Design Parameters to set regarding Roadway and Bridge:

Dubuque Street Elevation (north of Kimball Road intersection to Foster Road):

The Preferred Alternative for Dubuque Street as cleared during the NEPA process is a 4-lane roadway, shifted slightly west with an open, landscaped median similar in appearance to the existing condition. The minimum elevation of the roadway pavement was established at the 500+1 flood protection level over the length of the roadway between Foster Road and Kimball Road. This elevation was used in order evaluate & receive approval for the maximum possible footprint for all impacts in the Environmental Assessment Document. A Dubuque Street constructed at a lower elevation is expected to reduce direct physical impacts to adjacent properties (noise, grading, etc.) as well as to the social, environmental and cultural impacts.

The NEPA process is not meant to provide detailed project design information, but instead requires the examination and avoidance of potential impacts to the social and natural environment when considering approval of proposed transportation projects. It requires that environmental investigations, reviews and consultations be coordinated as a single process, and compliance with all applicable environmental requirements be reflected in a single document.

The maximum elevation considered, the 500–year flood elevation + 1 foot, was established because of the City's response to the 2008 Flood. Since then, City Code has been amended and now states that structures located in the floodplain must be constructed 1 foot above the 500-year flood elevation. The minimum elevation considered, the 100-year flood elevation + 1 foot, was established because the EDA funding is based on minimum improvements at this elevation. The flood protection levels that Dubuque Street, Park Road and Park Road Bridge are designed to, can be any elevation in between the 500-year and the 100-year flood events.

Factors to consider when choosing a roadway pavement elevation include:

Flood protection

Three flood protection elevations for the corridor have been considered. The 100+1 foot, the 2008+1 foot, and 500+1 foot flood protection elevations are all possible to construct. These flood protection elevations are designed to allow the roadway to stay open during the respective flood events.

In the past 20 years, Dubuque Street has been closed due to river flood events for approximately 150 days. This does not account for clean–up days after long closures or for heavy rain events. The heavy rain events occur almost every year when an inch or more of rainfall occurs in an hour and the closure typically last for a few hours. These events quickly fill the drainage areas adjacent to Dubuque Street, which in turn surcharges the storm sewers and cause water to pond on the roadway. These events fill up the creeks and smaller tributaries quickly, resulting in a storm surge on the Iowa River. The roadway can reopen when this storm surge passes and the water can drain once again. We saw both, a heavy rain event and a river flood event this year.

It is not possible to anticipate rainfall, flood events or road closures into the future. What is known is that there has been a steady increase in rainfall amounts since the 1950s and an increase in severe weather events. It is important to note that 8 of the top 20 Historical Crests on the Iowa River have occurred in the past 20 years, with 4 of the top 5 being in that time frame. Over half of the top 20 have occurred in the past 30 years.

Due to the proximity of the Park Road Bridge abutment to Dubuque Street, the elevation of the roadway between Kimball Road and Park Road is dependent on the mitigation level chosen for the bridge. The levels chosen for the roadway and for the bridge do not have to be the same. The roadway elevation will not protect Mayflower or any other structures near the road, but will maintain access during flood events. The University is completing a separate project to provide necessary flood protection for Mayflower, independent of this project.

Initial Alternatives that were not pursued include:

- An elevated roadway to allow flooding under the road, or a long bridge. This was determined to be too expensive to construct and to maintain in the future.
- Elevating either the northbound or the southbound lanes, but not both. This option does not allow for fully functioning intersections throughout the corridor. Once traffic is headed north or south, they would need to continue all the way through between Park Road and Foster Road.
- Maintaining a lower elevation on Dubuque Street and constructing a levee closer to the river. This option would include the construction of pump stations to pump 45 acres of runoff that is tributary to the corridor, and more importantly, it severely impacts the aesthetics of the corridor, blocking all views and access to the river.
- Maintaining a lower elevation on Dubuque Street that could be enhanced by removable flood walls or Hesco barriers. This option would also require pump stations to address runoff during flood events. Additionally, staff determined that there are too few “escape routes” along the corridor to allow for traffic to be maintained on the roadway with flood water flowing against the temporary barriers.

Grading impacts

The maximum possible impact footprint associated with Dubuque Street at the 500+1 year flood protection elevation was evaluated for impacts and documented in the EA. Constructing a roadway at lower flood protection elevation will reduce grading impacts. However, grading impacts will not be reduced proportionately. For example, a 25 percent reduction in roadway elevation will not likely result in a 25 percent reduction in grading impacts to trees, wetlands, streams, and parks. Much of this is due to the existing topography and the allowable slopes to tie into existing grades. Key spot elevations throughout the corridor are summarized in an attached chart for the three flood protection levels that are being considered.

Dubuque Street is a very unique transportation corridor with many historic properties, parks and University properties located along it with views of the Iowa River. During final design, staff has communicated that they will work with adjacent property owners to further reduce impacts, preserve quality trees and maintain/enhance the aesthetic qualities of the corridor. From the beginning of this project, it has been made clear that the aesthetic value of the corridor is just as important as providing a reliable transportation network.

Construction and constructability

Each of the three roadway flood protection elevations can be constructed in two construction seasons. One lane of traffic will be maintained in each direction during construction and unavoidable road closures to shift traffic and elevate intersections will be as short as possible and occur when the University is on break.

Summary of Roadway Options – Pros and Cons

There are three options that have been considered for roadway elevations on Dubuque Street from Kimball Road to Foster. Dubuque Street could be elevated to one of three levels (500+1, 2008+1, 100+1). Below is a summary of the pros and cons of each roadway option.

Dubuque Street pavement from Foster Road to Kimball Road at 500+1

Pros

- Maximizes ability to keep Dubuque Street open during Iowa River flooding. Dubuque Street would have been fully functional during the 2008 Flood.
- Reduces impacts to Dubuque Street due to localized heavy rain events.
- Allows the Army Corps of Engineers to release water from the Coralville Reservoir at their maximum amount of 20,000 cfs.

Cons

- Most expensive roadway elevation option.
- Most difficult to construct and maintain traffic, but it can still be done.
- Maximum potential grading impacts along Dubuque Street from Foster Road to Kimball Road.

Dubuque Street pavement from Foster Road to Kimball Road at 2008+1

Pros

- Reduces impacts to Dubuque Street due to localized heavy rain events.
- Increases the ability to keep Dubuque Street open during Iowa River flooding. Dubuque Street would have likely remained open during the 2008 Flood.
- Allows the Army Corps of Engineers to release water from the Coralville Reservoir at their maximum amount of 20,000 cfs.
- Reduces potential grading impacts along Dubuque Street from Foster Road to Kimball Road.
- Costs for earthen fill are reduced.

Cons

- Dubuque Street & sidewalks will be submerged and the transportation network impacted during a 500-year flood event.
- Preparation would have been underway to prepare for the road to close during the 2008 flood.

Dubuque Street pavement from Foster Road to Kimball Road at 100+1

Pros

- Reduces impacts to Dubuque Street due to localized heavy rain events.
- Allows the Army Corps of Engineers to release water from the Coralville Reservoir at their maximum amount or 20,000 cfs.
- Increases the ability to keep Dubuque Street open during Iowa River Flooding. Dubuque Street would have remained open for all but 6 days + clean up time during the 2008 Flood.
- Least costly option for elevating Dubuque Street roadway.
- Reduces potential grading impacts along Dubuque Street from Foster Road to Kimball Road.

Cons

- Offers least amount of protection of roadway elevation options during high water events.
- Dubuque Street & sidewalks will be submerged and the transportation network impacted during anything larger than the 100 – year event.
- Roadway would have been submerged for 6 days + clean up time during the 2008 Flood.

The "Do Nothing" Alternative, Dubuque Street and Park Roads at their current elevations

Pros

- No grading impacts along Dubuque Street from Foster Road to Kimball Road.

Cons

- Continued roadway closures due to river flooding and heavy rain events that disrupt the transportation network of Iowa City. Access to Terrell Mill Park, Beckwith Boathouse, private residences, Mayflower Residence Hall, apartments and a fraternity is lost, emergency response times are negatively impacted, and the Iowa River Trail, used for recreation and commuting is inaccessible.
- Due to aging infrastructure throughout the corridor, significant work is required and improvements have not been made in anticipation of the Gateway project. Whether or not the roadway is elevated, the corridor will still be impacted for two construction seasons to complete the improvements, resulting in traffic delays and lane restrictions. These improvements include:
    - Park Road Bridge was constructed in 1959, was re-decked in 1975 and at a minimum requires another new bridge deck. Based on the age of the bridge and numerous other maintenance and safety concerns, staff recommends construction of a new Park Road Bridge.
    - The Park Road 3rd lane Improvement project
    - A right hand turn lane from southbound Dubuque Street to westbound Park Road is warranted by MPOJC
    - The North River Corridor Trunk Sewer Reconstruction Project
    - Aging water main, storm sewer, street lighting and overhead utilities require upgrades for increased efficiency and capacity.
    - Dubuque Street pavement between Park Road and Foster Road is 30+ years old and requires replacement.

Park Road Bridge:

The Preferred Alternative for Park Road Bridge that was evaluated and cleared during the NEPA process is a 3-pier, 4-span, 450-foot long, 85-foot wide (5-travel lanes with 2-10 foot wide multiuse paths) steel girder bridge. The minimum elevation of the low steel (lowest point of the underside) of the bridge was set at the 500-year flood elevation +1 foot. This bridge concept represents the maximum environmental impact scenario, but also maximizes the availability of Dubuque Street, Park Road, the Park Road Bridge and reduces backwater created by the bridge during flood events.

However, it is possible to design and construct multiple bridge "structural types" at varying flood protection levels and still meet the Purpose and Need for the project. The City has evaluated multiple bridge types and have concluded that a traditional steel girder bridge or a deck arch bridge are feasible bridge types at this location based on cost, constructability, and potential aesthetic impacts.

A brief description of factors to consider when choosing a bridge type and "low steel" flood protection elevation:

Cost

A Deck Girder bridge is the least costly 4-span bridge that can be constructed at this location at the 500+1 foot flood protection level. The higher the "low steel" elevation of a deck girder bridge, the lower the cost of the bridge itself. A lower deck girder bridge becomes more costly due to the increased probability of the bridge of having to withstand greater amounts of water pushing against the bridge during a flood.

A Deck Arch is approximately $2.5 to $3 million more expensive than a Deck Girder bridge. Costs for a Deck Arch generally do not fluctuate based on its "low steel" elevation and the flood surface elevation it is designed to protect to.

A Cable Stayed Bridge offers the thinnest bridge deck profile and a striking appearance, but is approximately $12 million more expensive than a Deck Girder bridge to construct with additional yearly maintenance expenses. Due to cost, this bridge is not being considered for final design.

Low Steel Elevation/Flood Surface Elevation Protection

Three bridge low steel flood surface elevations (or "levels of flood protection") were evaluated:

- 100-year flood surface elevation plus 1-foot ("100+1"),
- 2008 flood level (as measured during the 2008 flood) plus 1-foot ("2008+1"), and
- 500-year flood surface elevation plus 1-foot ("500+1").

Backwater reduction

Virtually any new Park Road Bridge that is constructed higher and with fewer piers in the Iowa River will reduce (but not completely eliminate) the amount of backwater created by the existing Park Road Bridge during flood conditions. To completely eliminate backwater produced during a flood, it would require removing the Park Road Bridge permanently. In general, the higher the "low steel" of the bridge, the more backwater reduction one can expect. Based on preliminary hydraulic analyses, a deck girder bridge is slightly more effective at reducing backwater than a deck arch bridge. A deck girder could achieve approximately 1.5 more inches in backwater reduction immediately upstream of the bridge compared to a deck arch bridge when both are constructed with low-steel elevations at the 500+1 elevation. This is due to the deck girder

having fewer structural elements (piers, arch elements) impeding water flow and catching debris. A Condition Comparison for Backwater has been included and will be discussed further during the Work Session on September 17.

Grading impacts to private property and trees

The higher the low steel elevation of the bridge, the higher the Dubuque Street pavement elevation will need to be in order to meet the deck of the bridge. Based on preliminary design completed for the EA, if the low steel of a deck girder bridge is constructed at the 500+1 flood protection elevation, the Dubuque Street and Park Road intersection will need to be elevated approximately eight to ten feet above existing pavement. The same is true for the section of Dubuque Street traveling northward to the Kimball Road intersection.

This will result in grading impacts to adjacent private properties and the potential loss of shrubbery, young trees, and minor amounts of mature trees adjacent to Dubuque Street. Tree loss will be mitigated as part of the final landscape plan for the project. Options for reducing grading impacts at Dubuque Street and Park Road include using lower "low steel" flood protection elevations on the bridge, or constructing a deck arch bridge that has a thinner deck profile, reducing elevations at Dubuque Street and Park Road intersection by approximately 2-3 feet in comparison to a deck girder bridge.

Summary of Bridge Options – Pros and Cons

There are currently five bridge options to consider: a deck girder bridge at one of three elevations (500+1, 2008+1, 100+1), and a deck arch bridge at one of two elevations (500+1 and 2008+1). Below is a summary of the pros and cons of each bridge option.

Deck Girder Bridge at 500+1 elevation

Pros

- Minimizes Park Road and Park Road Bridge closures due to high water events in comparison to all other bridge options. It will allow the 500-year event and most debris to pass under the bridge.
- Reduces backwater during a 2008 comparable flood by approximately 9-12 inches
- Potentially least expensive deck girder option

Cons

- Requires elevation of new Dubuque Street / Park Road intersection by approximately 8-10 feet.
- Maximum potential grading impacts along Dubuque Street (south of Kimball) and Park Road.

Deck Girder Bridge at 2008+1

Pros

- Likely would have allowed Park Road Bridge to remain open during the 2008 flood and allowed most debris to pass under the bridge.
- Reduces backwater during a 2008 comparable flood by approximately 9-12 inches

- Reduces potential grading impacts along Dubuque Street (south of Kimball) and Park Road

Cons

- Requires elevation of new Dubuque Street / Park Road intersection by approximately 5-7 feet.

Deck Girder Bridge at 100+1

Pros

- Reduces backwater during a 2008 comparable flood by approximately 6-8 inches.
- Further reduces potential grading impacts along Dubuque Street (south of Kimball) and Park Road.

Cons

- Requires elevation of new Dubuque Street / Park Road intersection by approximately 2-4 feet.
- Increases likelihood of bridge and Park Road closures due to high water and debris being caught on the bridge.
- Cost for bridge may increase in comparison to other deck girder options due to need to design for greater forces and loads caused by high water and debris.

Deck Arch Bridge at 500+1

Pros

- Minimizes Park Road and Park Road Bridge closures due to high water events.
- Reduces backwater during a 2008 comparable flood by approximately 8-10 inches.
- Bridge type is more aesthetically pleasing compared to deck girder.
- In comparison to 500+1 deck girder bridge, potential grading impacts are reduced along Dubuque Street (south of Kimball) and Park Road by up to 3 feet.

Cons

- Requires elevation of new Dubuque Street / Park Road intersection by approximately 6-8 feet.
- Bridge type will cost approximately $2.5 to $3 Million more than a deck girder bridge.

Deck Arch Bridge at 2008+1

Pros

- Likely would have allowed Park Road Bridge to remain open during 2008 flood and allowed most debris to pass under the bridge.
- Reduces backwater during a 2008 comparable flood by approximately 8-10 inches.
- Reduces potential grading impacts along Dubuque Street (south of Kimball) and Park Road.

Cons

- Requires elevation of new Dubuque Street / Park Road intersection by approximately 4-6 feet.
- Bridge type will cost approximately $2.5 to $3 Million more than deck girder.

Deck Arch Bridge at 100+1

At this elevation, the “arch” disappears and the bridge essentially becomes the Deck Girder Arch.

Sidewalks

A 10’ Multi-use path, the Iowa River Trail, will be elevated with Dubuque Street on the west side, along the river. Placing this trail at a lower elevation, closer to the river has been discussed. This option may be explored briefly during final design to determine if it is feasible and at what elevation.

A split-grade crossing will be provided at the west abutment of the bridge, allowing trail users to cross under the bridge from the new Hancher Auditorium site to Lower City Park. A cross-walk will also be provided for use during flood events and trail closures. Consideration will be given during design of the east abutment at the Dubuque Street and Park Road intersection for a cantilevered trail to be added under the bridge in the future.

An 8’ wide sidewalk will be provided from Brown Street, north to Foster Road. Although this does result in additional impact and grading to adjacent properties, it was the most repeated request heard at the first two public meetings. The Dubuque Street corridor has the highest pedestrian and bike usage along the Iowa River Trail and would allow for both forms of travel to utilize the east and west side of the roadway. This walk would reduce the number of mid-block crossings in front of Mayflower and provide much needed connectivity for the Northside Neighborhood to City Park, Terrell Mill Park and locations north.

Flood Stages for the Iowa River at Iowa City

8.94 ft = Current Stage at 139 cfs
15.75 = “Normal” Stage at 6,000 cfs

21.0 ft = Action Stage & full closure of Dubuque St. at 12,300 cfs
22.0 ft = Flood Stage
23.0 ft = Moderate Flood Stage
25.0 ft = Major Flood Stage

50-year Flood = 23,820 cfs, 26.5 ft
100-year Flood = 31,010 cfs, 29 ft
2008 Flood = 41,100 cfs, 31.53 ft
500-year Flood = 45,260 cfs, 32.5 ft

Historical Crests for Iowa River at Iowa City

(1) 31.53 ft on 06/15/2008 – 35 days above 12,000 cfs, 6 over 31,000 cfs (100-year)

(2) 28.52 ft on 08/10/1993 – 83 days above12,000 cfs, 0 over 31,000 cfs (100-year)

(3) 24.89 ft on 06/06/2013 – 16 days above 12,000 cfs

(4) 24.10 ft on 06/01/1851

(5) 23.35 ft on 06/13/1991 – 17 days above 12,000 cfs

(6) 22.44 ft on 06/09/1974

(7) 22.04 ft on 05/01/1973

(8) 21.64 ft on 03/29/1979

(9) 21.50 ft on 03/04/1985

(10) 21.50 ft on 04/09/1975

(11) 21.44 ft on 06/15/1982

(12) 21.22 ft on 06/30/1986

(13) 21.10 ft on 07/17/1881 *Full Dubuque Street closure at 21.0 ft

(14) 20.91 ft on 02/21/1997

(15) 20.72 ft on 04/26/1983

(16) 20.68 ft on 03/01/1984

(17) 20.53 ft on 03/20/2001 *Northbound lanes close at 20.5 ft

(18) 20.36 ft on 04/09/1998

(19) 20.34 ft on 03/26/1978

(20) 20.31 ft on 07/13/2010

Key Spot Elevations		Roadway Elevations					
		500+1 Elevation		2008+1 Elevation		100+1 Elevation	
Cross Street	Existing	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.
Foster Road	659.84	659.84	0.00	659.84	0.00	659.84	0.00
Taft Speedway (old)	646.60	661.10	14.50	658.72	12.12	655.21	8.61
Mayflower Driveway	647.00	658.40	11.40	656.02	9.02	652.51	5.51
Kimball Road	645.63	658.13	12.50	655.75	10.12	652.24	6.61

Key Spot Elevations		Deck Arch Bridge											
		Bridge at 500+1						Bridge at 2008+1				Bridge at 100+1	
		500+1 Elevation		2008+1 Elevation		100+1 Elevation		2008+1 Elevation		100+1 Elevation		All 100+1 Elevation	
Cross Street	Existing	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.
Kimball Road	645.63	658.13	12.50	655.75	10.12	652.24	6.61	655.75	10.12	652.24	6.61	652.24	6.61
Park Road (old)	653.30	663.76	10.46	662.97	9.67	661.80	8.50	661.38	8.08	659.63	6.33	657.87	4.57
Park Road (new)	656.87	664.03	7.16	664.03	7.16	664.03	7.16	661.65	4.78	661.65	4.78	658.14	1.27
Brown St.	676.20	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60
Lower City Park Ent. (	653.75	656.50	2.75	654.50	0.75	654.50	0.75	654.50	0.75	654.50	0.75	654.50	0.75
West Hancher Ent.	674.75	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35
Riverside Drive	702.33	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00

Key Spot Elevations		Deck Girder Bridge											
		Bridge at 500+1						Bridge at 2008+1				Bridge at 100+1	
		500+1 Elevation		2008+1 Elevation		100+1 Elevation		2008+1 Elevation		100+1 Elevation		All 100+1 Elevation	
Cross Street	Existing	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.	Elevation	Diff.
Kimball Road	645.63	658.13	12.50	655.75	10.12	652.24	6.61	655.75	10.12	652.24	6.61	652.24	6.61
Park Road (old)	653.30	664.26	10.96	663.47	10.17	662.30	9.00	661.88	8.58	660.13	6.83	658.37	5.07
Park Road (new)	656.87	665.03	8.16	665.03	8.16	665.03	8.16	662.65	5.78	662.65	5.78	659.14	2.27
Brown St.	676.20	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60	675.60	-0.60
Lower City Park Ent. (	653.75	656.50	2.75	654.50	0.75	654.50	0.75	654.50	0.75	654.50	0.75	654.50	0.75
West Hancher Ent.	674.75	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35	675.10	0.35
Riverside Drive	702.33	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00	702.33	0.00

Iowa City Gateway Preliminary Cost Estimate

	Deck Arch Bridge						Deck Girder Bridge					
Category	500+1 Elevation*	2008+1 Elevation*	100+1 Elevation*	All 2008+1 Elevation	2008+1 Bridge & 100+1 Road	All 100+1 Elevation	500+1 Elevation*	2008+1 Elevation*	100+1 Elevation*	All 2008+1 Elevation	2008+1 Bridge & 100+1 Road	All 100+1 Elevation
Pavement & Base	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000	$4,660,000
Lighting and Signals	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000	$820,000
Structure	$14,550,000	$14,150,000	$13,570,000	$13,940,000	$13,490,000	$13,060,000	$11,950,000	$11,550,000	$11,430,000	$11,340,000	$10,890,000	$10,450,000
Grading & Drainage	$3,520,000	$2,890,000	$2,120,000	$2,870,000	$2,040,000	$1,910,000	$3,520,000	$2,890,000	$2,120,000	$2,870,000	$2,040,000	$1,910,000
Right of Way Acquisition	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000	$2,630,000
Pavement Marking	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000	$240,000
Aesthetics	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000	$980,000
Miscellaneous Costs	$12,580,000	$12,290,000	$11,920,000	$12,230,000	$11,870,000	$11,710,000	$11,850,000	$11,570,000	$11,320,000	$11,500,000	$11,150,000	$10,980,000
TOTAL	**$39,980,000**	**$38,660,000**	**$36,940,000**	**$38,370,000**	**$36,730,000**	**$36,010,000**	**$36,650,000**	**$35,340,000**	**$34,200,000**	**$35,040,000**	**$33,410,000**	**$32,670,000**

* Park Road and the Park Road Bridge are always assumed to be constructed based on the 500+1 elevation.

Assumptions:

500+1 Elevation	All pavement is elevated based upon the 500+1 Elevation. Roadway layout matches the preferred alternative.
2008+1 Elevation	All pavement north of Park Road is elevated based upon the 2008+1 Elevation. All other pavement is based upon the 500+1 Elevation. The roadway layout matches the preferred alternative.
100+1 Elevation	All pavement north of Park Road is elevated based upon the 100+1 Elevation. All other pavement is based upon the 500+1 Elevation. The roadway layout matches the preferred alternative.
All 2008+1 Elevation	All pavement is elevated based upon the 2008+1 Elevation. Roadway layout matches the preferred alternative.
2008+1 Bridge & 100+1 Road	All pavement north of Park Road is elevated based upon the 100+1 Elevation. All other pavement is based upon the 2008+1 Elevation. The roadway layout matches the preferred alternative.
All 100+1 Elevation	All pavement is elevated based upon the 100+1 Elevation. Roadway layout matches the preferred alternative.

Iowa River and Park Road Bridge
Condition Comparisons (using the 100yr or lesser flow Ayers HEC-RAS model)
By: John Blancett, PE - HNTB

	50yr		100yr		2008		500yr		Comments
Flowrate (cfs)	22,000		29,000		41,800		45,000		
Existing Conditions									
Water Surface Elevation									
at Parkview Terrace / City Park	648.92		651.32		655.31		656.68		xsec 31345
at Taft Speedway / Idyllwild	648.56		651.17		655.35		656.74		xsec 29763
at Mayflower	648.34		651.04		655.29		656.69		xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.08		650.83		655.17		656.58		xsec 27226
Immediately Upstream of Bridge	647.82		650.46		654.86		656.32		xsec 26494
Immediately Downstream of Bridge	647.69		650.22		653.97		655.57		xsec 26352
Water Surface Elevations used for setting Apex of Bridge underside	647.82		650.73		653.98		655.56		from Mark Pierson's 9/3 Email
Difference with Immediately Downstream of the Bridge	0.13		0.51		0.01		-0.01		xsec 26352
Proposed Conditions		Difference Prop vs Ex (inches)		Difference Prop vs Ex (inches)		Difference Prop vs Ex (inches)		Difference Prop vs Ex (inches)	
Deck Arch (Apex at 100yr +1ft)	651.73								
at Parkview Terrace / City Park	648.93	0.1	651.27	-0.6	655.01	-3.6	656.50	-2.2	xsec 31345
at Taft Speedway / Idyllwild	648.58	0.2	651.11	-0.7	655.05	-3.6	656.56	-2.2	xsec 29763
at Mayflower	648.35	0.1	650.97	-0.8	654.97	-3.8	656.49	-2.4	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.10	0.2	650.76	-0.8	654.75	-5.0	656.30	-3.4	xsec 27226
Immediately Upstream of Bridge	647.84	0.2	650.43	-0.4	654.31	-6.6	655.87	-5.4	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Arch)	636.73								
Deck Arch (Apex at 2008 +1ft)	654.98								
at Parkview Terrace / City Park	648.90	-0.2	651.22	-1.2	654.89	-5.0	656.44	-2.9	xsec 31345
at Taft Speedway / Idyllwild	648.54	-0.2	651.05	-1.4	654.92	-5.2	656.50	-2.9	xsec 29763
at Mayflower	648.31	-0.4	650.91	-1.6	654.84	-5.4	656.43	-3.1	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.05	-0.4	650.69	-1.7	654.62	-6.6	656.23	-4.2	xsec 27226
Immediately Upstream of Bridge	647.80	-0.2	650.36	-1.2	654.17	-8.3	655.80	-6.2	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Arch)	639.98								
Deck Arch (Apex at 500yr +1ft)	656.56								
at Parkview Terrace / City Park	648.90	-0.2	651.20	-1.4	654.85	-5.5	656.38	-3.6	xsec 31345
at Taft Speedway / Idyllwild	648.54	-0.2	651.04	-1.6	654.88	-5.6	656.44	-3.6	xsec 29763
at Mayflower	648.30	-0.5	650.89	-1.8	654.80	-5.9	656.37	-3.8	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.04	-0.5	650.67	-1.9	654.57	-7.2	656.17	-4.9	xsec 27226
Immediately Upstream of Bridge	647.79	-0.4	650.34	-1.4	654.13	-8.8	655.74	-7.0	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Arch)	641.56								
Haunched Girder (Apex at 100yr +1ft)	651.73								
at Parkview Terrace / City Park	648.87	-0.6	651.17	-1.8	655.03	-3.4	656.68	0.0	xsec 31345
at Taft Speedway / Idyllwild	648.50	-0.7	651.00	-2.0	655.07	-3.4	656.74	0.0	xsec 29763
at Mayflower	648.26	-1.0	650.85	-2.3	654.99	-3.6	656.68	-0.1	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.00	-1.0	650.63	-2.4	654.77	-4.8	656.49	-1.1	xsec 27226
Immediately Upstream of Bridge	647.74	-1.0	650.29	-2.0	654.34	-6.2	656.07	-3.0	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Haunch)	636.73								
Haunched Girder (Apex at 2008 +1ft)	654.98								
at Parkview Terrace / City Park	648.87	-0.6	651.15	-2.0	654.76	-6.6	656.36	-3.8	xsec 31345
at Taft Speedway / Idyllwild	648.50	-0.7	650.98	-2.3	654.80	-6.6	656.42	-3.8	xsec 29763
at Mayflower	648.26	-1.0	650.83	-2.5	654.71	-7.0	656.35	-4.1	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.00	-1.0	650.61	-2.6	654.48	-8.3	656.15	-5.2	xsec 27226
Immediately Upstream of Bridge	647.74	-1.0	650.27	-2.3	654.03	-10.0	655.72	-7.2	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Haunch)	639.98								
Haunched Girder (Apex at 500yr +1ft)	656.56								
at Parkview Terrace / City Park	648.87	-0.6	651.15	-2.0	654.74	-6.8	656.26	-5.0	xsec 31345
at Taft Speedway / Idyllwild	648.50	-0.7	650.98	-2.3	654.77	-7.0	656.32	-5.0	xsec 29763
at Mayflower	648.26	-1.0	650.83	-2.5	654.68	-7.3	656.25	-5.3	xsec 27911
at Backwater Cross-section (~20fft upstream of Kimball)	648.00	-1.0	650.61	-2.6	654.45	-8.6	656.05	-6.4	xsec 27226
Immediately Upstream of Bridge	647.74	-1.0	650.27	-2.3	654.00	-10.3	655.61	-8.5	xsec 26494
Immediately Downstream of Bridge	647.71	0.2	650.24	0.2	653.96	-0.1	655.54	-0.4	xsec 26352
Top of Pier (Bottom of Haunch)	641.56								

Notes:
"2008" condition is based on that flowrate, not the cofferdam or HESCO's in place
xsec 26352 (immediately downstream of bridge) tenths of inches of "rise" in water surface is a common modeling anomaly that not a concern, because subcritical impediments propagate upstream, not downstream

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