SECTION 2

ALTERNATIVES

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ALTERNATIVES

This section will discuss the alternatives investigated to address the project's purpose and need. A full range of alternatives was developed, including a broad array of roadway improvement strategies. The project history, alternatives development process, alternatives retained for detailed evaluation, alternatives considered but not recommended for further evaluation, and alternatives evaluation findings are discussed below.

2.1 Alternatives Development Process

A broad array of alternatives were considered to address the transportation needs and objectives defined in the purpose and need for the I-29 corridor study. Alternative improvements were considered for the I-29 mainline and four interchanges within the project study area. The project study area limits are shown on Figure 1-1, *Location Map*, in Section 1, *Purpose of and Need for Action*.

Alternatives were developed to address safety, traffic, design, and infrastructure needs in the corridor, to meet established planning and design criteria and standards, and to avoid or minimize impacts to environmental resources. Early identification of environmental and community constraints was used to develop location alternatives that would avoid or minimize environmental impacts. A geographic information system (GIS) database was assembled to allow efficient evaluation of potential environmental impacts of multiple alternatives. Input from the public, agencies, I-29 Siouxland Metropolitan Advisory Committee (SMAC), and the I-29 Project Management Team[3] (PMT) was encouraged and considered throughout the process. Summaries of these meetings and agency coordination are in Section 4, *Comments and Coordination*. The alternatives development process is briefly described below.

2.1.1 Step 1: Establish Engineering Requirements

Initially, the basic engineering requirements were established. These requirements and guiding principles were developed to address safety and aging infrastructure concerns, to meet the purpose and need, and to satisfy federal and state policies. The requirements provided the basis for establishing the proposed corridor sizing and general design features of the alternatives (see Section 2.2, *Range of Alternatives Considered*, for details).

2.1.2 Step 2: Develop and Evaluate Concept Alternatives

Roadway improvements were developed and tested at a conceptual level. The objective of this step was to test a full range of possible alternatives and to identify reasonable and representative proposed alternatives for more detailed consideration (see Section 2.2, *Range of Alternatives Considered*, for details).

[3] The PMT consisted of representatives from local government, regional planning, and transportation agencies to guide development of a consensus solution for I-29, to serve as a two-way communication link between the project team and the communities, and to provide a mechanism for key stakeholders to provide input on project actions and decisions.

The initial concepts development process considered purpose and need, potential environmental constraints, future traffic projections, and order of magnitude costs. Development and evaluation of the initial concepts also considered operational and driver expectancy issues, constructability, maintenance of traffic during construction, environmental impacts, approximate right-of-way impacts, and order of magnitude costs. Six initial concepts were presented to the PMT for evaluation. The PMT then narrowed the concepts down to the three that warranted additional refinement and analysis. The criteria used to evaluate the initial concepts included the following:

- Improvement of Traffic Operations;
- Fulfillment of Design Criteria and Guiding Principles;
- Improved Driver Expectancy;
- Constructability;
- Fulfillment of Local Issues and Concerns;
- Environmental Impacts;
- Right-of-Way Impacts; and
- Comparative Construction Costs.

2.1.3 Step 3: Refine and Evaluate Build Alternatives

Build alternatives were carried forward from the range of identified reasonable and representative alternatives. Build alternatives carried forward to be studied in detail included three of the six concept alternatives considered in Step 2 (relabeled as Alternatives A, B and C). With the further development and refinement of the build alternatives, a more accurate right-of-way footprint and cost estimate could be developed. The additional development of these alternatives included refined horizontal and vertical alignments, development of bridge concepts, and creating concept level standard engineering details. The additional detail provided by alternatives refinement was used in traffic simulation and analysis, hydraulic modeling, development of more detailed cost estimates, and development of conceptual construction staging plans.

Once the build alternatives had been further refined, they were reevaluated by the public, various local and regional agencies, and the PMT. The refined alternative evaluation considered a number of key variables. These variables included traffic simulation results, horizontal and vertical alignment, decision sight distance, entrance and exit ramp design, driver expectancy, constructability and maintenance of traffic, estimated right-of-way impacts, cost estimates, visual impacts and access to the Downtown area, and environmental issues.

2.2 Range of Alternatives Considered

This section includes a discussion of engineering requirements established for the project, as well as improvement options considered but not recommended for further evaluation through the concept alternatives development process. A variety of roadway improvements were developed

and tested at a conceptual level to allow identification of a complete set of reasonable and representative build alternatives for more detailed consideration.

Concept alternatives were developed via an iterative and interactive process, which included workshops and meetings with the Iowa DOT, the FHWA, and local agency staff, and small group meetings with the public and downtown business owners. Concept alternatives were developed to a level of detail that permitted an assessment of whether the improvements would address purpose and need, comply with engineering requirements, or result in disproportionate environmental or socioeconomic impacts. The alternatives were evaluated using a combination of qualitative and quantitative measures aimed at assessing transportation benefits, potential environmental and socioeconomic impacts, and financial issues. The process was structured to encourage input from the FHWA, the Iowa DOT, regulatory/resource agencies, the SMAC, area officials, and the public. Improvement options that could not meet purpose and need and engineering requirements, or resulted in disproportionate impacts, were eliminated from further consideration.

A discussion of engineering requirements and improvement options considered but not recommended for further consideration are discussed in sections 2.2.1-2.2.3.

2.2.1 Engineering Requirements

The engineering design criteria applied to the development and evaluation of initial concepts and refined alternatives were assembled from the Iowa DOT Design Manual, the 2001 American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets, and the 2000 Manual on Uniform Traffic Control Devices (MUTCD). Separate criteria were developed for mainline I-29 and ramps and collector distributor roads. The design criteria were documented in the *I-29 Corridor Study, Location Report*.

In addition to specific engineering design criteria, guiding principles were established for the project. The guiding principles document the rationale and priorities that were the basis for the concepts. The following guiding principles apply to the I-29 study area.

- Basic Lane Requirements – The initial concepts for the project corridor were developed based on development of a four-lane roadway that could be expanded to six lanes when traffic warranted. During the alternatives refinement phase of the study, Iowa DOT began considering building all six lanes with the initial construction. A comparison of four lane and six lane initial construction was performed that identified costs and benefits for each build scenario. The evaluation revealed that the total overall cost for four lane construction with future widening was more than six lane initial construction. Construction staging benefits of a six lane initial build over a four lane scenario were also identified. Based on the cost and construction benefits, minimal difference in impact "footprint," as well as concerns about programming of the future expansion project following the initial four lane project, Iowa DOT decided to change from the expandable four lane section to a full six lane section.

- Maintenance of Traffic During Construction – All build alternatives will be evaluated for constructability under traffic. The construction phasing will accommodate winter season operations. Two lanes of traffic in each direction will be maintained during construction. Some selected service interchange ramp movements may be closed alternating the closures during construction with closure of on-ramps being preferred over closure of off-ramps.
- Lane Balance – Lane balance refers to the appropriate number of lanes needed for traffic at places where merging and diverging points occur on the roadway. For the project corridor, lane balance will be provided with each build concept for mainline ramp movements. Preferably, concepts will also consider accommodating lane balance on the collector distributor roads, one-way frontage roads, and turning roadways.
- Ramp Considerations – Single lane exit ramps are desirable at system and service interchanges. Preferably, all ramps will enter and exit to the right of the mainline traffic. Multilane entrance ramps will be a parallel type design.
- Railroad Impacts – Impacts to the abutting railroad corridor will be minimized. As much as practicable, relocation of and impacts to railroad tracks and spur lines will be avoided.
- Access Considerations – Full access to Floyd Boulevard, Nebraska Street, Pierce Street, Wesley Parkway and Hamilton Boulevard will be provided via collection and distribution (C-D) roads, one-way frontage roads, or direct ramps. Federal Highway Administration (FHWA) approval will be required for partial access interchanges. The project would result in the full rebuild of the Wesley Parkway Interchange.
- Local Issue Considerations – Previous studies and early coordination with public and stakeholder groups generated several issues that warranted consideration during development of the initial concepts for improving I-29. One issue concerns access to downtown Sioux City during construction is important. Additionally, based on input from the public it is desirable to separate downtown commercial access to I-29 from industrial traffic. Pedestrian and bicycle access from the downtown to the riverfront is important to the community as well as maintaining trail and pedestrian movements during construction. Concepts should consider optimizing access to and traffic flow around the Tyson Events Center. Parkland between the Missouri River and Chris Larsen Park Road should be preserved. A large interceptor sanitary sewer is located in the corridor and impacts to this infrastructure should be minimized. The concepts for improving I-29 should consider the City of Sioux City's water well improvements occurring in the project corridor. Finally, the public and local stakeholders would prefer that the concepts maintain screening of the industrial property east of the Floyd River.

2.2.2 Initial Concept Not Recommended for Further Consideration

The PMT did not consider development or advancement of build concepts that maintained the existing center line alignment, pavement, or interchanges. Rather, because of the extent of the deficiencies discussed in Section 1, *Purpose and Need*, of this document, the initial concepts were developed based on complete reconstruction of I-29 and ramps in the project corridor. At the time the initial concepts were developed, they consisted of designing two lanes in each

direction with room for expansion of one additional lane in each direction. The expansion would have been accomplished by widening to the inside of the proposed driving lanes.

The initial concepts were labeled as Concept 1 through Concept 6. All concepts were evaluated against engineering design criteria and guiding principles and ultimately whether or not they fulfilled the purpose and need of the project. Concepts 1, 5, and 6 were similarly evaluated and recommended for further consideration and relabeled as Alternative A, B, and C, respectively.

After Concepts 1, 5, and 6 (Alternatives A, B, and C) were recommended for further consideration the City of Sioux City wanted to explore the idea of having an additional interchange that served the former Stockyards area. This section describes Concepts 2, 3, 4, and the Stockyards interchange concept and provides a discussion of why these concepts were not recommended for further consideration. Section 2.3 describes the alternatives carried forward for additional development and analysis.

Concept 2

Concept 2 was a variation of an alternative that evolved from a 1997 I-29 planning study and is shown on Figure 2-1, *Initial Concepts 2, 3, and 4* (Stanley Consultants, Inc., 1997). The evolved concept included northbound and southbound frontage roads extending from Floyd Boulevard to Hamilton Boulevard. The northbound frontage road connected to Gordon Drive at Nebraska Street, forming a fifth leg of that intersection; all five legs would carry approaching traffic. The existing segment of Gordon Drive from Pierce Street to Pearl Street was used as part of the frontage road. The concept included a connection from Nebraska Street to Pierce Street located south of 2nd Street, to convert Pierce Street to two-way traffic flow. Nebraska Street, between Gordon Drive and the Pierce Street connector, served only local ingress/egress to the adjoining properties. Only Pierce Street was extended under I-29 to the southbound frontage road and Chris Larsen Park Road, carrying two-way traffic.

Northbound exit ramps from I-29 connecting to the frontage road were located south of Floyd Boulevard, north of Floyd Boulevard, and between Wesley Parkway and Hamilton Boulevard. Northbound entrance ramps from the frontage road to I-29 were located between Pierce Street and Floyd Boulevard, between Pearl Street and Wesley Parkway, between Hamilton Boulevard and Wesley Parkway and west of Hamilton Boulevard. Concept 2 did not require modification to the southbound exit or entrance ramps for Hamilton Boulevard nor the frontage road between Hamilton Boulevard and Wesley Parkway except to adjust for the widened I-29 section. A southbound exit ramp from I-29 to the frontage road was located between Wesley Parkway and Pierce Street and an exit ramp was located between Pierce Street and Floyd Boulevard. Entrance ramps to southbound I-29 from the frontage road were located between Nebraska Street and Floyd Boulevard, and south of Floyd Boulevard.

Concept 2 was the first concept to include elimination of the third (top) level of the Wesley Parkway Interchange and modification of the middle level of the interchange. The concept included a two-level interchange with at-grade intersections on Wesley Parkway for the northbound and southbound I-29 frontage roads.

The main disadvantages of Concept 2 were the five-leg intersection at Gordon Drive and Pierce Street, the use of Gordon Drive as part of the northbound frontage road, and the conversion of Pierce to two-way traffic. The elimination of Concept 2 was based primarily on concerns about two-way traffic on Pierce Street. Two-way traffic was noted as being incompatible with existing one-way traffic in the downtown area and concerns surfaced regarding traffic backing up during railroad grade crossing blockages. Additionally, the five-leg intersection at Gordon Drive and Pierce Street was anticipated to operate at level of service (LOS) D and provided undesirable intersection geometry, introducing the potential for wrong-way traffic on the northbound exit ramp.

Concept 3

Concept 3 did not include the extent of frontage roads proposed in Concept 2 and is shown on Figure 2-1, *Initial Concepts 2, 3, and 4.* This Concept included three locations where one ramp crosses over another ramp (braided) and two locations where a ramp crosses under I-29. The northbound ramps at Floyd Boulevard were reconfigured to provide a loop entrance ramp in the northeast quadrant. A northbound exit ramp for downtown was connected with Gordon Drive at Nebraska Street, forming a fourth leg of that intersection. Gordon Drive was realigned in the vicinity of Pearl Street to form a northbound entrance ramp to I-29. Pearl Street was connected to the entrance ramp, but access was limited to right turns to and from Pearl Street and the ramp. The Gordon Drive entrance ramp was grade-separated and "braided" under a northbound exit ramp from I-29 to Wesley Parkway. As a result no connection existed from Gordon Drive to Wesley Parkway. A northbound frontage road was extended from Wesley Parkway to Hamilton Boulevard, with the same exit and entrance ramp locations as Concept 2.

The Wesley Parkway interchange was modified similar to Concept 2 with intersections for northbound and southbound I-29 ramps/frontage roads on Wesley Parkway.

In the southbound direction, the existing exit ramp to Hamilton Boulevard is the same as in Concept 2. The entrance ramp from Hamilton Boulevard was modified to cross under an exit ramp for Wesley Parkway. The frontage road between Hamilton Boulevard and Wesley Parkway was eliminated and there was no connection between Hamilton and Wesley Parkway for southbound traffic.

An entrance ramp from Wesley Parkway was braided over a southbound exit ramp to downtown. No southbound connection from Wesley Parkway to downtown via the I-29 ramp resulted from this configuration. The downtown exit ramp crossed under I-29 to tie directly into eastbound Gordon Drive. A southbound frontage road originated at the intersection of Gordon Drive and Pierce Street, crossed under I-29, and extended to Floyd Boulevard. Exit and entrance ramp locations along the southbound frontage road east of Pierce Street matched Concept 2. However, unlike Concept 2, there was no connection from either Pierce Street or Nebraska Street to Chris Larsen Park Road.

Although Concept 3 provided the most direct access to and from downtown and I-29 and fully satisfied traffic operations criteria, it provided these advantages by eliminating access from Gordon Drive to Wesley Parkway and isolating the Tyson Events Center. Concept 3 also included the most bridges and correspondingly the highest construction cost. Finally, traffic

patterns between Gordon Drive and Wesley Parkway would have been diverted to other city streets by Concept 3. For these primary reasons, Concept 3 was not recommended for further refinement or modification.

Concept 4

Concept 4 access provided by the existing interchanges at Floyd Boulevard and Nebraska Street/Pierce Street was consolidated into a single interchange located at Virginia Street as shown on Figure 2-1, *Initial Concepts 2, 3, and 4.* Virginia Street was extended to connect with the new interchange. The Virginia Street interchange had a diamond interchange configuration with northbound and southbound exit and entrance ramps. For Concept 4, Gordon Drive was terminated at Pearl Street and there was no direct northbound connection from Gordon Drive to I-29 or a frontage road. A northbound exit ramp from I-29 to Wesley Parkway was included in the concept. A frontage road segment extended northbound from Wesley Parkway to Hamilton Boulevard with exit and entrance ramps located as in Concepts 2 and 3.

In the southbound direction, the exit and entrance ramp locations and configuration from Hamilton Boulevard to Wesley Parkway were the same as Concept 3. East of Wesley Parkway a southbound entrance ramp was provided. Like Concepts 2 and 3, the existing Wesley Parkway interchange was modified to a two-level interchange, however in Concept 4 a single point interchange layout at Wesley was provided, involving only one signalized intersection for the I-29 ramps.

Between Wesley Parkway and Virginia Street there were no city streets crossing under I-29, so the I-29 grade was lowered to ground level. An overpass on I-29 at Floyd Boulevard maintained the existing Floyd Boulevard connection to Chris Larsen Park Road.

Concept 4 did not advance for further development based on changes the alternative made to downtown access and accompanying operations problems at key intersections. Direct access from Gordon Drive to I-29 and Wesley Parkway was severed in the concept, forcing traffic to divert to Virginia Street or through downtown. The rerouting of this traffic tended to focus traffic on Virginia Street and severe traffic operation problems were anticipated on the intersections along Virginia Street. The concept also severed interstate connections for Floyd Boulevard, the industrial areas adjacent to Floyd Boulevard south of Gordon Drive, and the Tyson Events Center. The local stakeholders on the SMAC strongly objected to Concept 4.

Stockyards Interchange Concept

In May 2005 the City of Sioux City requested an additional interchange be formally considered that would replace the existing Floyd Boulevard Interchange and provide access to the former Stockyards area. The Stockyards area is located immediately north of I-29 and is bounded by the Floyd River on the west, Gordon Drive to the north, and South Lewis Boulevard to the east. Iowa DOT modified Concept 1 (Alternative A) and Concept 5 (Alternative B) to include a Stockyards interchange as shown on Figure 2-2, *Stockyards Interchange Concept*. The City of Sioux City conducted further analysis of the changes to the local street network associated with a Stockyards interchange and was given responsibility to acquire and clear right-of-way for the interchange. Upon completion of further study of the Stockyard interchange concepts, the City of Sioux City determined that the Stockyards interchange was not desirable because of its effects

on access from I-29 to the Hoeven Valley corridor to the north. Additionally, the City of Sioux City determined that the likely delay on constructing I-29 improvements caused by the time required to obtain and clear the necessary right-of-way was not desirable. The City of Sioux City sent a letter to the Iowa DOT on May 9, 2006 requesting that the Stockyards Interchange concept be eliminated from further consideration.

2.2.3 Transportation Options Not Considered

Metropolitan areas with populations of less than 200,000 people are not required to consider Transportation System Management (TSM), Travel Demand Management (TDM), or mass transit solutions (FHWA October 30, 1987). Since the Sioux City metro area has a population of approximately 124,000 people TSM, TDM, and mass transit alternatives were not considered as solutions for this project.

2.3 Alternatives Retained for Detailed Evaluation

In 2004 the Iowa DOT began the early planning process of improving ten miles of I-29 through Sioux City. Initially, the planning process assumed the interstate had the same safety, capacity, and traffic flow issues throughout the ten mile corridor. As the planning process continued, it became evident that areas within the ten mile corridor had different characteristics and functioned differently. As a result, the FHWA divided the project into three individual projects. The northern-most of the three projects is the I-29/Riverside Boulevard Interchange project with project limits beginning at the South Dakota border and ending approximately 0.7 miles west of the existing Hamilton Boulevard Interchange with I-29. The southern-most of the three projects is the I-29/System Interchange project with project limits beginning 0.25 miles south of the BNSF Railway Bridge to approximately 0.75 miles south of the Sergeant Bluff/Sioux Gateway Airport Interchange. Both the northern-most and the southern-most projects were classified by FHWA as Categorical Exclusions (CE) type projects. The alternatives listed below are for the project that is located in the middle of the two CE projects as described in detail in Section 1.1, *Description of Proposed Action,* and is the project study area used for this EIS document.

2.3.1 No-Build Alternative

The no-build alternative is defined as no new major construction along the I-29 corridor. It does not meet the project purpose and need, but was carried forward as a basis for comparison for the build alternatives and is required to be considered by NEPA, as implemented through 40 Code of Federal Regulations (CFR) 1502.14. Improvements implemented with the no-build alternative would be limited to short-term restoration activities (maintenance improvements) needed to ensure continued roadway pavement and the structural integrity of the bridges over the Floyd River and Bacon Creek. The design of the existing roadway, including its location, geometric features, and current capacity constraints, would remain unchanged. Under this alternative, some minor improvements at high volume ramp intersections could occur. Under the no-build alternative, it is assumed that other committed and planned improvements (as detailed in Iowa DOT multi-year programs for the Sioux City Metropolitan Area) would still be undertaken and that safety concerns identified in Section 1, *Purpose and Need*, would still remain.

2.3.2 Build Alternatives

The build alternatives (proposed alternatives) retained for detailed study represent the range of reasonable and representative alternatives that meet project purpose and need. Proposed alternatives were developed on the basis of planning and design standards discussed in Section 2.2.1, *Engineering Requirements* and based on the data presented in Section 1, *Purpose and Need*.

The initial Concepts 1, 5, and 6 (Alternatives A, B, and C, respectively) were subject to refinements as well as value engineering suggestions throughout the early project development process and emerged as the alternatives to be analyzed for environmental impacts. A summary of the three proposed alternatives follows and are shown in Figures 2-3a, b, and c, *Alternatives Carried Forward*. An evaluation of the engineering performance characteristics of the proposed alternatives is included in Section 2.4, *Evaluation of Proposed Alternatives*.

Alternative A
Alternative A includes 15 bridges and is shown in Figures 2-3a, b, c, *Alternatives Carried Forward*. A full access interchange is provided for Floyd Boulevard (northbound exit/entrance and southbound exit/entrance), which separates industrial traffic from downtown commercial traffic. The northbound entrance ramp from Floyd Boulevard and the southbound exit ramp to Floyd Boulevard are braided with ramps to and from downtown because of the short distance between interchanges.

The interchange for downtown provides access to and from Nebraska Street and Pierce Street, similar to the existing downtown interchange. Direct northbound exit access and direct southbound exit and entrance access to downtown are provided. Northbound entrance access from downtown occurs by way of a frontage road and the Wesley Parkway Interchange.

One-way frontage roads parallel I-29 on the north and south sides between Nebraska Street and Wesley Parkway. Access from Gordon Drive to Nebraska Street or Pierce Street occurs by way of connector roadways to the frontage roads. The westbound Gordon Drive connector begins at Virginia Street and merges with the north side frontage road at approximately Jackson Street. The eastbound connector diverges from the south side frontage road at about Jackson Street and crosses under I-29 to rejoin existing Gordon Drive at Virginia Street. Existing Gordon Drive serves as a local circulation street from Jennings Street to Nebraska Street.

Northbound exit and entrance ramps provide direct access to and from Wesley Parkway. Southbound access to Wesley Parkway occurs through the south side frontage road and the Hamilton Boulevard exit ramp. Southbound access from Wesley Parkway occurs through the south side frontage road and the Nebraska/Pierce Street interchange. The existing Wesley Parkway Interchange will be reconstructed as a two-level interchange.

Third Street was extended to Wesley Parkway to provide additional access from Wesley Parkway to downtown.

A full access interchange is provided for Hamilton Boulevard. The northbound exit ramp to Hamilton Boulevard and the southbound entrance ramp from Hamilton Boulevard are located on frontage roads between Wesley Parkway and Hamilton Boulevard because of short distance between interchanges.

Alternative B

Alternative B includes 13 bridges and is shown in Figures 2-3a, b, c, *Alternatives Carried Forward*. Access to Floyd Boulevard and to downtown is combined in the form of a split-diamond[4] interchange with ramps connecting from I-29 to Floyd Boulevard and Virginia Street. One-way frontage roads on both sides of I-29 provide a connection between Floyd Boulevard and Virginia Street. The south side frontage road originates at Pierce Street and crosses under I-29, providing additional access from downtown. A separate, dedicated northbound exit ramp braided over the northbound Floyd Boulevard entrance ramp provides direct northbound access to downtown at Nebraska Street.

Full access to and from Wesley Parkway is provided except for southbound access to Wesley Parkway, which occurs by way of a south side frontage road and the Hamilton Boulevard exit ramp. The existing Wesley Parkway Interchange will be reconstructed as a two-level interchange.

Gordon Drive will be shifted to the north in the vicinity of Pearl Street to accommodate the reconstructed I-29 alignment. The one way westbound connection from Gordon Drive to Wesley Parkway will be maintained.

3rd Street extends to Wesley Parkway to provide additional access from Wesley Parkway to downtown, as in Alternative A.

A full access interchange is provided for Hamilton Boulevard. North side and south side frontage roads extend from Wesley Parkway to Hamilton Boulevard and ramps to and from I-29 merge onto and diverge from the frontage roads.

Alternative C

Alternative C includes seven bridges and is shown in Figures 2-3a, b, c, *Alternatives Carried Forward*. Alternative C maintains existing interchange access at Floyd Boulevard and at Hamilton Boulevard. Access provided by the existing interchange at Nebraska Street/Pierce Street is consolidated with the Wesley Parkway interchange, with ramp access to Pearl Street, which extends to cross under I-29.

The Floyd Boulevard interchange was reconfigured as a tight diamond[5] interchange and eliminated existing ramp connections to Dace Avenue. An auxiliary lane was provided on northbound and southbound I-29 between the Floyd Boulevard interchange and the Wesley Parkway/Pearl Street interchange.

[4] Split diamond interchange ramp pairs connect to separate crossroads a short distance apart.
[5] Diamond interchange with ramp terminal intersections spaced about 250 to 400 feet apart.

The consolidated Wesley Parkway/Pearl Street Interchange was designed as a split diamond interchange along with a rebuilt two-level Wesley Parkway interchange. The Wesley Parkway and Pearl Street interchanges were connected with one-way frontage roads paralleling I-29. Both interchanges shared common I-29 entrance and exit ramps. Because of the tight spacing of the Wesley Parkway and Hamilton Boulevard interchanges, the northbound I-29 entrance ramp was grade separated ("braided") over the I-29 northbound exit ramp to Hamilton Boulevard. The southbound I-29 exit ramp to Wesley Parkway was also "braided" with the Hamilton Boulevard entrance ramp because of tight interchange spacing.

Wesley Parkway existing alignment was maintained and a two-way connection to 3rd Street was added. The Hamilton Boulevard interchange was maintained as a diamond interchange with modified ramp geometry to accommodate the "braided" ramps necessary because of the close spacing of the Hamilton Boulevard and Wesley interchanges.

2.4 Evaluation of Proposed Alternatives

As stated in Section 2.1.3, *Step 3: Refine and Evaluate Build Alternatives*, once the build alternatives had been further refined, they were reevaluated by the public, resource agencies, and the PMT. Summaries of the public, agency, and PMT meetings are described in Section 4, *Comments and Coordination*. The refined alternative evaluation considered a host of variables. These variables included:

- Design features including horizontal and vertical alignment, decision sight distance, entrance and exit ramp design
- Traffic operations and traffic simulation
- Guiding principles
- Driver expectancy
- Constructability and maintenance issues including right-of-way impacts and cost estimates
- Fulfillment of the local issues including environmental impacts

A general evaluation of the refined build alternatives, in particular focusing on the project objectives established with the purpose and need, is described in Table 2-1. A more detailed comparative evaluation of the alternatives (A, B, and C) with respect to environmental issues is included in Section 3, *Environmental Analysis*.

Table 2-1. Refined Alternative Evaluation Results

Alternative A	Alternative B	Alternative C
Design Features		
• Overall number of entrances and exits remained the same as previously described in Section 2.3.2. • Northbound and southbound downtown frontage roads tie directly to Gordon Drive at Virginia Street via connector roadways. • Downtown and Floyd Boulevard ramps cross each other (i.e., they are "braided"). • Wesley Parkway Interchange reconstructed as a two-level interchange. • Continuous northbound and southbound frontage roads from Virginia Street to Hamilton Boulevard.	• Reduced number of entrances and exits in the southbound direction results from consolidated interchange access at Floyd Boulevard and Virginia Street. • Downtown and Gordon Drive traffic focused at Gordon Drive/Virginia Street intersection. • Consolidated access mixes downtown commercial traffic with Floyd Boulevard industrial traffic on frontage road. • Adds a dedicated northbound exit ramp that provides access to downtown at Nebraska Street. • Northbound downtown exit and northbound Virginia Street on ramp cross each other (i.e., they are "braided"). • Wesley Parkway Interchange reconstructed as a two-level interchange. • Northbound and southbound frontage roads from Wesley Parkway to Hamilton Boulevard.	• Downtown access consolidated with Wesley Parkway Interchange. • Split diamond configuration for Downtown/ Wesley interchange with cross roads at Wesley and Pearl St. • Wesley Pkwy. realigned to tie directly into 3rd St. (Wesley Pkwy/3rd St Connector) • Downtown access provided by Pearl Street and Wesley Pkwy/3rd St. Connector. • Weaving between Pearl St and Floyd Boulevard interchange on I-29. • Two-level reconstruction of Wesley Parkway Interchange. • Hamilton Boulevard and Wesley ramps braided due to close interchanges.
Traffic Operations		
• LOS C or better for all areas.	• LOS D at Gordon Drive/ Virginia Street intersection.	• Lengthens weaving section on I-29 between Floyd Boulevard and downtown interchange. • Poor LOS (E in AM, F PM) at Floyd Boulevard and Dace Avenue Intersection. • Adds significant traffic to 3rd and Pearl Street intersection. • Traffic to and from Gordon Drive and US 77 must route via 3rd Street and Wesley Parkway.

Alternative A	Alternative B	Alternative C
Guiding Principles/Driver Expectancy		
• Northbound traffic exiting to Hamilton Boulevard must exit over a half mile prior to Hamilton Boulevard. • Decision sight distance to two northbound exits and one southbound exit not met due to vertical geometry. • Three entrance and five exit ramp tapers occur on horizontal curves.	• Northbound traffic exiting to Hamilton Blvd. must exit over a half mile prior to Hamilton Boulevard. • Decision sight distance for two northbound exits and one southbound exit not met due to vertical geometry. • Three entrance and five exit ramp tapers occur on horizontal curves.	• Direct, full access to I-29 provided for Hamilton Boulevard and Floyd Boulevard. • Partial access interchanges at Wesley and Pearl Street. • Northbound access to US 77 is via Pearl Street exit ramp. Southbound access to Pearl Street is via Wesley Parkway exit ramp. • No direct access between Gordon Drive and I-29. Traffic must reroute through downtown using Nebraska / Pierce, 3rd Street and Wesley / 3rd Street connector. • Braiding of ramps between Hamilton Boulevard and Wesley Parkway results in very long ramps. Northbound exit for Hamilton Boulevard and Southbound exit for Wesley Parkway occur well in advance of their interchanges. • Northbound Hamilton Boulevard exit taper located on high side superelevated curve (4% cross slope).
Constructability Issues		
• Larger differences between existing and proposed profiles make staged reconstruction relatively more difficult. • Changes in interchange access locations make interstate access to downtown during construction difficult. • Reconstruction of Wesley as two level interchange complicates maintenance of traffic on Wesley.	• Changes in interchange access locations make interstate access to downtown during construction difficult. • May require some reconstruction as part of future Gordon Drive viaduct replacement. • Reconstruction of Wesley as two level interchange complicates maintenance of traffic on Wesley.	• Reconstruction of Wesley as two level interchange complicates maintenance of traffic on Wesley.

Alternative A	Alternative B	Alternative C
Fulfillment of Local Issues		
• One way northbound frontage road in front of Tyson Events Center diminishes circulation. • Tyson Events Center parking impacted. • No impacts to parkland south of Chris Larsen Park Road. • Downtown braided ramps separate downtown commercial traffic and Floyd Boulevard industrial traffic. • Approx. 11,600 ft. of sanitary sewer impacted.	• Two-way Gordon Drive to Pearl Street perpetuates existing Tyson Events Center access. • Tyson Events Center parking impacted. • No impacts to parkland south of Chris Larsen Park Road. • Northbound downtown braided ramps separate downtown commercial traffic and Floyd Boulevard industrial traffic. • Approx. 9,000 ft. of sanitary sewer impacted.	• Northbound industrial traffic from Floyd Boulevard mixes with downtown commercial traffic in mainline weaving areas. • Tyson Events Center has two-way access to Gordon Drive, but indirect access to I-29. • No impact to parkland south of Chris Larsen Park Road. • Approx. 10,000 ft. of sanitary sewer impacted.
Source: HDR and Howard R. Green Company, *Draft Location Study Report - I-29 Sioux City Interstate Study*, August 2007.		

Figure 2-1. Initial Alternatives 2, 3, and 4

11x17 Graphic

Figure 2-2. Stockyards Interchange Concept

11x17

Figure 2-3a. Alternatives Carried Forward

11x17

Figure 2-3b. Alternatives Carried Forward

11x17

Figure 2-3c. Alternatives Carried Forward

11x17