West A Street Grade Separation Project

Feasibility Study

City of Dixon

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I. INTRODUCTION

This Feasibility Study was undertaken to provide the City with a basis for assessing the possibility of grade separating West A Street at the existing railroad crossing to create an undercrossing that would accommodate new station tracks and a passenger platform overhead, while maintaining the street's existing right-of-way underneath. The undercrossing was studied to determine the project's impact on existing infrastructure, adjacent land uses and access, drainage and utilities. The study also prepared temporary shoofly track alignments for construction and a future triple-track alignment to adequately size a new railroad bridge and position a new station platform in the downtown location, retaining the pedestrian connection to the existing intermodal transit depot and transit facilities.

The grade separation would improve safety along the corridor and eliminate train-caused traffic delays to motorists and emergency responders. It would provide secondary benefits that include: beautification at one of the Cities key entrances, improved travel times, and air quality along the corridor. It would also impact access to some of the adjacent businesses requiring pre-emptive planning and mitigation measures, and the construction of alternate access routes.

II. PROJECT DESCRIPTION

Street Alignment
The grade separated underpass would require the depression of an existing section of West A Street between the cross-streets of Adams Street and Jackson Street, while maintaining both of these intersections in their existing horizontal alignment and configuration. The roadway cross-section will provide one traffic lane in each direction with a raised barrier transitioning to an optional landscaped median outside the bridge footprint. At the west end, the lanes could be striped to allow a westbound left hand turn lane onto Porter Street. A 12-foot walkway on the north side of the street would accommodate both bicycles and pedestrians and would be designed to meet all ADA requirements.

Bridge Structure
The grade separation would require a bridge structure over the depressed street to carry the UPRR tracks and a station platform. A two-span structure would minimize the depth of the bridge superstructure and ease the street profile due to vertical clearance constraints. The central bridge support would simply be incorporated into the raised barrier/median to provide added safety for users.

Track Alignment
The grade separation would require the construction of temporary shoofly tracks to maintain rail traffic and allow safe clearances between live tracks and the on-going construction activities. Temporary construction easements would be required to construction the shoofly tracks, which would allow the construction of the new railroad bridge over West A Street to be staged in two sections. The final track alignment would accommodate a new 35-foot by 800-foot concrete passenger platform between two new main tracks with adequate spacing for a future third main track. Construction of both shoofly tracks and main tracks would necessitate the modification and re-construction of the 1st Street at-grade crossing. These track alignments may also require the relocation of the 1st Street UPRR signal house.

Business Access
Several key land uses exist along this section of West A Street proposed for grade separation. These include: Air Perfection, Pro-Gas, Dixon Post Office, Dixon Police Department, a PG&E substation, and several small retail businesses. Access to some of the driveways/entrances will be impacted.

Drainage and Utilities
The grade separation undercrossing would require the design and construction of a sump and pump station to handle storm and surface water intrusion. Several key utilities with the UPRR right of way would require directional boring under the depressed street including: Kinder Morgan pipeline, MCI, Qwest, and Level 3 fiber optic communications.

Platform and Station Access
The new platform would extend for 800 feet from the area adjacent to the existing train depot to the south, across the new railroad bridge over the grade separated West A Street. This would allow the opportunity to make a connection from the Depot to the 12-foot pedestrian walkway along the north side of West A Street up to the center island platform in-between the new main tracks.

III. DESIGN CRITERIA

A UNDERPASS AND RAILROAD BRIDGE STRUCTURE

1.0 General

Calculations and construction documents will be in English units.

2.0 Codes and References

The governing reference for applicable loads and design approach for the railroad structure is the 2008 AREMA (American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering). Other codes and references shall be used for the portion of the underpass that is not required to support railroad loading conditions. In addition, a variety of other codes and standards will be used for reference—including the City of Dixon requirements. These include the following:

1. BNSF Railway – Union Pacific Railroad: Guidelines for Railroad Grade Separation Projects
2. AASHTO LRFD Bridge Design Specifications. 4th Edition
3. Caltrans Bridge Design Manuals
4. 2007 California Building Code
5. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures
6. AISC 360-05, Manual of Steel Construction, 13th Edition
7. AISC 341-05, Seismic Design Manual
8. ACI 318-05, American Concrete Institute Building Code Requirements for Structural Concrete and Commentary
9. AWS D1.1, D1.3, D1.4 and D1.5, American Welding Society Structural Welding Code

3.0 Loading Conditions

a. Dead Load
   i. Weight of all components of the structure, 30” of ballast above the deck, ties, rails and rail fastening devices, utilities and any architectural features.
   ii. Platform structure and miscellaneous fixtures.
   iii. Crash protection along bridge sides as needed.

b. Live Loads
   i. Vehicle loading shall be Cooper E80 train live load with impact factor. With multiple tracks, assume tracks can be located anywhere on the structure.
   ii. Seismic loading shall comply with the criteria of the current AREMA, Chapter 9 – Seismic Design for Railway Structures.

c. Additional Loads
   i. Shall be applied as specified in Chapters 8, 9 and 15 of AREMA as applicable.

d. Thermal Movement and Shrinkage
   i. Temperature Range: 0 to 120 degrees F
      Normal Installation: 64 degrees F

   ii. Coefficient of thermal expansion
      Concrete: 0.000006 ft/ft per degree
      Steel: 0.0000065 ft/ft per degree

4.0 Materials

a. Concrete (Normal Weight)

i. Structural Concrete	f'c = 4,000 psi
ii. Other Non-Structural Concrete	f'c = 4,000 psi
iii. Precast Prestressed Concrete	f'c = 6,000 psi

b. Reinforcing Steel

i. Unless Otherwise Noted	ASTM A 615, Grade 60
ii. Welded Rebar, Threaded Rebar	ASTM A 706, Grade 60, Low Alloy
iii. Deformed Bar Anchors	ASTM A 496
iv. Epoxy Coated Rebar	ASTM A 775

c. Structural Steel

i. Tubes	ASTM A 500, Grade B
ii. Angles, Channels, Base Plates & Misc. Stl	ASTM A 36
iii. Connection Material & Embedded Plates	ASTM A 36
iv. Bolts	ASTM A 325
v. Threaded Rods	ASTM A 36
vi. Anchor Rods/Bolts in Concrete	ASTM A 1554
vii. Welding Electrodes	70,000 psi low hydrogen electrode
viii. Headed Shear Studs	ASTM A 108
ix. Structural Steel	ASTM A 709 Grade 50

5.0 Permanent Vertical Clearances

a. 16'-6" for steel superstructure with 5 or more beams or 4 or more deck plate girders per track.
b. 17'-6" for concrete superstructure or steel through plate girders with bolted bottom flanges.
c. 20'-0" for steel through plate girders without bolted bottom flanges.

B RAILROAD TRACK AND PLATFORM

1.0 UPRR Right-of-Way

a. 120 feet wide Southwest (RR West) of A Street
b. Varies from 135 - 160 feet wide between A Street and 1st Street
c. 100 feet wide northeast (RR East) of 1st Street

2.0 UPRR Standards

a. New track construction will use concrete ties
b. New track construction will use 136 lb rail
c. 60mph Freight and 79mph Passenger speeds
    i. Freight - 1" unbalanced superelevation
    ii. Passenger – 3" unbalanced superelevation
    iii. 500-foot minimum tangent length
d. Future track 20 feet from Proposed MT-01 centerline to centerline
e. 15-foot minimum Horizontal clearance from centerline of tracks to Right-of-Way

3.0 Platform (800' x 35')

a. Proposed MT-01/MT-02 5'-4" from centerline of track to edge of platform
b. Platform elevation 8 inches above top of rail

The boarding platform will consist of a combination of slab on grade construction and a series of precast concrete T-beams on the bridge girders, forming an area that is 35-feet-wide by 800-feet-long. The top of platform shall be located 8 inches above top of rail, giving us a precast girder height of 38 inches based on the precast concrete bridge girders. The platform structure will be secured to the deck by a series of shear keys to prevent sliding along the transverse direction of the deck.

The new underpass structure will allow for through traffic below, with one 12'-0" lane and a 2'-6" shoulder in each direction. In our attachments, a 17'-6" minimum clearance is shown based on the assumption that precast concrete bridge girders are implemented, although the option of steel can be left for final design to determine preferred structure type.

C ROADWAY AND TRAFFIC

1.0 General

a. Calculations and construction documents will be in English units.

2.0 Codes and References

a. BNSF Railway – Union Pacific Railroad: Guidelines for Railroad Grade Separation Projects
b. City of Dixon Engineering Design Standards
c. Caltrans Highway Design Manual (HDM)
d. AASHTO A Policy on Geometric Design of Highways and Streets (GDHS), 2004 Edition

3.0 Vertical Geometry

a. Design Speed and Sight Distance Requirements:
   i. The following values were obtained from HDM and GDHS

Design Speed (mph)	Stopping Sight Distance(ft)
15	80
20	125

b. Vertical Curve Length Requirements:
   i. Shall be calculated for Sight Distances according to HDM Topic 201
   ii. Shall be calculated for comfort according to GDHS Chapter 3 Vertical Curves

c. Grade Requirements:
   i. City of Dixon Engineering Design Standards
      Maximum grade of 5% unless approved by City Engineer.

d. Vertical Clearance:
   i. UPPR requires a minimum clearance of 17.5 feet for entire width of the roadbed to the bridge structure

4.0 Typical Section

a. Standard Crown with minimum 2% cross slope
b. Minimum Lane Width = 12 feet
c. Minimum Shoulder Width:
   8 feet per City of Dixon Engineering Design Standards for a Minor Collector
d. Minimum mid-span column/median width.

D BICYCLE/PEDESTRIAN

1.0 General

a. Calculations and construction documents will be in English units.

2.0 Codes and References

a. BNSF Railway – Union Pacific Railroad: Guidelines for Railroad Grade Separation Projects
b. City of Dixon Engineering Design Standards
c. Caltrans Highway Design Manual Chapter 1000 (HDM)
d. AASHTO A Policy on Geometric Design of Highways and Streets (GDHS), 2004 Edition
e. The US Department of Justice, ADA Standards for Accessible Design

3.0 Vertical Geometry

a. Design Speed = 15 mph

b. Sight Distance Requirements:
   i. Calculated according to HDM Topic 1003.1.9

c. Vertical Curve Length Requirements:
   i. Shall be calculated for Sight Distances according to HDM Topic 1003.1.10
   ii. Shall be calculated for comfort according to GDHS Chapter 3 Vertical Curves

d. Grade Requirements:
   i. Maximum grade of 5% per HDM Topic 1003.2 and ADA ramp requirements

e. Vertical Clearance:
   i. UPPR and the HDM require a minimum clearance of 8 feet from the sidewalk to the bridge structure

4.0 Typical Section

a. Minimum Sidewalk Width per City of Dixon Engineering Design Standards:
   i. Sidewalk serving as a bike path: 10 feet
   ii. Sidewalk adjacent to a wall: additional 2 feet

E DRAINAGE

Storm water collected in the depressed section of West A Street will be captured in drain inlet catch basins located in the shoulders of both the east bound and west bound vehicle lanes. The catch basin drain pipes will convey the water to a storm water pump station located at the low point of West A Street. The pump station will be located beneath the proposed 12-foot-wide pedestrian walkway adjacent to the westbound vehicle lane. This location will allow maintenance crew access to the pump station without disrupting traffic.

The storm water pump station will be designed to handle run off associated with a 100-year storm event. The Rational method will be used to calculate the storm water flow and will assume a 100% impervious catchment area.

The storm water pump station will be equipped with two removable submersible pumps mounted on rails. One pump will serve as the lead or duty pump. The second will serve as a lag or back-up pump. The pumps will be equipped with variable speed motors to compensate for wide variations in incoming flow. The pump station sump will be approximately 8 feet deep (approximate elevation 26.59). The discharge Pumped flow will be discharge though a force main to the existing gravity storm drain system. Additional features for monitoring individual pump activity may be included to assist maintenance personnel and pre-empt pump outages. Appendix D shows the proposed storm water pump station.

F OTHER CRITERIA

- Traffic modeling and analyses (not included in this study) would project future traffic patterns for the streets around the undercrossing.

- Optional Landscaping may be used along the sides of West A Street in benched planters which may require an easement, and within a center median.

- Fire protection for undercrossing structures per Dixon Fire Department.

IV. UNDERPASS AND BRIDGE STRUCTURE

A BACKGROUND

To facilitate the development of the Dixon transit center a passenger boarding platform will be required to cross West A Street. To support the boarding platform, an underpass bridge structure is being proposed as a grade separation at West A Street. The proposed bridge will allow trains to operate within a dedicated right-of-way, which would be elevated, allowing vehicular and pedestrian traffic along West A Street to travel independent of the railroad. The current condition features an at-grade crossing with signaled crossing gate warning system. Based on the layout of the adjacent streets, the underpass structure seems to be the most logical; however certain restrictions need to be resolved.

Providing a design that reduces disruption to train service and city circulation, while offering a short construction period is the most important issue for an underpass project involving the railroad. Therefore, staging of the bridge construction needs to be carefully developed, and the construction of the bridge must be accomplished methodically with an absolute minimum of disruption to rail operations. The proposed travel width between each abutment face is 56 feet. To reduce the depth of the bridge structure, an intermediate support is proposed that will result in a structure span of 28’-0”. The bridge structure will have a high skew, which will necessitate the need for longer seat bearings at the supports. The bridge girders will be designed as simply supported, allowing prefabricated structural members to be brought in and lifted into place at the site. This solution alleviates the need to cure concrete or weld steel in the field and allows a shorter construction window than a cast-in-place structure.

B ALTERNATIVES DISCUSSION

The bridge structure will be required to support two tracks and a platform, with the option to add a future third track, such that the effective width of the structure is a minimum 86’-2”. For this study, typical 30-inch-deep precast single cell concrete box girders have been shown, along with precast T-beam platforms for the bridge portion. With this option, the minimum vertical clearance required is 17’-6” from top of pavement to bottom of bridge soffit at the critical points. The limiting factor for the underpass design is the amount of clearance that can be achieved under the bridge, while allowing the vertical curves of the vehicular roadway to achieve reasonable design speeds.

Based on structural guidelines for approximate sizing of the girders, a steel girder structure would provide a shallower section than that for concrete, but the top of rail to top of deck thickness increases from 2’-4” at the concrete section to 3’-0” for the steel section. Even though the clear height requirement is reduced to 16’-6”, a savings of only five inches will be achieved, which is minimal and will not affect the profile of the vertical curve alignment greatly. The bridge width along West A Street may be wider than just the

typical cross-section, if steel girders are used due to the additional width of the crash-protection that is required at each bridge face, to avoid severe damage to the bridge structure.

C STRUCTURE DESCRIPTION

The supporting elements for the bridge will consist of reinforced concrete abutments at each end, with an intermediate cast-in-place concrete shear wall or multiple column bent with an enlarged bent cap capable of supporting the bridge girders on the high skew. All of the substructure elements will be founded on piles. The northern abutment will be adjacent to a 12'-0" clear walkway, while the southern abutment will not have an adjoining walkway. If platform access is required, an opening through the abutment will be constructed to provide for an ADA ramp and stairs to the platform above. The intermediate pier (mid-span) could consist of either a continuous shear wall or a multiple column bent, which will have openings to break up the solid pattern of a solid shear wall. At the base of the supporting structures, crash protection features will be provided to avoid damage that may compromise their structural integrity. In addition to supporting the vertical weight of the bridge structure, the abutment will retain the soil behind the back wall. Beyond the abutments, along West A Street, new retaining walls will be installed to support the soil and structures adjacent to the existing street. This can be achieve by the installation of either soil nail walls or tie-back walls, which may require the relocation of existing utilities to avoid conflicts and will require an additional easement for the wall anchors. Otherwise, pile supported retaining walls can be constructed to support the existing soil and adjacent structures.

D. ROADWAY

1.0 Profile Design

The vertical realignment of West A Street is to be located between the cross streets of Jackson Street and Adams Street. In order to minimize impacts to the cross streets, the proposed profile grade conforms to the existing condition in advance of the curb returns of these intersections, limiting the project to approximately 675 feet in total length.

To accommodate the required 17.5-foot vertical clearance to the grade separation structure, the minimum possible grades of the proposed profile are -12.1% and 13.0% (See Appendix E); the maximum suggested grade of 5% is not feasible given the restriction of the project impact length. The City engineer has been informed of the proposed grades and the reason for their inability to meet Dixon City Standards.

Both crest vertical curves of the proposed profile allow for a design speed of 20 mph based on stopping sight distance. The sag vertical curve reduces the design speed to 15 mph based on headlight stopping sight distance. To improve the sight distance, and thus increase the design speed, additional lighting through the sag curve (under the rail bridge) can be provided. With additional lighting, the maximum comfortable design speed of the sag vertical curve can be 20 mph. This allows the design speed of the entire profile to be 20 mph.

2.0 Horizontal Alignment

The existing City right-of-way along West A Street is approximately 60 feet wide. To remain within the existing right of way, the proposed cross section of West A Street will accommodate one 12-foot sidewalk adjacent to the westbound (north) side of the roadway. The asymmetrical cross section will require that West A Street be horizontally realigned southward by 6.5 feet through the project area. The sidewalk could also be placed on the eastbound (south) side of the roadway with the street horizontally realigned to the north.

The proposed cross section of West A Street includes an optional 4-foot wide landscaped median and two optional 4.5-foot wide landscaped areas adjacent to the retaining walls. It includes 2.5-foot outside shoulders and 1-foot inside shoulders in each direction of travel. The City of Dixon standard for a minimum shoulder width of 8 feet is not possible within the existing city right-of-way without the elimination of the sidewalk (on one side of the street). Underneath the structure, the width of the structural columns and abutment walls will preclude landscaping. The inside shoulder widths will accommodate standard concrete barriers to protect the center column under the structure.

3.0 Traffic

The current posted speed limit on West A Street just beyond the project limits is 25 mph. Speed control measures are recommended to ensure through traffic slows to below the design speed of 20 mph between Jackson Street and Adams Street. The California Manual on Uniform Traffic Control Devices (MUTCD) should be consulted to determine the appropriate signage. The physical design of the roadway may also contribute to slowing vehicles in the area. For example, the non-standard proposed shoulder widths will provide horizontal narrowing which causes drivers to slow due to a feeling of confinement. Additionally, as drivers enter the project limits, their line of sight will immediately fall on the proposed large grade separation and tracks. Unfamiliar drivers will be compelled to drive cautiously through the area. Additional calming measures such as flashing warning signals, approach speed humps, tactile paving treatments, or stripping may also be considered.

E. WALKWAY/BIKEWAY

According to the HDM Chapter 1000, the sidewalk facility is classified as Class III bikeway which accommodates both pedestrians and bicyclists. To provide the mandatory 8-foot vertical clearance to the separation structure, the grades of the proposed sidewalk profile are -4.5% and 5%, which comply with both HDM and ADA standards. As the sidewalk cannot have grades as large as the roadway, and because the sidewalk does not require as much clearance as the roadway, it is proposed that the sidewalk be elevated with respect to the roadway.

The bikeway/sidewalk design speed is 15 mph. The crest vertical curves of the proposed sidewalk profile accommodate this design speed based on stopping sight distances. The sag vertical curve also accommodates this design speed based on comfort.

The total width of the sidewalk is 13 feet which includes a 12-foot-wide clear walkway and an additional 1 foot for a handrail or other fall hazard safety system to protect pedestrians and bicyclists from the vehicle traffic below. This facility is proposed to accommodate two-way pedestrian and bicycle traffic.

As a sidewalk is only provided on the north side of West A Street, pedestrians and bicyclists will be forced to cross to the north at the Jackson Street and Adams Street intersections. The existing Adams Street intersection is sufficient for pedestrian safety with signals and crosswalks in all directions. The existing through traffic at the Jackson Street intersection is not stop-controlled and requires the addition of north-south crosswalks and appropriate signage to allow pedestrians and bicyclists to navigate in a safe manner. The addition of pedestrian crossing flashing lights may also be considered due to the considerable amount of existing pedestrian and bicycle traffic in the area.

V. TRACK AND SIGNALS

A TRACK AND AT-GRADE CROSSINGS

During the construction of the bridge, the two main tracks must remain operational. To allow for this, the bridge must be constructed in stages with shoofly (temporary detour) tracks.

B RAILROAD STAGING SEQUENCE

1A. Close West A Street. Construct two shoofly tracks on RR south end of project.
1B. Remove existing tracks. Construct RR north side of bridge and platform.
2A. Construct shoofly tracks on north side over the constructed portion of the bridge.
2B. Remove RR south side shoofly tracks. Construct RR south side of the bridge and platform.
C. Construct/shift tracks into final alignment. Remove shoofly track.

With all the shoofly track work, the at-grade crossings at 1st Street will be affected. The flashings lights/gates and signal house will have to be removed and replaced. Each new track will need to have a new crossing installed. The existing and temporary at-grade crossings will have to be removed.

VI. DRAINAGE AND UTILITIES

A EXISTING UTILITIES

The grade separation of West A Street from the UPRR track will be constructed by depressing the road to create an underpass. This will involve relocation of some major and minor utilities at or in the vicinity of Adams Street and Jackson Street. Existing utilities in the project area include:

- Water, sanitary sewer, and storm lines
- Electric power lines
- Telephone lines
- Overhead electric and telephone lines
- Natural gas lines
- Petroleum gas line
- Fiber optic cables
- Traffic signals at adjacent intersection
- Railroad crossing arms/signals

B IMPACTED UTILITIES

As part of the grade separation project, many existing underground utilities along and across West A Street will be directly impacted by excavation operations and require temporary support and protection, relocation, or replacement. See the following for each of the impacted utilities.

1.0 Water, sanitary sewer, and storm lines

Two utilities that run the length of West A Street from Adams Street to Jackson Street are a 6-8-inch City of Dixon sanitary sewer line and an 8-inch Cal Water water line, including multiple feeds across West A Street. Both the sewer and water lines need to be relocated to facilitate the roadway design. Possible relocation options may include detouring around to edge of roadway retaining walls with lines running

outside and adjacent to roadway alignment or under proposed sidewalk area, or dropping the lines below the length of the proposed roadway if pressure amounts are feasible and/or pumps are installed. City of Dixon 12-24-inch storm drain lines are present at both intersection areas, and within and across A Street between Adams Street and the UPRR track to the north. The lines west of the railroad tracks may require relocation either around the proposed roadway or pumps may have to be installed.

Additional storm drain facilities would be required to handle the run-off down the proposed roadway from the depressed design configuration, as well as, a pump from the bottom of the road. New catch basins, manholes, water valves, and water meters would be required along with the main lines. Access to the new facilities must be maintained.

2.0 Electric power lines

Pacific Gas & Electric (PG&E) owns a power facility located at the southeast corner of West A Street at Adams Street. Two City of Dixon traffic signal cabinets are located between the sidewalk and property fencing at that intersection; impact to the cabinets is dependent on proposed roadway wall design and future access to this area. A group of electrical panels is located just east of the railroad track and another group at the southwest corner of West A Street at Jackson Street. Both of these areas are within existing sidewalks and the existing pull boxes and vaults may need to be relocated with the proposed sidewalk and roadway wall design.

3.0 Street Lighting

Street lighting poles run along West A Street on both sides of the roadway. One pole sits on either side of the UPRR track, just behind the northeast and southwest corners of sidewalk; both of these light poles would require relocation when the railroad bridge is installed. The remaining light poles may or may not need to be relocated, based on the final sidewalk and roadway wall construction limits.

Additional lighting would be required along the proposed depressed sidewalk that runs along West A Street underneath the proposed railroad bridge, as well as along the roadway itself.

4.0 Telephone lines

Telephone line pull boxes are located in the sidewalk on the south side of West A Street, between the UPRR track and the Jackson Street intersection. USA paint markings show telephone lines running within that sidewalk area. The existing pull boxes may need to be relocated with the proposed sidewalk and roadway wall design.

5.0 Overhead electric and telephone lines

Power poles stand in various locations along West A Street to the west of the UPRR track. Overhead power and telephone lines cross over West A Street at the Adams Street intersection, from the PG&E facility near the corner of Adams Street, and from the corner at Porter Street. As the adjacent property along West A Street will not be depressed, it may be possible to relocate any impacted existing poles further into the property areas to avoid major relocations with the proposed sidewalk design.

6.0 Natural gas lines

PG&E also has natural gas facilities within the south sidewalk and roadway of West A Street, including crossing the UPRR track. This 2-inch line would require relocation by PG&E prior to roadway construction.

7.0 Petroleum fuel transmission line

Kinder Morgan has a 14-inch petroleum fuel transmission line along the west side of the existing UPRR tracks extending in both north/south directions along the tracks. The gas line will be relocated by directional bore clear of the roadway to a depth greater than 20 feet below existing ground to avoid the proposed roadway design. Alternately, the line may be capped-in-place at the discretion of Kinder Morgan.

8.0 Fiber optic cables

MCI/Qwest and Level3 Communications both have buried fiber optic facilities along UPRR track in both north/south directions, one on either side of the track. Both lines will be relocated by directional bore clear of the roadway to a depth greater than 20 feet below existing ground to avoid the proposed roadway design.

9.0 Traffic signals at adjacent intersection

The intersection of West A Street at Adams Street is currently signalized; the intersection at Jackson Street is currently two-way stop-controlled for north-south traffic. No additional traffic signals are included in the project design; however the existing signal timing plans may need to be adjusted at Adams Street to accommodate changes in traffic levels on West A Street and pedestrian movements from the new sidewalk layout. Traffic calming measures at both entrances to the undercrossing may be included in the design to alert drivers to the reduced design speed limit from 25 to 20 miles per hour.

10.0 Railroad crossing arms/signals

UPRR has two signal crossing arms and corresponding electric pull boxes at the track crossing of West A Street. There is a signal house located approximately 80 feet north of West A Street on the west side of the tracks. All of this signal equipment would be removed and/or abandoned after the undercrossing is complete.

VII. ACCESS AND PROPERTY IMPACTS (EXHIBIT G)

Although an undercrossing may have minimal visual impact on the surrounding area, it would require the closure of several existing driveways. These existing facilities would require new alternate routes to access their adjacent uses. The impacts to these adjacent parcels have been classified into the following three categories:

Significant Impacts
Southeast quadrant: The impacted uses in this quadrant include the Dixon Post Office and the Air Perfection Company. The Dixon Police Station is located in this quadrant but the project will not impact vehicle or pedestrian access to the site.
Northwest quadrant: The uses in this quadrant include: the Motley Realty building, Real Estate Solutions, and the Pro-Gas Propane Company.

Moderate Impacts
Southwest quadrant: The only use along this section is a PG&E Substation with access gates along West A Street, Old Hwy. 40, and Porter Street.
Old Hwy. 40 would be closed and no longer connect to West A Street. A hammer-head could be constructed to vehicles adequate space to turn around.

Minimal Impacts
Northeast quadrant: This section is bounded by a vacant lot under Redevelopment Agency ownership.
Northwest quadrant: A possible alternate access route to Pro Gas Company from West B Street impacts a vacant triangular lot adjacent to a private residence.

A MITIGATING ACCESS AND PROPERTY IMPACTS

The existing land uses outlined above are identified on the *Access and Land Use Map* (Exhibit G) which also identifies the existing driveway that would require re-grading or be closed. The uses in the northwest quadrant are primarily small businesses with their primary access via West A Street. Driveways which are shown as re-graded would require review, with the property owner present, on the impact of conforming the deeper drives to existing parking lot. These small business uses could also benefit from the opening of an existing easement from the back side at B Street along an existing overhead power corridor. This easement would have to be carefully reviewed with PG&E and surveyed to determine its adequacy for a new two-way alternate access street.

The Pro-Gas property would require an alternate access route from B Street. The PG&E Substation driveway at West A Street would be re-graded and their remaining access gates would remain open and accessible via Adams Street and Old Hwy. 40. The existing Dixon Police Department building does not have a West A Street driveway; the Dixon Post Office and the Air Perfection Company both have West A Street driveways which would be closed for a grade separation. These two uses represent the most significant challenge because they both front West A Street and the building structures are positioned with their rear corners in very close proximity. Complicating the situation is another use on a triangular parcel behind the Dixon Post Office with a slender parcel that is leased to the Post Office for one-way vehicular access around the building. An adequate two-way alternate access route could not be provided without at a minimum, modifying one of these structures.

VIII. COST ESTIMATE

The Cost Estimate is developed from the drawings attached in the Appendices. The items of work are based on this conceptual level of drawings and with best judgment as to quantities and assumptions of construction. A General Contingency or Undefined Work Scope of 15% of total defined and costed work is included in the total cost. The total cost includes contractor direct cost, contractor overhead and profit. The estimate does not include design costs, cost of additional right-of-way, or owner's administration costs.

The basis of the estimate is current pricing for labor, equipment, materials and subcontractor work. An escalation of 4.0% of the cost has been added to consider the start of work in year 2010.

Bid Item	Bid Description	Units	Bid Quantity	Bid Total U.P.	Bid Total
500	MOBILIZATION	LS	1	$ 1,500,000.00	$ 1,500,000.00
1000	TRAFFIC CONTROL	LS	1	$ 255,000.00	$ 255,000.00
1050	EROSION & SEDIMENTATION CONTROL CONST	LS	1	$ 133,000.00	$ 133,000.00
1100	DEMOLITION	LS	1	$ 47,000.00	$ 47,000.00
1200	EXCAVATION	CY	12,444	$ 23.00	$ 286,212.00
1300	SUPPORT OF EXCAVATION	SF	12,000	$ 100.00	$ 1,200,000.00
1400	BACKFILL AT ABUTMENT & WALLS	CY	2,933	$ 59.00	$ 173,047.00
1410	BACKFILL PIER AND FOR SIDEWALK	CY	1,600	$ 59.00	$ 94,400.00
1500	BEARING PILE	EA	395	$ 6,000.00	$ 2,370,000.00
1600	CONSTRUCTION DEWATERING	LS	1	$ 94,000.00	$ 94,000.00
1700	STORM SEWER FOR UNDERPASS	LS	1	$ 271,000.00	$ 271,000.00
1800	CROSSING 1st STREET AT GRADE	TF	100	$ 740.00	$ 74,000.00
1900	ROADWAY AND SIGNAL MODIFICATION OTHER	LS	1	$ 48,000.00	$ 48,000.00
2000	ABUTMENT AND PIER CONCRETE	CY	2,889	$ 800.00	$ 2,311,200.00
2010	CONCRETE APPROACH SLAB	SF	3,600	$ 14.00	$ 50,400.00
2020	SIDEWALK	SF	5,200	$ 6.00	$ 31,200.00
2030	BARRIER RAIL	LF	980	$ 72.00	$ 70,560.00
2040	WALL FOR SIDEWALK	SF	5,000	$ 72.00	$ 360,000.00
2050	CONCRETE BARRIER AT WALL	LF	1,000	$ 60.00	$ 60,000.00
2060	ARCHITECTURAL RETAINING WALL FINISH	SF	8,960	$ 8.40	$ 75,264.00
2100	REINFORCING STRUCTURAL CONCRETE	LB	290,000	$ 1.40	$ 406,000.00
2200	PRECAST BEAMS DOUBLE (20 and 33 FT)	LF	1,296	$ 1,000.00	$ 1,296,000.00
2300	WATERPROOF DECK	SF	4,644	$ 12.00	$ 55,728.00
2400	CONCRETE PLATFORM	SF	28,000	$ 46.00	$ 1,288,000.00
2410	PLATFORM ENHANCEMENTS	LS	1	$ 240,000.00	$ 240,000.00
2420	RAMP ACCESS SIDEWALK TO PLATFORM	LS	1	$ 520,000.00	$ 520,000.00
2430	WALL TILE IN UNDERPASS	SF	1,600	$ 25.00	$ 40,000.00
2500	FENCE-RAILING UNDERPASS	LF	1,400	$ 295.00	$ 413,000.00
2510	FENCE-RAILING NEW BRIDGE	LF	200	$ 356.00	$ 71,200.00
2600	LIGHTING	LS	1	$ 291,000.00	$ 291,000.00
2700	LANDSCAPE AND IRRIGATION	LS	1	$ 200,000.00	$ 200,000.00
3000	RAIL MAIN TRACKS	TF	8,000	$ 100.00	$ 800,000.00
3100	RAIL SHOO FLY TRACKS	TF	8,000	$ 200.00	$ 1,600,000.00
3200	RAIL SHOO FLY TRACKS	TF	8,000	$ 150.00	$ 1,200,000.00
4000	ROADWAY AT UNDERPASS	SF	16,800	$ 10.00	$ 168,000.00
	TOTAL PROBABLE CONSTRUCTION COST				**$ 18,093,211.00**
	TEMPORARY EASEMENT ALLOWANCE	LS	1		$ 200,000.00
	RAILROAD FLAGGING UPRR	MO	8	$ 18,000.00	$ 144,000.00
	UPRR RAILROAD TIE-INS	EA	12	$ 16,000.00	$ 192,000.00
	UPRR SIGNAL RELOCATIONS	LS	1		$ 200,000.00
	FINAL DESIGN	LS	1		$ 2,000,000.00
	UTILITY RELOCATIONS	LS	1		$ 1,500,000.00
	TOTAL PROBABLE COST				**$ 22,329,211.00**

Notes:

1. Escalated to start of construction 2010
2. Contingency: 15% in items of w ork cost
3. Environmental w ork not included
4. Ow ner administration cost not included
5. No right-of-w ay purchase cost
6. Utility relocations, allow ance cost
7. No rock in excavation material
8. Dew atering system is sumping only
9. Optional Landscape Easement not included
10. Estimate w ith precast concrete superstructure for bridge
11. Utilities to be Relocated; Kinder Morgan (pipe)/MCI/Qw est/Level3(fibre optics)
12. 20 Palm Trees included

IX. CONSTRUCTABILITY

This Project is located in a well developed and heavy traffic location and will require local detours to allow construction. There will be noise impacts to the local area if driven piles are used. Any existing utilities in the West A Street area to be depressed will have to be relocated. Some may be depressed below the new roadway and some may have to be re-routed, possibly behind the new retaining walls.

The existing UPRR tracks will require a shoofly detour track to allow construction of the new bridge as it is constructed in the location of the existing tracks. As right of way for such shoofly is limited, the probable solution is to construct one shoofly track and then place rail traffic on this and also one of the existing tracks to allow construction of half the new bridge. When this phase is complete, rail traffic can be routed to the one new track on the bridge and the same shoofly track and construct the remaining portion of bridge and track. This phased construction will add some time and additional cost, but is a viable method of construction.

As the shoofly is being constructed, detours will be put in place to remove all roadway and pedestrian traffic from the affected section of West A Street. Construction activities should be phased to minimize periods requiring closure of both 1st Street and West A Street. While West A Street will need to be closed and traffic detoured for much of the project duration to accommodate the construction of the new bridge and underpass, 1st should remain open for most of the project except during the short periods requiring construction and removal of the shoofly and main tracks and rebuilding the at-grade crossing. These periods should be near the beginning and end of the project, but will be directly related to the detailed construction phasing plan and will need to be coordinated with the Union Pacific Railroad. During construction, the work required at 1st Street should be staged to minimize street closures of 1st Street and should not be expected to exceed two to three weeks depending on the required phasing. Detour routes for construction of the West A Street grade separation will likely utilize Adams Street or other routes as identified with the City Traffic Engineer. Once complete the construction of the depressed roadway can commence. As this is a deep excavation (+/- 25 feet), the earth will need to be supported, and a conventional way is with steel soldier pile and wood lagging retaining the earth and earth anchors for support. At this time the depressed areas outside of the one existing track and the shoofly can be constructed. There may need to be some added ground support at the bridge location to enable the existing track to remain open while constructing the new work directly adjacent.

Storm sewer lines to handle the water in the areas of the depressed section will need to be constructed and this may require deep trenching in various areas to connect to existing or, if unavailable, may necessitate the need for some type of pump station. Other construction in the depressed area is conventional consisting of driven pile and formed concrete.

Bridge beams for the new superstructure are of standard design for rail structures and are of length and weight so that hauling and setting will be able to be done with readily available equipment and personnel.

When the new partial portion of bridge is constructed and track on this section opened, the remaining existing track can be taken out of service and the remaining bridge constructed as described previous. Once the bridge is fully complete all tracks will be opened on the new bridge and then the shoofly removed. The area where the shoofly crossed West A Street is then available for completing the depressed roadway. An alternative, though may not be cost effective, would be to construct the depressed roadway prior to constructing the shoofly track in this area and then use a temporary bridge for the shoofly track to cross the depression area.

This sequencing of work will require two phases for the bridge and three phases for the ground support, excavation, pile driving, and concrete. The paving and finishing work can all be left until completion can be done in one continuous operation.

In the depressed section, there is potential for groundwater and further soils investigation will provide data for analysis. At this time we have considered for cost only sumping of surface and storm water with no engineered dewatering system.

X. RECOMMENDATIONS

1. **Intersection reconfiguration:** The City should undertake a Traffic Impact Study to assess the A Street/Adams Street and Jackson/A Street intersection roadway and signal reconfiguration requirements that would accommodate the grade separation project within the current roadway right-of-way.

2. **Right of Way:** The City should undertake Right of Way Research to confirm temporary easements, potential property acquisition requirements for alternate access routes, retaining walls and the optional landscape treatment on the undercrossing approaches.

3. **Property and Access Impacts:** The City should initiate discussions with key adjacent owners whose property may be impacted directly by the project:

    a. US Postal Service, regarding potential relocation of the entire A Street facility to another location in Dixon acceptable to USPS or, alternately, relocating just the public counter to an "Annex" location.

    b. PG&E, to assess their willingness to accommodate the closure of Old Hwy 40 and creation of improved dedicated access to their property; their willingness to modify their current overhead (OH) Line easement to allow new vehicular access to the businesses fronting A Street.

    c. Pro Gas, Motley Realty, Real Estate Solutions and private residence at B Street adjacent to Transit Depot entrance to identify an easement to allow new dedicated access to their properties and potential future access from the intermodal transit depot to the undercrossing.

    d. UPRR to ascertain:

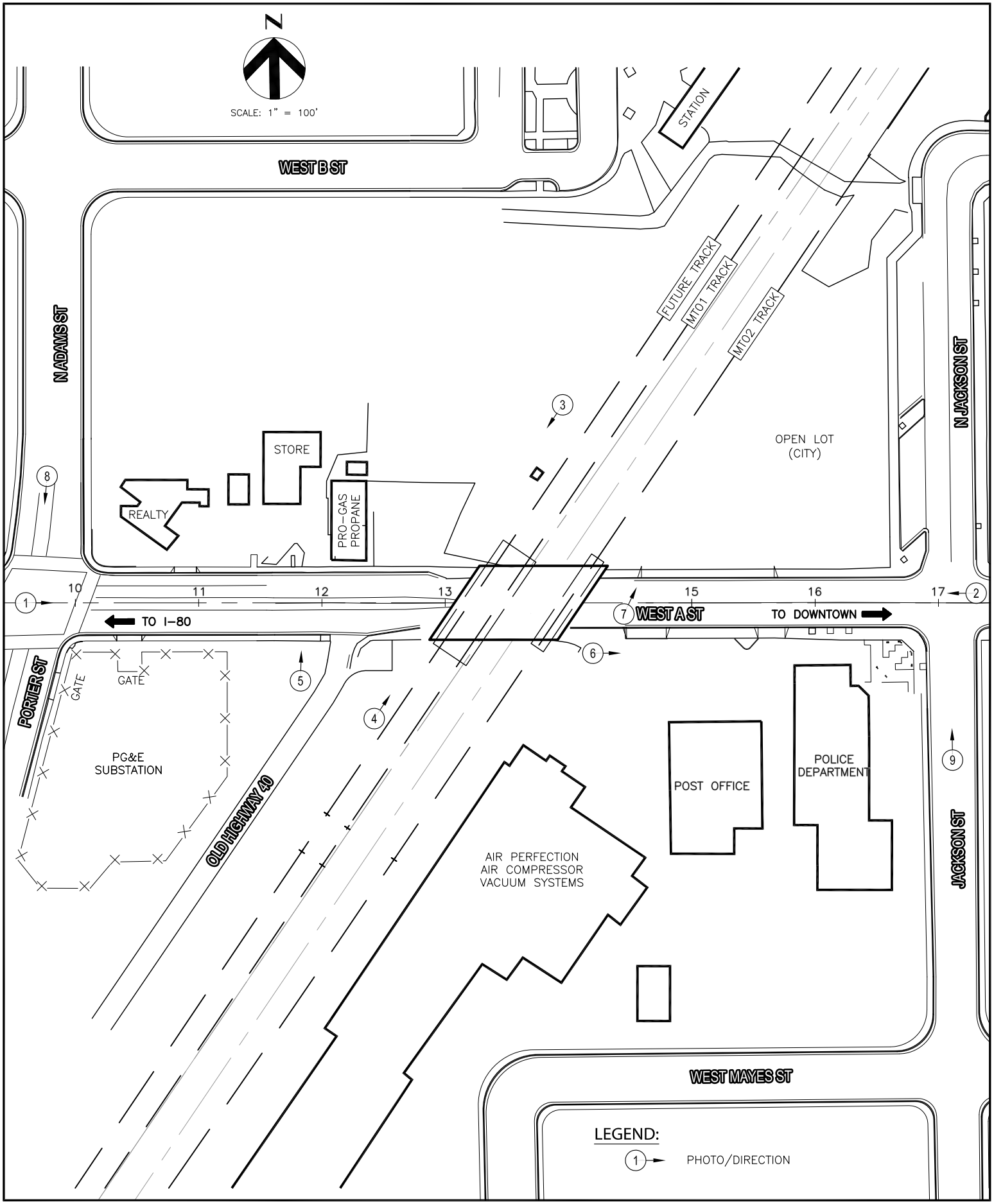
        i. Their willingness to accommodate the proposed A Street project, construction staging and shoofly arrangements.

        ii. The requirement for any bridge type selection study before final decision is made on bridge selection

4. **"A" Street as an alternative access to the future Station Platform**: The City could consider the A Street grade separation project as an alternative to the B Street Undercrossing project to access the future station platform, in place of two platform undercrossings, and analyze the integration of surface connections to the depot building and intermodal center parking.

5. **Environmental Clearance**: The City should review the existing CEQA and NEPA documents for the Transportation Center and update as necessary due to the addition of the undercrossing to the project scope.

APPENDICES FOLLOW



VICINITY MAP

EXHIBIT A

JULY 1, 2009

HDR | ONE COMPANY *Many Solutions*℠