reduction of at least 5 dB(A) at greater than 50 percent of impacted first row receivers, but it does meet the noise reduction design goal of 7 dB(A) at any impacted first row receiver. This traffic noise barrier is not proposed for incorporation into the project.

#### 4. References

Federal Highway Administration (FHWA). 2004. FHWA Traffic Noise Model (computer software). Version 2.5.

Texas Department of Transportation (TxDOT). 2011. Guidelines for Analysis and Abatement of Roadway Traffic Noise. April 2011. <http://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/730-02-gui.pdf> (accessed June 10, 2019).

# *Appendix A*

## *Figures*



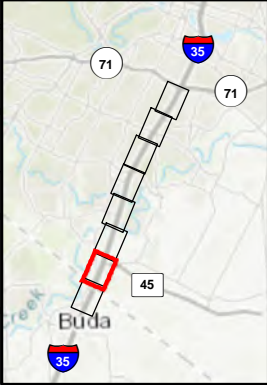






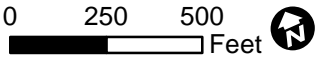






- Impacted Traffic Noise Receiver
- ⦿ Non-Impacted Traffic Noise Receiver
- Benefited Traffic Noise Receiver
- Proposed Traffic Noise Barrier
- Existing ROW
- Proposed ROW
- ▭ County Boundary

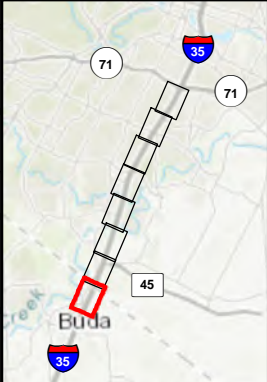
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< <https://tnris.org/texas-google-imagery/> (07 July 2021); TPWD (2013)



Traffic Noise Receiver Locations

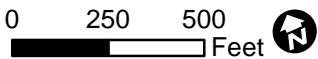
**Capital Express South**  
**US 290W/SH 71 to Main Street, Buda**

AUSTIN, TRAVIS COUNTY, TEXAS  
CSJs 0015-13-077. 0016-01-113



- Impacted Traffic Noise Receiver
- Non-Impacted Traffic Noise Receiver
- Benefited Traffic Noise Receiver
- Proposed Traffic Noise Barrier
- Existing ROW
- Proposed ROW
- County Boundary

Google, TNRS, Texas Google Imagery Service, 2018, 1:6,000; generated by Atkins; using ArcMap.  
< https://tnrs.org/texas-google-imagery/> (07 July 2021); TPWD (2013)



Traffic Noise Receiver Locations

**Capital Express South**  
**US 290W/SH 71 to Main Street, Buda**

TRAVIS AND HAYS COUNTY, TEXAS  
CSJs 0015-13-077, 0016-01-113

## *Appendix B*

### *Noise Barrier Constructability Assessment*



# MEMO

March 18, 2021

To: Jesse Bullard, P.E.  
Texas Department of Transportation

Through: Wally Elmasri, P.E.  
GEC

From: Wade Lansdell Strong, P.E.  
CP&Y

Subject: CSJ:0015-13-077 & 0016-01-113; Mobility 35 Capital Express South  
Noise Barrier Constructability Assessment

We investigated the four (4) locations provided in the January 2021 Traffic Noise Analysis Technical Report for inclusion of noise barriers with the project. Each of these locations, based on the GIS files provided by the GEC on 2/2/21, are depicted on the attached exhibit plan views of the proposed roadway with existing utilities included (see **Attachment 1**). There are also roadway cross sections for each location included in the exhibits.

As stated in the approved report, four (4) noise barriers were found to be reasonable and feasible based on TxDOT's 2011 *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (see **Table 1**).

Table 1. Traffic Noise Barriers Proposed (Preliminary)

Barrier	Representative Receivers	Total Benefited Receivers	Barrier Size (Feet)		Total Cost	Cost per Benefited Receiver
			Length	Height		
1	R-40	33	594	20	\$213,970	\$6,484
2	R-43	15	1,017	16	\$292,930	\$19,529
3	R-46	6	410	14	\$103,291	\$17,215
4	R-55	27	931	20-22	\$360,433	\$13,349

To avoid conflicts with utilities, right-of-way (ROW), and roadway design elements, the proposed noise barriers were re-analyzed at different locations. The updated locations are shown on **Attachment 2**, along with the roadway cross sections for the updated locations. An alternate barrier cost assessment was then conducted, in accordance with TxDOT's 2019 *Procedures for Analysis and Abatement of Roadway Traffic Noise and Construction Noise*, to determine if construction costs associated with the proposed noise barriers would be unreasonably high based on site-specific conditions. For this project, additional construction costs include right-of-way (ROW) acquisition and clearing, utility adjustments, drainage features, and additional design elements. The feasible/reasonable determination of the re-analyzed barrier locations, along with the details of the alternate barrier cost assessment is provided below. The Alternate Barrier Cost Assessment Worksheet, as well as a breakdown of the alternate costs, is shown in **Attachment 3**.

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OUR MISSION: Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods.

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### **Noise Barrier 1 (R40)**

Located along the IH 35 northbound (NB) Frontage Road FR (FR) from approximate station 743+25 to 750+00. A 594-foot barrier, 22 feet in height would achieve a 5 dB(A) reduction at greater than 50% of impacted first row receivers and also achieve the noise reduction design goal of 7 dB(A). The cost of the barrier would be \$457,380. A total of 28 receivers would be benefitted, at a total cost of \$16,335 per benefitted receiver. Therefore, this noise barrier is feasible and reasonable using the standard barrier cost assessment.

### **Conflicts with Previously Approved Barrier Location**

We found some utility issues/concerns with the previous location of this noise barrier. There seems to be sufficient ROW to relocate the proposed noise barrier away from the potential utility conflicts.

- A clear distance between 28' and 46' exists between the existing ROW and the edge of shared use path. This should allow for sufficient width for a noise barrier.
- A review of the existing utilities within the noise barrier limits shows one (1) existing gas line, one (1) existing water line, and one (1) existing overhead utility line. No Level A or B SUE in this location is currently available only Level C and D. The direct conflict would be with an existing 6" gas line that falls directly along the proposed noise barrier alignment. This gas line is not proposed to be relocated as part of this project. Another conflict would be with the existing overhead utility located along the ROW.
- After review of the proposed drainage system in the vicinity of the proposed barrier, we anticipate no potential conflicts other than "relief" holes in the bottom of the barrier to allow off-site water to enter the proposed drainage system.

### **Alternate Costs - \$104,049 Total**

- Drainage features - \$35,600
- Additional design elements
  - Grading - \$17,410
  - Engineering, Design, CE&I - \$51,039

### **Results**

The total cost of Noise Barrier 1 is \$561,429, which includes \$457,380 for the standard barrier cost and \$104,049 for the alternate barrier costs. With 28 benefitted receivers, the cost of this barrier per benefitted receiver is \$20,051. Therefore, this noise barrier is still reasonable using the alternate barrier cost assessment and is still proposed for incorporation into the proposed project.

### **Noise Barrier 2 (R-43)**

Located along the IH 35 NB FR from approximate station 755+00 to 765+50. A 1,016-foot barrier, 12 feet in height would achieve a 5 dB(A) reduction at greater than 50% of impacted first row receivers and also achieve the noise reduction design goal of 7 dB(A). The cost of the barrier would be \$426,720. A total of 13 receivers would be benefitted, at a total cost of \$32,825 per benefitted receiver. Therefore, this noise barrier is feasible and reasonable using the standard barrier cost assessment.

### **Conflicts with Previously Approved Barrier Location**

We found ROW and utility concerns that would preclude a noise barrier at the previous location.

- At this location ROW is being acquired for the widening of the frontage road and addition of the shared use path. A distance of 15' exists between the proposed ROW and the edge of the shared use path. Currently, short curb walls are proposed along the edge of the shared use path that will include a combination traffic rated rail that would serve as a protection for traffic as well as pedestrians. Although the 15' distance between the proposed ROW and edge of shared use path is sufficient for a noise barrier, the utilities located within this area would make it difficult to construct the barrier.
- A review of the existing utility plans shows numerous utilities (underground and overhead) within the limits of the proposed barrier. Some of these utilities are proposed to be relocated within the proposed ROW. The proposed overhead utility alignment directly conflicts with the alignment of the proposed noise barrier.

- After review of the proposed drainage system in the vicinity of the proposed barrier, we anticipate no potential conflicts other than the need for “relief” holes in the bottom of the barrier to allow drainage to continue to flow as intended.

#### Alternate Costs - \$820,526 Total

- Utility adjustments - \$532,700
- Additional design elements
  - Engineering, Design, CE&I - \$287,826

#### Results

The total cost of Noise Barrier 2 is \$1,247,246, which includes \$426,720 for the standard barrier cost and \$820,526 for the alternate barrier costs. With 13 benefitted receivers, the cost of this barrier per benefitted receiver is \$95,942. Therefore, this noise barrier is still reasonable using the alternate barrier cost assessment and is still proposed for incorporation into the proposed project.

#### Noise Barrier 3 (R-46)

Located along the IH 35 NB FR from approximate station 766+30 to 770+60. The TNM models prepared for the January 2021 Traffic Noise Analysis Technical Report did not include an existing 6-foot neighborhood (aesthetic) wall located between this development and IH 35. When the new barrier location was re-analyzed, the existing 6-foot neighborhood wall was added to the noise models. Results indicate that a noise barrier, up to 22 feet in height would reduce noise levels by 5 dB(A) at three of the six impacted first row receivers. Because greater than 50% of impacted first row receivers did not achieve a 5 dB(A) reduction, this noise barrier is not feasible and is no longer proposed for incorporation into the proposed project.

#### Noise Barrier 4 (R-55)

Located along the IH 35 southbound (SB) FR from approximate station 845+50 to 855+00. A 932-foot barrier, 22 feet in height would achieve a 5 dB(A) reduction at greater than 50% of impacted first row receivers and also achieve the noise reduction design goal of 7 dB(A). The cost of the barrier would be \$717,640. A total of 21 receivers would be benefitted, at a total cost of \$34,173 per benefitted receiver. Therefore, this noise barrier is feasible and reasonable using the standard barrier cost assessment.

#### Conflicts with Previously Approved Barrier Location

We found some utility issues/concerns with the previous location of this noise barrier. Within the limits of the noise barrier, there are ROW constraints.

- A clear distance between 8' and 12' exists between the existing ROW and the edge of shared use path. The areas where 8' of available space would make it difficult to construct the noise barrier. Currently, short curb walls are proposed along the edge of the shared use path that will include a combination traffic rated rail that would serve as a protection for traffic as well as pedestrians.
- A review of the existing utility plans shows numerous utilities (underground and overhead) within the limits of the proposed barrier. Some of these utilities are proposed to be relocated within the proposed ROW. The proposed alignments for the overhead utilities, gas line and telephone line are schedule to fall within the available 8' clear distance and severely limit the space for a noise barrier.
- After review of the proposed drainage system in the vicinity of the proposed barrier, we anticipate no potential conflicts other than the need for “relief” holes in the bottom of the barrier to allow drainage to continue to flow as intended.

#### Alternate Costs - \$1,913,402 Total

- ROW
  - Acquisition - \$1,517,000
  - Clearing - \$29,300
- Additional design elements
  - Sidewalk removal - \$4,200

- Engineering, Design, CE&I - \$362,902

#### Results

The total cost of Noise Barrier 4 is \$2,631,042, which includes \$717,640 for the standard barrier cost and \$1,913,402 for the alternate barrier costs. With 21 benefitted receivers, the cost of this wall per benefitted receiver is \$125,288, which exceeds the FHWA-approved cost threshold of \$105,000 per benefitted receiver. Therefore, this noise barrier is not reasonable and is not proposed for incorporation into the proposed project.

#### Attachments:

- Attachment 1 – Preliminary Noise Barrier Plan and Section Views
- Attachment 2 – Revised Noise Barrier Plan and Section Views
- Attachment 3 – Alternate Barrier Costs

## **ATTACHMENT 1**

### **Preliminary Noise Barrier Plan and Section Views**

## Noise Barrier 1



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NO.	REVISION	BY	DATE

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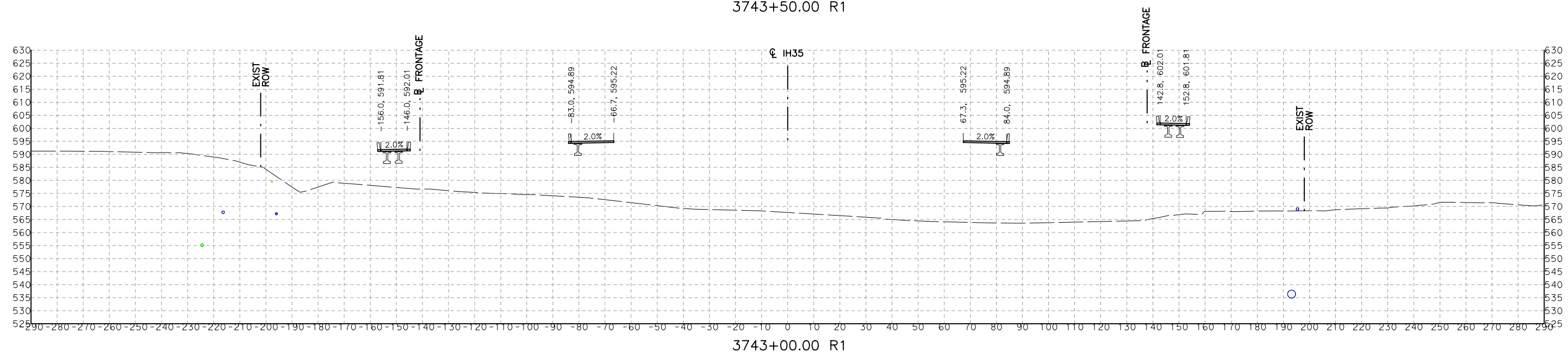
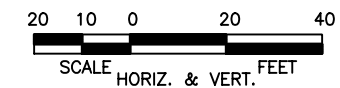
CAPITAL EXPRESS SOUTH

NOISE BARRIER 01-02 EXHIBIT

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 GAS LINE    
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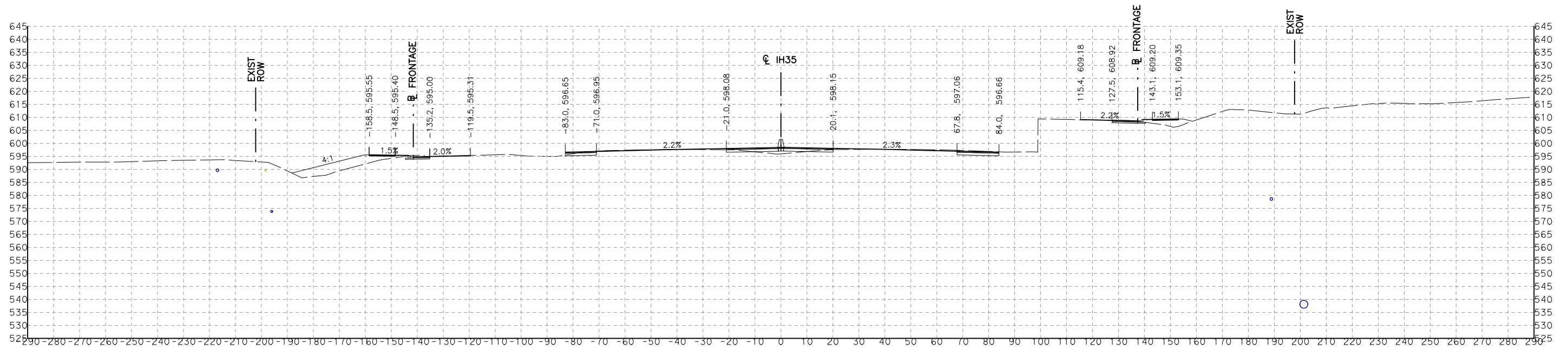
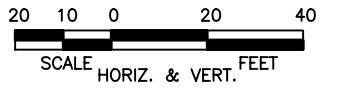
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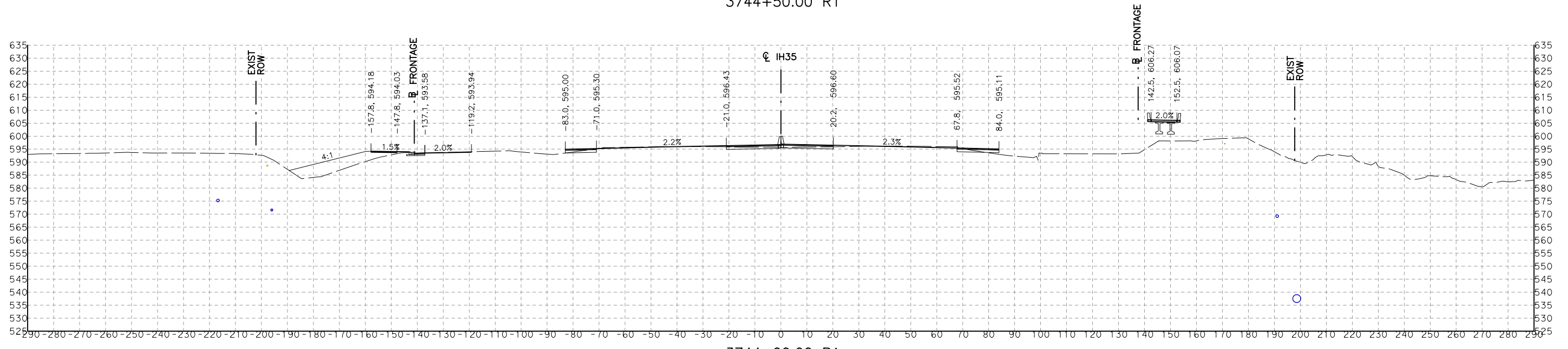
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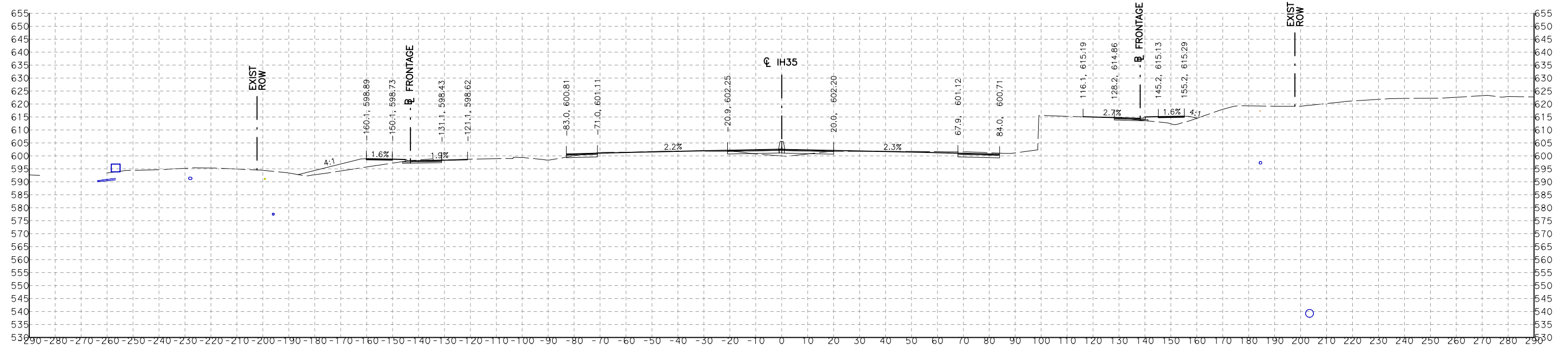
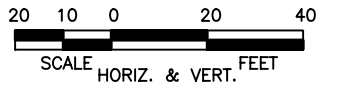
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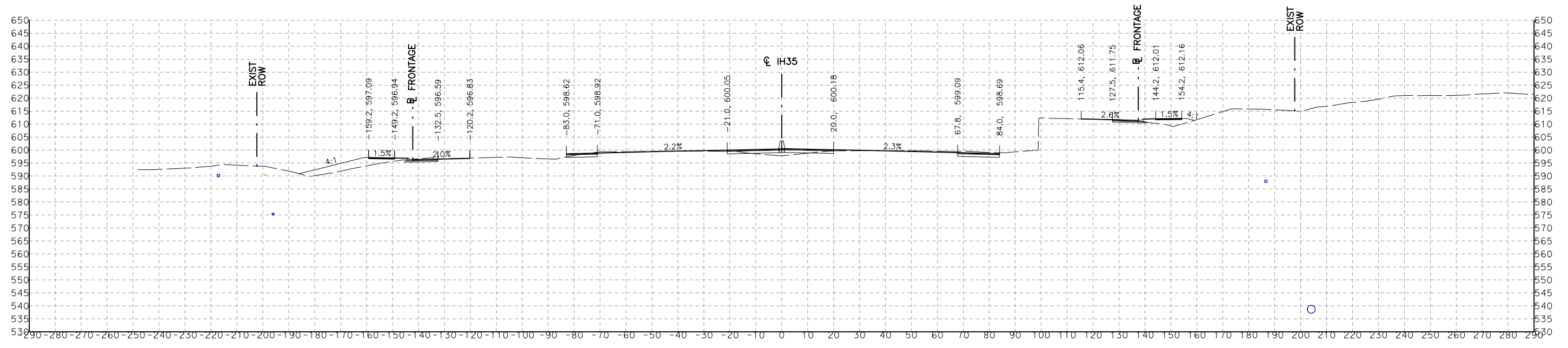
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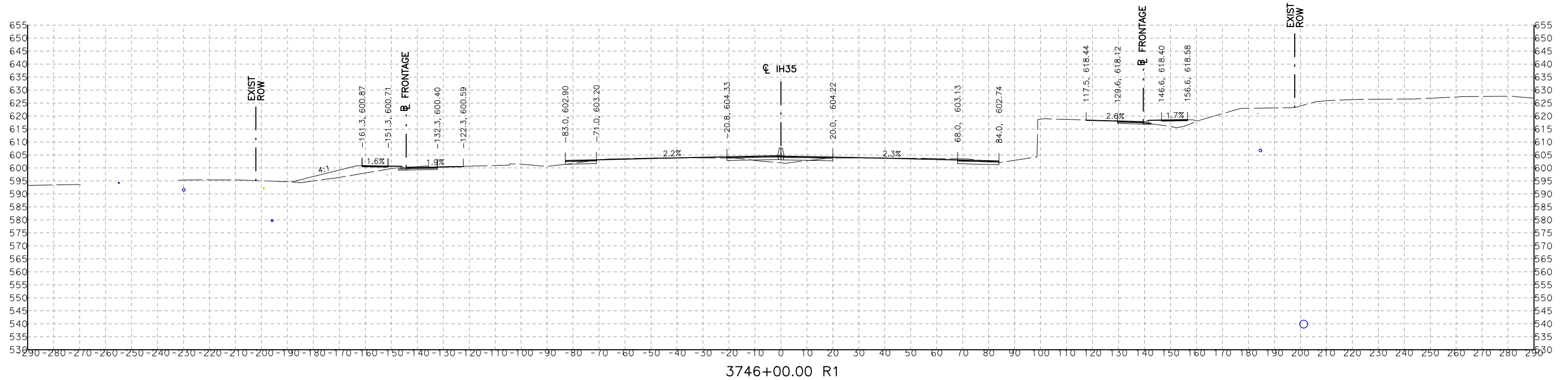
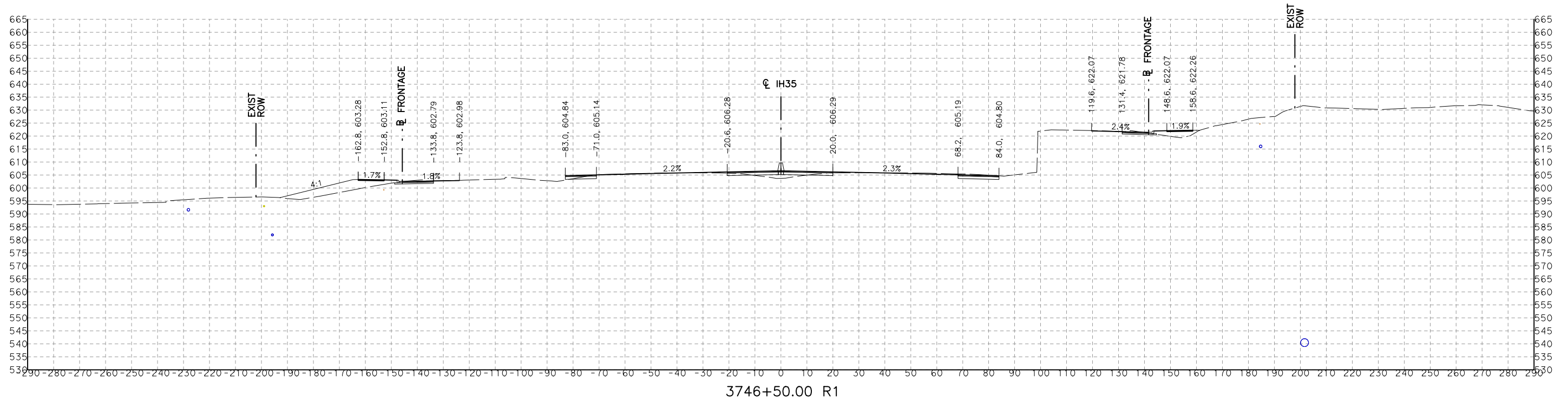
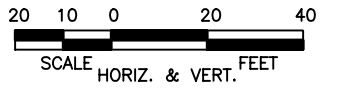
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LEGEND

- ELECTRIC LINE    — COMMUNICATION LINE    — WASTEWATER LINE  
— GAS LINE    — WATER LINE

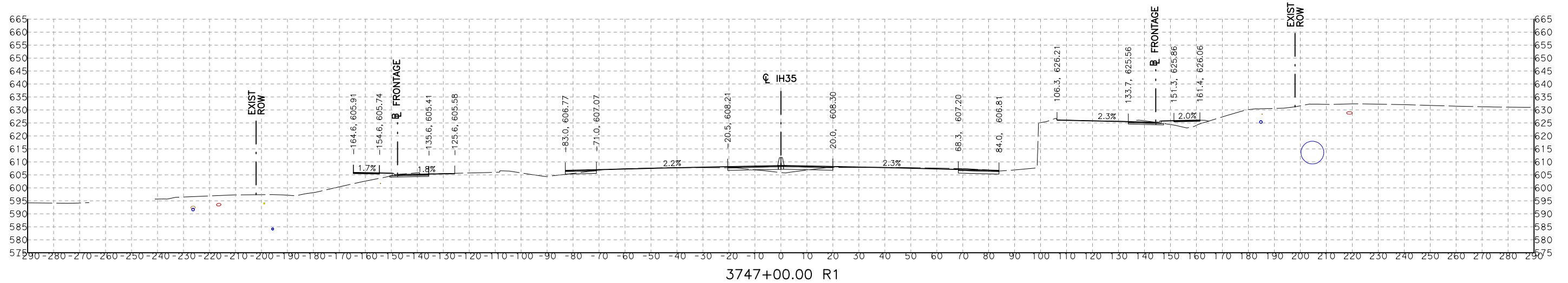
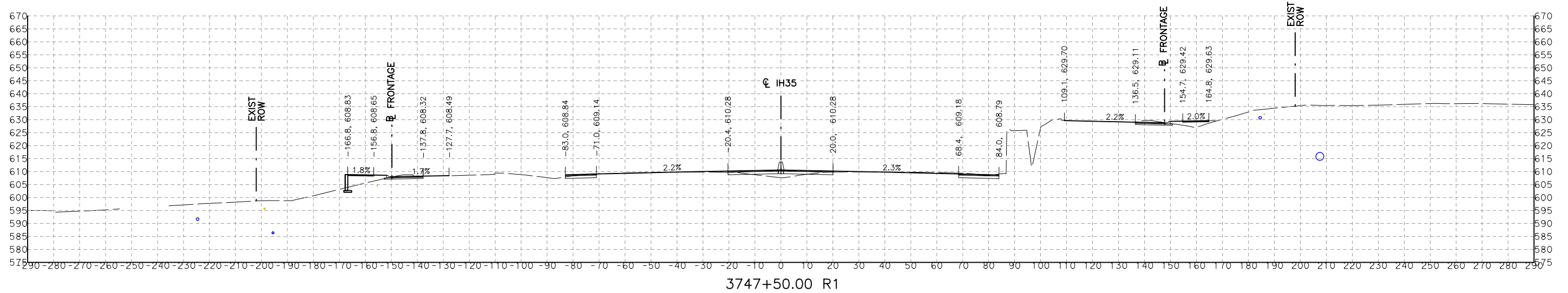
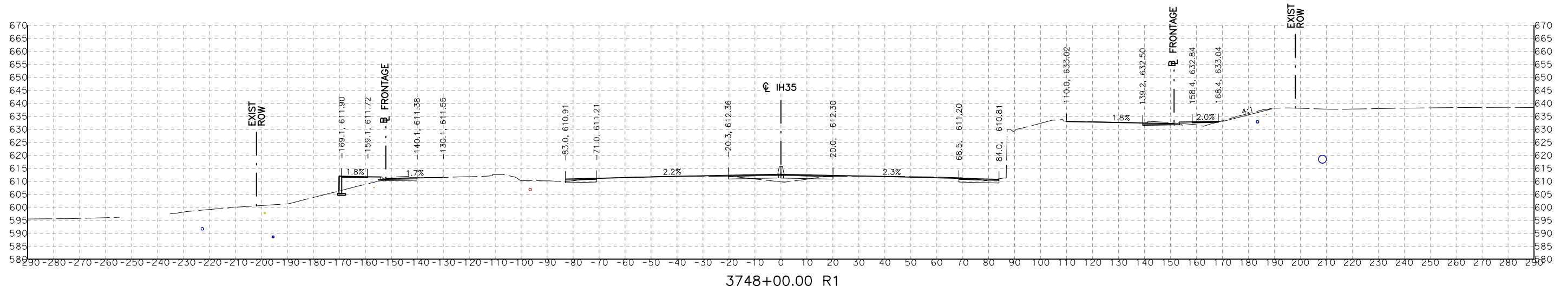
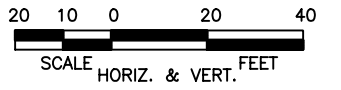


NOTES:

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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE

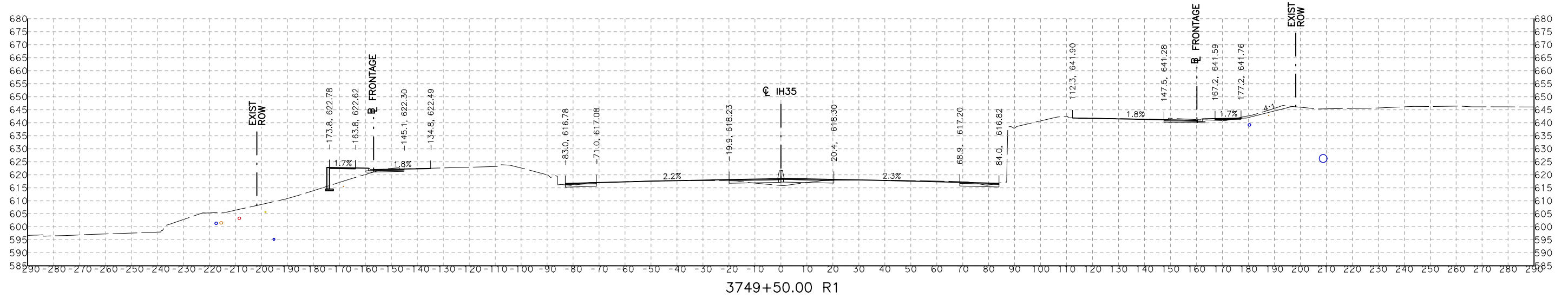
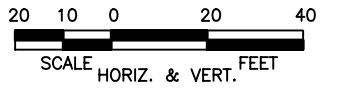


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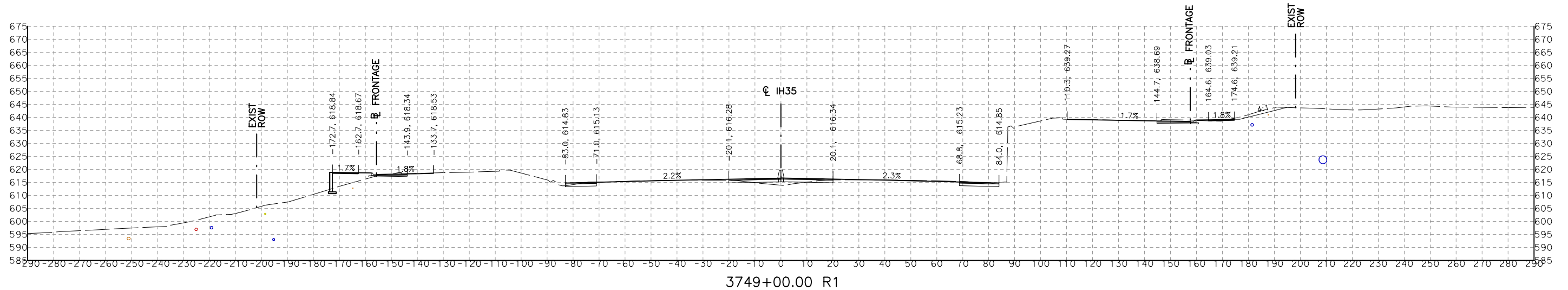
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LEGEND

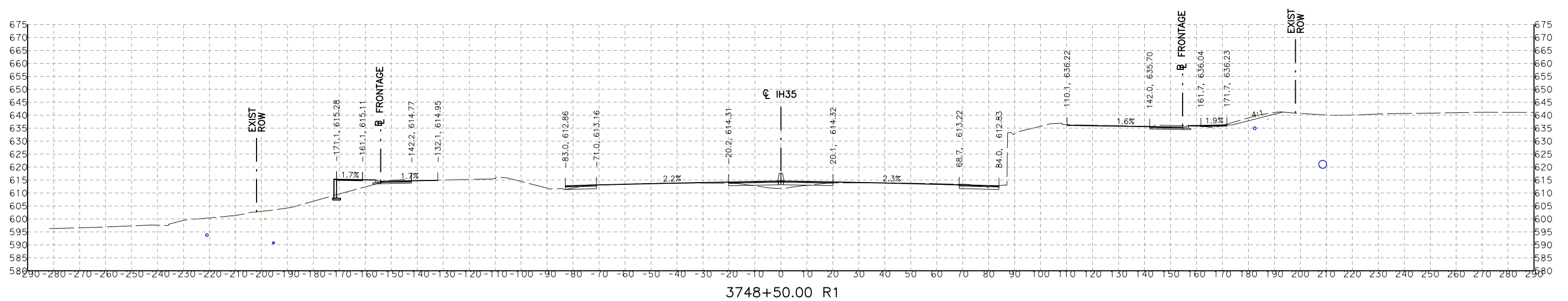
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GAS LINE    WATER LINE



3749+50.00 R1



3749+00.00 R1



3748+50.00 R1

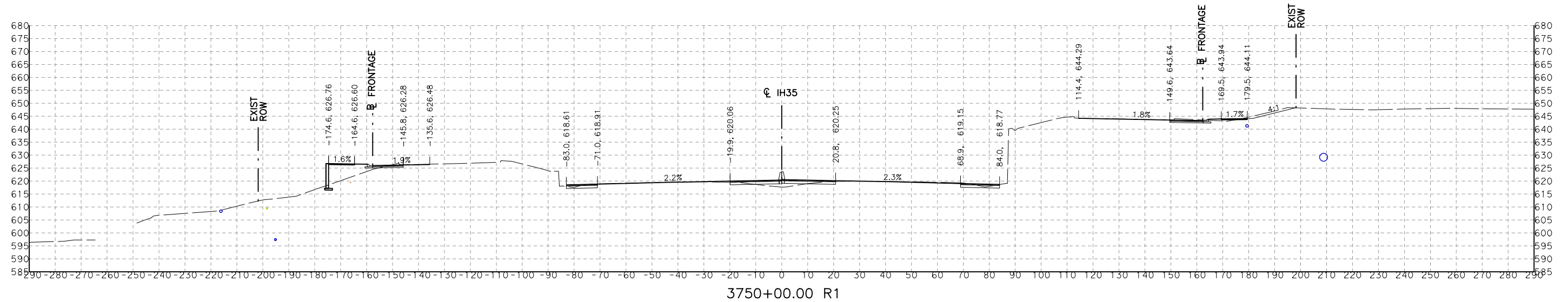
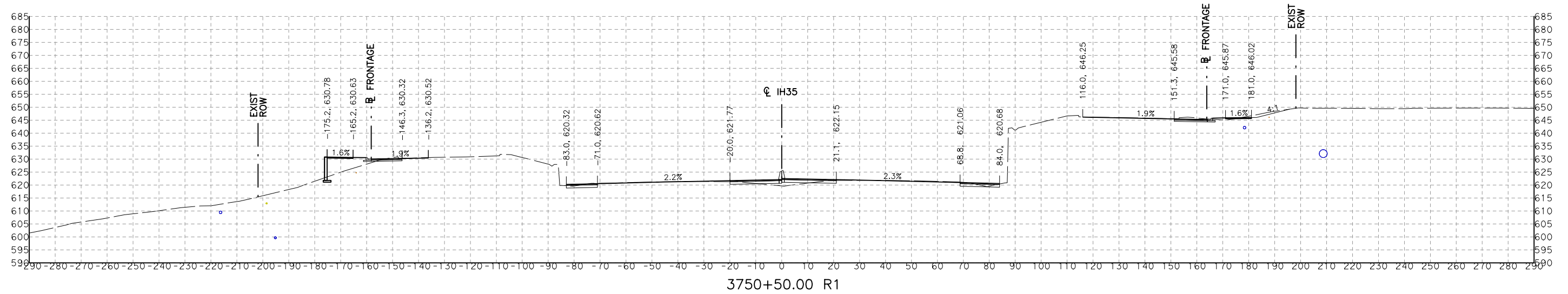
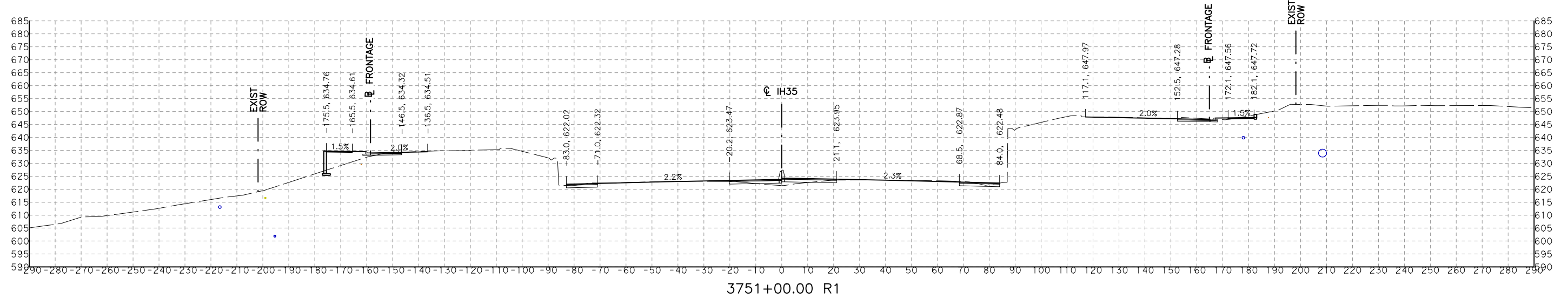
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## LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE

20 10 0 20 40  
SCALE HORIZ. & VERT. FEET



TEXAS REGISTERED ENGINEERING FIRM F-1741



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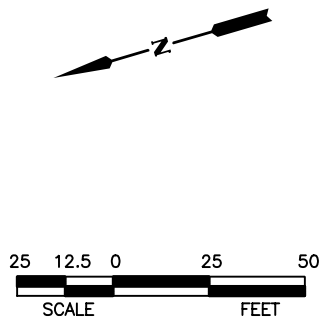
IH-35

## IH-35 CROSS SECTIONS

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Checked: AJS							I-35
Drawn: LVK	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET	
Checked: AJS	AUS	TRAVIS	0015	13	77,ETC.	172	



## Noise Barrier 2

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LEGEND

- FULL RECONSTRUCTION
- WIDENING
- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

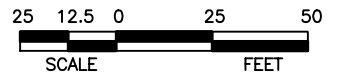
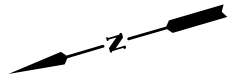
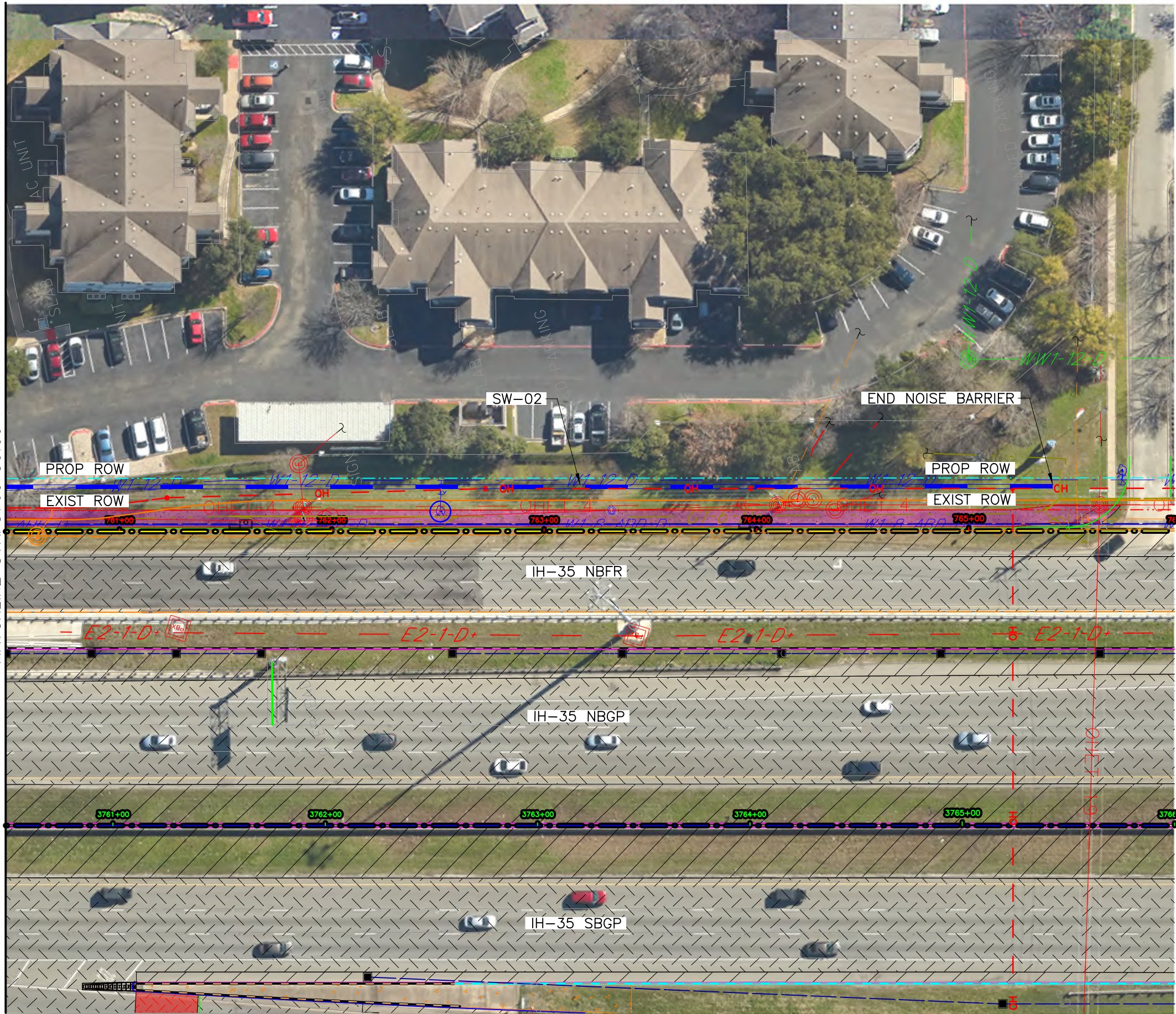
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MATCHLINE STA 3760+50.00



LEGEND

	FULL RECONSTRUCTION
	WIDENING
	HMA/TOM OVERLAY
	SUP RECONSTRUCTION

NO.	REVISION	BY	DATE	
TEXAS REGISTERED ENGINEERING FIRM F-1741				
©2021  Texas Department of Transportation				
CAPITAL EXPRESS SOUTH				
NOISE BARRIER 02-02 EXHIBIT				
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SHEET - OF -

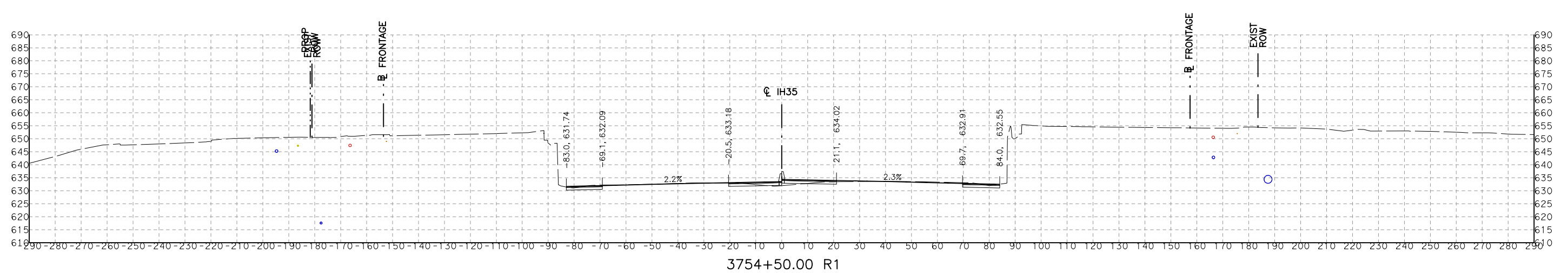
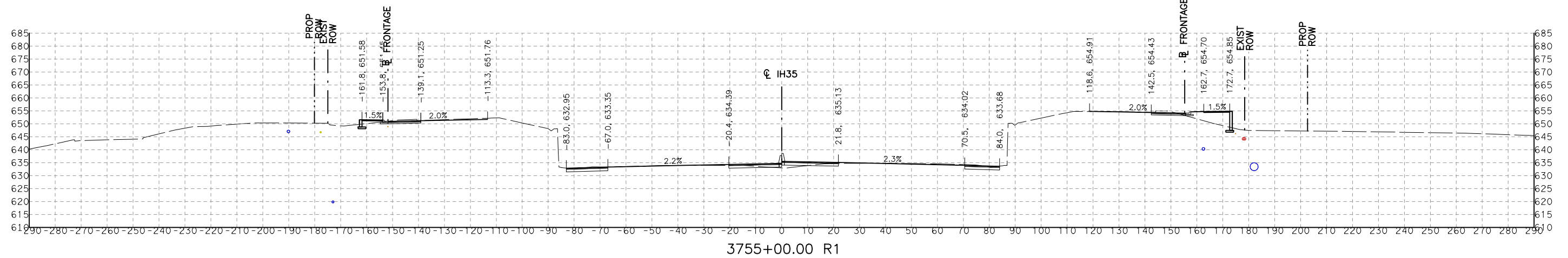
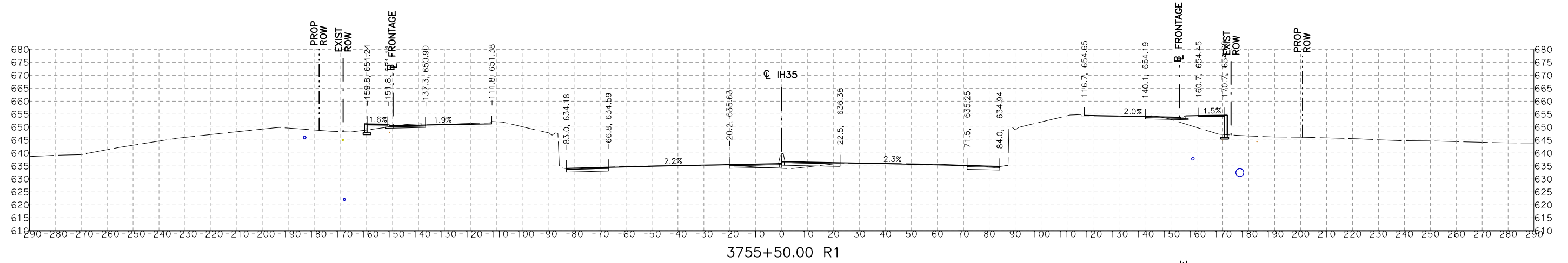
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2. VERTICAL LOCATION OF UTILITIES IS APPROXIMATE AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

LEGEND

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<span style="color: yellow;">—</span> GAS LINE	<span style="color: blue;">—</span> WATER LINE	

20 10 0 20 40  
SCALE  
HORIZ. & VERT. FEET

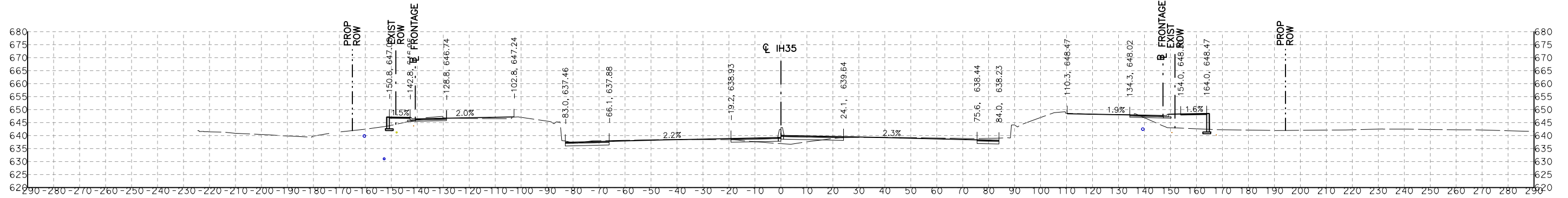
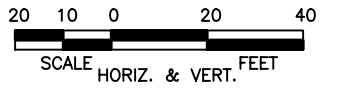


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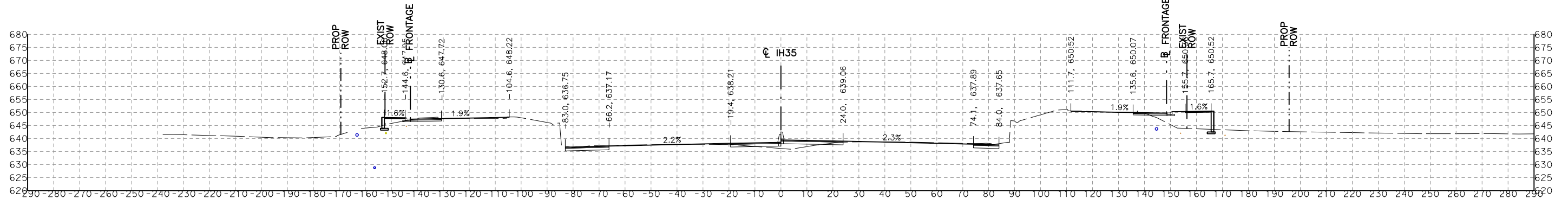
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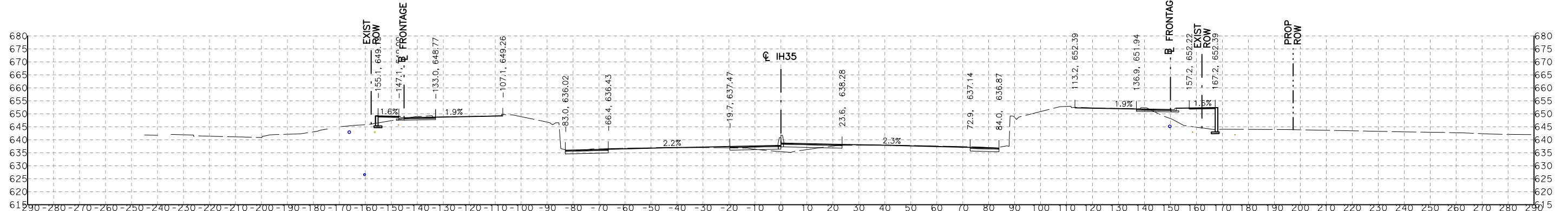
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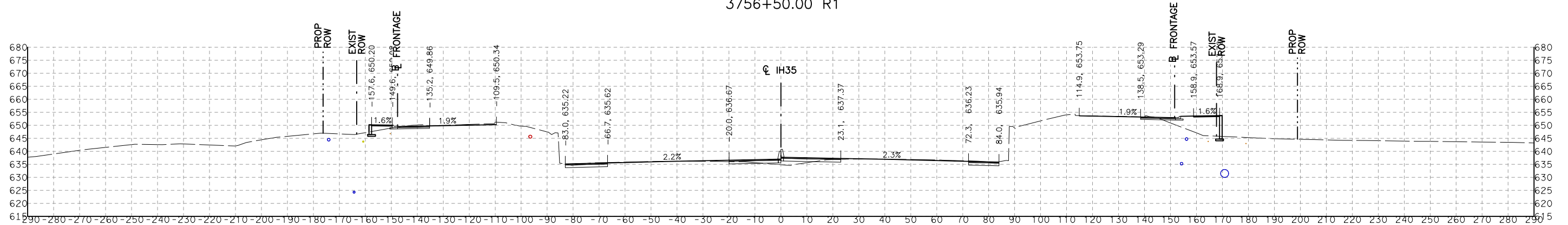
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3757+00.00 R1



3756+50.00 R1



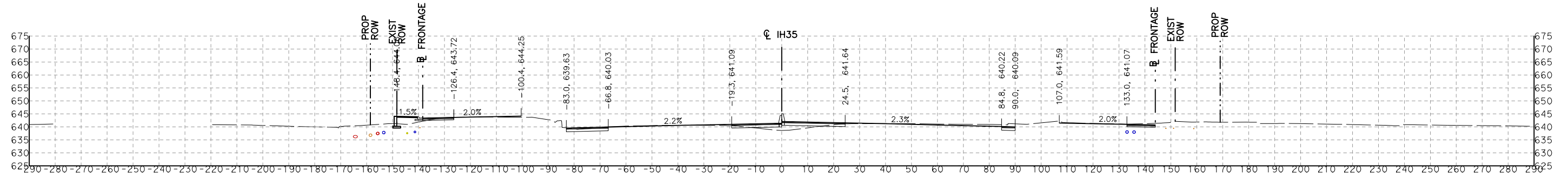
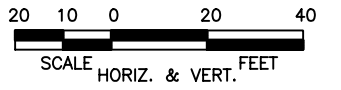
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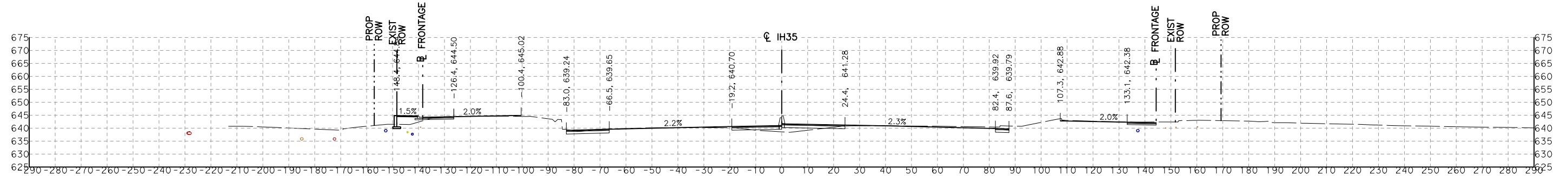
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LEGEND

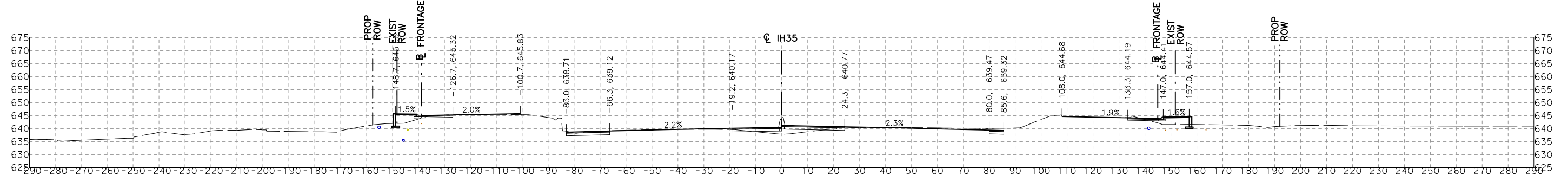
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GAS LINE    WATER LINE



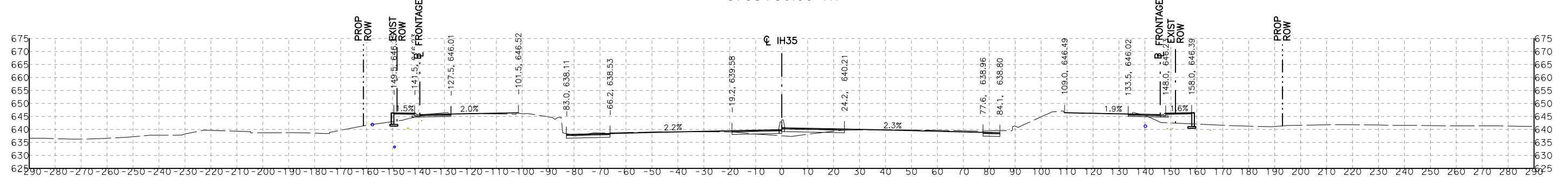
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3759+00.00 R1



3758+50.00 R1



3758+00.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

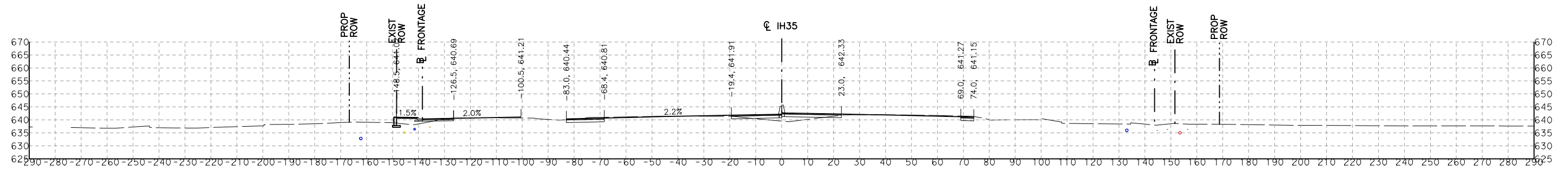
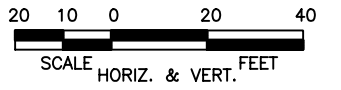
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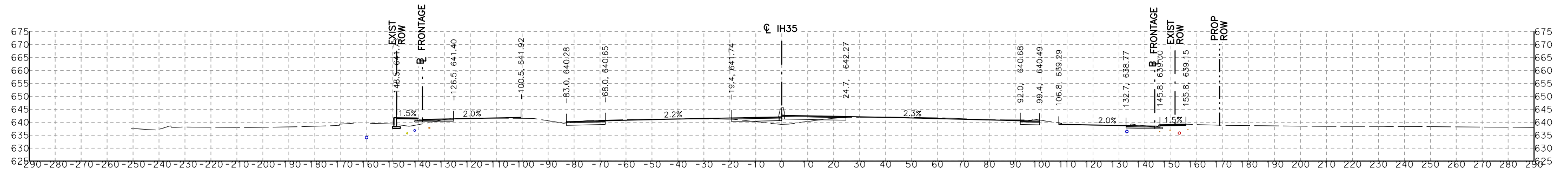
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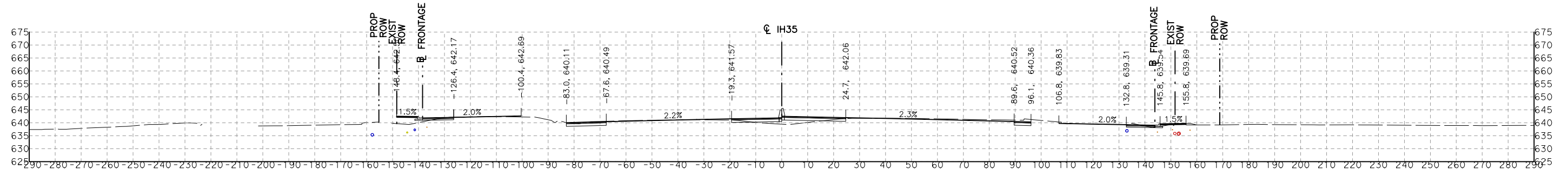
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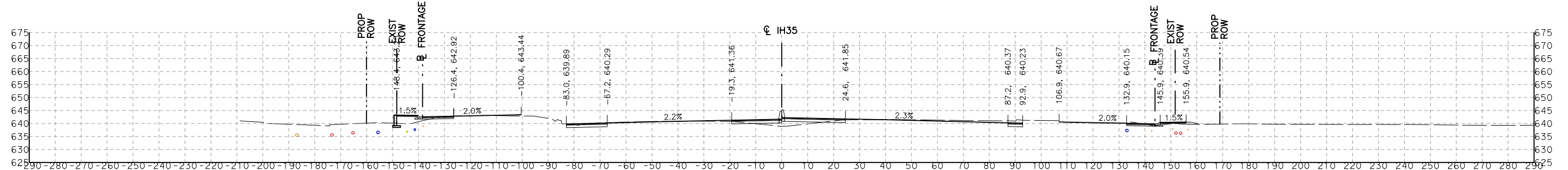
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3761+00.00 R1



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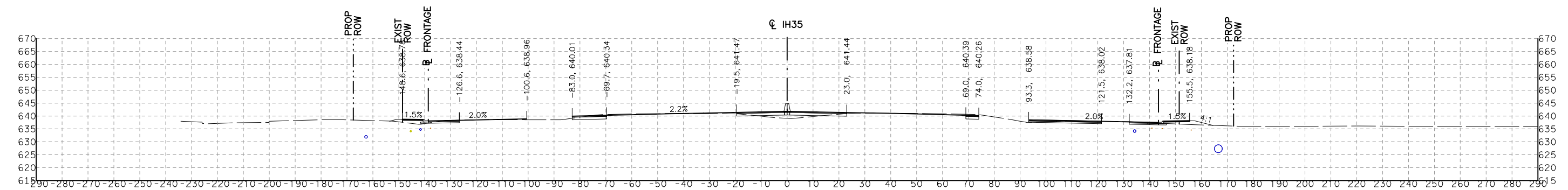


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### LEGEND

— WASTEWATER LINE



The diagram illustrates a cross-section of a road and its drainage system. The vertical axis represents elevation in feet, ranging from 615 to 670. The horizontal axis represents distance in feet, ranging from -290 to 290. The profile shows the existing ground (dashed line), the existing road level (solid line), and the proposed road level (dotted line). Key features include a 100-foot wide roadway with a 2.2% cross-slope, a 15-foot wide drainage ditch with a 1.5% slope, and various elevation points marked along the profile. Labels indicate existing and proposed road levels, drainage ditch levels, and specific elevation points. Dimensions of 100 feet and 15 feet are shown for the roadway and drainage ditch respectively.

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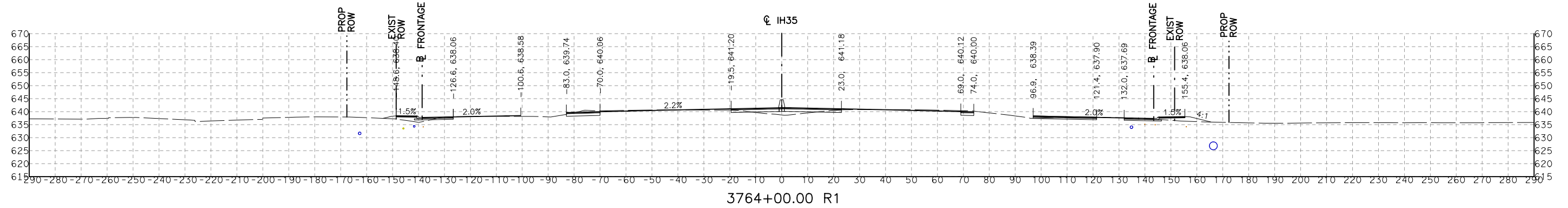
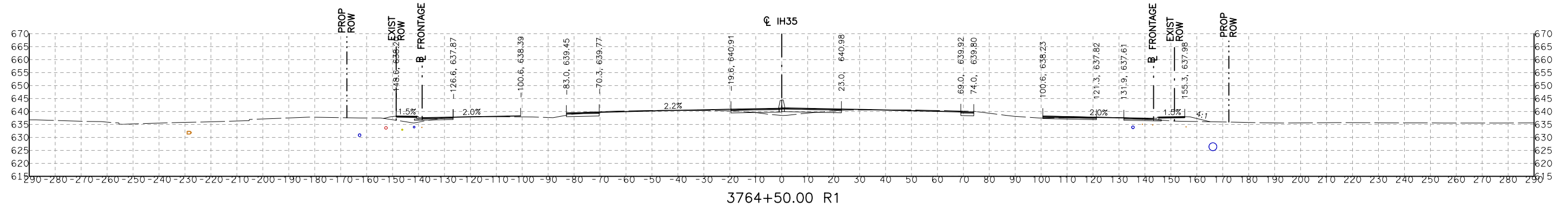
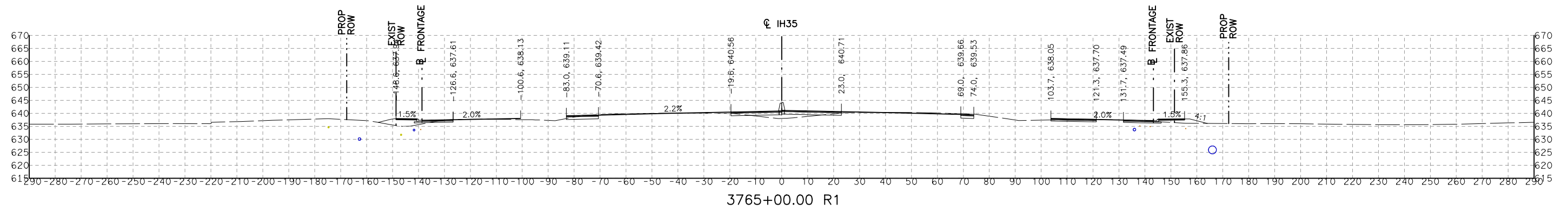
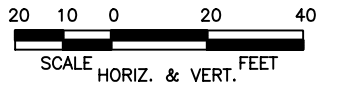
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Checked:	AJS	X	TEXAS				1-35
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Checked:	AJS	AUS	TRAVIS	0015	13	77, ETC.	179

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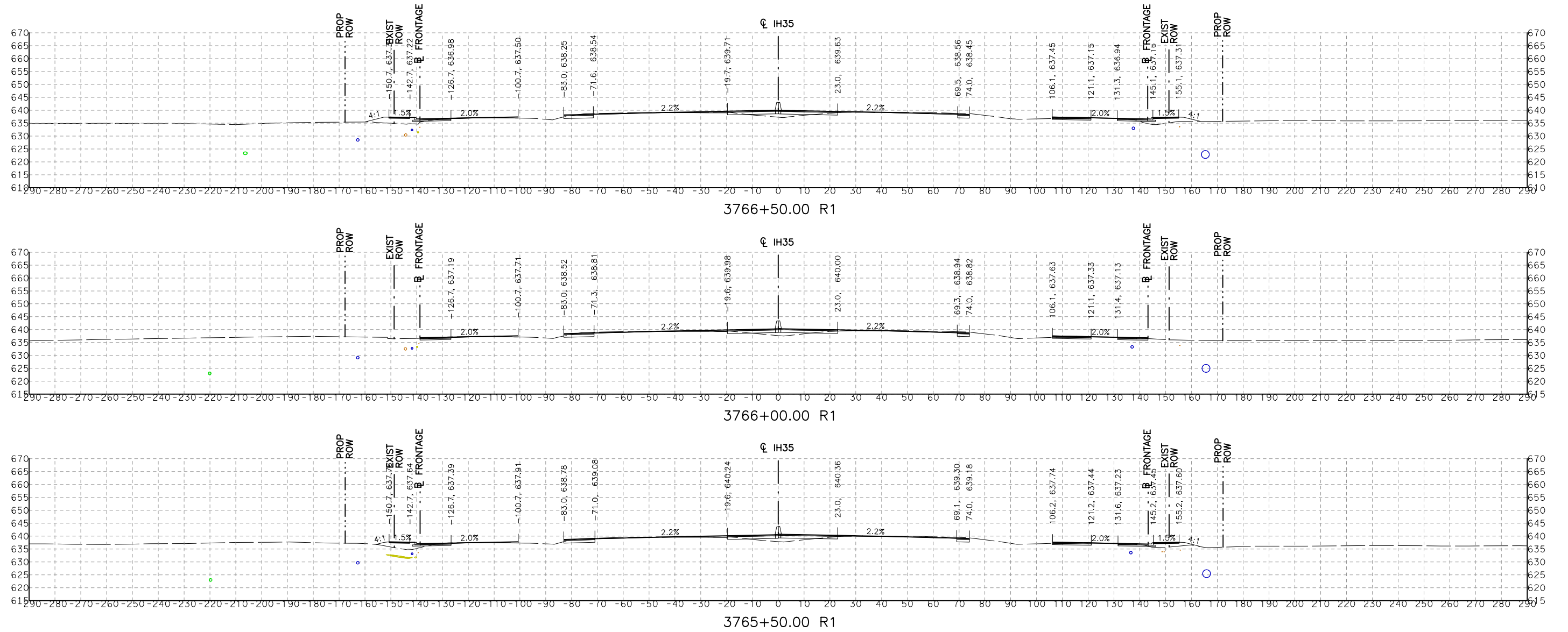
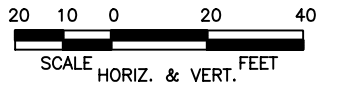
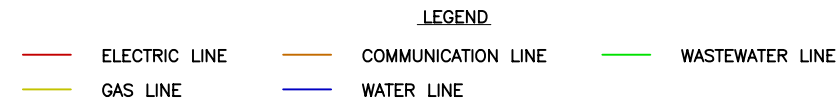
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- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE



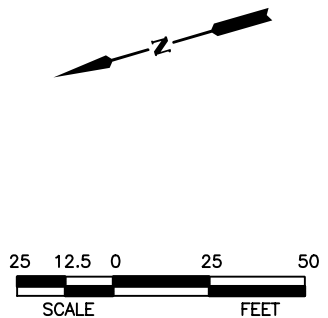
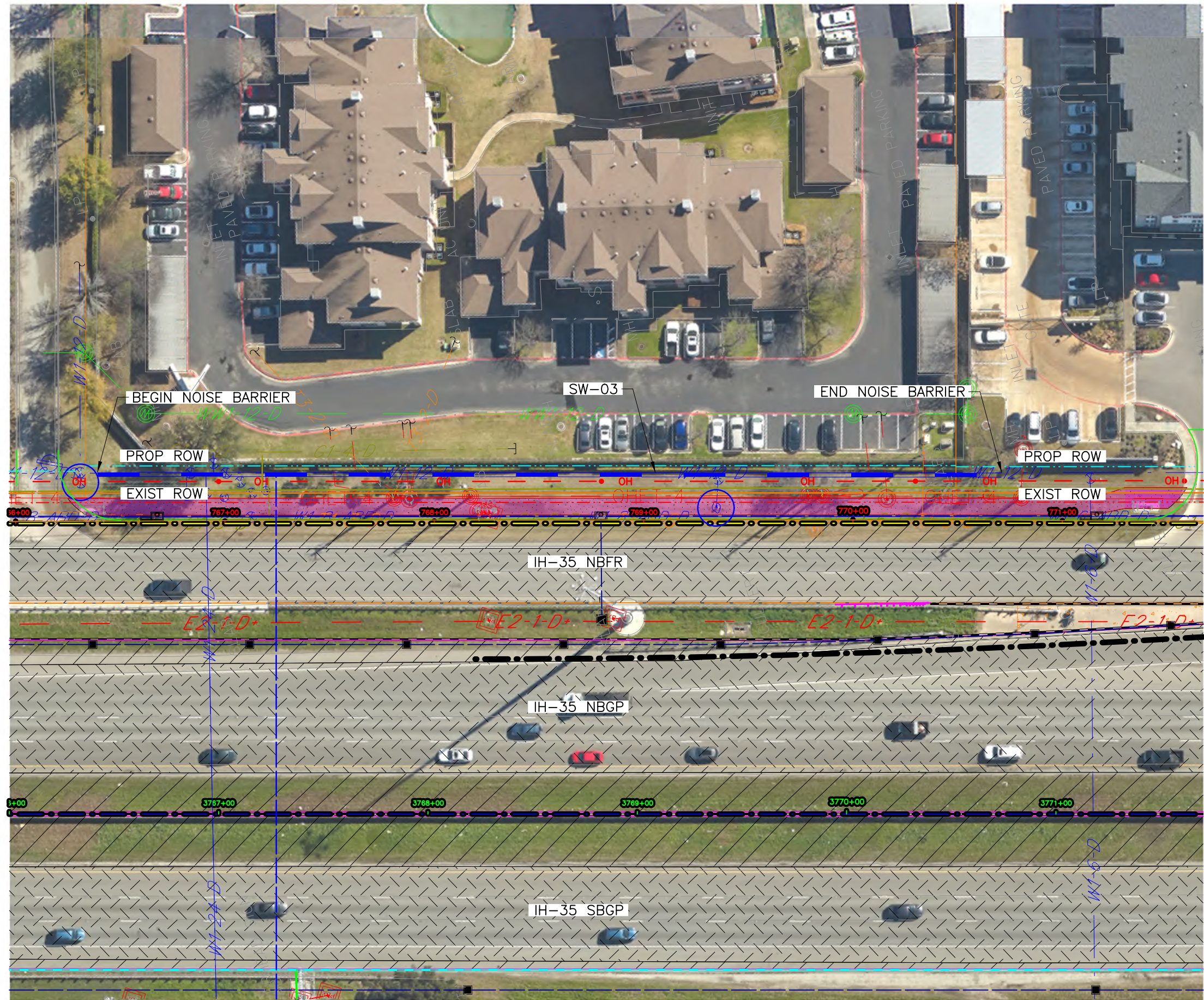
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## Noise Barrier 3

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LEGEND

- FULL RECONSTRUCTION
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- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

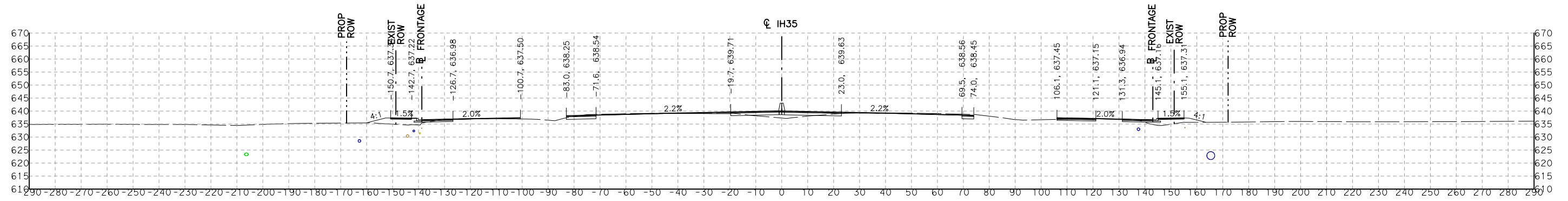
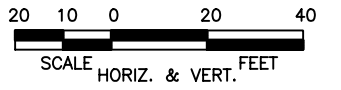
NO.		REVISION		BY		DATE	
TEXAS REGISTERED ENGINEERING FIRM F-1741							
©2021 Texas Department of Transportation							
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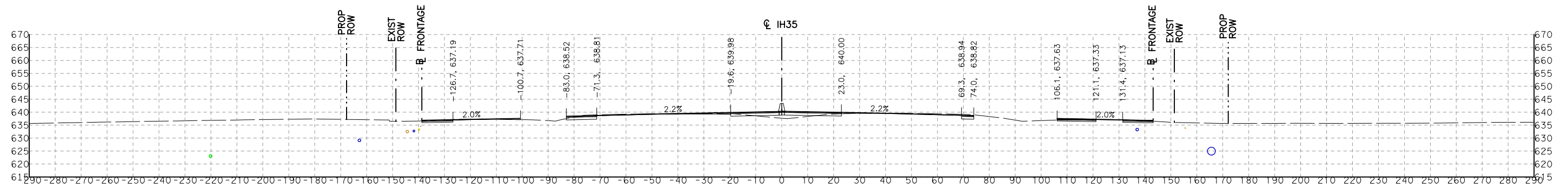
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LEGEND

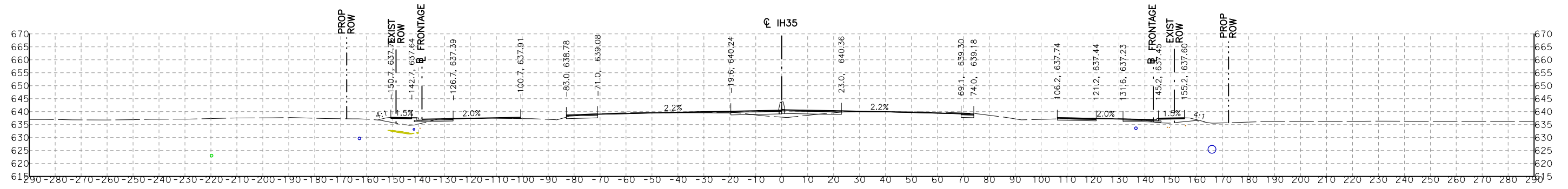
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GAS LINE    WATER LINE



3766+50.00 R1



3766+00.00 R1



3765+50.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

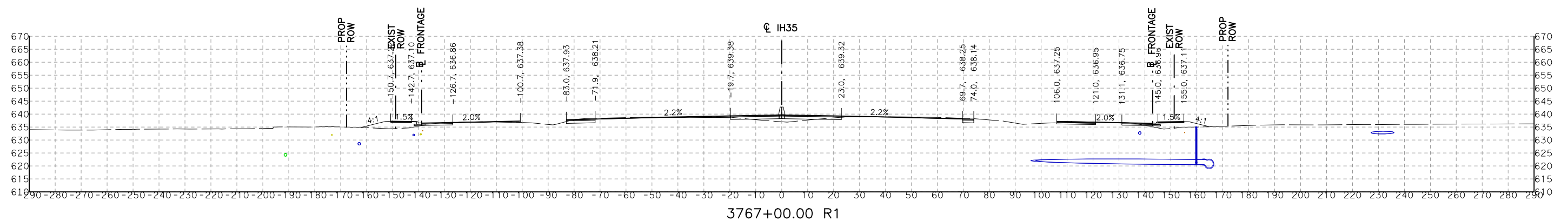
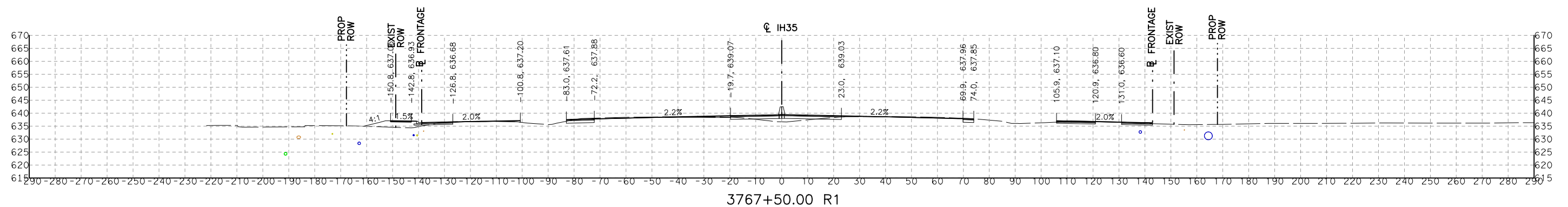
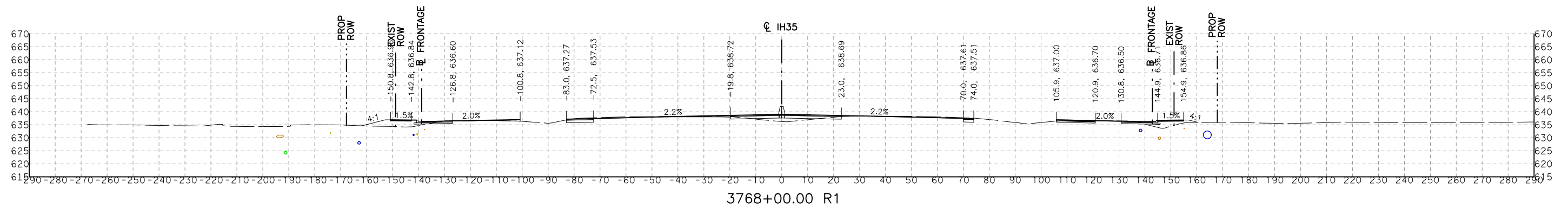
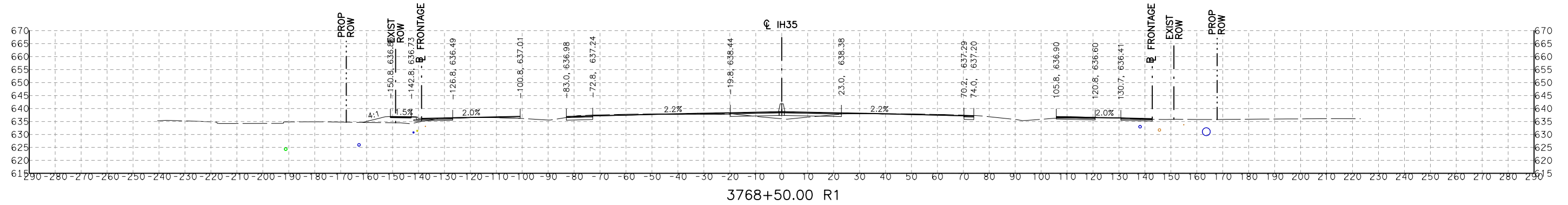
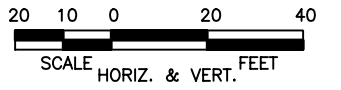
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Checked: AJS							

NOTES:

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LEGEND

- ELECTRIC LINE    — COMMUNICATION LINE    — WASTEWATER LINE  
— GAS LINE    — WATER LINE



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

Designed: LVK	FED. RD. NO. X	STATE TEXAS	FEDERAL AID PROJECT NO.				HIGHWAY NO.
Checked: AJS							I-35
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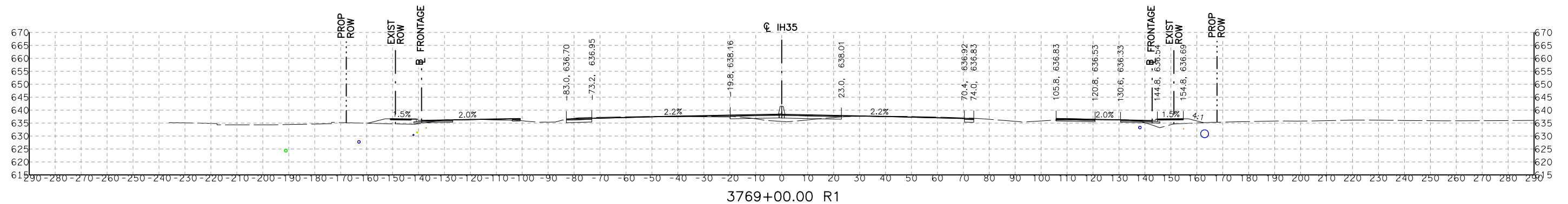
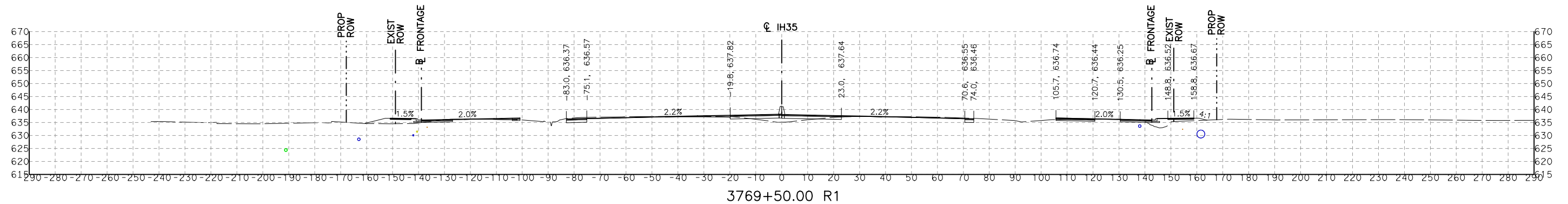
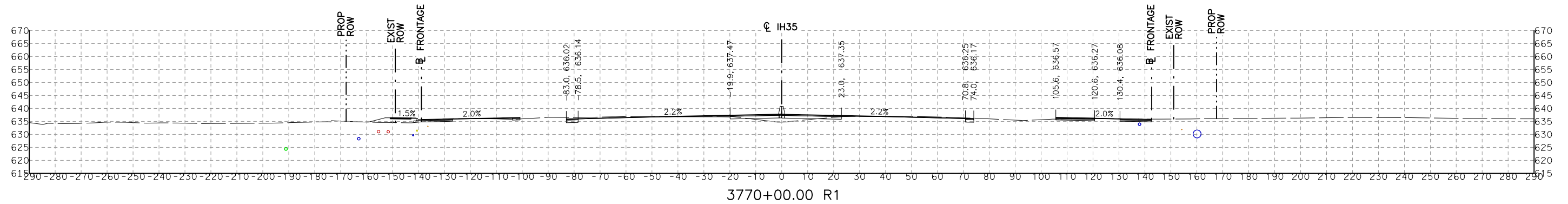
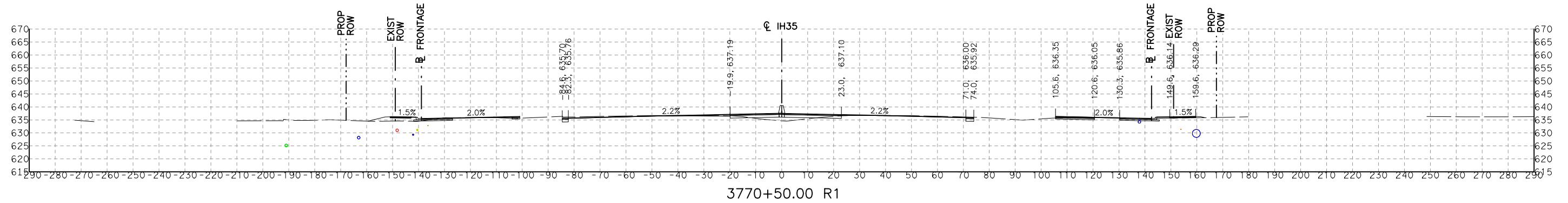
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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE

20 10 0 20 40  
SCALE HORIZ. & VERT. FEET

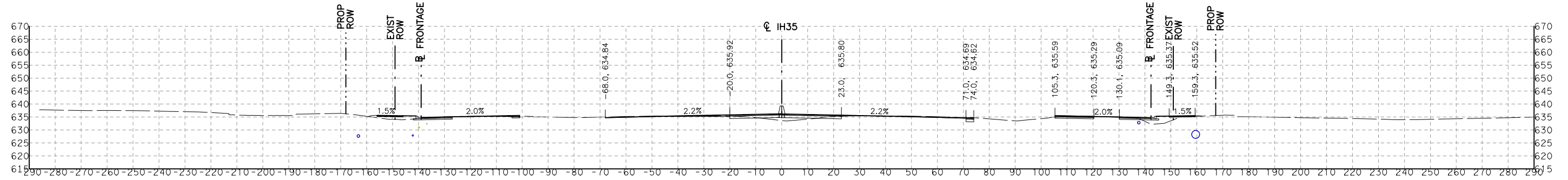
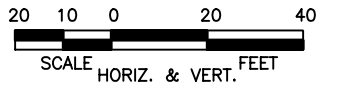


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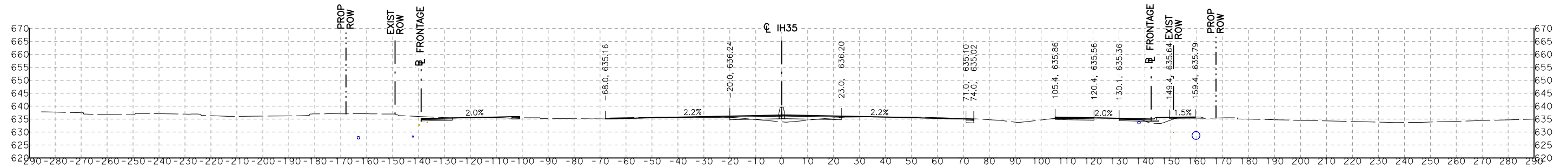
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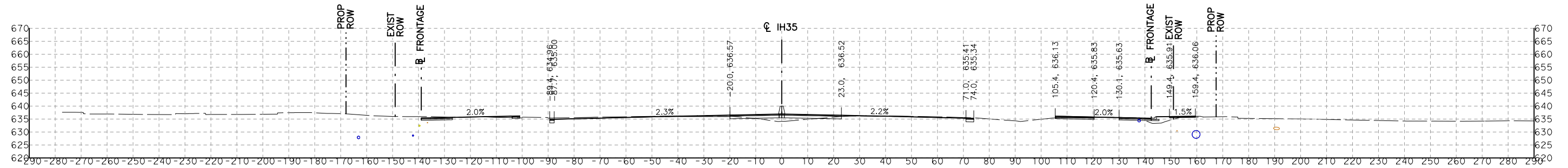
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GAS LINE    WATER LINE



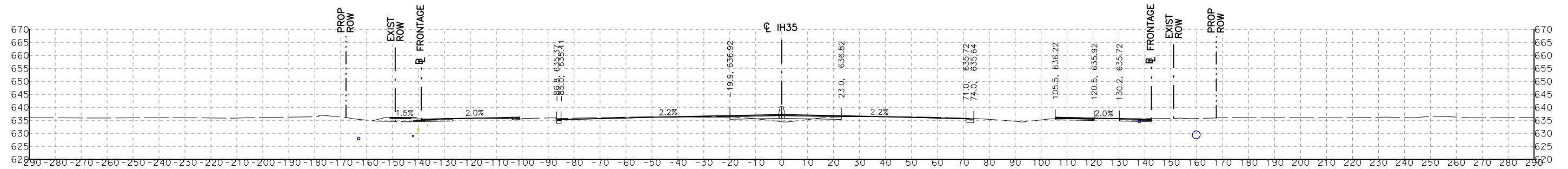
3772+50.00 R1



3772+00.00 R1



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3771+00.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



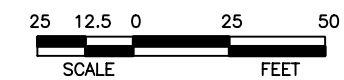
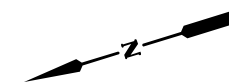
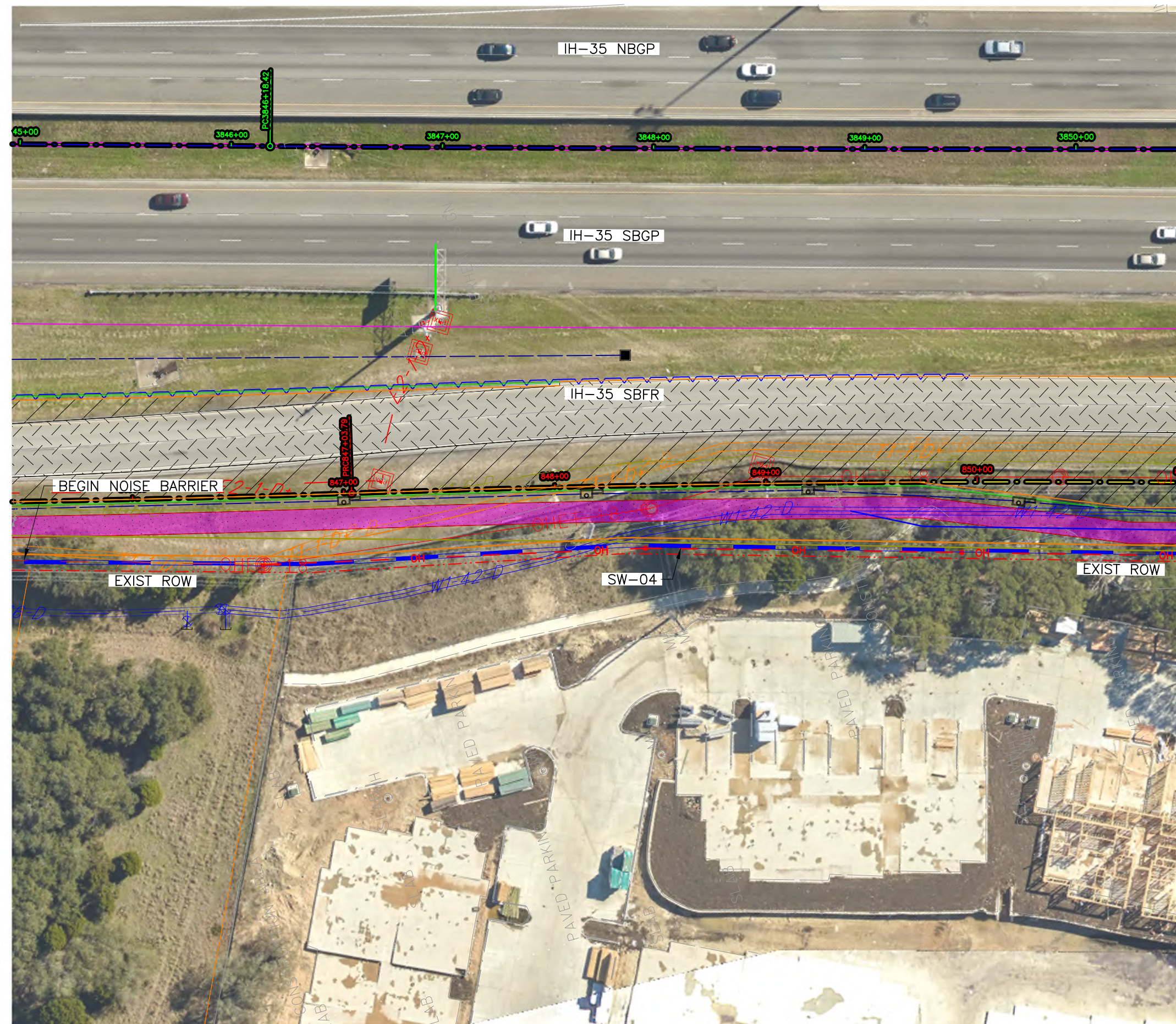
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IH-35





IH-35 CROSS SECTIONS

Designed: <b>LVK</b>	FED. RD. DIV. NO. <b>X</b>	STATE <b>TEXAS</b>	FEDERAL AID PROJECT NO.				HIGHWAY NO.
Checked: <b>AJS</b>							I-35
Drawn: <b>LVK</b>	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
Checked: <b>AJS</b>	AUS	TRAVIS	0015	13	77, ETC.	184	


## Noise Barrier 4




LEGEND

- |   |                     |
|---|---------------------|
|  | FULL RECONSTRUCTION |
|  | WIDENING            |
|  | HMA/TOM OVERLAY     |
|  | SUP RECONSTRUCTION  |

NO.	REVISION			BY DATE



TEXAS REGISTERED ENGINEERING FIRM F-1741



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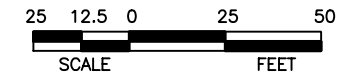
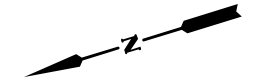
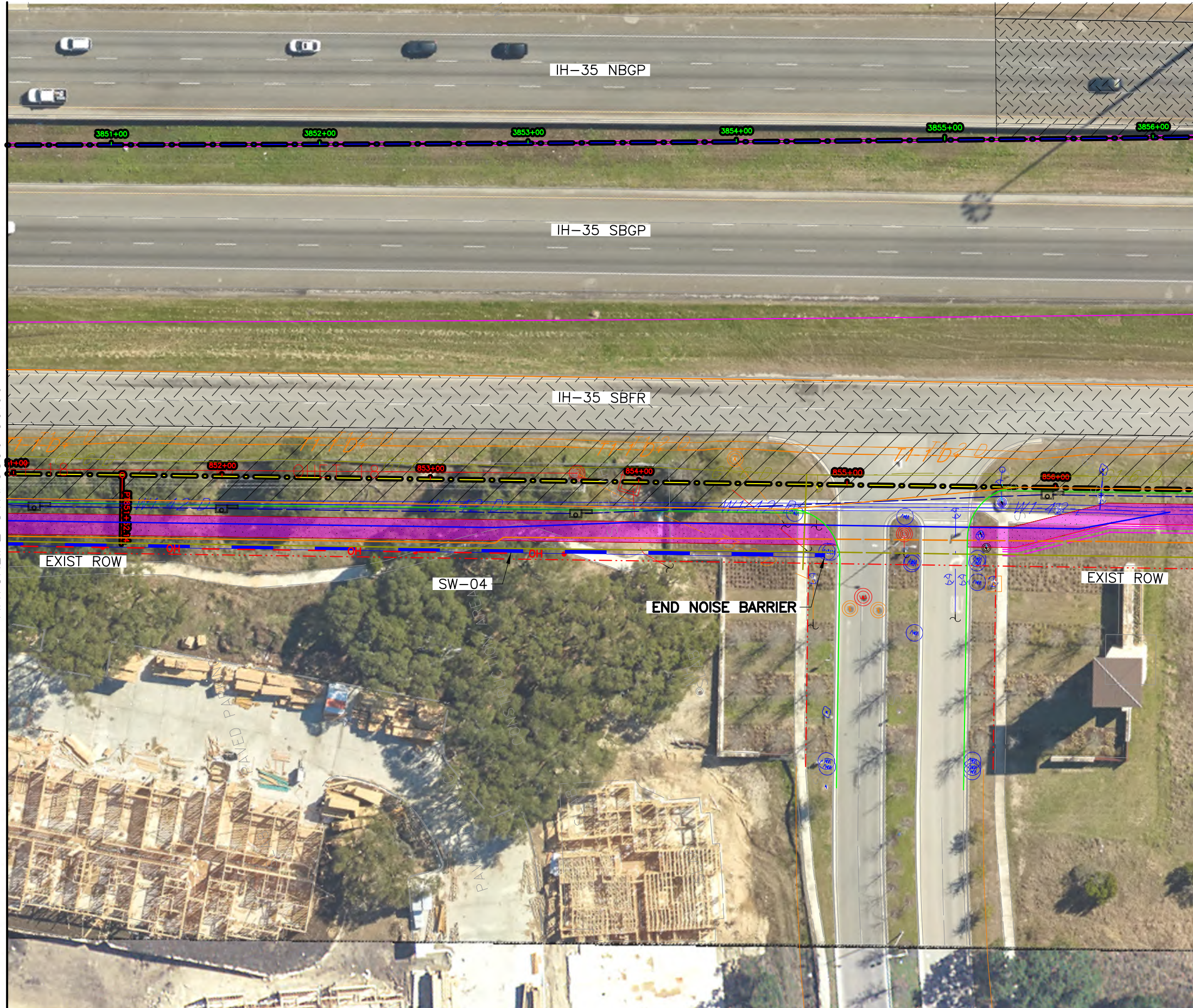
CAPITAL EXPRESS SOUTH

**NOISE BARRIER 04-01 EXHIBIT**

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Drawn:	—	DIST.	COUNTY	CONTROL NO.	SECTION NO.
Checked:	—	14	TRAVIS	0015	13
				077, etc.	JOB NO.
					SHEET NO.
					—



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MATCHLINE STA. 3850+50.00



LEGEND

- FULL RECONSTRUCTION
- WIDENING
- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

NO.	REVISION			BY DATE	
<div> TEXAS REGISTERED ENGINEERING FIRM F-1741</div>					
<div> ©2021 <i>Texas Department of Transportation</i></div>					
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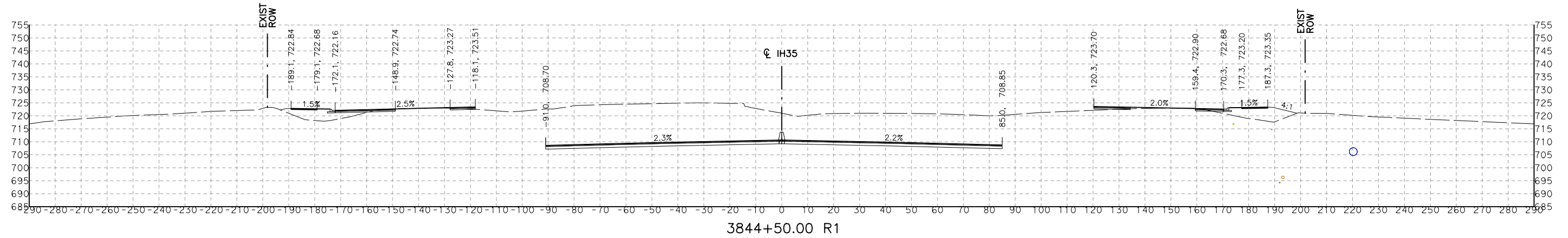
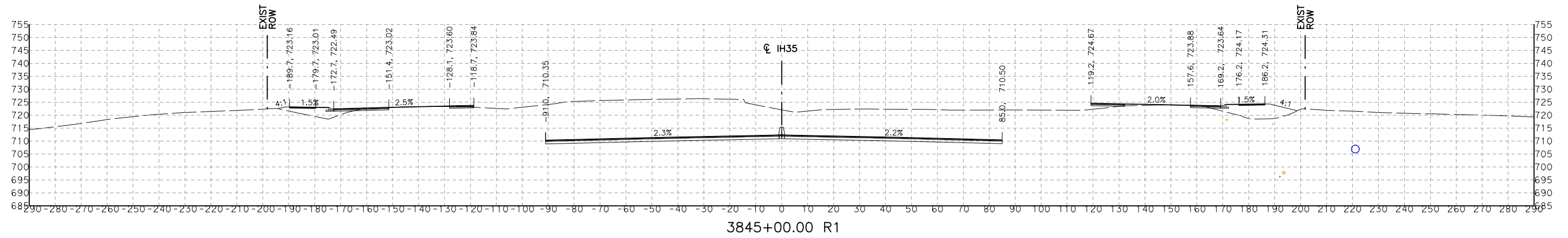
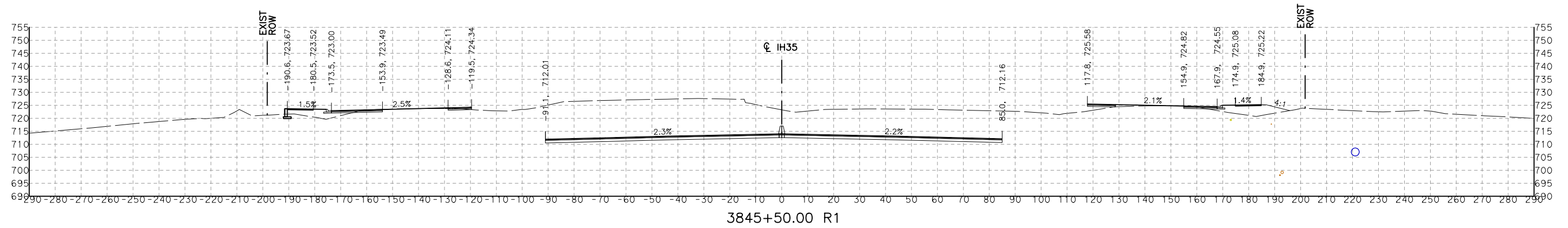
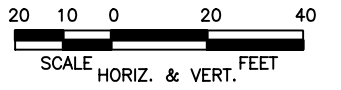
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NOTES:

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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

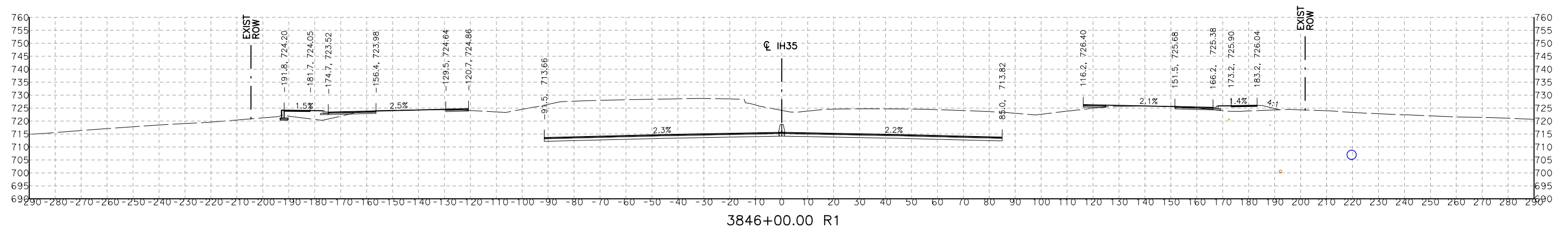
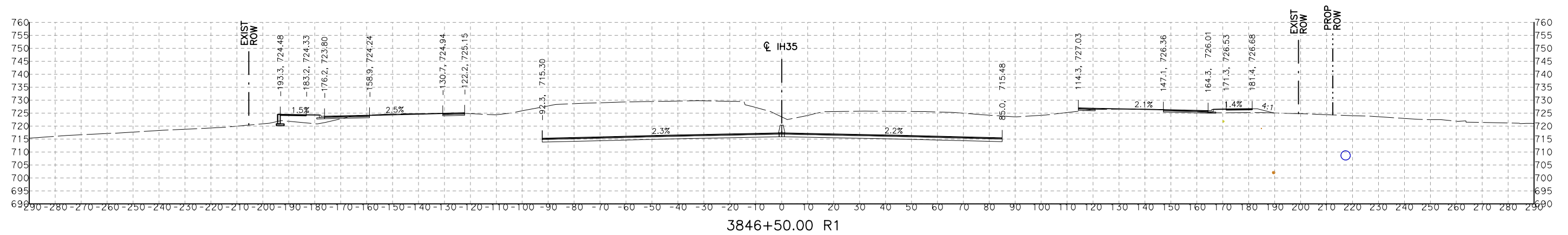
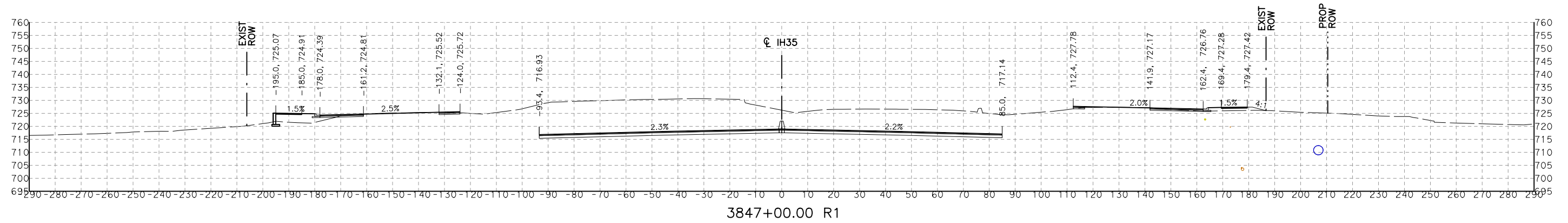
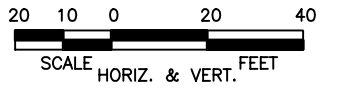
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— GAS LINE    — WATER LINE



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IH-35

IH-35 CROSS SECTIONS

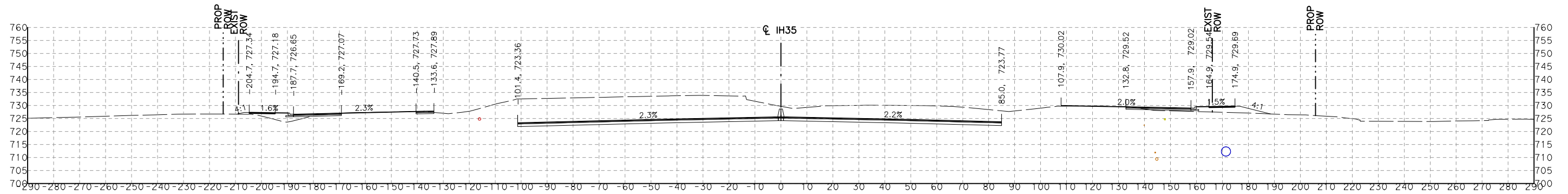
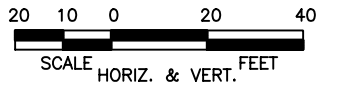
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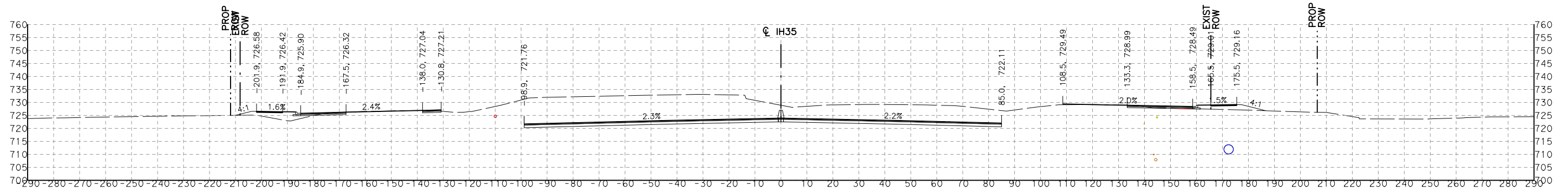
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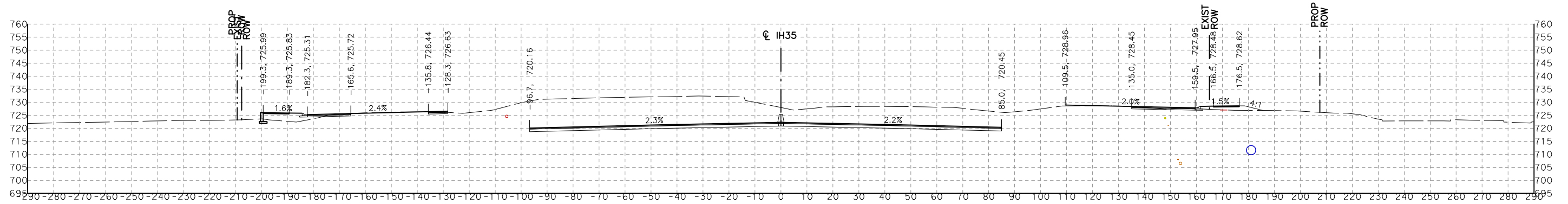
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GAS LINE    WATER LINE



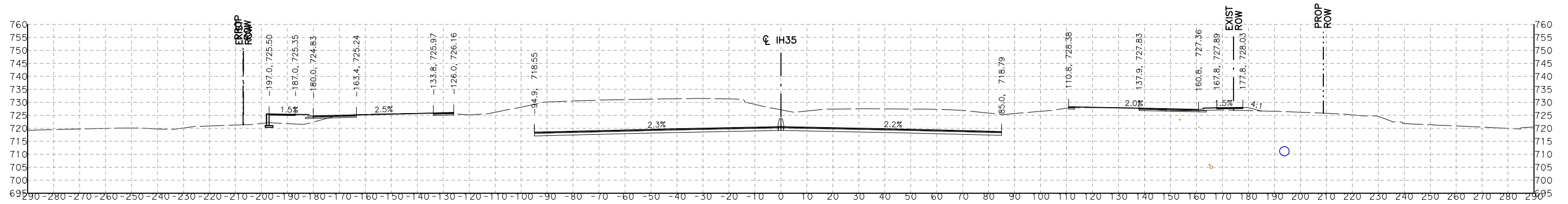
3849+00.00 R1



3848+50.00 R1



3848+00.00 R1



3847+50.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

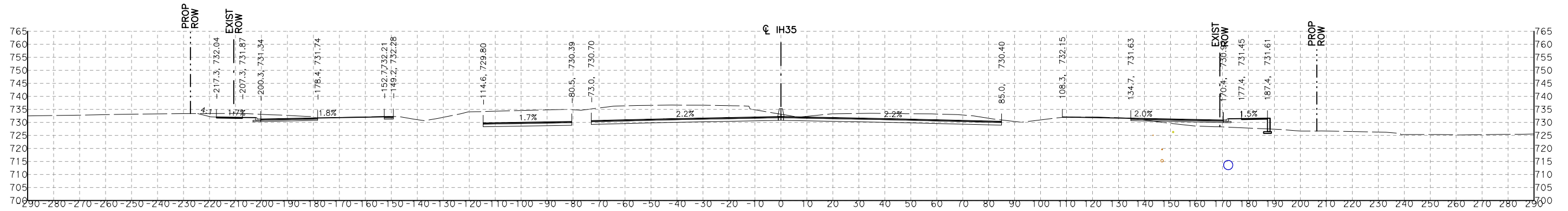
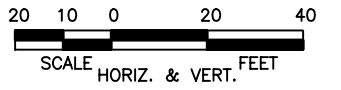
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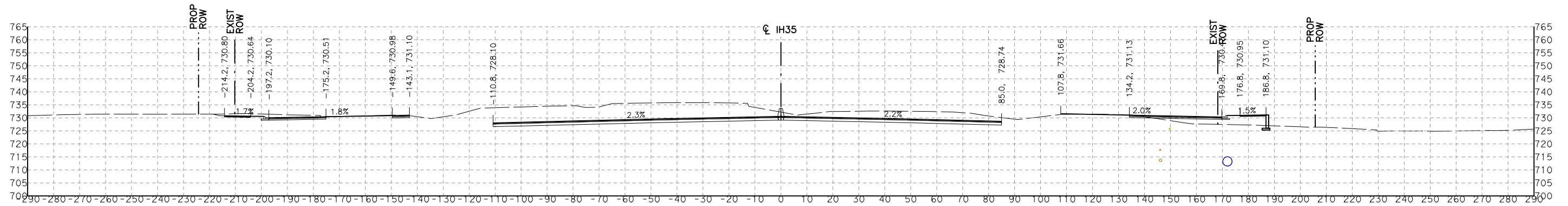
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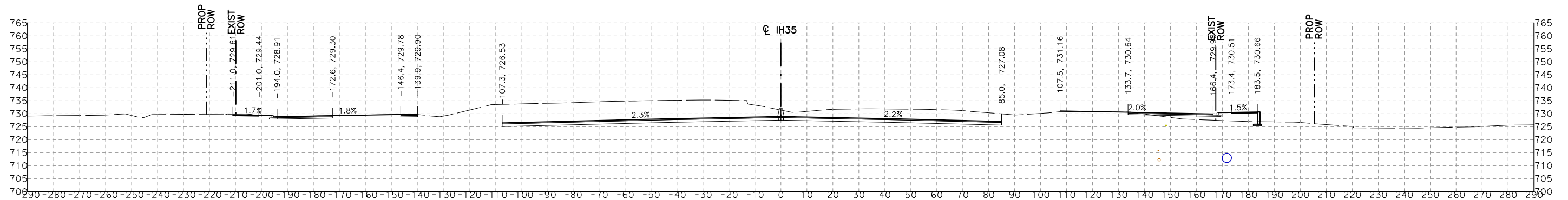
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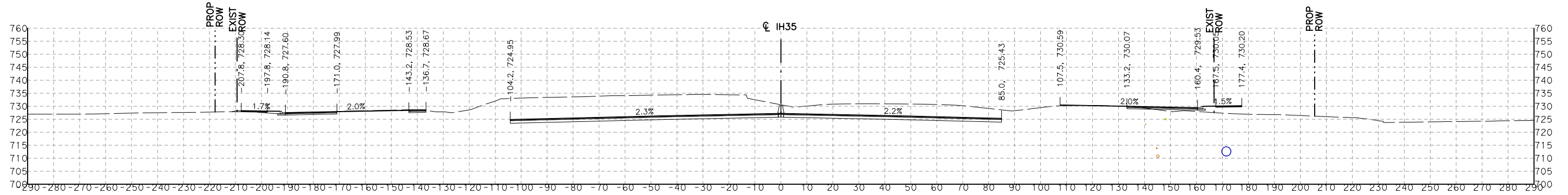
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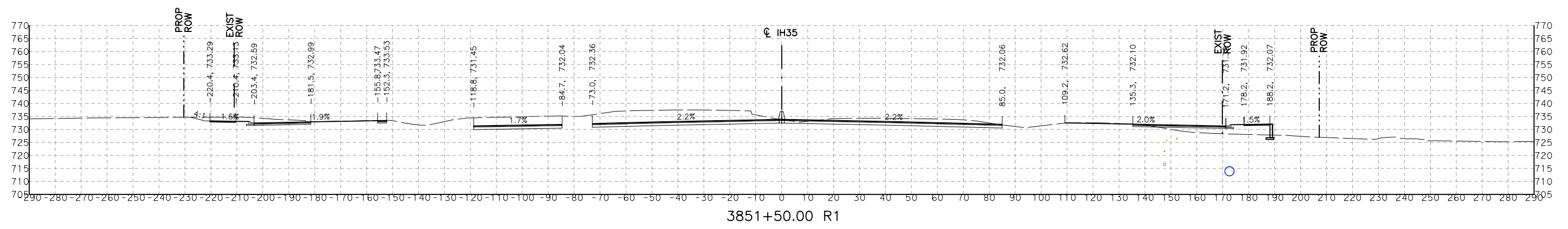
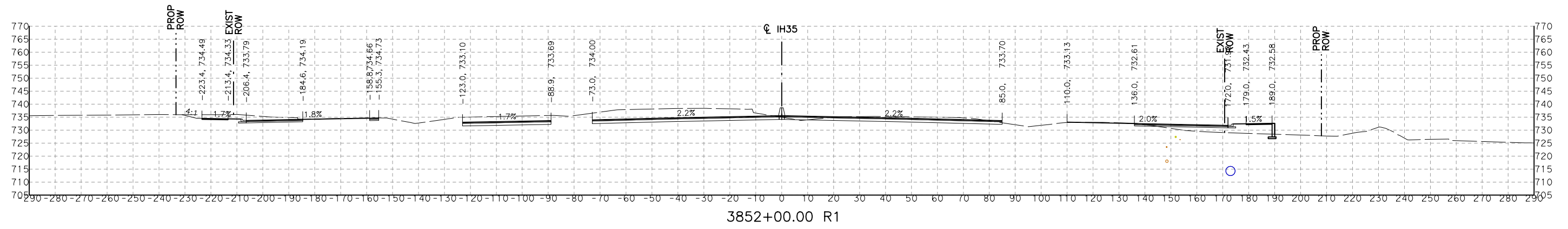
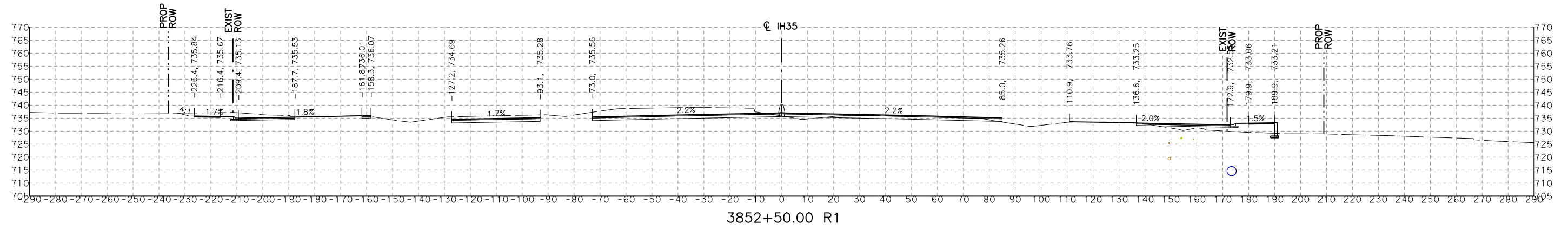
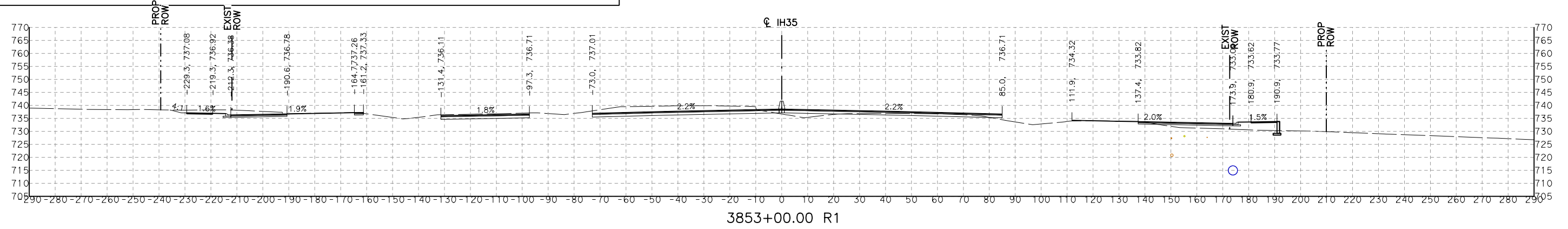
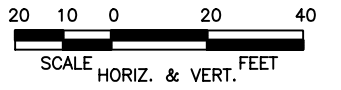
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LEGEND

- ELECTRIC LINE    — COMMUNICATION LINE    — WASTEWATER LINE  
— GAS LINE    — WATER LINE



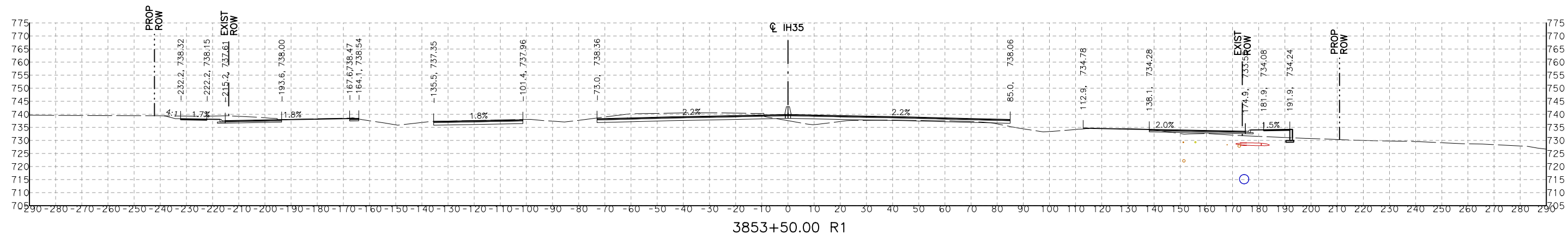
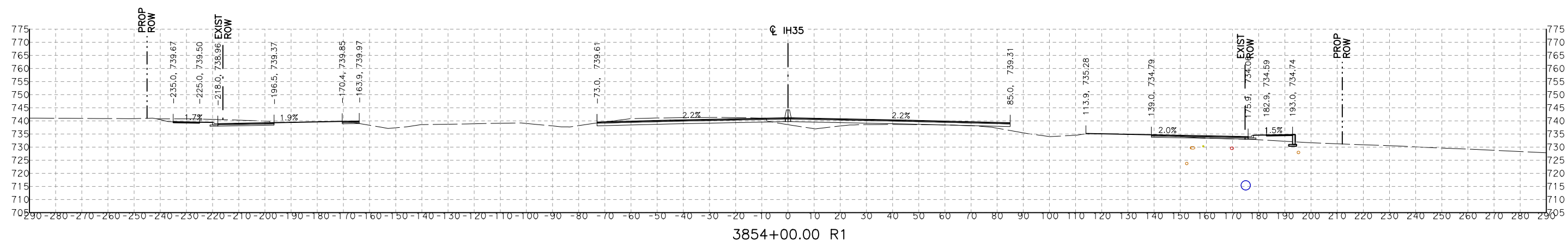
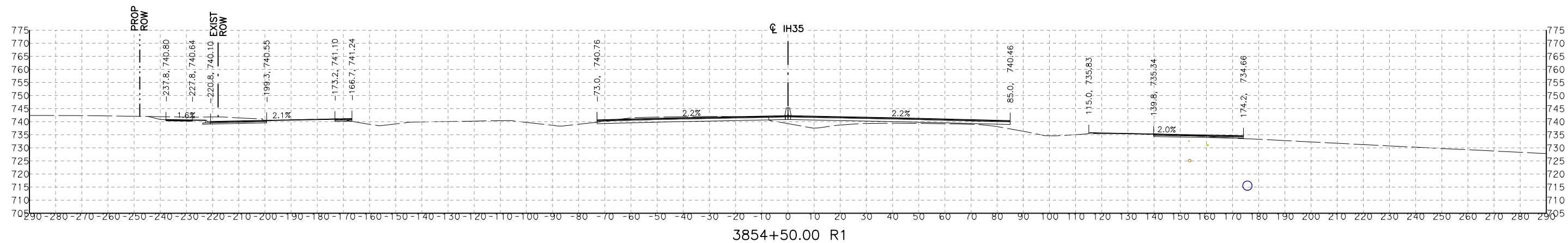
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## LEGEND

ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE

20 10 0 20 40  
SCALE HORIZ. & VERT. FEET



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

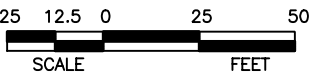
IH-35 CROSS SECTIONS

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Drawn: LVK	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
Checked: AJS	AUS	TRAVIS	0015	13	77, ETC.	239



## **ATTACHMENT 2**

### **Revised Noise Barrier Plan and Section Views**

## Noise Barrier 1

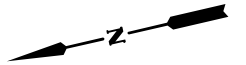


	FULL RECONSTRUCTION
	WIDENING
	HMA/TOM OVERLAY
	SUP RECONSTRUCTION

NO.	REVISION				BY DATE
<div style="text-align: center;">  <p>TEXAS REGISTERED ENGINEERING FIRM F-1741</p> </div>					
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<p><b>CAPITAL EXPRESS SOUTH</b></p> <p><b>NOISE BARRIER 01-01 EXHIBIT</b></p>					
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MATCHLINE STA. 3747+00.00



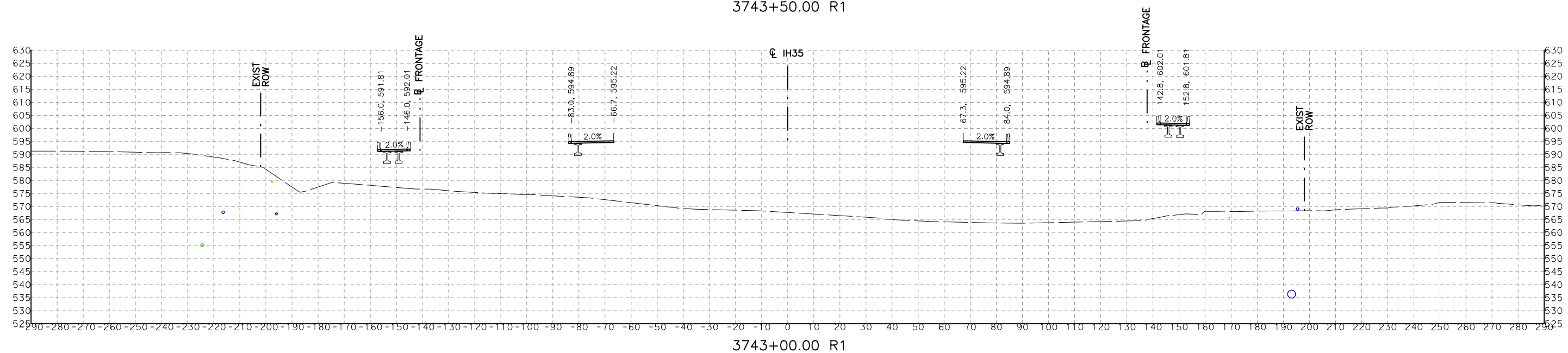
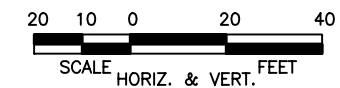
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- WIDENING
- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

NO.	REVISION			BY	DATE
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<div> ©2021 <i>Texas Department of Transportation</i></div>					
CAPITAL EXPRESS SOUTH					
NOISE BARRIER 01-02 EXHIBIT					
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 ELECTRIC LINE    
  COMMUNICATION LINE    
  WASTEWATER LINE  
 GAS LINE    
  WATER LINE



IH-35 CROSS SECTIONS

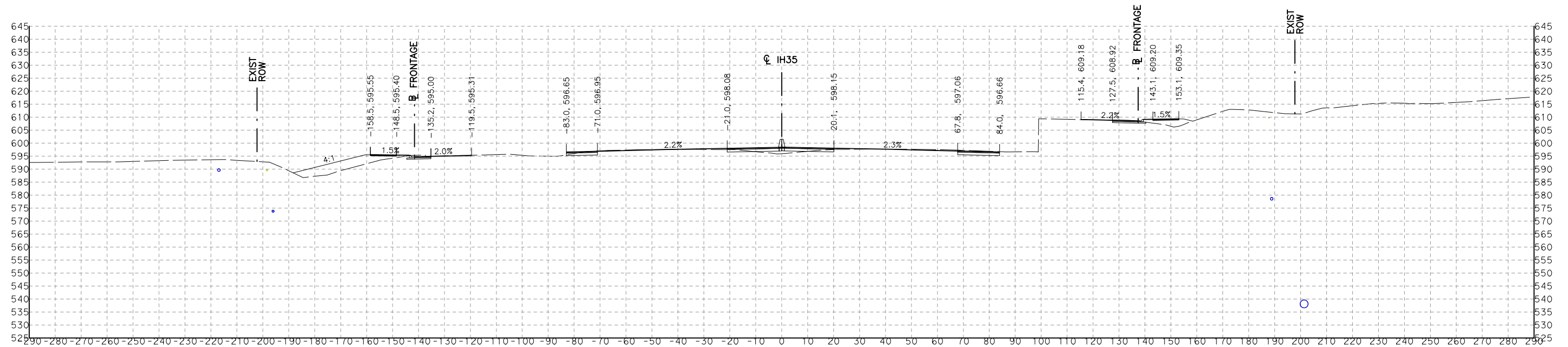
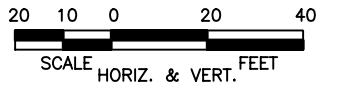
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NOTES:

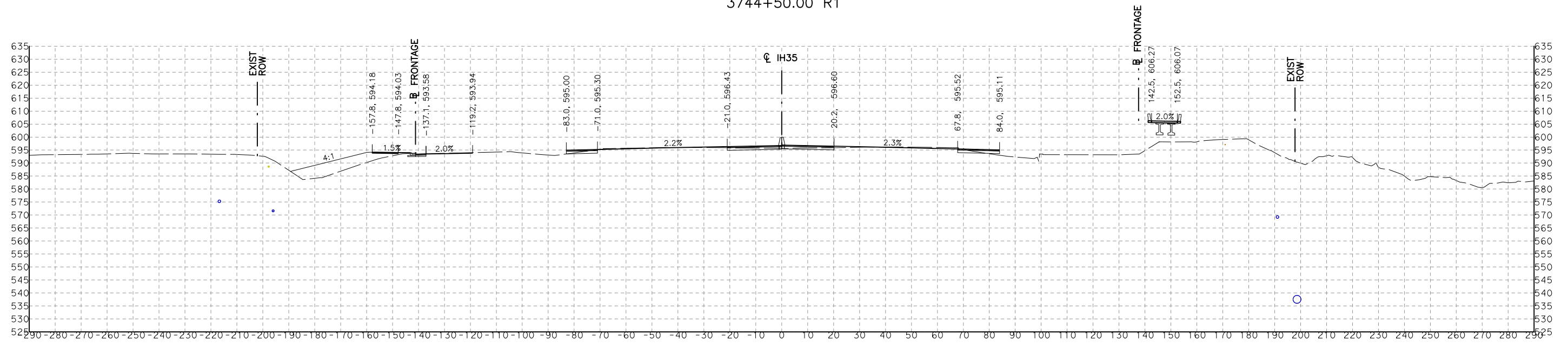
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2. VERTICAL LOCATION OF UTILITIES IS APPROXIMATE AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

LEGEND

- ELECTRIC LINE    — COMMUNICATION LINE    — WASTEWATER LINE  
— GAS LINE    — WATER LINE



3744+50.00 R1



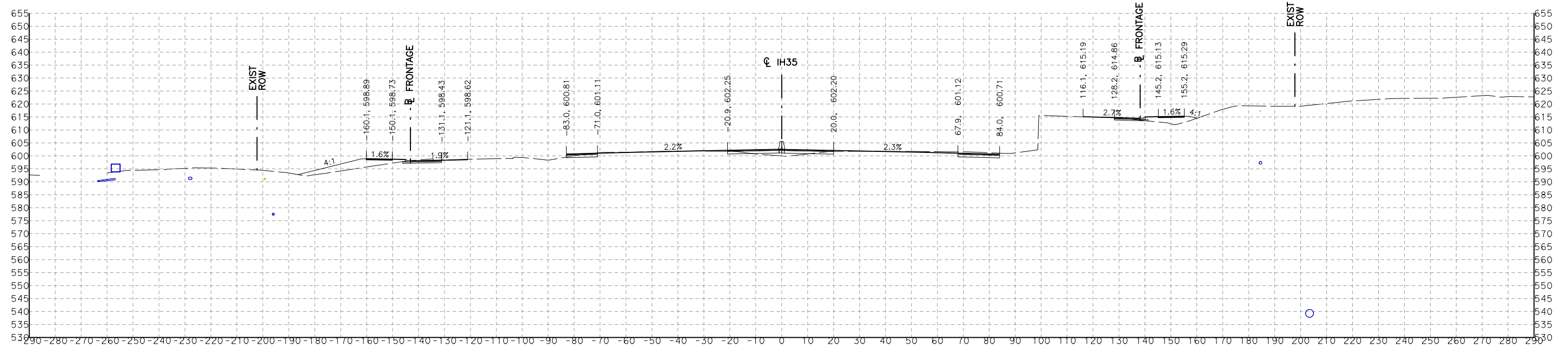
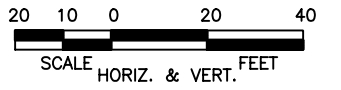
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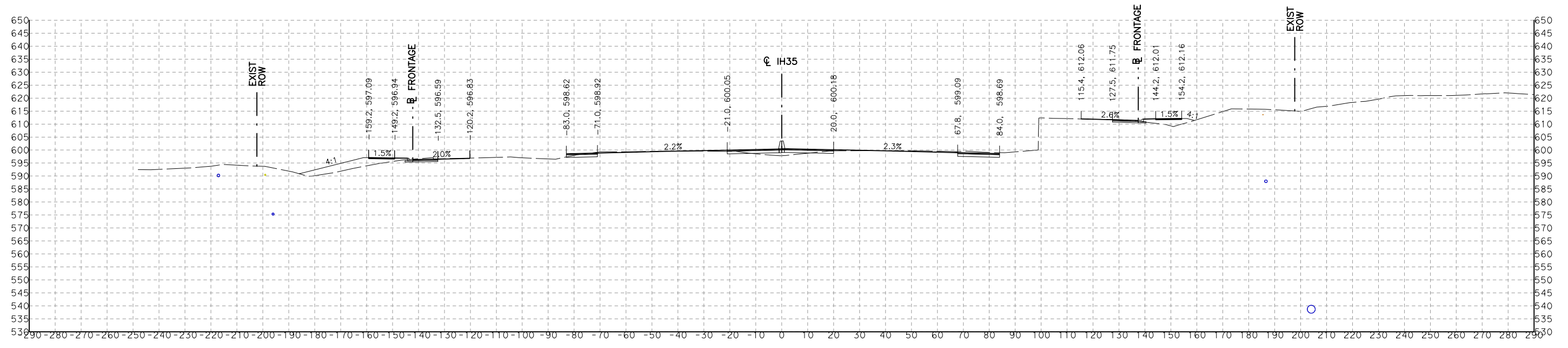
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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE



3745+50.00 R1



3745+00.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



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IH-35

IH-35 CROSS SECTIONS

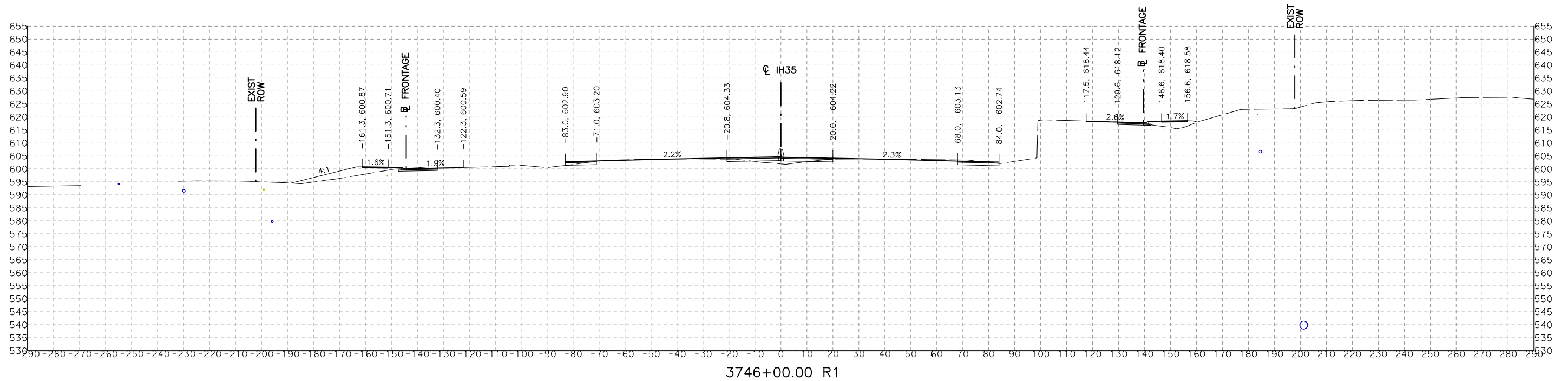
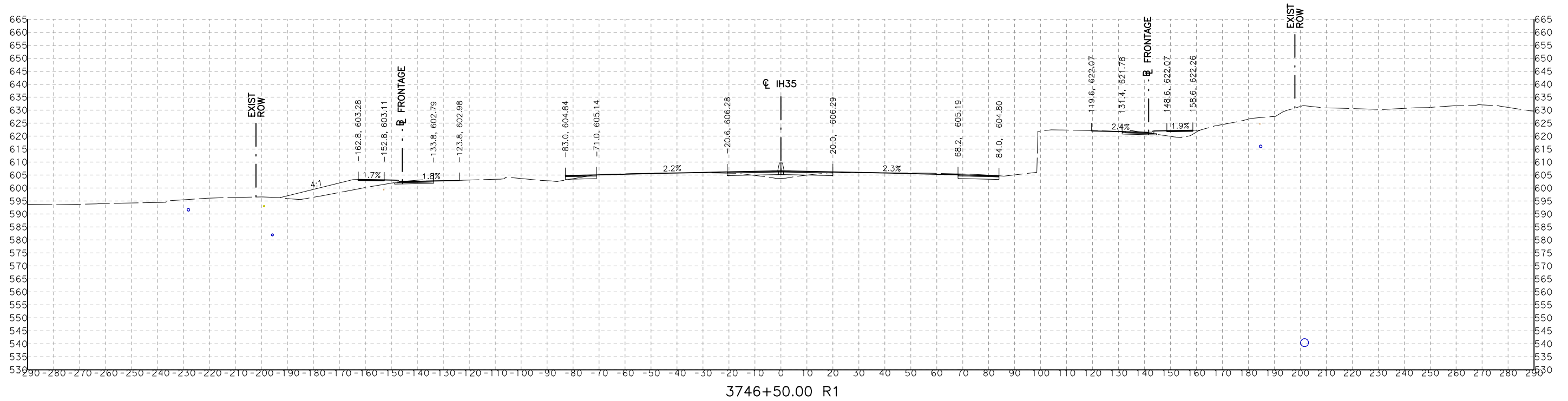
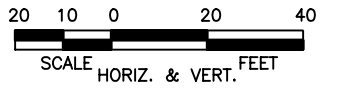
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Checked: <b>AJS</b>							I-35
Drawn: <b>LVK</b>	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.	
Checked: <b>AJS</b>	AUS	TRAVIS	0015	13	77,ETC.	168	

NOTES:

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LEGEND

- ELECTRIC LINE    — COMMUNICATION LINE    — WASTEWATER LINE  
— GAS LINE    — WATER LINE

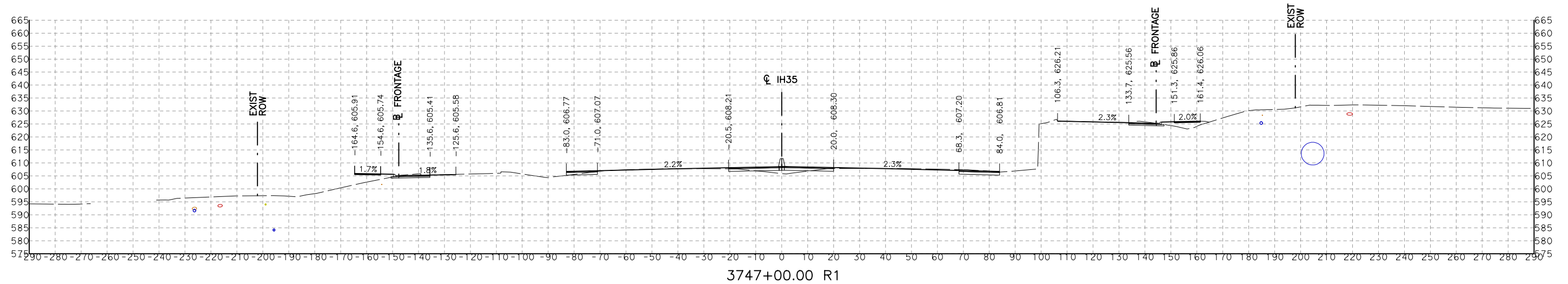
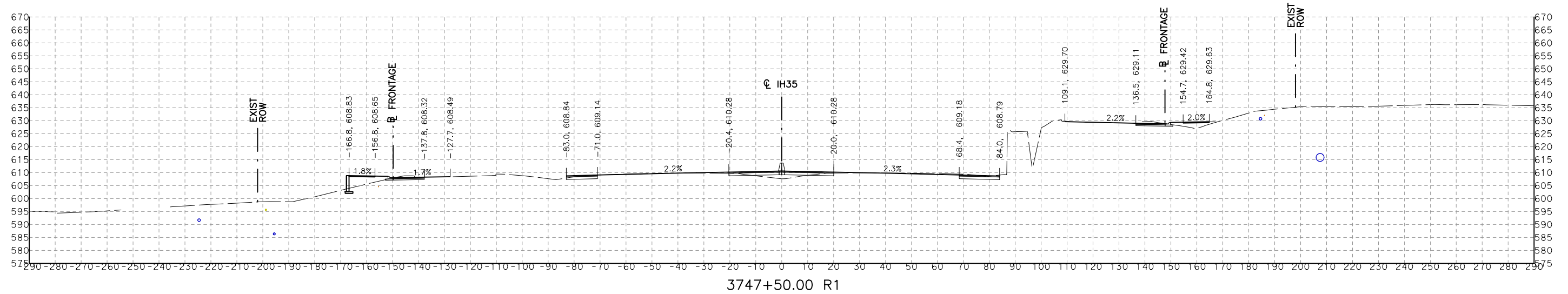
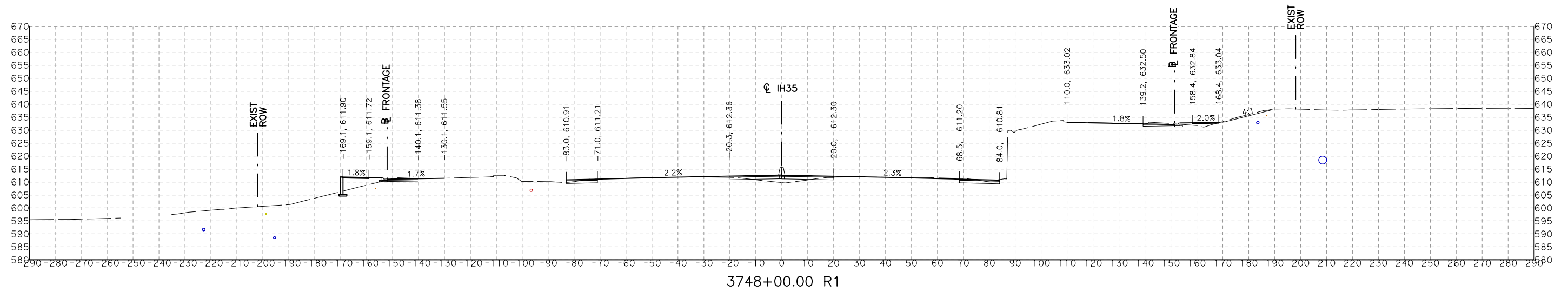
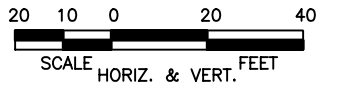


NOTES:

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LEGEND

- ELECTRIC LINE      COMMUNICATION LINE      WASTEWATER LINE  
GAS LINE      WATER LINE

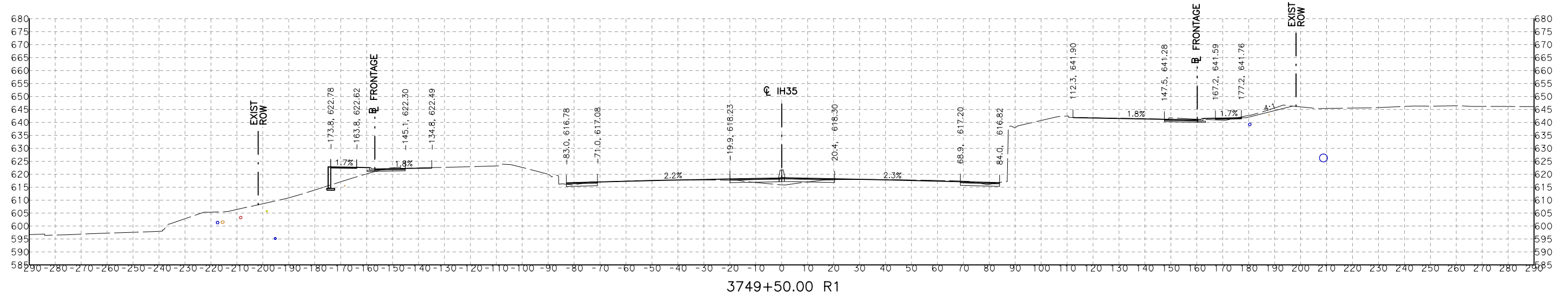
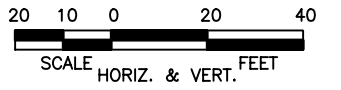


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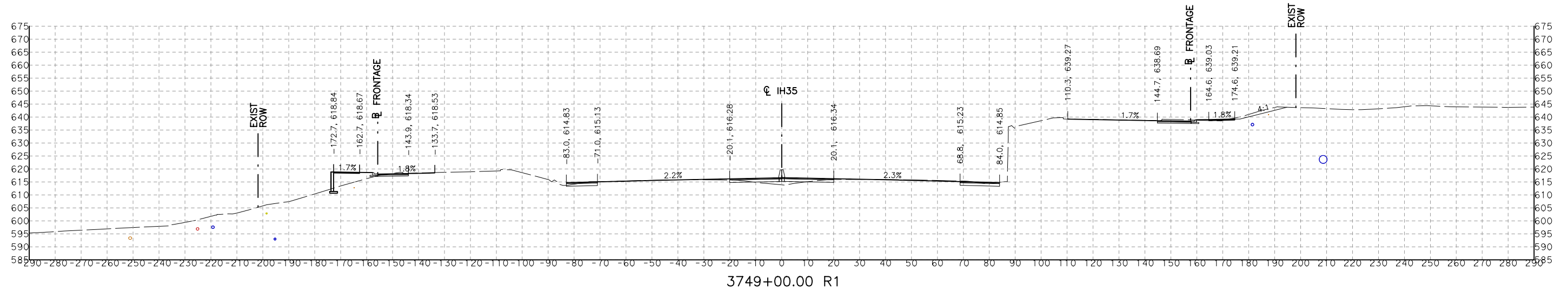
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LEGEND

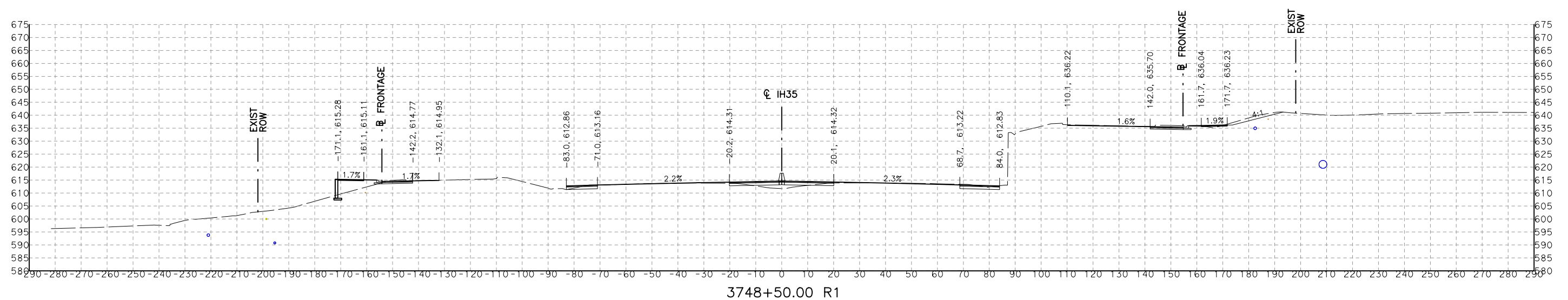
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GAS LINE    WATER LINE



3749+50.00 R1



3749+00.00 R1



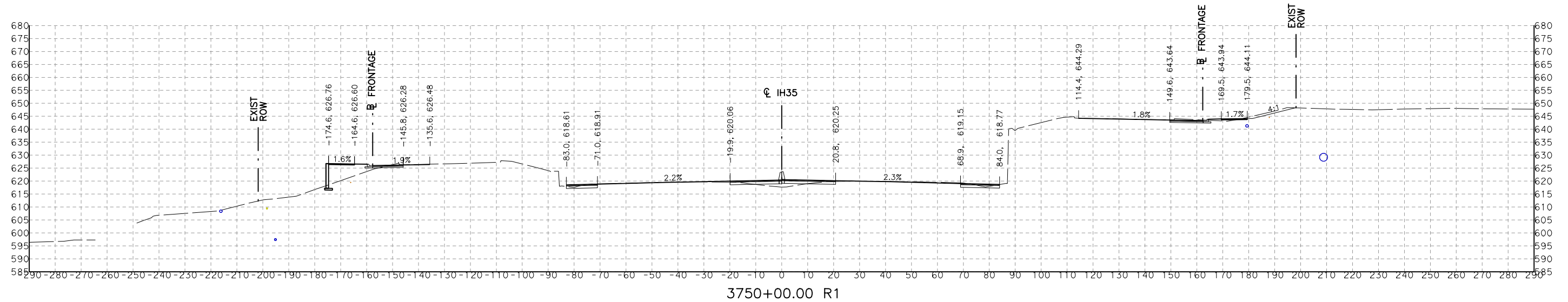
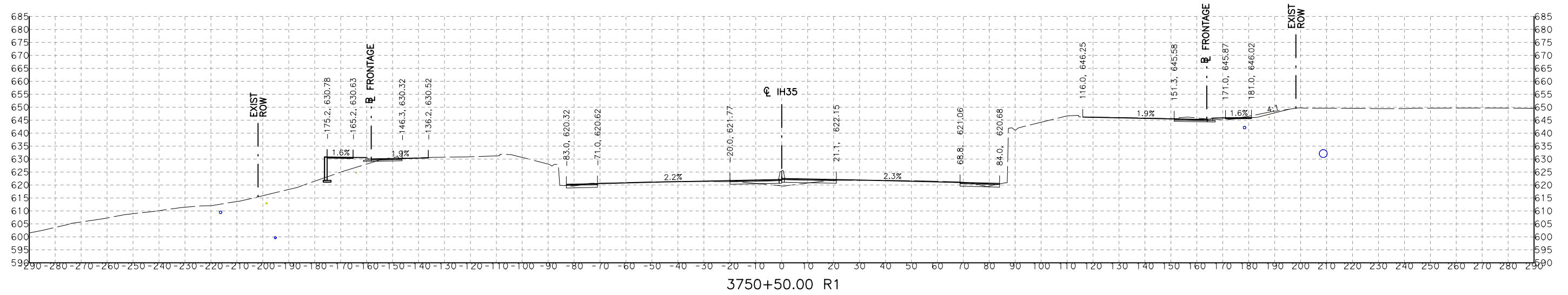
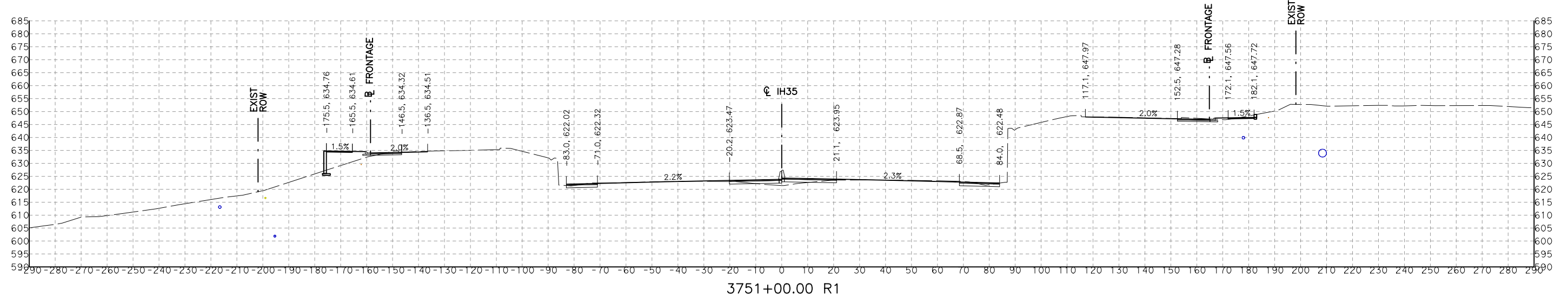
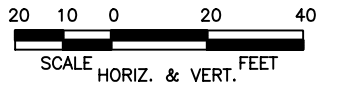
3748+50.00 R1

NOTES:

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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE



## Noise Barrier 2

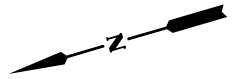
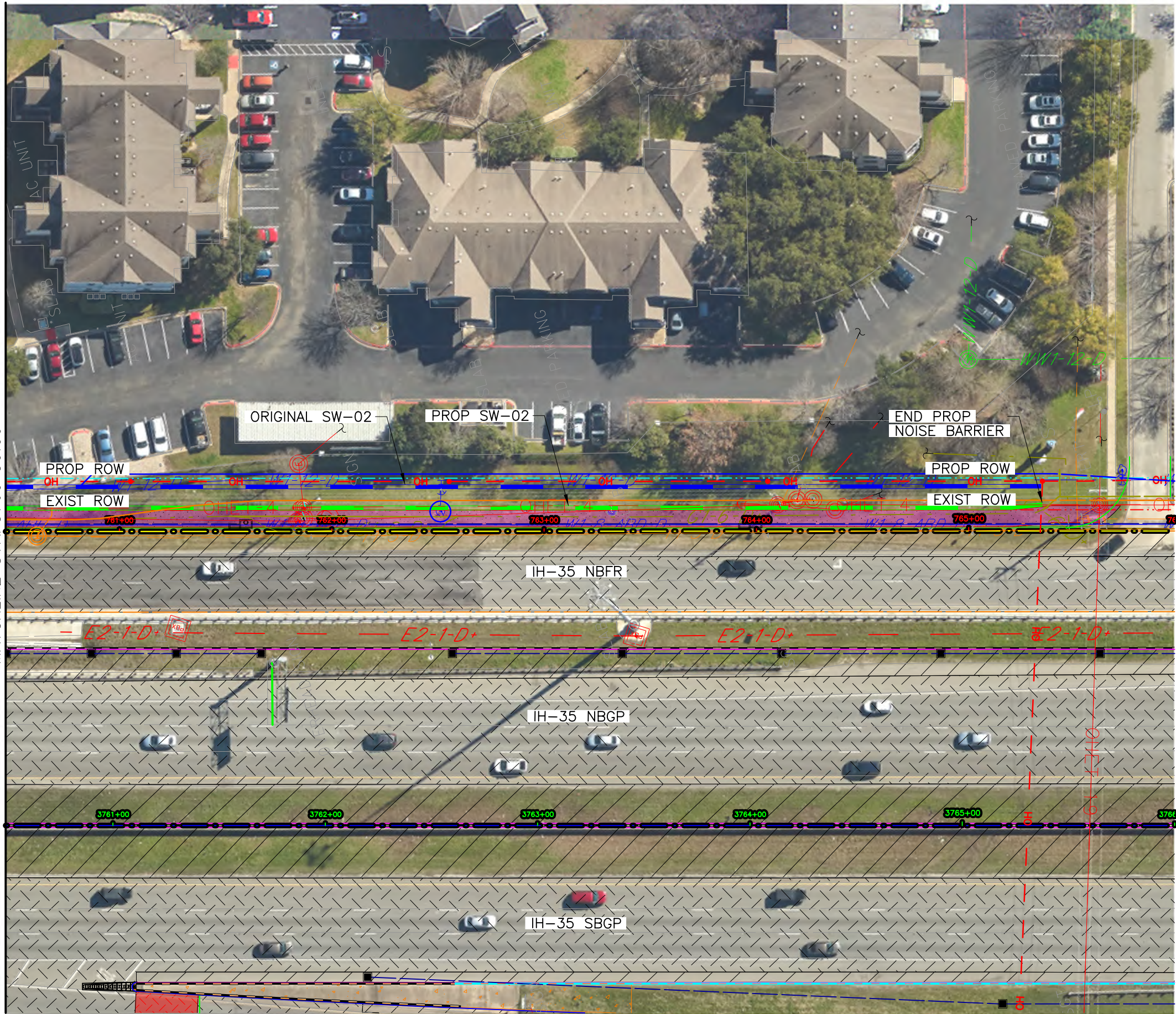


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3/5/2021 4:52:10 PM mrichardson



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MATCHLINE STA 3760+50.00



LEGEND

- FULL RECONSTRUCTION
- WIDENING
- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

NO.	REVISION			BY	DATE
<div> TEXAS REGISTERED ENGINEERING FIRM F-1741</div>					
<div> ©2021 <i>Texas Department of Transportation</i></div>					
CAPITAL EXPRESS SOUTH NOISE BARRIER 02-02 EXHIBIT					

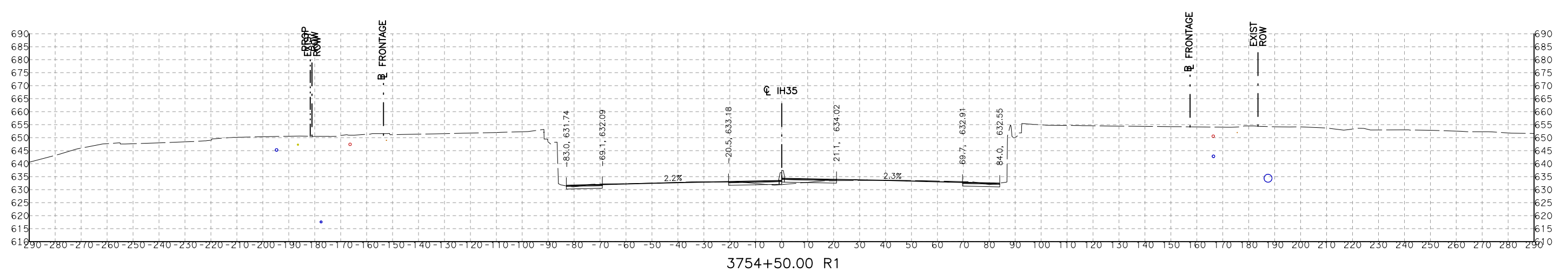
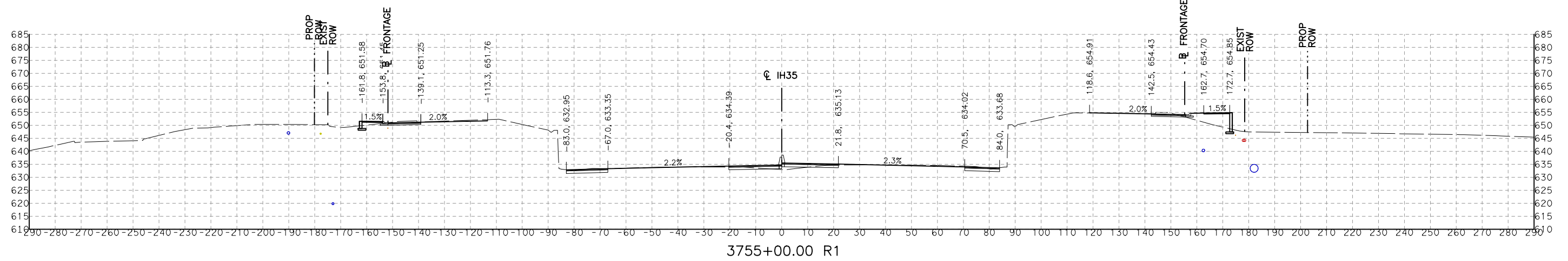
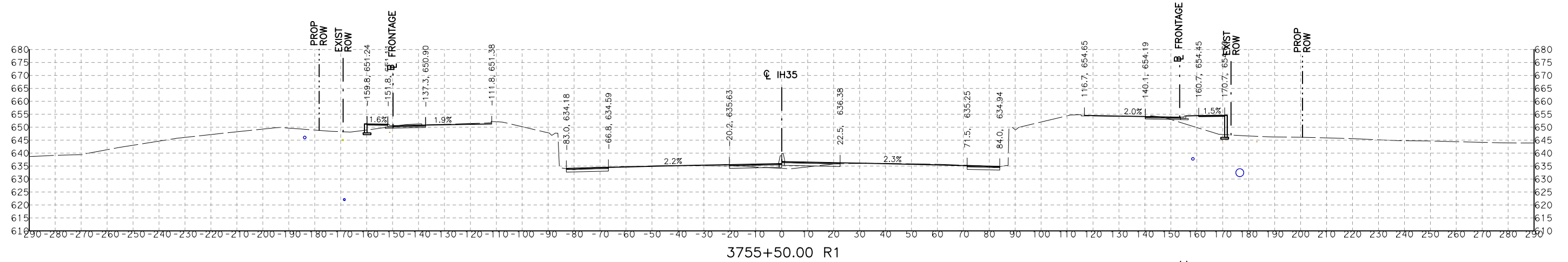
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LEGEND

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<span style="color: yellow;">—</span> GAS LINE	<span style="color: blue;">—</span> WATER LINE	

20 10 0 20 40  
SCALE  
HORIZ. & VERT. FEET

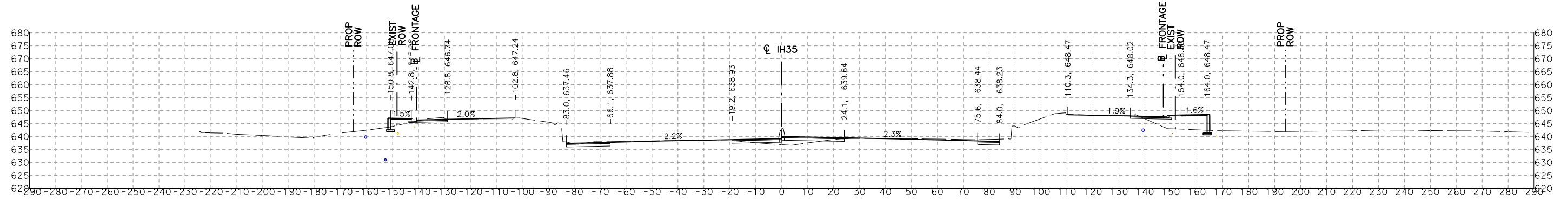
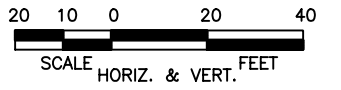


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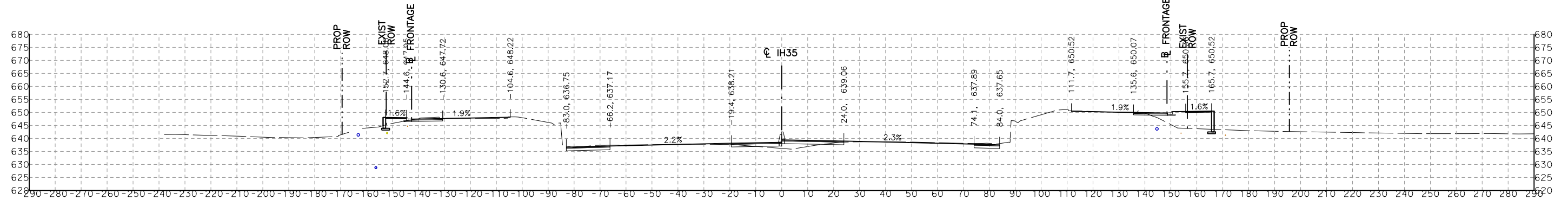
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LEGEND

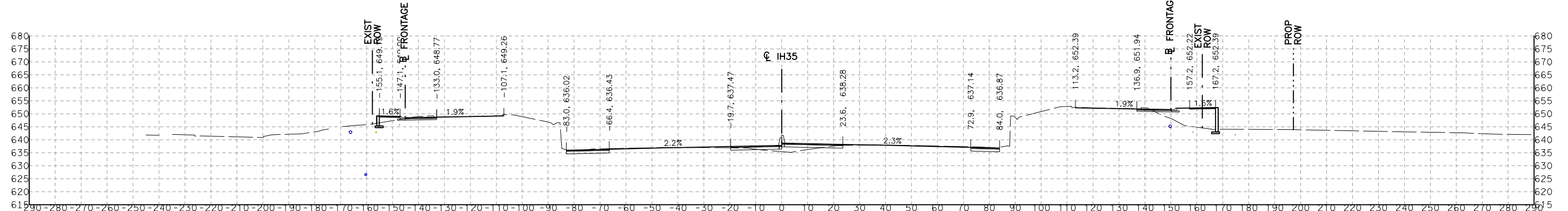
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GAS LINE    WATER LINE



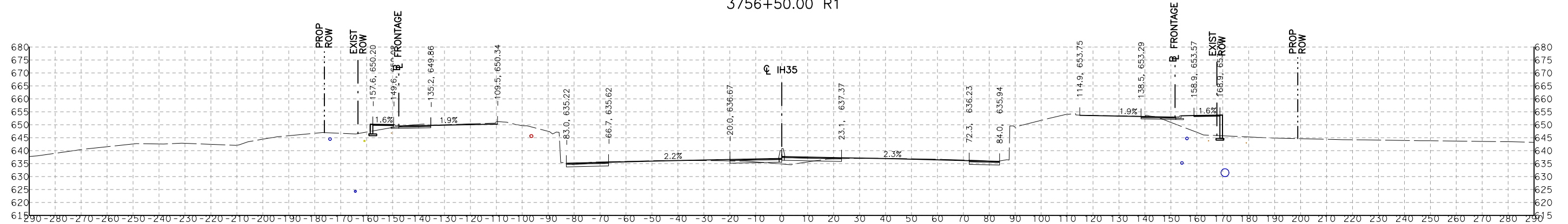
3757+50.00 R1



3757+00.00 R1



3756+50.00 R1



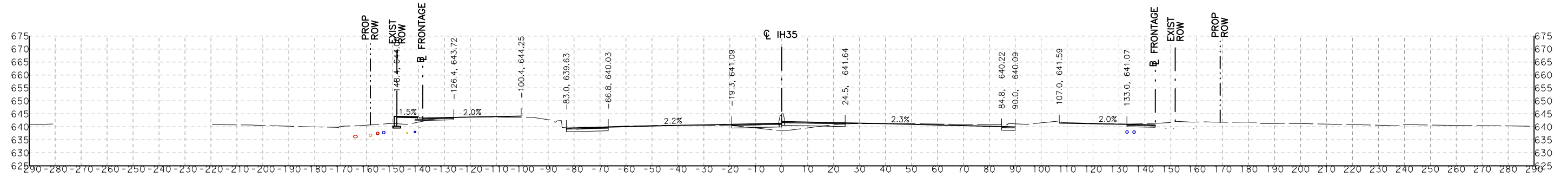
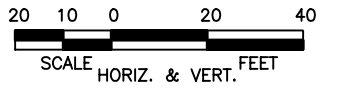
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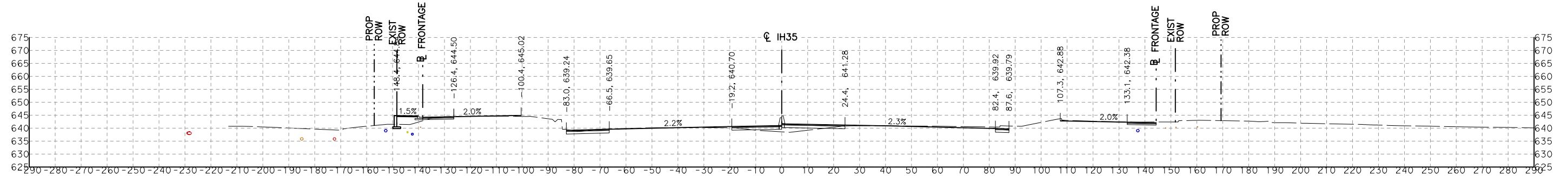
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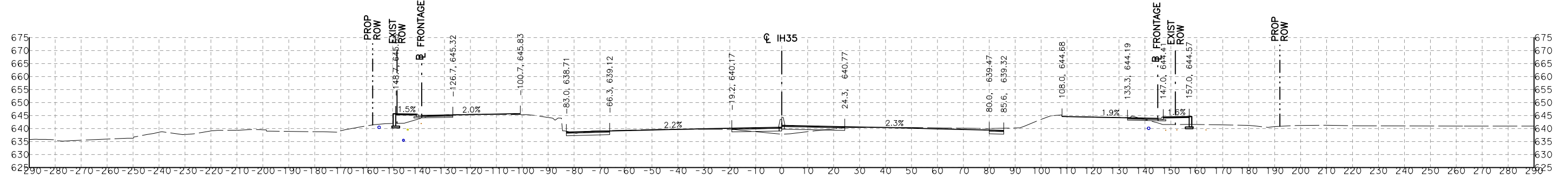
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GAS LINE    WATER LINE



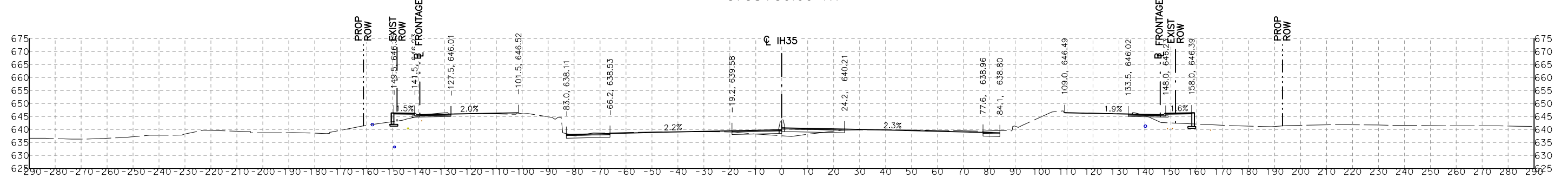
3759+50.00 R1



3759+00.00 R1



3758+50.00 R1



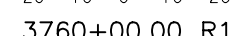
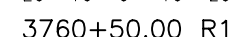
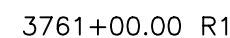
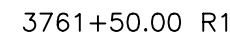
3758+00.00 R1

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### LEGEND

— GAS LINE

WATER LINE



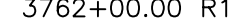
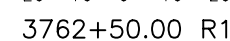
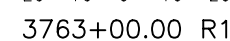
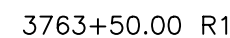
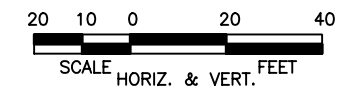
IH-35

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Checked:	AJS	X	TEXAS				1-35
Drawn:	LVK	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
Checked:	AJS	AUS	TRAVIS	0015	13	77, ETC.	178

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### LEGEND

— WASTEWATER LINE



IH-35 CROSS SECTIONS

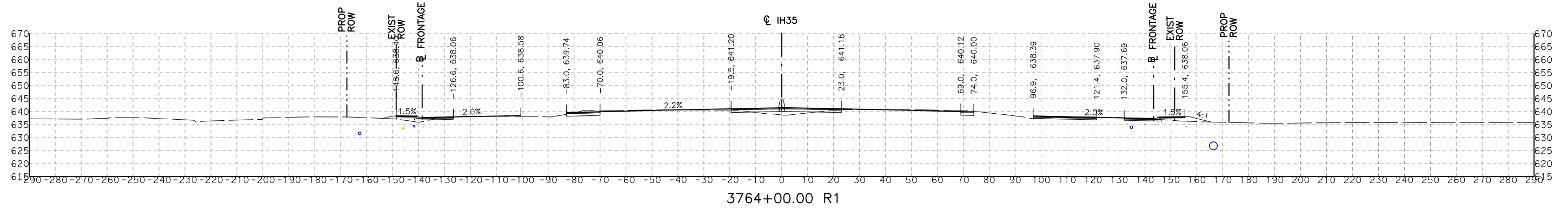
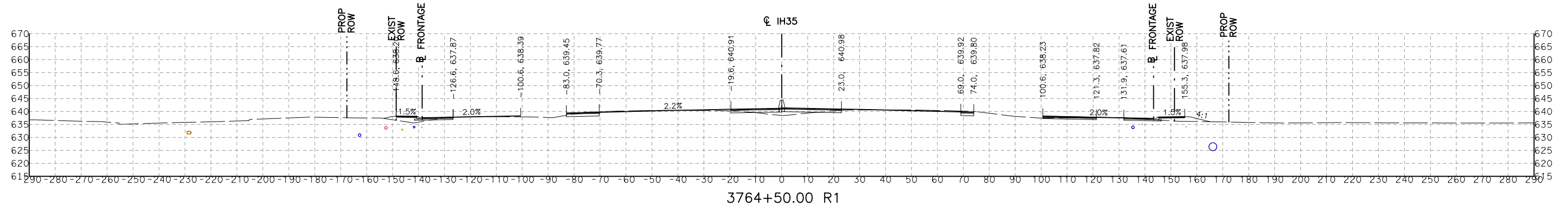
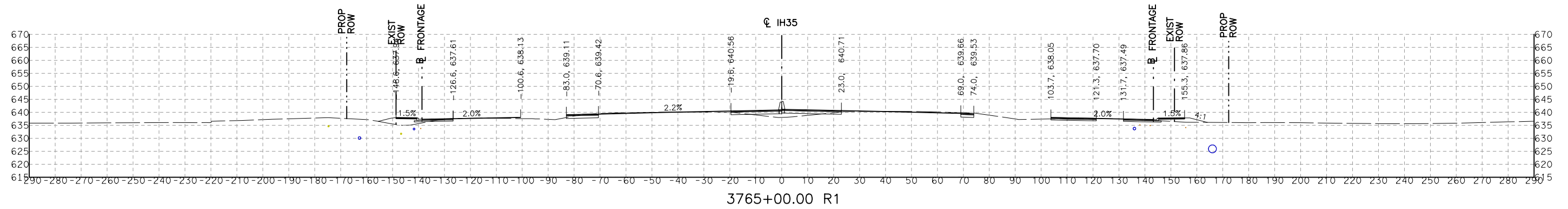
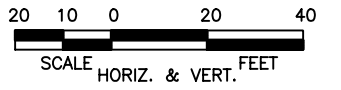
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Checked:	AJS	X	TEXAS				I-35
Drawn:	LVK	DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
Checked:	AJS	AUS	TRAVIS	0015	13	77, ETC.	179

NOTES:

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LEGEND

- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE

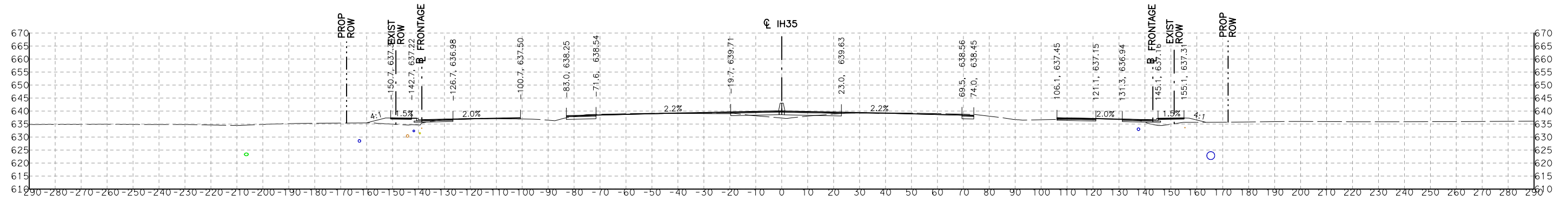
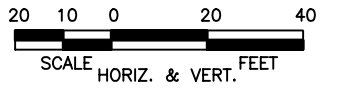


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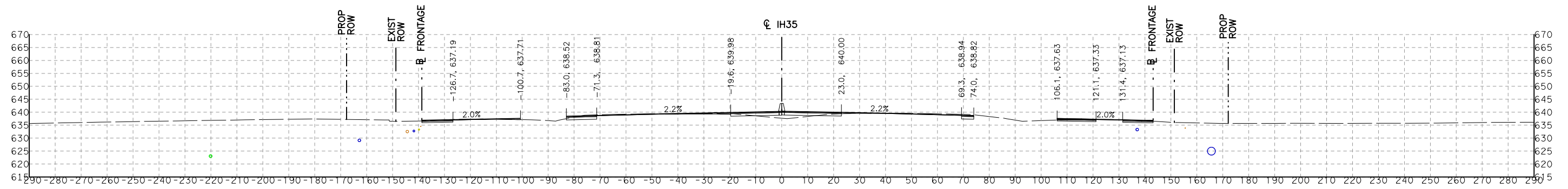
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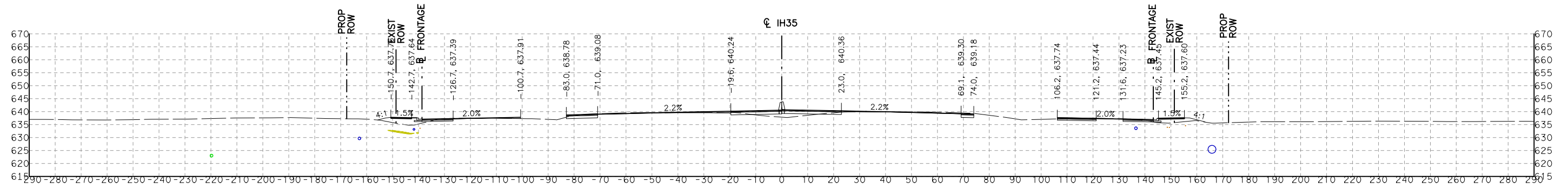
- ELECTRIC LINE    COMMUNICATION LINE    WASTEWATER LINE  
GAS LINE    WATER LINE



3766+50.00 R1



3766+00.00 R1



3765+50.00 R1



TEXAS REGISTERED ENGINEERING FIRM F-1741



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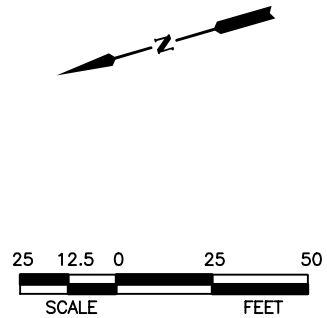
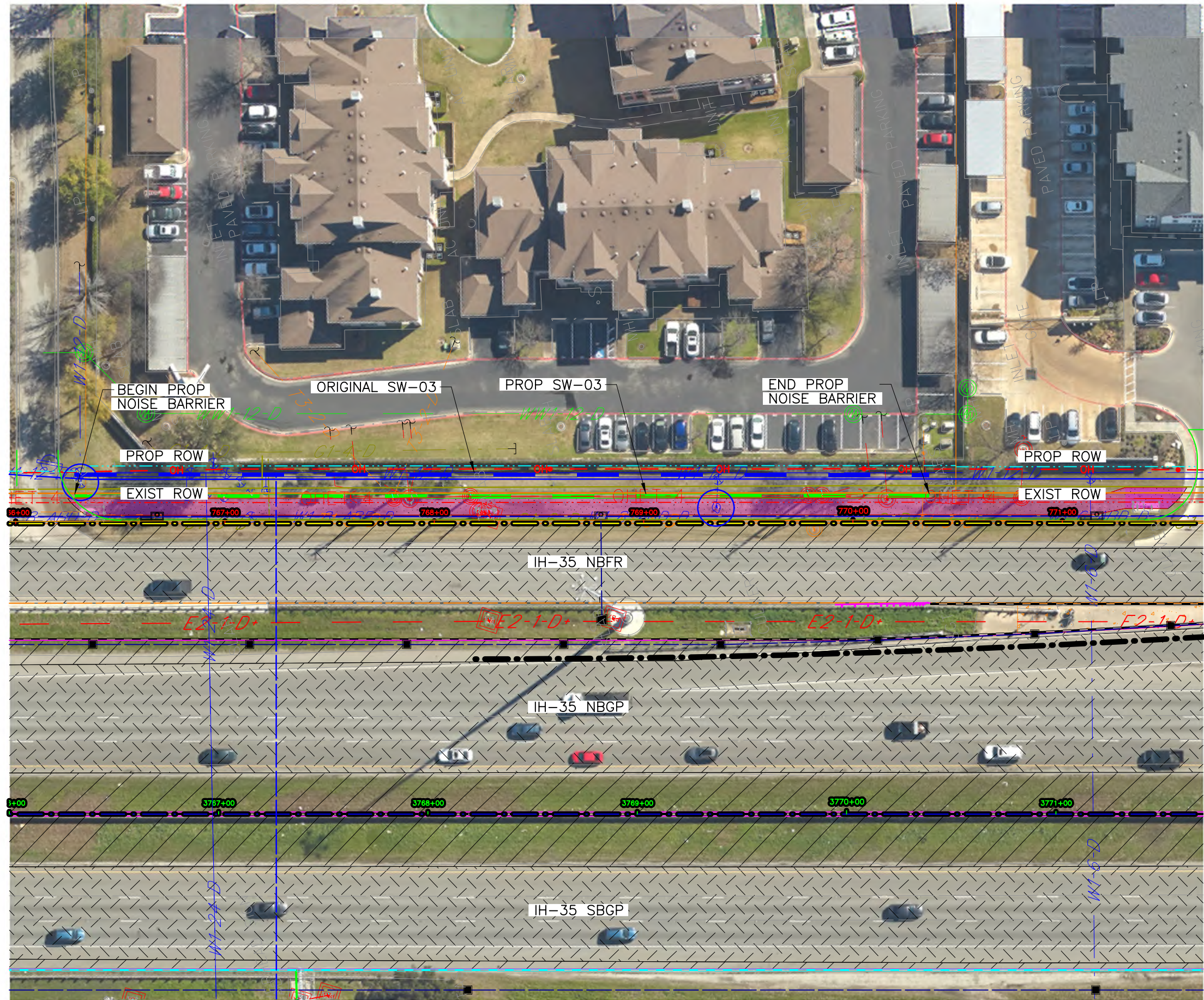
IH-35

IH-35 CROSS SECTIONS

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Checked: AJS	DIST.	COUNTY	CONTROL NO. 0015	SECTION NO. 13	JOB NO. 77, ETC.	SHEET NO. 181	
Drawn: LVK	AUS	TRAVIS					
Checked: AJS							



## Noise Barrier 3

3/5/2021 4:58:42 PM mrichardson  
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LEGEND

- FULL RECONSTRUCTION
- WIDENING
- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

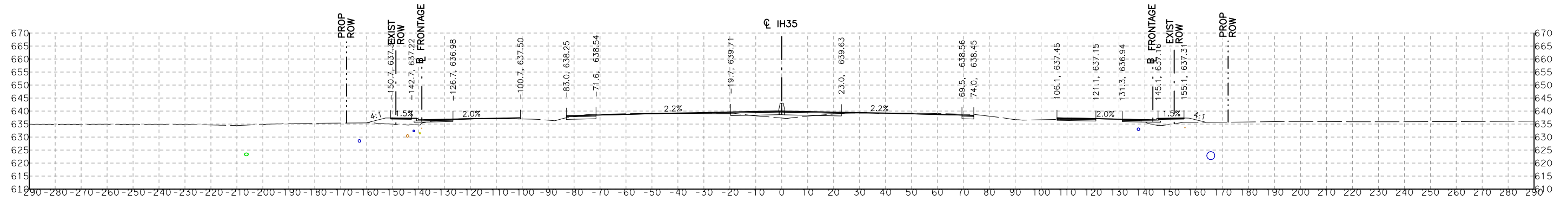
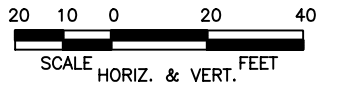
NO.		REVISION			BY DATE
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<div><div>©2021 <i>Texas Department of Transportation</i></div></div>					
CAPITAL EXPRESS SOUTH NOISE BARRIER 03 EXHIBIT					
Designed:	—	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.	HIGHWAY NO.
Checked:	—	X	TEXAS	STP ( )	IH-35
Drawn:	—	DIST.	COUNTY	CONTROL NO. SECTION NO.	JOB NO. SHEET NO.
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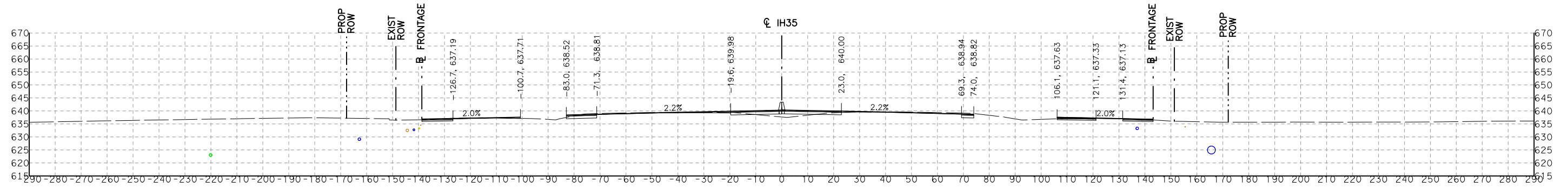
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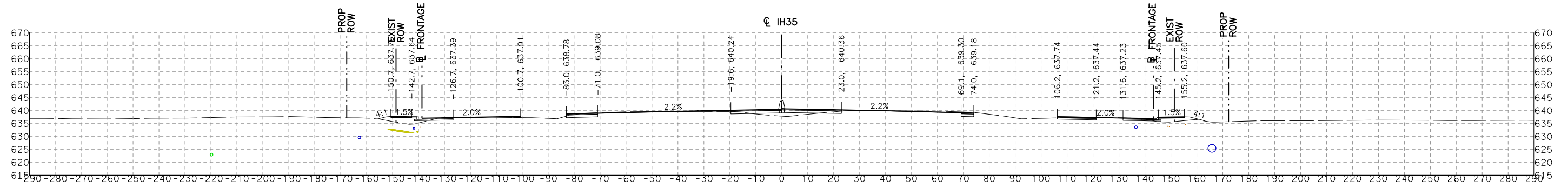
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IH-35

IH-35 CROSS SECTIONS

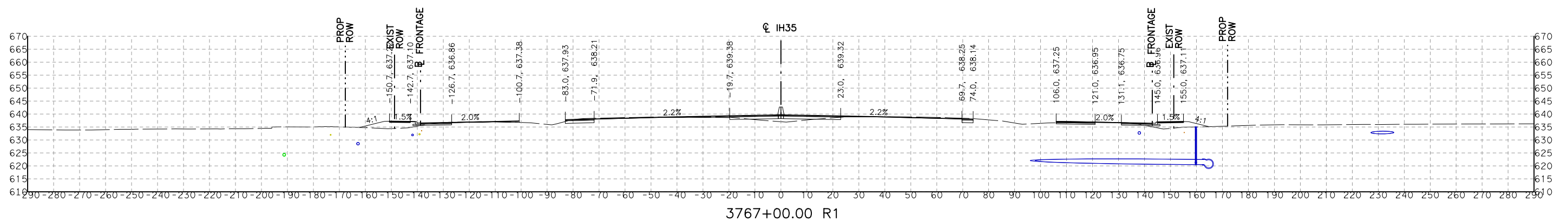
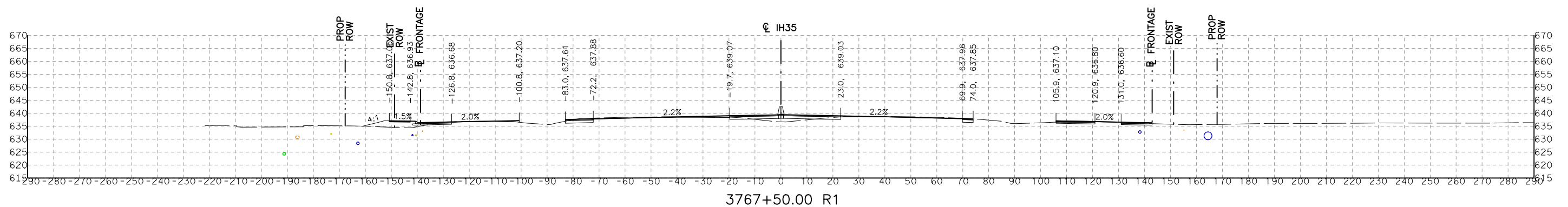
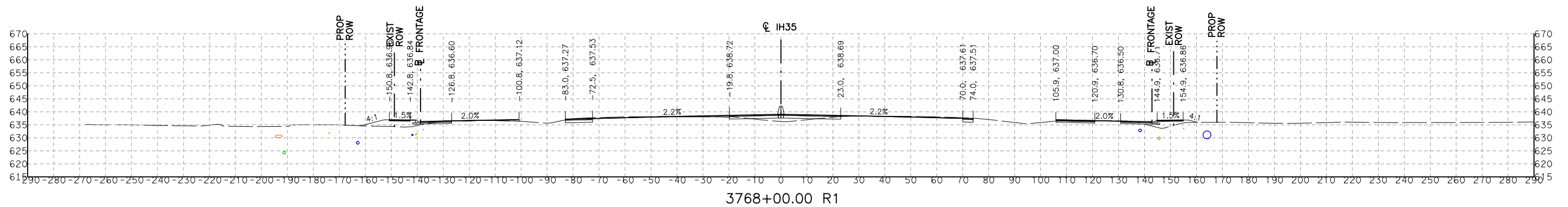
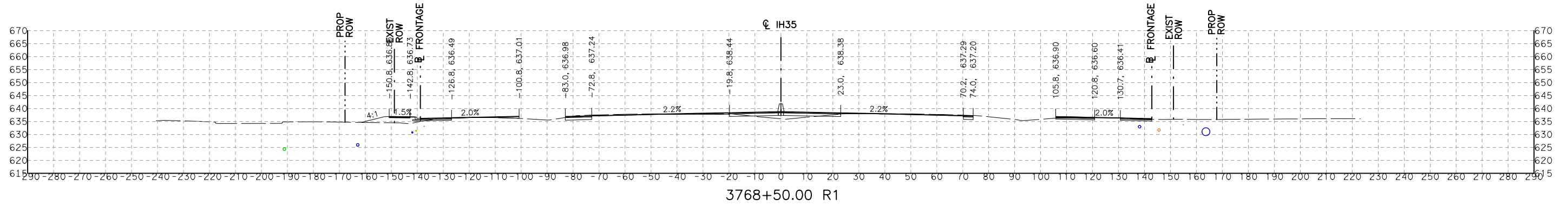
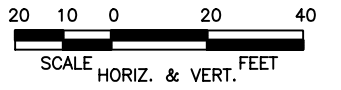
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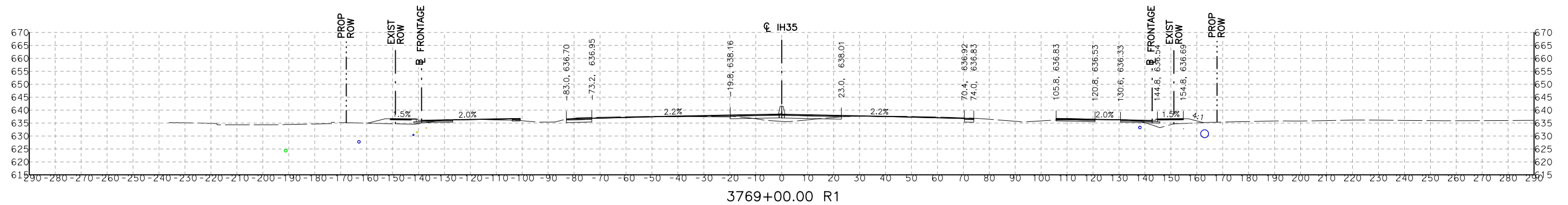
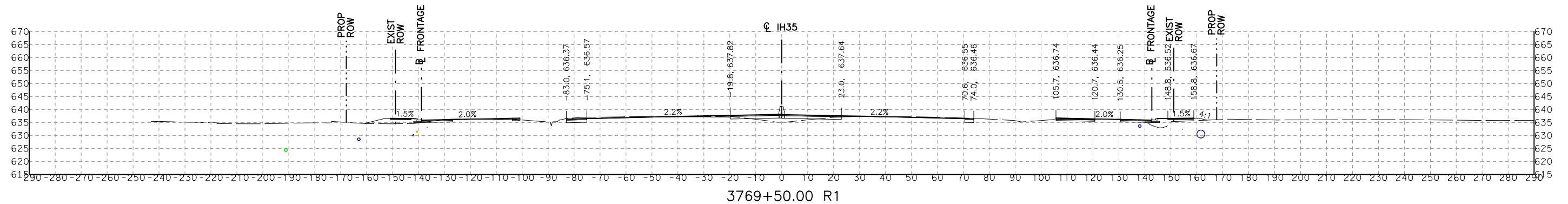
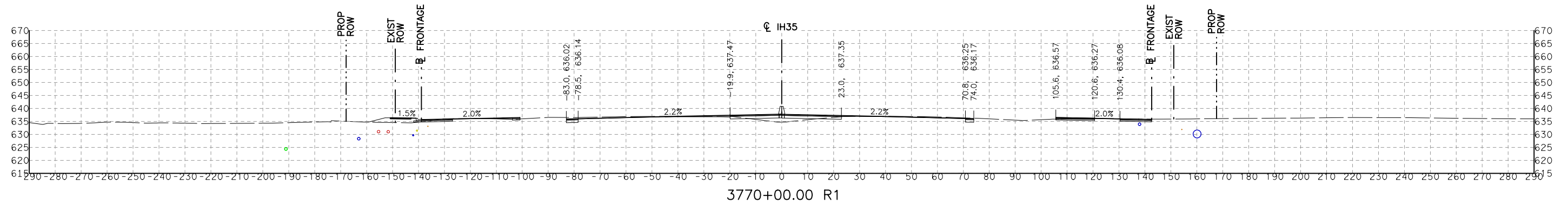
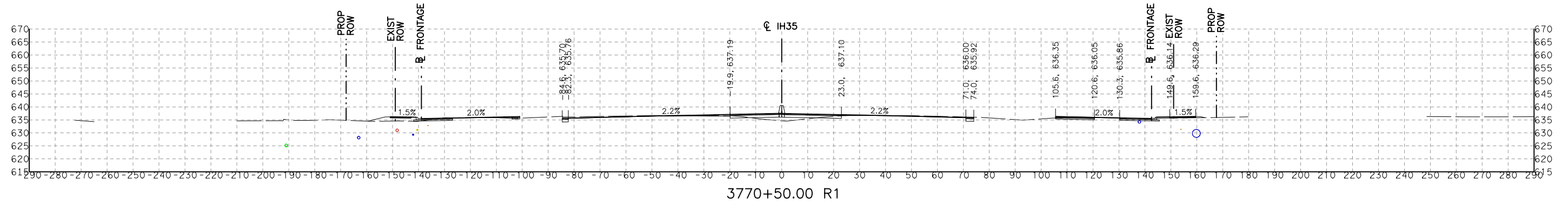
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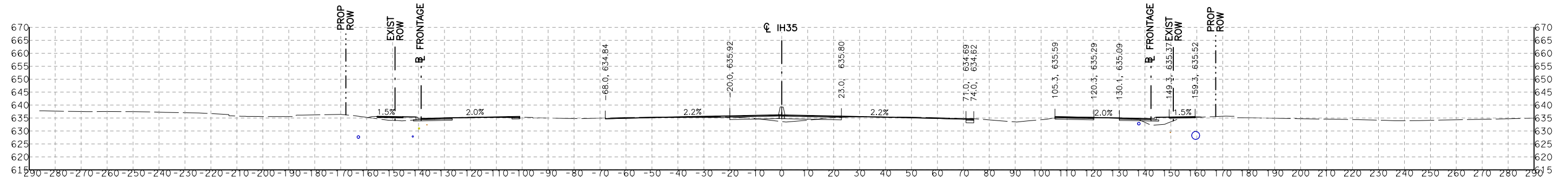
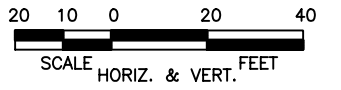


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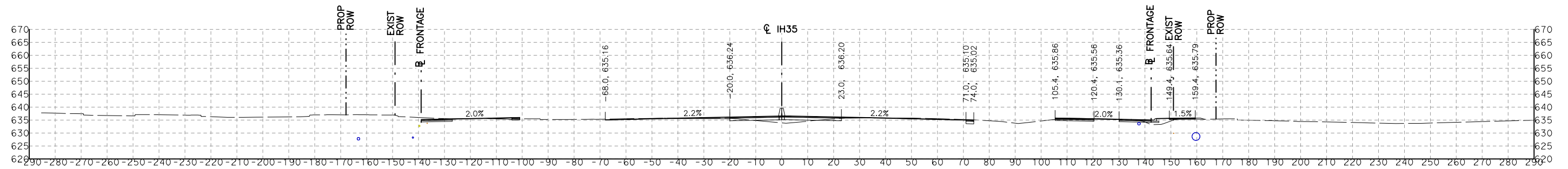
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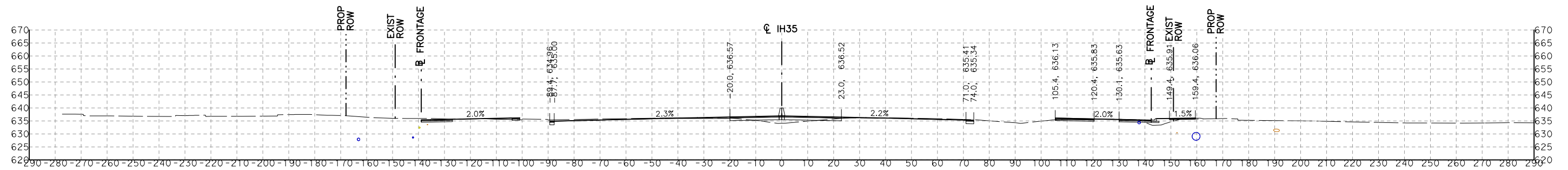
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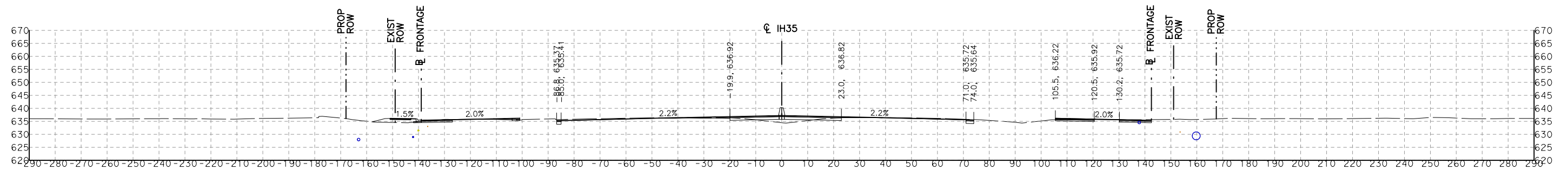
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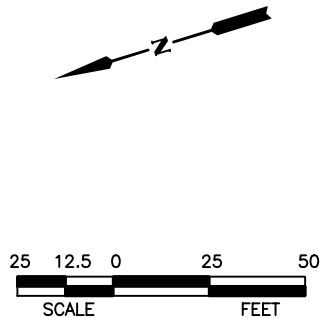
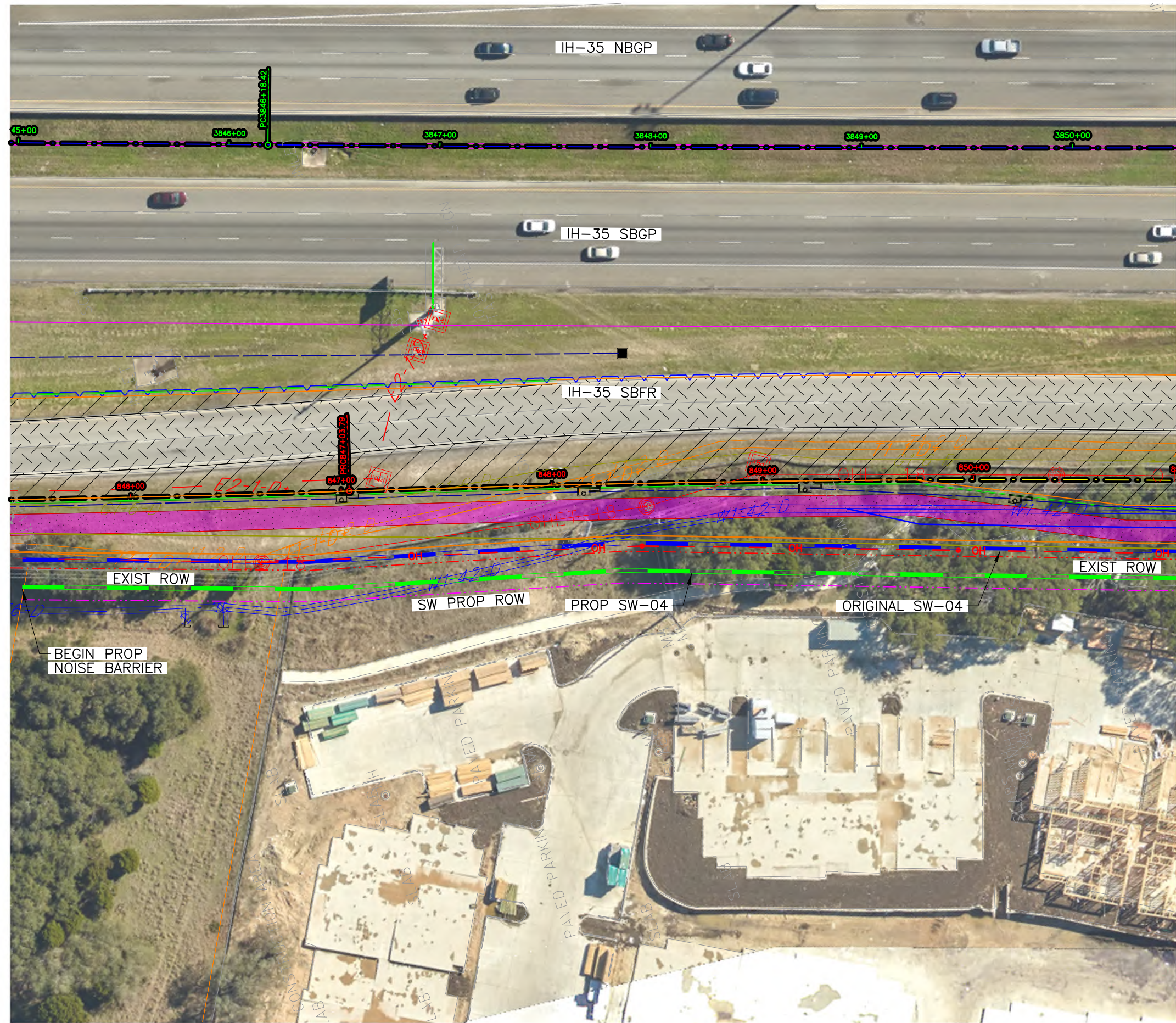
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## Noise Barrier 4

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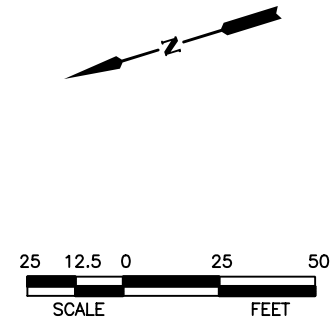
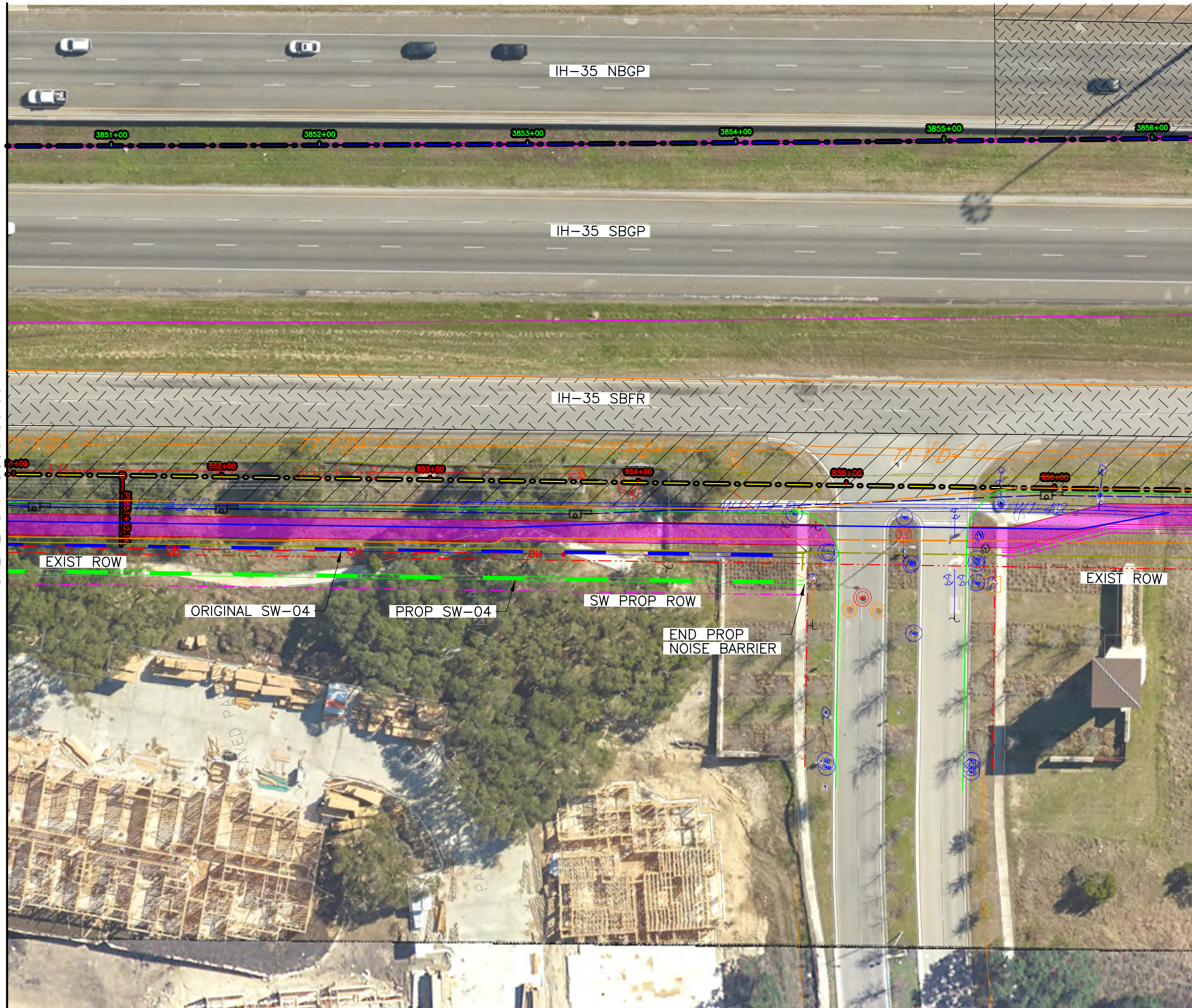
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- HMA/TOM OVERLAY
- SUP RECONSTRUCTION

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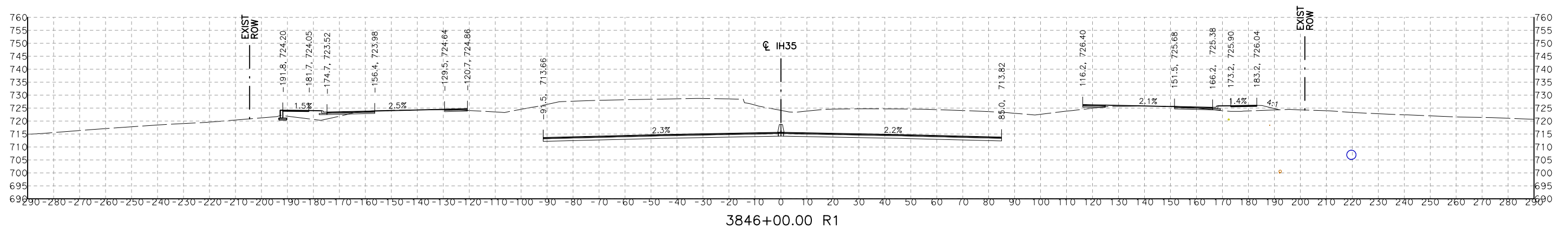
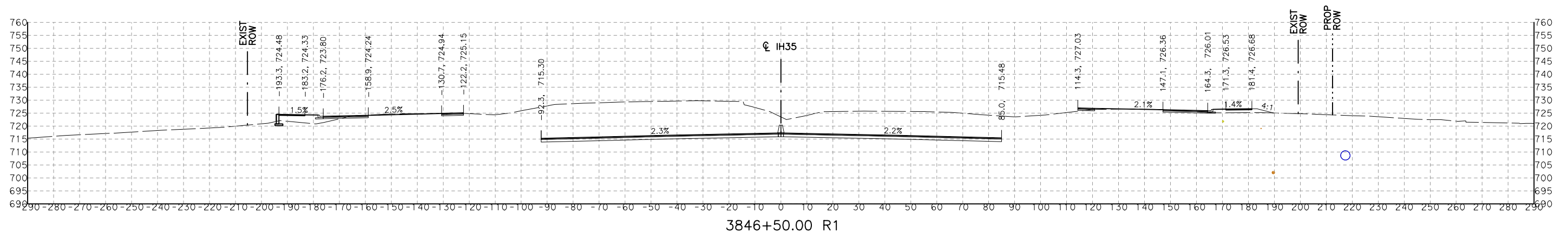
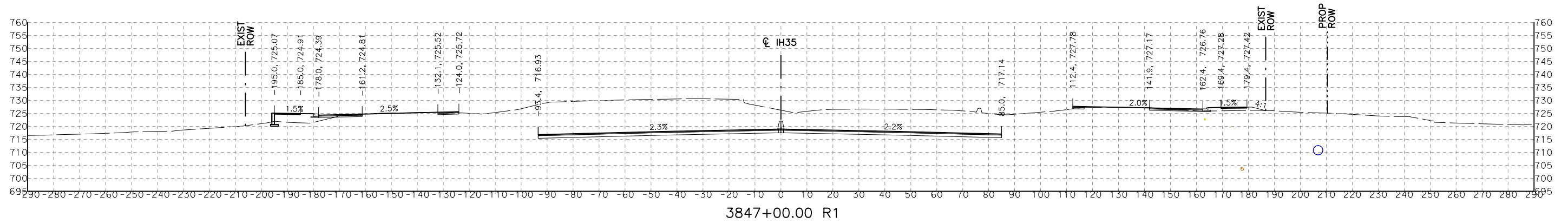
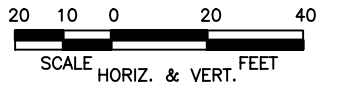
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LEGEND

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GAS LINE    WATER LINE



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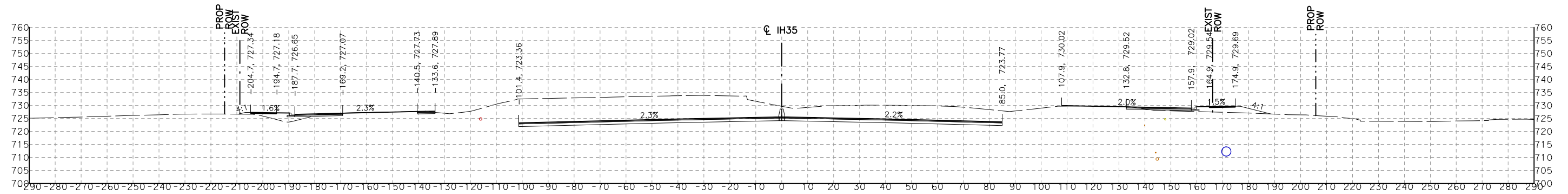
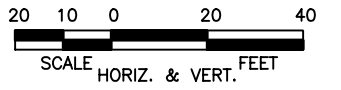
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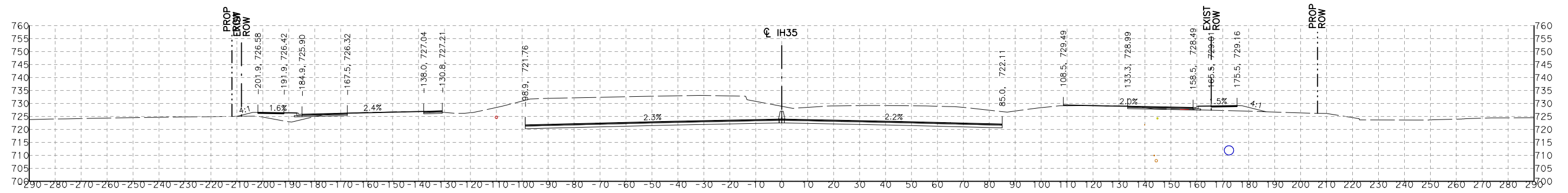
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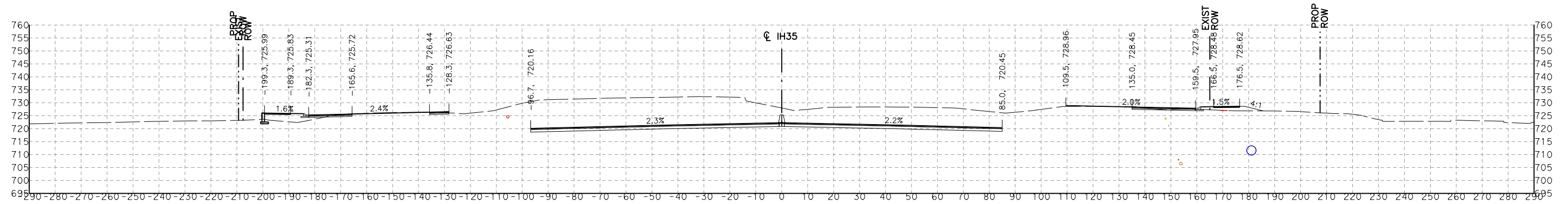
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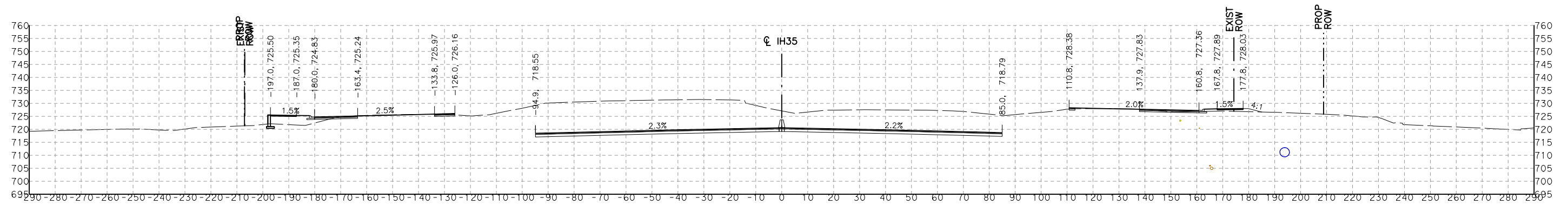
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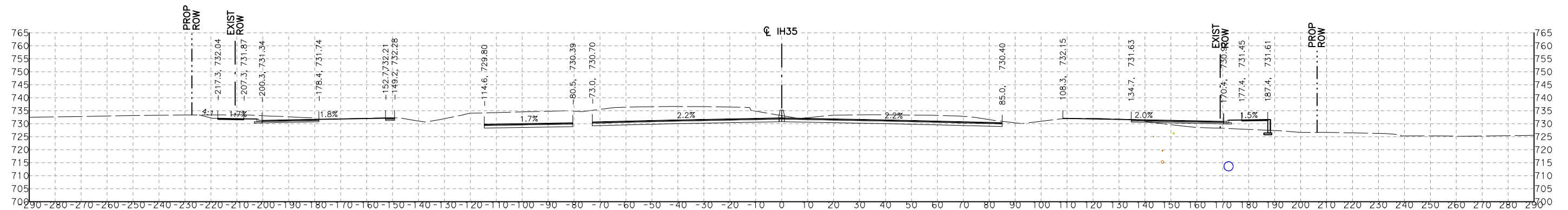
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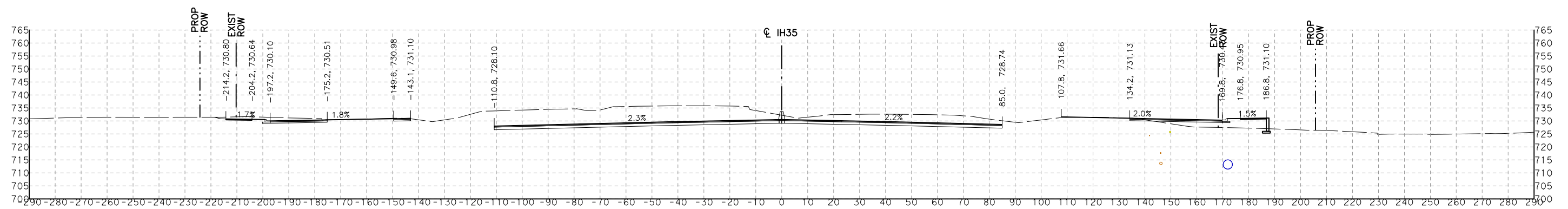
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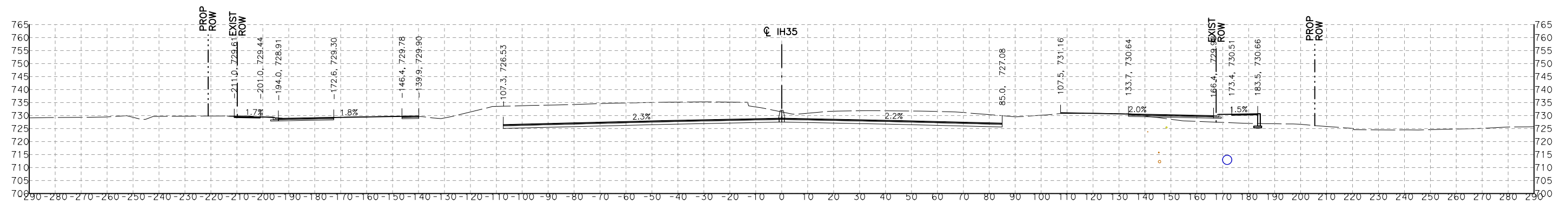
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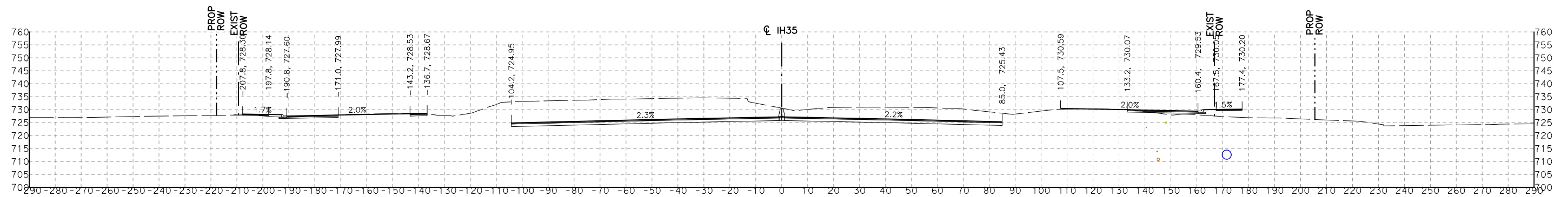
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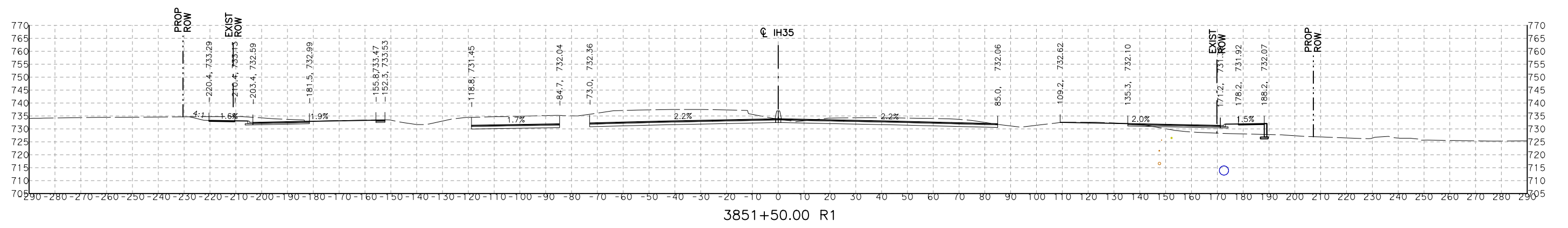
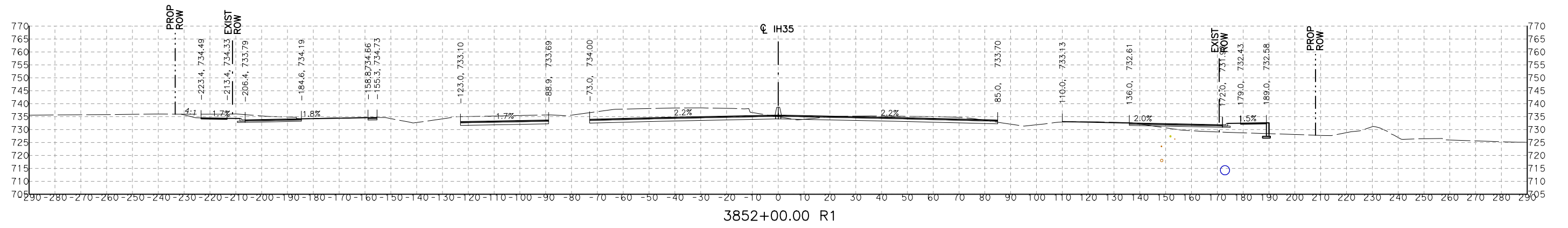
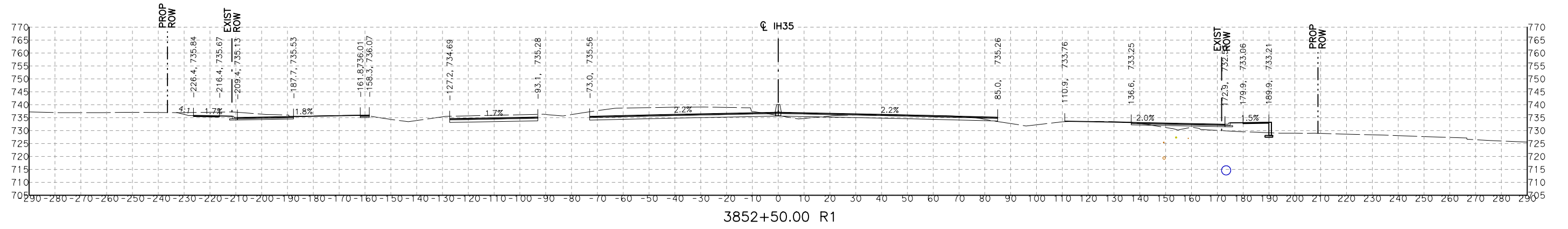
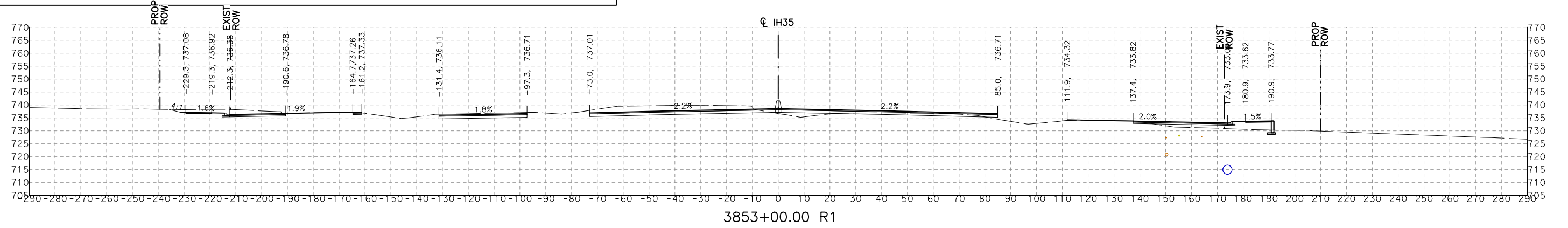
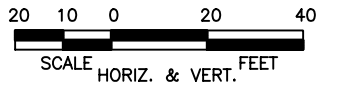
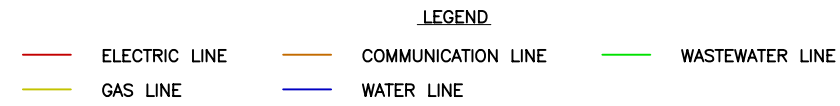
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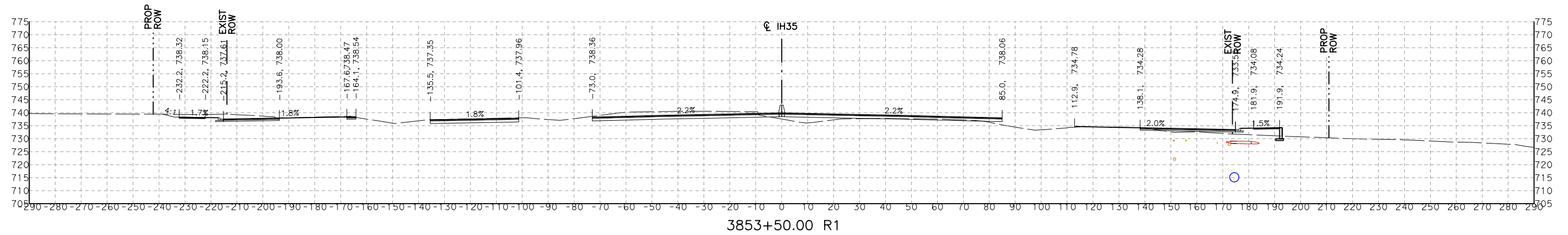
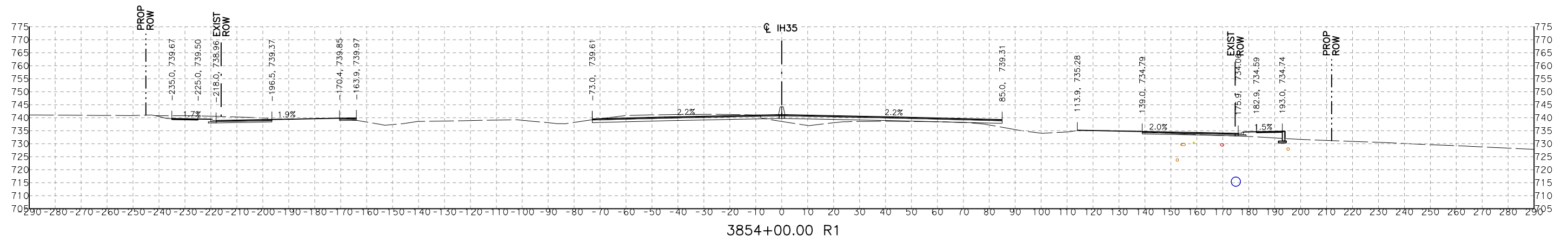
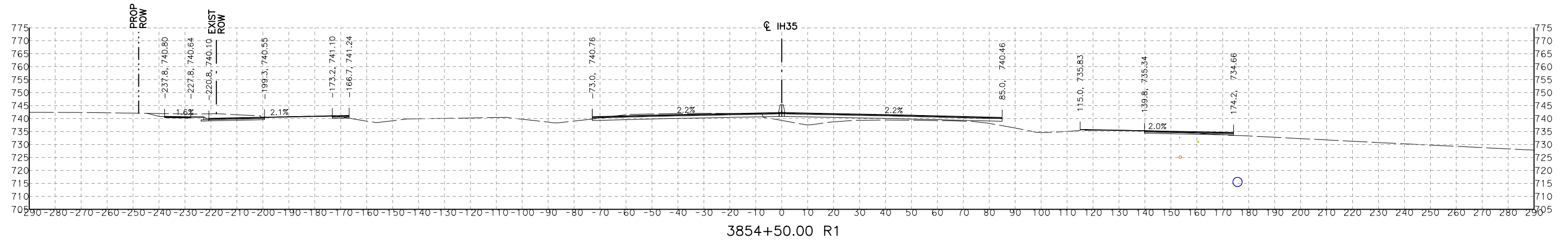
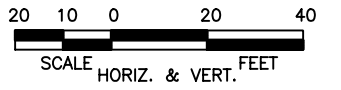


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**ATTACHMENT 3**  
**Alternate Barrier Costs**

## Noise Barrier 1

## Alternate Barrier Cost Assessment Worksheet

CSJs: 0016-01-113, 0015-13-077  
I-35 Capital Express South

Before utilizing the following worksheet, be certain that the barrier being proposed meets the acoustic feasibility and reasonableness criteria in the FHWA-approved TxDOT Noise Policy

**Barrier 1 - Along the I-35 northbound frontage road from approximate station 743+25 to 750+00**

### Module 1: Standard Barrier Cost Assessment

Total Length of Proposed Barrier (ft)	594
Average Height of Proposed Barrier (ft)	22
Benefited Receivers	28
<b>Standard Barrier Cost Total</b>	<b>\$457,380</b>
<b>Square Footage Per Benefiter</b>	<b>466.7142857</b>
<b>Cost Per Benefited Receiver</b>	<b>\$16,335</b>
<b>Current FHWA-approved cost</b>	<b>\$35</b>
<b>Current FHWA-approved square footage per benefited receiver</b>	<b>1500</b>
<b>Current FHWA-approved cost per benefited receiver</b>	<b>\$52,500</b>
<b>BARRIER IS COST REASONABLE. PROCEED WITH ALTERNATE COST ASSESSMENT</b>	

### Notes

### Module 2: Alternate Barrier Cost Assessment

<b>Standard Barrier Cost Total (from Module 1)</b>	<b>\$457,380</b>
Estimated costs of any <b>additional ROW</b> (including easements) needed to construct the <b>THIS</b> noise barrier.	\$0
Estimated costs for <b>ROW clearing</b> for permanent placement and construction access to <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>utility adjustments</b> directly associated with construction of <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>additional design elements</b> necessary to accommodate unusual topographic features due to the construction of this barrier.	\$17,410
Estimated costs of <b>drainage features</b> directly associated with construction of <b>THIS</b> noise barrier.	\$35,600
Estimated costs of <b>additional design elements</b> directly associated with <b>THIS</b> noise barrier (describe below)	\$51,039
<i>Austin Energy does not prefer to be located behind Noise Barrier for maintenance purposed</i>	
Estimated costs of Alternate Barrier Cost	\$561,429
Benefited Receivers	28
Project Total Per Benefited Receiver	\$20,051
<b>Current FHWA-approved Alternate Barrier Cost Per Benefited Receiver Cannot Exceed</b>	<b>\$105,000</b>
<b>BARRIER IS COST REASONABLE.</b>	

When utilizing the Alternate Barrier Cost Methodology, but sure to describe and document these finding in a tech report or memo.

None.

No adjustment wall moved to avoid utilities

Embankment cost average volume calculation using end areas (Item 0132 6010)

Removal of Conc Rip rap(Item 0104 6044) , (\$2000 erosion control), (\$2000 Misc. DR), added conc rip rap (10% of area added from removal quantity)

5% of Cost

**Barrier 1 - Alternate Barrier Costs**  
**I-35 Capital Express South**  
**CSJs: 0016-01-113, 0015-13-077**

Item	Description	Total
<b>Standard Barrier Cost</b>		
Noise Wall	Noise Wall	\$ 457,380.00
<b>Sum of Noise Wall</b>		<b>\$ 457,380.00</b>
<b>Drainage Features</b>		
Unquantified Costs	Temporary and Permanent Erosion Control	\$ 2,000.00
Unquantified Costs	Misc. Drainage and grading	\$ 2,000.00
Removal	Removal of Existing Concrete Rip Rap	\$ 2,900.00
Install	Install of Existing Concrete Rip Rap	\$ 28,700.00
<b>Sum of Drainage</b>		<b>\$ 35,600.00</b>
<b>Additional Design Elements</b>		
Grading Features	Embankment	\$ 17,410.00
<b>Sum of Additional Design Elements</b>		<b>\$ 17,410.00</b>
<b>Sum of Noise, Drainage, and Additional Design Elements</b>		<b>\$ 510,390.00</b>
<b>Additional Design Elements</b>		
Related Project Costs	Engineering and Design**	\$ 25,519.50
Related Project Costs	CE&I (Construction Engineering & Inspection)**	\$ 25,519.50
<b>Total Related Project Costs***</b>		<b>\$ 561,429.00</b>

**Notes**

\*\* 5.0 % of the sum of Noise, Drainage, and Additional Design Elements

\*\*\* Engineering and Design Cost, CE&I (Construction Engineering & Inspection), and Sum of Noise, Drainage, and Additional Design Elements

## Noise Barrier 2

## Alternate Barrier Cost Assessment Worksheet

CSJs: 0016-01-113, 0015-13-077

I-35 Capital Express South

Before utilizing the following worksheet, be certain that the barrier being proposed meets the acoustic feasibility and reasonableness criteria in the FHWA-approved TxDOT Noise Policy

**Barrier 2 - Along the I-35 northbound frontage road from approximate station 755+00 to 765+50**

### Module 1: Standard Barrier Cost Assessment

Total Length of Proposed Barrier (ft)	1016
Average Height of Proposed Barrier (ft)	12
Benefited Receivers	13
<b>Standard Barrier Cost Total</b>	<b>\$426,720</b>
<b>Square Footage Per Benefiter</b>	<b>937.8461538</b>
<b>Cost Per Benefited Receiver</b>	<b>\$32,825</b>
<b>Current FHWA-approved cost</b>	<b>\$35</b>
<b>Current FHWA-approved square footage per benefited receiver</b>	<b>1500</b>
<b>Current FHWA-approved cost per benefited receiver</b>	<b>\$52,500</b>
<b>BARRIER IS COST REASONABLE. PROCEED WITH ALTERNATE COST ASSESSMENT</b>	

### Notes

### Module 2: Alternate Barrier Cost Assessment

<b>Standard Barrier Cost Total (from Module 1)</b>	<b>\$426,720</b>
Estimated costs of any <b>additional ROW</b> (including easements) needed to construct the <b>THIS</b> noise barrier.	\$0
Estimated costs for <b>ROW clearing</b> for permanent placement and construction access to <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>utility adjustments</b> directly associated with construction of <b>THIS</b> noise barrier.	\$532,700
Estimated costs of <b>additional design elements</b> necessary to accommodate unusual topographic features due to the construction of this barrier.	\$0
Estimated costs of <b>drainage features</b> directly associated with construction of <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>additional design elements</b> directly associated with <b>THIS</b> noise barrier (describe below)	\$287,826
<i>Will need to have modified detail to construct noise barrier directly on top of F style high curb.</i>	
Estimated costs of Alternate Barrier Cost	\$1,247,246
Benefited Receivers	13
Project Total Per Benefited Receiver	\$95,942
<b>Current FHWA-approved Alternate Barrier Cost Per Benefited Receiver Cannot Exceed</b>	<b>\$105,000</b>
<b>BARRIER IS COST REASONABLE.</b>	

When utilizing the Alternate Barrier Cost Methodology, but sure to describe and document these finding in a tech report or memo.

None.

ATT Telephone and Gas Relocations

None.

None.

15% of cost

**Barrier 2 - Alternate Barrier Costs**  
**I-35 Capital Express South**  
**CSJs: 0016-01-113, 0015-13-077**

Item	Description	Total
<b>Standard Barrier Cost</b>		
Noise Wall	Noise Wall	\$ 426,720.00
<b>Sum of Noise Wall</b>		<b>\$ 426,720.00</b>
<b>Utility Adjustments</b>		
Utilities	AT&T Telephone	\$ 206,000.00
Utilities	AT&T Telephone and Pedestal	\$ 2,200.00
Utilities	Texas Gas Service 6" Steel	\$ 324,500.00
<b>Sum of Utilities*</b>		<b>\$ 532,700.00</b>
<b>Sum of Noise and Utilities</b>		<b>\$ 959,420.00</b>
<b>Additional Design Elements</b>		
Related Project Costs	Engineering and Design**	\$ 143,913.00
Related Project Costs	CE&I (Construction Engineering & Inspection)**	\$ 143,913.00
<b>Total Related Project Costs***</b>		<b>\$ 1,247,246.00</b>

**Notes**

\* AT&T telephone and texas Gas Service

\*\* 15.0 % of the sum of Noise and Utilities

\*\*\* Engineering and Design Cost, CE&I (Construction Engineering & Inspection), and Sum of Noise and Utilities

## Noise Barrier 4

## Alternate Barrier Cost Assessment Worksheet

CSJs: 0016-01-113, 0015-13-077

I-35 Capital Express South

Before utilizing the following worksheet, be certain that the barrier being proposed meets the acoustic feasibility and reasonableness criteria in the FHWA-approved TxDOT Noise Policy

**Barrier 4 - Along the IH 35 southbound frontage road from approximate station 845+50 to 855+00**

### Module 1: Standard Barrier Cost Assessment

Total Length of Proposed Barrier (ft)	932
Average Height of Proposed Barrier (ft)	22
Benefited Receivers	21
<b>Standard Barrier Cost Total</b>	<b>\$717,640</b>
<b>Square Footage Per Benefiter</b>	<b>976.3809524</b>
<b>Cost Per Benefited Receiver</b>	<b>\$34,173</b>
<b>Current FHWA-approved cost</b>	<b>\$35</b>
<b>Current FHWA-approved square footage per benefited receiver</b>	<b>1500</b>
<b>Current FHWA-approved cost per benefited receiver</b>	<b>\$52,500</b>
<b>BARRIER IS COST REASONABLE. PROCEED WITH ALTERNATE COST ASSESSMENT</b>	

### Notes

### Module 2: Alternate Barrier Cost Assessment

<b>Standard Barrier Cost Total (from Module 1)</b>	<b>\$717,640</b>
Estimated costs of any <b>additional ROW</b> (including easements) needed to construct the <b>THIS</b> noise barrier.	\$1,517,000
Estimated costs for <b>ROW clearing</b> for permanent placement and construction access to <b>THIS</b> noise barrier.	\$29,300
Estimated costs of <b>utility adjustments</b> directly associated with construction of <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>additional design elements</b> necessary to accommodate unusual topographic features due to the construction of this barrier.	\$4,200
Estimated costs of <b>drainage features</b> directly associated with construction of <b>THIS</b> noise barrier.	\$0
Estimated costs of <b>additional design elements</b> directly associated with <b>THIS</b> noise barrier (describe below)	
<i>Special design will have to engineered to foundation bridge over a 42" water line crossing the noise barrier and sidewalk access will be greatly limited to nearby residences</i>	\$362,902
Estimated costs of Alternate Barrier Cost	\$2,631,042
Benefited Receivers	21
Project Total Per Benefited Receiver	\$125,288
<b>Current FHWA-approved Alternate Barrier Cost Per Benefited Receiver Cannot Exceed</b>	<b>\$105,000</b>
<b>BARRIER IS NOT COST REASONABLE. PROJECT EXCEEDS FHWA-APPROVED ALTERNATE BARRIER COST.</b>	

When utilizing the Alternate Barrier Cost Methodology, but sure to describe and document these finding in a tech report or memo.

Additional ROW required.

None

Cost of sidewalk removal

None.

8% of cost

Unique 42" design to avoid, sidewalk access limitations

**Barrier 4 - Alternate Barrier Cost Assessment Summary**  
**I-35 Capital Express South**  
**CSJs: 0016-01-113, 0015-13-077**

Item	Description	Total
<b>Standard Barrier Cost</b>		
Noise Wall	Noise Wall	\$ 717,640.00
<b>Sum of Noise Wall</b>		<b>\$ 717,640.00</b>
<b>ROW Adjustments</b>		
ROW	Additional ROW	
<b>Sum of ROW</b>		<b>\$ 1,517,000.00</b>
<b>ROW Clearing</b>		
ROW	ROW Clearing	\$ 29,300.00
<b>Sum of Unquantified Costs</b>		<b>\$ 29,300.00</b>
<b>Additional Design Elements</b>		
Removal	Existing Sidewalk Removal	\$ 4,200.00
<b>Sum of Additional Design Elements</b>		<b>\$ 4,200.00</b>
<b>Sum of Noise, ROW, and Additional Design Elements</b>		<b>\$ 2,268,140.00</b>
<b>Additional Design Elements</b>		
Related Project Costs	Engineering and Design**	\$ 181,451.20
Related Project Costs	CE&I (Construction Engineering & Inspection)**	\$ 181,451.20
<b>Total Related Project Costs***</b>		<b>\$ 2,631,042.40</b>

**Notes**

\*\* 8.0 % of the sum of Noise, ROW, and Additional Design Elements

\*\*\* Engineering and Design Cost, CE&I (Construction Engineering & Inspection), and Sum of Noise, ROW, and Additional Design Elements