



June 18, 2018

Mr. Dylan Mullenix
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Re: Downtown Des Moines Water Trails Engineering Study

Dear Mr. Mullenix:

Attached please find the Assessment Document for the Downtown Des Moines Water Trails Engineering Study (Study). The McLaughlin Whitewater Design Group (MWDG) has partnered with RDG and HDR to build upon the Greater Des Moines and Water Trails Plan to complete a conceptual design for the entire downtown study area with a series of presentations, technical memos, reports, and illustrations. The enclosed Assessment Document and Appendices provide an organized compilation of the Study's results.

A CD has been provided to distribute the electronic data collected for this Study.

Please do not hesitate to contact Layton at 303-353-3676 with any questions or for additional information. We look forward to hearing your comments and feedback on the enclosed items. We appreciate the opportunity to assist you with this project.

Sincerely,

McLaughlin Whitewater Design Group
A Division of Merrick & Company

Richard E. McLaughlin, PE
Project Engineer

Layton R. Bodkins, PE
Assistant Project Manager

Enclosure: Assessment Document
Appendices
CD



Downtown Des Moines Water Trails Engineering Study

Workshop #4
December 19, 2017



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1.0 EXECUTIVE SUMMARY

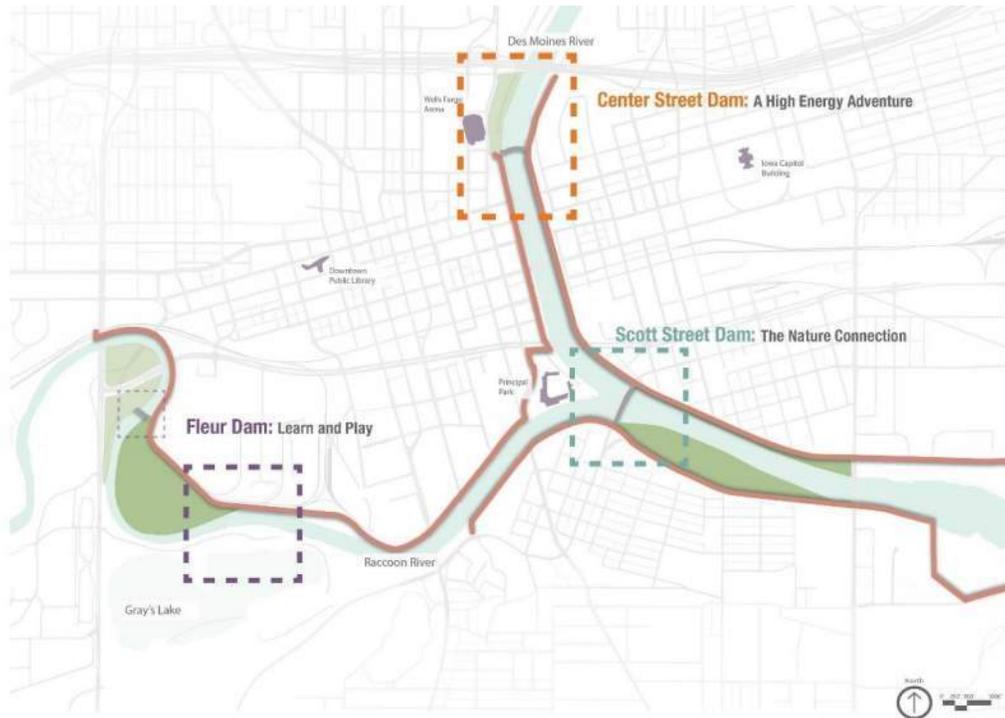


Figure 1. Context Map

The project study area extends along the Des Moines River from I-235 to SE 14th Street and the Raccoon River from Water Works Park to Scott Avenue within the City of Des Moines. The purpose of the Water Trails Engineering Study for Downtown Des Moines (Study) is to assess the feasibility of the Downtown Des Moines River Section objectives found in the Greater Des Moines and Water Trails Plan.

As part of the study, the design team collected feedback from the public, stakeholders, and the Water Trails Advisory Committee to develop three alternatives at each dam site for a total of nine alternatives. After comparison of opportunities, challenges, and preliminary budgets, one alternative at each site was selected by the Water Trails Advisory Committee. The selected three alternatives have been refined further and are detailed in this document. The Appendices within this document include illustrations, presentation slides, technical memos, and reports completed as part of the Study.

2.0 SUMMARY OF WORKSHOPS AND STAKEHOLDERS SESSIONS

The workshops and stakeholder sessions are summarized below. Presentation slides, summaries, and technical memorandums are provided in the Appendices.

WORKSHOP #1 – July 13 & July 18, 2017 – Project Background

Workshop #1 reviewed the project schedule and inventory data and collected project feedback from stakeholders. General project constraints and required background information were also discussed throughout the two-part meeting. Consideration of the ongoing Des Moines levee improvements project

Downtown Des Moines Water Trails Engineering Study

led to the consensus that the alternatives for the Study may not impact existing flood elevations and alternatives that raise flood elevations will be dropped from consideration.

WORKSHOP #2 – September 20, 2017 – Review Concept Alternatives

Workshop #2 identified the project areas opportunities and challenges with the stakeholders. Three alternatives were presented at each dam site for a total of 9 alternatives. A context map of the river corridor study area was provided illustrating opportunities and constraints. The team developed visual listening tools, matrix of concept feasibility and discussion guides for stakeholder input to enable development of concept alternatives for use in Workshops #3 and #4.

WORKSHOP #3 – October 19, 2017 – Review Final Alternatives

Workshop #3 engaged public input with the Dam Debate III, hosted by the Des Moines Register, and was followed by a debrief with the stakeholders. The presentation reviewed findings for the possible recreation scenarios at each dam site. Comments and feedback from the public and stakeholders were collected. A clear preference was shown for national to international interest active whitewater recreation at Center Street and regional to national interest active whitewater recreation at Scott and Fleur Dam sites.

WORKSHOP #4 – December 19, 2017 – Select Final Alternatives

Workshop #4 reviewed the remaining identified alternatives at each dam and presented budget ranges and vision for each alternative. Alternative One (dam removal and replacement) was selected at each site and will be further refined as part of the study.

WORKSHOP #5 – January 24, 2017 – Present Draft Study

Workshop #5 presented a draft version of the final presentation and collected comments and feedback from the stakeholders. Stakeholders were invited to write questions or concerns on a sticky note and place them on the site concept design posters. Following the meeting, the design team created a Q&A document to capture these questions and comments and document them for future discussion, planning, and design of the project.

FINAL PRESENTATION – June 21, 2018 – Present Final Study

The final presentation facilitated a public presentation with the MPO and answered public questions. The goal of the final steering committee meeting is to reach consensus and formally approve the Study.

STAKEHOLDER SESSIONS

The following organizations were contacted at various points throughout the Study to collect feedback and comments on the conceptual design.

- Des Moines Area MPO
- Des Moines Water Works
- City of Des Moines: Public Works, Community Development, Economic Development, Engineering, Police, Fire, Parks & Recreation
- IDNR
- ISG
- California Skateparks

- Iowa Rivers Revival

RDG and the Des Moines Area MPO hosted an environmental roundtable to address ecological functions of the downtown Des Moines River Water Trail. The discussion included habitat/ecological restoration; sustainable rivers stakeholder issues; obstacles/opportunities; and measuring success and early warnings. Meeting Minutes have been included in [D.2 Environmental Roundtable Summary](#).

RDG attended City Council meetings and regional open houses discussing the concepts and feasibility of the recommended Water Trails projects throughout the region. Their attendance helped educate the objectives and opportunities of the Regional Study's Downtown Water Trails segment.

The design team supported the Des Moines Area MPO and Water Trails Advisory Committee on two field trips to promote the economic, ecological and recreational potential for the downtown Des Moines and Raccoon River developments. The trips to Boise, ID and Columbus, GA provided examples of dam modification projects within urban areas, both designed by MWDG. Pictures of the field trip can be found in the Workshop #2 presentation slides.

3.0 REFINED CONCEPT ALTERNATIVES

Additional perspectives of the refined concepts can be found in [A.1 Perspective Renderings](#).



Figure 2. Center Street Alternative 1 – Dam Removal and Replacement

Center Street Dam is a high energy adventure park with a series of 4 drop crests. The most upstream drop includes flashboards and waveshapers for maintaining the upstream target pool elevation and providing flood conveyance. Each drop crest has several parallel recreational features and a fish passage.



Figure 3. Scott Avenue Alternative 1 – Dam modification and replacement

Scott Avenue Dam provides a connection to nature and includes a series of 2 drop crests. Each drop crest has several recreational features and a fish passage.



Figure 4. Fleur Dam Alternative 1 – Dam modification and replacement

Fleur Drive Dam serves as a site to learn and play with a series of 2 drop crests and a recreational bypass. The most upstream drop includes flashboards and waveshapers for maintaining the upstream target pool elevation and providing flood conveyance. The bypass offers a less active recreational experience and fish passage.

4.0 COMPARATIVE BUDGETS

General geometries, areas and elevations of recreational improvements aided in the completion of the comparative budgets. However, significant hydraulic modeling, physical model studies, analysis and design are required to refine the proposed improvements to allow more accurate cost estimating. The numbers shown in this memorandum are for preliminary budget purposes only and are based on the current project as of January 2018, prior to completion of a preliminary design

The budgets prepared for this memo are considered a Class 5 estimate as defined by the Association for the Advancement of Cost Engineering International (AACEI). They are based on our knowledge of similar projects and professional judgment, rather than detailed quantities and analysis of project components that are not fully developed at this stage. Typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side, depending on complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. We've determined the accuracy range for this estimate to be -30% to +30%. Refer to the Workshop #4 technical memo found in [C.4](#) for further information on the development of the budget numbers. A completed Funding Matrix is found in [A.2](#).

Table 1. Center Street Dam Preliminary Budget

Item	Budget (Prices shown in millions)
Dewatering	\$1.5
General Construction	\$1.5
Recreational Drops	\$18
Utility Relocation	\$1
In-River Contingencies	\$12.5
Upland Amenities	\$5.5 – 22
Total	\$40 – 56.5

Table 2. Scott Avenue Dam Preliminary Budget

Item	Budget (Prices shown in millions)
Dewatering	\$1
General Construction	\$1
Recreational Drops	\$8
Utility Relocation	\$0.5
In-River Contingencies	\$6
Upland Amenities	\$3 – 5
Total	\$19.5 - 21.5

Table 3. Fleur Drive Dam Preliminary Budget

Item	Budget (Prices shown in millions)
Dewatering	\$1
General Construction	\$1
Recreational Drops and Bypass	\$12
Levee Mitigation	\$1
Utility Relocation	\$0.8
In-River Contingencies	\$9.2
Upland Amenities	\$3
Total	\$28

5.0 PROJECT PLAN AND TIMELINE

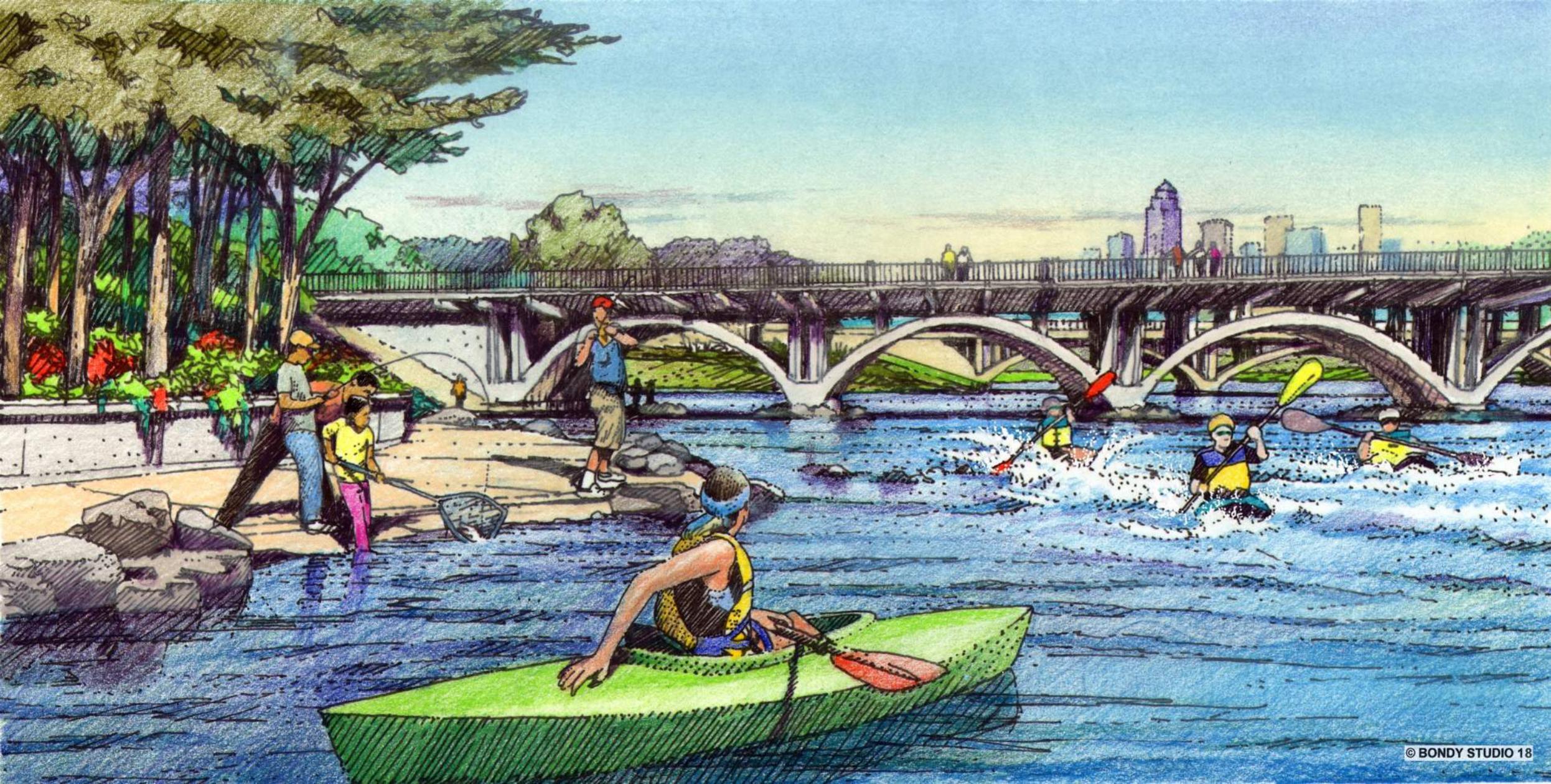
Durations provided below are based on an expeditious schedule. The following schedule can be applied to the entire project area or an individual dam location. See [A.3 Project Schedule](#) for a graphic of the expeditious project schedule.

- I. **Initial Funding and Scope Development.** Stakeholders to decide on going forth and organizing design funds and contracts. Estimated duration: 10 months.
- II. **30% Preliminary Design.** Develop design to a 30-percent level for permitting, budgeting, and funding. Gather detailed base information for the selected site: topographic and bathymetric survey/mapping, ownership, permitting delineations (as necessary) Water of the US/wetlands, available pertinent documents (past design drawings, permits, maintenance records, existing infrastructure details, etc.). Design drawings, quantities, engineer's opinion of costs, and basis of design documentation. Estimated duration: 12 months.
- III. **Preliminary Permitting Reviews.** Submit permit applications & conduct consultations. Likely permits include CWA Section 404 and Section 408 (USACE), Floodplain development, NEPA, EIS, stormwater discharge, construction dewatering. Estimated duration: 6 months.
- IV. **Authorization by Project Sponsors to Proceed.** Sponsors expected to be the City of Des Moines, Des Moines Area MPO, and the Water Trails Advisory Committee. Estimated duration: 3 months.
- V. **Final Design.** Final documents needed for bidding and construction. Include Contract Documents—bid documents, specification, technical specifications, and drawings. Estimated duration: 18 months.
- VI. **Permitting.** Permitting to begin at approximately 60% Design completion. Refer to [B.4](#) for the Jurisdictional Coordination and Permitting Plan. Estimated duration: 18 months.
- VII. **Bid Phase.** Acquire contractor bids, select contractor. Estimated duration: 2 months.
- VIII. **Construction Phase.** Build the designed project. inspection, contract administration. Estimated duration: 24 months.
- IX. **Start-up and Tuning.** Observation of built project, refinement to optimize recreation and safety performance. Estimated duration: 6 months.
- X. **Operations and Maintenance.** Long-term management to maintain facilities, safety, recreational performance. Varies with the quality of the design and construction. Estimated duration: Ongoing.

A.1 – PERSPECTIVE RENDERINGS







A.2 – FUNDING MATRIX

Description	Program Element	Possible Uses	Deadline	Available Funds	Required Match
Federal Transportation Enhancement Program; IDOT through Regional Planning Affiliate (RPA)					
Funding for enhancement or preservation activities of transportation related projects.	T, L, O, W	The following projects are funded: facilities for pedestrians and bicyclists; safety and educational activities for pedestrians and bicyclists; scenic or historic highway programs; acquisition of scenic or historic sites; landscaping and scenic beautification; historic preservation; rehabilitation and operation of historic transportation facilities; preservation of abandoned railway corridors; control and removal or outdoor advertising; archaeological planning and research; mitigation of water pollution due to highway runoff; or transportation museums.	Typically October 1 for statewide applications; MPO can advise on deadline updates.	Dependent on allocation as part of reauthorization of MAP-21. Funding had historically been \$4.5 million annually statewide. Funds available vary by region.	Varies by region; contact MPO
Recreational Trails Program (Federal)					
Funding for creation and maintenance of motorized and non-motorized recreational trails and trail related projects.	T	Recreational trail extension.	Typically October 1	Varies each year	20%
Recreational Trails Program (State); IDOT					
Funding for public recreational trails.	T	Trail projects that are part of a local, area-wide, regional, or statewide trail plan.	Typically July 1	Varies each year	25%
Iowa Clean Air Attainment Program (ICAAP); IDOT					
Funding for highway/street, transit, bicycle/pedestrian or freight projects or programs which help maintain Iowa’s clean air quality by reducing transportation related emissions.	T, O	Projects which will reduce vehicle miles traveled or single-occupant vehicle trips; Transportation improvements to improve air quality.	Typically October 1	Approximately \$4 million annually; minimum \$20,000 total project cost	20%
Land and Water Conservation Fund; Iowa DNR					
Federal funding for outdoor recreation area development and acquisition.	T, P	Improvements to existing recreation facilities and development of new facilities.	Typically March 15, or closest working day	Varies annually	50%
General Obligation Bonds					
Allows cities to secure funding by pledging future tax revenues to repay the bond.	W, T, P, L, O	Capital improvements	NA	Varies	NA
Community Attraction and Tourism – Enhance Iowa – Iowa Economic Development Authority (IEDA)					
To assist projects that will provide recreational, cultural, entertainment and educational attractions.	T, P, A	Packaged amenities and connections to existing tourist attractions	October 1; often times other deadlines throughout the year	In flux; contact Nicole Shala at enhanceiowa@iowaeda.com	1:1 (typically)
Iowa Great Places – Cultural Affairs					
Supports the development of new and existing infrastructure intended to cultivate the unique qualities of neighborhoods, communities and regions in Iowa.	T, P, A	Streetscape, façade repair, community spaces; may not apply downtown but could support other community efforts	Online application typically due May 1; June site visits; August letter of intent for grant funding	\$1,000,000 annually; communities can apply for \$15,000–\$400,000; can only apply for three years of funding after designation; average award \$185,000	1:01
Iowa Arts Council Grants – Cultural Affairs					
To support the creation and presentation of new artwork, development of an arts experience or formation of an arts education program.	A	Functional art; event space art; other community art projects; could apply to all downtown projects	Usually May and November rounds	\$1,000 to \$10,000 grants	At least 1:1
Brownfield/Grayfield Redevelopment Tax Credit – IEDA					
Tax credit incentive for the rehabilitation of dilapidated/underutilized commercial properties with environmental challenges.	H, W, O	Dilapidated/hazardous buildings and other redevelopment sites; perhaps more appropriate for Armory Building reuse	Typically September 1	Up to 30%, up to \$1,000,000 per project; up to \$10,000,000 each fiscal year.	None

Description	Program Element	Possible Uses	Deadline	Available Funds	Required Match
Brownfields Program – Iowa DNR					
Cost reimbursement for Phase I, asbestos/lead inspection; free Phase II services; 50% reimbursement for environmental cleanup.	H, W, O	Dilapidated/hazardous buildings and other redevelopment sites; perhaps more appropriate for Armory Building reuse or work in vicinity of DICO site	Rolling	Varies (up to \$25,000 each for investigation and cleanup)	50% for cleanups
National Endowment for the Arts					
Several grant programs that foster art and culture – Challenge America, ArtWORKS, and OurTown	A	Creative placemaking, community art; applicable to Armory, balustrades, cultural signage, public art and more	Varies	Varies	Varies
Public Works Program – EDA					
Provides resources to meet construction and design of infrastructure essential to economic development	O	Workforce facilities; shipping/logistics; business incubators; telecommunications; most applicable here for technology access	Rolling – Discuss with ECIA (project must meet CEDS goals)	\$100,000–\$3,000,000	
Community Foundation of Greater Des Moines					
The foundation supports grantmaking in seven key areas including social capital, arts and culture, community betterment, education and health	H, P, T, A, O	Potential to apply to many aspects of the water trails projects – from organizational management of a regional network to site specific improvements, signage, arts and interpretation	Timing depends on grant	Potentially significant; \$50,000–200,000 or more	Uncertain; likely preferred
Other Private Funders					
Additional private foundations and corporate giving programs are available for a variety of projects.	N, W, T, P, A, L, O	Varies	Varies	Varies	Varies
Healthy Watershed Consortium					
The goal of the Healthy Watersheds Consortium Grant Program is to accelerate protection and enhancement of healthy watersheds.	N, W	Restoration and monitoring [?]	Typically March	Grant range \$50,000–\$200,000	25% minimum match required
Community Development Block Grant (CDBG) – Sustainable Community Demonstration					
Provides grants for varied projects demonstrating comprehensive innovative approaches to support community sustainability. Applications must meet at least one HUD national objective.	N, W, O, Varied	Could address many amenities in the study	Contact in flux	Max award: \$500,000	Unclear
Iowa Initiative for Sustainable Communities (IISC)					
IISC partners with communities through a formal request for proposals process. Typically, the RFP is released each Fall for the following academic year. Each partnership is one year long, with the opportunity to extend into two years. If all partners choose to extend their partnerships each year, the RFP may be released on an every-other-year basis.	Many varied	Could serve as partner on numerous plan elements	Typically January	Appears focused on technical assistance	Unclear
Resource Enhancement and Protection (REAP)					
REAP-CEP; roadside vegetation; historical resources; public land management; city parks and open space; soil and water enhancement; county conservation; state open space. Administered through four state agencies: DNR, IDALS, DCA and DOT.	N, W, T, P, L	Varied	County Conservation – Aug; City Parks – Aug; Cost Share – Aug; REAP – CEP; May and Nov	Depends on annual allocation; REAP-CEP consistently \$350,000, however; \$12,000,000 allocation for 2017; 2018 unknown	Cost Share requires 25%
Wellmark Foundation					
Focus on active living and healthy nutrition	H, T	Community gardens, local foods and/or ped/trail links	Typically May	\$75,000 max	1:01

Description	Program Element	Possible Uses	Deadline	Available Funds	Required Match
Kresge Foundation					
Works to reduce health disparities among children and adults by addressing conditions that lead to poor health outcomes. Many programs. www.Kresge.org/opportunities; receive updates on Twitter for current opportunities @kresgefdn	H	Highly varied. Many potential fits. Equity initiatives could be of interest as well as promotion of active living/time in the great outdoors	Varied – some rolling; some with deadlines	Varied	Varied
RW Johnson Foundation					
Culture of Health Prize places priority on communities emphasizing health and partnerships to meet the needs of all, especially those with health challenges. Other funding sources through Robert Wood Johnson also available.	H	Varied.	Typically fall	\$25,000 “Prize”	N/A
De Beaumont Foundation					
Health related – many programs; not typically awarded to communities, but this appears possible	H, Varied	Varied	Varied	Varied	Varied
Meredith Foundation; Edwin T. Meredith Foundation					
Grants largely for youth agencies, higher education, cultural programs, and historic preservation areas; some support for hospitals and health agencies, as well as for conservation; sustainability	N, W, T, P, O	Conservation, youth programming, capital campaigns, varied	Appears rolling	Edwin T. Meredith \$500K in giving annually; Meredith \$1,500,000	Preferred; requirements unclear
State Revolving Fund Sponsored Projects					
Municipalities that borrow funds to complete sanitary collection or treatment projects can potentially support a stormwater project through the Sponsored Projects Program. The state adjusts the interest rate on the project loan, allowing an extra 10% to be borrowed, but the repayment amount remains the same. Essentially, for every \$1 million spent on a sanitary project, \$100,000 can be borrowed toward construction of a stormwater quality project, at no additional cost to the municipality receiving the loan.	N, W	Stormwater management projects, streambank stabilization, might apply to some aspects of habitat restoration; probably applicable at all three dam sites	Typically late summer, early fall	Depends on status of Wastewater Reclamation Authority loans; statewide total was \$35,000,000 for 2016	“Match” provided through sewer projects; technically this is not a grant but it functions similarly
Roy J. Carver Charitable Trust					
Interest in scientific research and the educational and recreational needs of youth.	H, O	STEAM stations, science education	Contact Trust staff	501(c)(3) institutions eligible, awards to Iowa projects; awarded \$15,000,000+ in 2016	Unclear
Maytag Family Foundation					
Interests unclear, but they have participated in the past in restoration/habitat projects	N, possibly others	Would consider researching potential interest in habitat/stream restoration or acquisition; possibly park development, other projects may be of interest	Unknown; personal contact likely required	Unknown but believed to have awarded \$7,000,000+ in years past	Unclear
America's Great Outdoors: Connecting Youth to the Outdoors					
Catalyzing efforts to increase the number of youth who build a connection with public lands as places for recreating, learning and volunteering; applies to organizations partnering with the Forest Service or Bureau of Land Management	E	Might be useful for components of City Play, overall plantings/restoration work and/or education programming	September		

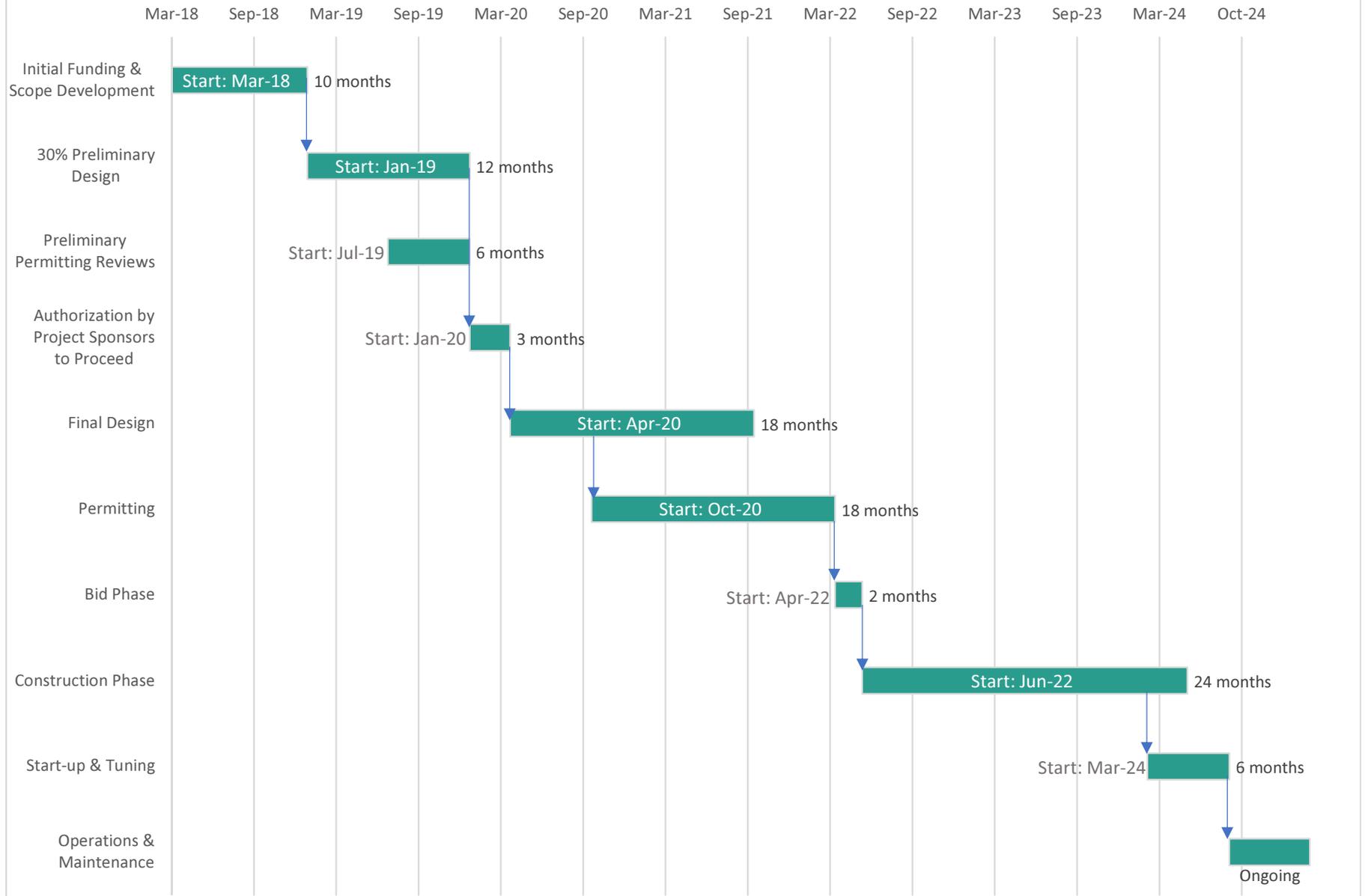
Description	Program Element	Possible Uses	Deadline	Available Funds	Required Match
Archer-Daniels-Midland Company					
Agricultural development, sound environmental practices, education for children and young adults, maintaining a vibrant community or related topics; nationwide, but emphasis is given to corporate operating locations	E, N, W	Education programming and/or habitat/nature restoration, plantings	Ongoing	Provide funds, including sponsorships, to 501(c)(3) organizations.	
Aria Foundation					
Environmental protection, clean energy, arts, education, social justice and assistance due to natural disaster	N, W, A	Arts/culture, historical and natural resources education components, habitat protection/restoration		Grants to 501c3 orgnaizations	
The Barbara Delano Foundation, Inc.					
Endangered species, environment, forests, natural resources, global programs	N, W	Mussels, other species protection; plantings; habitat restoration	Ongoing	Tax-exempt organizations	Unclear, likely preferred
Doris Duke Charitable Foundation					
The mission of the Environment Program is to enable communities to protect and manage wildlife habitat and create efficient built environments	N, W	Nature/habitat/wildlife restoration and protection; potentially fisheries, water protection/restoration	Letters of inquiry may be submitted at any time	The foundation generally awards multi-year grants that range from \$100,000 to \$1 million	
Educational Foundation of America (EFA)					
Arts & Education, the Environment and Sustainable Population	E, A	Educational programming and associated environmental arts/culture components—City Play and/or Celebration Circle, perhaps	Proposals by invitation only	Non-profit organizations are eligible; grants range from \$10,000–\$400,000	
FishAmerica Foundation					
FishAmerica provides grants to non-profits, conservation minded groups to enhance fish populations, restore fisheries habitat, improve water quality and advance fisheries research to improve sportfishing opportunities and success	N, W	Fisheries habitat restoration and protection; water quality monitoring(?)/protection	Varies with project	Varies with project	
Max and Victoria Dreyfus Foundation					
The Foundation will consider requests to support museums, cultural, and performing arts programs; schools, hospitals, educational and skills training programs, programs for youth, seniors, and the handicapped; environmental and wildlife protection activities; and other community-based organizations and their programs	E, N, W, A	Habitat/nature restoration activities, plantings, education programming—City Play and throughout the neighborhood	November 10 and March 10 each year		
National Environmental Education Foundation					
NEEF provides grants and awards to leverage the reach of our programs, implement our program goals, support the efforts of other organizations and strengthen the environmental education (EE) field as a whole	E	Environmental education; possibly STEAM stations	Varies by Program		
National Fish and Wildlife Foundation					
This program provides funds to restore damaged or degraded riverine habitats and native aquatic species through watershed restoration and improved land management	N, W	Watershed/stream and upland restoration/protection; mussels and other species protection	Two grant cycles; deadlines vary by specific program		

Description	Program Element	Possible Uses	Deadline	Available Funds	Required Match
Recreational Equipment, Inc. (REI) Gives					
Annually, REI dedicates a portion of its operating profits to help protect and restore the environment, increase access to outdoor activities, and encourage involvement in responsible outdoor recreation	N, W, P	City Play and/or support for teen hubs, habitat/nature restoration and outdoor programming	Monthly; must be nominated by an REI store to apply for grant, no unsolicited grant applications		
Rivers, Trails and Conservation Assistance Program (RTCA)					
	N, W, O	Likely use here to spark community service/volunteer involvement in habitat/nature restoration, trail construction/maintenance	Applications are due by August 1st for assistance beginning the following fiscal year (October 1st through September 30th)	RTCA does not award monetary grants or loans; instead, RTCA supplies a staff person with experience in community-based outdoor recreation and conservation	
Tourism Cares for Tomorrow					
Distributes grants to groups with one or more of the following goals: to protect, restore, and conserve sites of exceptional natural, cultural, or historic significance; to increase the traveling public’s awareness of and involvement in conservation efforts; and/or to promote conservation education within local host communities and to the traveling public	E, N, W	Might be a stretch, but probably worth learning more about as part of the Celebration Circle and/or signage, historical kiosks, welcoming edge	Letters of Inquiry due March 1 and July 1	Usual grants: \$10,000	
The Trust for Public Land					
National nonprofit that works to preserve open space; land acquisition	L	Gap purchases if/as needed; potentially expansion to habitat/nature restoration; research for funding opportunities	Check website for dates annually		
Turner Foundation, Inc.					
The foundation supports activities to preserve the environment, conserve natural resources, protect wildlife and develop and implement sound population policies	N, W	Habitat/natural resources protection	By invitation only		
U.S. Dept. of Interior, USFW: North American Wetlands Conservation Grants					
	N, W	Support for wetlands—possibly construction	Standard grants: Mar and Aug; small grants: Oct		Provides matching grants
U.S. Fish & Wildlife - Federal Aid in Sport Fish and Wildlife Restoration Acts					
Federal Aid in Sport Fish and Wildlife Restoration Acts were created to fund restoration efforts for the benefit of fish, wildlife and the American people; access through Iowa DNR	N, W	Fisheries/habitat restoration, protection	Varies by project	Awarded to states. Categories for funding are: Fish and Wildlife Resources; Sport Fish Resources; Wildlife Resources; Aquatic Ecosystems; Aquatic Resources and Hunter Education; State Wildlife Grant Program	
National Fish and Wildlife Foundation: Resilient Communities Program					
Focus areas are 1) adaptation through regional conservation projects and 2) community capacity building and demonstration projects	N, W, P	Potential to work for nature/habitat restoration with community service component; possibly support for “barnraising” approach to installation of fishing facilities, wildlife observation/protection, etc.	Proposals due in March	Eligible applicants include non-profit 501(c) organizations, local governments, and Indian tribes; grants range from \$100,000 to \$500,000	Projects that meet or exceed a 1:1 match ratio will be more competitive

A.3 – PROJECT SCHEDULE

Expeditious Project Schedule

***Applies to entire project or individual dam location**



B.1 – HYDRAULICS AND HYDROLOGY MEMO



Hydraulics Technical Memorandum

Date: Wednesday, February 28, 2018

Project: Des Moines Water Trails

To: Merrick & Company

From: Adrian Strain, MS, PE, and Andy McCoy, PhD, PE

Subject: Hydraulic Analysis of Dam Replacement Options

1 Introduction

1.1 Purpose

The following sections detail the methods used to develop numerical models (the one-dimensional [1D] Hydrologic Engineering Center [HEC] River Analysis System [RAS] model and the two-dimensional [2D] TUFLOW model) to support the alternatives analysis at each project location. The 1D HEC-RAS model provides hydraulic evaluation for flood profiles consistent with those in the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS). The 2D TUFLOW model provides visualization at low and high flows. This technical memorandum (TM) describes the model geometry, mesh development, and results. Multiple alternatives for each dam site were analyzed during the feasibility study and the selected alternatives are presented in the following sections.

This TM represents the simulations at the end of engineering feasibility. The data presented in the following sections was used for the feasibility study and should be treated as preliminary, not for design.

1.2 Background

The Des Moines Area Metropolitan Planning Organization completed the *Greater Des Moines and Water Trails Plan* (Plan) in late 2016, and required a feasibility of its recommendations for three dangerous dams in the downtown area—the Water Works dam near Fleur Drive on the Raccoon River, and Scott Avenue and Center Street dams on the Des Moines River.

The Plan was developed with extensive public outreach; governmental input at the state level and local level; engagement of the business community and NGOs. Participants overwhelmingly desire safety mitigation of the dams, on-water recreation, economic development, environmental restoration, historical preservation, and required pool levels, all within an attractive parkland setting.

Engineering feasibility included development of design concepts, cost estimates, and a project plan, all of which were developed once the basic flood hydraulics and safety criteria were determined and met for each of the three alternatives at each dam.

2 Hydraulic Criteria

As part of the ultimate design, a floodplain development permit and a United States Army Corps of Engineers (USACE) Section 408¹ approval will be required. Therefore, each recreational alternative was developed with consideration of the respective floodplain development and Section 408 requirements. The proposed project locations are located in Federal Emergency Management Agency (FEMA) Zone AE floodplains. Zone AE is designated by FEMA as areas where the 1 percent annual chance flood (100-year flood or base flood) water surface elevations (WSELs) have been established by detailed methods. It is noted that the 1 percent annual chance flood is the flood that has 1 percent chance of being equaled or exceeded in any given year.

A floodway for the Des Moines River and the Raccoon River has been determined in the project locations. The floodway is defined by FEMA as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments so that the 1 percent annual chance flood can be conveyed without substantial increases in flood heights. FEMA and Iowa Department of Natural Resources (IaDNR) regulation require that no fill be placed in the floodway, unless mitigation measures can be implemented to prevent an increase in the base flood WSEL. Any increase in floodway fill must be balanced by an increase in channel conveyance. Therefore, a numerical hydraulic analysis was required to iteratively design the proposed recreational features to attempt to obtain a no-rise (i.e. no increase in the base flood WSEL). If a no-rise could not be readily achieved, or be very near to being achieved, for any of the identified alternatives, then that alternative was eliminated from further consideration.

In accordance with the Section 408 approval process, it must be demonstrated that the recreational features do not negatively impact the performance of the Federal Levee project. This is accomplished by performing a hydraulic analysis for a range of loadings (i.e. discharges) with the highest of these being at the top of levee. More specifically, the hydraulic analysis needs to demonstrate that there is no impact at the 100-year event and at the event that is within six inches of the levee crest. For this effort, the 500-year flood was used as a surrogate for the “top of levee” flow rate, though, in final design, the actual profile at the levee crest should be evaluated.

¹ Section 14 of the Rivers and Harbors Act of 1899, codified at 33 United States Code 408 (Section 408).

3 Model Development

3.1 Model Description

HEC-RAS 5.0.3 was used for the hydraulic analysis. The Preliminary Effective FEMA model was used as the starting point for the evaluation (FEMA 2015). A 2D hydraulic analysis utilizing TUFLOW (BMT-WBM 2016) was also performed to qualitatively evaluate the alternatives.

3.1.1 1D Modeling Approach

The 1D model was updated to include new cross-sections based on the location of proposed features. The new cross-sections used bathymetry from a recent IHR-Hydroscience and Engineering in July 2011. The model was updated to reflect the removal of the railroad bridge downstream of Scott Avenue, an action which was completed in 2013.

Selected cross-sections in the vicinity of the project area(s) were updated with the proposed geometry. This model is known as Proposed Conditions. WSELs were compared and against criteria to determine if the proposed improvements met requirements (i.e. no-rise) at cross-sections upstream and downstream from the project. Figure 3-1 through Figure 3-3 illustrate location where 1D cross-sections were compared.

Manning's roughness values for the proposed alternatives were updated based on the anticipated characteristics of the project features. Fish passages were added to each location and an appropriate value was assigned based on relative flow depth. A value of 0.040 was assigned to fish passage areas. Manning's roughness values for the channel and overbank areas remained consistent with values of the preliminary model.

3.1.2 2D Modeling Approach

A 2D TUFLOW model was developed based on the bathymetry and proposed project features reflected in the 1D model. The 2D model included the levees and overland topography from the current Light Detection and Ranging (LiDAR) imagery.

The 2D model surface was comprised of 6 feet by 6 feet grid cells and used to create the modeling surface. Obstructions, when necessary, were defined with GIS shapefiles and imported into the modeling surface. Manning's roughness values were consistent with the 1D model. Figure 3-1 through Figure 3-3 show the 2D model domains.

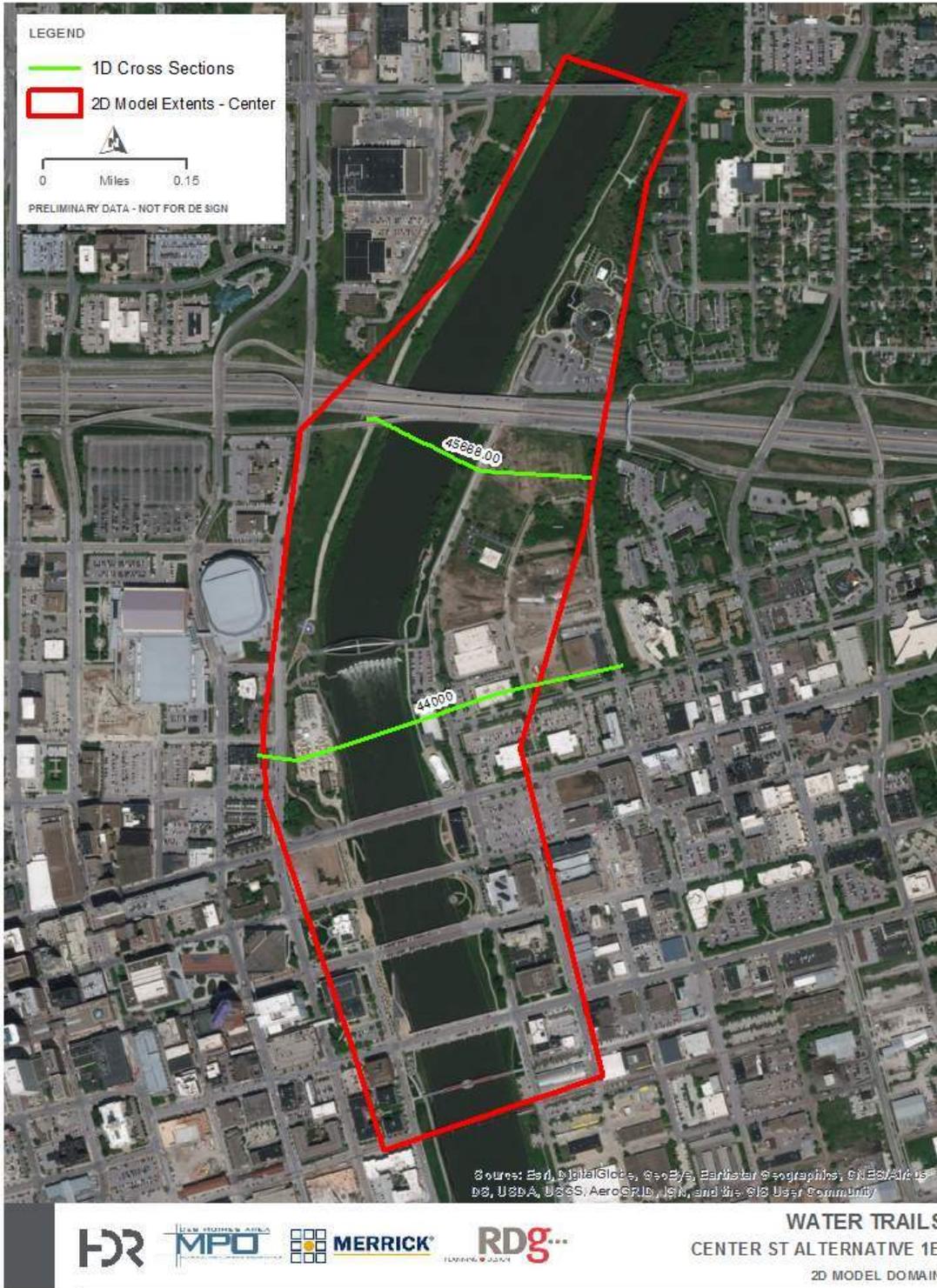


Figure 3-1: 1D Comparison Cross-Sections and 2D Model Domain for Center Street Alternative

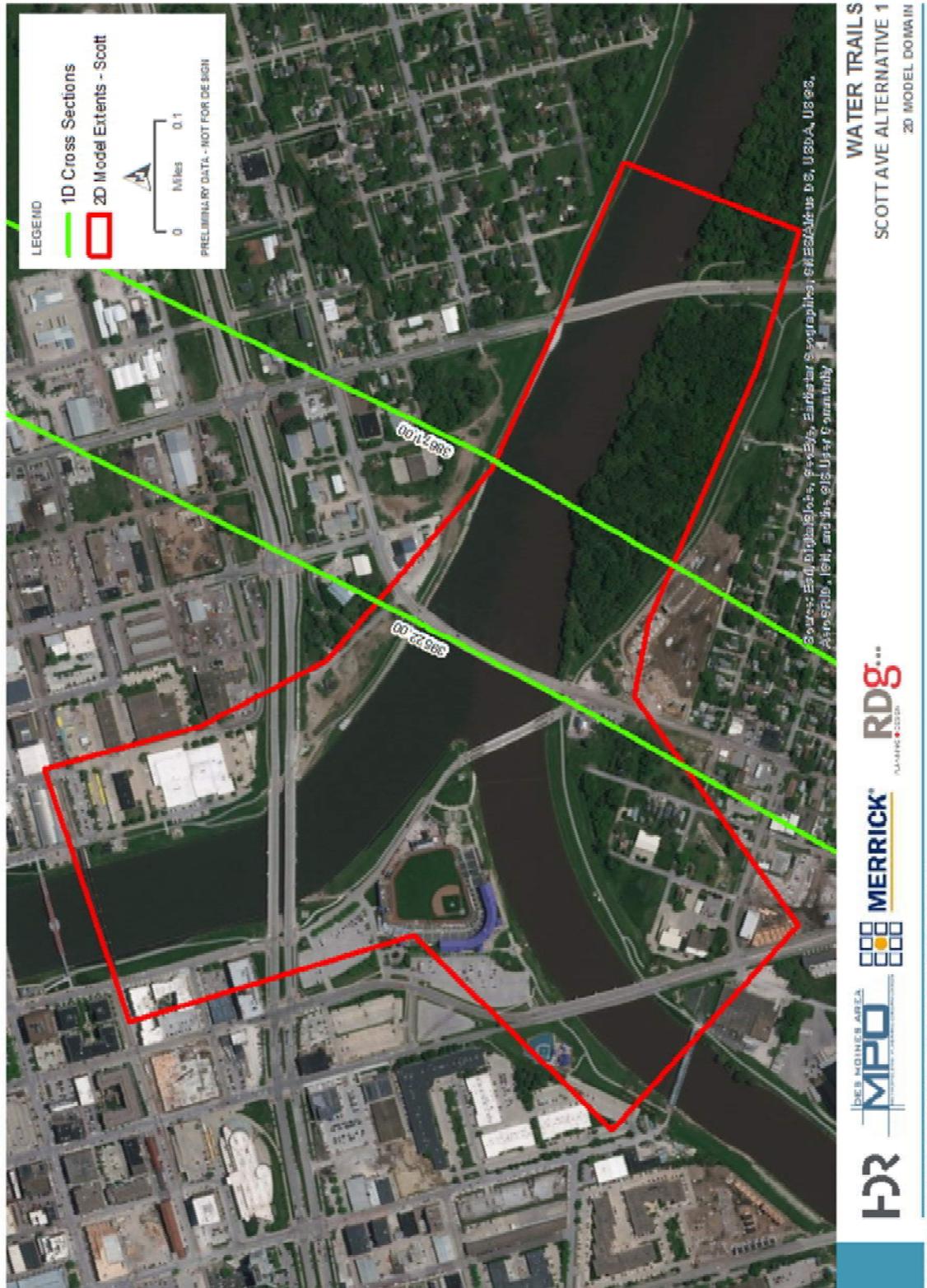


Figure 3-2: 1D Comparison Cross-Sections and 2D Model Domain for Scott Avenue Alternative



Figure 3-3: 1D Comparison Cross-Sections and 2D Model Domain for Fleur Drive Alternative

3.2 Proposed Alternatives

The hydraulics results from the recommended proposed alternatives are presented in this section. In the conceptualization process many other configurations (Dam Safeing Only, Partial Dam Removal, Complete Dam Removal, etc.) were modeled and the results presented in earlier stakeholder workshops.

3.2.1 Center Street Alternative

The recommended alternative at the Center Street Dam included removal of the existing structure. To maintain the upstream pool four recreational ramps and a fish passage area were designed. Figure 3-4 illustrates the modeled alternative for the feasibility study. In this concept, the fish passage is on the right bank (looking downstream). Figure 3-5 compares the existing and proposed terrain at one cross-section at the crest of the first flow feature within the 1D model demonstrating the balance of hydraulic conveyance that occurred during the alternatives analysis. Figure 3-6 compares the existing and proposed geometry at the Center Street Bridge.

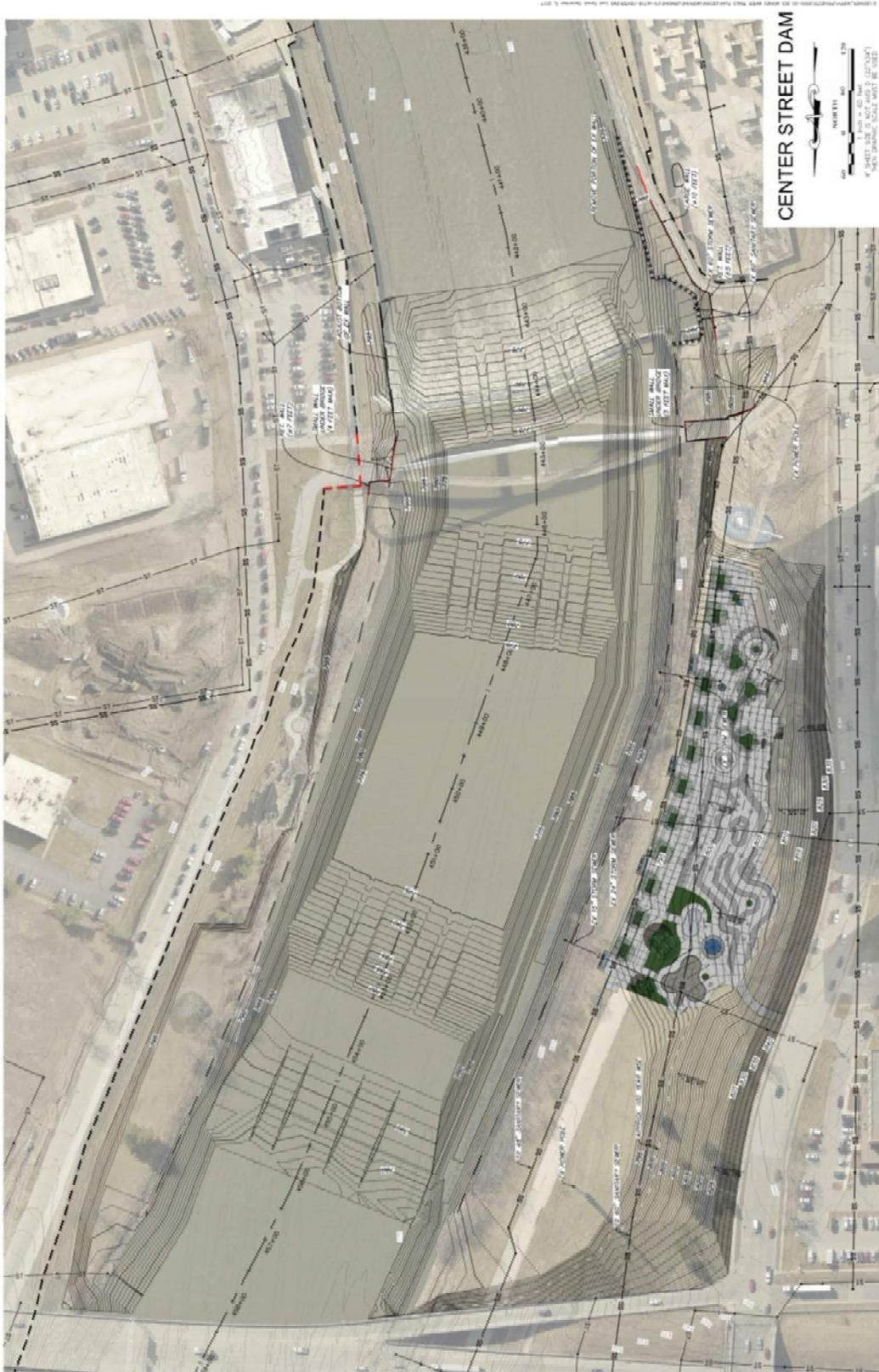


Figure 3-4. Plan View of Center Street Alternative

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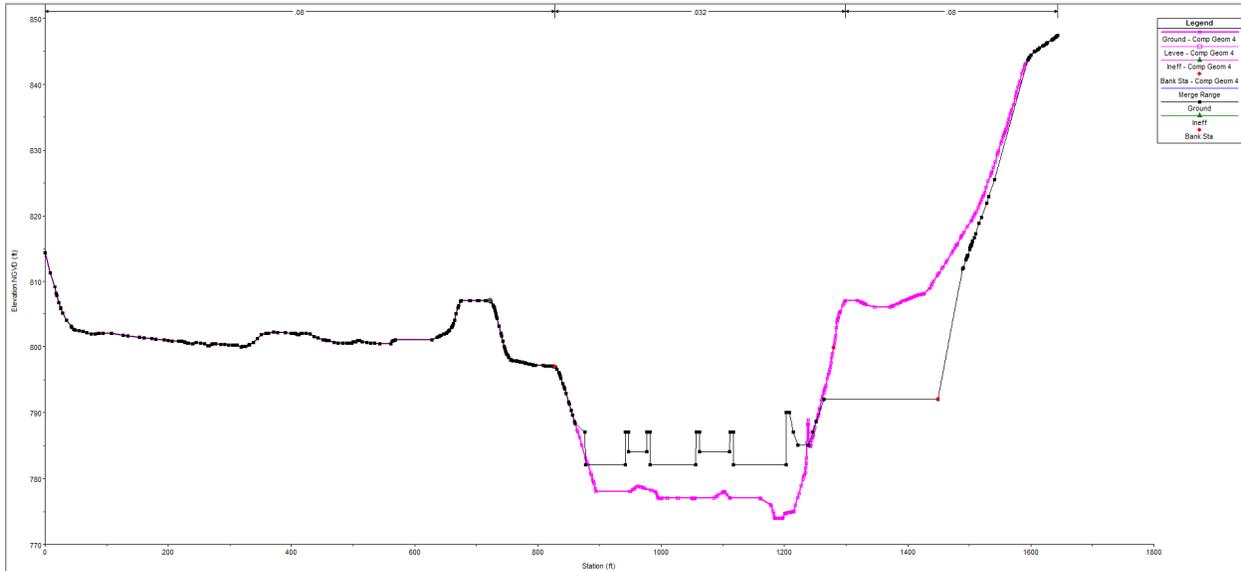


Figure 3-5. Model Cross-Section Comparison downstream of I-235 (Black - Proposed, Pink - Existing)

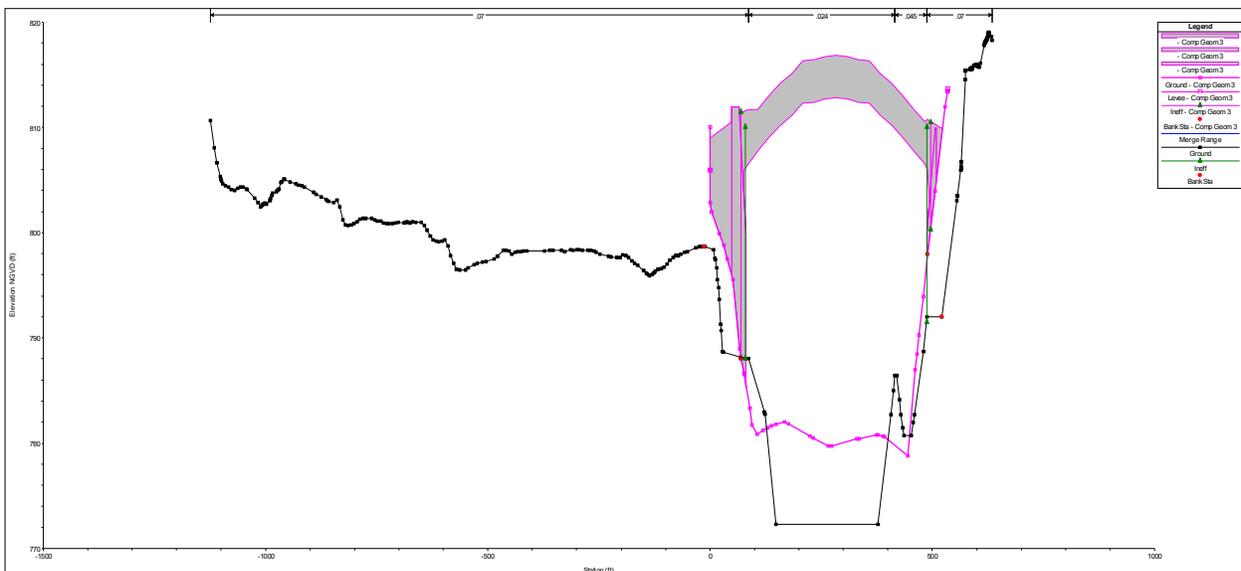


Figure 3-6. Model Cross-Section Comparison at Center Street Bridge (Black - Proposed, Pink - Existing)

3.2.2 Scott Avenue Alternative

The recommended Scott Avenue Alternative included the removal of the dam and replacement of the structure with two recreational ramps and a separate fish passage area. Figure 3-7 illustrates the modeled alternative for the feasibility study. Figure 3-8 shows a representative cross-section through the Scott Avenue Bridge comparing the existing and proposed geometry. Figure 3-9 shows a representative cross-section approximately 200 ft downstream of the Scott Avenue Bridge.



Figure 3-7. Plan View of Scott Avenue Alternative

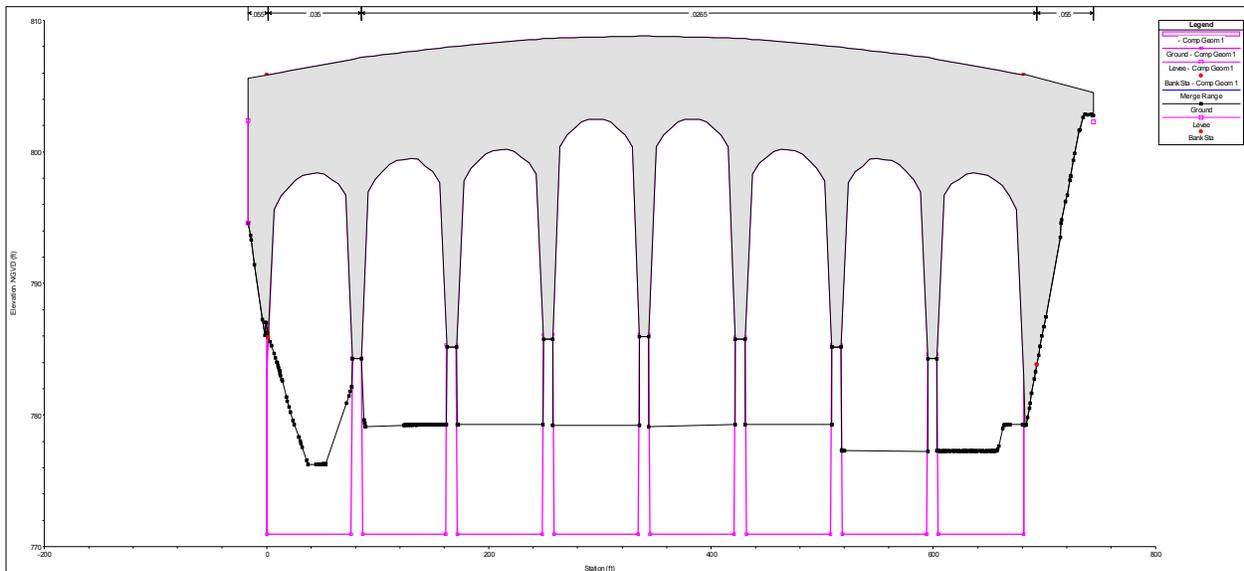


Figure 3-8. Model Cross-Section Comparison at Scott Avenue Bridge (Black - Proposed, Pink - Existing)

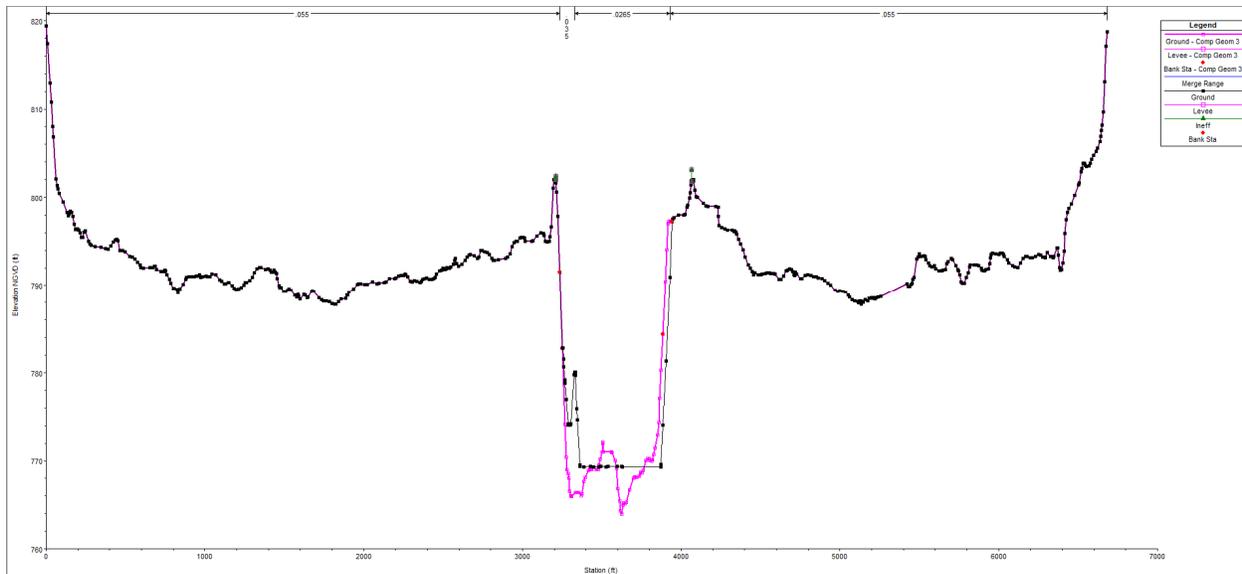


Figure 3-9. Model Cross-Section Comparison (Black - Proposed, Pink - Existing)

3.2.3 Fleur Drive Alternative

The proposed alternative for the Raccoon River featured a series of drop structures and fish passage in Grays Lake Park. Figure 3-10 shows the modeled alternative for the feasibility study. The green line shows the approximate location of the pedestrian bridge. Figure 3-11 compares the existing and proposed terrain at one cross at the crest of the first flow feature of the main channel within the 1D model demonstrating the balance of hydraulic conveyance. Figure 3-12 shows a comparison for the existing and proposed geometries near the middle of the proposed water trails feature.

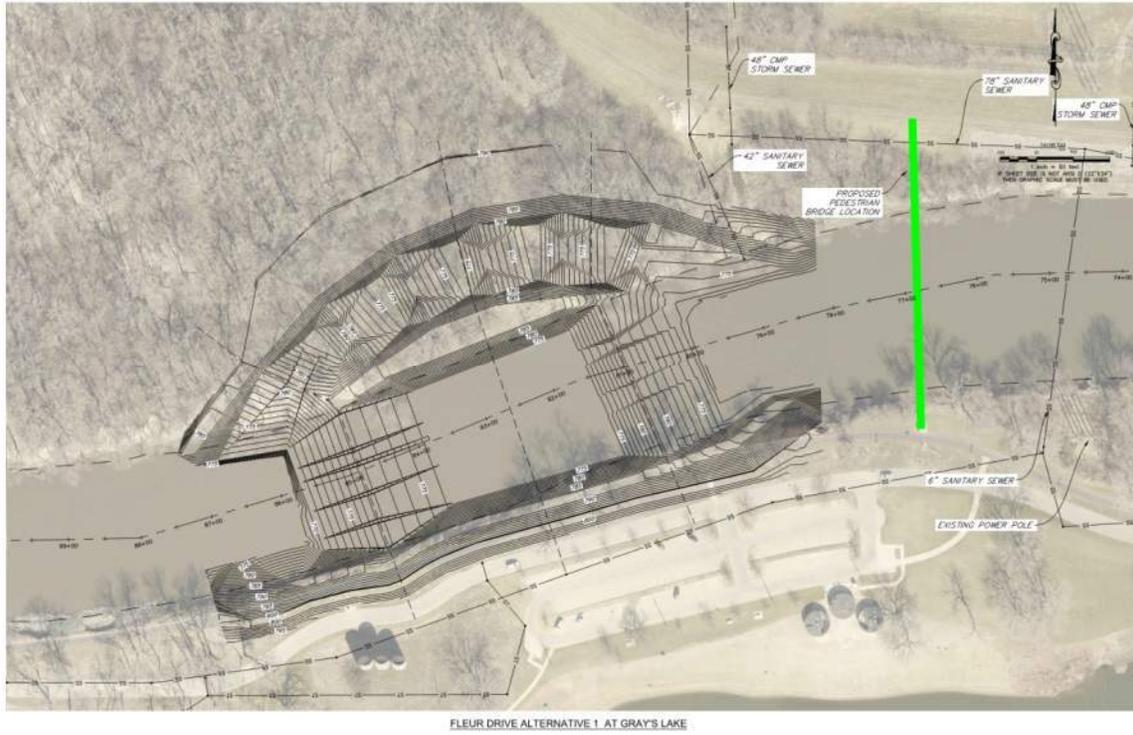


Figure 3-10. Plan View of Grays Lake Alternative

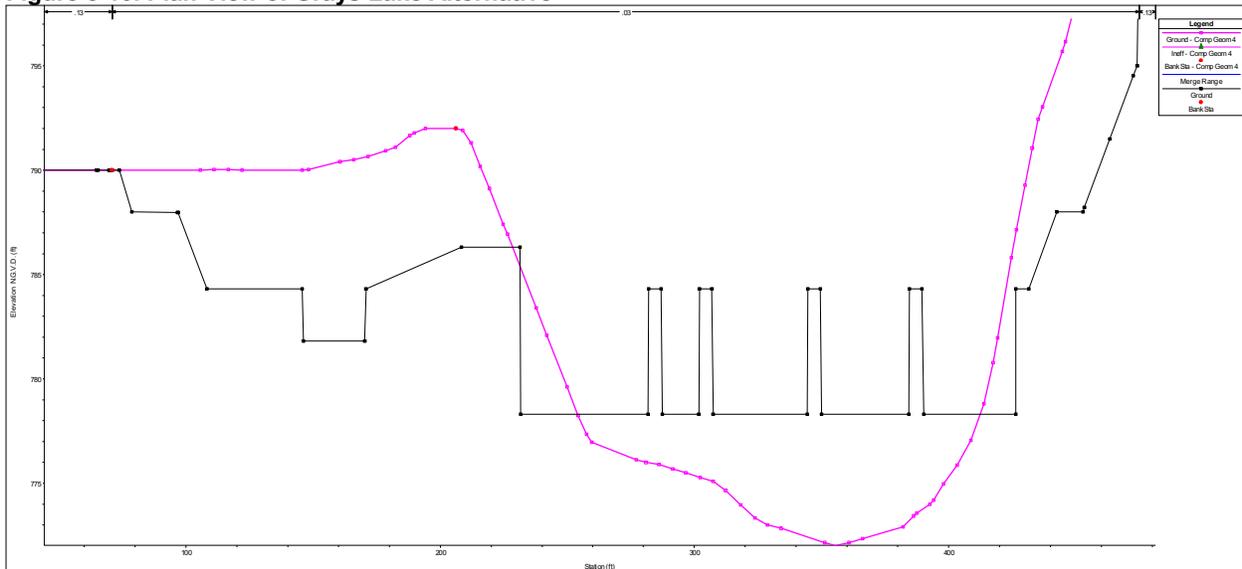


Figure 3-11. Model Cross-Section Comparison (Black - Proposed, Pink - Existing)

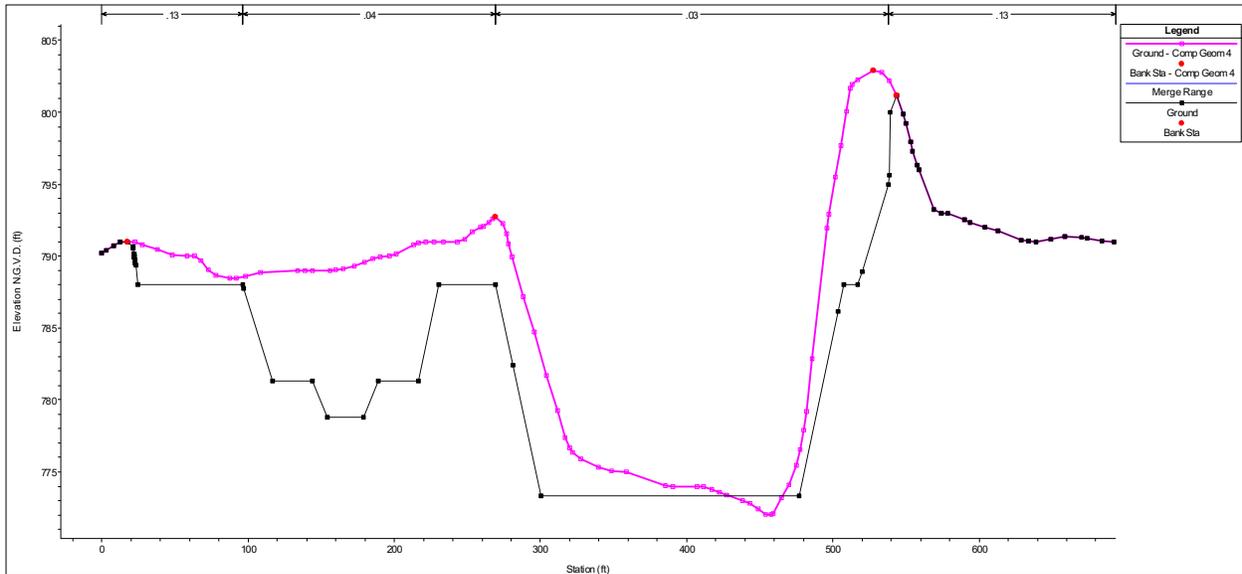


Figure 3-12. Model Cross-Section Comparison near the middle of the Proposed feature (Black - Proposed, Pink - Existing)

3.3 Model Scenarios

3.3.1 Model Scenarios

Multiple alternatives were evaluated at each location for four different hydraulic conditions. The upstream boundary conditions for each model were the 10-, 50-, 100-, and 500-year flood. The 2D model simulated two flows for each of the alternatives; the 100-year flood and 80 percent exceedance were selected as the flows to be modeled. The 80 percent exceedance was developed to show potential in season (May-September) flow rates for use in the design of the flow features.

3.3.2 Boundary Conditions for 1D Model

Boundary conditions for the HEC-RAS model remained unchanged from the preliminary effective models. Table 3-1 and Table 3-2 show the boundary conditions for the 1D models. Volume flow rates, in cubic feet per second (cfs), were used at the upstream cross-sections and junctions. The known water surface boundary condition prescribes a known elevation for the water surface, based on a specific flow rate, at the downstream end of the model.

Table 3-1. Boundary Conditions for 1D Model at Center Street and Scott Avenue

	River	Reach	Location (Section)	10-yr(cfs)	50-yr (cfs)	100-yr (cfs)	500-yr (cfs)
1	Des Moines	Des Moines	79127	19,470	48,510	57,220	78,900
2	Des Moines	Des Moines	39522	44,100	83,300	107,500	142,000

Table 3-2. Boundary Conditions for 1D Model at Fleur Drive

	River	Reach	Location (Section)	10-yr(cfs)	50-yr (cfs)	100-yr (cfs)	500-yr (cfs)
1	Raccoon River	upstream	45396	31,900	51,100	60,400	84,600
2	Raccoon River	Fleur Bypass	1975	1,048	11,689	19,724	41,657
3	Raccoon River	Fleur Loop	16251	31,352	40,211	41,576	44,243
4	Raccoon River	Fleur Loop	15752	31,352	40,211	41,576	44,243
5	Raccoon River	Below Fleur Drive	8989	32,400	51,900	61,300	85,900
6	Raccoon River	Below Fleur Drive	89	32,400	51,900	61,300	85,900

3.3.3 Boundary Conditions for 2D Model

Boundary conditions for the 2D model were taken from the 1D model results and exceedance calculations. Table 3-3 shows the flow rates and stage for the 100-year and 80 percent exceedance simulations. The upstream boundaries of the 2D models were defined as volumetric flow inlets and the downstream boundaries were approximate stages.

Table 3-3. Boundary Conditions for 2D Model at the Three Project Locations

Flow Event (cfs)	Center Street		Scott Avenue		Fleur Drive	
	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)
100-year	57,220	800.91	107,500	798.41	61,300	779.56
80% Exceedance	876	779.51	1,264	770	388	777.63

3.4 Model Evaluation

4 Model Evaluation and Results

The completed model runs for the proposed alternatives described in Section 3.2 were primarily evaluated based on their performance compared to the existing condition (preliminary models) 100-year flood levels. The 10-, 50-, and 500-year floods were also evaluated with the 1D model. Evaluation of the 2D model results was limited to the 100-year and 80% exceedance events. The 2D models intent was to provide a visual representation of the potential flow extents. The 2D model results are qualitative in nature and not for design or permitting.

Results for each of the proposed alternatives are shown in the following sections. The results of the model were compared to the updated preliminary model. The updated preliminary model for Center Street and Scott Avenue included the removal of the railroad bridge downstream of Scott Avenue.



4.1 Center Street Dam

Table 4-1 and Table 4-2 show model results, comparing water surface elevations between the recommended alternative and the preliminary model. Table 4-1 lists the WSELs, Table 4-2 shows the changes in water surface in term of adverse effect versus the preliminary model. If the water surface was higher than the preliminary model, a positive value is listed and if a reduction of the water surface occurred, the listed value is negative. The recommended alternative shows no effect upstream and downstream from the project.

The 2D model results are illustrated in Figures 4-1 through 4-4, with the 100-year event shown in Figures 4-1 and 4-2 and the 80% exceedance flow shown in Figures 4-3 and 4-4. The figures illustrate water surface elevations and depth, respectively, for the proposed alternative.

Table 4-1. Comparison of Water Surface Elevations for Center Street

Location	Existing Conditions	Alt 1B
500-Yr Flood WSE		
South of I-235 (XS-45668)	806.97	806.72
North of Grand St (XS-44000)	805.96	805.96
100-Yr Flood WSE		
South of I-235 (XS-45668)	802.98	802.81
North of Grand St (XS-44000)	802.20	802.20
50-Yr Flood WSE		
South of I-235 (XS-45668)	799.26	799.11
North of Grand St (XS-44000)	798.14	798.14
100-Yr Flood WSE		
South of I-235 (XS-45668)	792.44	792.46
North of Grand St (XS-44000)	791.50	791.50



Table 4-2. Comparison of Water Surface Elevations for Center Street

Location	Existing Conditions	Alt 1B
500-Yr Flood Difference (ft)		
South of I-235 (XS-45668)	-	-0.25
North of Grand St (XS-44000)	-	0.0
100-Yr Flood Difference (ft)		
South of I-235 (XS-45668)	-	-0.16
North of Grand St (XS-44000)	-	0.0
50-Yr Flood Difference (ft)		
South of I-235 (XS-45668)	-	-0.15
North of Grand St (XS-44000)	-	0.0
100-Yr Flood Difference (ft)		
South of I-235 (XS-45668)	-	0.0
North of Grand St (XS-44000)	-	0.0



Figure 4-2: Water Depth, Center Street, 100-year Proposed Alternative (2D Model)

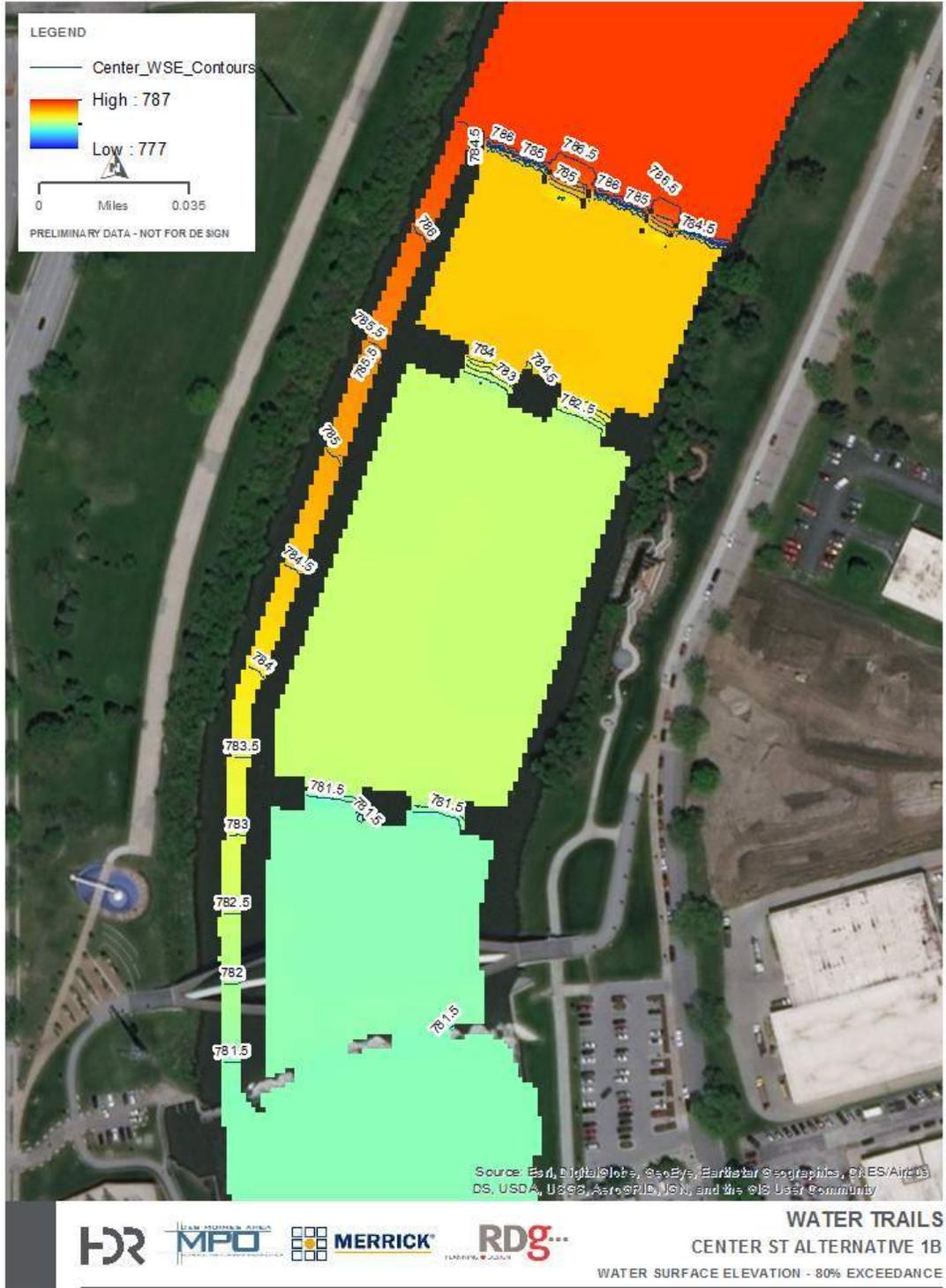


Figure 4-3: Water Surface Elevation, Center Street, 80 percent Exceedance Proposed Alternative (2D Model)

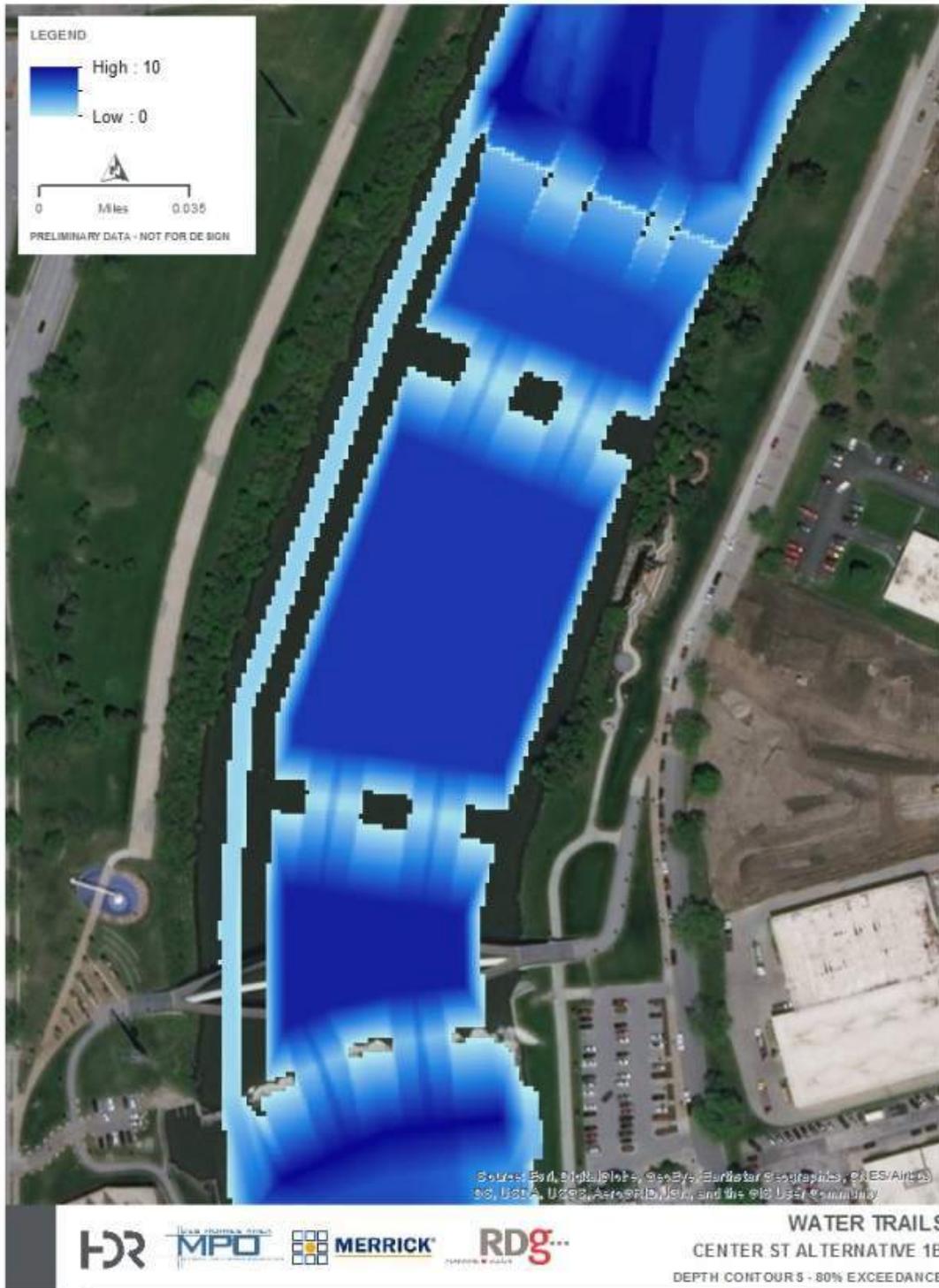


Figure 4-4: Water Depth, Center Street, 80 percent Exceedance Proposed Alternative (2D Model)

4.2 Scott Avenue Dam

Table 4-3 and Table 4-4 show the results of the model. Table 4-3 lists the WSELs and Table 4-4 shows the changes in water surface in term of adverse effect versus the preliminary model. If



the water surface was higher than the preliminary model, a positive value is listed and if a reduction of the water surface occurred, the listed value is negative. The results for the Scott Avenue Alternative show a small rise (0.06 foot) in WSEL for the 100-year flood and a larger rise during the 500-year flood (0.59 foot). The increased WSEL at the 500-year flood is a function of the complex pressure flow situation at the bridge during the 500-year flood and it is beyond the limits of what can reasonably be modeled with a 1D approach. The final design will have to be further coordinated with IaDNR to include fish passage requirements that came to light after hydraulic modeling had been performed and with USACE during the Section 408 Compliance. It is thought that the effect will be mitigated during final design.

Figure 4-5 through Figure 4-8 show the results from the 2D model. Figure 4-5 and Figure 4-6 shows the 100-year flood flowing through the proposed alternative. Figure 4-7 and Figure 4-8 shows the proposed alternative with the 80 percent exceedance flow.

Table 4-3. Water Surface Elevations for Scott Avenue Alternative

Location	Existing Conditions	Alt 1B
500-Yr Flood WSE		
U/S Confluence (XS-39916)	802.81	803.40
Old CNWRR Bridge (XS-38671)	802.03	802.03
100-Yr Flood WSE		
U/S Confluence (XS-39916)	799.98	800.04
Old CNWRR Bridge (XS-38671)	798.47	798.47
50-Yr Flood WSE		
U/S Confluence (XS-39916)	796.96	796.89
Old CNWRR Bridge (XS-38671)	795.85	795.85
10-Yr Flood WSE		
U/S Confluence (XS-39916)	791.16	791.22
Old CNWRR Bridge (XS-38671)	790.48	790.48

Table 4-4. Comparison of Water Surface Elevations for Scott Avenue

Location	Existing Conditions	Alt 1B
500-Yr Flood Difference (ft)		
U/S Confluence (XS-39916)	-	0.59
Old CNWRR Bridge (XS-38671)	-	0.0
100-Yr Flood Difference (ft)		
U/S Confluence (XS-39916)	-	0.06
Old CNWRR Bridge (XS-38671)	-	0.0
50-Yr Flood Difference (ft)		
U/S Confluence (XS-39916)	-	-0.07
Old CNWRR Bridge (XS-38671)	-	0.0



Location	Existing Conditions	Alt 1B
10-Yr Flood Difference (ft)		
U/S Confluence (XS-39916)	-	0.07
Old CNWRR Bridge (XS-38671)	-	0.0

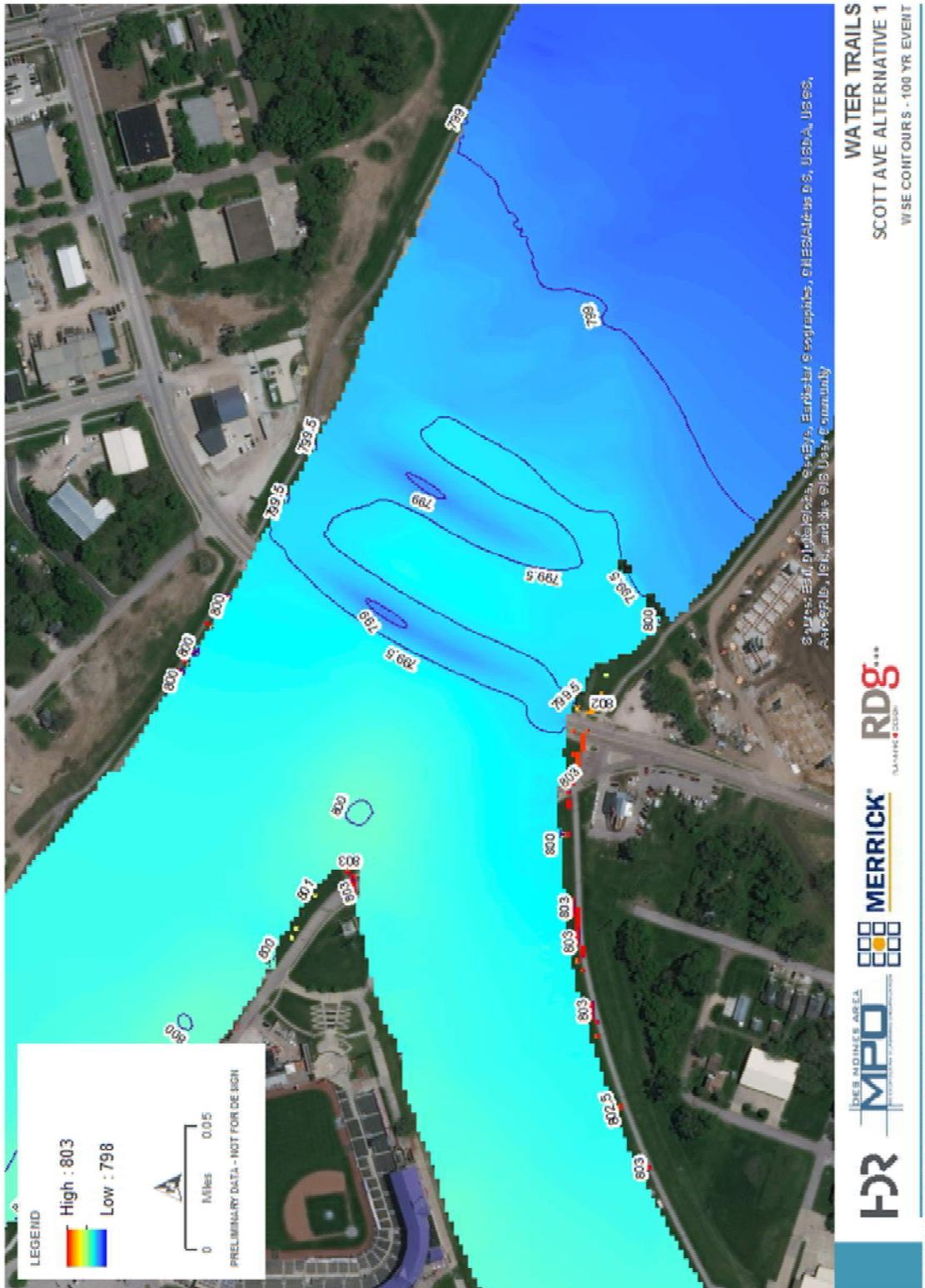


Figure 4-5: Water Surface Elevation, Scott Avenue, 100-year Proposed Alternative (2D Model)



Figure 4-6: Water Depth, Scott Avenue, 100-year Proposed Alternative (2D Model)

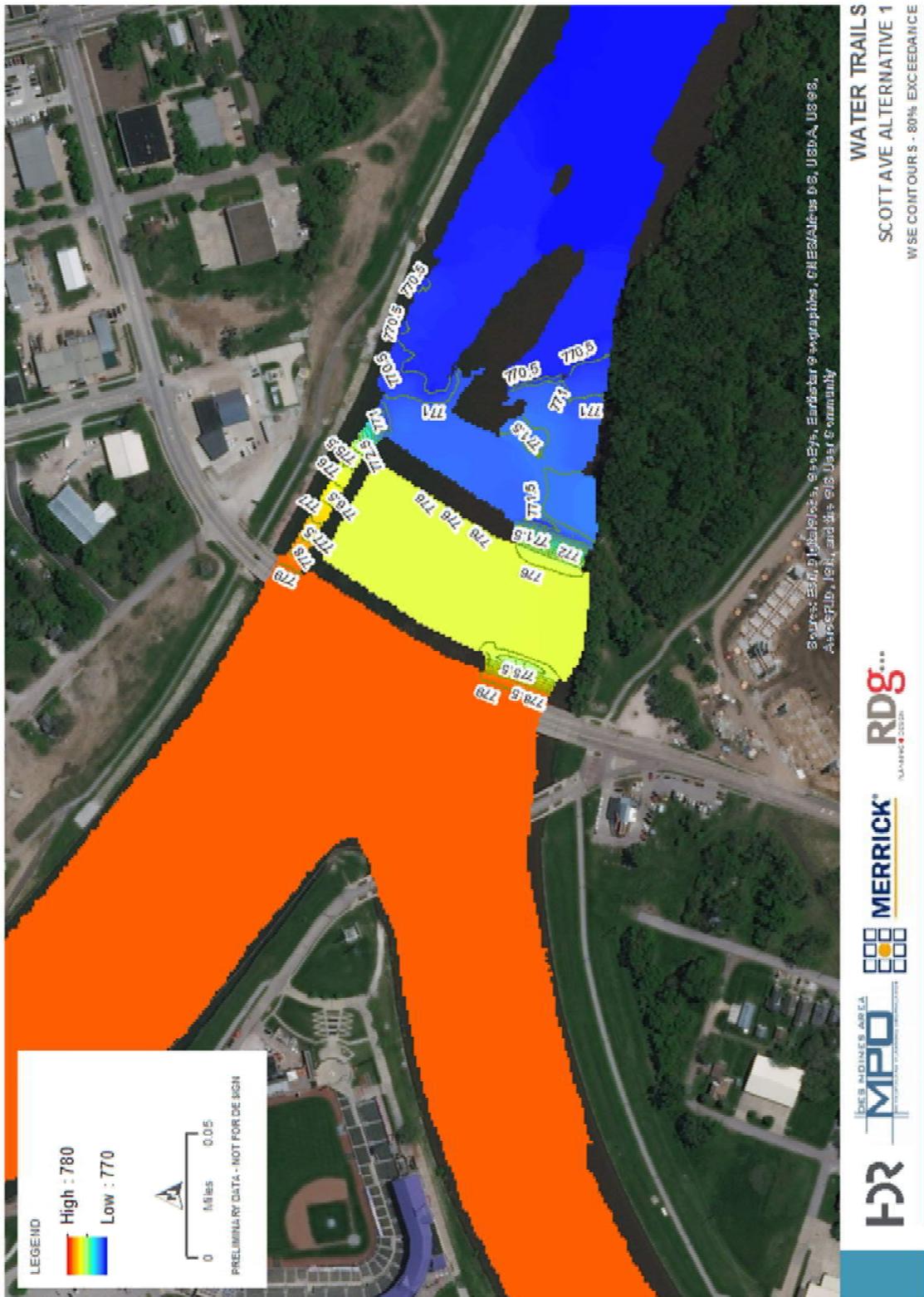


Figure 4-7: Water Surface Elevation, Scott Avenue, 80 percent Exceedance Proposed Alternative (2D Model)

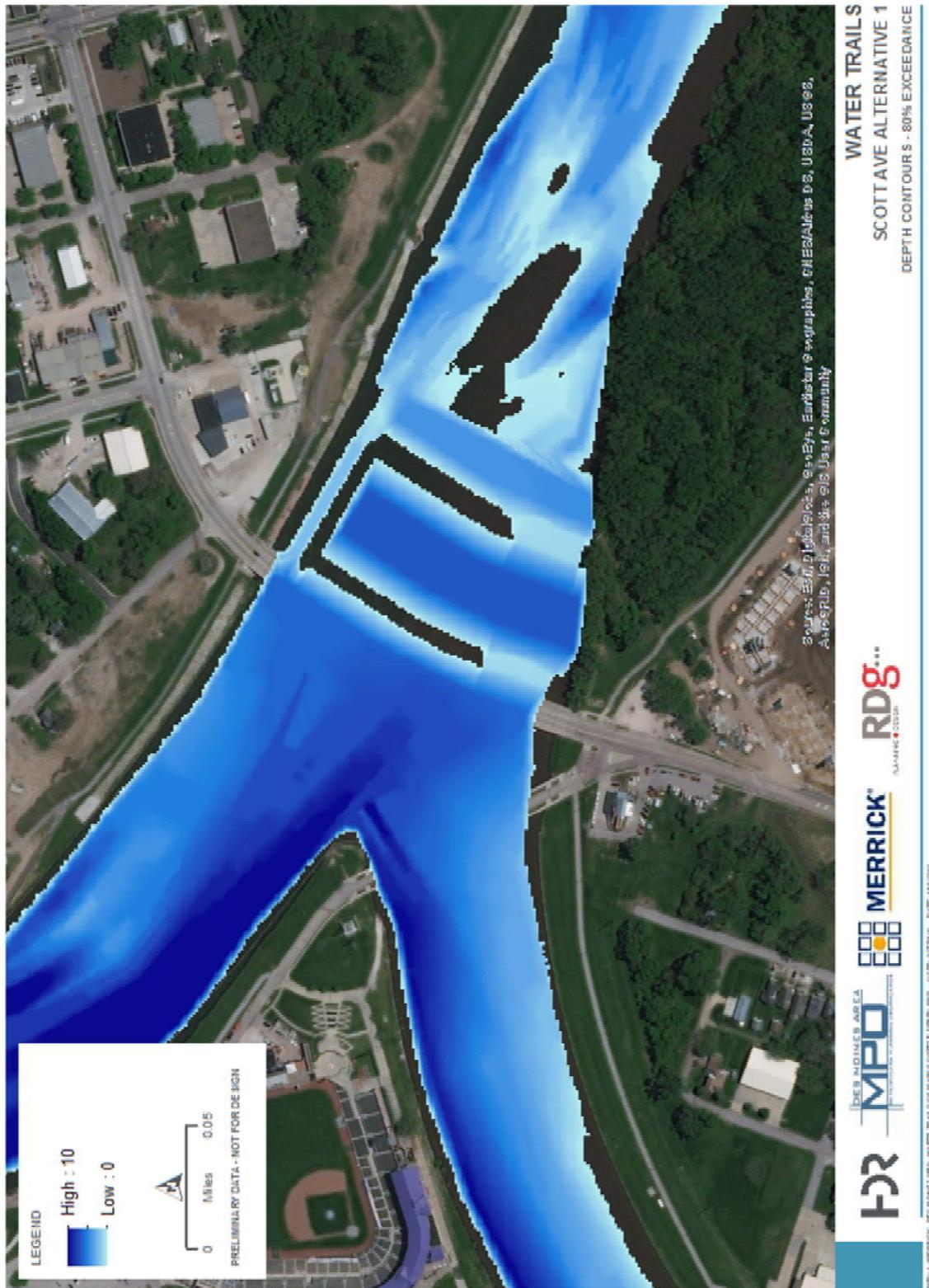


Figure 4-8: Water Depth, Scott Avenue, 80 percent Exceedance Alternative (2D Model)

4.3 Fleur Drive Alternative

Table 4-5 and Table 4-6 show the results of the model. Table 4-5 lists the WSELs, Table 4-6 shows the changes in water surface in term of adverse effect versus the preliminary model. If the water surface was higher than the preliminary model, a positive value is listed and if a reduction of the water surface occurred, the listed value is negative. The recommended alternative shows no effect upstream and downstream from the project.

Figure 4-9 through Figure 4-13 show the results from the 2D model. Figure 4-9 and Figure 4-10 shows the 100-year flood flowing through the proposed alternative. Figure 4-11 and Figure 4-12 shows the proposed alternative with the 80 percent exceedance flow.

Table 4-5: Water Surface Elevations for Fleur Drive Alternative

Location	Existing Conditions	Alt 4N
500-Yr Flood WSE		
XS-8989	807.37	806.85
XS-5709	805.87	805.87
100-Yr Flood WSE		
XS-8989	802.48	801.74
XS-5709	800.84	800.84
50-Yr Flood WSE		
XS-8989	800.50	799.57
XS-5709	798.70	798.70
10-Yr Flood WSE		
XS-8989	795.82	795.08
XS-5709	793.61	793.61

Table 4-6. Comparison of Water Surface Elevations for Fleur Drive

Location	Existing Conditions	Alt 4N
500-Yr Flood Difference (ft)		
XS-8989	-	-0.16
XS-5709	-	0.0
100-Yr Flood Difference (ft)		
XS-8989	-	-0.32
XS-5709	-	0.0
50-Yr Flood Difference (ft)		
XS-8989	-	-0.39
XS-5709	-	0.0



10-Yr Flood Difference (ft)		
XS-8989	-	-0.24
XS-5709	-	0.0

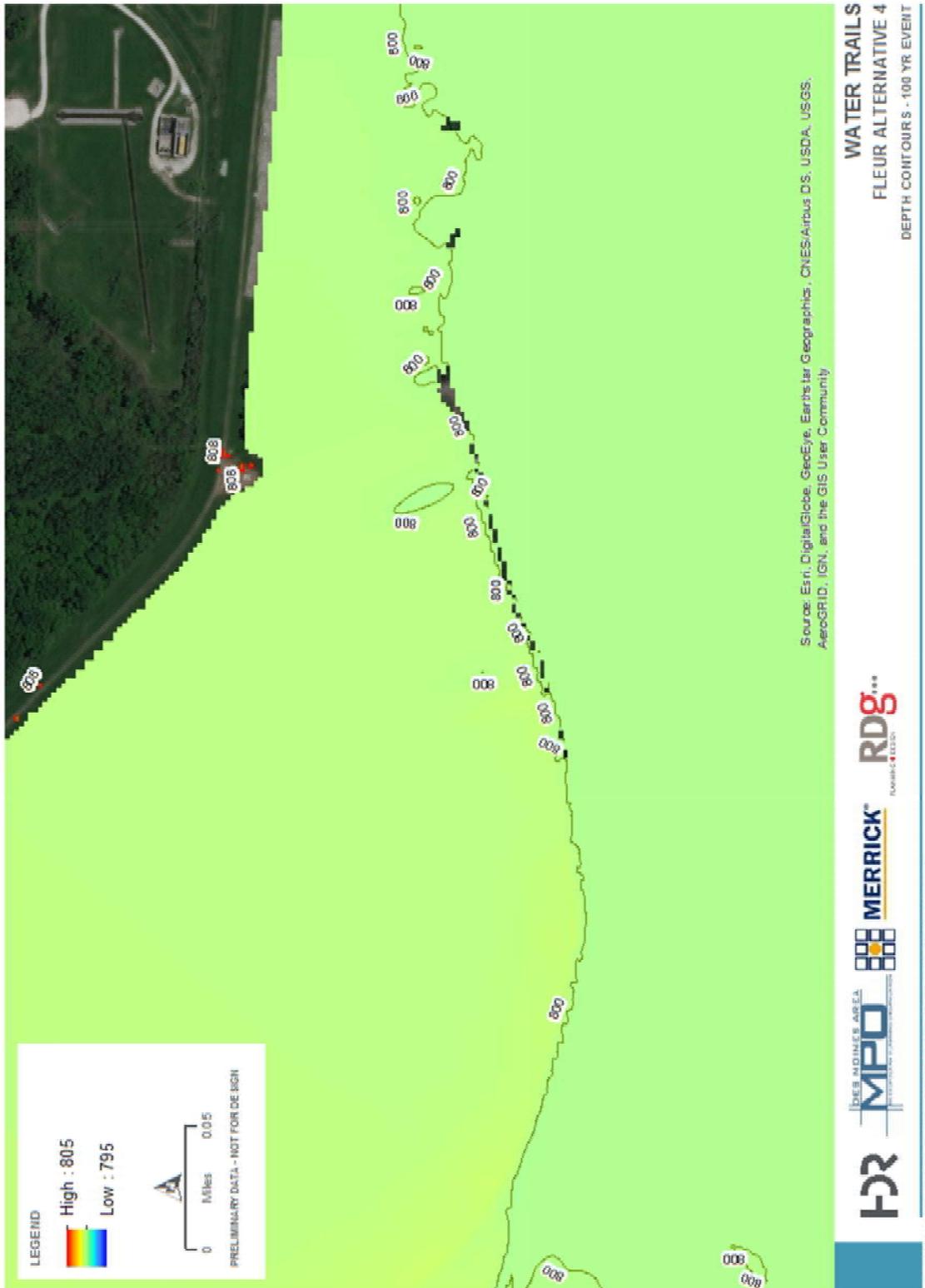


Figure 4-9: Water Surface Elevation, Fleur Drive, 100-year Proposed Alternative (2D Model)

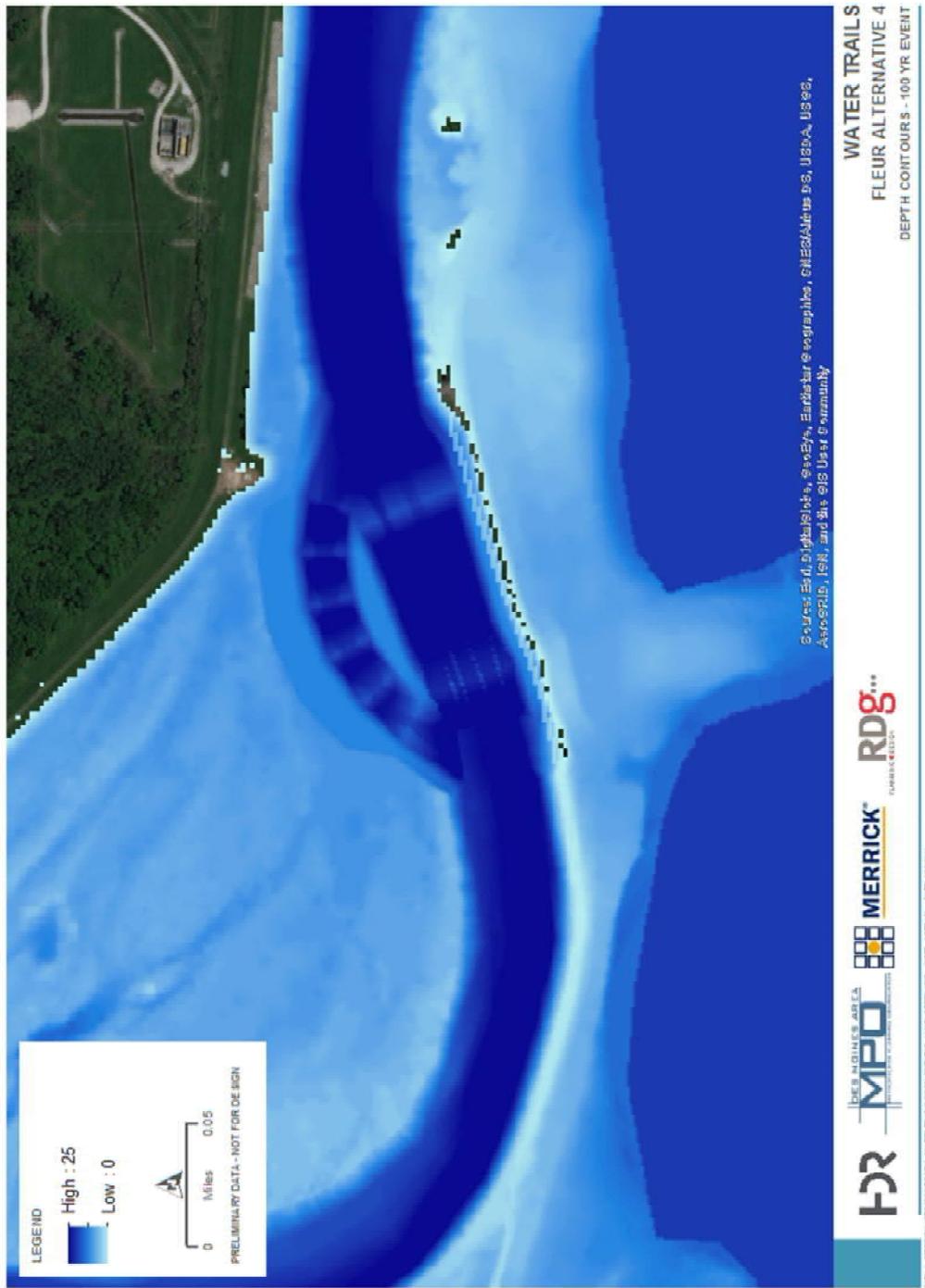


Figure 4-10: Water Depth, Fleur Drive, 100-year Proposed Alternative (2D Model)

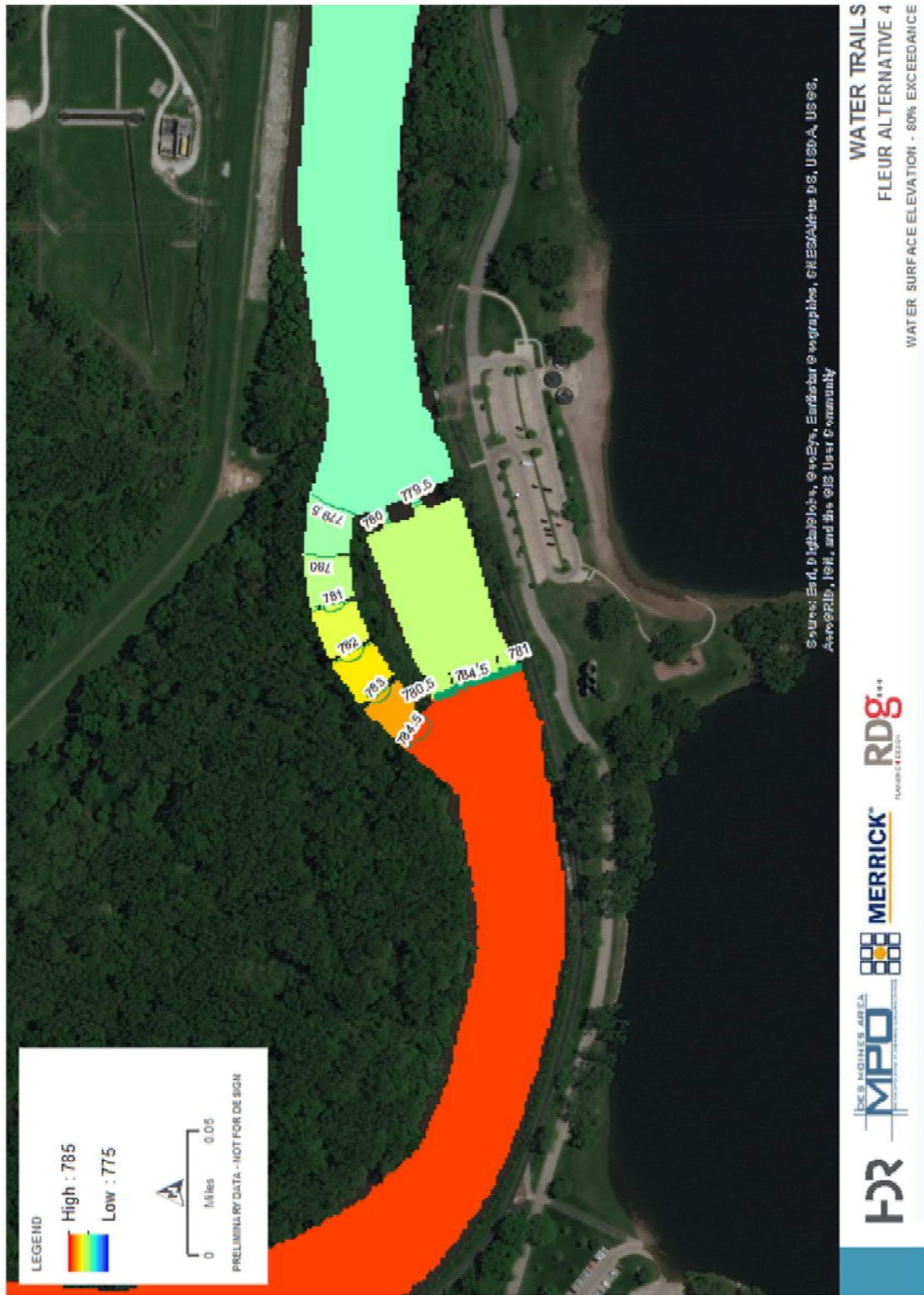


Figure 4-11: Water Surface Elevation, Fleur Drive, 80 percent Exceedance Proposed Alternative (2D Model)

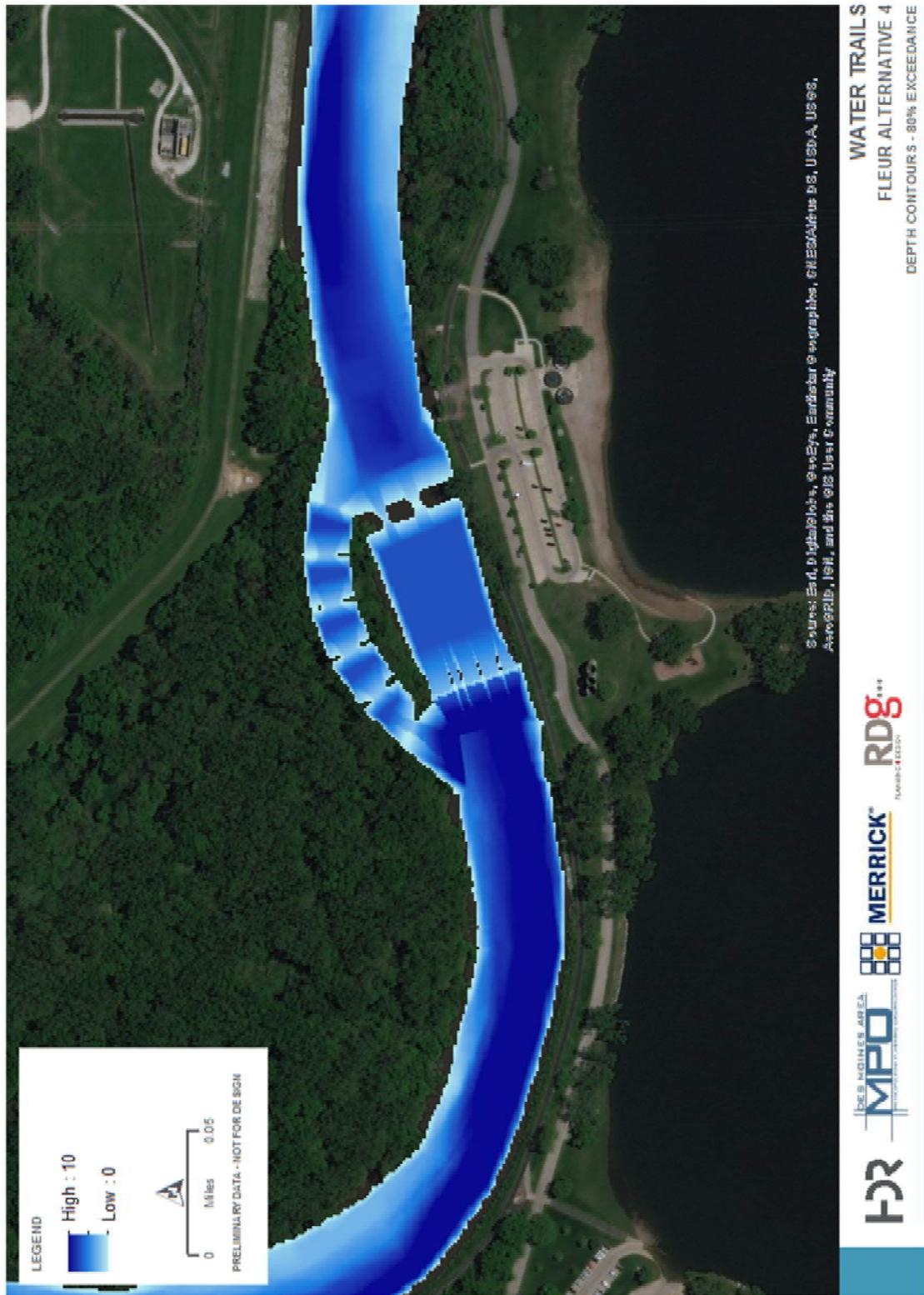


Figure 4-12: Water Depth, Fleur Drive, 80 percent Exceedance Proposed Alternative (2D Model)

5 Model Limitations

HDR used generally accepted engineering methods in preparation of the models reported in this TM.

The analyses conducted and the conditions modeled were intended to provide information for alternative(s) selection and analysis. The models and results presented herein are not suitable for final design and permitting, because additional design decisions will be necessary during the final design process. These decisions will require additional regulatory 1D modeling, 2D modeling, and possible Computational Fluid Dynamics (CFD) three-dimensional (3D) modeling reflecting the final design. Additional hydraulic modeling requirements may be likely, however will not be fully understood until further along in the environmental review process.

The conclusions in this report are based on the conditions of the project sites), numerical hydraulic models, and the associated watersheds at the time of this study. Any modifications to the site, human made or natural, could alter the analysis, findings, and recommendations contained herein and could invalidate the analysis, findings, and recommendations. This includes scour and erosion during floods that would alter the riverine hydraulic controls near the project and therefore, could not be anticipated not included in the analysis. Site conditions, completion of upstream or downstream projects, upstream or downstream land use changes, climate changes, vegetation changes, maintenance practice changes, or other factors may change over time. Additional analysis or updates may be required in the future because of these changes.

This report was developed by HDR for the Merrick & Company and the Des Moines Metropolitan Planning Organization's sole and exclusive use on this project. This report is not for the benefit of any third party and may not be distributed to, disclosed in any form to, used by, or relied upon by, any third party without prior written consent, which consent may be withheld in its sole discretion. Use of this work product by others is at their own risk and the user assumes all liability for its use.

Some of the information provided in this report was developed or provided by others. Except as specifically identified within this report, HDR has not performed independent validation or verification of exploration data, modeling data, or other analysis on data provided by others. While HDR has used its best efforts in preparing this report, HDR has assumed that third-party data is accurate, complete, reliable, and current.

The content included in this report is correct to the best of our knowledge and has been developed in accordance with the standard of care that is customarily followed by a practitioner

6 Summary

Multiple Water Trails alternatives were examined for each of the three locations. Only the hydraulically viable alternatives for Center Street, Scott Avenue, and Fleur Drive were reported. The analyses show that removal of the existing dams and placement of water trails features on the Des Moines River and Raccoon River did not have a significant effect on the WSEL during

the 100-year flood. Additional design coordination and modeling will be required during final design to further coordinate and model fish passage facilities, fishing access, and compliance with USACE Section 408 criteria, especially at the Scott Avenue Dam. Additionally, the selected alternatives were simulated in a 2D model to help visualize the flow patterns of the 100-year flood and 80 percent exceedance.

7 References

BMT-WBM (2016). TUFLOW User Manual. Build 2016-03-AA

FEMA (1988). Flood Insurance Study, City of Des Moines, Iowa, Polk County. 190227V000.
Community Number 190227

FEMA (2015). Preliminary Flood Insurance Study, City of Des Moines, Iowa, Polk County.
19153CV001A. Community Number 190227 6/17/2015.

B.2 – PRELIMINARY ECOLOGICAL ASSESSMENT



Technical Memorandum

Date: Friday, February 23, 2018

Project: Des Moines Water Trails Project

To: Andy McCoy (HDR)

From: Ben Fisher (HDR)

Subject: Preliminary Ecological Assessment

1. INTRODUCTION

The Des Moines MPO completed the Greater Des Moines and Water Trails Plan (Plan) in late 2016. The Plan required additional engineering services to assess the feasibility of its recommendations for the following three low-head dams in downtown Des Moines:

- Water Works Dam near Fleur Drive on the Raccoon River
- Scott Avenue Dam on the Des Moines River
- Center Street Dam on the Des Moines River

The recommended Des Moines Downtown Water Trails alternatives involve modifications to the existing in-river and riparian infrastructure and environmental habitats in the vicinities of the three dams (the Project). Based on the location and scope of the recommended alternatives, there would be a number of changes in the in-river ecology and riparian habitat.

Following an environmental stakeholder meeting on August 18, 2017, it was determined that the ecological assessment should focus on fisheries and mussel habitat, and avian riparian habitat. This assessment will consider the pre-Project condition of the Des Moines and Raccoon Rivers near the three dams and the anticipated post-Project condition.

The purpose of this memorandum is to qualitatively evaluate the potential ecological impacts of the proposed modifications of the three dams. At this time the Project only includes conceptual designs for the dam modifications. As such, this ecological assessment will broadly evaluate the ecological impacts of the Project and leave further detailed ecological assessment to accompany final Project design.

2. EXISTING CONDITIONS

2.1. Low-Head Dams

The Water Works Dam is 205-feet long, 3-feet tall, and encases a water main. The dam is submerged most of the year, allowing fish passage for the majority of the year (Gelwicks and Steuck, 2011). Land use adjacent to the Water Works Dam consists of maintained right-of-way



on the west bank and commercial properties on the east bank. Forested riparian areas exist south of the dam and east of the Raccoon River.

Within the Scott Avenue Dam is an abandoned sanitary sewer and the dam is approximately 5-foot tall, 440-foot long, and was built in 1938 (Meinch, 2016). The dam is directly beneath Scott Avenue with rock rip-rap lined banks on the north side of the Des Moines River and residential/commercial developments on the south side of the river. Maintained levees are also located north and south of the river. Downstream of the dam and on the south side of the river is a forested riparian area.

The Center Street Dam was built in 1917 and is approximately 15-foot tall, 364-foot long, and was designed to pool water upstream to feed Des Moines Water Works intake pipes near Prospect Park and create pooling for the Birdland Marina (Meinch, 2016). The adjacent land use includes a federal levee and maintained landscapes on both the east and west banks of the Des Moines River.

2.2. Wildlife and Habitat

In general, the three dams are located in developed areas of downtown Des Moines with maintained riparian habitat that includes maintained levees and City property. However, there is an approximate 40-acre forested riparian area south of the Water Works Dam and an approximate 15-acre forested riparian area southeast of the Scott Avenue Dam. According to the National Wetlands Inventory (NWI), these forested areas consist of forested and emergent wetlands (USFWS, 2018). Other than these isolated riparian forests, the riparian habitat in the vicinity of the three dams is heavily influenced by human development and consists of residential and/or commercial properties and transportation infrastructure. The existing riparian habitat provides minimal habitat for avian and terrestrial species.

When considering the full extent of the Des Moines River, it is important to recognize the use of the river as an avian corridor. The Des Moines River has been identified by the U.S. Fish and Wildlife Service (USFWS) as an avian migration corridor (USFWS, 2016). The Des Moines River connects many important bird areas, including Red Rock Reservoir, Chichaqua Bottoms Greenbelt (Jasper and Polk Counties), and the Shimek Forest (Van Buren and Lee Counties). Due to the well-forested corridor, the Des Moines River provides a major pathway for migrant and breeding birds. The dominant bird groups that utilize this corridor include waterfowl, waterbirds, raptors, shorebirds, gulls, and both migrant and breeding songbirds (USFWS, 2016).

The in-stream habitat near the three dams resembles a hybrid riverine/lacustrine (lake-like) habitat. The dams have altered the natural flow of the rivers and created lake-like habitat upstream of the structures. The existing in-stream habitat supports several fish species, including bigmouth buffalo, black bullhead, black crappie, bluegill, channel catfish, common carp, flathead catfish, freshwater drum, northern pike, quillback, river carpsucker, smallmouth bass, smallmouth buffalo, walleye, white bass, white crappie, white sucker, and wiper (Iowa DNR, 2016).

In addition to the common fish species listed above, the following species are listed as Federally Endangered or Threatened in Polk County, IA:



- Indiana bat
- Northern Long-Eared Bat
- Interior least tern
- Western Prairie Fringed Orchid
- Prairie bush-clover

The Project area and vicinity does contain suitable summer (roosting) habitat consisting of wooded or semi-wooded areas often along streams for the Indiana and northern long-eared bat. There does appear to be suitable habitat in the Project vicinity for these species.

The preferred habitat of Least Terns is sandbar habitat along large, slow moving rivers. The Western Prairie Fringe Orchid is most often found in tallgrass prairies and sedge meadows and the Prairie Bush-clover prefers dry-mesic prairies. The Project areas do not appear to provide suitable habitat for the Prairie Bush-Clover, Western Prairie Fringe Orchid, or Least Tern.

There are also 40 state listed species in Polk County, including three fish species (Blacknose Shiner, Grass Pickerel, and Western Sand Darter), and two mussel species (Creepers and Pistolgrip) (Iowa DNR, 2018). The Blacknose Shiner habitat includes small creeks in weedy shallow areas, the Grass Pickerel prefers clear, shallow, densely vegetated waters in low gradient streams and avoiding turbid or muddy water with silt bottoms, and the Western Sand Darter prefers large streams or rivers with slight to moderate current with sandy bottom. The two mussel species are found in small to medium-sized streams and occasionally large rivers in mud, sand, or gravel (Iowa DNR, 2001). Threats to the Pistolgrip and Creeper mussels include dredging, river pollution, invasion by non-native species, and the alterations of the natural flow of rivers due to dam construction (Iowa DNR, No Date.) A sediment analysis of the Des Moines and Raccoon Rivers was completed by IIHR – Hydroscience and Engineering on October 2, 2017. The analysis revealed that most of the riverbed material in all samples falls within international classifications of medium to coarse sand. In general, coarser sediment materials were found in the Des Moines samples, likely due to the Saylorville reservoir which captures a significant amount of material (Young et al., 2017). The Des Moines and Raccoon Rivers may provide habitat for the two mussel species, and measures for impact minimization and/or avoidance would be coordinated with the Iowa DNR and USFWS during the environmental permitting process as part of final Project design.

When considering the existing habitat near the three dams, it should be noted that low-head dams can alter the natural ecological process of the rivers. The Iowa 2010 Plan for Dam Mitigation describes several problems associated with low-head dams; those associated with wildlife and habitat include blocked fish passage, fine-particle sediment accumulation upstream of the dam, and high scour and sediment disequilibrium downstream of the dam (Hoogeveen, 2010). Recent research shows majority of Midwestern fish species require movement for several reasons, including accessing overwintering habitat, feeding habitat, predator avoidance, and reproduction (Hoogeveen, 2010). The Scott Avenue and Center Street dams are the only low-head dams between Saylorville Lake and Lake Red Rock, hindering fish migration between the two lakes and movement of fish up the Raccoon River.



In addition, the dams have created low gradient habitat behind the structures and the lake-like habitat is more conducive to the spread of invasive species (e.g. bighead carp and zebra mussels), because the native species are not well suited to the altered habitat and cannot successfully compete (Luther, 2010). Altering the river's natural flow also limits the diversity of aquatic species to a small number of generalist species (Ohio EPA, 2013). In Iowa, the generalist species such as common carp and green sunfish replace the more specialized species such as smallmouth bass and various darters, which favor coarse substrates and flowing water (Hoogeveen, 2010).

3. POST-PROJECT CONDITIONS

3.1. Proposed Low-Head Dam Modifications

Following several stakeholder meetings/workshops, the Project team received feedback on the preferred alternatives for the three dams. Preferred improvements would include world class whitewater recreation at the Center Street Dam, where practical at the Scott and Water Works dams provide multi-level experiences with wide ranging recreation accommodating many different skill levels and types of uses, address safety concerns, and incorporate natural resources at all locations to receive protection/habitat restoration. Provided below are brief descriptions of the proposed modifications:

- Water Works Dam – The proposed alternative for the Water Works Dam would include leaving the existing dam in place and developing in-river recreational opportunities downstream of the existing structure. The improvements would also include a low-flow bypass for recreation and fish passage, and levee mitigation would likely be required. The creation of the downstream recreational areas would create additional low gradient (pool) habitat between the existing dam and the new variable crest dam.
- Scott Avenue Dam – The Scott Avenue dam would include full to partial removal of the existing structure and construction of fish passage on the north side of the river and two fixed drops with recreation chutes located downstream of the existing dam.
- Center Street Dam – The Center Street dam would be removed. The upstream pool would be maintained with creation of recreational drops upstream from the existing dam. Fish passage would be integrated into the reach. An adventure park would be created along the upstream banks.

3.2. Wildlife and Habitat

In general, the complete removal of low-head dams increases the ecological function of a river. The proposed Projects remove and replace the existing dams with structures that accommodate recreation, fish passage, and accomplish increased public safety. The U.S. Army Corps of Engineers (USACE) issues nationwide permits (NWP) to authorize certain activities that require Clean Water Act (CWA) Section 404 permits. This includes Nationwide Permit No. 53 – Removal of Low-Head Dams. As stated in the 2017 CWA Section 404 Nationwide Permit No. 53, "Because the removal of the low-head dam will result in a net increase in ecological



functions and services provided by the stream, as a general rule compensatory mitigation is not required for activities authorized by this NWP.” (82 FR 1860-2008).

While it has not been determined if the Projects would qualify for NWP No. 53 and/or if mitigation would be required, the State of Iowa Stream Mitigation Method (ISMM) (USACE, 2017) provides guidance on evaluating impacts on streams and rivers and the potential for mitigation. The ISMM determines the need for mitigation credits based on the proposed impacts and anticipated improvements, such as fish passage. Dams can limit fish passage to upstream waters and over 200 dams in Iowa have been pre-scored for determining mitigation credits associated with dam removal. The benefit factor score ranges from 0.1 to 1.0 and is based on multiple factors that reflect the level of impact on fish movement and other aquatic species impacts due to habitat fragmentation (USACE, 2017). All three of the low-head dams have been pre-scored; the Center Street dam received a benefit factor of 0.20, while the two other dams received benefit scores of 0.16.

Recent dam removal projects have also shown to have a beneficial impact on the river ecosystem. The low-head dam on the Turkey River at Vernon Springs, Iowa was modified with a rock arch dam, thus creating fish passage and increasing the number of smallmouth bass and black redhorse upstream of the former low-head dam (Kilen, 2015). Another success story was the removal of the dam on the Shell Rock River in Rockford, Iowa, which saw an increase in the number of fish species upstream of the former dam from 10 to 28 species (Kilen, 2015). Success stories have also been documented in Minnesota and Wisconsin in which rapids conversions and dam removals have resulted in rapid colonization of upstream segments of waterways (Hoogeveen, 2010). As the proposed Projects are not complete dam removals, benefits to the river ecosystem may not be as strong as the cited examples. However, all three Projects seek to significantly improve river connectivity by integrating fish passages into the Project design.

Removal of the low-head dams would improve fish migration (as long as final Project designs are coordinated with fish passage principles and Iowa DNR experience), and consequently would benefit mussel reproduction and dispersal. Removing the Center Street and Scott Avenue dams would provide for an unimpeded segment of the Des Moines River between Saylorville Lake and Lake Red Rock and allow for fish migration upstream of the Raccoon River and Des Moines River confluence. Among the reasons mussel abundance is declining is the dependence on fish migration to distribute offspring (Blair, 2016). Mussels use fish as hosts for the larval stage of mussels; juvenile freshwater mussels attach to the gills of fish and as the range of fish increases so does the mussel distribution (Kilen, 2015).

The proposed Project alternatives would have a small localized adverse impact on avian riparian habitat, but would not impact the avian corridor of the Des Moines River. Due to the adjacent levees and floodwalls, there is limited opportunity to improve the riparian habitat. The modifications at the Center Street and Scott Avenue dams would have no impact on existing riparian habitat. Consistent with the current riparian habitat, the proposed riparian corridors adjacent to the Center Street and Scott Avenue dams would include maintained grasses, and planted shrubs and trees. The proposed Project modifications downstream of the Water Works



dam includes a fish/recreation passage on the north side of the river in an area that is an NWI mapped forested wetland (USFWS, 2018). At the current conceptual level of design, the Project would impact approximately 1-2 acres of forested riparian habitat. The anticipated tree removal at this location would likely have a negligible impact on riparian habitat given that the 1-2 acre impact area is part of a larger 40-acre forest.

4. DISCUSSION

This memorandum provides high level ecological review of the proposed modifications to three dams in downtown Des Moines. Based on preliminary designs, it is anticipated that the proposed Project, when constructed, would benefit fish and mussel species by improving fish passage along the Des Moines and Raccoon Rivers and creating a more natural riverine system through increased connectivity. However, the Water Works Dam portion of the Project may result in negative impacts on the Raccoon River by increasing the pool area and duration of pooling between the existing dam and the proposed Project location. In addition, the Project would have only a minor impact on the avian riparian habitat by removing a small area of trees downstream of the Water Works Dam, and there would be no impact on the avian migration corridor along the Des Moines River.

It should be noted that the proposed Project is currently in the conceptual stage of planning and future design developments will provide more detail on the potential improvements on Raccoon and Des Moines Rivers. Details such as construction timing, methods, and materials have not been determined. Prior to construction of the Project, it is anticipated that a number of environmental regulatory compliance permitting actions would be required. These environmental permits would likely involve coordination with the Iowa DNR and USFWS to determine potential impacts on threatened and endangered species. The Iowa DNR and/or USFWS may recommend design features that would improve the ecological functions of the impacted river segments. Such recommendations could include designing the fish passages so the fish can freely move upstream and downstream during free flowing conditions, including low flows. This may require designing the fish passages with a slope no steeper than a 20:1 slope with maximum velocities of 2-3 feet per second.

Further refinement of Project design will allow for a more in-depth review of the impacted segments of the Des Moines and Raccoon Rivers. This review could include a habitat assessment utilizing developed Habitat Evaluation Procedures and correlating Habitat Suitability Index model for reference species to assess the pre-project and post-project habitats for these species as a surrogate for riparian and stream habitat. Other habitat index models that focus on the hydraulics of a stream channel could also be considered. One model includes the Qualitative Habitat Evaluation Index (QHEI) (Ohio EPA, 2006). QHEI could be used to evaluate the pre-project and post-project habitat of target species. The QHEI uses six input variables and metrics to evaluate habitat characteristics of flowing waters. The six variables are substrate, in-stream cover, channel morphology, riparian zone, pool/glide and riffle/run quality, and gradient.



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B.3 – REAL-TIME COMMUNICATIONS SUMMARY



Real-Time Communications Summary

Date: Friday, February 23, 2018

Project: Des Moines Water Trails

To: Merrick & Co

From: HDR and IIHR-Hydrosience and Engineering/Iowa Flood Center

Subject: Real-Time Communications Summary

1 Introduction and Purpose

As part of the engineering feasibility study for downtown dam modification, a review of potential real-time public communications technologies was conducted. This is not meant to be an exhaustive investigation but rather to provide insight around these three questions:

- 1) What are other communities with water recreation, including white water recreation doing to communicate with the public?
- 2) What mobile phone applications are available - built around water recreation, specifically riverine water recreation?
- 3) What other mobile phone applications are available to communicate riverine information to the public?

This memorandum acknowledges that future recreational use of the Des Moines and Raccoon Rivers through the downtown Des Moines as well as throughout the region will require real-time communications with the public pertaining to safety issues, river stages, water quality, recreational conditions, and other relevant news. It summarizes what other communities have made available to the public, what technology is currently available, and what type of features should be a part of the Des Moines Area Water Trails communications system.

2 Similar Communities and Projects

As part of the Water Trails Engineering Study, two site visits were taken specifically to other communities similar in size to Des Moines; Columbus, Georgia, and Boise, Idaho. Both cities have enhanced public safety and created economic and recreational opportunities in their region by safeing low-head dams and adding in-stream recreational features. More locally, the Iowa towns of Manchester, Charles City, and Elkader have also completed dam removal/modification and recreational enhancement projects.

A summary of real-time communications to the public associated with these projects includes: informational web sites, web-site linking to USGS stream gage flow and stage information, live web cameras, text descriptions linking river flows, YouTube videos, expected in-river

recreational features, and linkages and invitations to social media. An example is shown in Figure 1.

Of the five projects investigated, none had information related to water quality, real-time water quality, or a dedicated mobile-phone based application focused on real-time water and recreational conditions.

However, In Columbus, Georgia, there is real-time audible alarm warning system for peaking flow. Peaking flow due to hydropower operations occurs in Columbus up to twice a day and causes the river to rise quickly from 800 cfs up to 13,000 cfs in the span of a few minutes. A rising stream gage near (but not part of) the hydro plant triggers the audible alarm which consists of an array of loud speakers over two miles of river, which broadcast a warning.



Figure 1. Public-Facing Website (Elkader, Iowa)

3 Mobile Application - RiverApp

The only mobile phone application available in the google or apple app store that provides real-time water and recreational information is called RiverApp. It has the ability to show live river conditions from more than 20,000 sites in Europe and North America, as long as there is a stream gage nearby. In river reaches with known whitewater recreation, the application lists the class and the known hazards. Countries included are Canada, Germany, Austria, Switzerland, Slovenia, France, Belgium, Italy, Spain, UK, Czech Republic, and the USA. Interestingly, none of the reaches reviewed in this section (Boise, Chattahoochee, Turkey, Cedar, and Maquoketa Rivers) appear in the application, indicating that the information is largely dependent on publically available stream gages and crowdsourcing. The application includes color coding to illustrate river stage (RED = high water, YELLOW = medium water, GREEN = low water, GREY = not enough water), which serves as the main real-time recreational information. The application has the ability for users to read and leave comments on river runs as well as communicate river dangers. It largely appears to be run on publically available data and then sustained by the recreational community interacting and commenting. A typical mobile phone screen is shown in Figure 2.



Figure 2. Recreational Reach (WW Class II-iV) via RiverAPP

4 Iowa Flood Center – Iowa Flood Information System (IFIS)

The most comprehensive real-time communications platform reviewed is, IFIS Mobile, a one-stop mobile platform to access community-based flood and weather conditions, forecasts, visualizations, inundation maps and flood-related data, information, and visualizations. It was developed and supported by Dr. Ibrahim Demir, IFIS Project Architect and Developer at the Iowa Flood Center (IFC). It is based on 547 real-time stage sensors in 1,064 towns and cities in Iowa. Flooding scenarios are mapped and flood alerts and forecasts are developed at each real-time stage sensor location. Though not specifically designed for recreational purposes, the flexibility and customizable features of the IFIS system is apparent.

The IFIS provides community-centric watershed and river characteristics, weather (rainfall) conditions, and streamflow data and visualization tools. Interactive interfaces allow access to inundation maps for different stage and return period values, and flooding scenarios with contributions from multiple rivers. Real-time and historical data of water levels, stage heights, and rainfall conditions are available in the IFIS by streaming data from automated IFC bridge sensors, USGS stream gauges, NEXRAD radars, and NWS forecasts. Interactive visualizations (2D and 3D) in the IFIS make the data more understandable to general public. Users are able to filter data sources for their communities and selected rivers. Figure 3 shows the live river stage for the Des Moines River at Second Avenue in Des Moines, Iowa.

The platform can be viewed both on mobile phones as well on a web interface. Applied to the Des Moines Area Water trails network, IFC would look at building a real-time mobile based information system using local sensors and live video that would provide the current water conditions in the river including stage, flows and velocities in the recreational areas. It is possible that other features such as water forecast and flood warning information could also be made available.

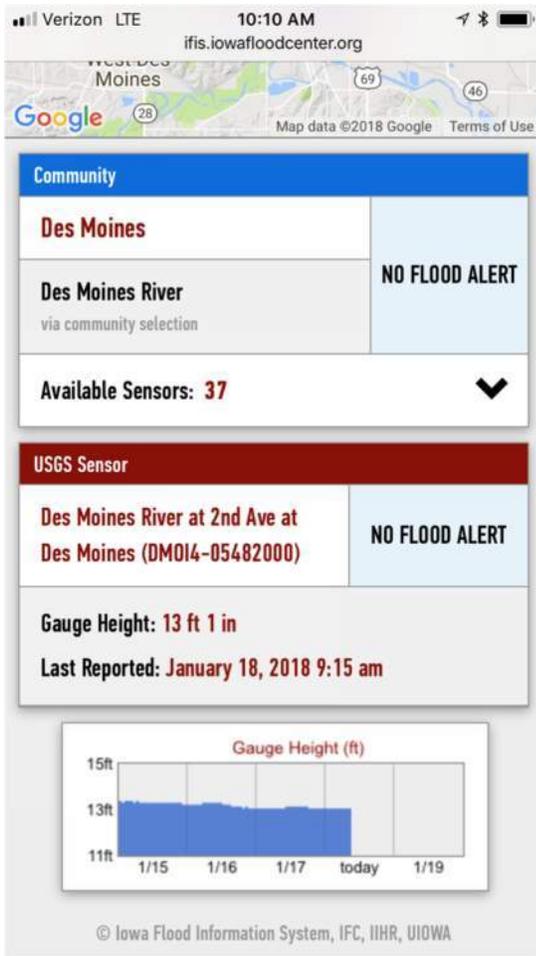


Figure 3. IFIS River Stage for Des Moines River from Mobile Phone.

5 IIHR–Hydroscience & Engineering, Iowa Nutrient Research Center – Iowa Water Quality Information System

The Iowa Flood Center’s parent organization, IIHR–Hydroscience & Engineering (IIHR), has been engaged with the Iowa Nutrient Research Center, housed at Iowa State University, in developing a real-time water quality information system. The Iowa Water Quality Information System (IWQIS) makes available real-time water quality measurements at 77 sites monitored by the USGS and IIHR throughout Iowa. Parameters include nitrate concentration, orthophosphate concentration, dissolved oxygen, pH, conductivity, turbidity, and temperature.

It should be noted that some important water quality data, within a primary contact context (i.e. bacteria), is not available in real-time because it requires laboratory work. Public health warnings (beach closings for example) do not occur in real-time. Future real-time water quality information that includes bacteria levels in recreational areas is not possible would have to be



developed based on future research, scientific literature guidance or rigorously developed correlations between bacteria and measureable data such as total suspended sediment, nutrients, rainfall, antecedent rainfall conditions, and other seasonal information.

6 Summary

A major opportunity that exists with the Des Moines Area Water Trails Project is the potential for development of real-time communication with water trails users. A comprehensive real-time mobile-accessible communications platform built around recreation, water conditions, and water quality does not currently appear to exist. The mobile and customized functions developed as part of the IFIS combined with recreational-centric information as seen in RiverApp, with the local information served up by the websites reviewed for Charles City, Elkader, and Manchester would be a reachable and apt goal for the Des Moines Area Water Trails system to develop during final project design.

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B.4 – JURISDICTIONAL COORD. AND PERMITTING PLAN

Water Trails Engineering Study
for
Greater Des Moines Water Trails & Greenway Plan

DOWNTOWN DES MOINES RECOMMENDATIONS

JURISDICTIONAL COORDINATION
REGULATORY PERMITS AND COMPLIANCE PLAN

Water Trails Engineering Study
for
Greater Des Moines Water Trails & Greenway Plan

DOWNTOWN DES MOINES RECOMMENDATIONS

JURISDICTIONAL COORDINATION

REGULATORY PERMITS AND COMPLIANCE PLAN

The recommended Des Moines Downtown Water Trails alternatives involve modifications to the existing in-river and riparian infrastructure and environmental habitats in the vicinities of the Center Street, Scott Avenue and Fleur Dams located on the Des Moines and Raccoon Rivers. Based on the location and scope of the Water Trails recommended alternatives, a number of environmental, engineering, cultural, historic, floodplain, and sovereign lands regulatory compliance permitting actions and clearances are required.

The Des Moines and Raccoon Rivers fall under the classifications for designated waters of the United States, thus proposed projects in or along these rivers are subject to satisfying the Federal and state environmental laws and regulations, including the Clean Water Act's (CWA) Sections 404 and 401, the Endangered Species Act (ESA), and the National Historic Preservation Act's (NHPA) Section 106.

In addition, the Water Trails improvements are located within a Federal Emergency Management Agency (FEMA) mapped Special Flood Hazard Area (100-year floodplain) as shown on the City of Des Moines Flood Insurance Study (FIS) maps. Thus, the Federal, state and local floodplain management permitting requirements must also be satisfied.

Additionally, the Downtown Water Trail project improvement locations are located in river reaches that have adjacent levee systems that provide flood risk mitigation benefits to large regions of the Downtown Des Moines area. These Des Moines levee systems were designed and constructed by the US Army Corps of Engineers (USACE); and thus subject to USACE's Section 408 approval processes. The Section 408 review process requires a determination that the requested Water Trails improvements are "not injurious to the public interest" and "will not affect the USACE project's ability to meet its authorized purpose".

The Engineering Study phase of the Water Trails project involves the identification of required project permits related to the recommended alternatives, a summary of jurisdictional coordination with the regulatory agencies and the preparation of a regulatory compliance permitting plan. The study phase does not involve the applying for or obtaining of the actual permits; additional project details and documentation will be required before the permit applications can be submitted for regulatory agency action. The following paragraphs will address the regulatory compliance permitting processes in more

detail and provides a summary of the jurisdictional coordination undertaken as part of the Engineering Study phase. A

Section 408 (USACE)

Section 14 of the Rivers and Harbors Act of 1899 and codified in 33USC 408 (referred to as Section 408) authorizes USACE to grant permission for the alteration of a Federal civil works project provided the alterations (modifications or improvements) are determined to not be injurious to the public interest and will not impair the usefulness of the Federal project. For the Water Trails project, the Des Moines and Raccoon River levee systems were designed and constructed by the USACE – Rock Island District and are operated and maintained by the City of Des Moines. Thus, the City’s downtown levee system falls under the purview of Section 408. USACE Engineering Circular 1165-2-216 “*Policy and Procedural Guidance for Processing Requests to Alter USACE Civil Works Projects*” outlines the review process and provides infrastructure specific considerations for dams, levees, floodwalls and flood channels, all of which are part of the downtown levee systems and the Water Trails project.

All approved alterations must be designed and constructed to applicable Corps design standards. In many cases USACE design standards exceed other Federal, state, and local requirements. In addition, issuing Section 408 permission is considered a Federal action which requires each project to comply with Federal acts including the CWA-Section 404/401, NHPA, ESA, and NEPA.

Jurisdictional Coordination: *A meeting was held with the USACE – Rock Island District Section 408 representative (Paul St. Louis) on January 10, 2018. The goals and objectives of the Water Trails project were presented along with an overview of the Workshop #4 recommended alternatives at the Center Street, Scott Avenue and Fleur Dams.*

Section 408: The project requirement to obtain a Section 408 approval from USACE was confirmed. Section 408 applies due to several project features including:

- *The verification of hydraulic performance will not impair the usefulness of the levee project. This is interpreted to be that Des Moines and Raccoon River flood levels will not be increased and adversely impact on the levels-of-flood protection provided by the Des Moines Levee Systems. Hydraulic impacts for flow ranges up to the top-of-levee will need to be evaluated for hydraulic performance. Section 408 can allow for some minor flood level increases if the project benefits are determined to override the adverse flood impacts. However, the Section 408 approval success for projects that have flood level impacts is very unpredictable and Section 408 approvals unlikely if levee freeboard requirements are impacted. Independent External Peer Reviews (IEPR) Type II Safety Assurance Reviews would likely be required per and as part of the Section 408; and these safety reviews could also halt the approval of the project if determined that the water trails project would negatively impact on levee safety. Thus, USACE advised that it is in the best interest of a successful Section 408 review action to design the Water Trails project in accordance with “no rise” water surface profile criteria dictated by local, state and FEMA floodplain management criteria.*
- *The integrity of the Des Moines Levee System cannot be jeopardized by the construction and operation of the Water Trails project. Any Water Trails modifications in the “critical zone” of the*

levees and floodwalls must be designed and evaluated so as to not diminish the existing levee stability and seepage characteristics. Due to the narrowness of the overbank area between the Des Moines and Raccoon River levees and the river channels; the “critical zone” is considered to be in effect for all locations where the Water Trail is adjacent to the Des Moines Levee System.

- *As the recommended alternatives include a variable crest (movable flashboards) at the Center Street and Fleur Dams in order to satisfy hydraulic performance criteria, a comprehensive Operation and Maintenance (O&M) type manual that clearly identifies responsible parties will need to be a part of the Section 408 application. As a failure to operate or a mechanical malfunction of the flashboards would result in flood level increases; the 408 application package would also require hydraulic performance sensitivity modeling to establish the flood risks associated with the inoperability of the flashboard systems.*
- *The Section 408 application package will also need to demonstrate that the altered flow characteristics on the Des Moines and Raccoon River will not cause scour or erosion issues within the top-of-levee channel of the rivers.*
- *Landscaping amenities to be included along the Water Trail (plazas, access points, access gates, stairways to/from the river channel) must be included in the project condition hydraulic performance modeling, and the evaluations of levee stability and erosion.*

Clean Water Act – Section 404 (USACE)

Section 404 of the Clean Water Act (CWA) establishes a regulatory program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. The location and context of the recommended Des Moines Water Trails improvements dictate that Section 404 permitting will be a project requirement. The basic premise of the Section 404 program is that no discharge of dredge or fill material may be permitted if: 1) a practical alternative exists that is less damaging to the aquatic environment or 2) the nation’s waters would be significantly degraded. Thus, the Water Trails project must show that to the extent possible:

- Aquatic environment of the Des Moines and Raccoon Rivers is not damaged, or
- Wetland impacts have been avoided, or
- Potential impacts on wetlands have been minimized, and
- Compensation for any remaining unavoidable impacts has been provided.

Proposed project activities are regulated through a USACE permit process under either “individual” or “general” permits. The Des Moines Water Trails recommended alternatives will require an individual permit due to wetland impacts likely exceeding 0.5 acres, potentially significant changes to the existing in-river flow conditions at the dams and the public interest in the proposed improvements. It is noted that USACE has a Section 404 nationwide permit, NWP No. 53 – Removal of Low-Head Dams”. However, due to the dam modifications proposed rather than dam removal, this nationwide permit would not be applicable. The Rock Island District of the USACE will be the lead office in evaluating the Section 404 application. The State of Iowa will also have a role in the Section 404 decision through the State’s CWA Section 401 water quality certification program.

In evaluating the permit application, a wetlands delineation report will need to accompany the initial Section 404 permit application. The USACE will consider all factors of the proposed activity, including conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply and water quality, energy needs, safety, food production, and the needs and welfare of the people. A public notice is issued on most individual permit applications. Significant comments received from individuals, groups, or government agencies will be furnished to the applicant for his comment/rebuttal and/or resolution. Sometimes a public hearing will also be held before the District Engineer issues or denies a permit. Major controversial cases may be referred to higher headquarters for a decision. A permit decision will be based on compliance with the 404(b)(1) guidelines and that the project is found to be not contrary to the public interest.

As the Section 404 permit triggers Federal involvement, USACE, as part their Federal decision, will need to show compliance with NEPA, ESA, and NHPA. NEPA compliance would likely be the responsibility of USACE as part of their permit decision documentation. If an Environmental Assessment (EA) is required in conjunction with the Section 408 approvals, the preparation of these documents will be the responsibility of the project applicant. As part of the 404 reviews, the compliance with the Endangered Species Act (ESA) will be coordinated with the US Fish and Wildlife Service (USFWS). Additionally, compliance with the National Historic Preservation Act (NHPA) will be coordinated with the State Historic Preservation Office (SHPO) for cultural and historic impacts and possible preservation or mitigation requirements. A Phase 1 cultural/historic assessment will be a project requirement. See discussions regarding these acts below.

Jurisdictional Coordination: *A meeting was held with the USACE – Rock Island District Section 404 representative (Michael Hayes) on January 10, 2018. The goals and objectives of the Water Trails project were presented along with an overview of the Workshop #4 recommended alternatives at the Center Street, Scott Avenue and Fleur Dams.*

Section 404: The project requirements to obtain a Section 404 permit and that the 404 permit would highly likely be an “individual” permit was confirmed by USACE representatives. Other dam modification/whitewater projects around Iowa (Charles City, Manchester, Elkader) have been able to be 404 permitted under a “general” permit. However, the two-to-three location scope of this project, potential new fill above ordinary highwater line, adjacent overbank impacts, effects to known cultural and historic properties, and expected level of public involvement dictate the “individual” permit.

Wetland impacts of greater than 0.5 acre require that wetland compensation be provided in the area of the project, at an approved offsite location, or through a wetland mitigation bank. Additionally, impacts to forested wetlands of greater than 0.5 acres would require similar in-kind compensation. If the ecological function of the river is determined to be improved by the dam modifications, then the project itself may be eligible for habitat improvement mitigation credits.

As part of the Section 404 process, USACE will coordinate with the USFWS on compliance with the ESA and with the Iowa SHPO on NHPA adverse effects. A Phase 1 cultural and historic effects report will be

required associated with any modifications to the Center Street and Scott Avenue Dams and the Des Moines River balustrade wall; and other historic district or cultural resources in the Area of Potential Effect.

If Federal funding becomes involved in the Water Trails project, then a Lead Federal agency will be designated for NEPA regulatory compliance activities. Typically the Lead agency designation would track with the agency through which the Federal funding is provided. In this case, the Lead Federal agency would have greater responsibilities on the conducting of NEPA compliance documentation and compliance. If no Federal funding is involved in the development of the water trails, then the USACE would be considered the lead Federal agency for NEPA compliance activities under the Section 404 program.

Clean Water Act – Section 401 (IDNR)

The CWA Section 401 water quality certification program provides States with a means to help protect water quality by providing them an opportunity to address the aquatic resource impacts of federally issued 404 permits. Iowa's Section 401 program is administered by the Iowa Department of Natural Resources (IDNR). A Section 401 water quality certificate is the IDNR's certification that the Des Moines Water Trails project will not violate state water quality standards. The Section 401 certification is required before the USACE can issue a Section 404 permit. As such, a Joint Application Form shall be submitted to both USACE and the IDNR to begin the 404/401 permit process.

Jurisdictional Coordination: A meeting was held with an IDNR representative (Christine Schwake) that administers the State's Section 401 program on January 18, 2018. The goals and objectives of the Downtown Water Trails project were presented along with an overview of the Workshop #4 recommended alternatives at the Center Street, Scott Avenue and Fleur Dams. A Section 401 water quality certification would be required as part of the joint Section 404/401 permitting action. The primary concerns related to issuing the 401 certification would be the placement of excavated material into the Des Moines and Raccoon River channels. Placement of materials that would impact water quality parameters such as turbidity would not be permitted. A sediment management plan associated with the proposed modifications to the dams would need to be developed, especially for any potential sediment flushing associated with a dam removal.

Sovereign Lands Construction Permit (IDNR)

The recommended Water Trails improvements are located on the Des Moines and Raccoon Rivers, rivers that are classified under Iowa statutes as a meandered sovereign river. Any construction on, above, or under all fee title lands and waters, dedicated lands and waters under the jurisdiction of the IDNR or managed by the IDNR for public access to a meandered sovereign river requires an IDNR Sovereign Lands Construction Permit.

Jurisdictional Coordination: A meeting was held with an IDNR representative (Seth Moore) that administers the State's Sovereign Lands programs on January 18, 2018. The goals and objectives of the Downtown Water Trails project were presented along with an overview of the Workshop #4

recommended alternatives at the Center Street, Scott Avenue and Fleur Dams. As the Des Moines and Raccoon Rivers at the project locations are sovereign rivers, the State of Iowa has the prevailing land ownership of the channel rights-of-way. The sovereign lands permit includes a biological impacts review and would check if any Threatened and Endangered Species are known in the area along with other natural resources impacts. Any tree clearing would likely involve a bat survey and mitigating any impacts to identified habitat such as restricting time of year for tree removal activities. If eagle nests are impacted, avoidance or mitigation will likely be requested. As a part of this discussion, the DNR's fisheries representative (Ben Dowd) provided input that fish passage on the Scott Avenue and Fleur Dams was of more importance than fish passage on the Center Street Dam. Opening up the Raccoon River stream network is more important than the limited Des Moines River corridor from the Center Street Dam upstream to the Saylorville Dam. The fish passage features of the dam modifications should be designed at locations where the prevailing river flows provide fish attraction. The sovereign lands review will also check overall technical soundness of the proposed project and recommended revisions that may be needed. If bank stabilization is involved, sound engineering criteria shall be employed for the placement of the stabilization.

Endangered Species Act (USFWS)

Section 10 of the Endangered Species Act (ESA) provides for the conservation of fisheries or wildlife species that are endangered or threatened throughout all or a significant portion of their range, and the protection of the habitats on which they depend. The lead Federal agency for administering the ESA is the US Fish and Wildlife Service (USFWS). The ESA requires Federal agencies, in consultation with the USFWS to ensure that actions they permit are not likely to jeopardize the continued existence of any listed species or adversely impact on their habitat. Thus, as part of the Section 404 permitting process, USACE will consult with the USFWS as to the Water Trails compliance with the ESA. For additional information concerning the wildlife, fisheries and habitat characteristics of the project area, see Appendix F – Ecological Assessment.

Jurisdictional Coordination: *At the January 10, 2018 jurisdictional coordination with the USACE Section 404 representative, USACE confirmed their office will consult with the USFWS for compliance with the ESA as a part of the Section 404 permit process. If any ESA species are identified to be impacted, in order for the project to proceed, the adverse impacts will need to be avoided or mitigated. The project reaches of the Des Moines and Raccoon Rivers were noted to not have any EDS Federally protected mussel populations identified, thus a mussel survey may not be required as part of the compliance actions. However, State of Iowa Threatened and Endangered (T&E) species could be present that could dictate some level of field surveys.*

National Historic Preservation Act (Iowa SHPO)

Section 106 of the NHPA requires a Federal agency to take into account the impacts of permitted projects on structures eligible for or listed on the National Register of Historic Places. Thus, as part of the Section 404 permitting process, USACE will consult with Iowa's SHPO on providing information and guidance to USACE on the potential effects of the project on cultural and historic resources in the Area

of Potential Effect. Any identified adverse effects will need to be resolved (avoided or mitigated) as part of the Water Trails project. Given the historic relevance of the Des Moines River Balustrade Wall and the three dams, NHPA requirements will be a part of the Water Trails project based upon the specific NHPA impacts.

Jurisdictional Coordination: *The State Historical Society of Iowa's State Historical Preservation Office (SHPO) was e-mail contacted on January 16, 2018. Section 106 NHPA compliance would be under the Section 404 permit process with USACE as the lead Federal regulatory agency. SHPO office coordination indicated as the project(s) is so early in the planning stages, it is difficult for SHPO staff to foresee the types and magnitudes of project effects upon historic properties or what might serve as an acceptable range of mitigation options. Given the likelihood for adverse effects, project planners should be taking historic properties into account by devising design alternatives that will avoid or minimize impacts to them.*

The Iowa DNR (Nate Hoogeveen) is working on the preparation of a Phase 1 cultural/historical assessment that will begin to define the Area of Potential Effects and determining the potential types and magnitudes of effects and range of mitigation requirements. This assessment is projected to be completed by Spring 2018.

Floodplain Management Permit (IDNR)

The recommended Water Trails alternatives are located within the mapped floodways of the Des Moines and Raccoon Rivers. The IDNR regulates construction on all flood plains and floodways in the state to protect life and property; and to promote the orderly development and wise use of Iowa's flood plains. The primary floodplain permit requirement will involve a determination of no impact to the regulatory Base Flood Elevation (100-year flood), or what is referred to as a "no rise" certification. The Engineering Study phase hydraulic modeling included an evaluation of each alternatives impact on flood elevations; and identified which alternatives preliminarily satisfied the "no rise" criteria, those alternatives that did not, and recommended flood profile mitigation measures to bring selected alternatives into compliance such as the installation of a variable crest elevation (flashboards) on the modified dams.

Jurisdictional Coordination: *A meeting was held with the IDNR representatives (Bill Cappuccio and Jeff Simmons) that administer the State's Floodplain programs on January 18, 2018. The goals and objectives of the Downtown Water Trails project were presented along with an overview of the Workshop #4 recommended alternatives at the Center Street, Scott Avenue and Fleur Dams. State floodplain permitting compliance would be similar to the USACE Section 408 hydraulic performance criteria. For state permitting, slight water surface profile increases (in the 0.01s-foot range) can potentially be permitted if the impacts can be mitigated or with an approved revision of the NFIP mapping with a Letter of Map Revision (LOMR). However the only successfully predictable permitting approach is to adhere to a "no rise" criteria. Damageable structures associated with the water trail would need to be located 1-foot above the 100-year flood elevation. A detailed flood operation plan for*

the variable crest dams would need to accompany the floodplain permit application.

IDNR Dam Safety Program Permit (IDNR)

The Iowa DNR is responsible for the state's dam safety program. The program involves the review and approval of applications for the construction of new dams, modifying existing dams, drawdown of water above dams, or removal of dams that meet jurisdictional size thresholds. For urban dams, the governing threshold is any dam where the upstream storage exceeds 18 acre-feet and has a height of 5 feet or more. The Center Street, Scott Avenue and Fleur Dams' recommended alternatives all exceed these thresholds. The dam designs shall comply with IDNR "Bulletin No. 16 Design Criteria and Guidelines for Iowa Dams".

Jurisdictional Coordination: A meeting was held with an IDNR representative (Casey Welty) that administers the State's Dam Safety program on January 18, 2018. The goals and objectives of the Downtown Water Trails project were presented along with an overview of the Workshop #4 recommended alternatives at the Center Street, Scott Avenue and Fleur Dams. A state dam safety permit would be required for the recommended dam modification alternatives. Sound and accepted dam engineering principals would need to govern the designs of the modifications. A sediment management plan would need to be developed for the potential sediments that could be released downstream with the proposed modifications.

Floodplain Development and Grading Permit (City of Des Moines)

The IDNR works with Iowa communities, including the City of Des Moines, to develop and administer local floodplain management programs that work in coordination with the State's and FEMA's National Flood Insurance Program (NFIP) floodplain management regulations. In some cases, the IDNR's floodplain permitting process is delegated to NFIP compliant communities. The City has adopted IDNR and FEMA compliant regulations which apply to development within the 100-year floodplain. A Flood Plain Development Permit in addition to a Grading Permit will be required from the City. If any buildings are proposed that are located within the 100-year floodplain as part of the Water Trails project, then the floodplain development permit application must show compliance with minimum 100-year plus 1-foot floor elevation requirements also. For more significant floodplain development projects, the IDNR will remain involved in the permit evaluation and permitting process. IDNR and City floodplain permitting will both be required of the Water Trails project.

Jurisdictional Coordination: The City's Permit and Development Center (Adam Prilipp) recommends the water trails applicant and engineering consultant set up a "Pre-App" meeting with City staff once the project advances to a point where scope of work is defined and engineering design layouts and details are available. At a "Pre-App" meeting, the City would be able to walk the applicant through all the steps required for the City's process and permitting. Floodplain permitting at the City level would likely be processed in conjunction with the Iowa DNR floodplain permit review.

Tree Mitigation Plan (City of Des Moines)

A tree mitigation plan will be required if any trees greater than 12" diameter are being removed. As development of the adjacent riverfront water trail amenities at the Center Street and Scott Avenue Dams and the by-pass channel at the Fleur Dam will involve the removal of trees, many with diameters greater than 12", the project will require a Tree Mitigation Plan.

Jurisdictional Coordination: *The City's Permit and Development Center recommends the water trails applicant and engineering consultant set up a "Pre-App" meeting with City staff once the project advances to a point where scope of work is defined and engineering design layouts and details are available. At a "Pre-App" meeting, the City would be able to walk the applicant through all the steps required for the City's process and permitting.*

Urban Design Review Board (City of Des Moines)

The City's Urban Design Review Board (UDRB) may need to review the project depending on the level of financial investment the City is providing to the project. Based upon the preliminary project cost estimates, the assumption is that the water trails project will dictate the UDRB be involved to provide design review and recommendations on revisions to various project features.

Jurisdictional Coordination: *The City's Permit and Development Center recommends the water trails applicant and engineering consultant set up a "Pre-App" meeting with City staff once the project advances to a point where scope of work is defined and engineering design layouts and details are available. At a "Pre-App" meeting, the City would be able to walk the applicant through all the steps required for the City's process and permitting.*

Planning and Zoning Commission (City of Des Moines)

Projects that fall within the Downtown Riverfront Zoning District may require a review and approval from by the City's Planning and Zoning Commission. Based on the scope, size and cost of the Downtown Water Trail recommended alternatives, the planning and zoning review should be considered required for the project.

Jurisdictional Coordination: *The City's Permit and Development Center recommends the water trails applicant and engineering consultant set up a "Pre-App" meeting with City staff once the project advances to a point where scope of work is defined and engineering design layouts and details are available. At a "Pre-App" meeting, the City would be able to walk the applicant through all the steps required for the City's process and permitting.*

Attachment A
Water Trails Engineering Study
for
Greater Des Moines Water Trails & Greenway Plan

DOWNTOWN DES MOINES RECOMMENDATIONS

**REGULATORY PERMITS AND COMPLIANCE PLAN
CHECKLIST**

Federal Actions

- US Army Corps of Engineers – Rock Island District
 - Section 408 – Permission to Alter Des Moines Levee System
<http://www.mvr.usace.army.mil/About/Offices/Programs-and-Project-Management/District-Projects/Projects/Article/1171725/section-408-program/>
 - Section 404 (Waters of the U.S.) – Clean Water Act Compliance–
<http://www.mvr.usace.army.mil/Missions/Regulatory.aspx>

- US Fish and Wildlife Service
 - Section 10 - Endangered Species Act – coordinated by USACE under USACE’s Section 404 compliance actions
<https://www.fws.gov/endangered/permits/index.html>

- Iowa State Historic Preservation Office (SHPO)
 - Section 106 – National Historic Preservation Act – coordinated under USACE’s Section 404 compliance actions
<https://iowaculture.gov/history/preservation/review-compliance>

State Actions

- Iowa Department of Natural Resources
 - Section 401 (Water Quality) – Clean Water Act – joint application with USACE’s Section 404
<http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Wetlands-Permitting>
 - Floodplain - joint application with Sovereign Lands permit
<http://www.iowadnr.gov/Environmental-Protection/Land-Quality/Flood-Plain-Management>

- Dam Safety
<http://www.iowadnr.gov/Environmental-Protection/Land-Quality/Dam-Safety>
- Sovereign Lands – joint application with Floodplain permit
<http://www.iowadnr.gov/Environmental-Protection/Land-Quality/Sovereign-Lands-Permits>

Local Actions

- City of Des Moines
<https://www.dmgov.org/Departments/CommunityDevelopment/Pages/PermitDevelopmentCenter.aspx>
 - Floodplain/Grading
 - Tree Mitigation
 - Urban Design Review Board
 - Planning and Zoning Commission

B.5 – SEDIMENT ANALYSIS



December 14, 2017

Andy McCoy, PhD, PE
HDR, Inc.
300 East Locust St.
Des Moines, IA 50309

Subject: Water Trails Engineering Study – Sediment Analysis

Dear Dr. McCoy:

Please find the attached report describing collection and analysis of sediment samples made by IIHR – Hydroscience & Engineering on the Des Moines and Raccoon Rivers on October 2, 2017. If you have any questions or if we can be of any further assistance please let me know.

Sincerely,

Nathan Young, PhD, PE
Research Engineer
IIHR – Hydroscience and Engineering
The University of Iowa
Iowa City, IA 52242
319-354-1216

**SEDIMENT SAMPLE COLLECTION AND ANALYSIS ON
THE RACCOON AND DES MOINES RIVERS NEAR DES
MOINES, IOWA**

by

Nathan Young, Daniel Gilles, Tony Loeser

Submitted to
Andy McCoy, PhD, PE
HDR, Inc.
Des Moines, Iowa



IIHR – Hydroscience & Engineering
College of Engineering
The University of Iowa
Iowa City, Iowa 52242-1585

December 2017



1. INTRODUCTION

Sediment samples were collected by IIHR – Hydrosience & Engineering (IIHR) personnel on the Raccoon and Des Moines Rivers near downtown Des Moines on October 2, 2017. The study area, shown in Figure 1, included Raccoon and Des Moines River reaches upstream of the Center Street and Scott Avenue low head dams. Collection and analysis of sediment samples was intended to characterize bed material upstream of the dams as part of the Greater Des Moines Water Trails and Greenways Plan.

2. SITE CONDITIONS

Sediment samples were collected by research engineer Nathan Young and staff engineers Daniel Gilles and Tony Loeser. Data collection began at 12:00PM and continued through 5:00PM on October 2nd. Air temperatures ranged from 81-84°F throughout the data collection period. Average wind speed was 15 miles per hour (mph) from the southeast. Des Moines River discharge was approximately 750 cubic feet per second at the nearest United States Geological Survey (USGS) river gage station (05485500) located just downstream of the confluence with Raccoon River. Shallow water depths downstream of the Center Street Dam prevented vessel-based access.

3. SAMPLE COLLECTION

Des Moines River samples upstream of the Center Street Dam were collected using a Specialty Devices, Incorporated (SDI) Vibecore D, shown in Figure 2, deployed from a 25-foot pontoon boat. Due to low flow conditions, Des Moines River samples collected downstream of Center Street Dam and Raccoon River samples were collected by wading using a handheld SDI Vibecore Mini, also shown in Figure 2.

At sample sites 1 and 2, the Vibecore D was only able to penetrate the first few inches of the bed. These samples were observed to be uniform and were therefore analyzed in bulk. They can be considered equivalent to surface grab samples. The Vibecore Mini was able to penetrate the bed at locations 3 through 6, downstream of Center Street Dam, to depths below the bed surface of 9.0, 11.0, 22.8, and 19.2 inches, respectively. All cores were capped at collection time and stored vertically until analyzed to preserve any stratification.



Figure 1. River sediment sample locations on the Des Moines and Raccoon Rivers near downtown Des Moines. The Vibrecore D was unable to significantly penetrate the bed at locations 1 and 2, upstream of the Center Street Dam. The Vibecore Mini was able to penetrate the bed at locations 3 through 6, downstream of Center Street Dam to depths below the bed surface of 9.0, 11.0, 22.8, and 19.2 inches, respectively.



Figure 2. Devices used to vibrate aluminum core tubes into substrate included an SDI Vibecore D (left) and Vibecore Mini (right)

4. SAMPLE ANALYSIS

Samples 1, 2, and 3 were observed to be vertically uniform and were analyzed in bulk. Visual inspection of samples 4, 5, and 6 indicated variation in sediment character without clearly defined strata; therefore they were separated into upper and lower halves for analysis.

Each sample portion was subjected to mechanical agitation and allowed to fall through nested sieve filters to separate particle sizes. Each sieve was weighed following agitation to determine the particle mass fraction captured. Sieve analysis results for each sample or subsample are summarized in Tables 1 and 2.

The percent of sample retain on each sieve was calculated using the following equation:

$$R_i = \frac{\text{Mass Retained}, W_i}{\text{Total Mass}, W} \times 100$$

The percent of sample passing through each sieve was calculated using the following equation:



$$\% \text{ finer} = 100 - \sum_{i=1}^{i=i} R_i$$

Because the mass fraction passing the finest sieve was relatively insignificant for all samples, no additional size distribution analyses were performed to further characterize the distribution.

Grain size distributions for each sample location are shown in Figure 3. Summary statistics describing mean and variability in sediment size for each sample or subsample are shown in Tables 1 and 2. The geometric mean (d_g), geometric standard deviation (σ_g), and gradation coefficient (G) of each grain size distribution were calculated according to the following relationships:

$$d_g = (d_{16}d_{84})^{\frac{1}{2}}$$

$$\sigma_g = \left(\frac{d_{16}}{d_{84}}\right)^{\frac{1}{2}}$$

$$G = \frac{1}{2} \left(\frac{d_{84}}{d_{50}} + \frac{d_{50}}{d_{16}}\right)$$

The critical bed shear stress (τ_c) at which sediment particles would be mobilized was also calculated based upon the geometric mean grain size of each sample or subsample using criteria described by Shields (1936). These values are also reported in Tables 1 and 2.

5. DISCUSSION

Grain size distribution curves for each sample site are plotted in

Figure 3. Most of the material in all samples falls within international classifications of medium to coarse sand. The sample with the largest fraction of fine sand and silt was site 6, with approximately 30 percent of the sample finer than 0.2 mm, and approximately 5 percent finer than 0.1 mm. Significant vertical variability in sediment size was only observed in samples 4 and 5, where coarser sediments were overlain by finer sediments.



Center Street Dam appears to capture some fine material, which is indicated by the geometric mean grain size decreasing from site 2 to site 1, located nearest the dam.

There are generally coarser materials in Des Moines River samples, likely due to the influence of Saylorville Reservoir. Because reservoir sedimentation captures a significant amount of material on the Des Moines, some finer materials transported downstream from the study reach are not replenished.

Subsurface exploration near Center Street Dam was completed in 2004 by TEAM Services, a subcontractor of Stanley Consultants, Inc., for the Riverwalk Pedestrian Bridge proposal. Two of three Des Moines River channel borings encountered a layer of wood debris with gravel, silt and sand located on the riverbed. This layer extended to depths of 8 to 16.5 feet below the water level at the time of the exploration. Another channel boring encountered a layer of fine to coarse sand mixed with gravel and cobbles at the riverbed, with a thickness of 7 feet. The alluvium was found to be generally very loose and classified as silty sand. Detailed subsurface profiles and boring logs can be found in the subsurface exploration report (TEAM Services 2004).

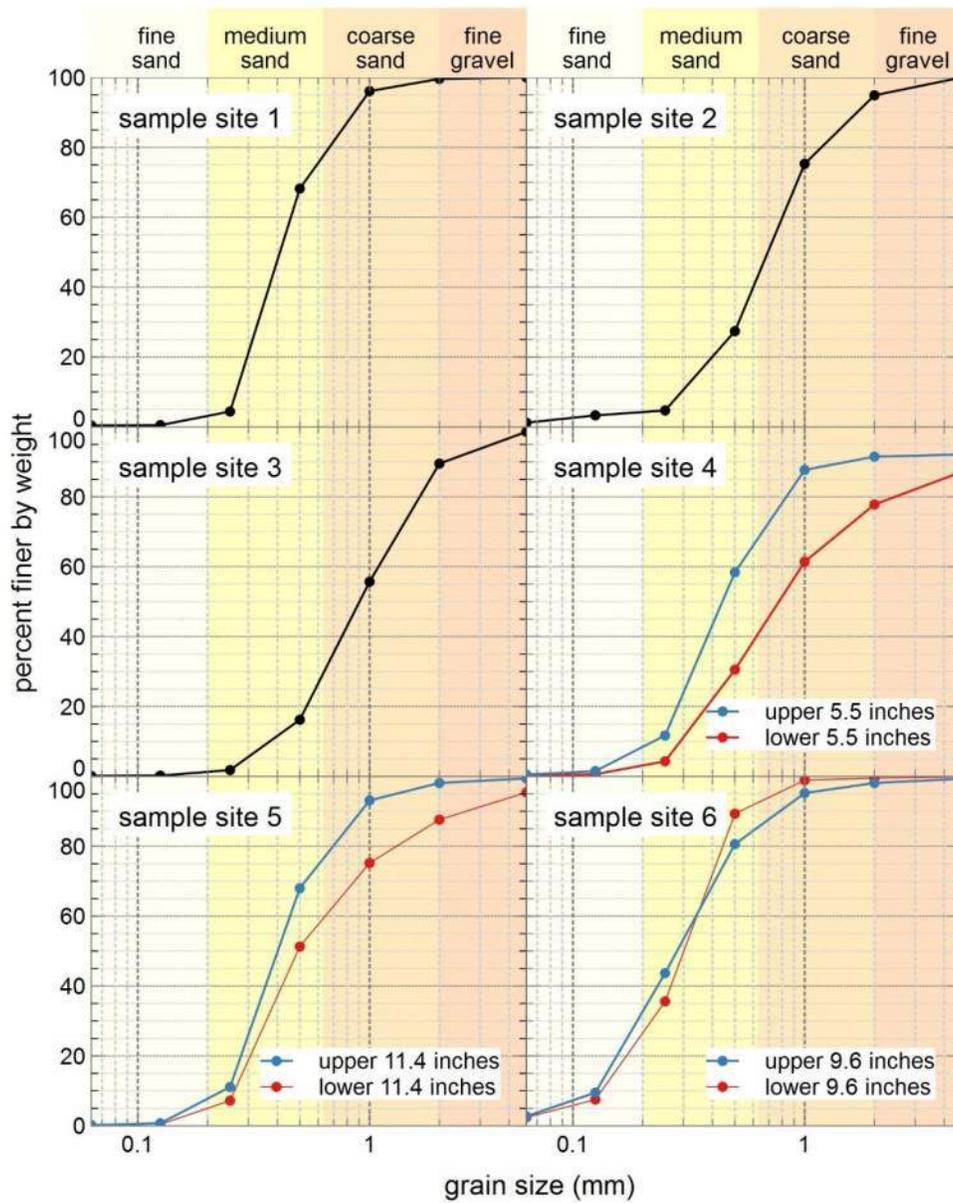


Figure 3. Sediment grain size distributions for samples collected on the Des Moines and Raccoon Rivers near downtown Des Moines. Sample locations are shown in Figure 1. Samples 1, 2, and 3 had no vertical variability and were therefore they were analyzed in bulk. Visual inspection of samples 4, 5, and 6 indicated vertical variation in sediment character without clearly defined strata; therefore they were separated into upper and lower halves for analysis.



Table 1. Grain size distributions and sample characteristics for sample locations 1 through 4.

	sieve #	sieve diameter (mm)	mass (g)	% finer	d_{10} (mm)	d_{16} (mm)	d_{30} (mm)	d_{50} (mm)	d_{60} (mm)	d_{75} (mm)	d_{84} (mm)	d_g^a (mm)	s_g^b (mm)	G^c	τ_c^d (N/m ²)
sample 1 surface grab total mass: 153.1601 g	4	4.75	0.0000	100.0	0.272	0.295	0.350	0.429	0.468	0.622	0.783	0.481	1.276	1.639	0.47
	10	2	0.5893	99.6											
	18	1	5.3835	96.1											
	35	0.5	42.7844	68.2											
	60	0.25	97.6180	4.4											
	120	0.125	5.9571	0.5											
	230	0.063	0.2215	0.4											
	fines		0.6063												
sample 2 surface grab total mass: 52.2994 g	4	4.75	0.0000	100.0	0.308	0.375	0.527	0.736	0.840	0.997	1.444	0.735	1.401	1.963	0.71
	10	2	2.6710	94.9											
	18	1	10.2405	75.3											
	35	0.5	25.0752	27.4											
	60	0.25	11.8504	4.7											
	120	0.125	0.7185	3.3											
	230	0.063	1.1364	1.2											
	fines		0.6074												
sample 3 core (9.0 inches) total mass: 987.6039	4	4.75	13.4090	98.6	0.393	0.497	0.675	0.928	1.127	1.572	1.838	0.955	1.387	1.925	0.93
	10	2	90.6850	89.5											
	18	1	333.3400	55.7											
	35	0.5	390.1670	16.2											
	60	0.25	142.5590	1.8											
	120	0.125	15.3217	0.2											
	230	0.063	0.8462	0.1											
	fines		1.2760												
sample 4 (upper 5.5 inches) core total mass: 594.0945 g	4	4.75	47.0590	92.1	0.229	0.273	0.348	0.455	0.528	0.783	0.936	0.506	1.361	1.862	0.49
	10	2	3.6892	91.5											
	18	1	22.0828	87.7											
	35	0.5	174.5300	58.4											
	60	0.25	277.4150	11.7											
	120	0.125	60.3076	1.5											
	230	0.063	6.2309	0.5											
	fines		2.7800												
sample 4 (lower 5.5 inches) core total mass: 916.3489 g	4	4.75	118.1332	87.1	0.304	0.361	0.495	0.815	0.977	1.829	3.832	1.177	1.804	3.478	1.14
	10	2	85.3084	77.8											
	18	1	150.1720	61.4											
	35	0.5	283.0010	30.5											
	60	0.25	240.1210	4.3											
	120	0.125	34.0527	0.6											
	230	0.063	2.9008	0.3											
	fines		2.6598												

^a geometric mean ^b geometric standard deviation ^c gradation coefficient

^d critical bed shear stress for geometric mean based on Shields (1936)



Table 2. Grain size distributions and sample characteristics for sample locations 5 and 6.

	sieve				d ₁₀	d ₁₆	d ₃₀	d ₅₀	d ₆₀	d ₇₅	d ₈₄	d _g ^a	s _g ^b	G ^c	τ _c ^d
	sieve #	diameter (mm)	mass (g)	% finer	(mm)	(mm)		(N/m ²)							
sample 5 (upper 11.4 inches) core total mass: 841.2245 g	4	4.75	5.0109	99.4	0.237	0.272	0.333	0.421	0.465	0.640	0.819	0.472	1.318	1.747	0.46
	10	2	10.9615	98.1											
	18	1	41.8576	93.1											
	35	0.5	211.7685	68.0											
	60	0.25	478.4370	11.1											
	120	0.125	87.1210	0.7											
	230	0.063	4.0110	0.2											
	fines		2.0570												
sample 5 (lower 11.4 inches) core total mass: 1161.3330 g	4	4.75	53.4739	95.4	0.266	0.300	0.379	0.493	0.682	0.996	1.712	0.716	1.546	2.558	0.69
	10	2	90.9570	87.6											
	18	1	143.4418	75.2											
	35	0.5	278.1396	51.3											
	60	0.25	511.6350	7.2											
	120	0.125	78.8400	0.4											
	230	0.063	4.1127	0.1											
	fines		0.7330												
sample 6 (upper 9.6 inches) core total mass: 829.1799 g	4	4.75	6.1352	99.3	0.127	0.149	0.200	0.293	0.360	0.462	0.617	0.303	1.427	2.038	0.29
	10	2	9.2740	98.1											
	18	1	24.1920	95.2											
	35	0.5	121.4820	80.6											
	60	0.25	305.4470	43.7											
	120	0.125	283.8290	9.5											
	230	0.063	56.0927	2.7											
	fines		22.7280												
sample 6 (lower 9.6 inches) core total mass 964.8659 g	4	4.75	1.3703	99.9	0.136	0.163	0.225	0.317	0.364	0.433	0.475	0.278	1.307	1.723	0.27
	10	2	3.1204	99.5											
	18	1	6.4404	98.9											
	35	0.5	92.2210	89.3											
	60	0.25	518.1580	35.6											
	120	0.125	271.4843	7.5											
	230	0.063	49.2515	2.4											
	fines		22.8200												

^a geometric mean ^b geometric standard deviation ^c gradation coefficient

^d critical bed shear stress for geometric mean based on Shields (1936)

6. REFERENCES

Shields, A. (1936). “Application of Similarity and Turbulence Research to Bed-Load Movement,”
California Institute of Technology, Pasadena.

TEAM Services (2004). “Subsurface Exploration Proposed Riverwalk Pedestrian Bridge Des
Moines, Iowa.”

C.1 – ABBREVIATED IN-RIVER CRITERIA AND OBJECTIVE MEMO

ABBREVIATED IN-RIVER CRITERIA & OBJECTIVE MEMORANDUM

UPDATED: OCTOBER 11, 2017

GENERAL REQUIREMENTS

Per Primary Contract and MPO

I. Safety Mitigation of the Dams

- a. Alternative 1: Dam Removal and Replacement with smaller river-wide drops
- b. Alternative 2: Reduce overly retentive hydraulics at the spillway and provide navigable bypass
- c. Alternative 3: Reduce overly retentive hydraulics at the spillway

II. Required Minimum Pool Levels

- a. Center Street Dam: 787.1' (785.1' Winter/Spring)
- b. Scott Ave Dam: N/A Target existing headwater elevations
- c. Fleur Drive Dam: 784.3' (781.3' Winter/Spring)

III. No-Rise to Existing Floodplain Levels

- a. Any consideration of raising regulatory flood elevations is out of scope and will need to be discussed as a team before analyzing.

IV. Modifications to Existing Bridges and Levees

- a. None except potential levee openings for access
- b. No impacts allowed within 15-feet of the riverside toe of the levee embankment

REFINED REQUIREMENTS

I. Flashboards

- a. Must be automated
- b. No significant (± 4 inches) overtopping of a closed flashboard

II. Recreational Drops

- a. Drop height: 3' max with pools between drops 150-250' long
 - i. Smaller drops allow for smaller pools
- b. The effective Manning's "n" is 0.040 for the drops and navigable bypass

III. Fish Passage – Feasibility Study Criteria

- a. Maximum hydraulic slope: 20:1
- b. Minimum water depth of 6 inches
- c. Target sending the first 50 cfs to the fish passage channel
- d. The effective Manning's "n" is 0.055 (Flood Flows)

IV. Fish Passage – (Future) Preliminary Design Criteria

- a. Must operate year-round and be active during low flows
- b. Provide a variety of velocities and depths, including deep holes and pockets
- c. Fish can freely move upstream and downstream of the dams during free-flowing conditions
- d. Balance the need for dam safety improvements with the need for attraction flow at or near the dam face and adjacent to the main flow path
- e. Avoid dead ends since fish do not seek passage by traveling downstream
- f. Path with velocity of 2 fps or less (not needed for entire fish passage width)

V. Adjacent Open Space Restricted Areas

- a. Proposed skate park upstream river-right of Center Street Dam
- b. Asian gardens upstream river-left of Center Street Dam

STAKEHOLDER OBJECTIVES

Per Meetings and Coordination

I. Ecological

- a. Use riverside vegetation and connectivity to improve habitat
- b. Species other than fish to consider: Mussels, Mudpuppies, Chestnut Lamprey
- c. Provide/enhance habitat for flathead, small mouth bass
- d. Slackwater habitats (e.g. more debris, substrate, jetties)
- e. Consider opportunities for oxbows/backwater
- f. Minimize concrete in riverbed
- g. Additional Wetlands

II. Recreational

- a. Improve access to river
- b. Paddleboarding (flatwater) activities
- c. High- and low-performance whitewater features
- d. Angler destinations
- e. Separate paddlers from anglers

C.2 – WORKSHOP #2 TECHNICAL MEMO

WORKSHOP #2
TECHNICAL MEMORANDUM
Downtown Des Moines Water Trails Engineering Study
September 20, 2017

PROJECT OVERVIEW

Three proposed designs in compliance with the Criteria Memorandum have been developed for each dam to meet the project objectives. The following alternatives have been developed for Center Street Dam, Scott Avenue Dam, and Fleur Drive Dam:

- Alternative 1 - Dam Removal and Replacement with In-River Navigable Drops
- Alternative 2 - Dam Safeing Modification with Recreational Bypass Channel
- Alternative 3 - Dam Safeing Modification

MODEL RESULTS

The above alternatives at each dam were modeled in HEC-RAS to analyze the flood hydraulics and floodplain impacts. Initial results have gauged the feasibility of each alternative at Center Street, Scott Avenue, and Fleur Drive.

Alternative 1 – Each in-river drop crest proposed at the dams includes a large boat chute and a smaller 16' wide fish passage.

- I. **Center Street Dam:** A series of 4 drop crests with automated flashboards provided at the upstream drop. Each drop crest has a 100' wide boat chute and 16' wide fish passage. Per initial modeling results, Alternative 1 appears to be somewhat feasible. The proposed design resulted with the following maximum floodplain rise:
 - 500-yr +0.32-ft
 - 100-yr +0.16-ft
 - 10-yr +0.06-ft

- II. **Scott Avenue Dam:** A series of 2 drops crests, each with a 140' wide boat chute and 16' wide fish passage. Per initial modeling results, Alternative 1 appears to be feasible. The proposed design resulted with the following maximum floodplain rise:
 - 500-yr None
 - 100-yr None
 - 10-yr None

- III. **Fleur Drive Dam:** A series of 2 drop crests with automated flashboards provided at the upstream drop. Each drop crest has a 60' wide boat chute and 16' wide fish passage. Per initial modeling results, Alternative 1 appears to be feasible. The proposed design resulted with the following maximum floodplain rise:
 - 500-yr None
 - 100-yr None
 - 10-yr None

Alternative 2 – Each dam modification includes steps beginning at the existing dam crest with a riprap apron added to the bottom of the lowest step. One side of each dam will be modified to allow for a bypass as shown in the *Workshop #2 Presentation Slides*. Fish passage was not included in the hydraulic model.

- I. **Center Street Dam:** The existing 9-foot drop was modified to have nine (9) 1-foot steps with an overall 7:1 slope. The existing 2-foot flashboard would be replaced with an automated flashboard (with notches for aesthetics). A ±70-foot wide, 675-foot long in-river bypass with a 36' wide entrance gate and navigable drops is proposed on the river-left (east) side of the

existing dam. Per initial modeling results, Alternative 2 appears to be somewhat feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr None
100-yr None
10-yr None

- II.  **Scott Avenue Dam:** The existing 7-foot drop was modified to have seven (7) 1-foot steps with an overall 7:1 slope. A 90-foot wide, 500-foot long in-river bypass with navigable drops is proposed through the river-right (west) side of the existing dam. Per initial modeling results, Alternative 2 appears to be somewhat feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr None
100-yr None
10-yr None

- III.  **Fleur Drive Dam:** The existing 5-foot drop was modified to have three (3) 1-foot steps with one (1) final 2-foot step and an overall 7:1 slope. The existing 3-foot flashboard would be replaced with an automated flashboard. A 75-foot wide and 700-foot long bypass with navigable drops is proposed adjacent to the river-right (west) side of the existing dam. Per initial modeling results, Alternative 2 appears to be somewhat feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr +0.02-ft
100-yr +0.01-ft
10-yr None

Alternative 3 – The dam safeing modification involves adding steps beginning at the existing dam crest with a riprap apron added to the bottom of the lowest step as shown in the *Workshop #2 Presentation Slides*.

- I.  **Center Street Dam:** The existing 9-foot drop was modified to have nine (9) 1-foot steps with an overall 20:1 slope. The existing 2-foot flashboard would be replaced with a 2-foot automated flashboard (with notches for aesthetics). Per initial modeling results, Alternative 3 appears to be feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr +0.24-ft
100-yr None
10-yr +0.01-ft

- II.  **Scott Avenue Dam:** The existing 7-foot drop was modified to have seven (7) 1-foot steps with an overall 20:1 slope. Per initial modeling results, Alternative 3 appears to be somewhat feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr +0.6-ft
100-yr None
10-yr None

- III.  **Fleur Drive Dam:** The existing 5-foot drop was modified to have three (3) 1-foot steps with one (1) final 2-foot step and an overall 20:1 slope. The existing 3-foot flashboard would be replaced with an automated flashboard. Per initial modeling results, Alternative 3 appears to be feasible. The proposed design resulted with the following maximum floodplain rise:

500-yr None
100-yr None
10-yr None

C.3 – WORKSHOP #3 TECHNICAL MEMO

WORKSHOP #3
TECHNICAL MEMORANDUM
Downtown Des Moines Water Trails Engineering Study
Meeting Date: October 19, 2017
November 22, 2017

PROJECT OVERVIEW

Three proposed designs in compliance with the Criteria Memorandum have been developed for each dam to meet the project objectives. The following alternatives have been developed for Center Street Dam, Scott Avenue Dam, and Fleur Drive Dam:

- Alternative 1 - Dam Removal and Replacement with In-River Navigable Drops
- Alternative 2 - Dam Safeing Modification with Recreational Bypass Channel
- Alternative 3 - Dam Safeing Modification

MODEL RESULTS

The above alternatives at each dam were modeled in HEC-RAS to analyze the flood hydraulics and floodplain impacts. The following conceptual alternatives have demonstrated that meeting floodplain criteria as well as criteria that pertain to a USACE Section 408 review is reasonably attainable with the addition of various sizes of flashboards and channel excavation. The following alternatives are constrained to the parameters described below to maintain a zero-rise regulatory floodplain impact and meet the project criteria. The provided dimensions are approximate and will be refined in preliminary design. Sizes of proposed improvements such as flashboard and navigable flashboards (WaveShapers) height and length are approximate and provided for comparison purposes. Recreational reliability was determined based on historical flow gage data and the overall hydraulic drop available based on headwater and tailwater elevations during the recreational season.

Center Street Dam

Recreational Reliability: 30 days/month with a recreational feature during recreational season (May – September). Center Street has the opportunity for Recreational Scenarios B, C & D (refer to slideshow). Location:

Summary of Infrastructure:

The location of the recreational features at Center Street are positioned around the existing dam crest to minimize construction costs and meet the previously defined criteria. Per the hydraulic modeling results, shifting the features upstream is not advantageous without consideration of removal and/or renovation of the restricted areas (proposed skate park and/or Asian Gardens).

Alternative 1 is a series of 4 drop crests with automated flashboards provided at the upstream drop and possibly the second drop (need based upon future refinement). Each drop crest has several parallel recreational features and a 16 feet wide fish passage.

- Flashboards and Navigable Gates
 - 5 feet tall, 220 feet wide automated flashboard on first drop;
 - 5 feet tall WaveShaper on first drop with an approximate 100 feet total width distributed into 2-4 features;
 - Additional WaveShaper and/or flashboards may be required on the second drop to meet hydraulic flood conveyance criteria.
- Portions along the entire length of existing dam (±350 feet) to be removed to accommodate fish passage and recreational feature inverts.

Alternative 2 is a ±145 feet wide, ±700 feet long in-river bypass with navigable drops and fish passage proposed on the river-left (east) side of the existing dam.

- Flashboards and Navigable Gates
 - Two or more 4 feet tall WaveShapers at bypass entrance with an approximate total width of 50 feet;
 - 5 feet – 11 feet tall, ±210 feet wide automated flashboard;
 - Installation of a new automated flashboard will require significant modifications/removal of the existing dam.
- ±150 feet of existing dam width to be removed
- Lowering of remaining dam crest by 3 feet – 9 feet
- Addition of steps downstream of remaining dam crest with an overall 7:1 slope to eliminate overly-retentive dangerous hydraulics.

Alternative 3 is a modification of the existing 9 feet drop to be a stepped dam with an overall downstream slope of 7:1 that transitions to a 20:1 roughed channel fish passage along the east bank.

- 2 feet tall, ±350 feet wide automated flashboard
- Installation of a new automated flashboard will require significant modifications to the existing dam crest
- Optional: Increase the width of the entire downstream face to allow for a 20:1 roughed channel fish passage across the entire dam.

Scott Avenue Dam

Recreational Reliability: 18 days/month with a recreational feature during recreational season (May – September). Scott Avenue has the opportunity for Recreational Scenarios A, B, & C (refer to slideshow).

Summary of Infrastructure:

The location of the recreational features at Scott Avenue begins at the existing dam crest, directly below the existing bridge to minimize construction costs and best facilitate access to the features. Per the hydraulic modeling results, consideration of moving the recreational features downstream would require additional lowering of the existing dam crest and excavation of the west bank.

Alternative 1 is a series of 2 drops crests, each with a 140 feet total width of parallel recreational features and 16 feet wide fish passage.

- Portions along the entire length of existing dam (±600 feet) to be removed to accommodate fish passage and recreational feature inverts
- Optional: Cut into western slope banks for access/viewing and additional conveyance
- Optional: Additional conveyance provides opportunities to move the design recreational features downstream or a milder recreational experience with the construction of a third drop
- Optional: Lower upstream water surface elevation by lowering/removing entire length of existing dam; and
- Optional: Lower upstream regulatory flood water surface elevation while maintaining the upstream water surface elevation at lower flows by lowering entire length of existing dam and adding a flashboard.

Alternative 2 is a ±125 feet wide, ±600 feet long in-river bypass with navigable drops and fish passage proposed on the river-right (west) side of the existing dam.

- ±100 feet of existing dam width to be removed
- Addition of steps downstream of remaining dam crest with an overall 7:1 slope to eliminate overly-retentive dangerous hydraulics.

Alternative 3 is a modification of the existing 7-foot drop to be a stepped dam with an overall 7:1 slope that transitions to a 20:1 roughed channel fish passage near the river's edges.

- Optional: Increase the width of the entire downstream face to allow for a 20:1 roughed channel fish passage across the entire dam.

Fleur Drive Dam

Recreational Reliability: 14 days/month with a recreational feature during recreational season (May – September). Fleur Drive has the opportunity for Recreational Scenarios A, B, & C (refer to slideshow).

Summary of Infrastructure:

Alternative 1 is a series of 2 drop crests with automated flashboards provided at the upstream drop. Each drop crest has a total of approximately 60 feet in width of parallel recreational features and a 16 foot wide fish passage. Per the hydraulic modeling results, the location of the recreational features is restricted to upstream of the existing dam crest.

- Flashboards and Navigable Gates
 - 4 feet tall, 50 feet wide automated flashboard;
 - Two or more 4 feet tall, WaveShapers with a total width of approximately 60 feet.
- Portions along the entire length of existing dam (± 205 feet) to be removed to accommodate fish passage and recreational feature inverts.

Alternative 2 is a ± 150 feet wide, ± 900 feet long river bypass with navigable drops and fish passage proposed adjacent to the river-right (west) side of the existing dam. The location of the recreational features is proposed west of the existing dam to avoid removing any portion of the existing dam.

- Flashboards and Navigable Gates
 - 2 feet tall, 36 feet wide WaveShaper;
 - 2 feet tall, 205 feet wide automated flashboard.
- Modify dam crest with stepping at an overall 7:1 slope

Alternative 3 is a modification of the existing 5-foot drop to be a stepped dam with an overall 7:1 slope that transitions to a 20:1 roughed channel fish passage along the banks.

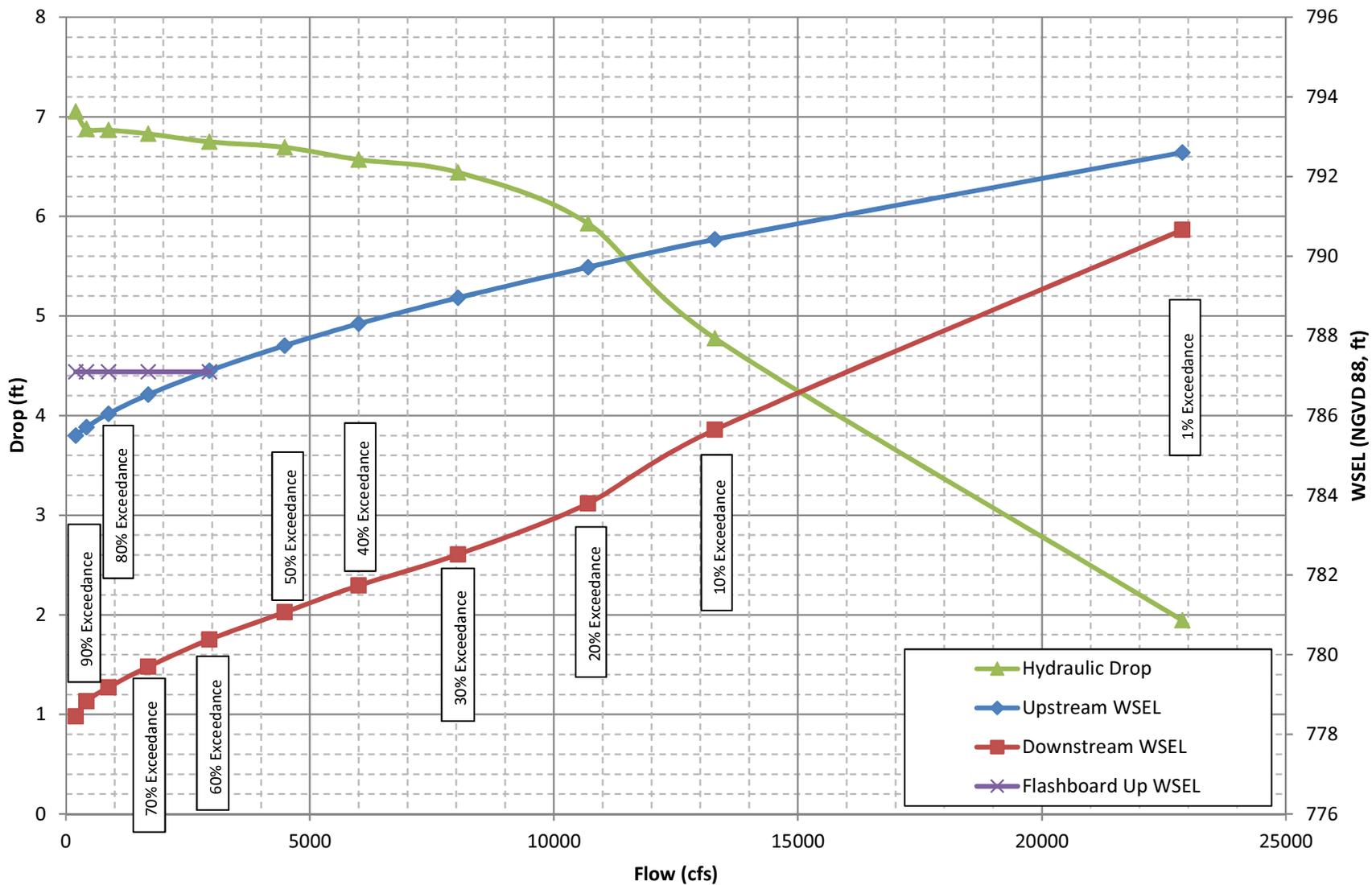
- Optional: Increase width of the 20:1 roughed channel fish passage.

ATTACHMENTS

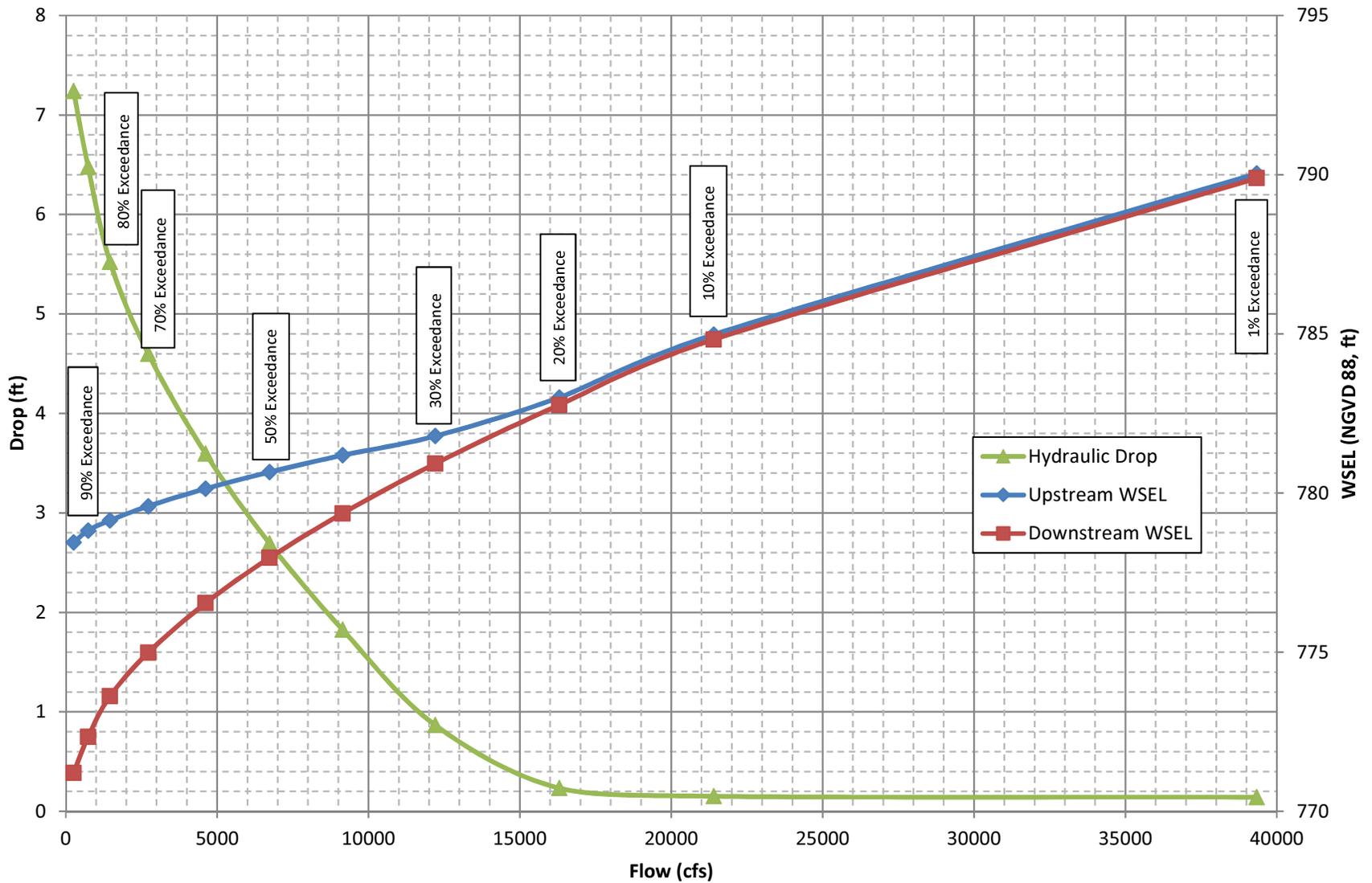
Conceptual Hydraulic Rating Curves
Flow Exceedence Calculations

Attachment 1
Conceptual Hydraulic Rating Curves

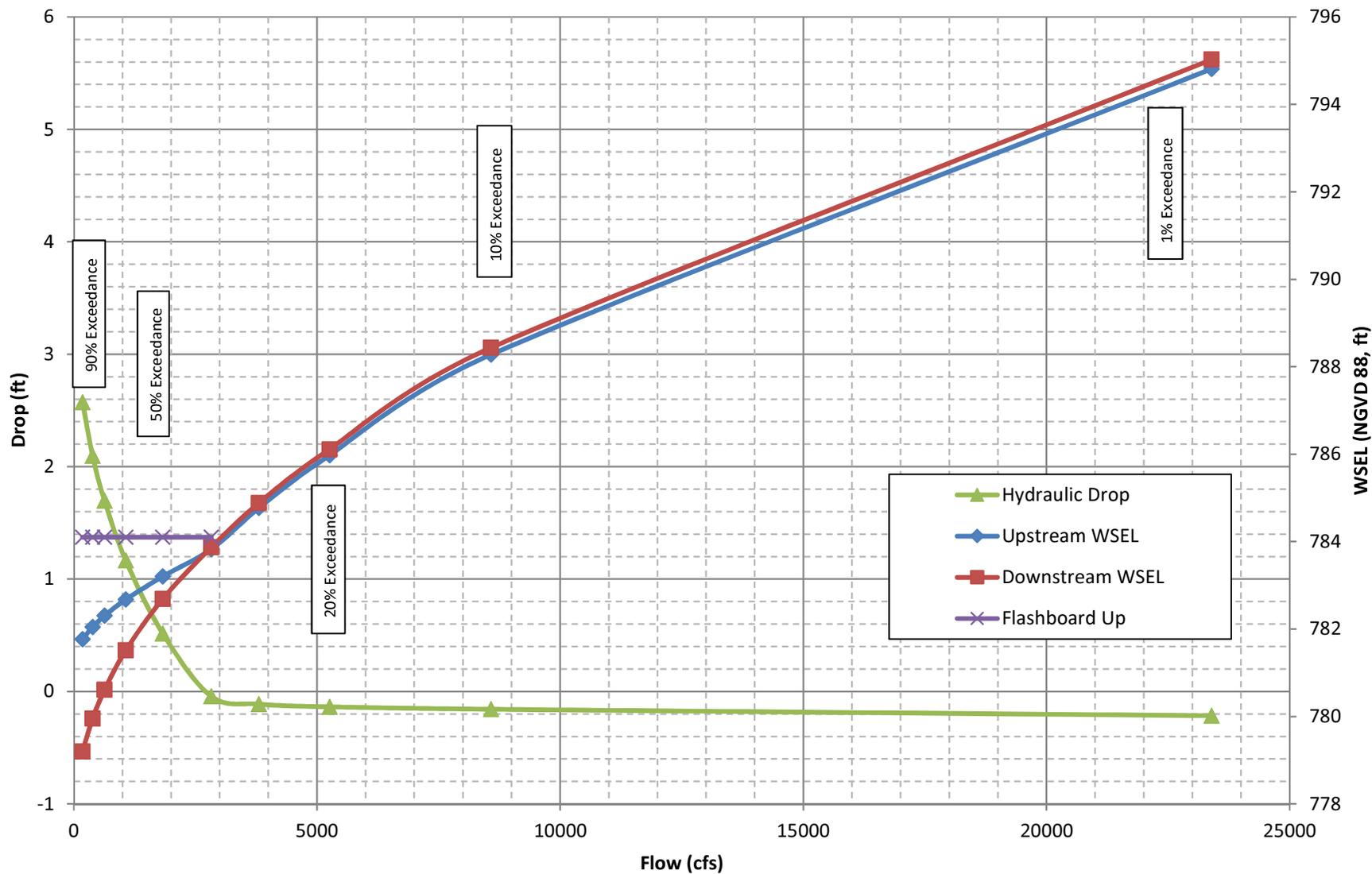
Center Street Dam - Existing Condition Rating Curve (May-Sept)



Scott Street Dam - Existing Condition Rating Curve (May-Sept)



Fleur Drive Dam - Existing Condition Rating Curve (May-Sept)



Attachment 2
Flow Exceedence Calculations

Center Street Dam Flow Exceedences (cfs)
Gage Data: #USGS 05482000 Des Moines River at 2nd Avenue at Des Moines, IA

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	May to Sept	
1% Exceedance	20300	10674	15168	22258	17900	16779	37860	25959	20053	15194	14748	10807	16096	22878	1% Exceedance
10% Exceedance	12000	2227	4538	11900	14700	13700	14670	13390	6865	6539	7382	5253	3390	13300	10% Exceedance
20% Exceedance	7700	1568	2716	7222	12380	12700	13100	11660	4554	3678	4382	3390	2336	10700	20% Exceedance
30% Exceedance	5040	1230	1502	4764	10000	10700	12500	9207	2721	1807	2294	2164	1884	8037	30% Exceedance
40% Exceedance	3130	855	1200	3416	8110	9190	9962	7182	1840	862	1410	1656	1570	6000	40% Exceedance
50% Exceedance	1980	650	882	2585	5905	8345	7995	5875	1410	607	807	1320	1150	4485	50% Exceedance
60% Exceedance	1360	459	600	1830	4418	6554	6354	4320	1100	464	460	889	912	2944	60% Exceedance
70% Exceedance	850	312	330	1353	2828	5469	5056	3000	874	343	290	341	552	1690	70% Exceedance
80% Exceedance	448	254	240	973	1822	4002	4070	1874	714	252	220	233	295	876	80% Exceedance
90% Exceedance	241	229	211	444	1144	2532	3000	1072	470	218	210	210	233	426	90% Exceedance
99% Exceedance	190	180	186	189	344	220	1790	367	244	190	189	167	179	205	99% Exceedance
Min (daily avg)	157	163	171	180	324	190	1260	216	202	160	180	157	165	160	Min (daily avg)
Max (daily avg)	46700	13200	16100	23000	20700	17300	46700	36600	20700	16500	16300	11600	16800		
Mean	4165	1198	1776	4487	6984	8162	9226	6985	2947	2154	2386	2029	1864		

Scott Avenue Dam Flow Exceedences (cfs)

Gage Data: #USGS 05485500 Des Moines River blw Raccoon Riv at Des Moines, IA

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	May to Sept	
1% Exceedance	34502	15395	23578	46891	27799	31816	68044	38754	37432	23189	22592	17169	33352	39339	1% Exceedance
10% Exceedance	17900	3576	7768	17690	20990	22600	28390	21690	9229	10300	12100	7960	5368	21400	10% Exceedance
20% Exceedance	11900	2660	4058	12080	17500	19600	21700	15880	5996	6918	6386	5190	3496	16300	20% Exceedance
30% Exceedance	7590	2384	2942	7756	14800	17100	18400	12600	4244	2747	3920	4147	3004	12200	30% Exceedance
40% Exceedance	5010	1900	2386	5536	12200	14520	16000	9892	3210	1452	2466	3120	2532	9142	40% Exceedance
50% Exceedance	3260	1210	1810	4045	9775	12500	13050	8000	2360	1010	1710	2010	2070	6730	50% Exceedance
60% Exceedance	2310	776	1234	2888	6976	11000	10300	6216	1864	840	1148	1474	1356	4620	60% Exceedance
70% Exceedance	1510	551	633	2273	4530	8315	7852	4705	1503	644	508	747	952	2723	70% Exceedance
80% Exceedance	824	413	460	1842	2840	6360	5736	2924	1132	490	406	489	521	1462	80% Exceedance
90% Exceedance	440	296	315	906	1543	3961	4211	1780	757	331	305	420	343	739	90% Exceedance
99% Exceedance	246	240	239	245	516	552	2610	409	251	237	208	264	183	263	99% Exceedance
Min (daily avg)	146	228	232	233	480	420	1940	347	219	218	146	256	173	218	Min (daily avg)
Max (daily avg)	98900	18800	27900	50100	39600	39500	98900	56400	41100	26700	24100	20500	37400		
Mean	6655	2013	3075	7388	10526	13140	15341	10213	4623	3577	3862	3330	3134		

Fleur Drive Dam Flow Exceedences (cfs)
Gage Data: #USGS 05484900 Raccoon River at Fleur Drive at Des Moines, IA

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	May to Sept	
1% Exceedance	20704	5434	12974	25258	17475	23643	38374	19512	20559	13688	10292	8961	20968	23395	1% Exceedance
10% Exceedance	5942	1770	2880	6142	6037	9994	14670	7600	3697	4744	4110	2690	1940	8580	10% Exceedance
20% Exceedance	3750	1170	1514	4170	5034	7178	8638	4650	2038	2638	2372	2118	1256	5260	20% Exceedance
30% Exceedance	2480	899	1150	3041	4041	5320	6410	3384	1437	893	1300	1591	1044	3807	30% Exceedance
40% Exceedance	1580	587	972	2036	3436	4480	5172	2480	1080	560	841	816	688	2826	40% Exceedance
50% Exceedance	1010	346	608	1200	2665	3795	3905	1740	733	460	407	479	462	1830	50% Exceedance
60% Exceedance	646	256	346	910	1940	3214	3064	1280	559	309	268	323	318	1070	60% Exceedance
70% Exceedance	372	210	230	677	1332	2623	2209	932	415	241	188	278	252	634	70% Exceedance
80% Exceedance	241	158	159	495	655	1752	1230	645	303	179	141	210	174	388	80% Exceedance
90% Exceedance	120	63	77	280	283	445	618	331	145	90	98	115	84	181	90% Exceedance
99% Exceedance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99% Exceedance
Min (daily avg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Min (daily avg)
Max (daily avg)	52800	7220	15500	28200	33600	30400	52800	27600	24000	16200	14100	10300	28300		
Mean	2439	782	1259	2812	3215	4938	6099	3183	1747	1512	1415	1192	1256		

C.4 – WORKSHOP #4 TECHNICAL MEMO



**WORKSHOP #4
TECHNICAL MEMORANDUM**

Downtown Des Moines Water Trails Engineering Study
Meeting Date: December 19, 2017
January 17, 2018

Per the results of Workshop #3 and feasibility assessments, eight (8) identified alternatives were analyzed to develop preliminary comparative budgets. Refer to the Workshop #4 Presentation Slides for further information on each alternative.

Center Street Alternative 1 – Dam removal and replacement with in-river navigable drops
Center Street Alternative 3 – Dam safeing

Scott Avenue Alternative 1 – Dam removal and replacement with in-river navigable drops
Scott Avenue Alternative 2 – Dam safeing modification with recreational bypass
Scott Avenue Alternative 3 – Dam safeing

Fleur Drive Alternative 1 – Dam removal and replacement with in-river navigable drops and recreational bypass
Fleur Drive Alternative 2 – Dam safeing modification with recreational bypass
Fleur Drive Alternative 3 – Dam safeing

The numbers shown in this memorandum are for in-river alternative comparison only and are based on the current project as of December 2017, prior to completion of a preliminary design. The upland amenities budget ranges were based on the preferred activities and experience. An itemized list or “menu” of upland amenities will be provided in the final Assessment Document. After reviewing the following budget ranges for each alternative, the Water Trails Advisory Committee unanimously selected Alternative 1 at each site for further refinement.

IN-RIVER BUDGET SUMMARY

General geometries, areas and elevations of recreational improvements have been initially evaluated. However, significant hydraulic modeling, physical model studies, analysis and design are required to refine the proposed improvements to allow more accurate cost estimating.

The budgets prepared for this memo are considered a Class 5 estimate as defined by the Association for the Advancement of Cost Engineering International (AACEI). Typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side, depending on complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. The accuracy range for this estimate has been determined to be -30% to +30%.

Preliminary In-River Budget (Price Shown in Millions)

Item	Center Street		Scott Avenue			Fleur Drive		
	Alt 1	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Dewatering	\$1.5	\$0.5	\$1	\$1	\$1	\$1	\$0.5	\$0.25
General Construction	\$1.5	\$0.5	\$1	\$1	\$0.5	\$1	\$2	\$0.25
Recreational Drops and/or Bypass	\$18		\$8	\$6		\$12	\$7	
Dam Safeing		\$4		\$2	\$4		\$1	\$2
Levee Mitigation						\$1		
Utility Relocation	\$1	\$0.3	\$0.5	\$0.5	\$0.3	\$0.8	\$2.6	\$0.1
Contingencies	\$12.5	\$2.7	\$6	\$4.5	\$3.2	\$9.2	\$7.9	\$1.4
Total	\$34.5	\$8	\$16.5	\$15	\$9	\$25	\$21	\$4

IN-RIVER BUDGET BREAKDOWN

Dewatering costs include shoring, cofferdams, temporary sheeting, and pumping. The total estimate varies based on the anticipated dewatering area and estimated number of temporary sheeting at each site.

Dewatering Comparison (Price Shown in Millions)

Project	Dewatering Budget	Dewatering Area, Acres	Price per 10 Acres of Dewatering Area
River Run Park	\$0.6	3	\$2
Center Alternative 1	\$1.5	15	\$1
Center Alternative 3	\$0.5	5	\$1
Scott Alternative 1	\$1	9	\$1
Scott Alternative 2	\$1	6	\$2
Scott Alternative 3	\$1	6	\$2
Fleur Alternative 1	\$1	6	\$2
Fleur Alternative 2	\$0.5	4	\$1
Fleur Alternative 3	\$0.3	1	\$2

General construction costs include erosion and sediment control; access and restoration; demolition of existing infrastructure; and earthwork. The total estimate varies based on the anticipated disturbed area at each site and specific design elements, such as amount of fill material and extent of demolition. HDR modeled configurations at Center, Scott, and Fleur dams to minimize bank excavation needed to meet the “no-rise” regulatory flood level requirement.

Recreational drops and/or bypass costs include flashboards; waveshapers; grouted and surface boulders; grouted fishway; sheet pile and abutments. The total estimate varies based on the number of drops and specific design elements, such as width of drops and approximate size of flashboards. HDR modeled configurations at Center and Fleur dams to minimize flashboards needed to meet the “no-rise” regulatory flood level requirement.

Recreational Drops Comparison (Price Shown in Millions)

Project	Recreational Drop Budget	Number of Drops	Price per number of drops
Boise	\$5	1	\$5
Center Alternative 1	\$18	4	\$4.5
Scott Alternative 1	\$8	2	\$4
Fleur Alternative 1	\$12	2	\$6

Dam safeing costs include roller compacted concrete (RCC) steps; abutments; grouted rock fishway; grouted boulders; sheet pile, and flashboards. The total estimate varies based on the river width and specific design elements, such as amount of concrete material and size of flashboard.

Dam Safeing Comparison (Price Shown in Millions)

Project	Dam Safeing Budget	Approximate Dam Area, Square-Foot (width x height)	Price per 1000 Square-Foot of Dam Area
Yorkville Dam	\$4	2750	\$1.5
Center Alternative 3	\$4	2800	\$1.4
Scott Alternative 2	\$2	3500	\$0.6
Scott Alternative 3	\$4	4200	\$1.0
Fleur Alternative 2	\$1	1000	\$1
Fleur Alternative 3	\$2	1000	\$2

Levee mitigation is anticipated at the Fleur Alternative 1 site due to proposed excavation near the toe of the existing levee.

The **utility relocation** budget item is a 5% contingency of the subtotal to account for adjustments to existing utilities as part of the project. Additional cost was included in the Fleur Alternative 2 Site for the anticipated 30" water main relocation due to excavation required adjacent to the existing Fleur Dam.

Contingencies were added to the subtotals of each alternative to account for the following items: 5% Vegetation; 15% Engineering, Permitting, Construction Inspection; 10% Miscellaneous Appurtenances; and 30% Unknown Construction Costs.

Referenced Project Comparisons:

- | | |
|--|-------------|
| 1. "River Run Park Phase III" Sheridan, Colorado | In Progress |
| 2. "Boise River Park" Boise, Idaho | 2011 |
| 3. "Yorkville Dam" Yorkville, Illinois | 2009 |

C.5 – WORKSHOP #5 TECHNICAL MEMO

**WORKSHOP #5
TECHNICAL MEMORANDUM**

Downtown Des Moines Water Trails Engineering Study
Meeting Date: January 22, 2018
January 31, 2018

The following proposed concepts at Center Street, Scott Avenue, Fleur Drive can feasibly meet the “no-rise” criteria for regulatory 100-year floodplain by balancing floodway fill with dam removal. The designs propose no impacts to levee performance for all flood flows up to the top of levee. However, levee mitigation will likely be required at the Fleur Drive Dam site in its current configuration. Center Street and Fleur Drive propose dam designs that rely on variable crest dams (flashboards) to meet criteria.

FLEUR DRIVE DAM



Seasonal flow exceedences from May to September have been provided by HDR and were determined from the Raccoon River gage (USGS #05484650 Raccoon River at 63rd Street at Des Moines, IA). The exceedence flows were analyzed in the existing regulatory HEC-RAS floodplain model to determine water surface elevations (WSE) near the proposed water feature. Results at cross sections 72+01 and 89+89 were interpolated to determine water surface elevations at STA 78+00. A proposed target upstream WSE is 784.3 feet, and the resulting drop is provided below.

Table 1 – Raccoon River Flow Exceedences (STA 78+00)

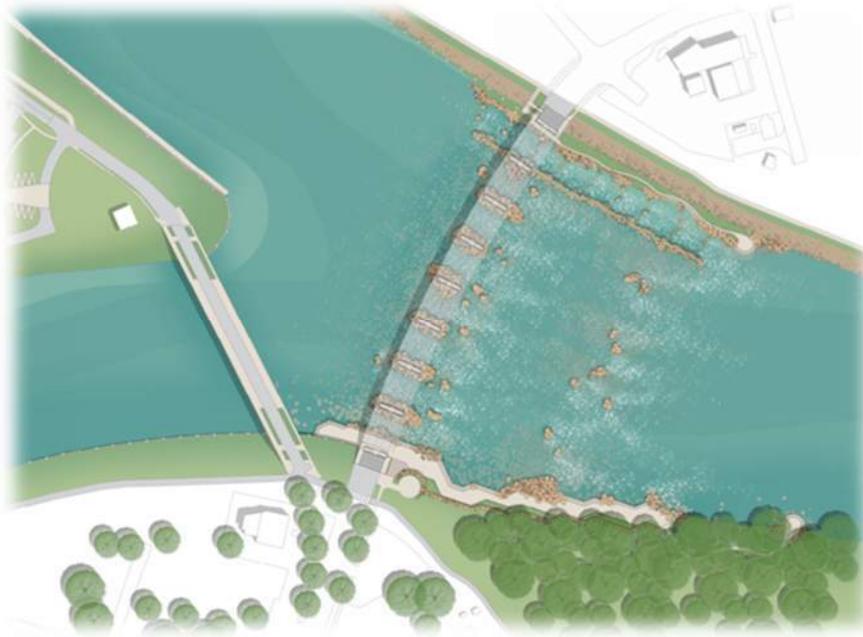
Flow, cfs	Flow Exceedence %	HW, ft	TW, ft	Hydraulic Drop, ft
192	90	783.6	777.5	6.1
406	80	784.3	778.4	5.9
663	70	784.3	779.2	5.1
1100	60	784.3	780.1	4.2
1885	50	784.3	781.1	3.2
2860	40	784.3	782.2	2.1
3867	30	784.3	783.1	1.2
5280	20	784.3	784.1	0.2
8609	10	786.1	786.1	-

Bypass/Fish Passage: A bypass with a fixed opening is proposed to convey the first 300 cfs for fish passage and recreation. Preliminary calculations indicate that at 50 cfs, the fish passage will have at least 6 inches of depth. For the first 300 cfs, only the bypass channel will receive flow. This will ensure that when the hydraulic drop is 6.6' (192 cfs), the two drops in the main river channel will not be active.

In-River Recreational Drops: Two drops are proposed that will receive flow after the bypass is full (300 cfs). The upstream drop will be a series of waveshapers and flashboards, and the second drop will be a fixed crest.

Recreational Reliability: The bypass is expected to convey low to high flows and will be active up to 60% of the time from May to September. The bypass channel will be designed to maintain a maximum 300 cfs flow 90% of the time. The in-river recreational drops are expected to convey medium to high flows and will be active up to 60% of the time.

SCOTT AVENUE DAM



Seasonal flow exceedences from May to September have been provided by HDR and were determined from the Des Moines River gage (#USGS 05485500 Des Moines River below Raccoon River). The exceedence flows were analyzed in the existing regulatory HEC-RAS floodplain model to determine water surface elevations (WSE) upstream and downstream of the existing dam. Without the use of flashboards, the upstream WSE cannot maintain a target elevation. Instead, the first drop crest was designed to best match the existing headwater elevations.

Table 2 – Des Moines River Exceedences at Scott Avenue

Flow, cfs	Flow Exceedence %	HW, ft	TW, ft	Hydraulic Drop, ft
739	90	778.2	772.3	5.9
1462	80	779.0	773.6	5.4
2723	70	779.7	775.0	4.7
4620	60	780.3	776.5	3.8
6730	50	780.9	778.0	2.9
9142	40	781.5	779.4	2.1
12200	30	782.1	780.9	1.2
16300	20	782.9	782.8	-
21400	10	784.8	784.8	-

Bypass/Fish Passage: A separated fish passage bypass is proposed to convey the first 100 cfs. The flow in the fish passage channel varies.

In-River Recreational Drops: Two drops are proposed that will receive flow after the fish passage exceeds 1 foot of depth. The two drops will both be a fixed crest.

Recreational Reliability: The upstream in-river recreational drop will be active up to 70% of the time from May to September. The downstream in-river recreational drop will be active up to 40% of the time.

CENTER STREET DAM



Seasonal flow exceedences from May to September have been provided by HDR and were determined from the Des Moines River gage (#USGS 05482000 Des Moines River at 2nd Avenue). The exceedence flows were analyzed in the existing regulatory HEC-RAS floodplain model to determine water surface elevations (WSE) upstream and downstream of the existing dam. A proposed target upstream WSE is 787.10', and the resulting drop is provided below.

Table 3 – Des Moines River Exceedences at Center Street

Flow, cfs	Flow Exceedence %	HW, ft	TW, ft	Hydraulic Drop, ft
205	99	787.1	778.4	8.7
426	90	787.1	778.7	8.4
876	80	787.1	779.2	7.9
1690	70	787.1	779.7	7.4
2944	60	787.1	780.2	6.8
4485	50	787.1	781.2	5.9
6000	40	787.7	781.7	6.0
8037	30	788.5	782.5	6.0
10700	20	789.4	783.8	5.6
13300	10	790.2	785.6	4.6

Bypass/Fish Passage: A separated fish passage bypass is proposed to convey the first 200 cfs.

In-River Recreational Drops: Four drops are proposed that will receive flow after the fish passage is full (200 cfs). The upstream drop will be a series of waveshapers and flashboards, and the remaining drops can be a fixed crest.

Recreational Reliability: The in-river recreational drops, except for the upstream drop, will be active up to 90% of the time from May to September. The upstream drop features will be active up to 40% of the time.

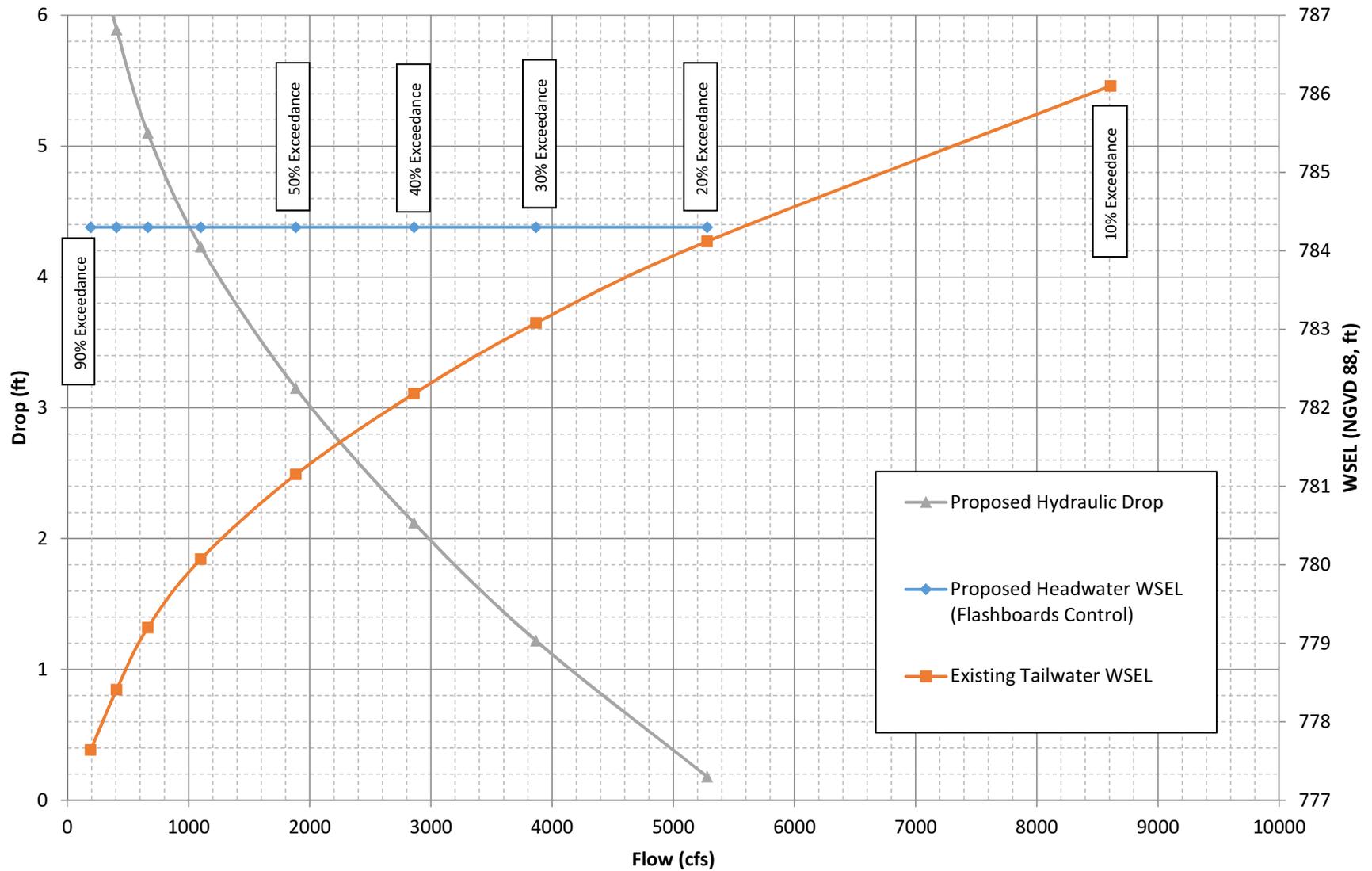
ATTACHMENTS

Fleur Drive Dam Rating Curve, Anticipated Hydraulics
 Scott Avenue Dam Rating Curve, Anticipated Hydraulics
 Center Street Dam Rating Curve, Anticipated Hydraulics

Attachment 1

Fleur Drive Dam Rating Curve, Anticipated Hydraulics

Fleur Dam near Gray's Lake - Rating Curve (May-Sept)

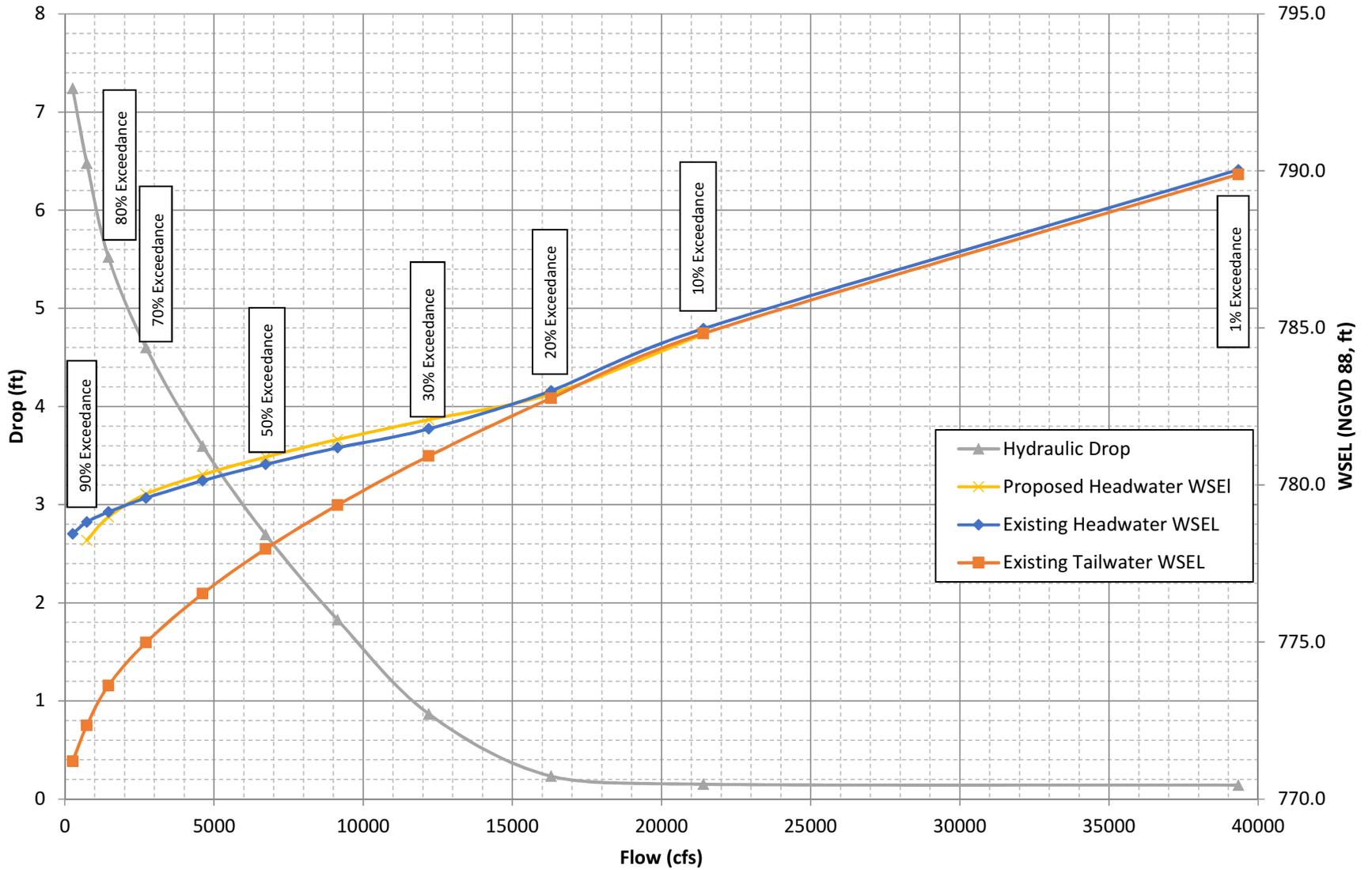


Fleur Drive Dam near Gray's Lake
Anticipated Hydraulics and Recreational Reliability

Flow, cfs	Flow Exceedence, %	Upstream Pool elevation, ft (Headwater)	Hydraulic Drop #1, ft	Middle Pool elevation, ft	Hydraulic Drop #2, ft	Downstream Pool elevation, ft (Tailwater)	Bypass/Fish Passage Flow, cfs	Bypass Number of 1 foot drops
0	NO FLOW	781.8	n/a	778.3	n/a	777.4	0	n/a
192	90	783.6	n/a	778.3	n/a	777.6	192	6
406.2	80	784.3	3.8	780.5	2.1	778.4	300	6
663.2	70	784.3	2.6	781.7	2.5	779.2	300	6
1100	60	784.3	1.7	782.6	2.5	780.1	300	4
1885	50	784.3	1.0	783.3	2.1	781.2	300	2
2860	40	784.3	0.3	784.0	1.8	782.2	300	1
3867	30	784.6	n/a	784.6	1.5	783.1	300	n/a
5280	20	784.2	n/a	784.2	n/a	784.1	300	n/a
8609	10	786.1	n/a	786.2	n/a	786.1	684	n/a

Attachment 2
Scott Avenue Dam Rating Curve, Anticipated Hydraulics

Scott Avenue Dam - Rating Curve (May-Sept)

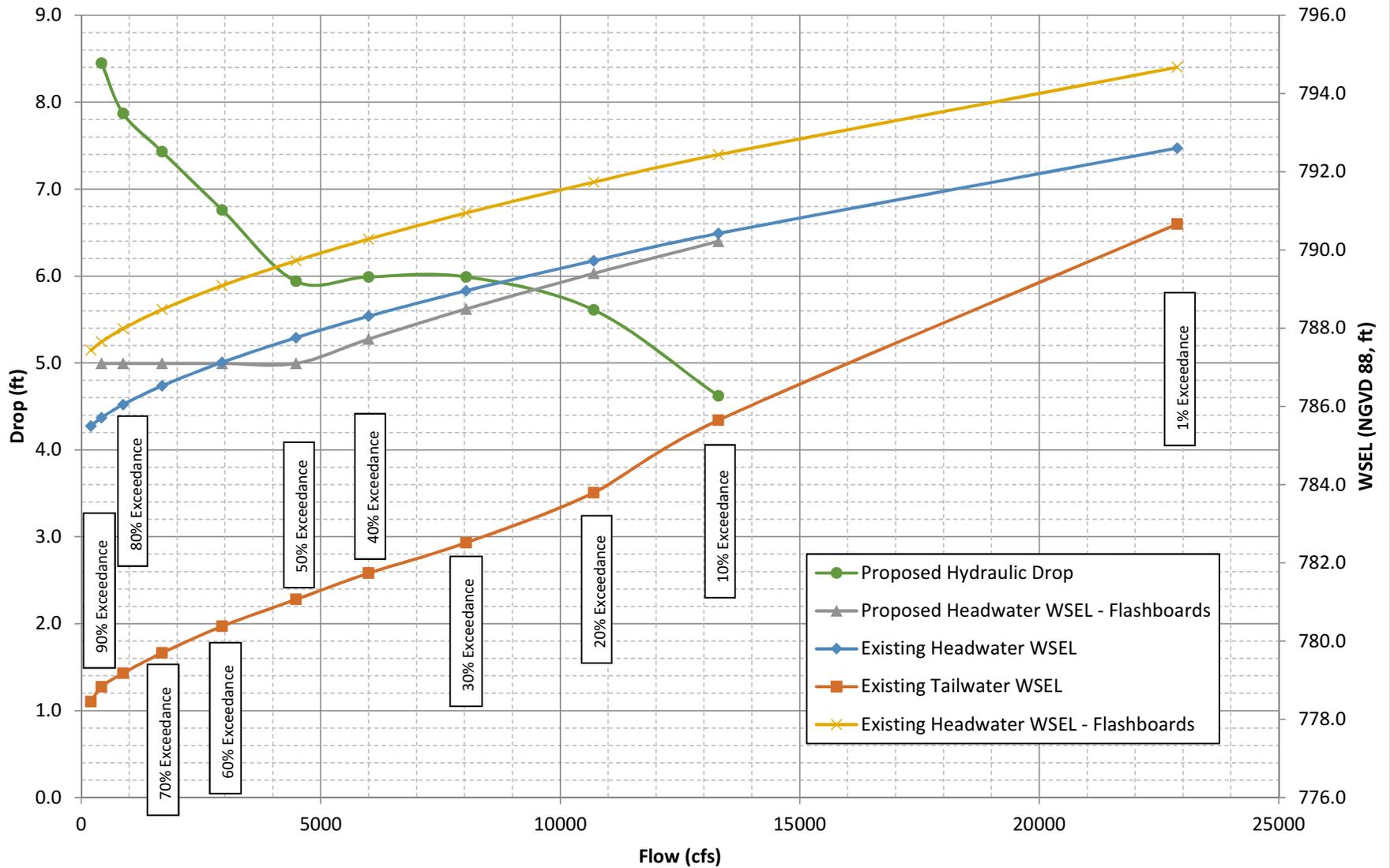


Scott Avenue Dam
Anticipated Hydraulics and Recreational Reliability

Flow, cfs	Flow Exceedence, %	Existing Upstream Pool, ft (Headwater)	Proposed Upstream Pool, ft (Headwater)	Drop #1, ft	Middle Pool, ft	Drop #2, ft	Downstream Pool, ft (Tailwater)	Fish Passage Flow, cfs
0	NO FLOW	778.4	776.3	-	774.3	-	770.9	0
739	90	778.8	778.2	3	775.3	3	772.3	306
1462	80	779.1	779.0	3	776.0	2.4	773.6	488
2723	70	779.6	779.7	2.9	776.8	1.8	775.0	708
4620	60	780.1	780.3	3	777.5	0.9	776.5	917
6730	50	780.7	780.9	2.9	778.0	-	778.0	1120
9142	40	781.2	781.5	2.1	779.4	-	779.4	1330
12200	30	781.8	782.1	1.2	780.9	-	780.9	1600
16300	20	783.0	782.9	-	782.8	-	782.8	1920
21400	10	785.0	784.8	-	784.8	-	784.8	2320

Attachment 3
Center Street Dam Rating Curve, Anticipated Hydraulics

Center Street Dam - Rating Curve (May-Sept)



Center Street Dam
Anticipated Hydraulics and Recreational Reliability

Flow, cfs	Flow Exceedence, %	Upstream Pool, ft (Headwater)	Drop #1, ft	Middle Pool #1, ft	Drop #2, ft	Middle Pool #2, ft	Drop #3, ft	Middle Pool #3, ft	Drop #4, ft	Downstream Pool, ft (Tailwater)	Fish Passage Flow, cfs
0	NO FLOW	787.1	-	781.3	-	779.3	-	777.4	-	777.4	0
426	90	787.1	4	783.1	2	781.1	2	779.1	0.4	778.7	200
876	80	787.1	3	784.1	2	782.1	2	780.1	0.9	779.2	200
1690	70	787.1	2	785.0	2	783.0	2	781.0	1.3	779.7	200
2944	60	787.1	1	786.1	2	784.1	2	782.1	1.7	780.3	200
4485	50	787.1	-	787.1	2	785.1	2	783.1	1.9	781.2	200
6000	40	787.7	-	787.7	2	785.7	2	783.7	2	781.7	325
8037	30	788.5	-	788.5	2	786.5	2	784.5	2	782.5	500
10700	20	789.4	-	789.4	2	787.4	2	785.4	1.6	783.8	750
13300	10	790.2	-	790.2	2	788.2	2	786.2	0.6	785.6	1000

C.6 – PROPOSED FLEUR SITE IMPACTS



MEMORANDUM
February 13, 2018

TO: IDNR
FROM: Layton Bodkins
PROJECT: Des Moines Water Trail Study
RE: **Proposed Fleur Site Impacts**

The following list of attachments are provided for analyzing the morphologic and hydraulic impacts on the reach between the existing Fleur Drive dam and its proposed location near Gray's Lake. All exceedences provided are for the recreational months of May through September.

SUMMARY OF RESULTS

Flashboards

- Existing flashboards are 3 feet tall, top elevation of 784.3'
- Proposed flashboards are 5 feet tall, top elevation of 784.3', approximately 1 mile downstream
- Gates are expected to start dropping around 2500 cfs, 40% exceedance
- Gates are expected to be completely down at 3800 cfs, 30% exceedance
 - This is the flow at which the fixed crest (second drop) maintains the target WSE of 784.3'

Existing Conditions

- River between existing and proposed dam reaches a target pool elevation of 784.3 near 5300 cfs, 20% exceedance, and exceeds the existing dam crest of 781.3 near 1900 cfs, 50% exceedance
- Existing fleur dam crest elevation is 781.3'
- The flashboards are used to maintain an upstream pool of 784.3'

Proposed Conditions

- When proposed flashboards are up:
 - The water surface of river between existing and proposed dam sites will be raised from its existing elevation up to an additional 6 feet at lowest flows and no increase at flows above 8600 cfs, 10% exceedance (See *Figure C-2*)
 - The existing dam will be navigable without having to make any modifications
- DMWW can control WSE needed for its Raccoon intake system
- The DMWW infiltration gallery will have more reliable river water available.
- The hydraulic drop at fleur dam will adjust as shown in *Figure C-1*.

ATTACHMENTS

Appendix A: River Flows

- Figure A-1: Rating Curve
- Figure A-2: Proposed Site Raccoon River Flows, Exceedence and Flood
- Figure A-3: Existing Site Raccoon River Flows, Exceedence and Flood Flows

Appendix B: Proposed Feature Conditions

- Table B-1: Anticipated Hydraulics and Recreational Reliability
- Figure B-1: Exceedence Flows & Hydraulic Profile

Appendix C: Comparison to Existing Conditions

- Table C-1: Overall Calculated Hydraulic Drop
- Figure C-1: Existing vs. Proposed Hydraulic Drop Comparison
- Figure C-2: Impacts to Raccoon Water Surface Elevation

Appendix D: Additional Resources

- FEMA FIRM
- DMWW Criteria (Email Correspondence)

Appendix A

River Flows

- Rating Curve (Figure A-1)
- Proposed Site Raccoon River Flows, Exceedence and Flood (Figure A-2)
- Existing Site Raccoon River Flows, Exceedence and Flood Flows (Figure A-3)

Figure A-1

Fleur Dam near Gray's Lake - Rating Curve (May-Sept)

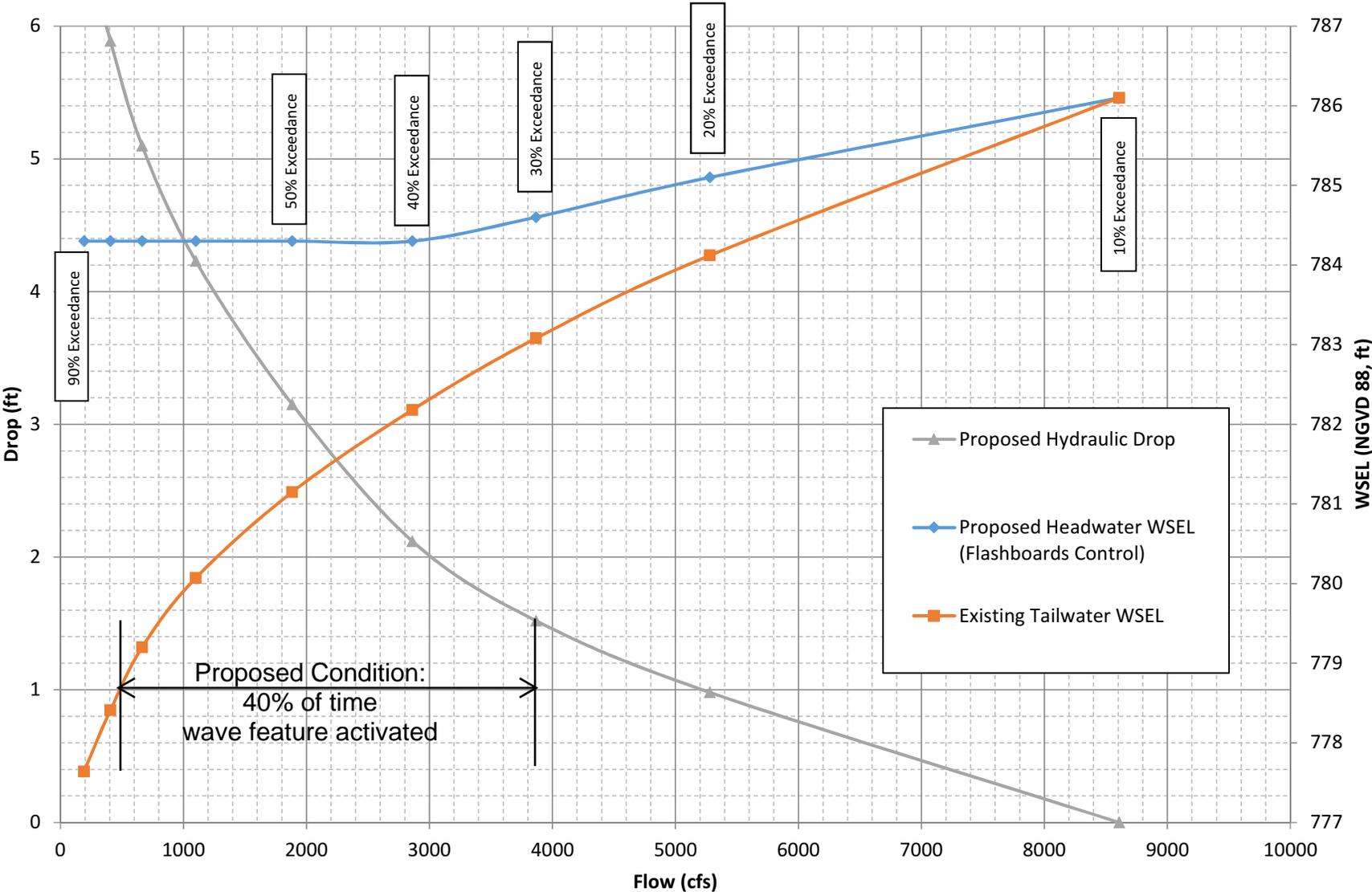
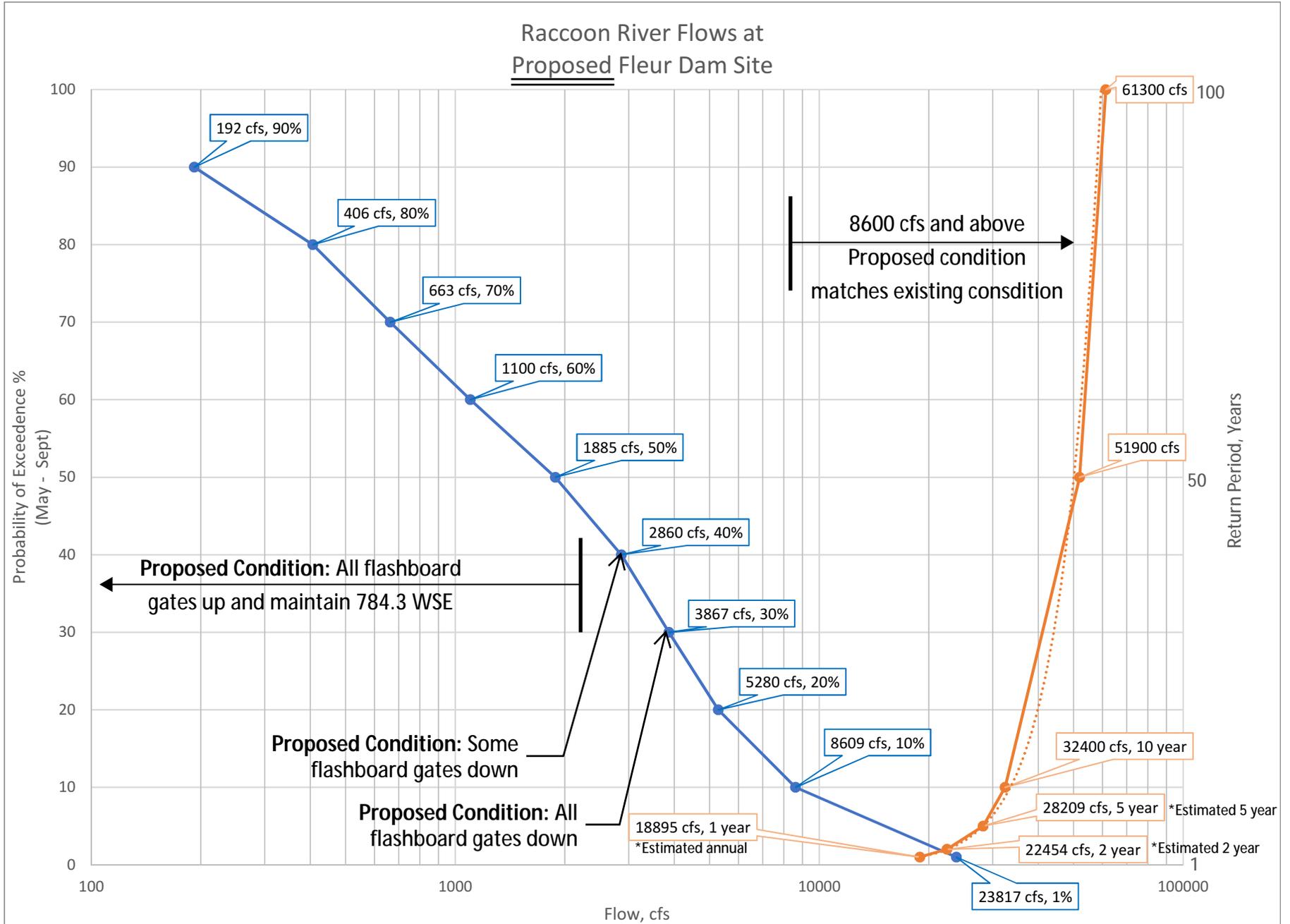


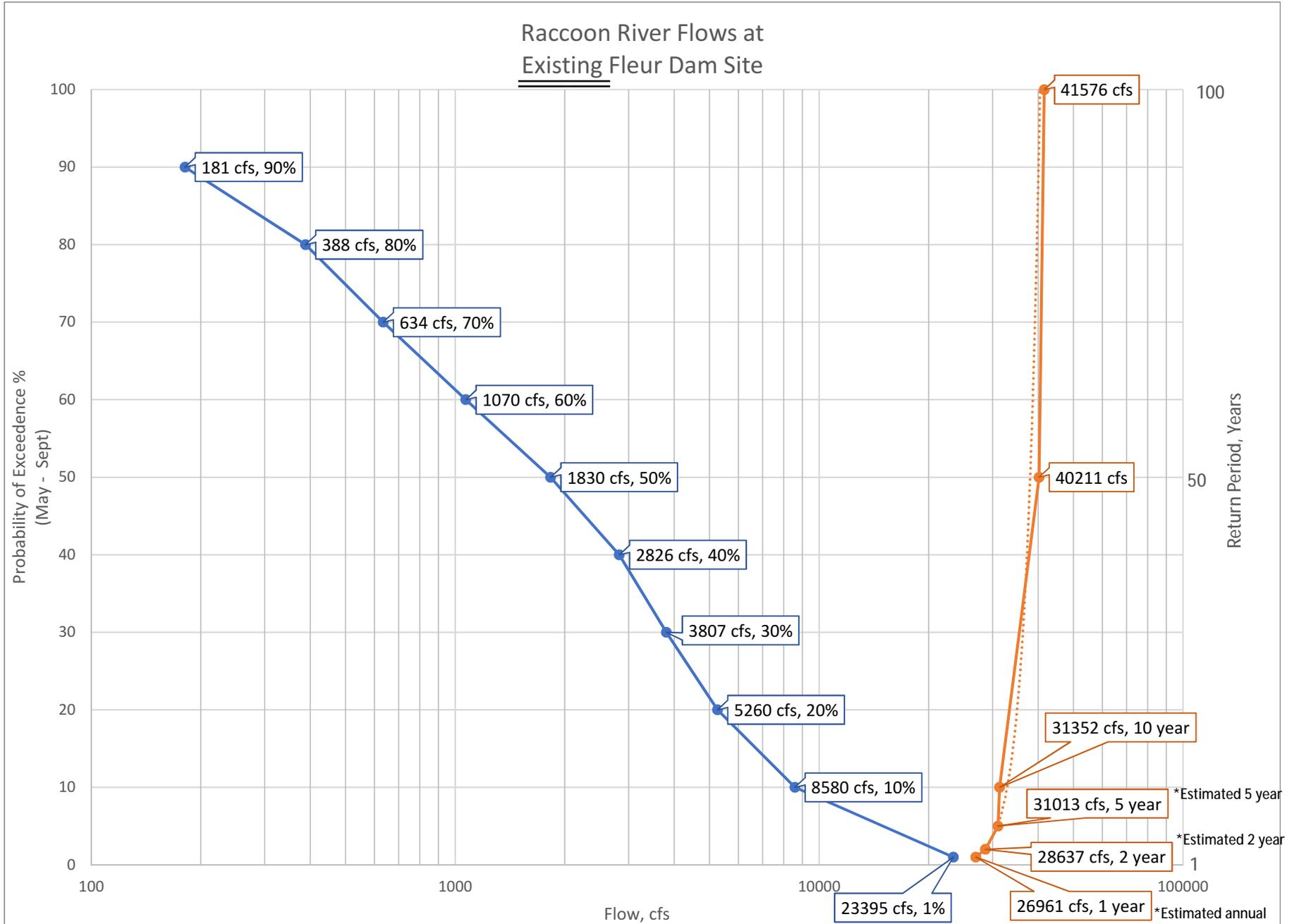
Figure A-2



Probability of Exceedence: Seasonal flow exceedences from May to September have been provided by HDR and were determined from the Raccoon River gage (USGS #05484650 Raccoon River at 63rd Street at Des Moines, IA).

Probability of Annual Occurrence: The 10, 50, 100, and 500 year flows were pulled from the HECRAS model used by HDR at the location "Below Fleur Drive." A power regression trendline (formula: $y = 7E-18x^{4.0071}$) was used to calculate the remaining flood flows (1, 2 and 5 year).

Figure A-3



Probability of Exceedence: Seasonal flow exceedences from May to September have been provided by HDR and were determined from the Raccoon River gage (USGS #05484900 Raccoon River at Fleur Drive at Des Moines, IA).

Probability of Annual Occurrence: The 10, 50, 100, and 500 year flows were pulled from the HECRAS model used by HDR at the location "Below Fleur Drive." A power regression trendline (formula: $y = 9E-50x^{11.076}$) was used to calculate the remaining flood flows (1, 2 and 5 year).

Appendix B

Proposed Feature Conditions

- Anticipated Hydraulics and Recreational Reliability (Table B-1)
- Exceedence Flows & Hydraulic Profile (Figure B-1)

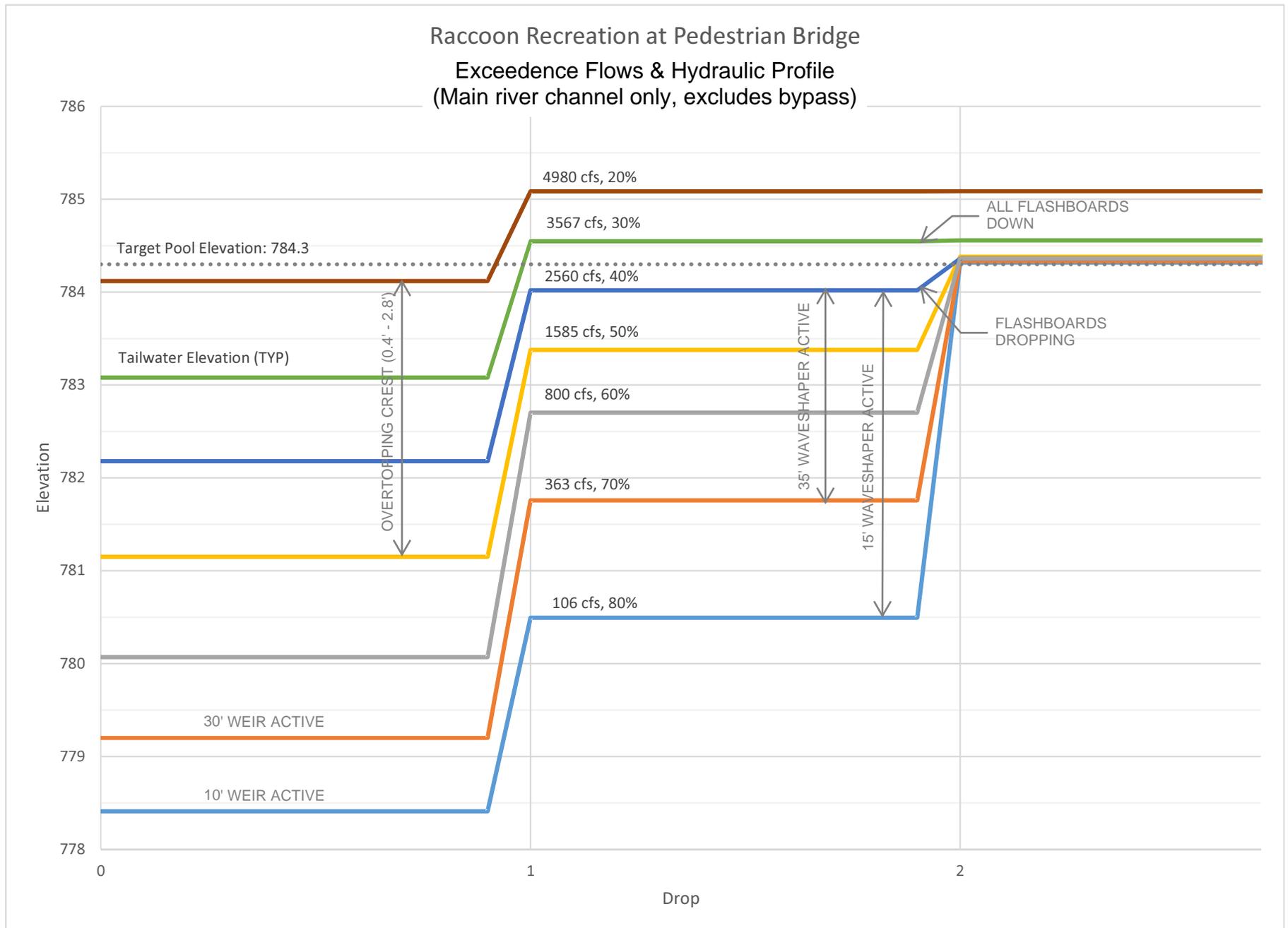


Fleur Drive Dam near Gray's Lake
Anticipated Hydraulics and Recreational Reliability

Table B-1

Total Flow, cfs	Flow Exceedence, %	Upstream Pool elevation, ft (Headwater)	Hydraulic Drop #1, ft	Middle Pool elevation, ft	Hydraulic Drop #2, ft	Downstream Pool elevation, ft (Tailwater)	Bypass/Fish Passage Flow, cfs	Bypass Number of 1 foot drops
0	NO FLOW	781.8	n/a	778.3	n/a	777.4	0	n/a
192	90	783.6	n/a	778.3	n/a	777.6	192	6
406.2	80	784.3	3.8	780.5	2.1	778.4	300	6
663.2	70	784.3	2.6	781.7	2.5	779.2	300	6
1100	60	784.3	1.7	782.6	2.5	780.1	300	4
1885	50	784.3	1.0	783.3	2.1	781.2	300	2
2860	40	784.3	0.3	784.0	1.8	782.2	300	1
3867	30	784.6	n/a	784.6	1.5	783.1	300	n/a
5280	20	785.1	n/a	785.1	1.0	784.1	300	n/a
8609	10	786.1	n/a	786.2	n/a	786.1	684	n/a

Figure B-1



Appendix C

Comparison to Existing Conditions

- Overall Calculated Hydraulic Drop (Table C-1)
- Existing vs. Proposed Hydraulic Drop Comparison (Figure C-1)
- Impacts to Raccoon Water Surface Elevation (Figure C-2)



Table C-1

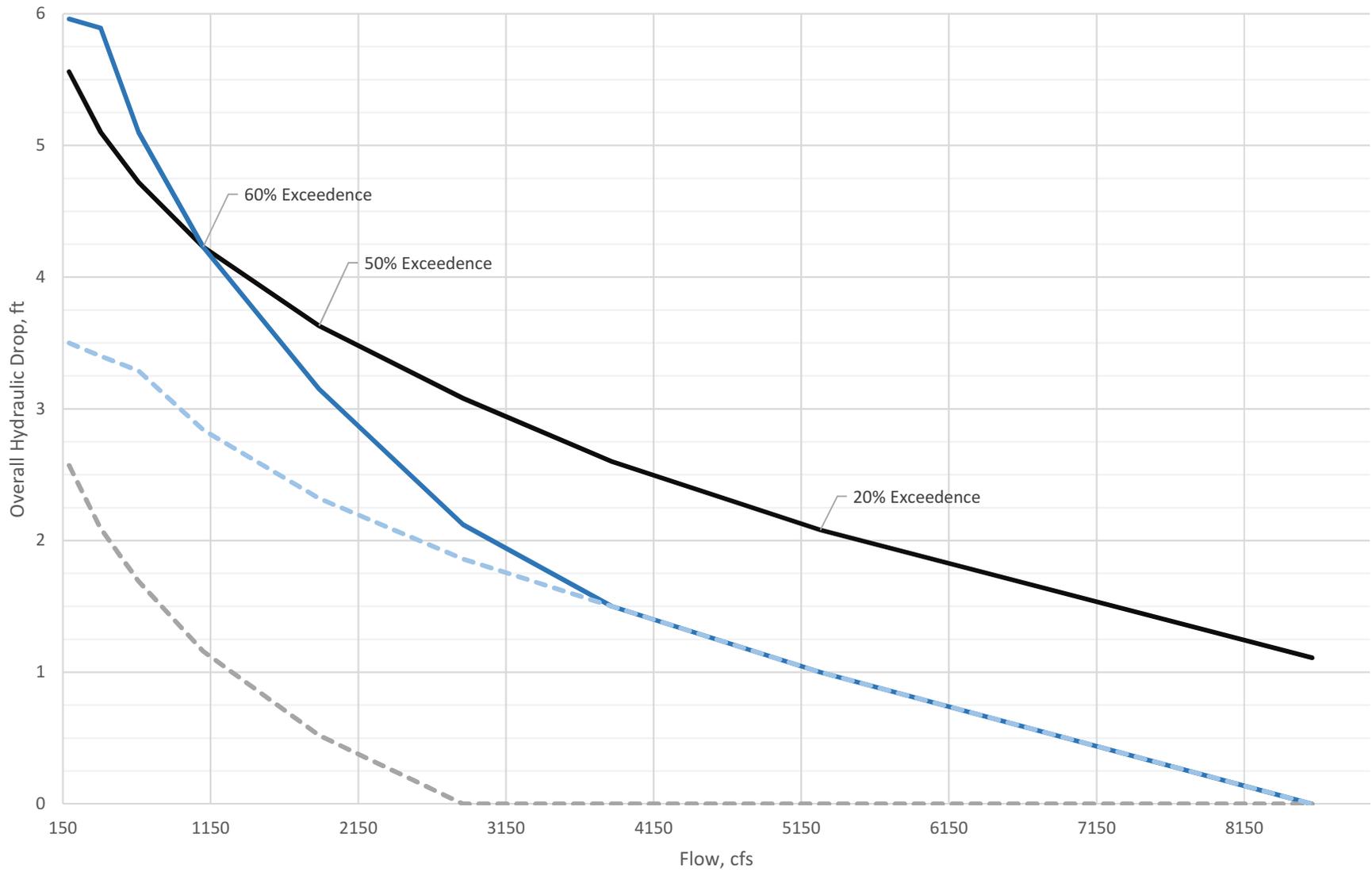
Flow, cfs	Flow Exc., %	Overall Calculated Hydraulic Drop (ft)							
		Existing				Proposed			
		Ex Dam Site		Proposed Dam Site		Ex Dam Site		Proposed Dam Site	
		Flash down	Flash up	Flash down	Flash up	Flash down	Flash up	Flash down	Flash up
192	90	2.6	5.6	-	-	2.6	-	3.5	6.0
406.2	80	2.1	5.1	-	-	2.1	-	3.4	5.9
663.2	70	1.7	4.7	-	-	1.7	-	3.3	5.1
1100	60	1.2	4.2	-	-	1.2	-	2.8	4.2
1885	50	0.5	3.6	-	-	0.5	-	2.3	3.1
2860	40	-	3.1	-	-	-	-	1.9	2.1
3867	30	-	2.6	-	-	-	-	1.5	1.5
5280	20	-	2.1	-	-	-	-	1.0	1.0
8609	10	-	1.1	-	-	-	-	-	-

Notes:

1. Existing scenario with the flashboards up allows for overtopping of closed flashboards
2. Proposed scenario involves the new flashboard system, with the old flashboards removed
3. Proposed scenario with flashboards down experiences hydraulic drop due to bypass weir and the fixed crest (second drop)
4. No hydraulic drop is represented as "-"

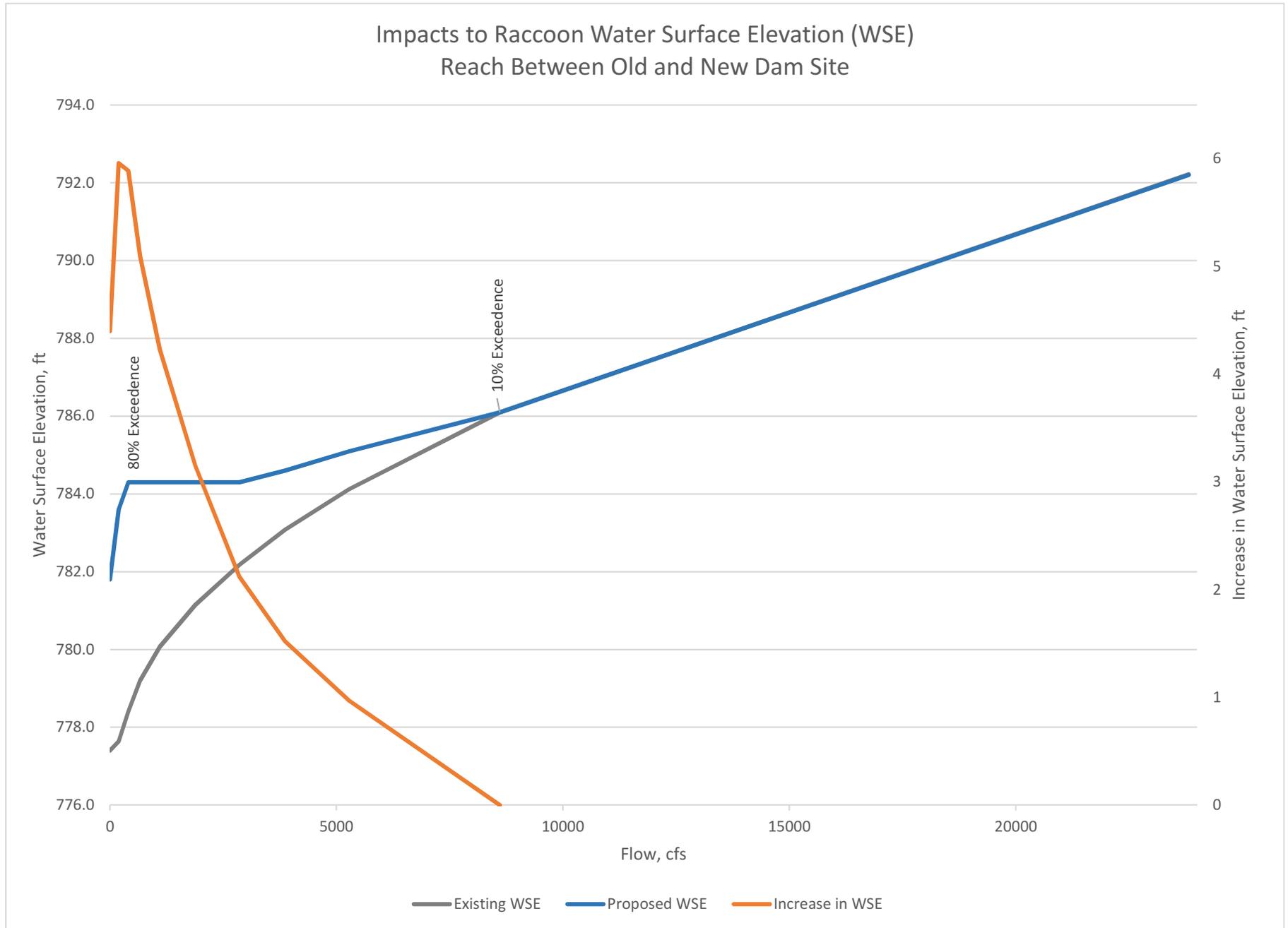
Figure C-1

Existing vs. Proposed Hydraulic Drop Comparison



— Ex Dam Current Condition w/ Flashboards Up — Proposed Site w/ Flashboards Up
- - - Ex Dam No Flashboards - - - Proposed Dam Site no flashboards

Figure C-2

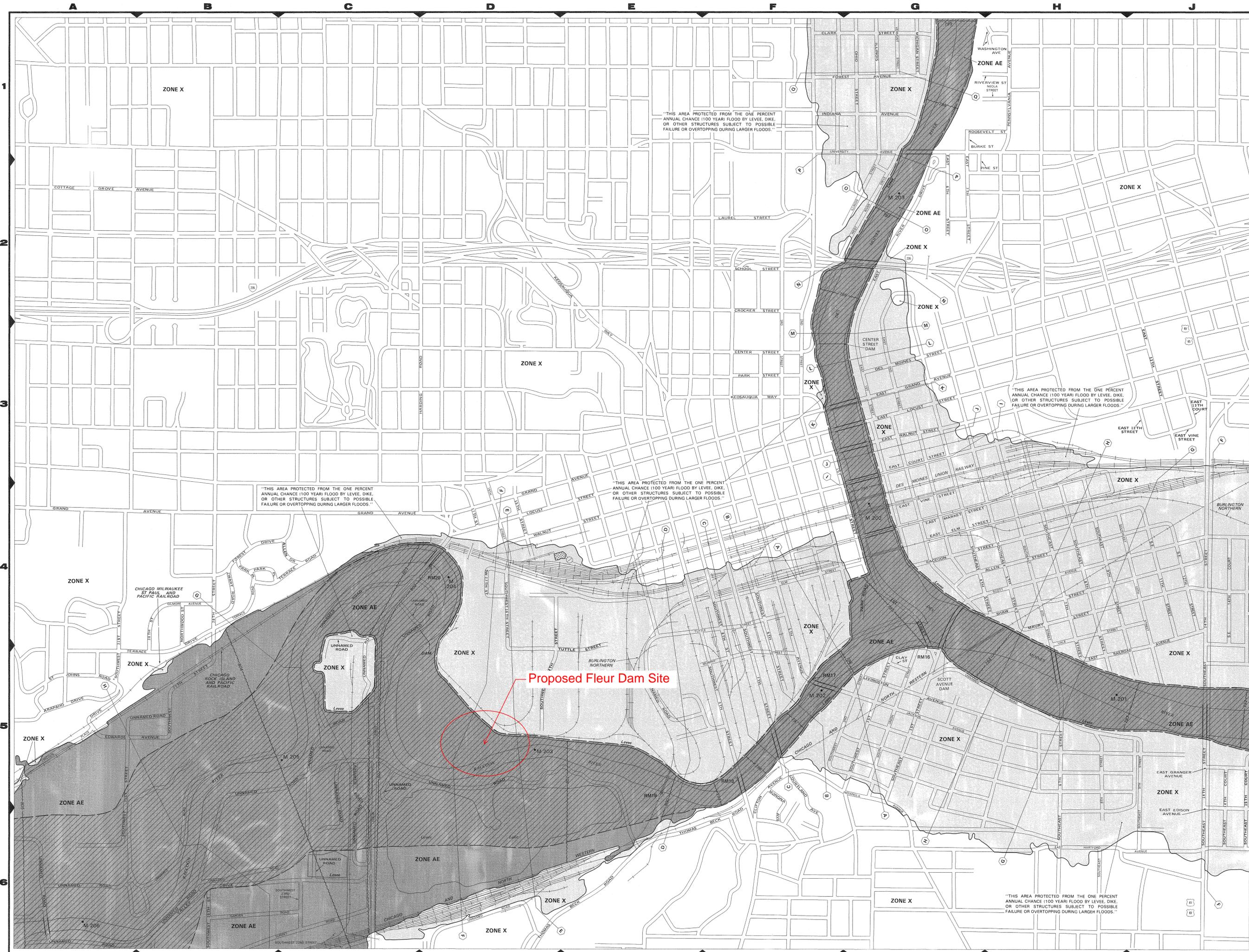


Appendix D

Additional Resources

- FEMA FIRM
- DMWW Criteria (Email Correspondence)





LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDED BY 100-YEAR FLOOD

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

- ZONE X** Areas determined to be outside 500-year flood plain.
- ZONE D** Areas in which flood hazards are undetermined.

Boundary

- Flood Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones

513 Base Flood Elevation Line; Elevation in Feet*

(E) 987 Cross Section Line

RM7 X Base Flood Elevation in Feet Where Uniform Within Zone*

MI.5 Elevation Reference Mark

River Mile

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Certain areas not in the Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the Floodways were computed at cross sections and interpolated between cross sections. The Floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/20 inch.

Coastal base flood elevations apply only to landward of the shoreline. Elevation reference marks are described in the Flood Insurance Study Report.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For adjoining panels, see separately printed Map Index.

MAP REPOSITORY

City Engineer's Office, City Hall, East 1st and Locust Street, Des Moines, Iowa 50309 (Maps available for reference only, not for distribution)

INITIAL IDENTIFICATION
SEPTEMBER 6, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 29, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
FEBRUARY 4, 1981

FLOOD INSURANCE RATE MAP REVISIONS:

- Map revised June 19, 1985 to change special flood hazard areas, base flood elevations, zone designations, add base flood elevations, revise corporate limits, and to reflect new FEMA site block.
- Map revised September 18, 1987 to change special flood hazard areas, base flood elevations, and to revise corporate limits.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM FLOOD INSURANCE RATE MAP

CITY OF DES MOINES, IOWA
POLK COUNTY

PANEL 6 OF 11
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
190227 0006 D

MAP REVISED:
SEPTEMBER 18, 1987

Federal Emergency Management Agency

Layton Bodkins

From: Corrigan, Ted <corrigan@dmww.com>
Sent: Friday, August 25, 2017 4:00 PM
To: McCoy, Andrew; SLNaber@dmgov.org
Cc: Less, Roger; Rick McLaughlin; Layton Bodkins; McCurnin, Mike
Subject: RE: water trails question regarding maintaining low pool elevation

Andy,

I'm not sure I understand the question but let me provide a couple of data points. The water levels established by the dams with flashboards up/in place are the minimum levels we would like to see regardless of how low the flow gets. In addition we need to be able to withdraw water from the pool behind each of the dams without reducing those levels. We can currently withdraw at a 75 million gallon per day rate from the pool above the Center Street Dam and a 75 million gallons per day rate from the pool above the Fleur Drive Dam. These capacities need to be maintained.

DMWW has an agreement with the State of Iowa (and indirectly with the COE) for ownership of water storage in Saylorville Reservoir. The agreement is fairly complex involving other water using entities. This agreement allows DMWW to request water release from the reservoir for "water supply demand" purposes in amounts greater than would normally be released during low flow conditions. This rate varies depending on the month of the year and can be fairly small. We need to ensure that whatever is done here accounts for making this water released from the reservoir available at our intake so we can meet the water supply needs of the metro in an emergency.

If that creates more questions than answers feel free to contact me to discuss.

Ted

TED CORRIGAN | Chief Operating Officer
Des Moines Water Works | **WATER YOU CAN TRUST FOR LIFE**
2201 George Flagg Parkway | Des Moines, Iowa 50321 | www.dmww.com
Phone: (515) 283-8751 | fax: (515) 283-8723 | e-mail: corrigan@dmww.com

From: McCoy, Andrew [mailto:Andrew.McCoy@hdrinc.com]
Sent: Friday, August 25, 2017 10:48 AM
To: SLNaber@dmgov.org; Corrigan, Ted
Cc: Less, Roger ; Rick McLaughlin ; Layton Bodkins (Layton.Bodkins@merrick.com)
Subject: water trails question regarding maintaining low pool elevation

Steve and Ted,

This might be a Chad Christensen or Dan P. question as well, but can you answer the following, as it relates to your respective infrastructure and operations ?

We plan to maintain the existing headwater elevations in the pool related to the Center, Scott, and Fleur Dams. We expect that the minimum WSE upstream of the dams is close to the existing crest and/or flashboard elevation.

Center Street: Crest = 785.10' (787.10' w/flashboard)
Scott Avenue: Crest = 778.44'
Fleur Drive: Crest = 781.33' (783.33' w/flashboard)

The question that I have, with respect to Des Moines Water Works intakes - Is there any information related to flow requirements related to the pool information? My guess, is no, there isn't but I am double checking. We are targeting the pool elevations and are assuming a very low flow associated with them. Is there any other Pool elevation that we would need to maintain besides what is referenced above?

For the City of Des Moines question, in the Birdland Pool, if the pool is raised (due to a variable crest pool) at times will that impact any storm sewer operations of functionality? If so what would the pool elevation be where impacts occur?

Thanks and if you have any questions, please give me a call.

Andy McCoy, PhD, PE
Senior Water Resources Engineer

HDR
300 East Locust Street Ste. 210
Des Moines, Iowa 50309
D 515.280.4950 M 515.201.3912
andrew.mccoy@hdrinc.com

hdrinc.com/follow-us

C.7 – BUDGET COMPARISON TECHNICAL MEMORANDUM

BUDGET COMPARISON TECHNICAL MEMORANDUM

Downtown Des Moines Water Trails Engineering Study
March 9, 2018

The budget estimates outlined in this memorandum for the Des Moines Project are for preliminary budgeting and are based on the current project as of March 2018. The upland amenities budget was excluded from this memo to focus on the comparison to other whitewater venues.

DES MOINES PROJECT BUDGET SUMMARY

General layouts and geometries, sites, and elevations of recreational improvements have been initially evaluated. Significant field investigations, design, hydraulic modeling, and various analyses are required to refine the proposed improvements and support more accurate cost estimating.

The budgets prepared for this memo are considered a Class 5 estimate as defined by the Association for the Advancement of Cost Engineering International (AACEI). Typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side, depending on complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. The most difficult costs to predict at this level of study include those related to environmental issues, dewatering and water control associated with working within this large river, issues related to permitting and project phasing, and impacts to existing infrastructure. At this concept-level, the project definition is around two to five percent (compared to final design at 100%). A preliminary design level of about 30% which includes field studies, surveys, detailed analysis and design, is typically needed to improve estimates needed for project authorization. The budgets provided below include “soft” costs such as engineering, design, permitting, and construction inspection (15%); and 30% for unknown or unidentified construction or other project costs. The budgets can therefore be considered as estimates of total project costs (rather than just construction costs).

WHITEWATER BUDGET COMPARISONS

The preliminary budgets for the Des Moines Project are compared to similar venues in the attached figures. Major design components including sets of flashboards, pools to be maintained, fish passage, wave shapers, and number of dams mitigated are identified in Figure 1 – Project Comparison Matrix.

It is difficult to compare costs between various recreational whitewater venues because of the wide variety of projects, the amount of fall or drop of the various features and the size of rivers. However, to provide some basis for comparison, the total length of major structures is used as the base parameter for comparison. The results of this analysis are shown on the attached Figure 2 – Project Comparison Chart.

The length of “Major Structures” (basis for comparison) includes the total length of drop crests that span the entire river that focus the flow and create the wave features. It also includes the length of constructed divider structures in venues where there is an in-river bypass. As defined, it includes construction and project costs for all in-river features and structures and includes dewatering, engineering, etc.

Referenced Projects:

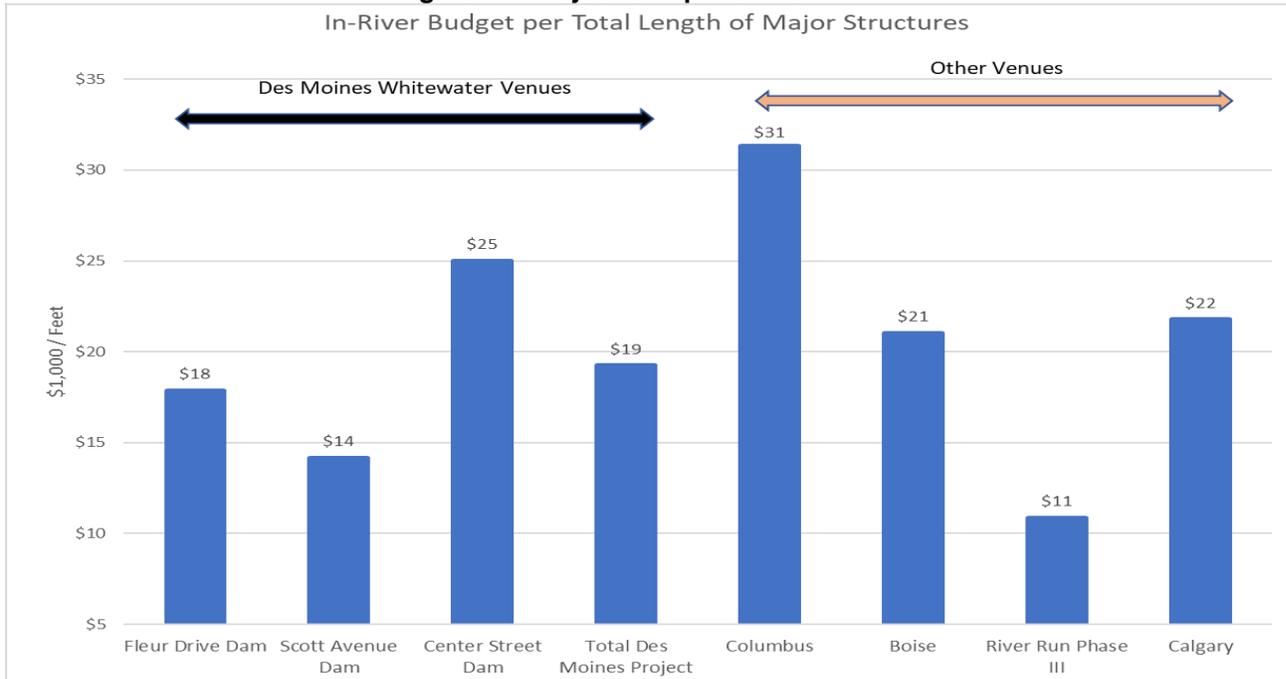
1. “Columbus”	Chattahoochee River	Columbus, Georgia	2013
2. “Boise”	Boise River	Boise, Idaho	2011
3. “River Run Phase III”	S. Platte River	Sheridan, Colorado	Partially completed
4. “Calgary” (includes reconstruction)	Bow River	Calgary, Alberta, Canada	2018
5. “Grand Rapids”	Grand River	Grand Rapids, Michigan	Planned

Attachments: Figure 1 – Project Comparison Matrix
Figure 2 – Project Comparison Chart

Figure 1 – Project Comparison Matrix

Project	Approximate Cost (\$ million)	Flashboard (Total Sets)	Pools to be Maintained (Total #)	Fish Passage (Y/N)	Waveshaper (Total Sets)	Total Length of Structures Built (Ft)	Dams Mitigated (Total #)
Fleur Drive Dam	\$25	1	1	Y	2	1400	1
Scott Avenue Dam	\$17	0	0	Y	0	1200	1
Center Street Dam	\$35	1	1	Y	2	1400	1
Total Des Moines Project	\$77	2	2	Y	4	4000	3
Columbus	\$26	0	0	N	1	830	2
Boise	\$4.2	1	1	N	2	200	1
River Run Phase III	\$4.3	0	0	Partial	0	400	2
Calgary	\$44	0	1	N	0	2020	1
Grand Rapids	\$35	1	1 - 2	Y	0	?	2

Figure 2 – Project Comparison Chart



C.8 – HISTORIC PRESERVATION OF DAMS

MEMORANDUM

May 2018

TO: Layton Bodkins, Rick McLaughlin

FROM: John Anderson

PROJECT Des Moines MPO

RE: **Historic Preservation of Dams**

The removal of and/or modification of three dams on the Des Moines and Raccoon rivers in downtown Des Moines has the objectives of:

1. **Safety:** elimination or reduction of the dams' dangerous hydraulics in order to prevent accidental drowning in the reversal currents. Provide a portage route around the dam so that recreational users have a dry route around the dam. This should be universal access.
2. **Environmental:** Provide environmental benefits such as fish passage, aquatic habitat restoration and stream function, i.e. sediment transport.
3. **Recreation and economic development:** provide varied recreation opportunities in and adjacent to the river for the purpose of quality of life for city residents, promoting visitation to Des Moines and related economic development.
4. Maintain existing minimum pool levels.

The Office of the State Archaeologist in Technical Report 699 (the report) provides background on the historic nature of the three subject dams and outlines impacts of the proposed alternatives at each. This memo outlines an approach that takes into account all public benefits, including historic preservation, with the project in order to arrive at a balanced project that meets the stated objectives. It also provides background on two past projects in which historical dams were removed in order to achieve a variety of safety, environmental and recreation goals.

Project Precedents

Chattahoochee River Restoration, Columbus, Georgia.

This project removed portions of two historic dams for the purpose of safety, recreation and environmental restoration of rare falls line habitat. Both dams were contributing elements of a National Register's Columbus Historic Industrial Riverfront District (1978). The City Mills Dam and the Eagle and Phenix Mills dam are both part of historic industrial complexes that include powerhouses, water intakes, low head



masonry dams and masonry abutments. The Eagle and Phenix Mill also includes a power canal. Several predecessor dams were discovered during the removal process and were documented prior to removal. Both dams had produced hydroelectric power in the past but were uneconomic and fell into disuse. They were acquired from private owners and removed as part of the US Army Corps of Engineers Section 206 Ecosystem Restoration Program, in 2011 to 2013. Because of Federal funding, the removal was subject to full NEPA review and permitting. As part of the NEPA, Both Georgia and Alabama SHPOs were consulted on the removal plan, eventually receiving a Finding of No Significant Impact (FONSI). The following points were persuasive to SHPO in obtaining a FONSI.

- The project would not physically modify the adjacent mill buildings (which were and remain in private ownership).
- The project would preserve the masonry abutments in full
- The project would partially remove the spillways only to the extent needed to meet project objectives. Several alternatives for the breach widths were modeled and presented to SHPO. The minimum width needed at each dam to meet user safety objectives and fish passage was recommended and selected.
- The remnants of the spillways would be capped and stabilized to prevent deterioration over time

Embry Dam Removal, Rappahannock River at Fredericksburg, VA



Though creating a relatively short impoundment, removal of the Embry dam opened up 106 miles of river to anadromous fish. The 1909 dam was 22 feet tall and is an example of a buttressed concrete structure (photo above) wherein a thin concrete spillway is supported by an array of concrete piers that resemble cathedral buttresses. Embry Dam was removed by the Army Corps of Engineers with a coalition of State, local and Federal partners in 2004-2005.

Approach to historic preservation at the three subject dams.

Center Street Dam

As noted in the report, Center Street is the most significant structure, as it is a rare example of a multiple arch dam. The preferred alternative removes much of the dam's spillway in order to achieve the project objectives. The historic balustrade below the dam precludes downstream options which would preserve much of the dam structure. (The vertical walls and balustrade themselves present a safety problem as they limit egress and ingress to the river in the event of an emergency.) The preferred replacement option is upstream of the dam, requiring removal of the spillway. One or more of the measures below can help mitigate its loss:

1. Partial spillway removal, preserving one or both abutments. The dam would be notched horizontally leaving some spillway on one or both sides. A range of notch widths would be modeled to determine the minimum width that would be required in order to achieve the project objectives. In addition to hydraulic objectives, the notch width would have to include a portage path at the river level, i.e. within the notch. Possible alternatives to include notch widths of 400, 350 and 350 feet.
2. Remove one intact arch of the spillway and place it within the park area adjacent to the dam as an interpretive display.
3. Provide other interpretive displays such as a description of the significance of the dam and its design, with photographs and drawings.

Scott Avenue Dam

The proposed alternative envisions rock fill downstream of the spillway with a small notch in the crest at each low flow passage. From a historic preservation perspective, the rock fill conceals the downstream face of the spillway but removes very little historic fabric. We believe that the rock fill will extend the life of the historic dam considerably since the hydraulic energy and erosive force of the river will be transferred downstream. The overturning and sliding forces that act on the face of the dam will be borne by the massive structure below the spillway. The typical service life of a dam is 50 to 100 years provided that the design is adequate, and it is maintained. The subject dam is over 80 years old and is nearing the end of its design service life. The rock fill effectively resets the clock on its design service life. Though concealed from view the historic dam and the utilities enclosed within it are still extant.

Fleur Dam

The preferred alternative replaces the Fleur dam with a new flashboard structure a short distance downstream. The new dam achieves the environmental, recreational, safety goals of the project while maintains the historic pool elevations. The pool elevations maintain the present and historic functioning of the Des Moines Waterworks water supply. As at Scott Avenue dam, the original dam remains *in situ* while much of the hydraulic and erosive forces are transferred downstream to the new dam. In addition, the elimination of flashboards at the old dam reduce the sliding and overturning forces acting on it as well as scour. This could have the effect of extending the life of the structure. Apart from the flashboards, the original dam structure will be preserved and can be viewed and inspected by lowering the flashboards and the replacement dam.

C.9 – OPERATIONS AND MAINTENANCE MEMO

D.1 – WORKSHOP #1 SUMMARY



Workshop 1 Meeting Summary

July 13, 2017 part 1

July 18, 2017 part 2

PROJECT Des Moines Water Trail Study
ATTENDEES Rick McLaughlin, Layton Bodkins (MWDG)
Pat Boddy, Scott Crawford, Mike Bell (RDG)
Andy McCoy, Roger Less (HDR)
Teva Dawson, Dylan Mullenix (MPO)
Matt Anderson (City)
Jenny Richmond (City)
Steve Naber (City)
Ted Corrigan (DMWW)
Jonathan Gano (City)

Project Overview

- Not modifying bridges or levees with the exception of potential levee openings for access
- Matt in support of funding major projects
- Initial concepts will be prepared early October, and be presented to the public at that time
- By late September or early October, will have some concepts to provide council (hold off from updating council now)
- Additional Stakeholders? Council, 2 Downtown neighborhood associations
- Need to look at strategic phasing of the alternatives
- Teva to work with Engineering on the data items requested.

Levee and Floodplain Discussion

- Matt: We can't affect the water surface elevations (WSEL), another City project had 1/100th-foot of an increase that was denied (check with Steve)
- Levee improvements on all downtown and Southeast Des Moines levee reaches pending to meet FEMA re-certification requirements
 - Section 408 concept submittal of May 2017 is still under review and is being delayed due to ACOE budget constraints
 - 408 approval expected mid 2018, then final designs for proposed levee improvements thereafter
 - Pump station improvements to be combined with the levee improvements, starting in 2018
- Dam options include: steps, passage around the dam (with recreation), complete dam passage (specialized dam), remove and replace
- Purpose of the dam alternatives: safety, enhance depth for whitewater recreation, increase flatwater activities, improved sediment transport, in-stream ecological improvements

- These alternatives may affect WSELs and any raises will need to be mitigated to comply with the “no-rise” criteria
- The 408 levee improvements require raises mostly downstream of the confluence of the Des Moines and Raccoon Rivers with some localized raises of the levees and floodwalls upstream of the confluence.
- Any Water Trail raises in the WSELs and corresponding levee raise mitigation would need to be approved through another separate 408 submittal, but chances are not good the City would want to move forward with this option
- Raising levees to mitigate WSELs raises is a remote possibility and not preferred
- The consensus is that the alternatives for the Study will maintain existing flood elevations, and any consideration of raising the WSELs is out of scope and will need to be discussed as a team before analyzing.

Levee Closures for Pedestrian Access

- Jenny: It’s okay to affect the balustrade in the appropriate locations
 - *Not discussed in meeting: SHPO coordination would be required and outcomes are uncertain as to changes in balustrade*
- Levee openings became more fixed with the Riverwalk improvements and the City and ACOE have recently completed additional closure improvements on the levee system. Adding new closures is possible, but they should be kept to a minimum and would be subject to ACOE Section 408 reviews.
- Levees, floodwalls and Balustrade walls block access to the river
 - Additional closure in the levees may be needed for access improving emergency response access to the river should also be considered

Misc. Site Area Constraints and Information

- Locust and Walnut Street bridges will be replaced similar to Grand Avenue; and Court Avenue bridge will be rehabilitated. This work will be on-going over the next few years with Locust scheduled to start in late 2018.
- Now is the time to bring up any bridge modifications: Locust Street bridge (replace 2019, running out of time), Walnut Street bridge (replace), Court Avenue (rehab, historic bridge), 1st Street ped bridge (rehab),
- Bridge replacements and rehabs are federally funded as part of the FWHA *Tiger grants*
- East Side River: One of the alternatives was a passage around the bank, but now not an alternative for this study because of the recent park improvements
- Center Street Dam is a historic structure – leave the ends/abutments so you can see a piece of the history
- Major development projects in the project area? Central business district tie to east side of river?
- Matt wants to see projects differentiate themselves, location is going to be important, River will become a major amenity; They’ll go to raccoon river since it’s underdeveloped
- *Not discussed in meeting: Need an exhibit from RDG to show places discussed and visions and goals for each area; constraints such as buildings that won’t be touched, areas subject to change, criteria for each area; areas with opportunities for white water courses (i.e. undeveloped areas)*
- The City-owned Armory Building is a historic structure and in the near future will be available for redevelopment per the City vacating their office space in the building. Redevelopment potential of the Armory related to the Project and resulting economic impacts would be helpful to know; people excited about adding features near Armory, not further downstream than Scott Ave

- Jenny – trail section south of below conference area is proposed; a lot of recreation in that area; can we link into those? Bike paddle connection opportunities?
 - *Not discussed in meeting: areas such as these that were part of the previous plan need to be considered with caution. City engineering objected to portions of the plan because it wasn't feasible. A meeting with Nate Hoogeveen is in the works to discuss further.*
- The Des Moines and Raccoon Rivers confluence has historical significance per Fort Des Moines location.
- Matt - Be wary of things moving too fast without city council involvement; give formal status updates so that the communication continues;
- Jenny: Des Moines enjoys large events
- Fleur Dam's purposes are to keep upstream ground water tables elevated for the Des Moines Water Works (DMWW) intake galleries and provide river level depths for their river intake.
 - ~2' Flashboards, operated manually, are on the dam and are raised during low flows on the Raccoon River;
 - Flashboards typically require annual repairs
 - Dam without flashboards is mostly submerged and creates a minimal safety hazard
 - No known safety incidents at the dam, but when the flashboards are raised, they do create a greater safety concern
 - The DMWW has an upstream Raccoon River rubble dam that is located outside the Study reach that also provides benefits to the infiltration galleries.
- Any changes or retrofit information on the Birdland Pool upstream of Center Street Dam are vital for Study evaluation (DMWW river intake, Birdland Marina). Boating community in Birdland Pool were well represented at past stakeholder meetings.
- The Des Moines River box sewers adjacent to the balustrade walls are mostly outdated. City is requesting SHPO concurrence to not rebuild the box sewer between Grand and Locust as part of the repair of the balustrade wall in front of City Hall.
 - RDG to sketch locations of non-functional storm sewer boxes
- There is a City webcam available along the Des Moines River
- Utilities may still be active at Scott Ave Dam; follow up verification needed with the City
- Fleur Dam has a large DMWW water main crossing in close proximity to the dam.
- Study needs to determine and identify what existing structures in the river corridor may be altered or not (i.e. Armory)

D.2 – ENVIRONMENTAL ROUNDTABLE SUMMARY

Des Moines MPO Water Trails—Meeting Notes

Environmental Roundtable

August 18, 2017

- Ecologically-speaking, Environmental Roundtable tends to see more opportunity along the Racoon River vs. the channelized/alterd downtown stretch but no one wants to abandon opportunities to enhance habitat (both in-river and upland) on any stretch of the study area
 - Racoon has sinuosity
- Seeking habitat for flathead, small mouth bass needed/desired
 - Slackwater habitats (e.g., more debris, substrate, jetties)
- Pre-project survey of fish species/others recommended
- Measure more than fish
 - Mussels
 - Mudpuppies
 - Chestnut lamprey
- Measure: pre/post mussels
- Recreational/fishery interests—find an appropriate balance among these interests
- Provide diversity of depth, substrate
- Use riverside vegetation and connectivity to improve habitat
- Opportunity for oxbows/backwater
 - Near Fleur/below Scott (include eagle nesting)
- Deep water holes important
- Avoid concrete in riverbed
- Separate paddlers from anglers
- Confluence or below more opportunity for angling?
- Bird habitat/riparian (trees) with levee challenges
- Focus: pocket areas for planting
- Bird-friendly architecture
- Fewer dead migratory birds
- Safe access to river
 - More interaction
- Corridors leading people to river—these are redevelopment areas
- Increase tree cover
- Lower combined sewer overflows/mitigate stormwater infiltration
- Wetlands—could go in pockets (“fringe wetlands”)
- Birdland lagoon (off map) has habitat restoration potential
- Rivers toolbox?
- Bird-friendly glass downtown, reduce nighttime lighting
- CONCERN: stopped Saylorville flow (e.g., when cleaning trash racks)
 - Solution: pneumatic gates?

Additional thoughts:

D.3 – WORKSHOP #2 PRESENTATION AND SUMMARY



DES MOINES AREA MPO

Greater Des Moines Water Trails and Greenways Steering Committee

September 20, 2017

September 20, 2017 Agenda

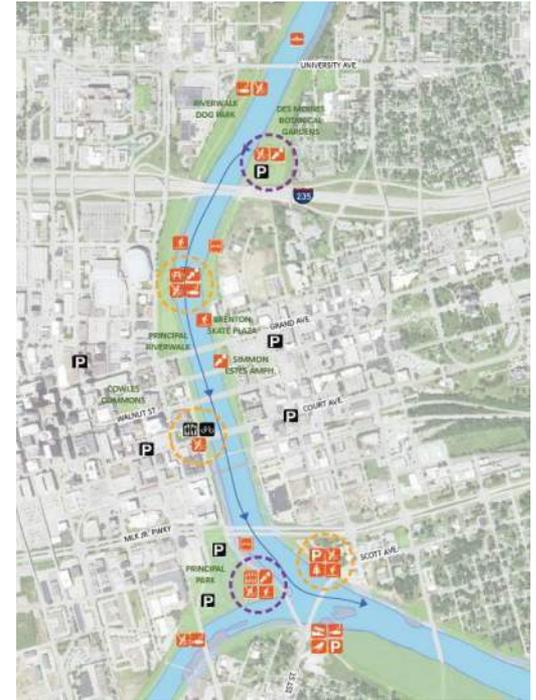
1. Call To Order and Introductions
2. Approval of Agenda
3. Recap of plan's recommendations for downtown dams (5 minutes)
4. Show and tell – field trips to Boise, Idaho, and Columbus, Georgia (5 minutes)
5. Facilitated Discussion (90 minutes)
6. Communications update (5 minutes)
7. Other Announcements or Non-Action Items
8. Next Meeting Date – October 19
9. Adjournment

Greater Des Moines Water Trails
and Engineering Study Recommendations

DOWNTOWN DES MOINES

Downtown Considerations

- Water levels: low-flow pool need to match flash board water levels
- Consensus: dams should be mitigated
- Edge treatment: more habitat, less formal
- Channel treatment: full spectrum of experiences
- Historic nature of balustrades
- Below dams: fishing/birding important







Project Overview > Primary Objectives

Downtown Des Moines Water Trails Engineering Study

- Activate the Des Moines River in Downtown
- Reduce existing safety hazards at dams
- Provide or improve fish passage around dams
- Create in-river recreation for all levels and abilities (upstream, through and/or around dams)
- Provide river access for anglers, boaters, swimmers, etc.
- Identify opportunities to enhance the existing biota for targeted species
- Identify opportunities to improve stream water quality
- Integrate stakeholder input



Project Overview > General Criteria

Downtown Des Moines Water Trails Engineering Study

- Eliminate overly retentive hydraulic hazards at dams
- No adverse impact to regulatory floodplain
- Maintain required minimum existing pool levels upstream of Center Street and Fleur Dams
- No modifications to existing bridges and levees



Show and Tell

FIELD TRIPS TO BOISE, ID, AND COLUMBUS, GA

Des Moines Representatives



Boise Attendees

- Jay Byers
- Rick Tollakson
- Angela Connolly
- Jonathan Gano
- Todd Ashby
- Andy McCoy

Columbus Attendees

- Jay Byers
- Rick Tollakson
- Dylan Mullenix
- Zach Young
- Jenny Richmond
- Andy McCoy
- Hannah Inman



Des Moines, IA: 2017



Boise, Idaho: 2000



Boise, Idaho: 2017





Boise



Boise



INDUSTRY ON THE RIVERBANK

Historical information about the riverbank area, including a photo of a factory and a map of the area. The panel features a blue background with white and red text.

ROUTE 30

WEST END BOISE

THE HISTORIC WEST END TRAIL

Historical information about the West End Trail, including a map and photos of the trail. The panel features a red and blue background.

WEST END BOISE

DIVERSITY IN BOISE'S WEST END

Information about diversity in the West End, featuring photos of people and a section titled "Jordan's Street Garden" with an image of carrots. The panel features a yellow and red background.

Jordan's Street Garden

WEST END BOISE

Boise



Boise



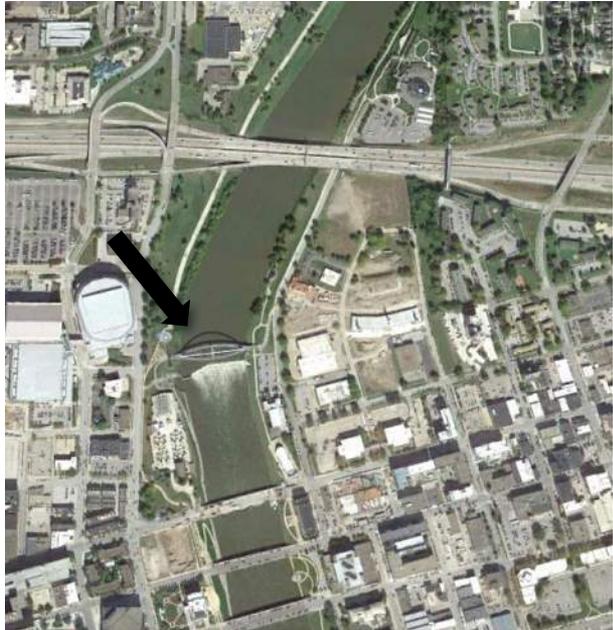
Boise





Boise





Des Moines, IA: 2017

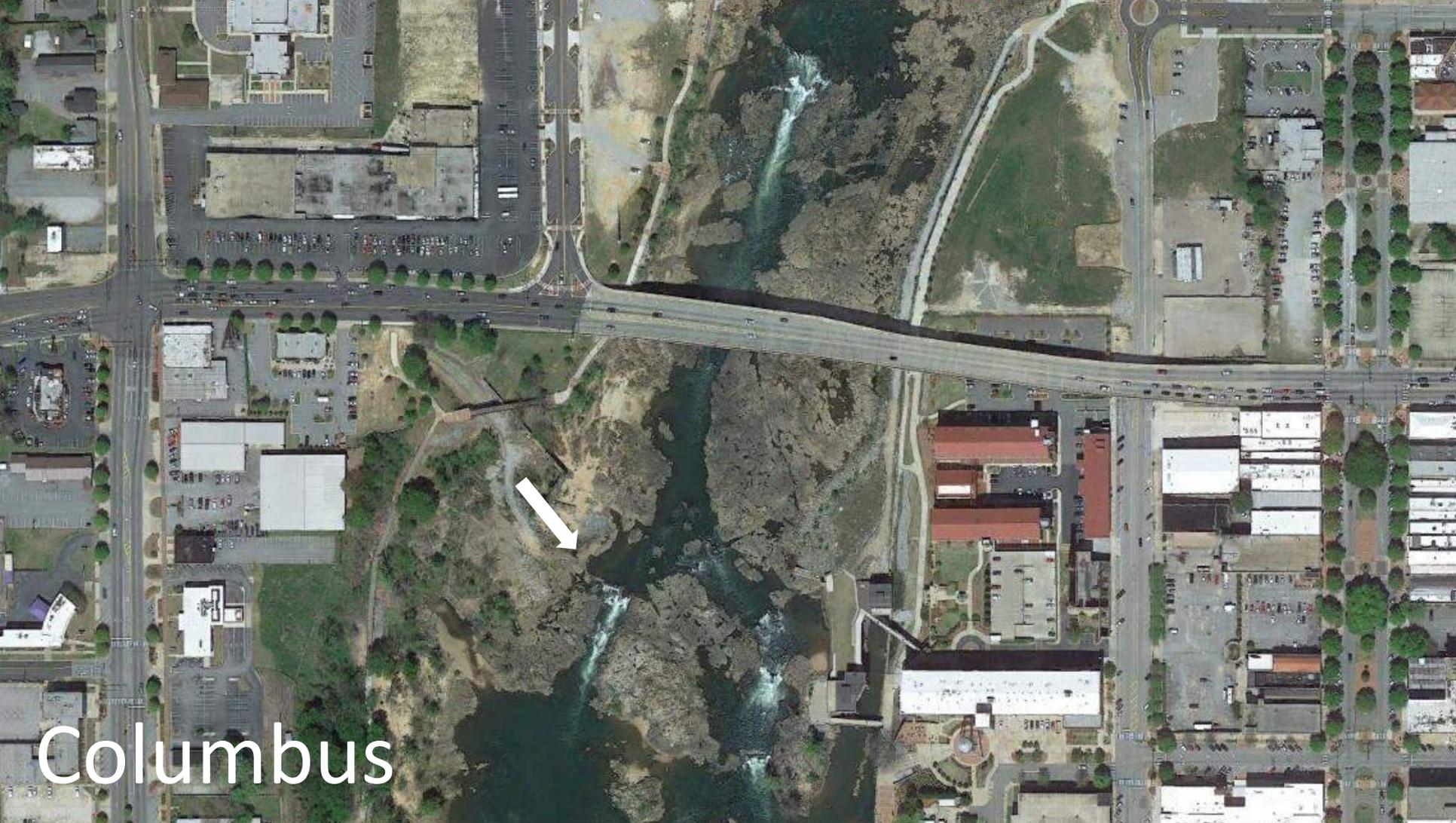


Columbus, Georgia: 2010



Columbus, Georgia: 2017





Columbus

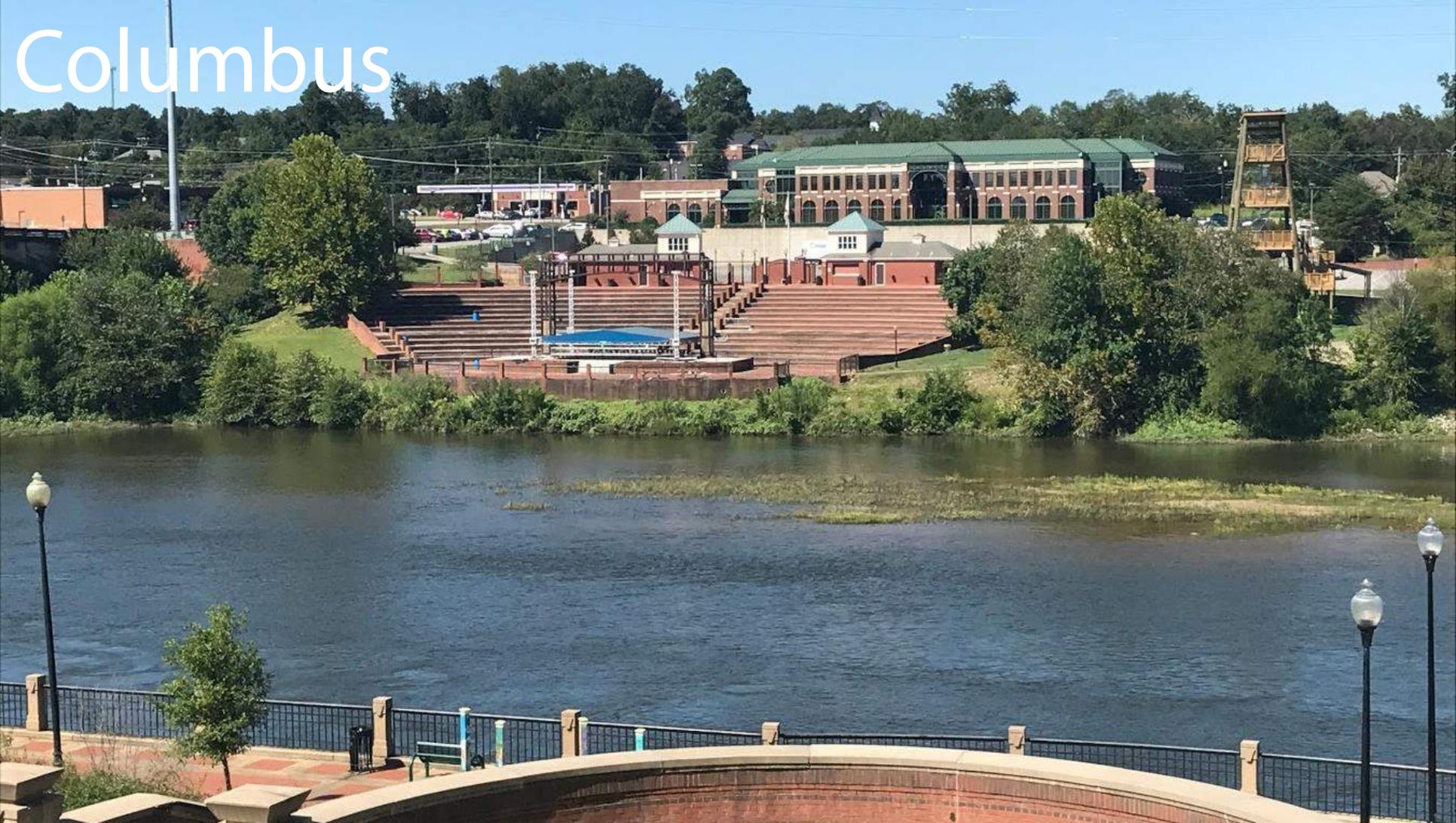


Columbus

Columbus



Columbus



Columbus





Columbus

Put on your thinking hats

FACILITATED DISCUSSION



Downtown Des Moines Water Trails Engineering Study

Workshop #2
September 20, 2017



I. Facilitated Discussion



ABBREVIATED IN-RIVER CRITERIA & OBJECTIVE MEMORANDUM

UPDATED: OCTOBER 11, 2017

GENERAL REQUIREMENTS

Per Primary Contract and MPO

I. Safety Mitigation of the Dams

- a. Alternative 1: Dam Removal and Replacement with smaller river-wide drops
- b. Alternative 2: Reduce overly retentive hydraulics at the spillway and provide navigable bypass
- c. Alternative 3: Reduce overly retentive hydraulics at the spillway

II. Required Minimum Pool Levels

- a. Center Street Dam: 787.1' (785.1' Winter/Spring)
- b. Scott Ave Dam: N/A (Target existing headwater elevations)
- c. Flea Drive Dam: 784.3' (781.3' Winter/Spring)

III. No-Rise to Existing Floodplain Levels

- a. Any consideration of raising regulatory flood elevations is out of scope and will need to be discussed as a team before analyzing.

IV. Modifications to Existing Bridges and Levees

- a. None except potential levee openings for access.
- b. No impacts allowed within 15-feet of the riverside toe of the levee embankment.

REFINED REQUIREMENTS

I. Flashboards

- a. Must be automated
- b. No significant (± 4 inches) overtopping of a closed flashboard

II. Recreational Drops

- a. Drop height: 3' max with pools between drops 150-250' long
 - i. Smaller drops allow for smaller pools
- b. The effective Manning's 'n' is 0.040 for the drops and navigable bypass

III. Fish Passage – Feasibility Study Criteria

- a. Maximum hydraulic slope: 20:1
- b. Minimum water depth of 6 inches
- c. Target sending the first 50 cfs to the fish passage channel
- d. The effective Manning's 'n' is 0.055 (Flood Flows)

IV. Fish Passage – (Future) Preliminary Design Criteria

- a. Must operate year-round and be active during low flows
- b. Provide a variety of velocities and depths, including deep holes and pockets
- c. Fish can freely move upstream and downstream of the dams during free-flowing conditions
- d. Balance the need for dam safety improvements with the need for attraction flow at or near the dam face and adjacent to the main flow path
- e. Avoid dead ends since fish do not seek passage by traveling downstream
- f. Path with velocity of 2 fps or less (not needed for entire fish passage width)

V. Adjacent Open Space Restricted Areas

- a. Proposed skate park upstream river-right of Center Street Dam
- b. Asian gardens upstream river-left of Center Street Dam

STAKEHOLDER OBJECTIVES

Per Meetings and Coordination

I. Ecological

- a. Use riverside vegetation and connectivity to improve habitat
- b. Species other than fish to consider: Mussels, Mudcrupes, Chestnut Lamprey
- c. Provide/enhance habitat for flathead, small mouth bass
- d. Slackwater habitats (e.g. more debris, substrate, jetties)
- e. Consider opportunities for oxbows/backwater
- f. Minimize concrete in riverbed
- g. Additional Wetlands

II. Recreational

- a. Improve access to river
- b. Paddleboarding (flatwater) activities
- c. High- and low-performance whitewater features
- d. Angler destinations
- e. Separate paddlers from anglers

GENERAL REQUIREMENTS

Per Primary Contract and MPO

I. Safety Mitigation of the Dams

- a. Alternative 1: Dam Removal and Replacement with smaller river-wide drops
- b. Alternative 2: Reduce overly retentive hydraulics at the spillway and provide navigable bypass
- c. Alternative 3: Reduce overly retentive hydraulics at the spillway

II. Required Minimum Pool Levels

- a. Center Street Dam: 787.1' (785.1' Winter/Spring)
- b. Scott Ave Dam: N/A Target existing headwater elevations
- c. Fleur Drive Dam: 784.3' (781.3' Winter/Spring)

III. No-Rise to Existing Floodplain Levels

- a. Any consideration of raising regulatory flood elevations is out of scope and will need to be discussed as a team before analyzing.

IV. Modifications to Existing Bridges and Levees

- a. None except potential levee openings for access
- b. No impacts allowed within 15-feet of the riverside toe of the levee embankment

REFINED REQUIREMENTS

I. Flashboards

- a. Must be automated
- b. No significant (± 4 inches) overtopping of a closed flashboard

II. Recreational Drops

- a. Drop height: 3' max with pools between drops 150-250' long
 - i. Smaller drops allow for smaller pools
- b. The effective Manning's "n" is 0.040 for the drops and navigable bypass

III. Fish Passage – Feasibility Study Criteria

- a. Maximum hydraulic slope: 20:1
- b. Minimum water depth of 6 inches
- c. Target sending the first 50 cfs to the fish passage channel
- d. The effective Manning's "n" is 0.055 (Flood Flows)

IV. Fish Passage – (Future) Preliminary Design Criteria

- a. Must operate year-round and be active during low flows
- b. Provide a variety of velocities and depths, including deep holes and pockets
- c. Fish can freely move upstream and downstream of the dams during free-flowing conditions
- d. Balance the need for dam safety improvements with the need for attraction flow at or near the dam face and adjacent to the main flow path
- e. Avoid dead ends since fish do not seek passage by traveling downstream
- f. Path with velocity of 2 fps or less (not needed for entire fish passage width)

V. Adjacent Open Space Restricted Areas

- a. Proposed skate park upstream river-right of Center Street Dam
- b. Asian gardens upstream river-left of Center Street Dam

STAKEHOLDER OBJECTIVES

Per Meetings and Coordination

I. Ecological

- a. Use riverside vegetation and connectivity to improve habitat
- b. Species other than fish to consider: Mussels, Mudpuppies, Chestnut Lamprey
- c. Provide/enhance habitat for flathead, small mouth bass
- d. Slackwater habitats (e.g. more debris, substrate, jetties)
- e. Consider opportunities for oxbows/backwater
- f. Minimize concrete in riverbed
- g. Additional Wetlands

II. Recreational

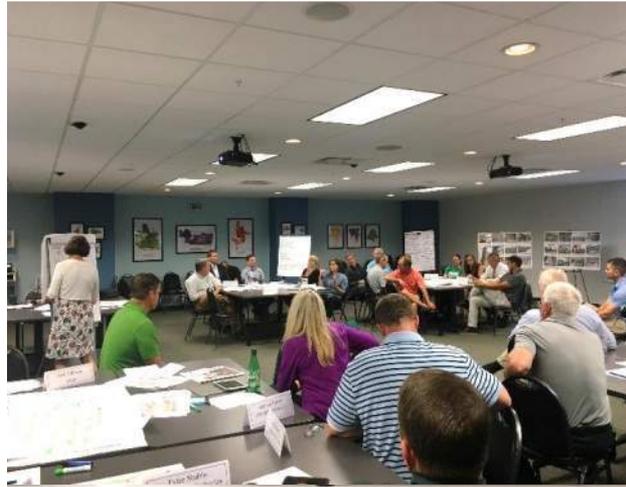
- a. Improve access to river
- b. Paddleboarding (flatwater) activities
- c. High- and low-performance whitewater features
- d. Angler destinations
- e. Separate paddlers from anglers

WORKSHOP NO. 2 – Facilitated Discussion

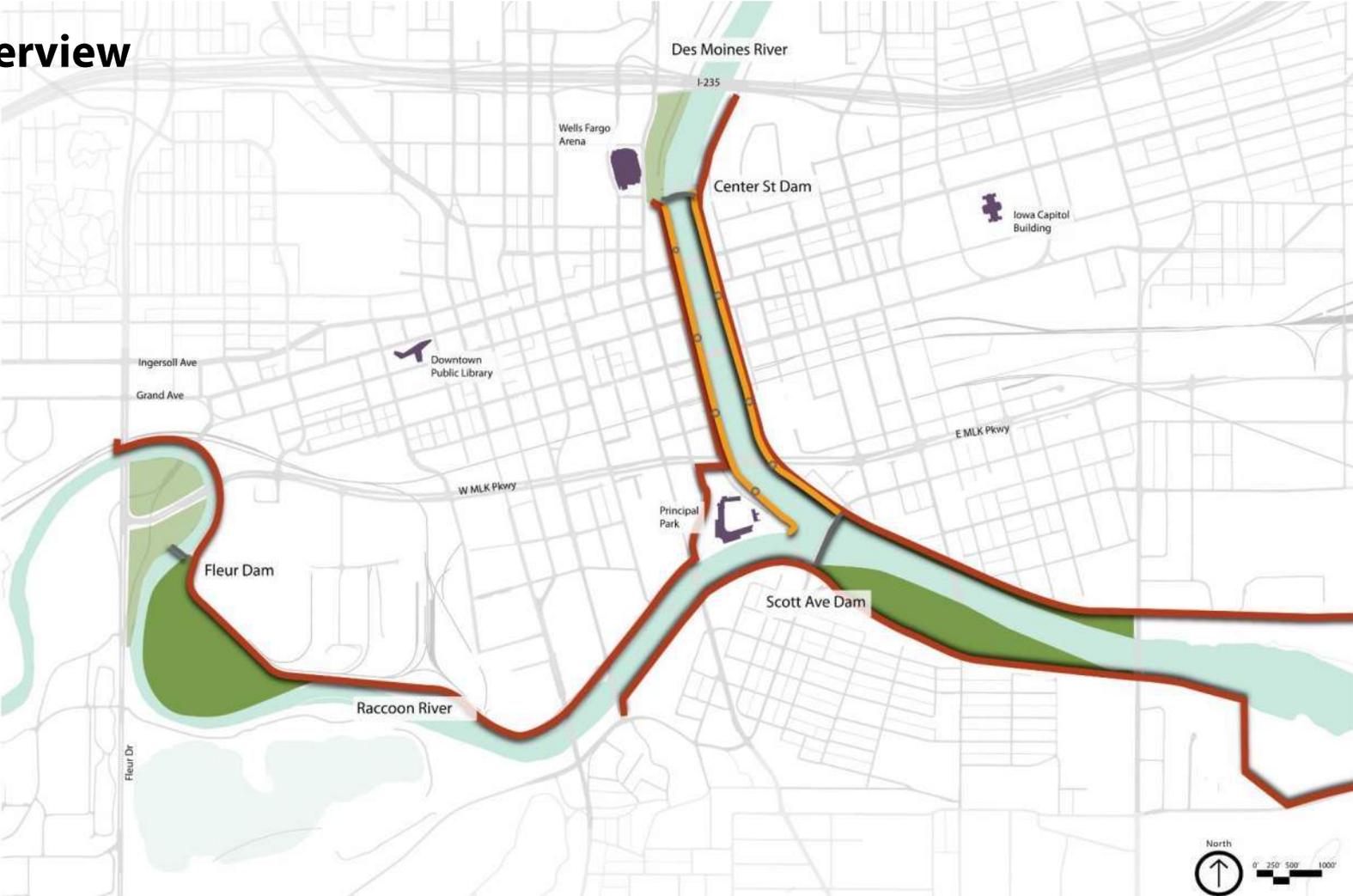
Downtown Des Moines Water Trails Engineering Study



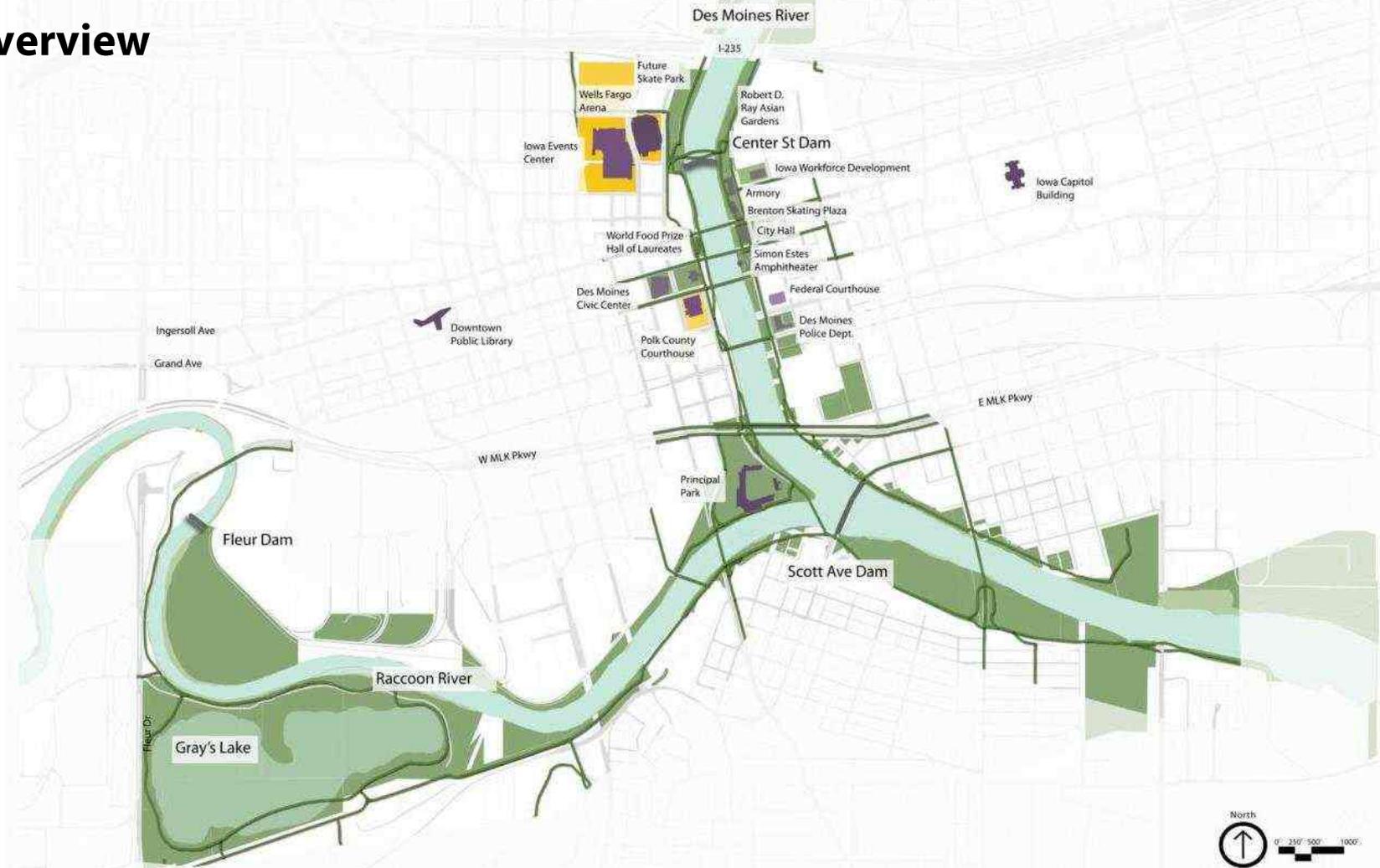
WORKSHOP NO. 2 – DISCUSSION



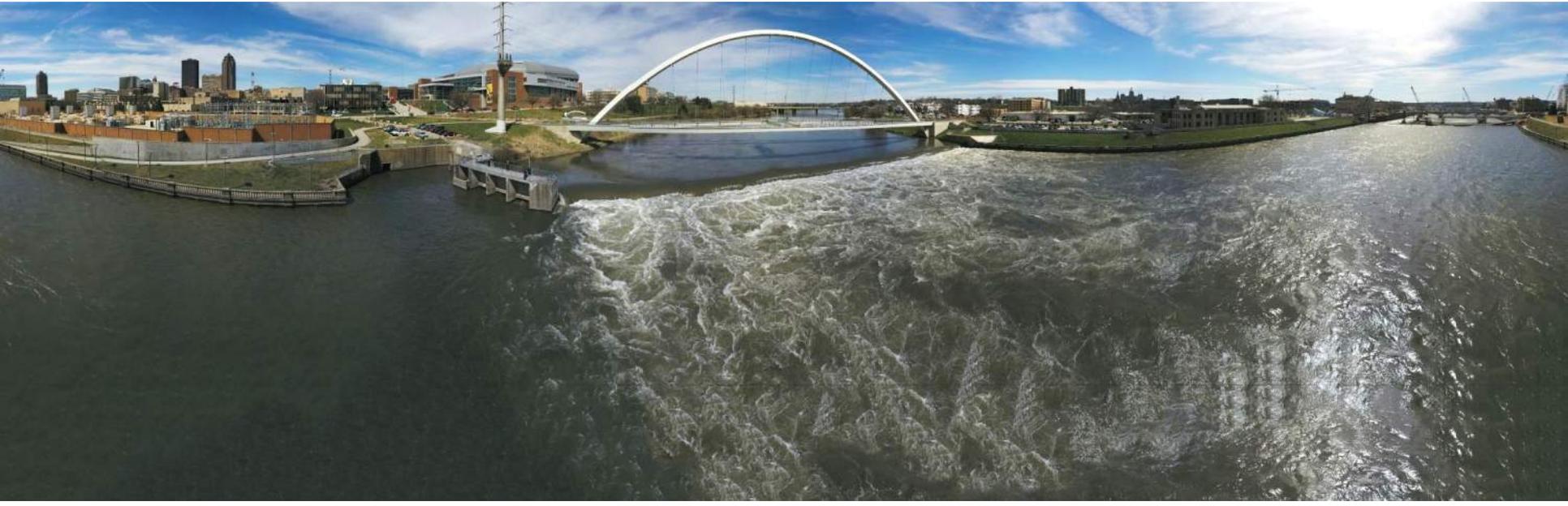
Overview



Overview



CENTER STREET DAM



WORKSHOP NO. 2 - CENTER STREET DAM PHOTOS



Center Street Dam

Showcase/significant destination potential; a key element of the water trails plan

Challenges: Trail/angler conflicts/user conflicts, levee/floodwall -box culvert, storm sewer outfalls, parking, balustrades, 2nd Avenue Traffic, infrastructure, lack of parking, Principal Riverwalk, noise, height of bridges, development/cars/runoff, fish passage, maintaining the 2-stage dam crest with and without flashboard operations & native river streambed profile is very flat

Opportunities/assets: New parking ramp, skate park, Armory redevelopment/repurpose, drop elevation, visibility from I-235 and Wells Fargo Arena, sculling/small rowing shells, triathlon swim, bike lanes, bridges, amphitheater, west side connectivity, improved fishing/access, leverage current venues and East side development

Needed assets: restrooms/showers, fish cleaning station, parking, concessions, livery/outfitters, connecting destinations along the river by path/trail, exciting stops, supporting businesses, 2nd Avenue traffic calming (could become an opportunity), lighting, kayak inputs, fishing, viewing, education/interpretation, bars/shops, legitimate transportation options, maps/signage, greenspace/areas for people, restored floodplain

Service for: fishermen (bait/tackle/restrooms), kayakers/paddlers/surfers, viewers, power boaters/rowers (flat water), visitors, residents/employees, observers/cyclists, wildlife/nature/habitat, school kids, tourists, young professionals, 16-30 year olds, older residents, families, regional users,

Future functions: recreation destination, fish passage/habitat, beauty, awareness, reduce work for flashboard installations, safety, access points/viewing, portage carts, activate a lot of interest, available to the whole community, water taxi, zip line, climbing wall, dining, play features/splash pad

Programming needs: fireworks viewing, triathlon swimming, coordinate with Corp of Engineers for flow rates

Additional comments:

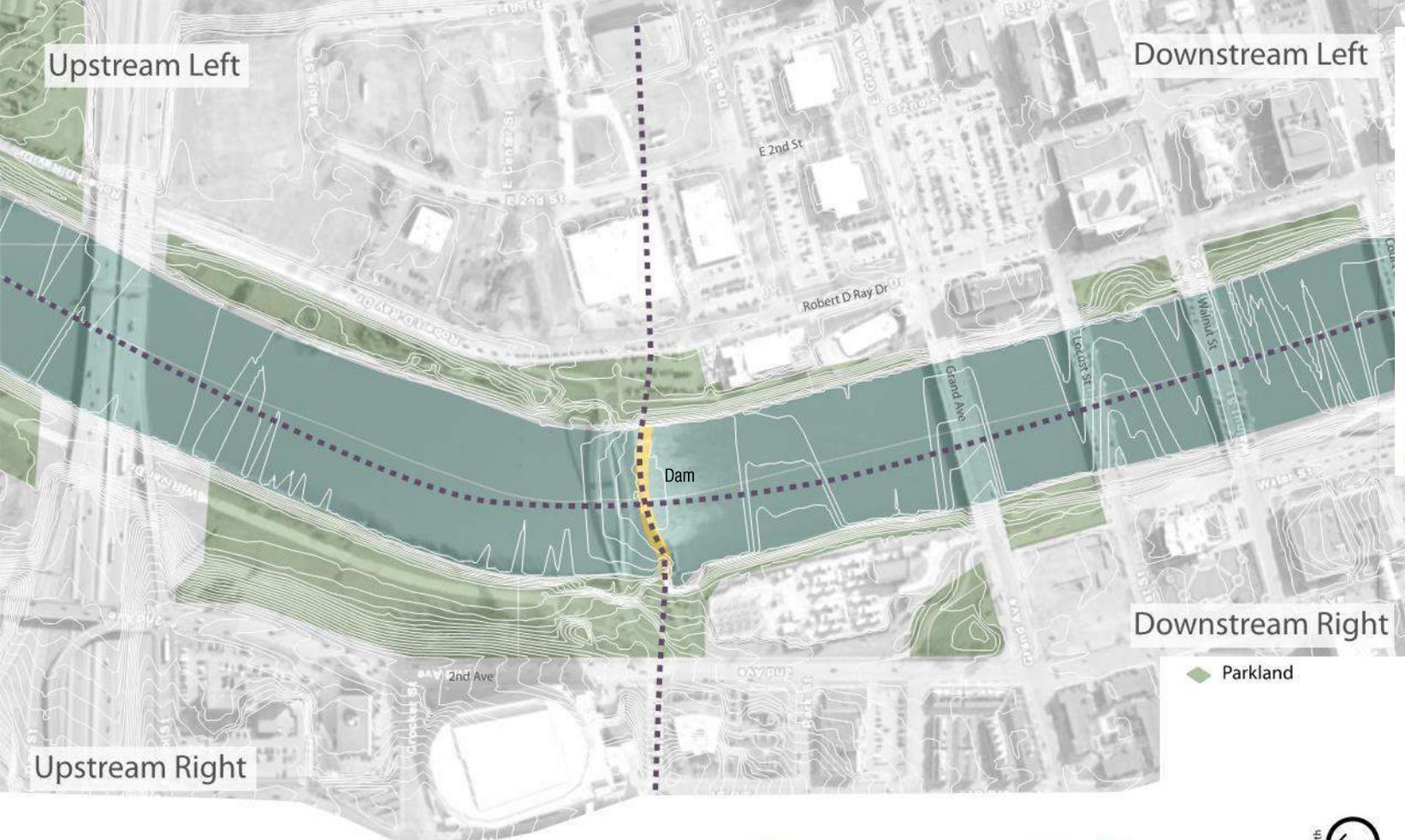
- Need more information on the suitability of fish passage
- What options are available for quiet water passage?
- Visibility needed
- Must maintain public access
- “kayak to work”
- Under-water viewing
- Could create shorter tubing circuits



- Trail System
- River Access
- Parking
- Non-Peak Parking
- Viewshed
- Levee System
- Historic Ballustrade
- Stair Through Ballustrade
- One-Way Street
- Civic Buildings
- Sanitary Sewer
- Storm Sewer
- Parkland
- Land Classifications**
- Civic/Government
- Park System
- Residential
- Commercial
- Utility
- Vacant
- Future Development

Center St Dam - Land Use & Ownership

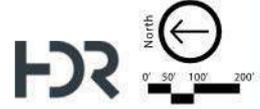


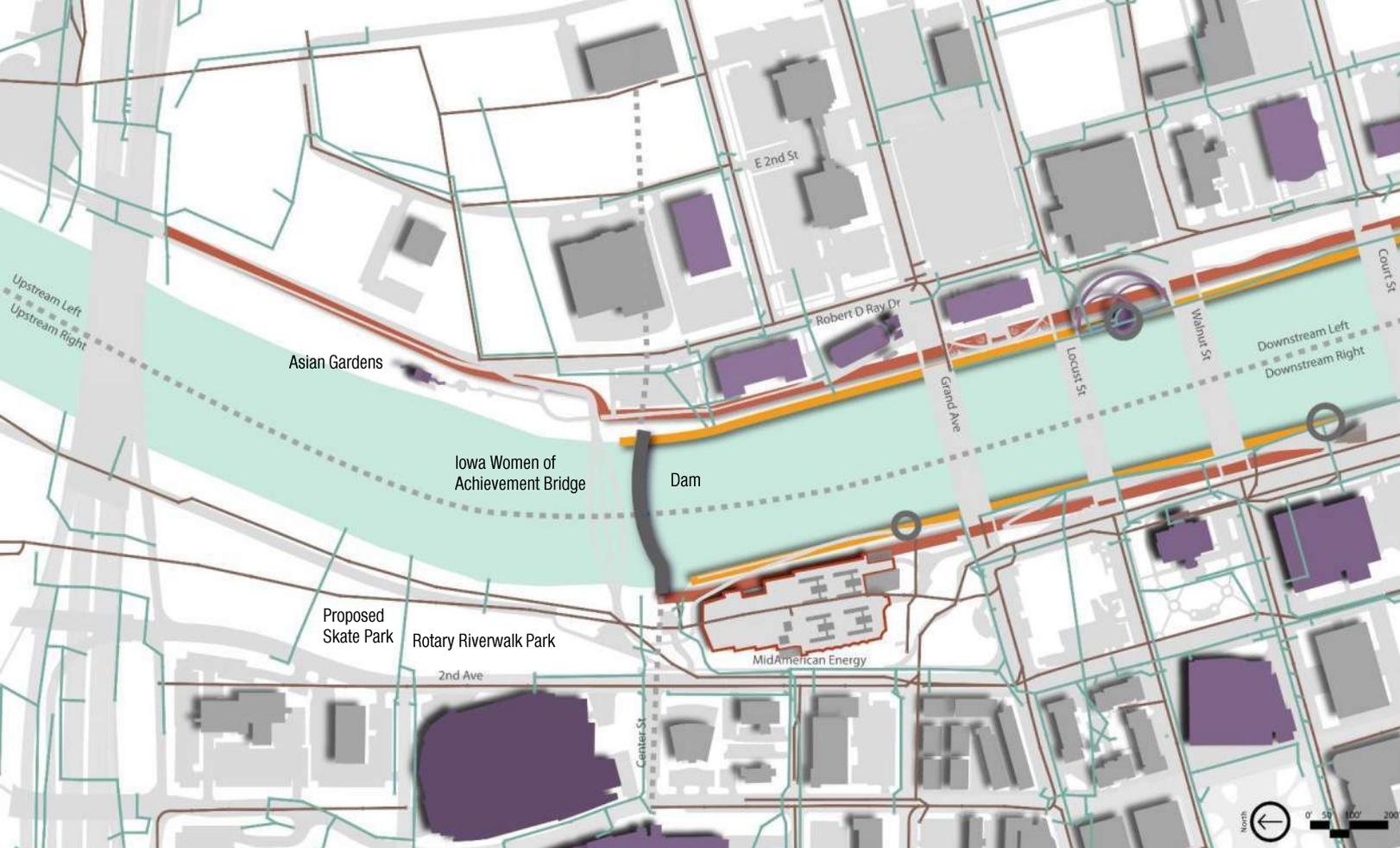


- Trail System
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- Historic Ballustrade
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- Land Classifications**
- Civic/Government
- Park System
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- Commercial
- Utility
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- Future Development

Parkland

Center St Dam - Natural Environment

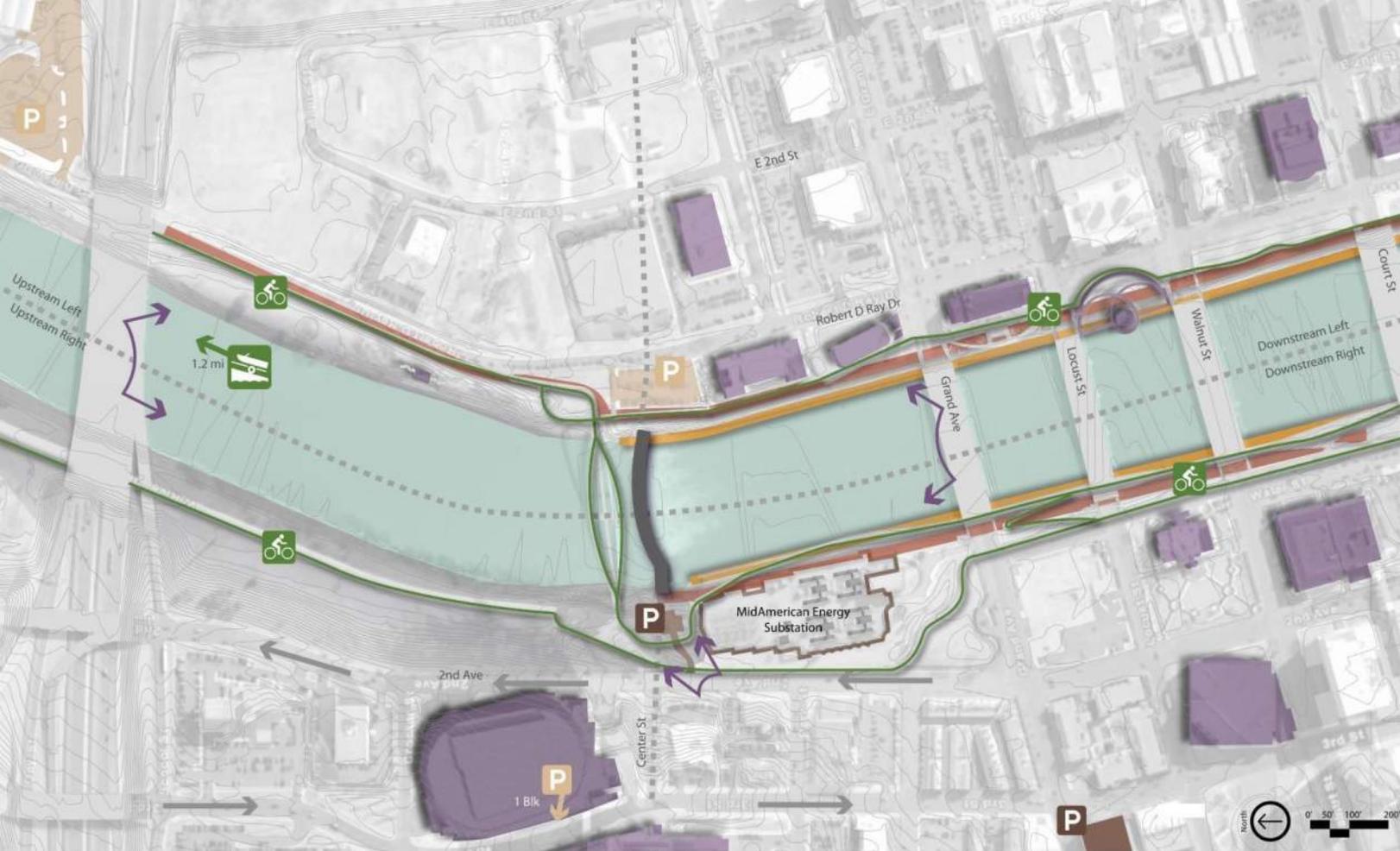




- Trail System
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Center St Dam - Built Environment





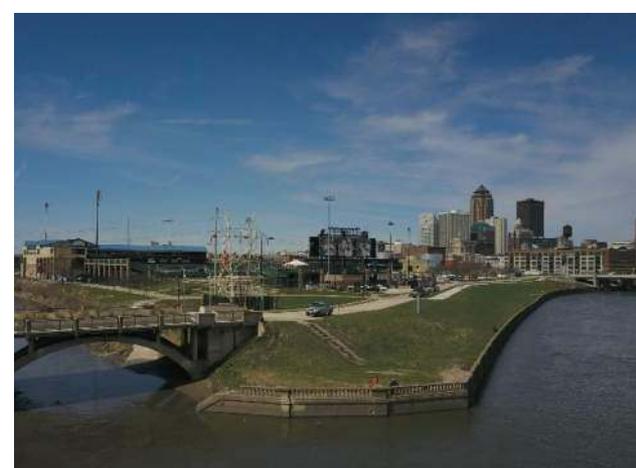
- Trail System
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Center St Dam - Access & Constraints



SCOTT AVENUE DAM

WORKSHEET NO. 2 – SCOTT AVENUE DAM PHOTOS



Scott Avenue Dam

Significant destination

Challenges: fish passage/catfish movement, homeless displacement & native river streambed profile is very flat

Opportunities/assets: public land, major history interpretation opportunity, use Principal Park

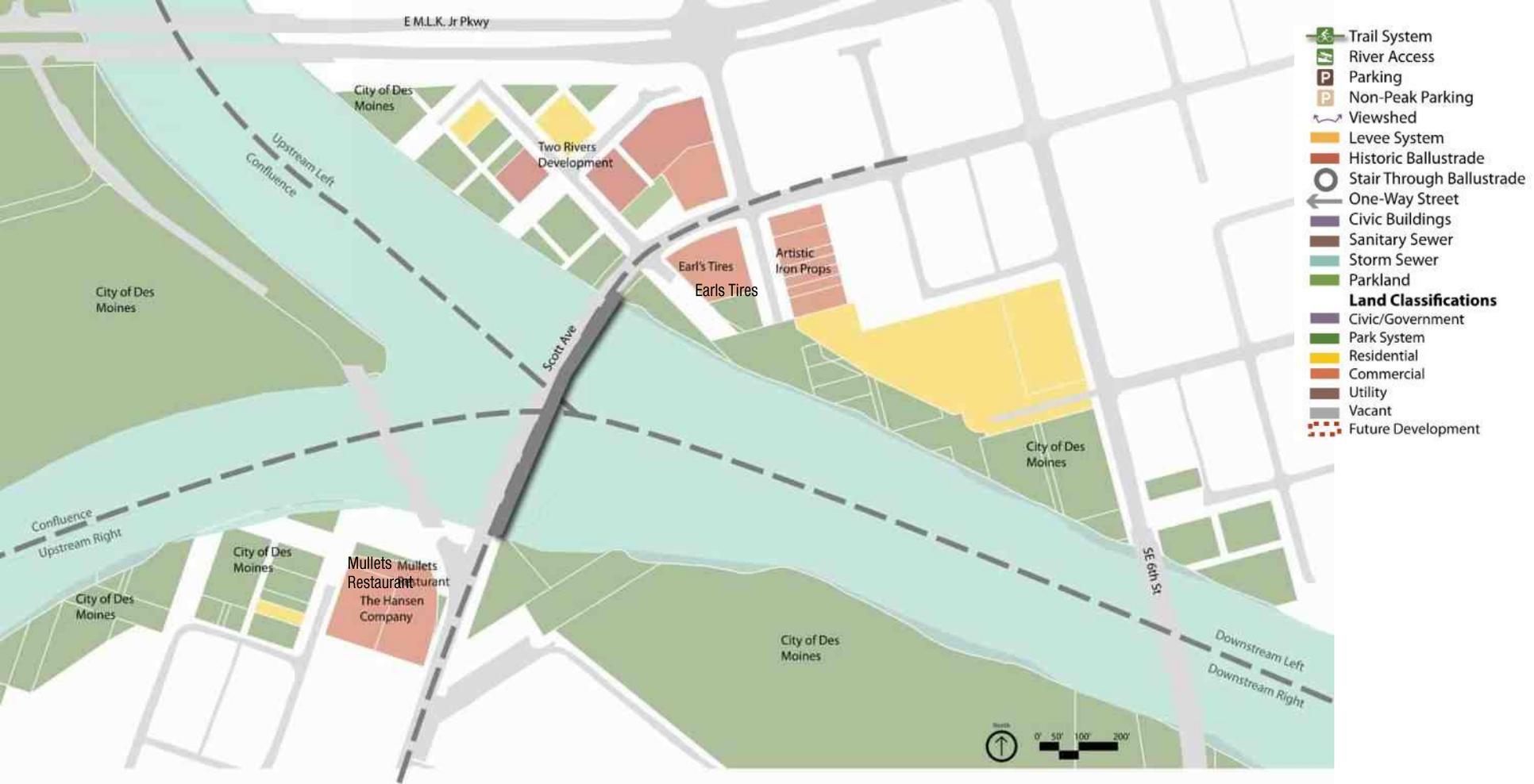
Needed assets: parking, restrooms, storage facilities,

Service/access for: pedal/paddlers, anglers, mixed use,

Future functions: “kayak to Cubs game”, underwater viewing, consider birders/Southside bald eagles/flood plain

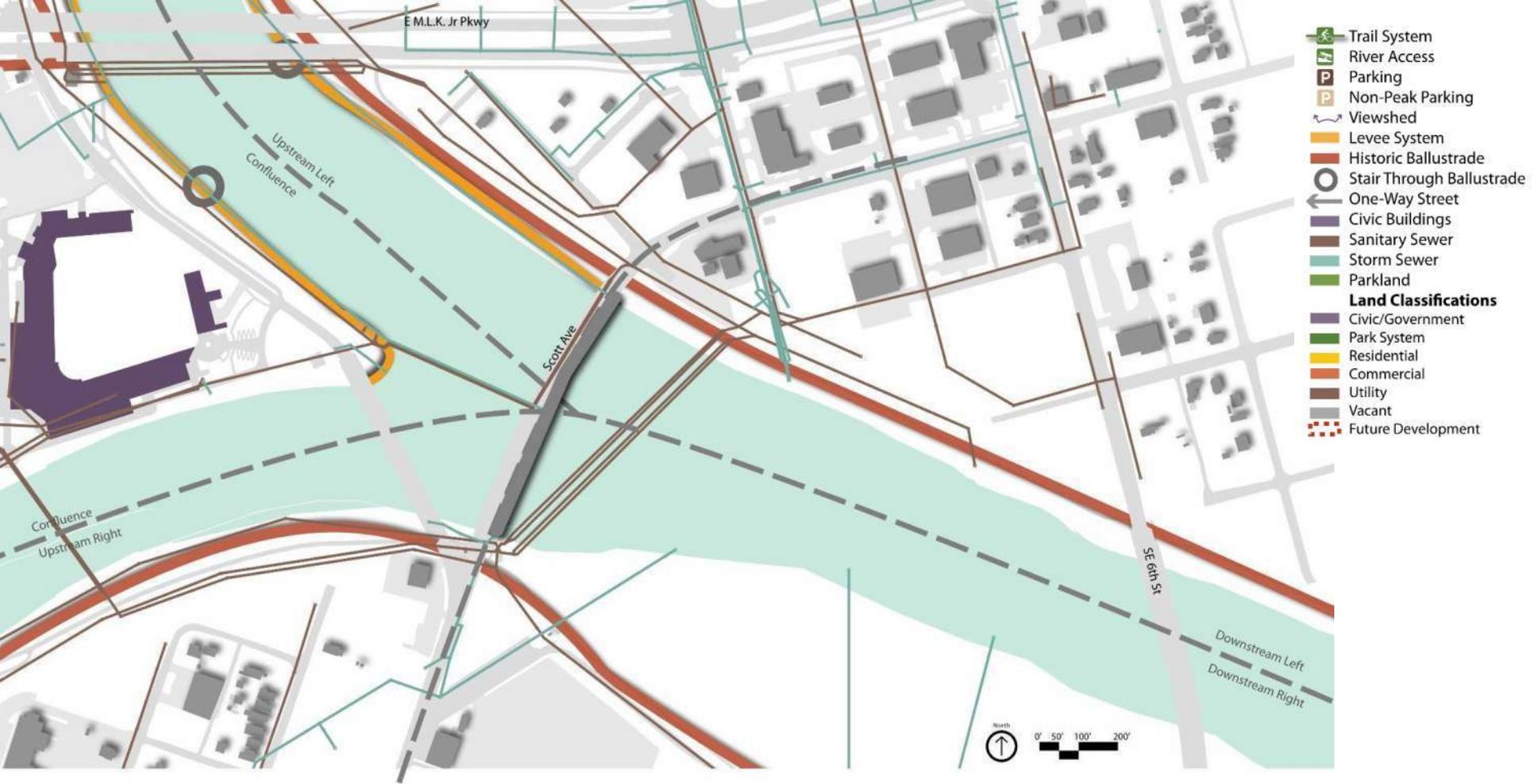
Additional comments

Create multi-modal hub



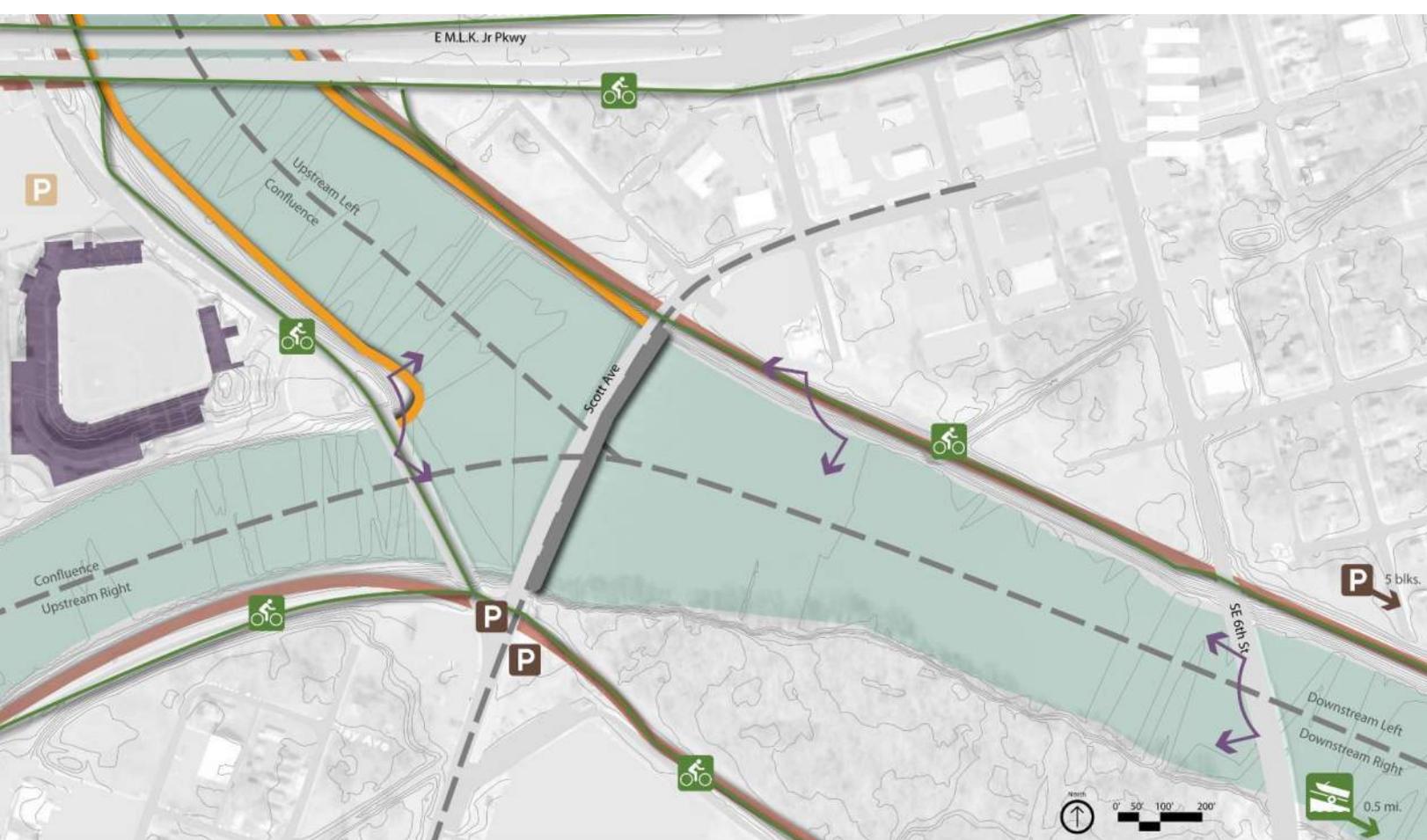
Scott Ave Dam - Land Use & Ownership





Scott Ave Dam - Built Environment





- Trail System
- River Access
- Parking
- Non-Peak Parking
- Viewshed
- Levee System
- Historic Ballustrade
- Stair Through Ballustrade
- One-Way Street
- Civic Buildings
- Sanitary Sewer
- Storm Sewer
- Parkland
- Land Classifications**
- Civic/Government
- Park System
- Residential
- Commercial
- Utility
- Vacant
- Future Development

Scott Ave Dam - Access & Constraints



FLEUR DAM

Fleur Dam

Modest destination?

Proximity to Gray's Lake enhances the appeal of this location, however.

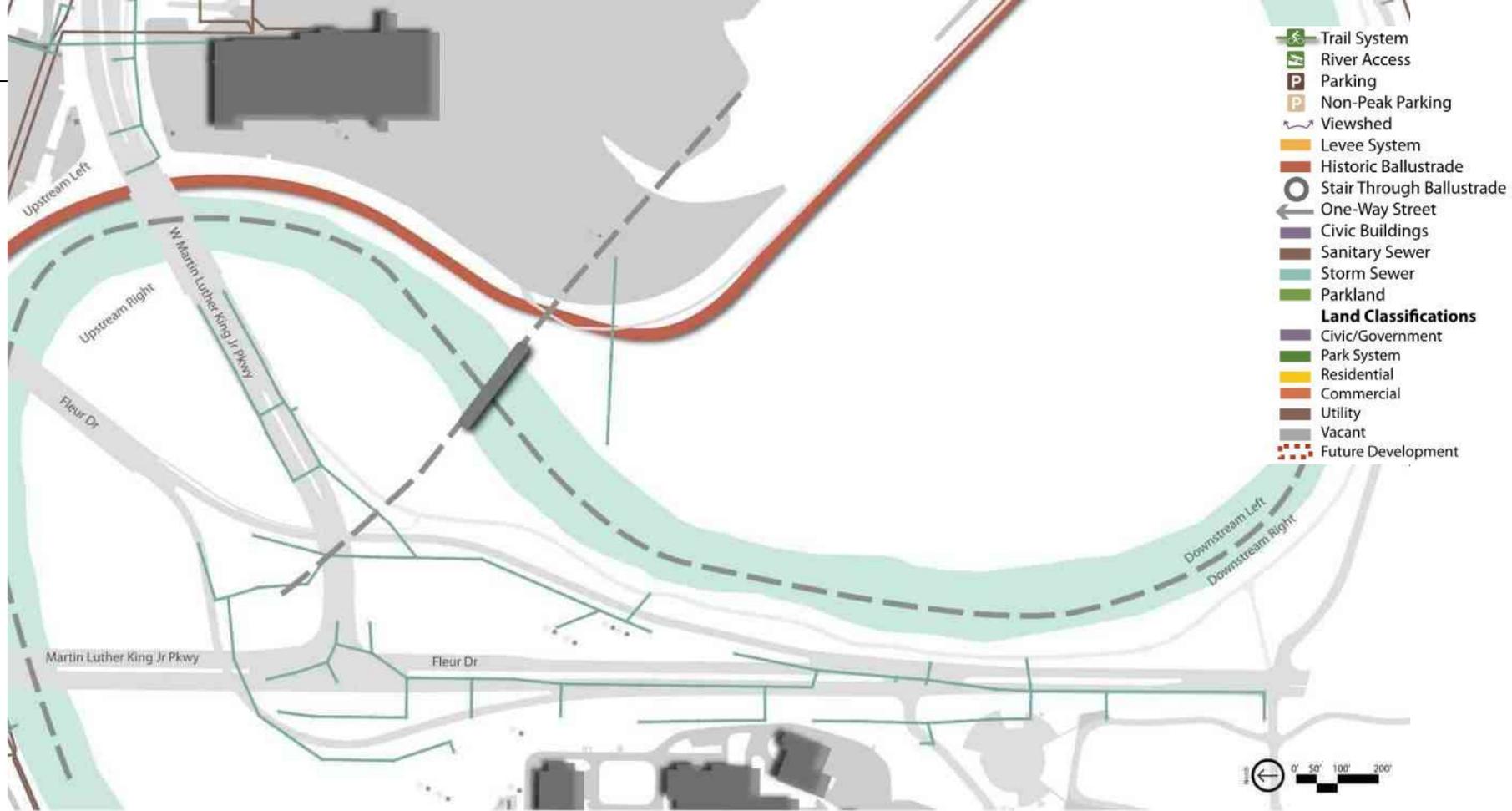
Challenges: Dico Site, maintaining the 2-stage dam crest with and without flashboard operations, native river streambed profile is very flat, adjacent levee, water main & access from fleur drive

Opportunities: Water Works Park Master Plan, walk-in fishing site, rock cross veins, portage training, wildlife viewing, trails, preserve natural scenery, connect Walnut Woods to Gray's Lake, enhance access from Gray's Lake



Fleur Dam - Land Use & Ownership





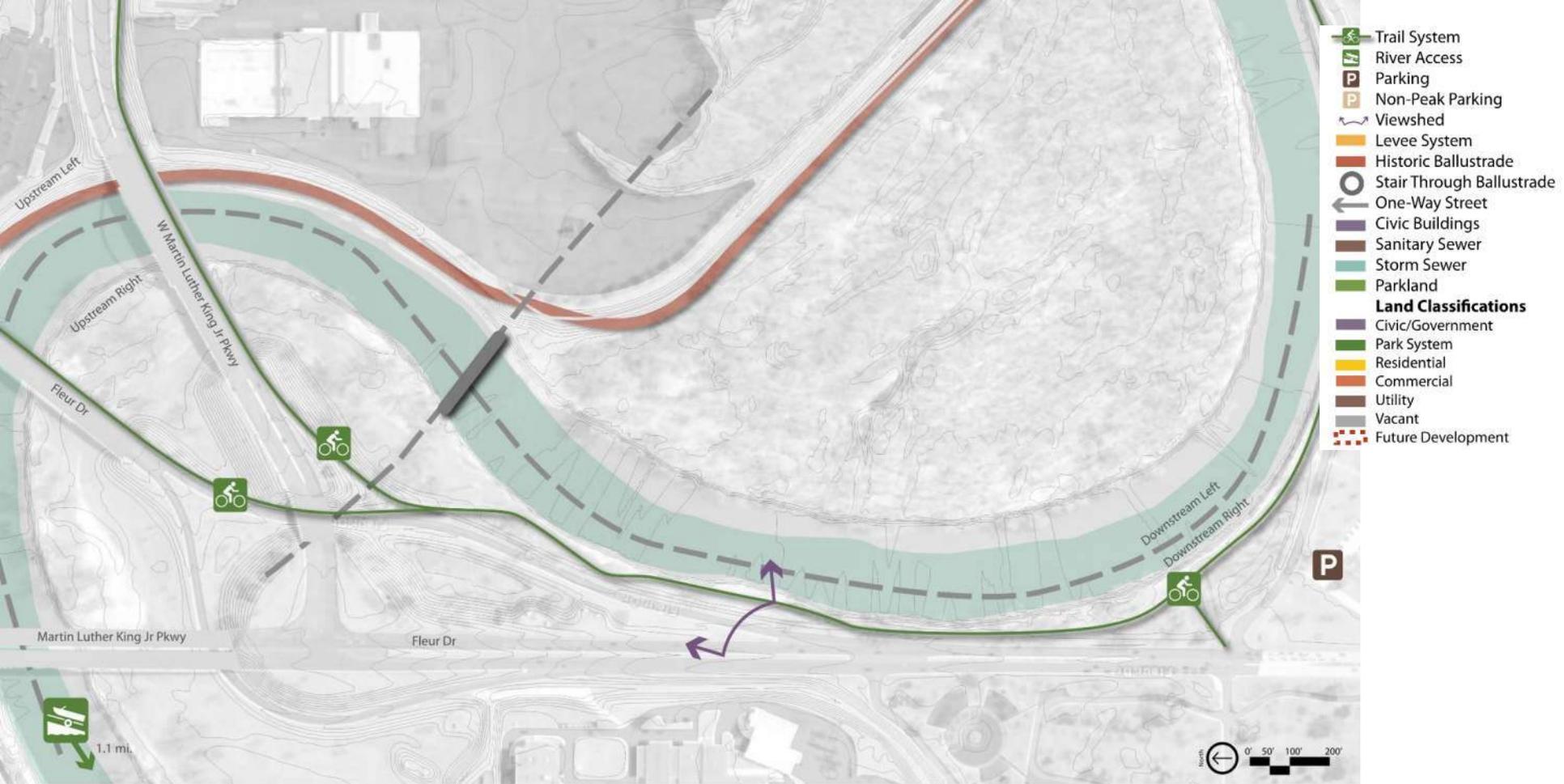
Fleur Dam - Built Environment





Fleur Dam - Natural Environment



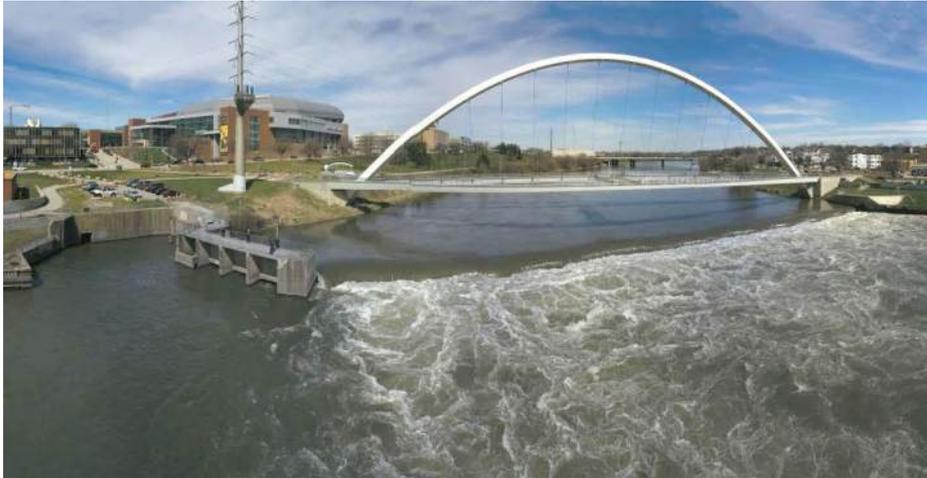


Fleur Dam - Access & Constraints



River Safety Principles

- Mitigate Dam Hazard



River Safety Principles

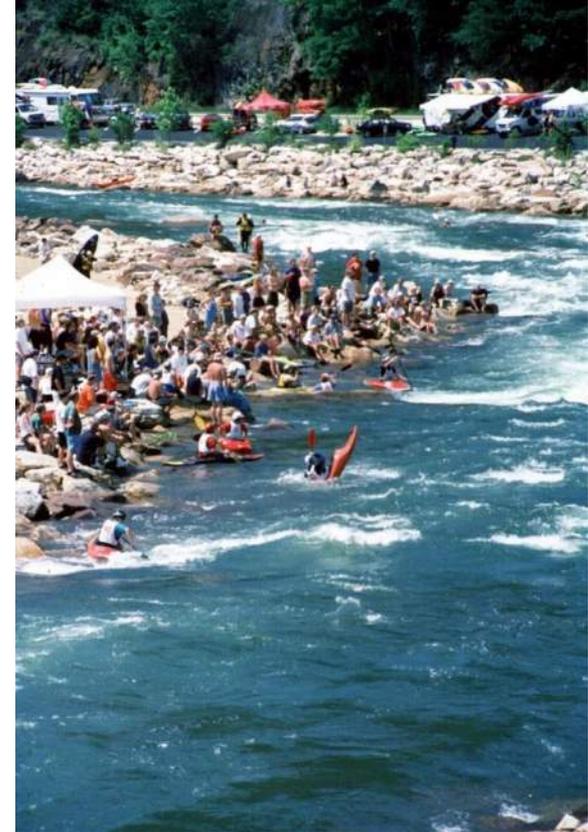
- Warning signage and buoys



River Safety Principles

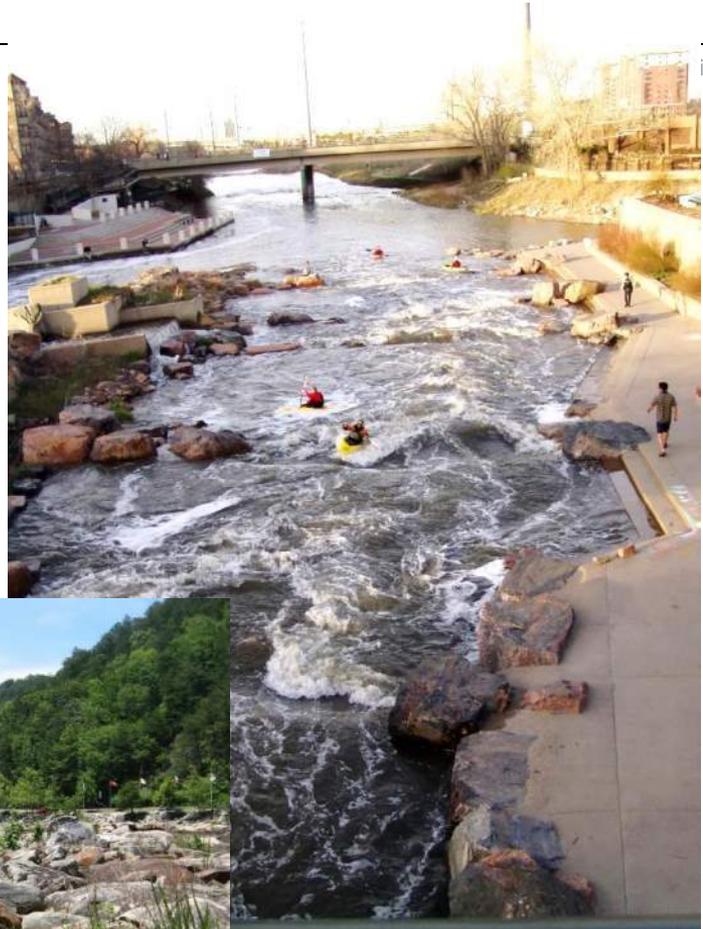
Downtown Des Moines Water Trails Engineering Study

- Self rescue—not assisted rescue



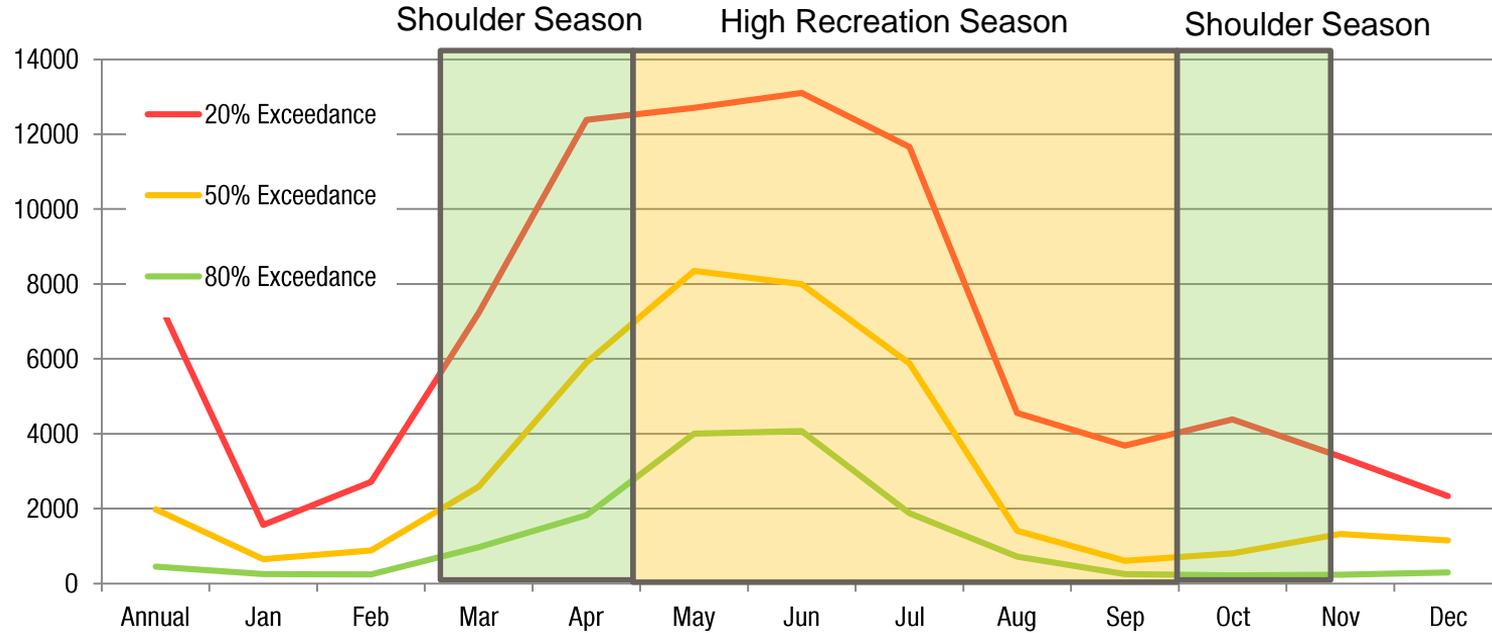
River Safety Principles

- Activity close to one shore
- Portage path adjacent to water



Project Overview > Hydrology

Downtown Des Moines Water Trails Engineering Study



Des Moines River, 2nd Ave. Gage



Project Overview > Available Drop

Downtown Des Moines Water Trails Engineering Study



Flatwater – Stand Up
Paddleboard
Kayak, Canoe, Tubing
Wide Availability

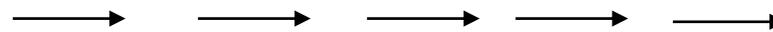


River Surfing/Kayaking
**Typically Requires 2ft
of drop
(Center/Fleur/Scott)**



Major Kayak and Rafting
Features
Requires 2-4ft of Drop

Drop Increases



Center Street Dam > Recreational Reliability

Center Street Dam Available Drop Based on 1997-2016 Flows During Recreational Season With Flashboards and Variable Crest to Add Drop



High Flows

No Drop

99% of May-September has more drop than this



Moderate Flows

4 ft of drop

95% of May-September has more drop than this



Normal Flows

8.5 ft of drop (9.5 ft Max)

50% of May-September has more drop than this

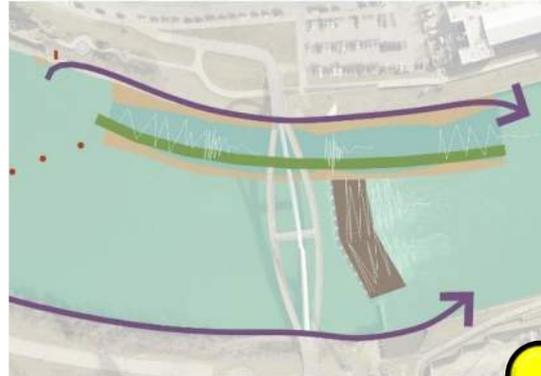
Concept Alternatives > Initial Results

Center Street Dam



Alternative 1

Dam Removal and Replacement with In-River Navigable Drops



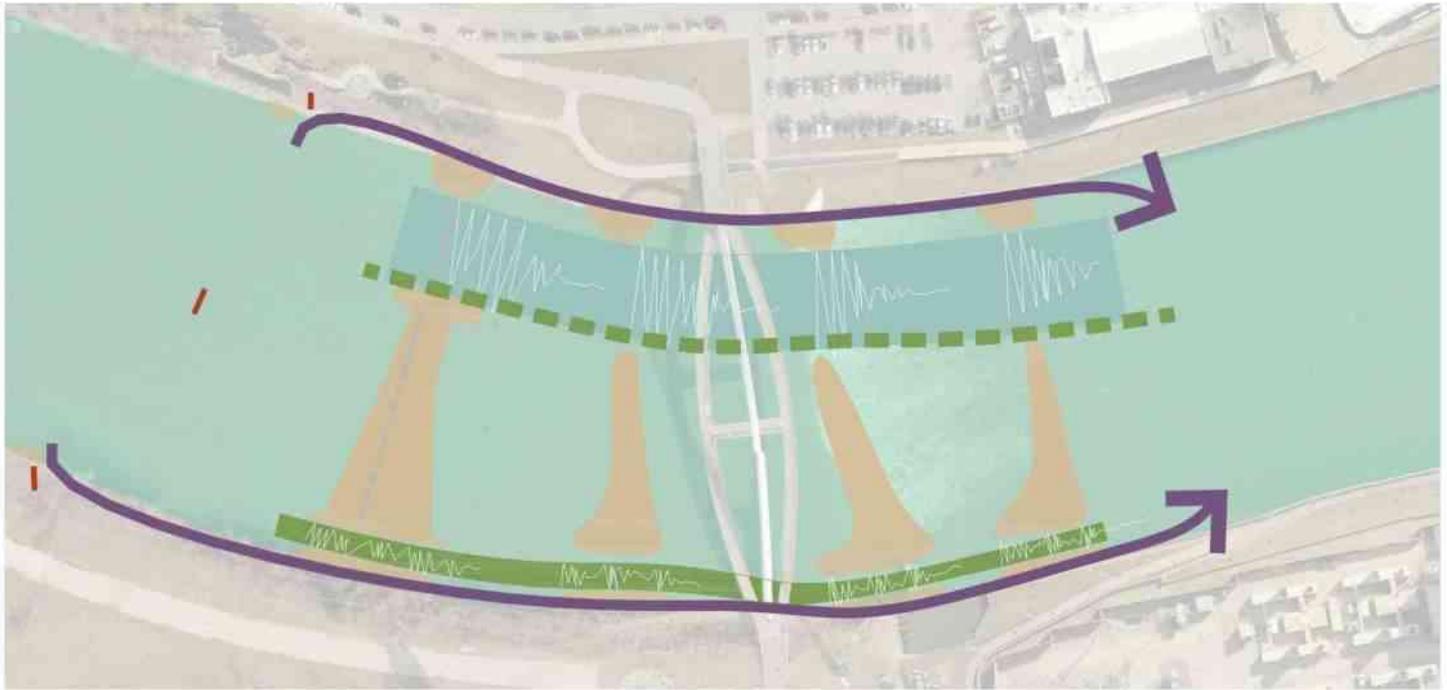
Alternative 2

Dam Safeing Modification with Recreational Bypass Channel



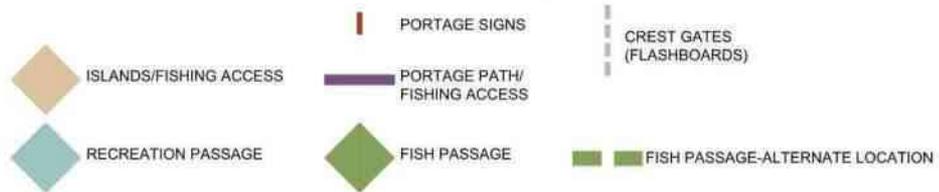
Alternative 3

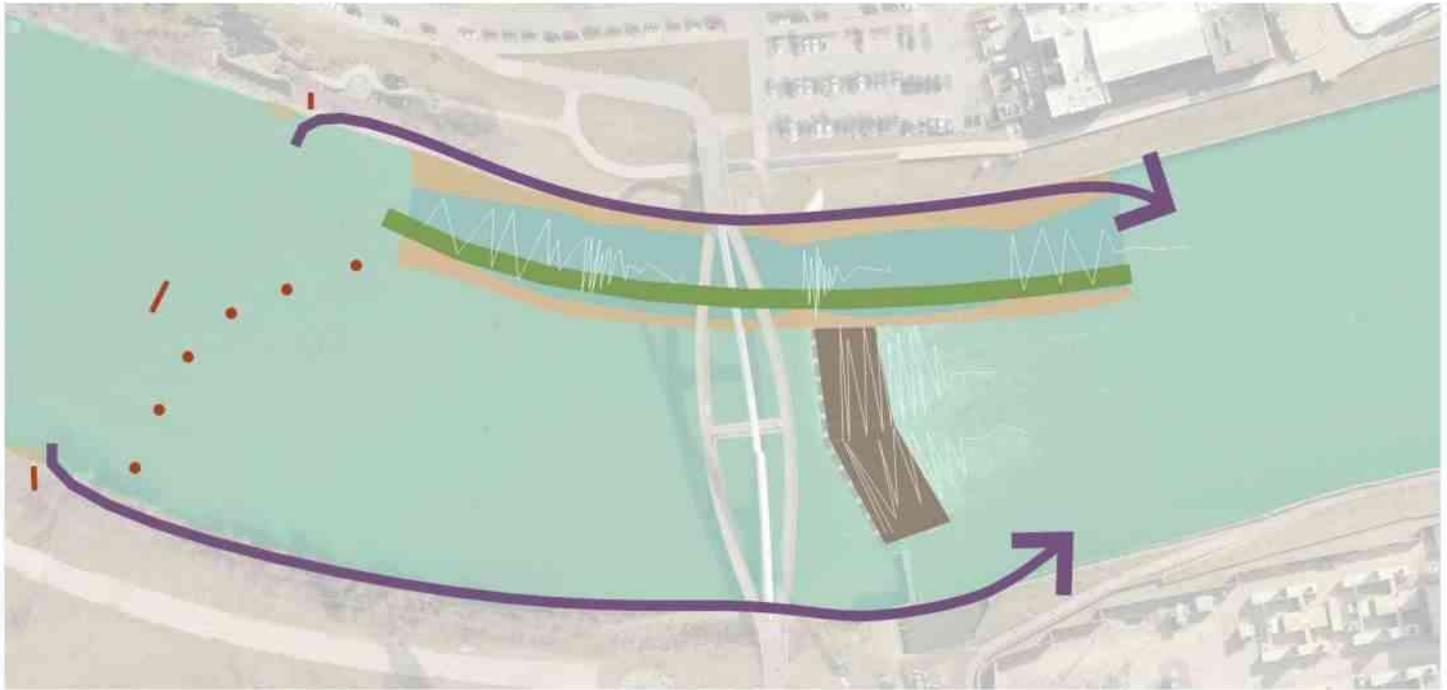
Dam Safeing Modification



CENTER STREET ALTERNATIVE 1

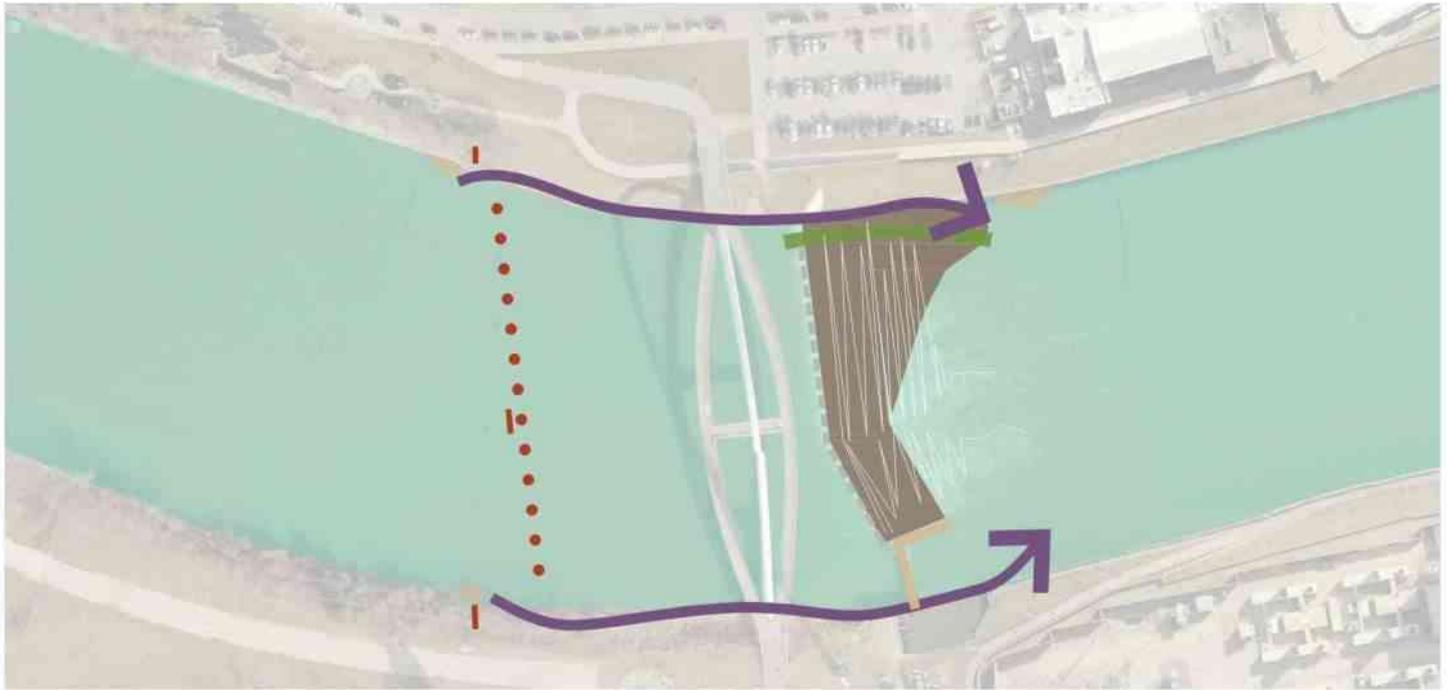
Dam Removal and Replacement with In-River Navigable Drops





CENTER STREET ALTERNATIVE 2
 Dam Safety Modification with Recreational Bypass Channel

- | | | | | | |
|--|------------------------|---|---------------------------------|--|------------------------------|
|  | WARNING BUOYS |  | PORTAGE SIGNS |  | CREST GATES
(FLASHBOARDS) |
|  | ISLANDS/FISHING ACCESS |  | PORTAGE PATH/
FISHING ACCESS |  | DAM HAZARD REDUCTION |
|  | RECREATION PASSAGE |  | FISH PASSAGE | | |



CENTER STREET ALTERNATIVE 3
 Dam Safering Modification

- | | | | |
|--|------------------------|---|---------------------------------|
|  | WARNING BUOYS |  | PORTAGE SIGNS |
|  | JETTIES/FISHING ACCESS |  | PORTAGE PATH/
FISHING ACCESS |
|  | DAM HAZARD REDUCTION |  | CREST GATES (FLASHBOARDS) |
| | |  | FISH PASSAGE |

Scott Avenue > Recreational Reliability

Scott Avenue Available Drop Based on 1997-2016 Flows During Recreational Season



High Flows

No Drop

80% of May-September has more drop than this



Moderate Flows

1 ft of drop

70% of May-September has more drop than this



Normal Flows

2.5 ft of drop (7.5 ft Max)

50% of May-September has more drop than this

Concept Alternatives > Initial Results

Scott Avenue Dam



Alternative 1

Dam Removal and Replacement with In-River Navigable Drops



Alternative 2

Dam Safeing Modification with Recreational Bypass Channel



Alternative 3

Dam Safeing Modification



SCOTT STREET ALTERNATIVE 1

Dam Removal and Replacement with In-River Navigable Drops

- | | | | |
|--|--|--|---------------------------------|
|  | PORTAGE SIGNS |  | PORTAGE PATH/
FISHING ACCESS |
|  | ISLANDS (VISIBLE AT LOW
WATER)/FISHING ACCESS |  | ALTERNATE FISH PASSAGE LOCATION |
|  | RECREATION PASSAGE |  | FISH PASSAGE |



SCOTT STREET ALTERNATIVE 2
 Dam Safening Modification with Recreational Bypass Channel

-  WARNING BUOYS
-  PORTAGE SIGNS
-  FISH PASSAGE AT MEDIAN FLOW AND ABOVE
-  JETTIES/FISHING ACCESS
-  PORTAGE PATH/
FISHING ACCESS
-  DAM HAZARD REDUCTION
-  RECREATION PASSAGE
-  FISH PASSAGE



SCOTT STREET ALTERNATIVE 3
Dam Safering Modification

- WARNING BUOYS
- PORTAGE SIGNS
- JETTIES/FISHING ACCESS
- DAM HAZARD REDUCTION WITH FISH PASSAGE ELEMENTS
- PORTAGE PATH/FISHING ACCESS

Concept Alternatives > Recreational Reliability

Fleur Dam Available Drop Based on 1997-2016 Flows During Recreational Season With Flashboards and Variable Crest to Add Drop



High Flows

No Drop

99% of May-September has more drop than this



Moderate Flows

2 ft of drop

80% of May-September has more drop than this



Normal Flows

3.5 ft of drop (5 ft Max)

50% of May-September has more drop than this



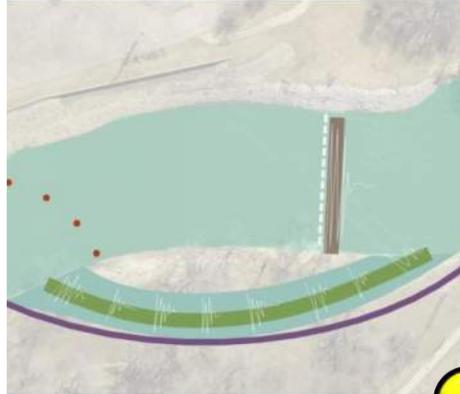
Concept Alternatives > Initial Results

Fleur Drive Dam



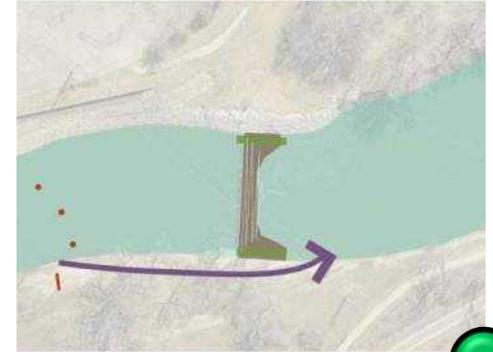
Alternative 1

Dam Removal and Replacement with In-River Navigable Drops



Alternative 2

Dam Safeing Modification with Recreational Bypass Channel



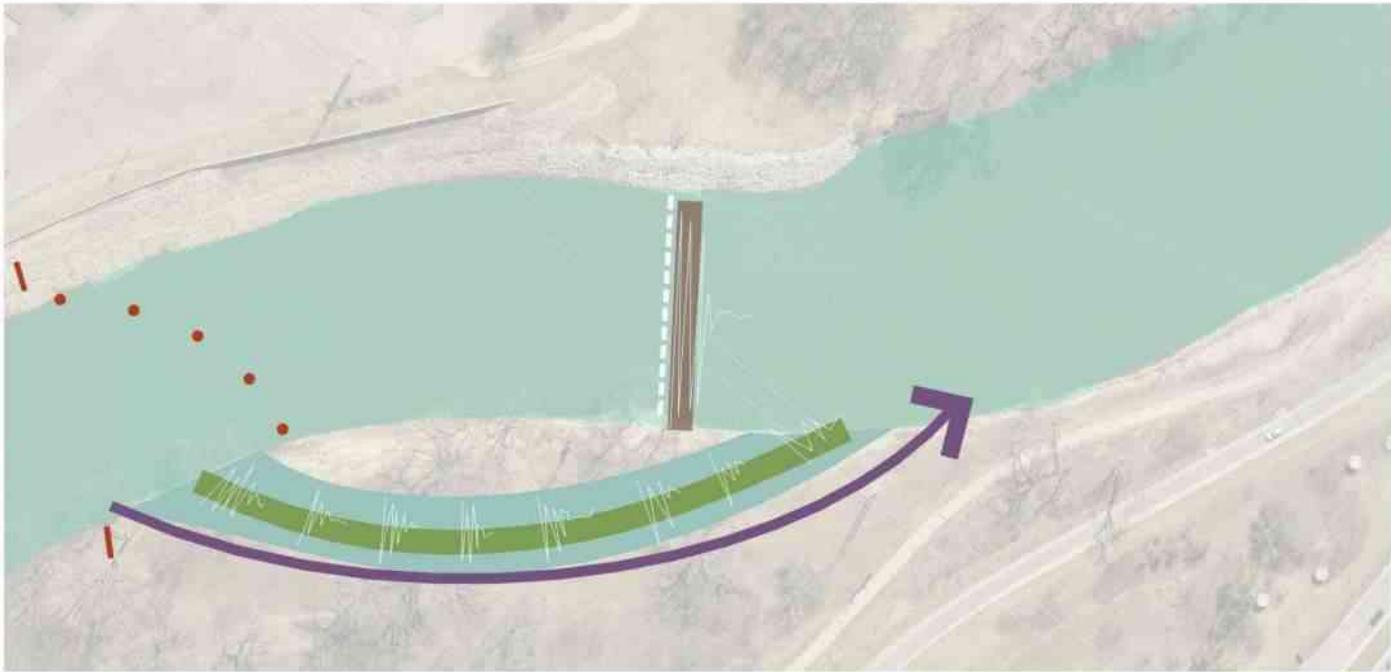
Alternative 3

Dam Safeing Modification

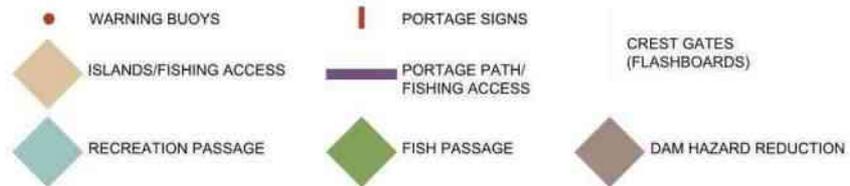


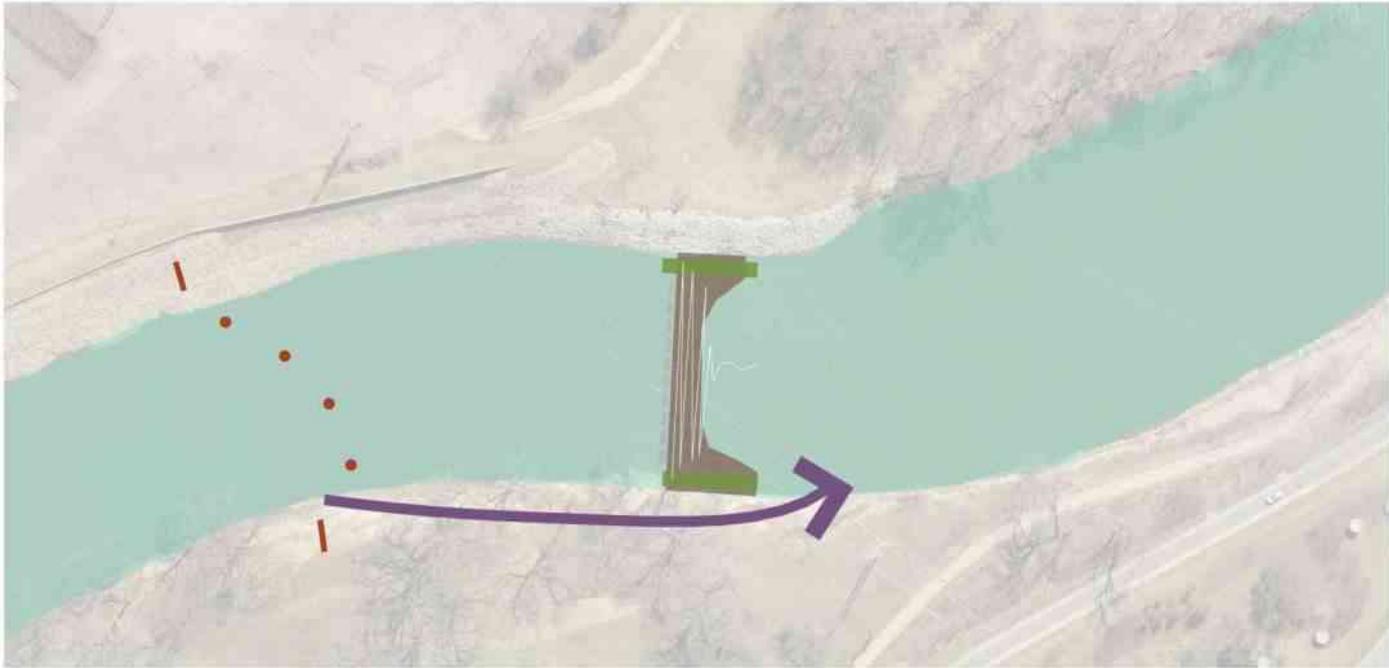
DES MOINES WATERWORKS ALTERNATIVE 1
 Dam Removal and Replacement with In-River Navigable Drops

- | | | | | |
|---|------------------------|---|-------------------------------------|------------------------------|
| ● | WARNING BUOYS | ┃ | PORTAGE SIGNS | CREST GATES
(FLASHBOARDS) |
| ◆ | ISLANDS/FISHING ACCESS | — | PORTAGE PATH/
FISHING ACCESS | |
| ◆ | RECREATION PASSAGE | ◆ | FISH PASSAGE (TWO
OPTIONS SHOWN) | |

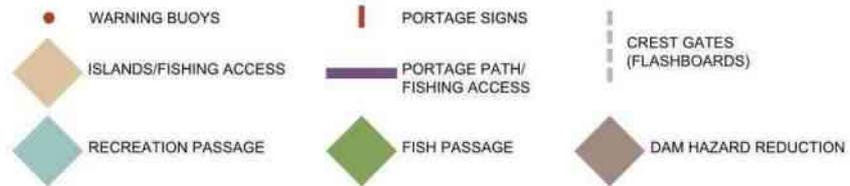


DES MOINES WATERWORKS ALTERNATIVE 2
 Dam Safering Modification with Recreational Bypass Channel





DES MOINES WATERWORKS ALTERNATIVE 3
Dam Safeing Modification



Keeping Water Trails in the Public Eye

COMMUNICATIONS UPDATE

Communications



Overall Goals:

- Let public and stakeholders know the plan is moving steadily toward implementation and is still very “real”
- Engage community and user groups for ongoing feedback on design
- Set stage for next phases, including fund-raising

The Des Moines Register / USA Today

“This project, if it goes forward, it could be a project with what we call national notoriety. It’s got a lot of potential.”

-- Rick McLaughlin

The screenshot shows a USA Today article from June 26, 2017. The headline is "Surfing the Des Moines River? Whitewater rafting? Nothing is off the table, expert says" by McKenna Elmer. The article features a video player and a Samsung Galaxy S8 Active advertisement. A "Share your feedback" section is visible at the bottom. The article text includes: "Change could be on the horizon for the Des Moines River dams downtown. The Des Moines Area Metropolitan Planning Organization is developing a proposal and wants to know what you can imagine for the Des Moines River. Kelley Krensen/The Register".

The newspaper page features several articles. The top headline is "Reliving her youth" with a photo of a woman. Below it is "The Des Moines Register" masthead. The main article is "IOWA SUPREME COURT Godfrey can sue over GOP actions" by Justin M. Sizemore, with a sub-headline "Justices allow former state official to seek damages for alleged retaliation under Branstad". To the right is a small "Insider" section with a photo of a man. Below the main article is a large photo of a river with the headline "WHAT MIGHT D.M. WATER TRAILS LOOK LIKE?". To the right of this photo is an article "Salvating for Iowa sweet corn?" with a photo of corn. At the bottom of the page are advertisements for Hummel's and Altima.

Des Moines Business Record

“If we can make that downtown part of the river open to people actually being in the river between the two low-head dams, making the river accessible, that could be a game changer for how we view the river downtown. You get to be part of nature and you get to see that everything is interconnected.”

-- Dr. Richard Deming,
Leadership Circle Chair

GUEST OPINION

Des Moines deserves and needs game-changing water trails

By Jay Byers, CEO Greater Des Moines Partnership and Rick Tollaason, President and CEO of Hubbell PwC

As our region continues to grow and maximize momentum, it is imperative that we continue to push the envelope in big ideas. The Des Moines Area Metropolitan Planning Organization is currently in the midst of implementing a Water Trails and Greenways Master Plan, and we encourage the business community to support this initiative.

The plan was adopted by unanimous vote by the MPO Policy Committee in November. It has been identified as a regional priority through the Capital Connection Regional Vision Plan, which has experienced broad support among Des Moines business leaders, elected officials and other stakeholders. The water trails plan provides the region a road map for enhancing citizen experiences in and along the 100 miles of waterways in the region.

Water trails are recreational corridors and routes on rivers and lakes that provide a unique experience for all water users. They

The MPO has shown strong leadership in setting the stage for this initiative, and we commend the MPO's member governments for their regional collaboration on the project in fact. We also commend Executive Director Todd Hahley on his recent efforts.

After initially having the study approved in November they have coordinated the Water Trails Engineering Study as the first phase of implementation. As part of the study the MPO is working with H2O Engineering and Architecture, which will focus on the proposed projects throughout the region, and McLaughlin White-water Group, which will tackle the unique constraints of the water trail recommendations for downtown Des Moines.

This study has involved community support with more than \$200,000 raised from public and private organizations. To keep the momentum on this project, we must continue to support its implementation efforts.

Des Moines is experiencing tremendous

critically important to attracting and retaining top talent, which is a key part of our region's economic development strategy.

The business community has already been instrumental in the water trails project, and it is important that we continue to be vital in our support of the project. The engineering study will have the opportunity to work closely with our local elected officials to act on the findings of the study.

Capital Connection encourages local governments to integrate the plan's recommendations into their short- and long-range planning and capital improvement budgets.

Implementation would be a signature win. Learn more about the Water Trails and Greenways Master Plan at dmapo.org/water-trails.




JAY BYERS
RICK TOLLAASON

making a splash

GREATER DES MOINES EYES WHITEWATER AS WORKFORCE DEVELOPMENT

BY PAUL BEAMAN






Catherine Kling
RICHARD LEPPOLD
TRACI DAWSON
MELISSA BEAMAN

Business Record

Ideas for downtown fun on the river should get by fall River surfing, anyone?

BY FELIX BEIDMAN, Managing Editor

The idea has been tossed by fall about the water for turning the Des Moines River downtown into an attraction for cyclists, kayakers, canoeists, fishing enthusiasts and others.

McLaughlin White-water Group, with subcontractors H2O Planning & Design and HDR, has submitted plans to dig up and build a temporary park on the site of the Center Street and East River low-head dams, which have been built, abandoned and later by former U.S. Army Corps of Engineers workers in the 1950s to make sure the plane sits within regulations. And it's not a half-acre on the park site for the removal of a building frame through the area.

H2O Engineering and Architecture will issue an permits proposal in the next of the 150 miles of river stretches in Central Iowa.

Initial findings will be available by early fall -- after some summer study meetings -- with final design and cost estimates due by the end of the year.

The contractors were asked to submit three options and need estimates by November 20 and proposals and other needs for estimating, zoning, emergency services, fall surfing, boat and motor launch. There's talk of a hot and boathouse near Van Meter and Granddams, Inc.

Hubbell PwC CEO, President and CEO Rick Tollaason, who has led a local white-water industry working on the project, said the business community agrees to making to make money for the entrepreneurs -- which would be in the \$20 million to \$100 million we get on the downtown Des Moines area. There is hope the Corps of Engineers will help fund some of the work.

"We are going to go up and visit tonight, we want to know what the parks look like. They are beautiful and that they will cost," Tollaason said. That's what the study is about.

The Des Moines Area Metropolitan Planning Organization has been coordinating the planning, along with the Iowa Department of Natural Resources.

Tollaason and Greater Des Moines Partnership CEO Jay Byers have talked about building in Cambridge, Ia., which has a successful fall of a hot water in the Des Moines River.

The effort to improve recreation is a key quality of the initiative that is one of the 100-year-old vision on how it's currently built by two workers, said Tollaason, who recently has sought to improve position upon a Hubbell PwC.

"What great ideas it is in other initiatives when there are no obstacles," Tollaason added. "We are trying hard to attract workers. We want to get people to work to live here."

Tollaason said the city of Johnston has been busy thinking about how to make a water trail in Beaver Creek for public.

Dr. Richard Deming chairs the Leadership Circle of the Greater Des Moines Community Foundation, which gives \$200,000 for the feasibility study and is hoping to be added to give more.

"The Leadership Circle is really happy to do some real projects, and that's to be part of the growth," Tollaason said. "It's about water. It's about nature. It's about recreation. It's about development."

Five a stock story from the river" said Tollaason, a spokesman for a medical clinic at Mercy Center. "It can make the downtown part of the river open to people actually being in the river and see the river downtown. That would be a game changer for how between the two low-head dams, making the river accessible, that could be a game changer for how we view the river downtown. You get to be part of nature and you get to see that everything is interconnected. It's about nature."

Study supporters:
Greater Des Moines Partnership, \$30,000
Greater Des Moines Partnership, \$30,000
PWA County Connection, \$14,000
Des Moines Area Partnership, \$10,000
Greater Des Moines Community Foundation, \$200,000
Jacquie De Vries, Dr. Richard Deming, Paul and Linda Hubbell, Mark and Jill Olson, Paul Smith, Jay and Traci Dawson, Jay and Pam Cramer
Local governments: \$196,000
Hubbell PwC, University of Iowa, City of Des Moines, Greater Des Moines Partnership, McLaughlin White-water Group, HDR, Van Meter, Granddams, Inc.

Next steps: Public Engagement

The Dam Debate III – 12-1 p.m. Thursday, Oct. 19, Des Moines Register Community Room

Regional Open Houses – Oct. 17-19

- **Johnston** – 5:30 - 7 p.m. Tuesday, Oct. 17, Crown Point Community Center
- **West Des Moines** – 7:30 – 9 a.m. Wednesday, Oct. 18, the Lodge at Walnut Woods State Park
- **Pleasant Hill** – 5:30 – 7 p.m. Wednesday, Oct. 18, Riley Resources
- **Downtown** – 5:30-7 p.m. Thursday, Oct. 19, Des Moines Register Community Room

Looking ahead



Fall – Several media opportunities with public engagement

- Media pitches and releases
- Op-ed
- Social Media
- Please help!

2018 – Looking for opportunities to celebrate study completion and start of implementation

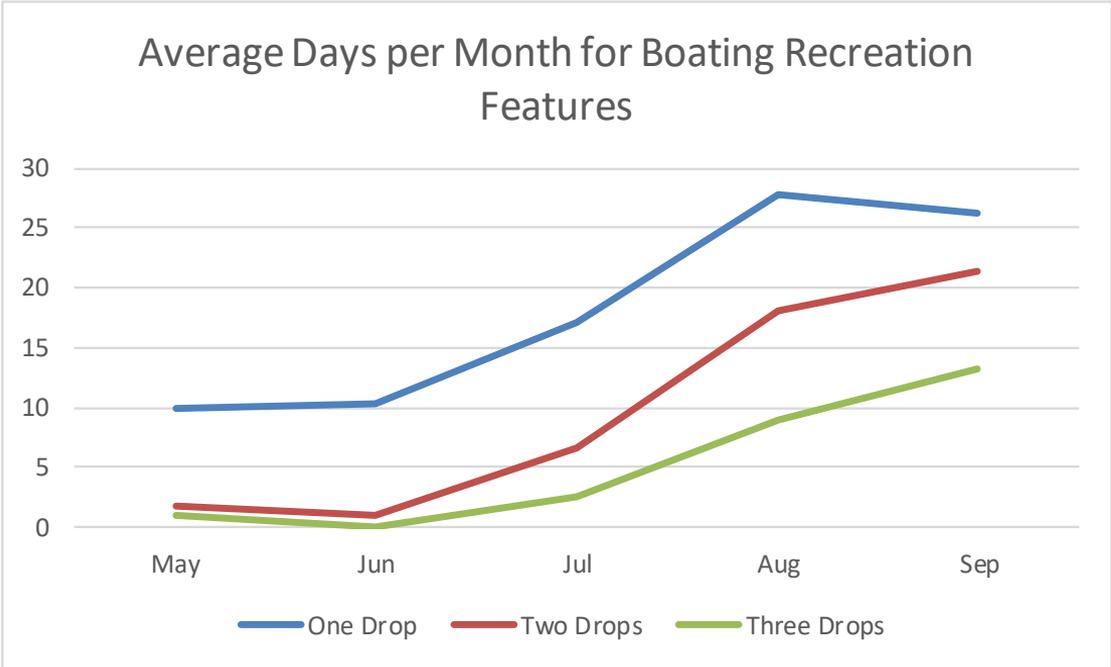
September 20, 2017 Agenda

1. Call To Order and Introductions
2. Approval of Agenda
3. Recap of plan's recommendations for downtown dams (5 minutes)
4. Show and tell – field trips to Boise, Idaho, and Columbus, Georgia (5 minutes)
5. Facilitated Discussion (90 minutes)
6. Communications update (5 minutes)
7. Other Announcements or Non-Action Items
8. Next Meeting Date – October 19
9. Adjournment

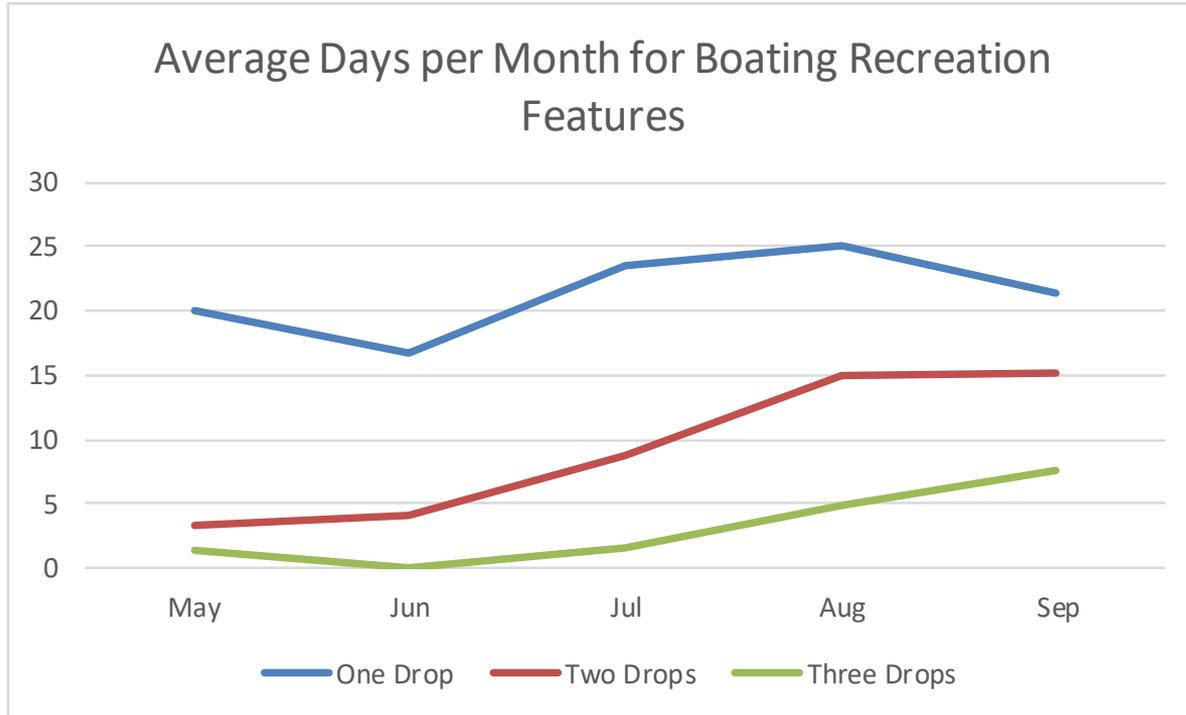
Recreation Potential

Insert slides into main presentation or use as sideshow for special interests

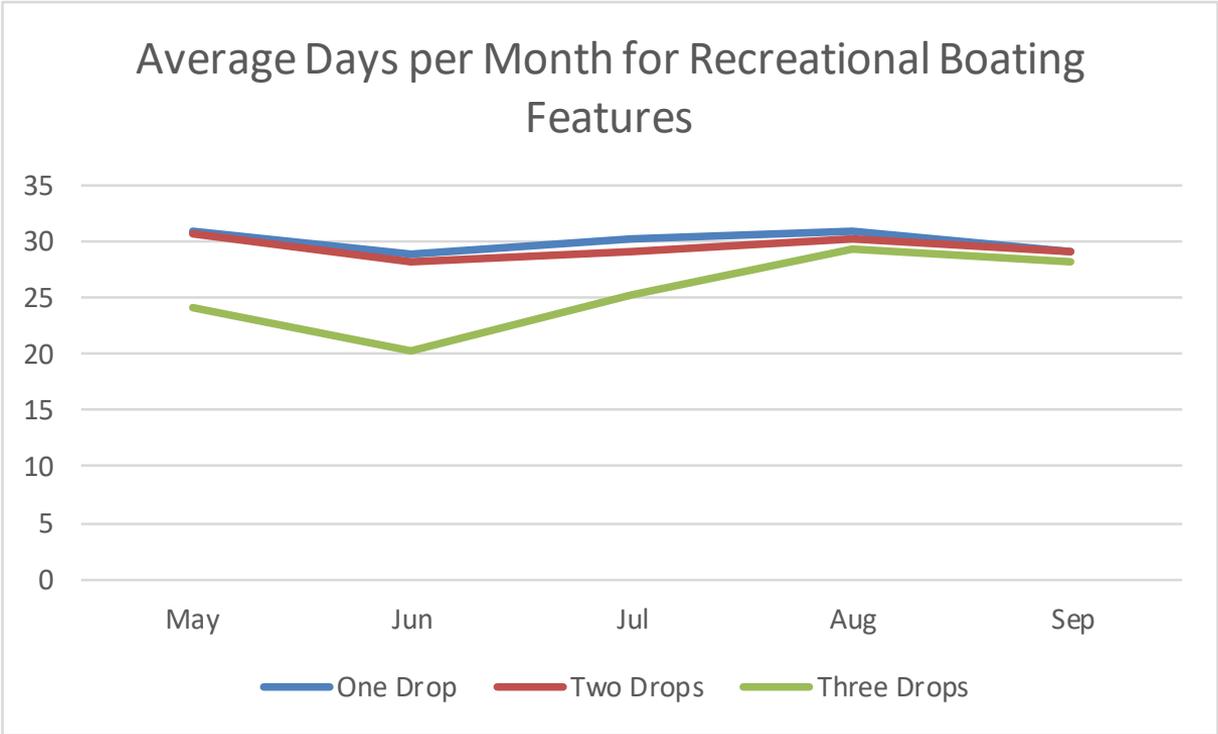




Fleur Avenue Dam



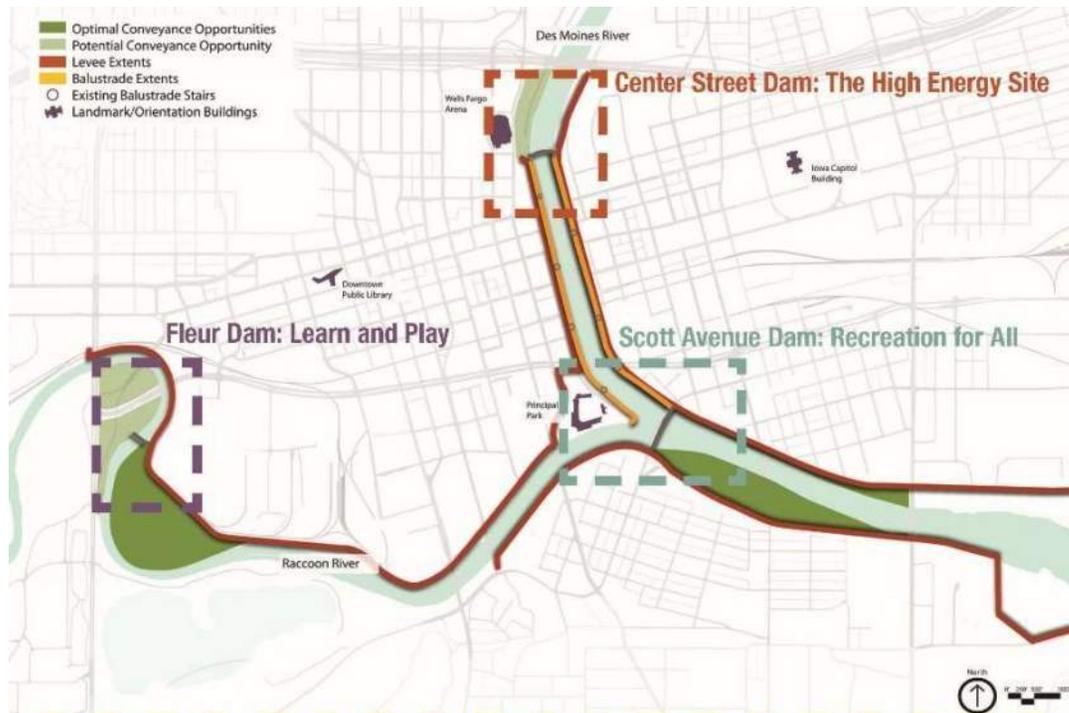
Center Street Dam



D.4 – WORKSHOP #3 PRESENTATION AND SUMMARY

THE DAM DEBATE III:

We know what's possible. Let's talk.

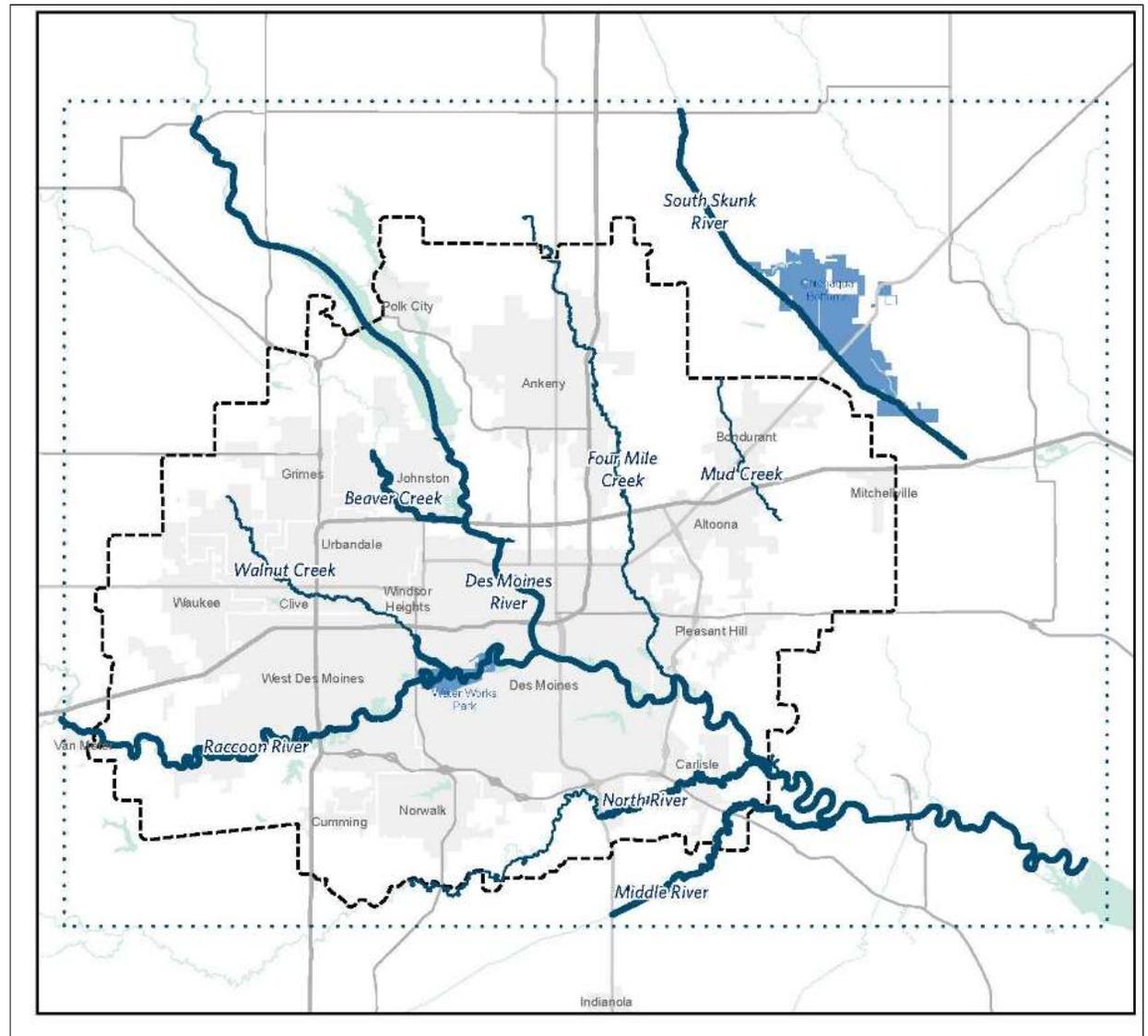


Thursday, Oct. 19

The Des Moines Register
 Community Room
 Capital Square
 400 Locust St.
 Des Moines



- Greater Des Moines Water Trails and Greenways Master Plan
- Fund-raised \$500,000 for Phase I implementation
- Conduct Water Trails Engineering Study (2017-2018)



Thank you to the funders

- Leadership Circle of the Greater Des Moines Community Foundation – \$205,000
- Area jurisdictions – \$196,000
 - Includes: Altoona, Ankeny, Bondurant, Carlisle, Clive, Des Moines, Grimes, Johnston, Mitchellville, Norwalk, Pleasant Hill, Urbandale, Waukee, West Des Moines, Windsor Heights, Polk County, Van Meter, and Warren County
- Greater Des Moines Convention and Visitors Bureau – \$30,000
- Greater Des Moines Partnership – \$30,000
- Polk County Conservation – \$30,000
- Des Moines Area Association of REALTORS – \$16,500

Water Trails Engineering Study

Regional Projects



Downtown Dams





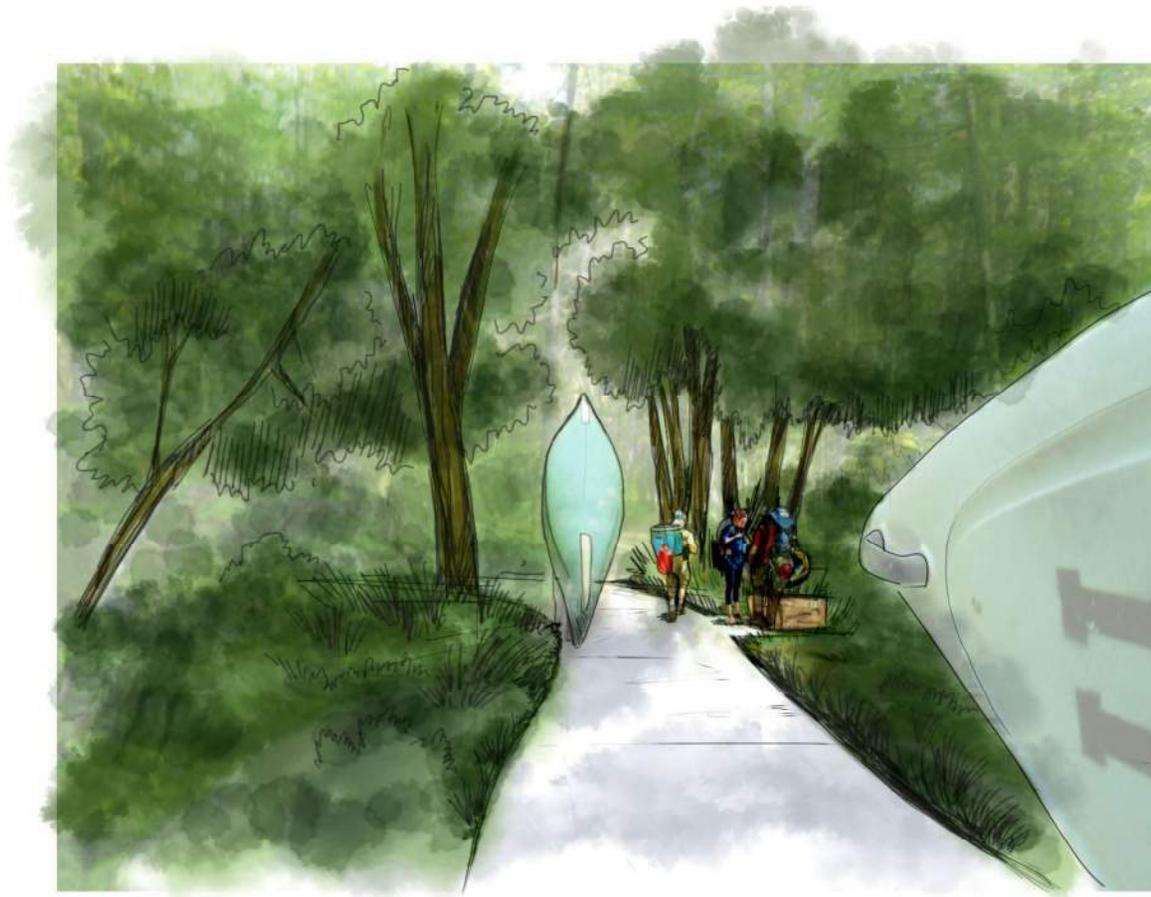
CONCEPTUAL SITE PLAN

DESIGN CONCEPTS

DESIGN CONCEPTS



PARKING AREA PERSPECTIVE



PATHWAY PERSPECTIVE

ARCHITECTURE + ENGINEERING + ENVIRONMENTAL + PLANNING
www.is-grp.com

MPO WATER TRAILS

Des Moines, Iowa
2017
ISG Project No 19905





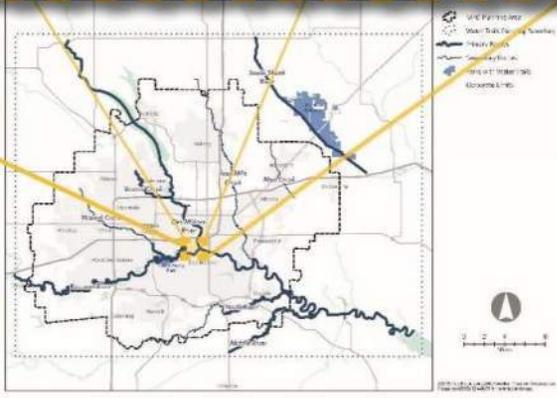
RIVER PERSPECTIVE

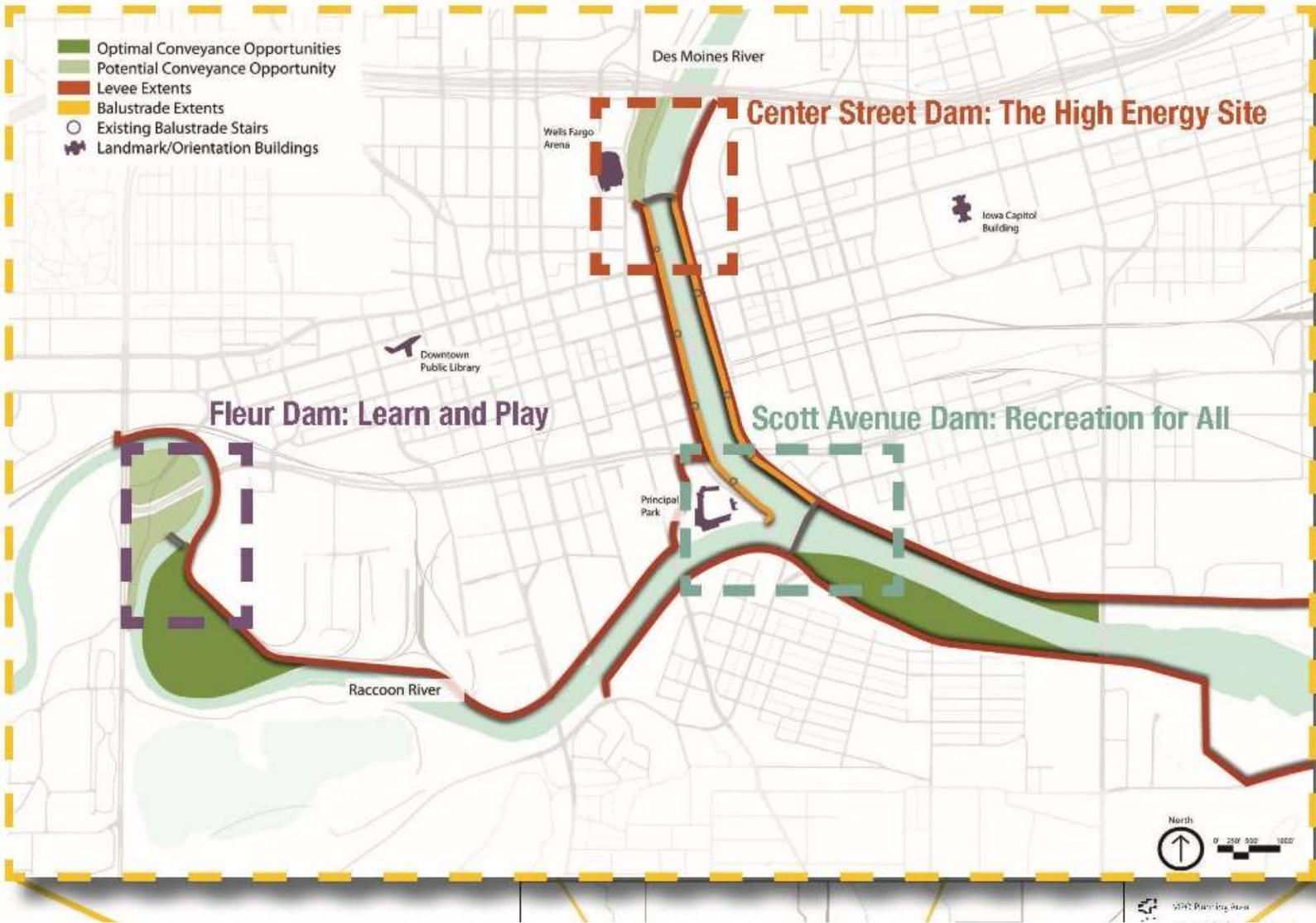
ARCHITECTURE + ENGINEERING + ENVIRONMENTAL + PLANNING
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MPO WATER TRAILS

Des Moines, Iowa
2017
ISG Project No 19905







Project Overview > Scope and Schedule

Downtown Des Moines Water Trails Engineering Study

The purpose of this study is to assess the feasibility of dam mitigation at Center Street, Scott Avenue, and Fleur Drive and create a vision for the entire study area based on input from City residents and stakeholders.

Today's Objective:

- Review findings for the scenarios at each dam site
- Collect comments and feedback on moving-water opportunities at each dam

Next Steps:

- Steering Committee to review public feedback on alternatives for each dam
- Steering Committee to recommend an alternative for each dam
- Consultants to provide costs ranges of the preferred alternative at each dam
- Consultants finalize feasibility study in early 2018



Project Overview > Primary Objectives

Downtown Des Moines Water Trails Engineering Study

- Activate the Des Moines River in Downtown
- Reduce existing safety hazards at dams
- Provide or improve fish passage around dams
- Create in-river recreation for all levels and abilities (upstream, through and/or around dams)
- Provide river access for anglers, boaters, swimmers, etc.
- Identify opportunities to enhance the existing biota for targeted species
- Identify opportunities to improve stream water quality
- Integrate stakeholder input



Project Overview > General Criteria

Downtown Des Moines Water Trails Engineering Study

- Eliminate overly retentive hydraulic hazards at dams
- No adverse impact to regulatory floodplain
- Maintain required minimum existing pool levels upstream of Center Street and Fleur Dams
- No modifications to existing bridges and levees



Project Elements > Portage and Safety

Downtown Des Moines Water Trails Engineering Study



- **All alternatives** provide dam safeing elements
 - i. Stepped dams
 - ii. Automated flashboards
 - iii. Availability for flatwater recreation zones closer to the dam
- Portage will be available for any user to bypass the dam if/when needed
- Buoys and signage



Project Elements > **Habitat Improvements**

Downtown Des Moines Water Trails Engineering Study

Fish Passage across the dams is included with **all alternatives**

Other Improvements:

- Fishing Access
- Mussel Habitat
- Improved Aeration
- Deeper Pools*



*Items starred not available with all alternatives



Project Elements > Impacts to Flatwater Recreation



- Center Street Dam improvements create an additional **8 – 10 acres** of flatwater recreation area with opportunities for deeper pools
- Scott Avenue Dam improvements create approximately **45 acres** of additional flatwater recreation
- Fleur Dam improvements opens up all of the Raccoon river within Des Moines' city limits, approximately **8 miles**, for flatwater recreation

Downtown Des Moines Water Trails Engineering Study



Related > **Water Quality**

- Water trails support work of the Watershed Management Authorities in the metro
- Water trails build sense of environmental stewardship
- Water trails projects can include water-quality monitoring at sites across region
- Current conditions





Downtown Des Moines Water Trails Engineering Study

October 19, 2017



Project Elements > Flashboards

- Needed to provide capacity for flood conveyance
- Maintains upstream pool elevation
- Required at **Center Street Dam** and **Fleur Dam**



Downtown Des Moines Water Trails Engineering Study



Project Elements > **Recreational Reliability**

Downtown Des Moines Water Trails Engineering Study

Average Days per Month (May – September) with a Recreational Feature:

- Center Street Dam: 30 days / month
- Scott Ave. Dam: 18 days / month
- Fleur Dam: 14 days / month

Great flows available in recreational months



Wide range of recreational opportunities at the 3 dams

- Scenario A – Local draw
- Scenario B – Local/Regional draw
- Scenario C – Regional/National draw
- Scenario D – National/International draw



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A

DAM ALTERNATIVE B

DAM ALTERNATIVE C

DAM ALTERNATIVE D

SCOTT STREET



FLEUR DRIVE



CENTER STREET



Confluence Park Video > Denver, CO

Downtown Des Moines Water Trails Engineering Study



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A



DAM ALTERNATIVE B



DAM ALTERNATIVE C



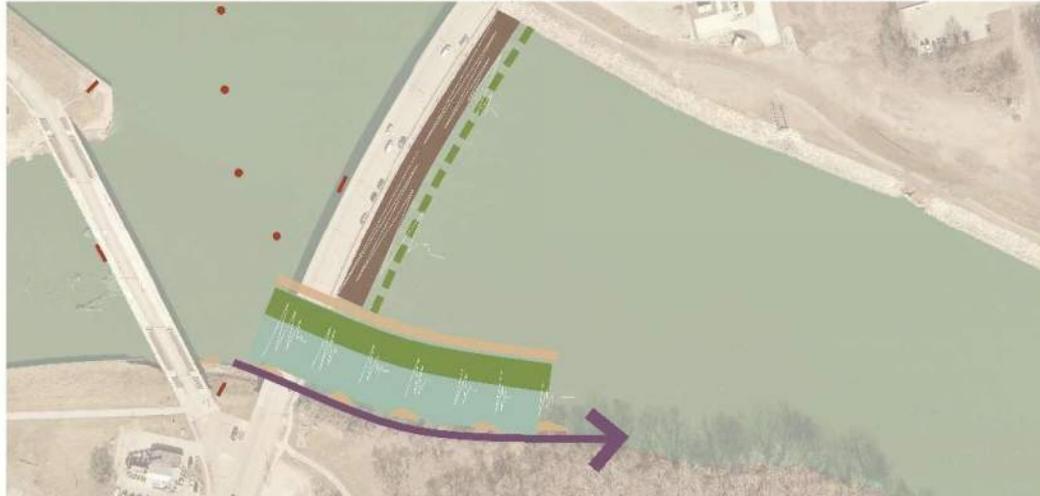
DAM ALTERNATIVE D



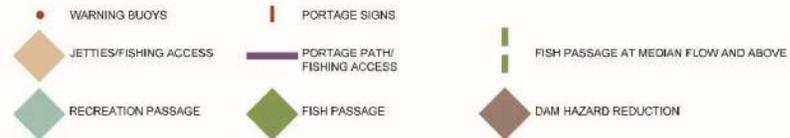
SCOTT STREET



Project Scenarios



SCOTT STREET ALTERNATIVE A - LOCAL INTEREST



Project Scenarios

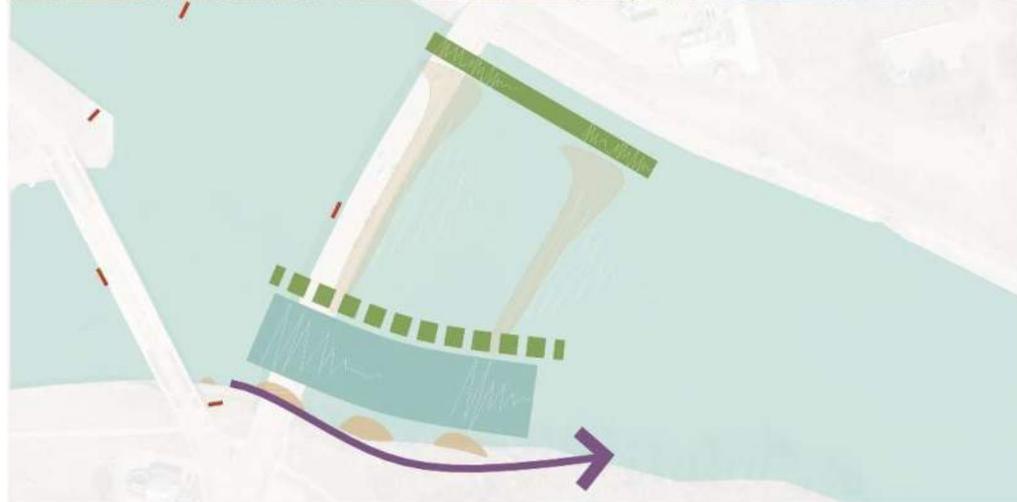


SCOTT STREET ALTERNATIVE B - LOCAL TO REGIONAL INTEREST

- WARNING BUOYS
- | PORTAGE SIGNS
- | FISH PASSAGE AT MEDIAN FLOW AND ABOVE
- ◆ JETTIES/FISHING ACCESS
- PORTAGE PATH/
FISHING ACCESS
- ◆ DAM HAZARD REDUCTION
- ◆ RECREATION PASSAGE
- ◆ FISH PASSAGE



Project Scenarios



SCOTT STREET ALTERNATIVE C - REGIONAL INTEREST

- PORTAGE SIGNS
- ISLANDS (VISIBLE AT LOW WATER)/FISHING ACCESS
- RECREATION PASSAGE
- PORTAGE PATH/ FISHING ACCESS
- ALTERNATE FISH PASSAGE LOCATION
- FISH PASSAGE

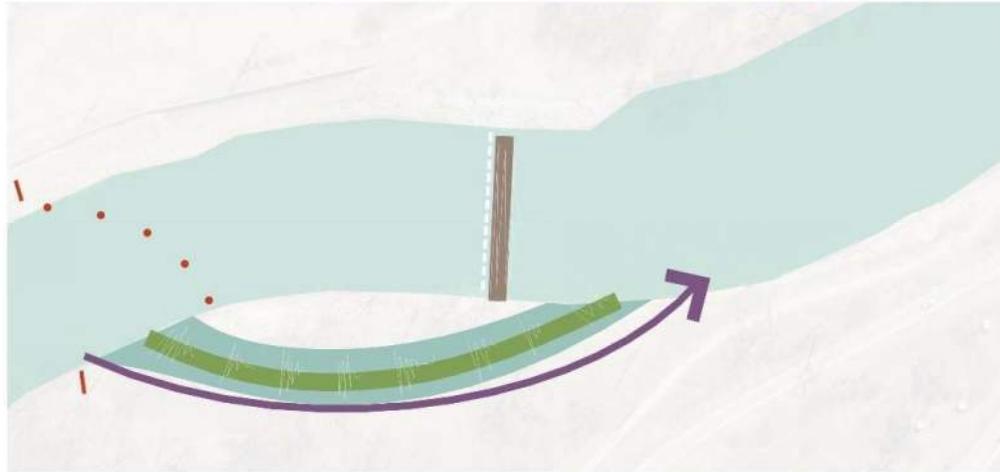


DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

FLEUR DRIVE



Project Scenarios

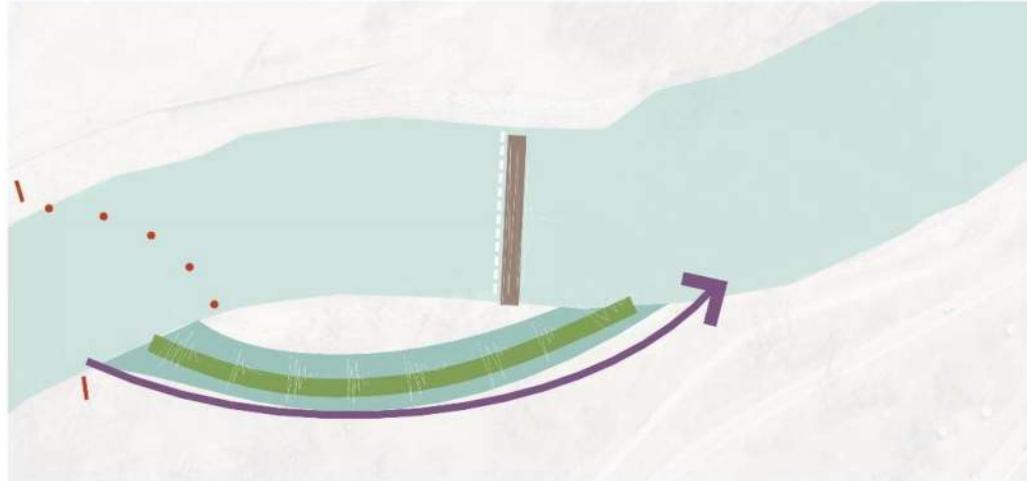


FLEUR DRIVE ALTERNATIVE A - LOCAL INTEREST

- WARNING BUOYS
- ISLANDS/FISHING ACCESS
- ◆ RECREATION PASSAGE
- PORTAGE SIGNS
- PORTAGE PATH/FISHING ACCESS
- ◆ FISH PASSAGE
- CREST GATES (FLASHBOARDS)
- ◆ DAM HAZARD REDUCTION



Project Scenarios

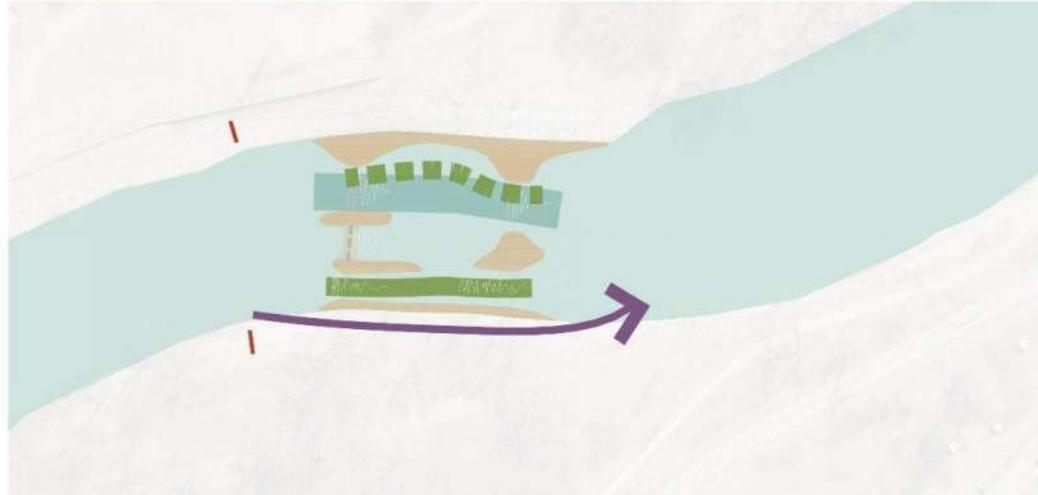


FLEUR DRIVE ALTERNATIVE B - LOCAL TO REGIONAL INTEREST

- WARNING BUOYS
 - PORTAGE SIGNS
 - ◇ ISLANDS/FISHING ACCESS
 - PORTAGE PATH/FISHING ACCESS
 - ◇ RECREATION PASSAGE
 - ◇ FISH PASSAGE
 - ◇ DAM HAZARD REDUCTION
- ◇ CREST GATES (FLASHBOARDS)



Project Scenarios



FLEUR DRIVE ALTERNATIVE C - REGIONAL INTEREST

- WARNING BUOYS
- ◆ ISLANDS/FISHING ACCESS
- ◆ RECREATION PASSAGE
- PORTAGE SIGNS
- PORTAGE PATH/FISHING ACCESS
- ◆ FISH PASSAGE (TWO OPTIONS SHOWN)
- - - CREST GATES (FLASHBOARDS)



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A

DAM ALTERNATIVE B

DAM ALTERNATIVE C

DAM ALTERNATIVE D

CENTER STREET



Project Scenarios

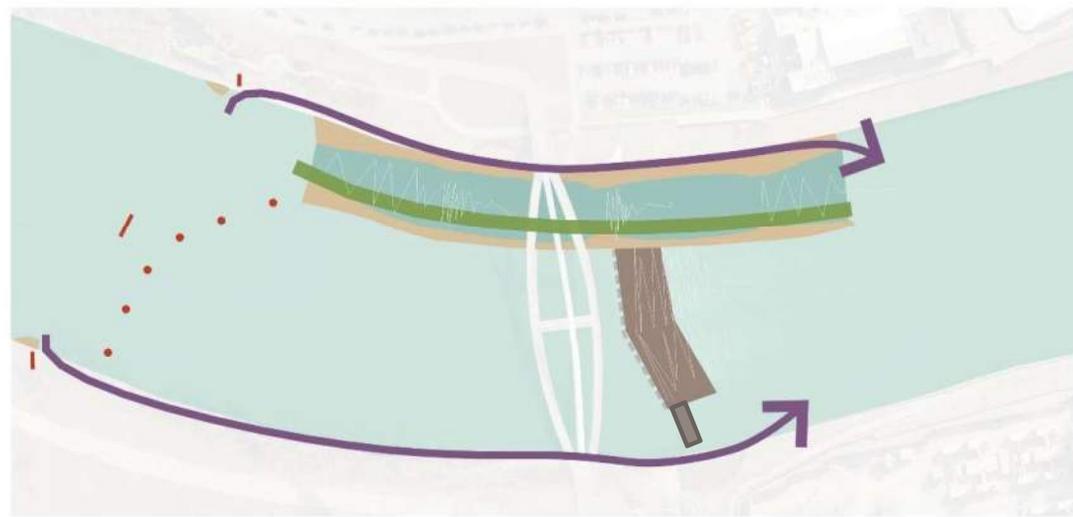


CENTER STREET ALTERNATIVE B - LOCAL TO REGIONAL INTEREST

- WARNING BUOYS
- | PORTAGE SIGNS
- | CREST GATES (FLASHBOARDS)
- ◆ ISLANDS/FISHING ACCESS
- PORTAGE PATH/ FISHING ACCESS
- ◆ DAM HAZARD REDUCTION
- ◆ RECREATION PASSAGE
- FISH PASSAGE



Project Scenarios

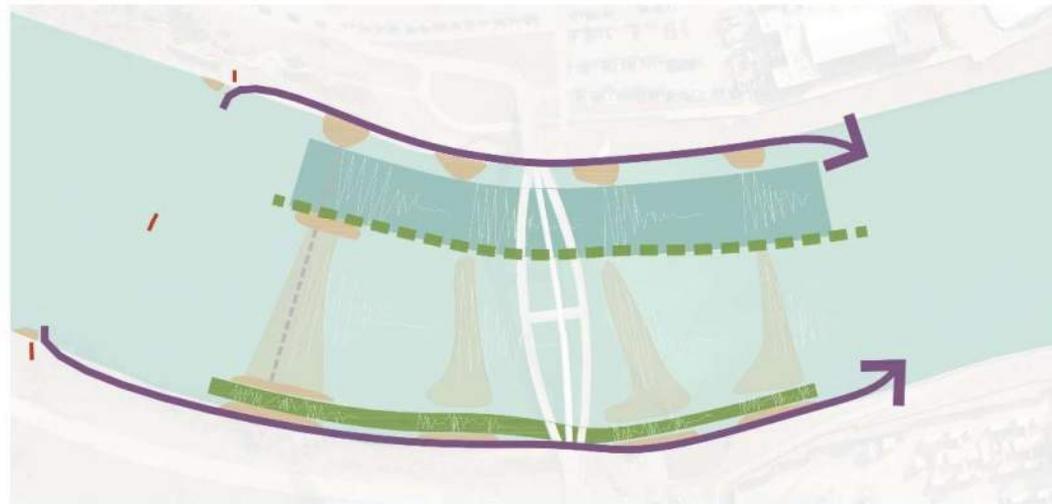


CENTER STREET ALTERNATIVE C - REGIONAL INTEREST

- WARNING BUOYS
- ISLANDS/FISHING ACCESS
- CREST GATES (FLASHBOARDS)
- PORTAGE PATH/FISHING ACCESS
- FISH PASSAGE
- DAM HAZARD REDUCTION



Project Scenarios



CENTER STREET ALTERNATIVE D - NATIONAL INTEREST



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A

DAM ALTERNATIVE B

DAM ALTERNATIVE C

DAM ALTERNATIVE D

SCOTT STREET



FLEUR DRIVE



CENTER STREET

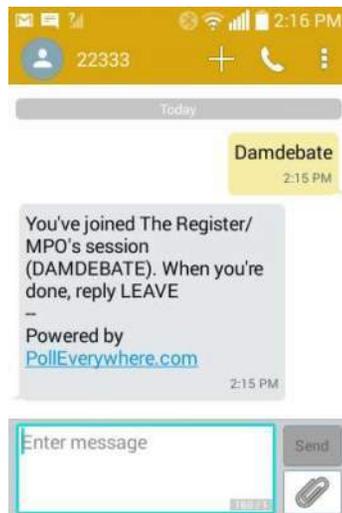


**We know what's
possible. Let's talk.**

THE DAM DEBATE III

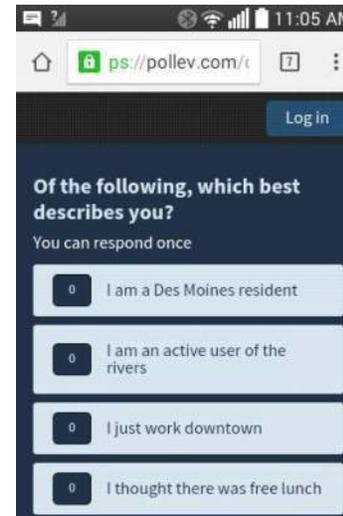
TEXT:

DAMDEBATE to 22333



BROWSE:

pollev.com/damdebate



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A

DAM ALTERNATIVE B

DAM ALTERNATIVE C

DAM ALTERNATIVE D

SCOTT STREET



FLEUR DRIVE



CENTER STREET



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A



DAM ALTERNATIVE B



DAM ALTERNATIVE C



DAM ALTERNATIVE D



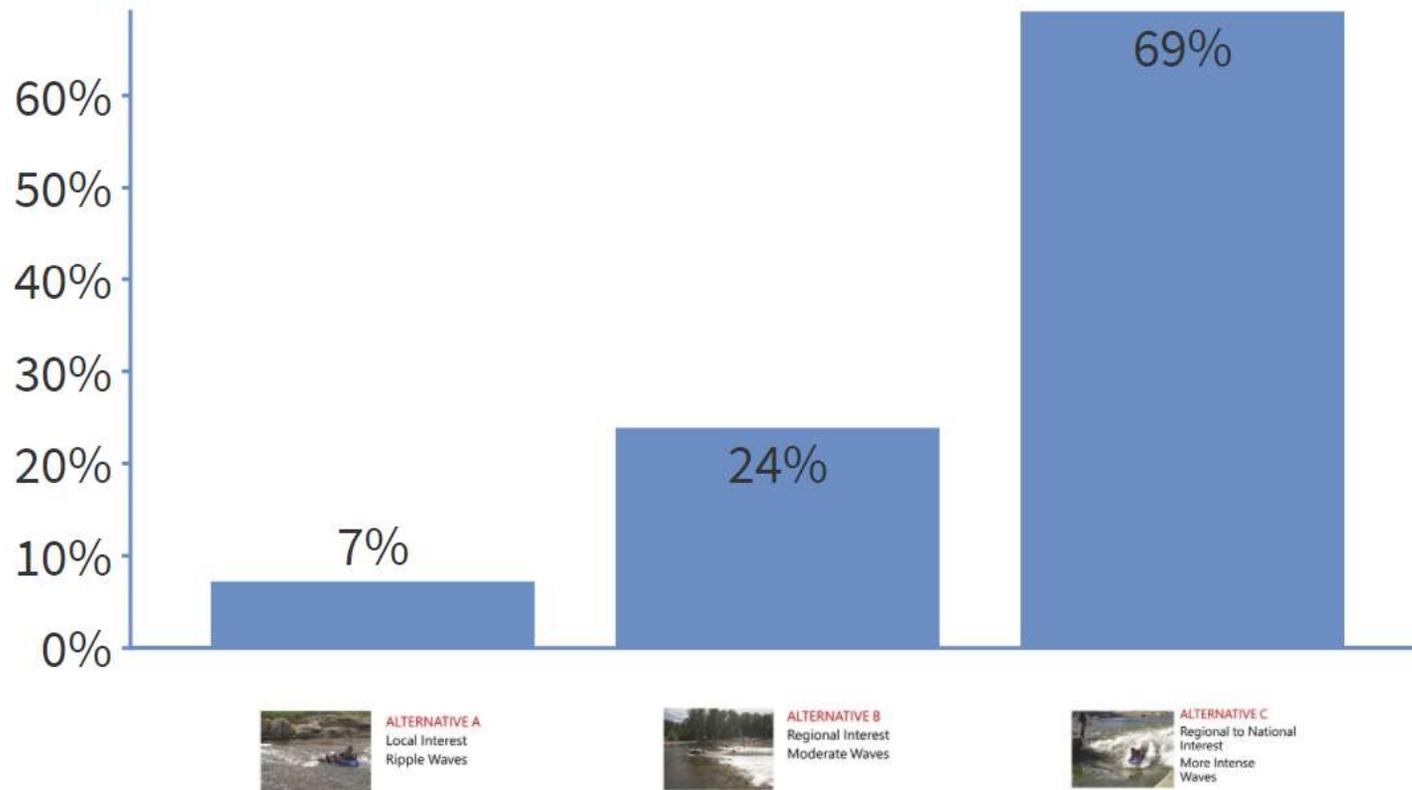
SCOTT STREET



For the Scott Street Dam: Which is your preferred Alternative?

When poll is active, respond at PollEv.com/damdebate

Text **DAMDEBATE** to **22333** once to join



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

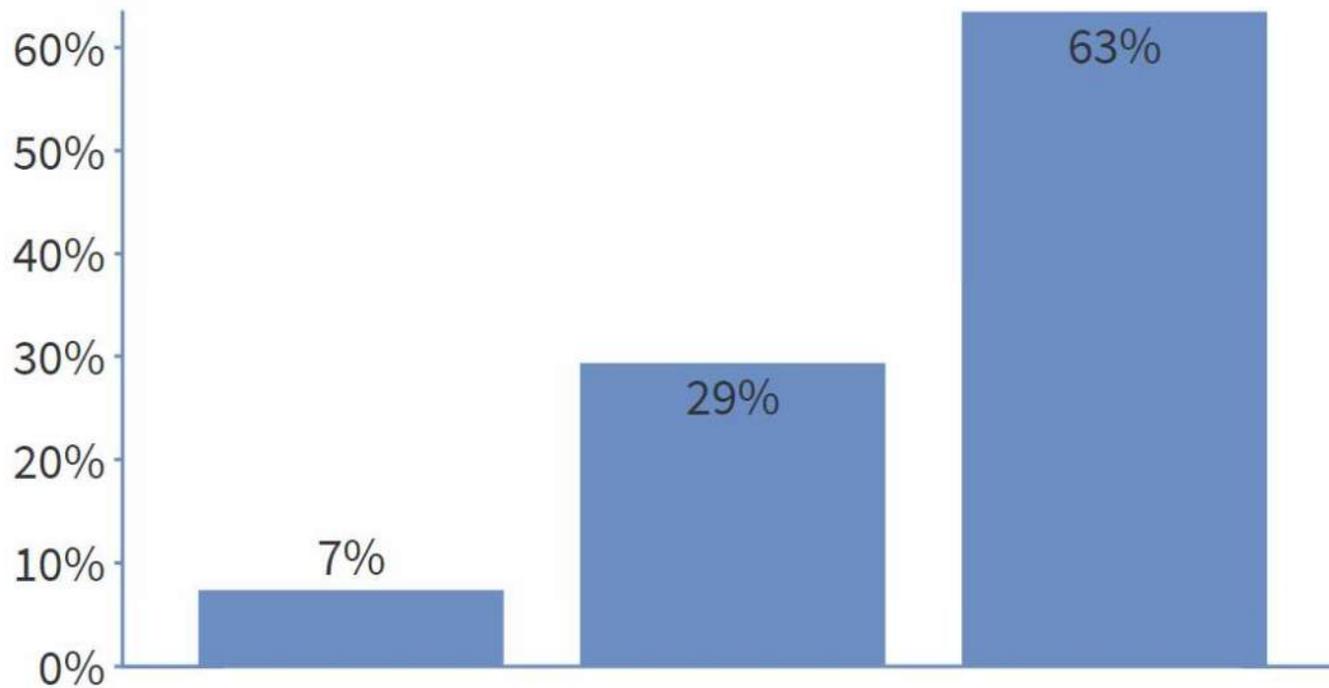
FLEUR DRIVE



For the Fleur Drive Dam: Which is your preferred alternative?

When poll is active, respond at PollEv.com/damdebate

Text **DAMDEBATE** to **22333** once to join



ALTERNATIVE A
Local Interest
Ripple Waves



ALTERNATIVE B
Regional Interest
Moderate Waves



ALTERNATIVE C
Regional to National
Interest
More Intense
Waves



DAM ALTERNATIVES RECREATION AND LOCATIONS POSSIBLE

DAM ALTERNATIVE A

DAM ALTERNATIVE B

DAM ALTERNATIVE C

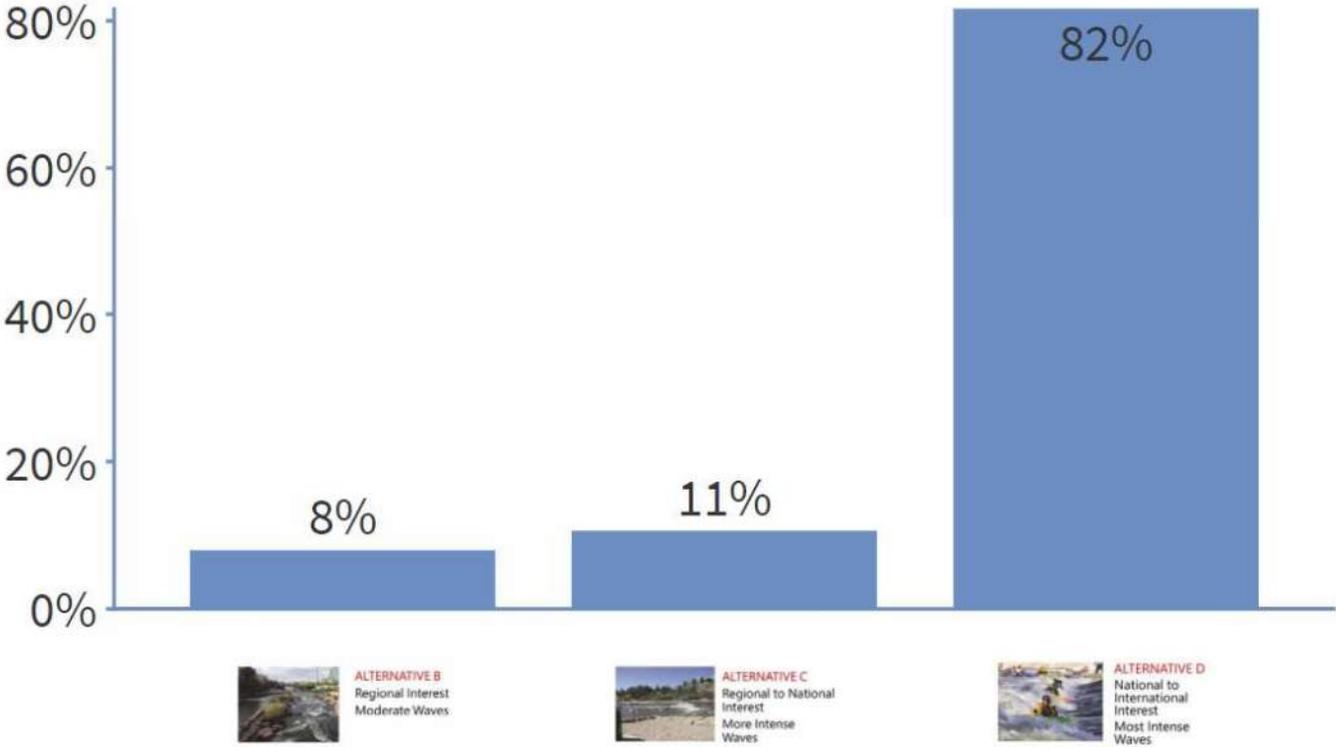
DAM ALTERNATIVE D

CENTER STREET



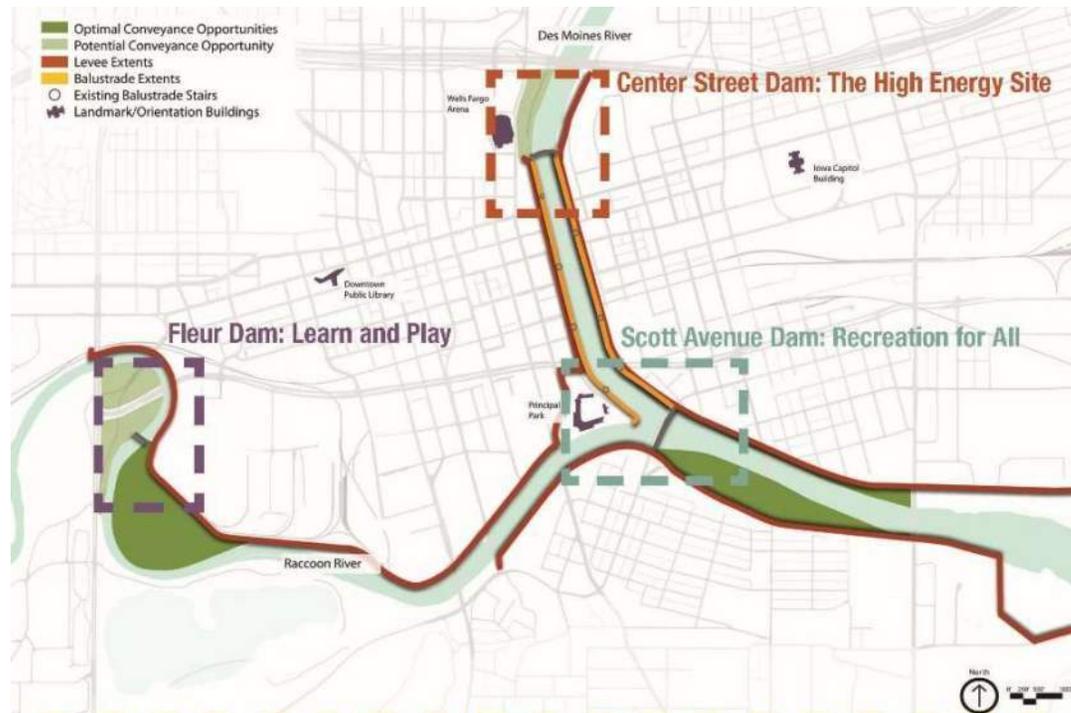
For the Center Street Dam: Which is your preferred alternative?

When poll is active, respond at PolleEv.com/damdebate
Text **DAMDEBATE** to **22333** once to join



THE DAM DEBATE III:

We know what's possible. Let's talk.



Thursday, Oct. 19
12 p.m. to 1 p.m.

The Des Moines Register
Community Room
Capital Square
400 Locust St.
Des Moines



Summary of Workshop No. 3

Workshop No. 3 (October 2017) included a series of events:

October 17/18

- Participation in three public open houses around the region (Johnston, West Des Moines and Pleasant Hill) in partnership with the regional planning process
 - Regional open houses included boards representing potential dam site amenities as a “conversation starter” and a handout (included in this summary report) offering attendees an opportunity to check from 20 possible amenities for each dam location and “circle” photographs reflecting how they personally might engage with each dam location
 - Results – The preferred amenities appear in the “tabulated questionnaire” section of this report. The circled photographs are less quantifiable but indicate open house participants could “see themselves” at each dam site – while their experiences of interest might vary from site to site. Several did identify with the high end whitewater at Center as participants while others saw themselves as observers; however, observers at Center Street might still see themselves in the water – as tubers, waders, swimmers or paddlers at Scott or Fleur. The upshot of the interactions at these open houses indicated people could see themselves engaged with the water at multiple locations in multiple ways – including IN the water at often 2-3 of the 3 dam sites. Safety and natural resources preservation concerns surface in these discussions as well (see October 19 results below).

October 19

- The Dam Debate, MPO-led, in partnership with The Des Moines Register and Editorial Director Lynn Hicks for expanded media coverage and improved attendance at an interactive public session. Dam debate included:
 - A presentation of modeling results for each dam location
 - A panel discussion followed by Q&A with Steering Committee Chair Rick Tollakson, Council Member Joe Gatto, DNR Director Chuck Gipp, Consultants Rick McLaughlin and Pat Boddy – Moderator Lynn Hicks
 - A Poll Everywhere interactive component to assess interest in recreation activities at each dam site (results appear in this report)
- The steering committee meeting where the presentation and poll results were reviewed
- A meeting of the MPO where the presentation and poll results were reviewed
- An evening meeting/open house with nearly a dozen Iowa State University students who are developing the region's greenways initiative in attendance

Results – (Quantified elsewhere) World Class active/whitewater recreation preferred for Center Street Dam site location; regional to regional/national interest experiences identified for Fleur and Scott, but multi-level experiences (wide-ranging to accommodate many different skill levels and types of uses) preferred if this can be accomplished.

Safety concerns surface, particularly when looking at the self-rescue constraints of the walls at the Center Street location. Natural resources protection/habitat restoration continue to be a desired result, especially at Fleur and Scott, with the current urban/historical/architectural nature of the Center Street location holding equal sway for some members of the public.

October 20

Debrief of results from workshop(s) with MPO

Conclusions from debrief:

Direction for Center Street Dam is clear from a desired recreation perspective - Alternative D – National to International Interest

Fleur and Scott results imply interest in a range of activities – finding the best target for these venues is Alternative D – National to International Interest, but allowing for less intense or a variety of recreational passage if practical.

These workshops lead this project in the following directions:

- To pursue Alternative 1 for Center Street Site
- To determine the validity of pursuing an “adventure park” approach to the Center Street Dam Site (considering the public’s interest in World Class Whitewater coupled with plans for a Skate Park in close-proximity)
- To potentially test the viability of moving the Center Street project upstream (but still South of 235) to minimize any historical impacts and allow for improved habitat
- To potentially look at the means for “split” use amenities at Fleur and/or Scott - using a bypass channel to allow for both a regional whitewater and a more local-interest (family oriented) recreational experience at one or both of those sites; this likely means pursuit of Alternative 2 for these locations if feasible

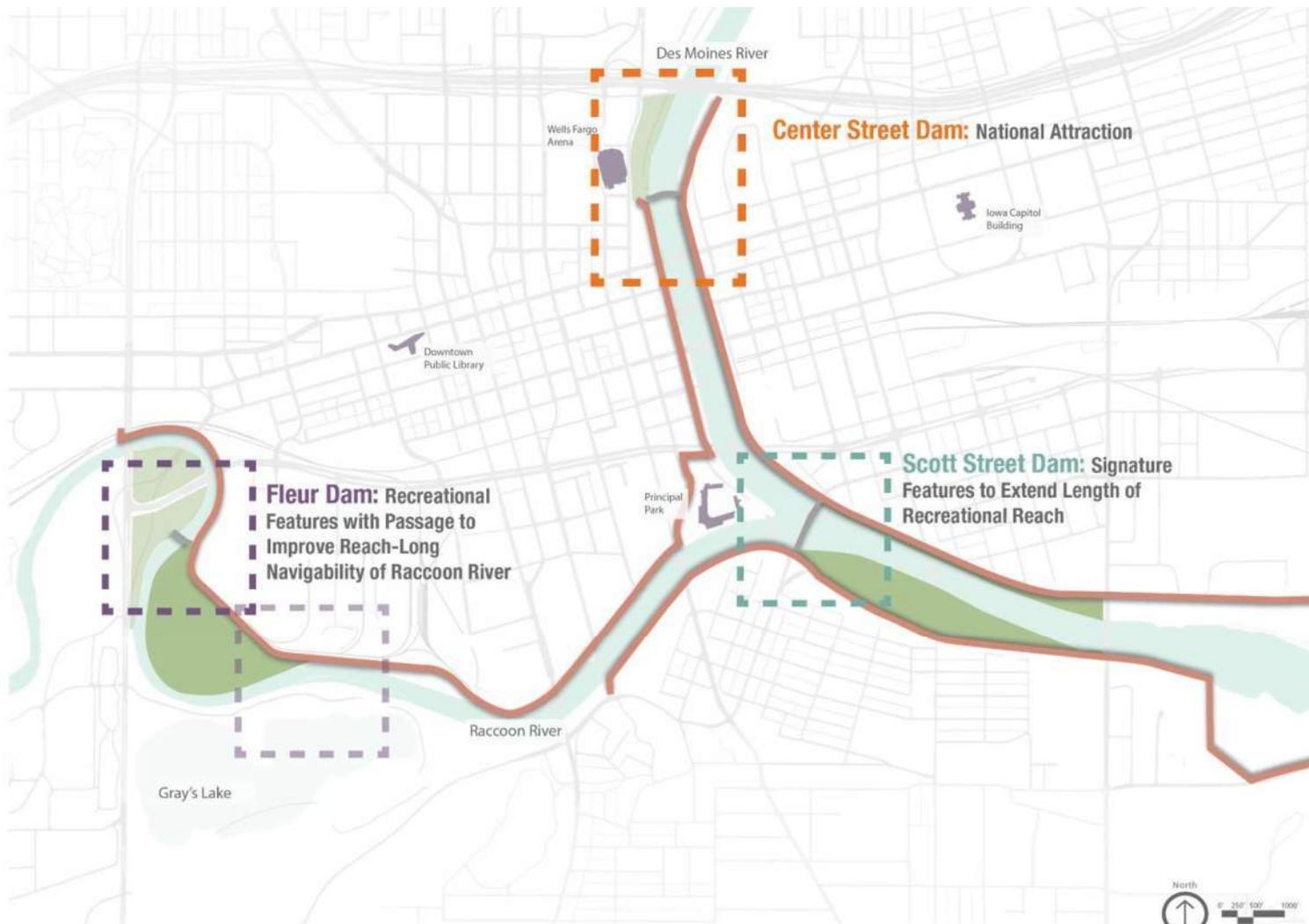
D.5 – WORKSHOP #4 PRESENTATION AND SUMMARY



Downtown Des Moines Water Trails Engineering Study

Workshop #4
December 19, 2017





Project Overview > Scope and Schedule

Downtown Des Moines Water Trails Engineering Study

The purpose of this study is to assess the feasibility of dam mitigation at Center Street, Scott Avenue, and Fleur Drive and create a vision for the entire study area based on input from City residents and stakeholders.

Today's Objective:

- Review identified alternatives at each dam
- Present budget ranges and vision for each alternative
- Select preferred alternative at all 3 sites

Future Steering Committee Meetings: Present Study

- Meeting #5 Present draft Study, collect comments and feedback
- Meeting #6 Present final Study



Project Overview > Dam Debate III (Workshop #3) Summary

Downtown Des Moines Water Trails Engineering Study

Feedback

- Center Street Dam Site: National to international interest (world class) active whitewater recreation preferred
- Where practical at Scott & Fleur sites, provide multi-level experiences with wide-ranging recreation accommodating many different skill levels and types of uses is preferred
- Address safety concerns (such as self-rescue constraints due to the walls)
- Desire for natural resources at all locations to receive protection/habitat restoration



Project Overview > Dam Debate III (Workshop #3) Summary

Downtown Des Moines Water Trails Engineering Study



Results

- Proceeded with preferred alternatives at each dam site. Identified alternatives will be presented at this workshop.
- Revised scope at Center Street to move recreational drops upstream, integrate with proposed skate park, and develop an adventure park along banks
- Developed a new alternative at the Fleur Dam site with a recreational feature downstream at the proposed Gray's Station development to allow for both a regional whitewater and more local-interest (family oriented) recreational experience integrated into one site.



Project Overview > Alternatives

Downtown Des Moines Water Trails Engineering Study



- In-river objectives refined from previous workshops
- All alternatives promote recreation, water awareness and education
- Recreation can be tuned for a desired user group within reason during future design phases
- Upland amenities will be presented for each site
- Comparative budgets for initial evaluation will be presented



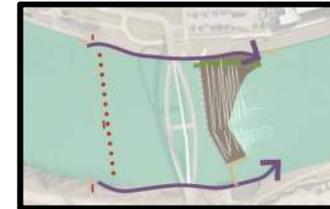
Project Overview > Identified Project Alternatives

Downtown Des Moines Water Trails Engineering Study

Center Street

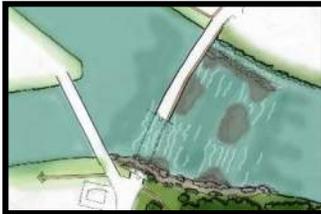


Alternative 1
Big River Experience with Adventure Park

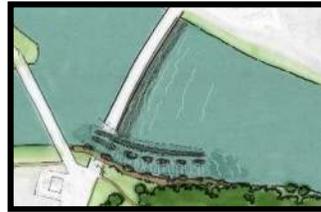


Alternative 3
Dam Safeing

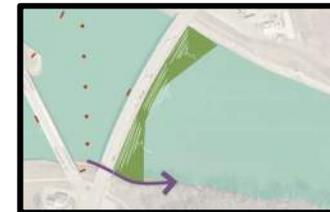
Scott Avenue



Alternative 1
Big River Experience

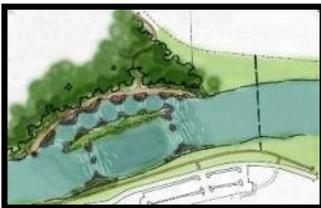


Alternative 2
Recreational Bypass



Alternative 3
Dam Safeing

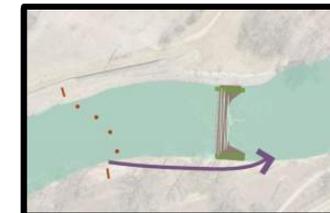
Fleur Drive



Alternative 1
Big River Experience and Bypass



Alternative 2
Recreational Bypass



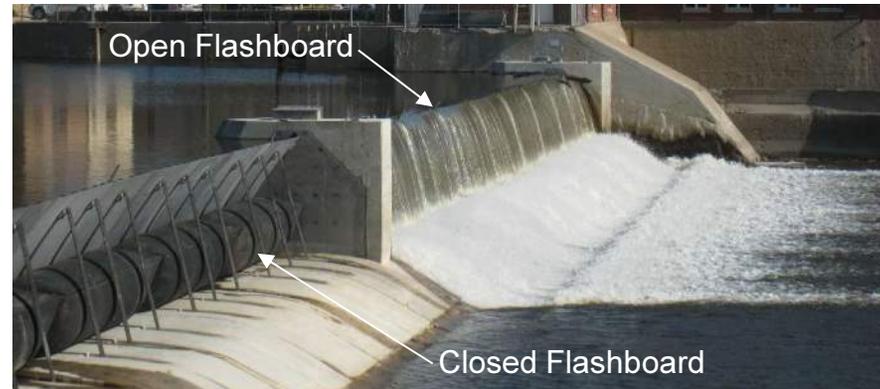
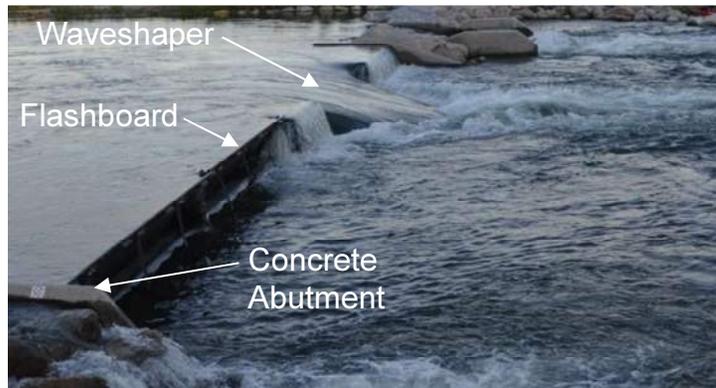
Alternative 3
Dam Safeing



Project Overview > Feasibility Assessment

Downtown Des Moines Water Trails Engineering Study

HDR has modeled configurations at Center, Scott, and Fleur dams to minimize the amount of flashboards and bank excavation needed to meet the “no-rise” regulatory flood level requirement.

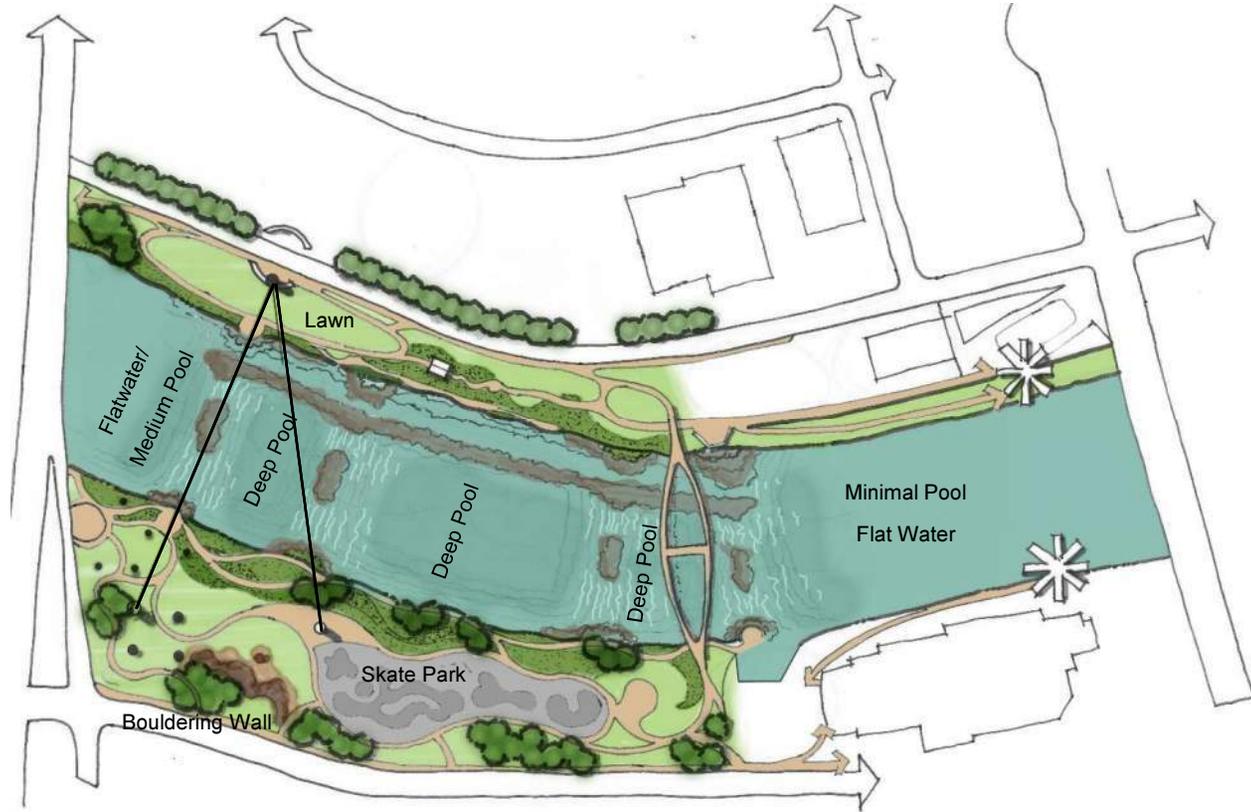


Iterations of hydraulic profile models have determined the need and approximate size of flashboards, and the extent of adjacent bank excavation necessary to provide capacity for flood flows.



Center Street > Alternative 1 Concept Diagram

Downtown Des Moines Water Trails Engineering Study



Center Street > Preliminary Comparative Budgets

Downtown Des Moines Water Trails Engineering Study



Recreation Alternative 1	Comparative Budget
In-River Improvements	\$24–45 million
Upland Amenities	\$10–18 million
Total	\$34–63 million



Dam Safeing Alternative 3	Comparative Budget
In-River Improvements	\$6–11 million
Upland Amenities	\$2–3 million
Total	\$8–14 million



Project Overview > Feedback

Center
Street



Alternative 1: \$34 – 63M

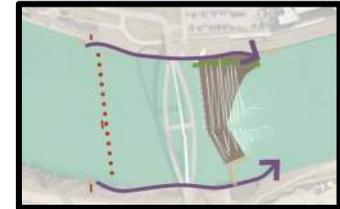
Big River Experience with Adventure Park

- Highest Economic Potential
- Greatest outdoor active sports amenity
- Parking & Access Opportunities
- Highest Cost
- Existing Utilities in east bank
- Fish passage on one side of river

Downtown Des Moines Water Trails Engineering Study

Alternative 3: \$8 – 14M

Dam Safeing



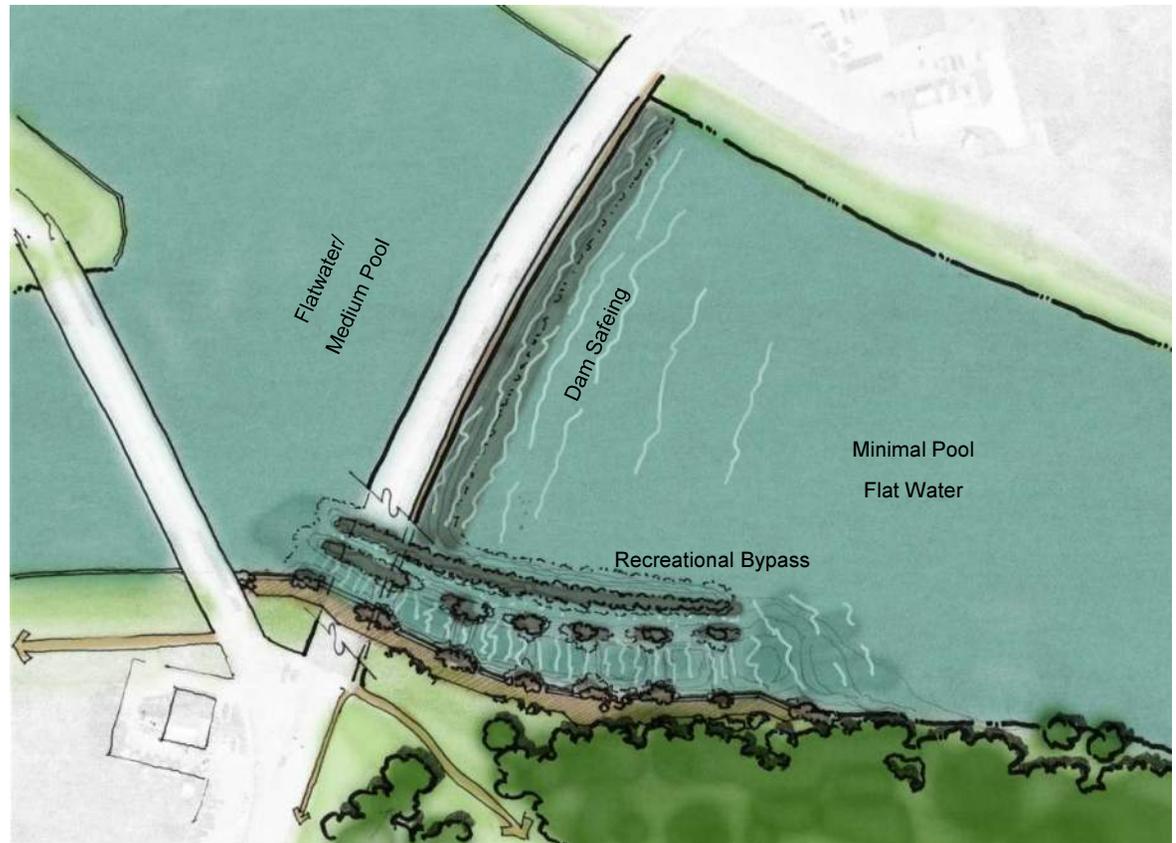
Scott Avenue > Alternative 1 Concept Diagram

Downtown Des Moines Water Trails Engineering Study



Scott Avenue > Alternative 2 Concept Diagram

Downtown Des Moines Water Trails Engineering Study



Scott Avenue > Preliminary Comparative Budgets

Downtown Des Moines Water Trails Engineering Study



Recreation Alternative 1	Comparative Budget
In-River Improvements	\$11–22 million
Upland Amenities	\$5–8 million
Total	\$16–30 million



Recreation Alternative 2	Comparative Budget
In-River Improvements	\$10–20 million
Upland Amenities	\$4–6 million
Total	\$14–26 million



Dam Safeing Alternative 3	Comparative Budget
In-River Improvements	\$6–11 million
Upland Amenities	\$1–3 million
Total	\$7–14 million



Project Overview > Feedback

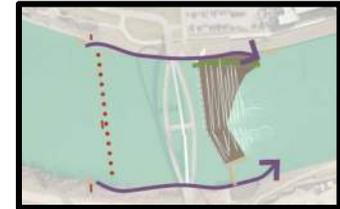
Downtown Des Moines Water Trails Engineering Study

Center Street

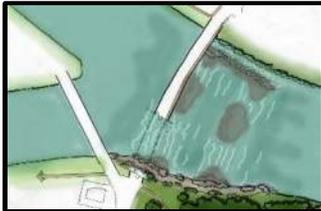


- Alternative 1: \$34 – 63M**
 Big River Experience with Adventure Park
- Highest Economic Potential
 - Greatest outdoor active sports amenity
 - Parking & Access Opportunities
 - Highest Cost
 - Existing Utilities in east bank
 - Fish passage on one side of river

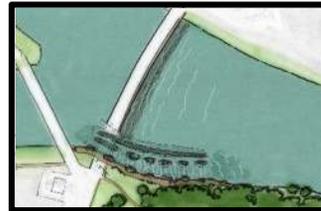
Alternative 3: \$8 – 14M
 Dam Safeing



Scott Avenue

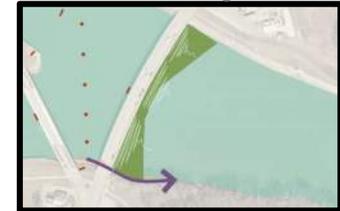


- Alternative 1: \$16 – 30M**
 Big River Experience
- Fish Passage on north side of river
 - 2 Fixed Drops with recreational chutes



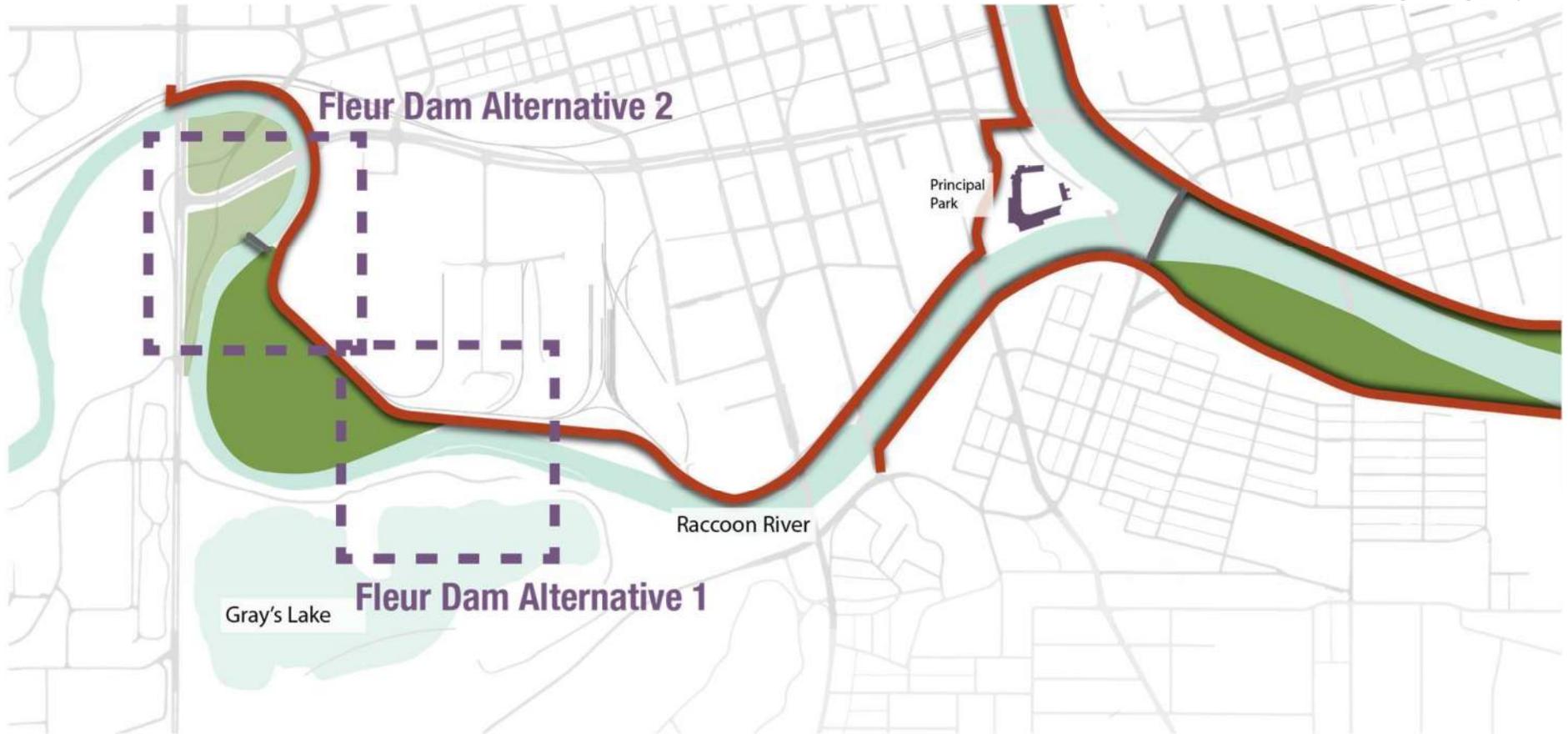
- Alternative 2: \$14 – 26M**
 Recreational Bypass
- Fish passage and recreation concentrated on south side of river
 - Dam Safeing steps on remainder of River
 - More adaptive to changing tailwater

Alternative 3: \$7 – 14M
 Dam Safeing



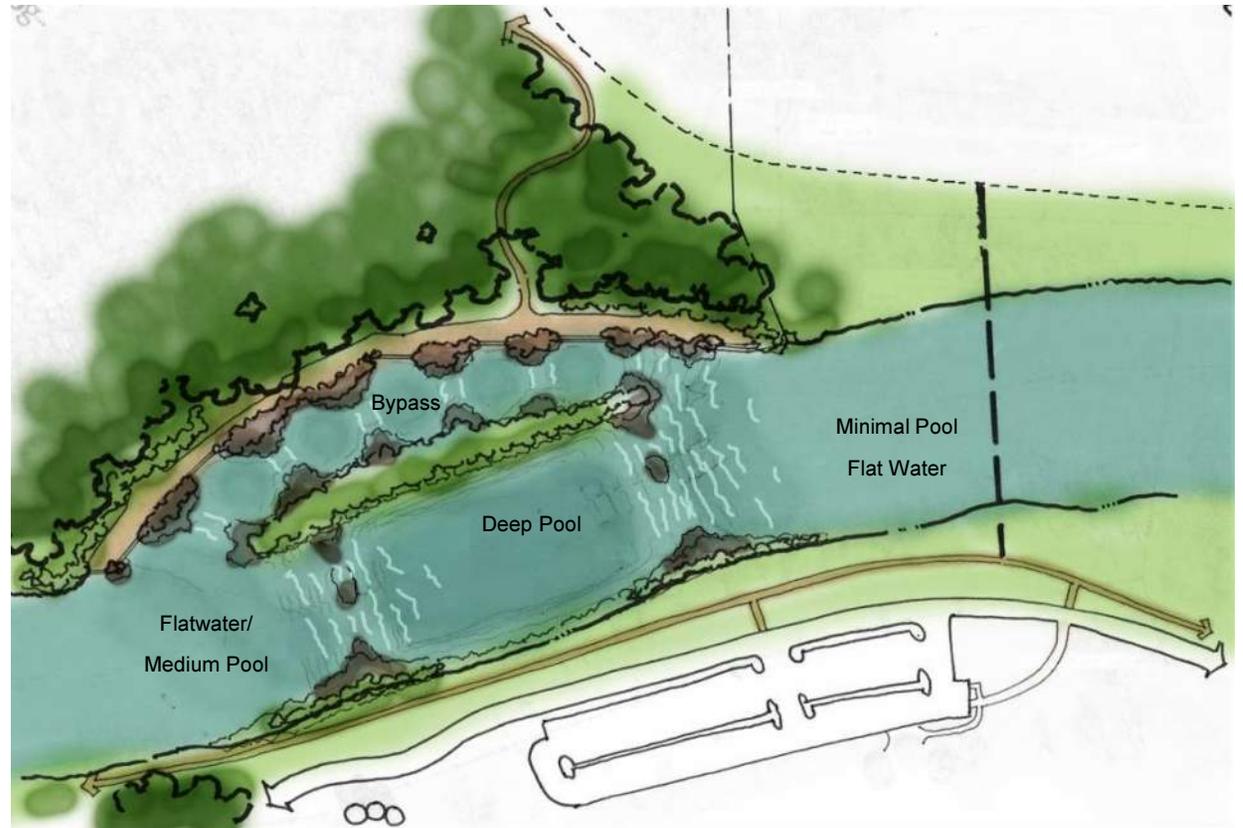
Fleur Dam > Alternate Locations

Downtown Des Moines Water Trails Engineering Study



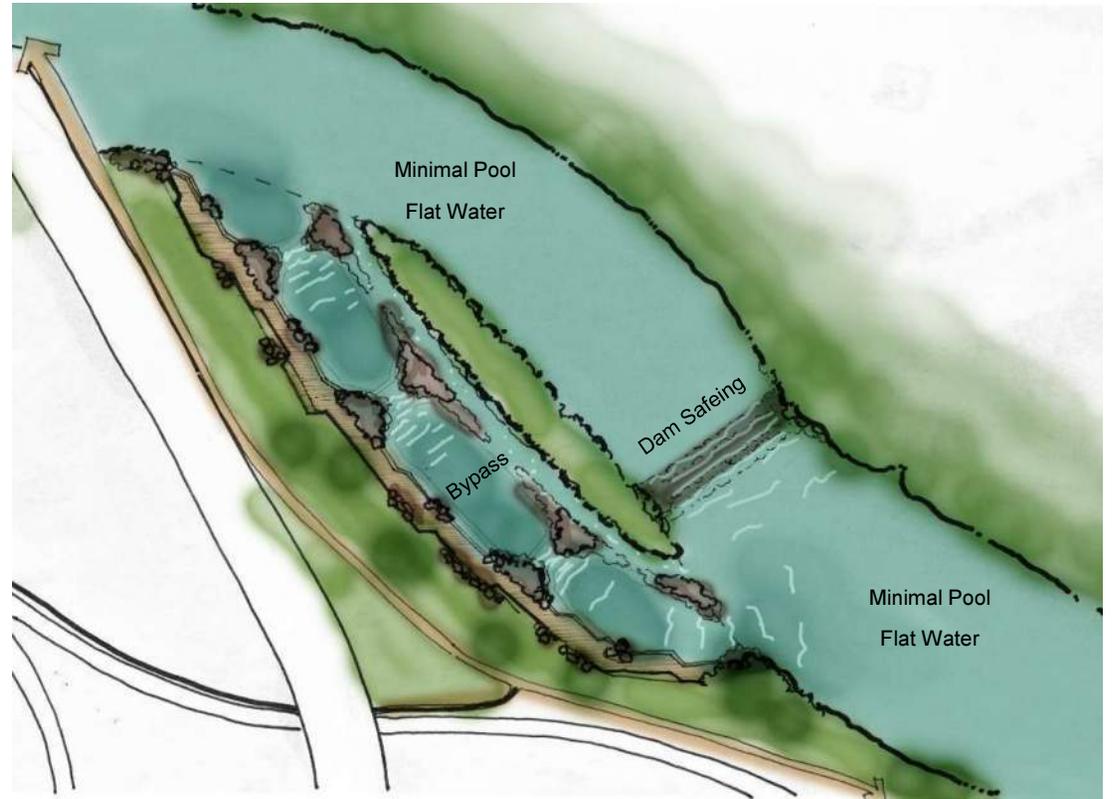
Fleur Dam > Alternative 1 Concept Diagram

Downtown Des Moines Water Trails Engineering Study



Fleur Dam > Alternative 2 Concept Diagram

Downtown Des Moines Water Trails Engineering Study



Fleur Dam > Preliminary Comparative Budgets

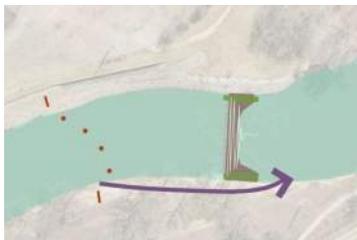
Downtown Des Moines Water Trails Engineering Study



Recreation Alternative 1	Comparative Budget
In-River Improvements	\$17–33 million
Upland Amenities	\$5–8 million
Total	\$22–41 million



Recreation Alternative 2	Comparative Budget
In-River Improvements	\$15–28 million
Upland Amenities	\$4–6 million
Total	\$19–34 million



Dam Safeing Alternative 3	Comparative Budget
In-River Improvements	\$3–6 million
Upland Amenities	\$1–3 million
Total	\$4–9million



Project Overview > Feedback

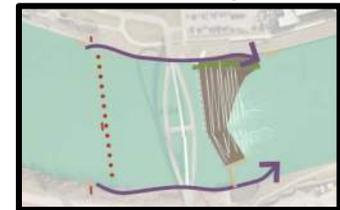
Downtown Des Moines Water Trails Engineering Study

Center Street

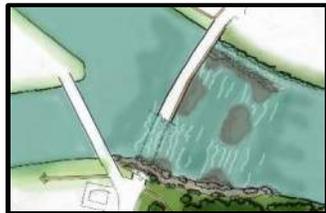


- Alternative 1: \$34 – 63M**
 Big River Experience with Adventure Park
- Highest Economic Potential
 - Greatest outdoor active sports amenity
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 - Highest Cost
 - Existing Utilities in east bank
 - Fish passage on one side of river

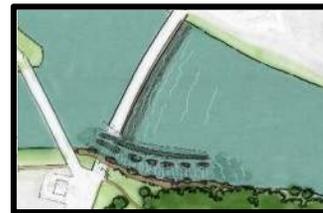
Alternative 3: \$8 – 14M
 Dam Safeing



Scott Avenue

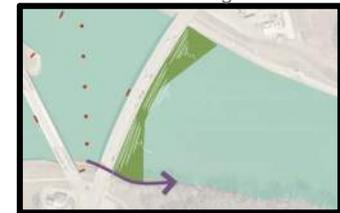


- Alternative 1: \$16 – 30M**
 Big River Experience
- Fish Passage on north side of river
 - 2 Fixed Drops with recreational chutes



- Alternative 2: \$14 – 26M**
 Recreational Bypass
- Fish passage and recreation concentrated on south side of river
 - Dam Safeing steps on remainder of River
 - More adaptive to changing tailwater

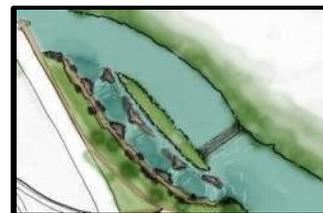
Alternative 3: \$7 – 14M
 Dam Safeing



Fleur Drive

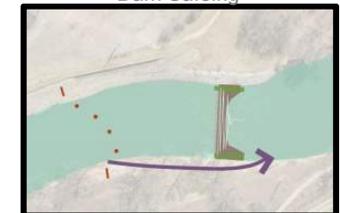


- Alternative 1: \$22 – 41M**
 Big River Experience and Bypass
- Range of recreational opportunities
 - Low flow bypass for recreation and fish passage
 - Existing Fleur Dam becomes navigable
 - Levee mitigation likely required



- Alternative 2: \$19 – 34M**
 Recreational Bypass
- Limited parking and access
 - Fish Passage between bypass and dam
 - Dam Safeing steps on remainder of River

Alternative 3: \$4 – 9M
 Dam Safeing



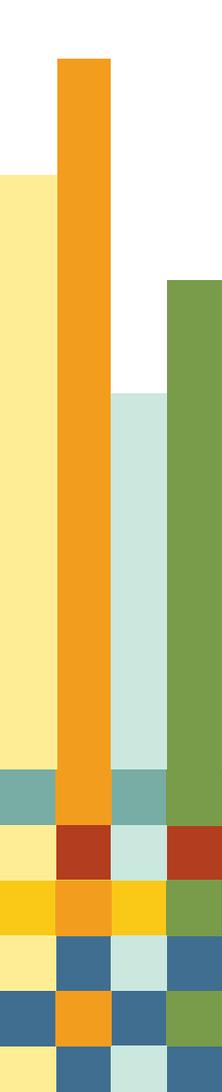
Summary of Workshop No. 4

The stakeholders were divided by table and given time to review alternatives. After time for answering questions and discussion, the room unanimously selected the following alternatives:

- Center Street Alternative 1
- Scott Avenue Alternative 1
- Fleur Drive at Gray's Lake Alternative 1



D.6 – WORKSHOP #5 PRESENTATION



DES MOINES AREA MPO

Greater Des Moines Water Trails and Greenways Advisory Committee

January 24, 2018

January 24, 2018 Agenda



1. Call To Order and Introductions
2. Approval of Agenda
3. Regional Study Update
4. Downtown Study Update
5. Communications Update
6. Other Announcements or Non-Action Items
7. Next Meeting Date – TBD
8. Adjournment

REGIONAL STUDY



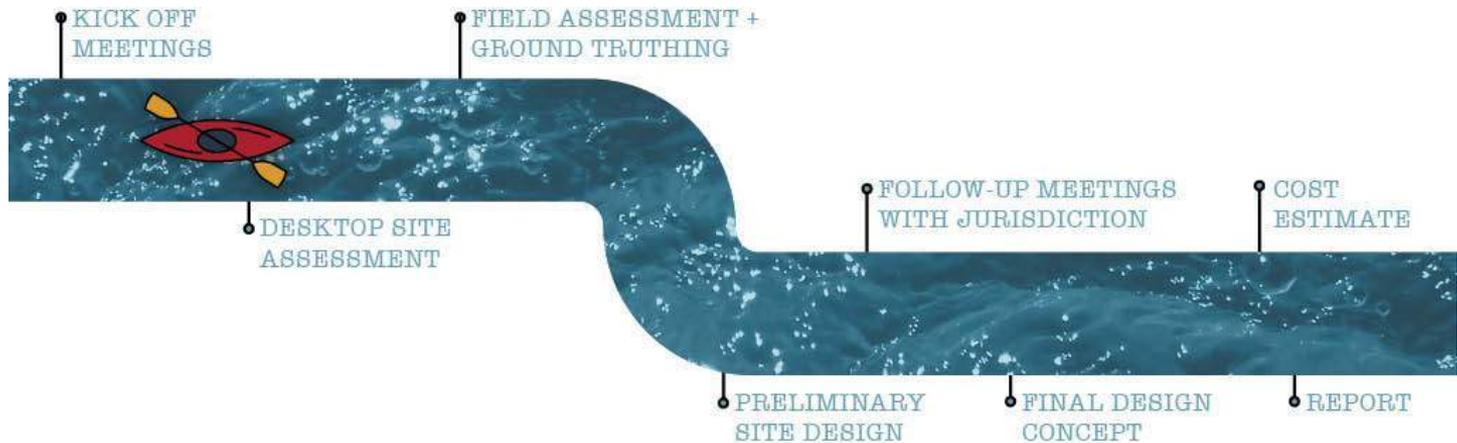
GREATER DES MOINES

WATER TRAILS + GREENWAYS



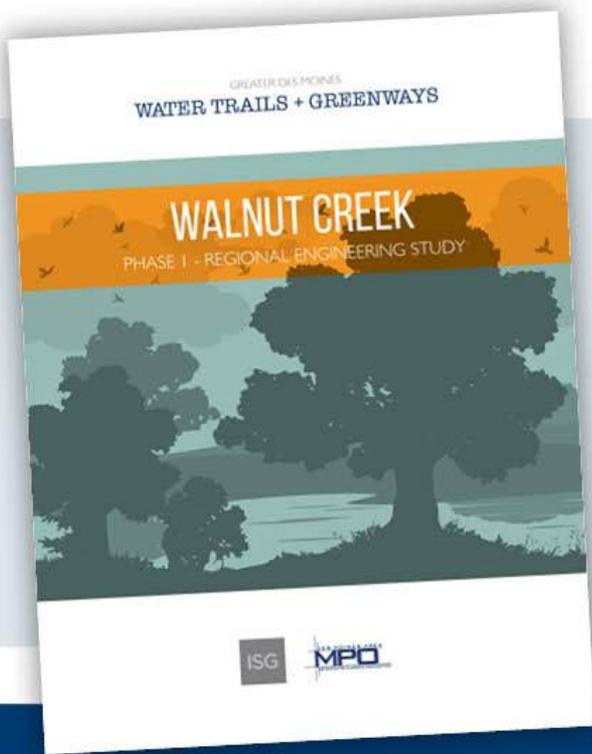


PROCESS





REPORTS





SITES



WALNUT CREEK





SITES



WALNUT CREEK

ISG

DES MOINES AREA
MPO
METROPOLITAN PLANNING ORGANIZATION

ISG



SITES



WALNUT CREEK

ISG



ISG



SITES



NORTH RIVER

ISG



ISG

SITES



DES MOINES RIVER

ISG

DES MOINES AREA
MPO
METROPOLITAN PLANNING ORGANIZATION



SITES



FOURMILE CREEK

ISG

DES MOINES AREA
MPO
METROPOLITAN PLANNING ORGANIZATION

ISG



SITES



SKUNK RIVER CHICHAQUA BOTTOMS





SITES



SKUNK RIVER CHICHAQUA BOTTOMS





SITES



RACCOON RIVER





SITES



RACCOON RIVER



SITES



RACCOON RIVER

ISG

DES MOINES AREA
MPO
METROPOLITAN PLANNING ORGANIZATION



SITES



BEAVER CREEK

ISG



ISG



GREATER DES MOINES WATER TRAILS + GREENWAYS

THANK YOU!



ISG



DOWNTOWN STUDY



Downtown Des Moines Water Trails Engineering Study

Workshop #5
January 24, 2018



Today's Objective:

- Present the draft Final Presentation
 - Project Overview
 - Refined Concepts
 - Next Steps
- Collect comments and feedback for Final Presentation

Meeting #6 (Spring):

- Facilitate a public event to present Final Presentation
- Water Trails Advisory Committee final debrief meeting



Project Overview > Meetings

Downtown Des Moines Water Trails Engineering Study

Workshop #1: Project Overview

Schedule, constraints, and objectives

Workshop #2: Reviewed Concept Alternatives

Presented 9 alternatives, identified opportunities and challenges

Workshop #3: Reviewed Final Alternatives

Dam Debate III, collected polls on recreational scenarios

Workshop #4: Selected Alternatives

Committee unanimously selected Alternative 1 at each site



Project Overview > Meetings

- Des Moines Area MPO
- Des Moines Water Works
- City of Des Moines
 - Public Works
 - Community Development
 - Economic Development
 - Engineering
 - Police, Fire
 - Parks & Recreation
- IDNR
- ISG
- SHPO
- California Skateparks
- Environmental Roundtable
- City Council
- Field Trips to Boise & Columbus

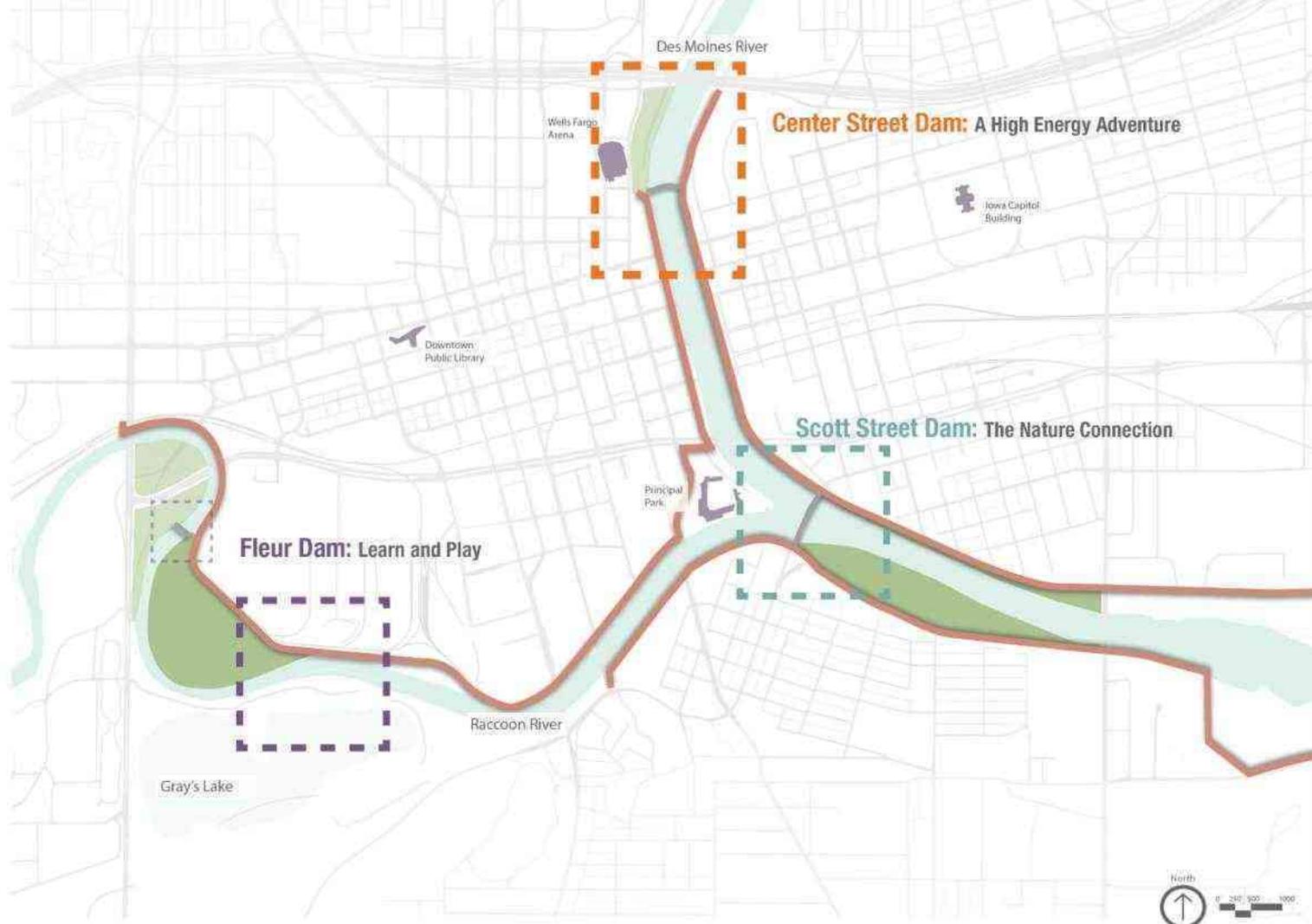
Downtown Des Moines Water Trails Engineering Study



IOWA DEPARTMENT OF
NATURAL RESOURCES







Refined Concepts

Downtown Des Moines Water Trails Engineering Study

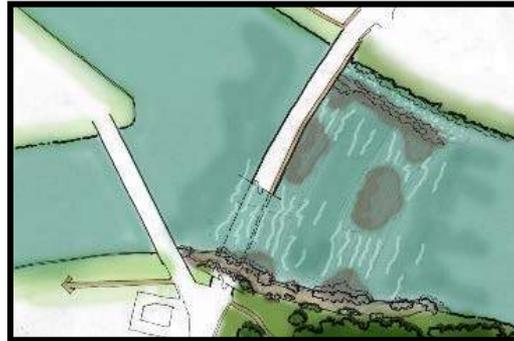
Center Street

A High Energy Adventure



Scott Avenue

The Nature Connection



Fleur Drive

Learn and Play



- Selected by Water Trails Advisory Committee
- Promote recreation, water awareness and education
- Water activities can be tuned for a desired user group within reason during future design phases



Criteria



Photo Credit: Des Moines Register



- 1) Eliminate overly retentive hydraulic hazards at dams
- 2) No adverse impact to regulatory floodplain
- 3) Maintain required minimum existing pool levels upstream of Center Street and Fleur Dams
- 4) Fish Passage
- 5) No modifications to existing bridges and levees

Criteria > Eliminate overly retentive hydraulic hazards at dams

Downtown Des Moines Water Trails Engineering Study



Project proposes to **remove existing dams** and replace with multiple, navigable drops

Project proposes to **flood existing dam** with a deep flatwater pool



Criteria > Maintain required minimum existing pool levels

Downtown Des Moines Water Trails Engineering Study



Center Street

Flashboards Required

- Target Pool Elevation: 787.1'
- Birdland Marina
- Des Moines Water Works Intake Pipes near Prospect Park



Scott Avenue

- Target existing headwater elevations
- Provides visual benefits



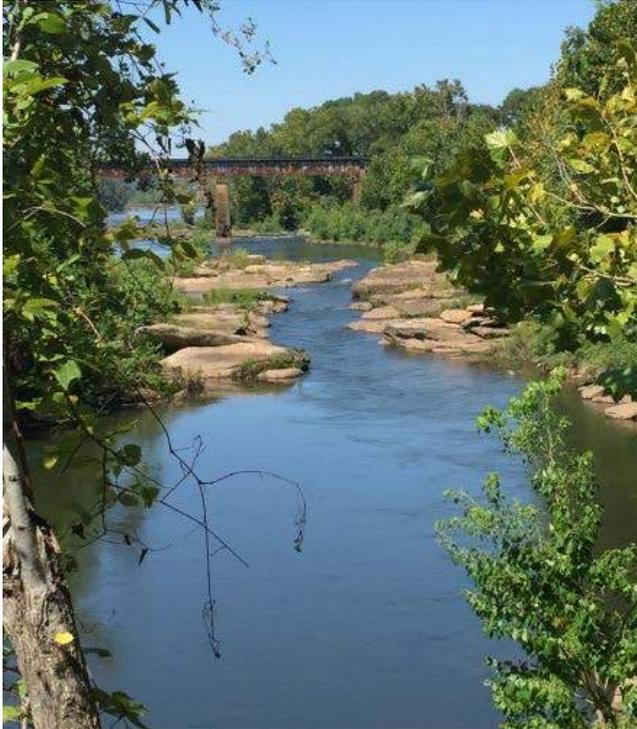
Fleur Drive

Flashboards Required

- Target Pool Elevation: 784.3'
- Des Moines Water Works Intake
- Increases surcharging of ground water tables needed for the DMWW's infiltration galleries



Fish passage and fishing access are proposed at all sites



- Operate year-round
- Active during low flows
- Provide a variety of velocities & depths
- Provide deep holes & pockets
- 20:1 Maximum hydraulic slope
- 6 inches minimum water depth

Criteria > No adverse impact to regulatory floodplain

Downtown Des Moines Water Trails Engineering Study

- Alternatives must meet “no-rise” criteria for regulatory 100-year floodplain
- Alternatives must not impact levee performance for all flood flows up to the top of levee
- Alternatives balance floodway fill with dam removal to meet criteria
- Center and Fleur alternative rely on variable crest dams (flashboards) to meet criteria



Center Street Dam > 2D Modeling (Low Flow – 80% Exceedence)

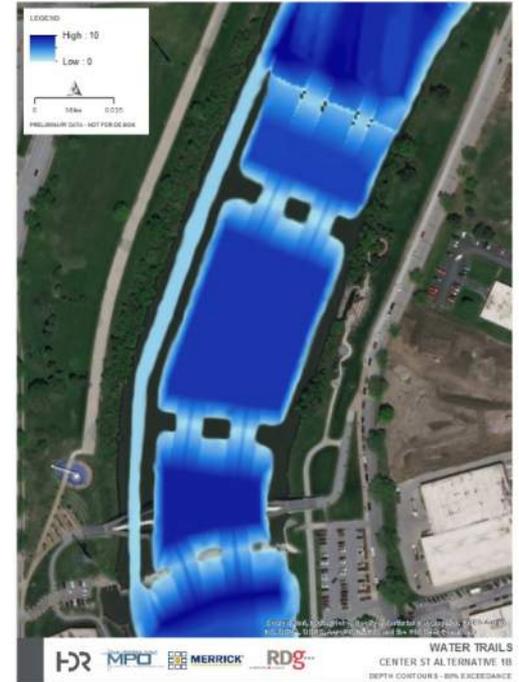
Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)

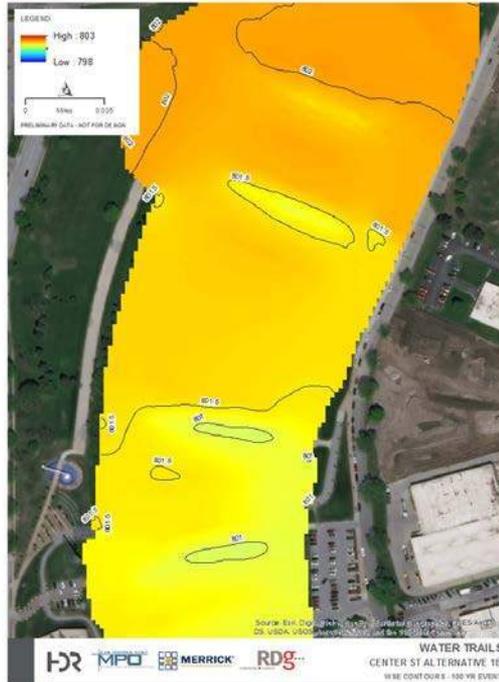


Depths (ft)

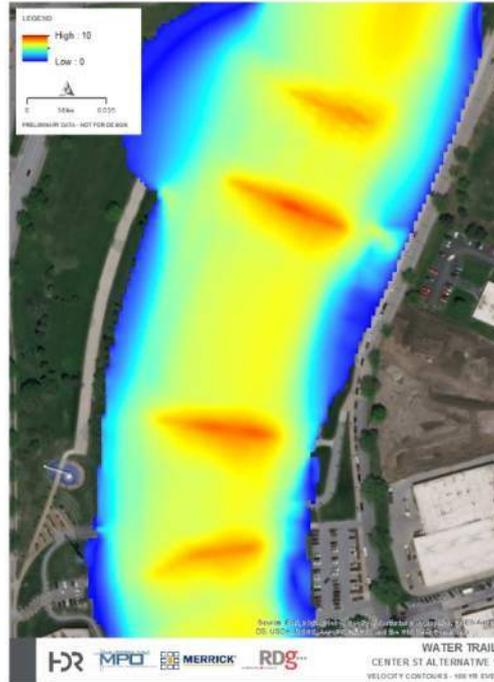


Center Street Dam > 2D Modeling (100-yr event)

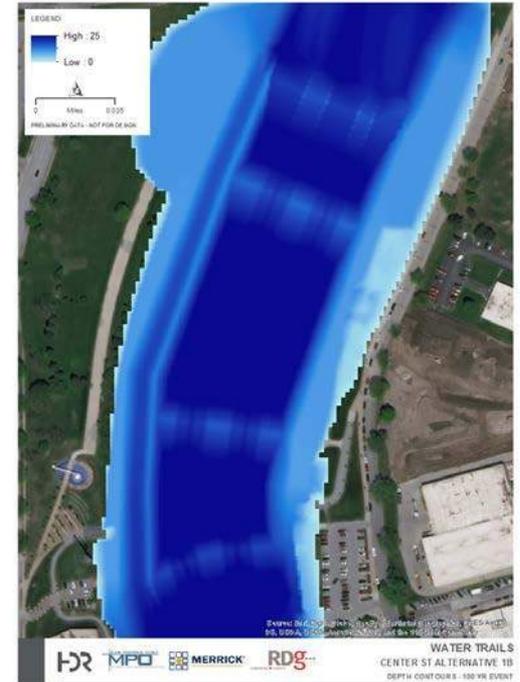
Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)

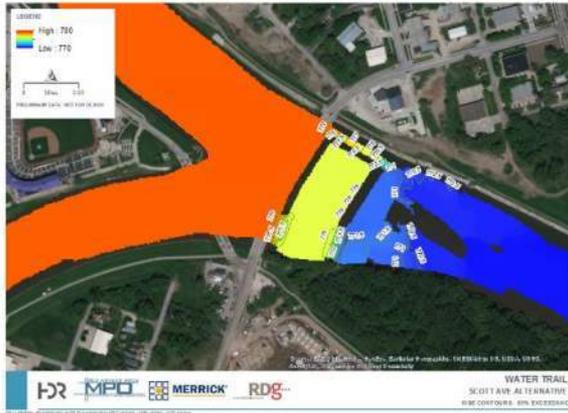


Depths (ft)

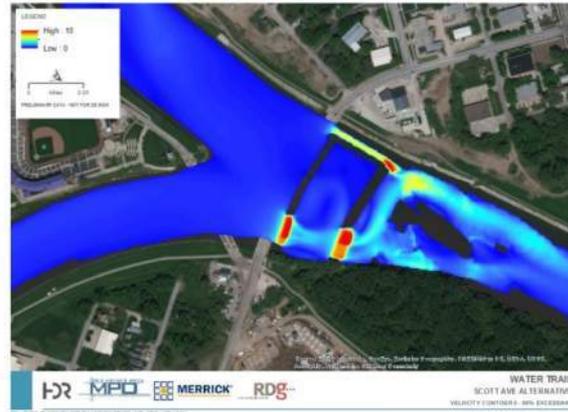


Scott Avenue Dam > 2D Modeling (Low Flow – 80% Exceedence)

Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)

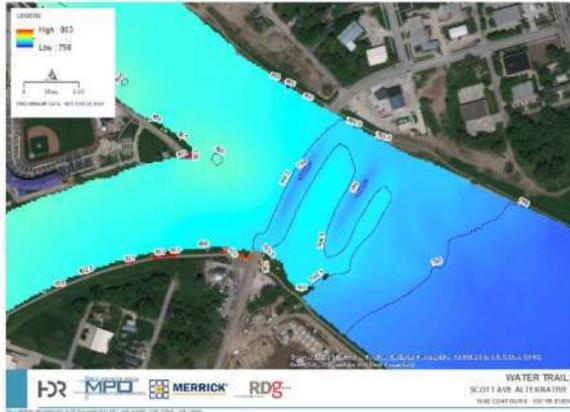


Depths (ft)

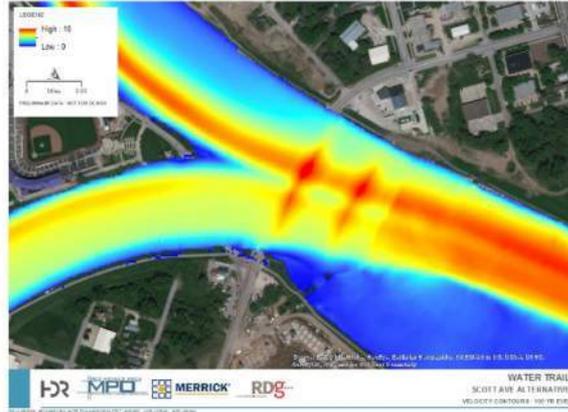


Scott Avenue Dam > 2D Modeling (100-yr event)

Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)



Depths (ft)

Fleur Dam > 2D Modeling (Low Flow – 80% Exceedence)

Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)

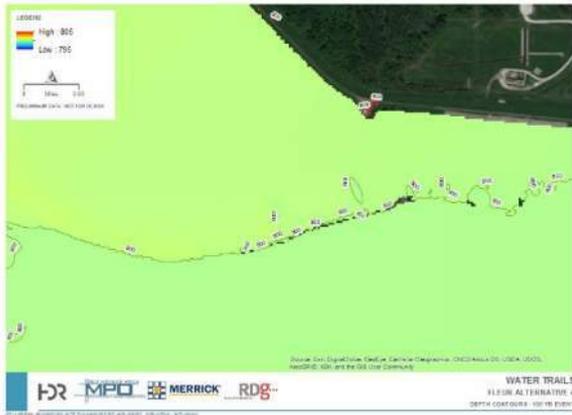


Depths (ft)

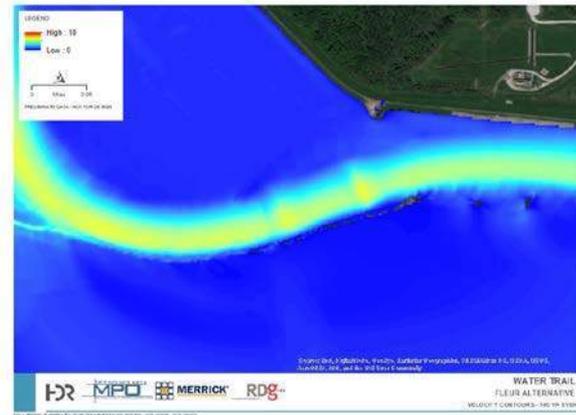


Fleur Dam > 2D Modeling (100-yr event)

Downtown Des Moines Water Trails Engineering Study



Water Surface Elevations (ft)



Velocities (fps)



Depths (ft)



Design Aspects > Water Quality

Downtown Des Moines Water Trails Engineering Study



- “Real-time” quality monitoring to be incorporated into final design
 - Bacteria levels require lab work, can not be monitored in real time
- Water quality data to be collected during preliminary design
- Des Moines River and Raccoon River partially meeting designated uses for primary contact (bacteria)

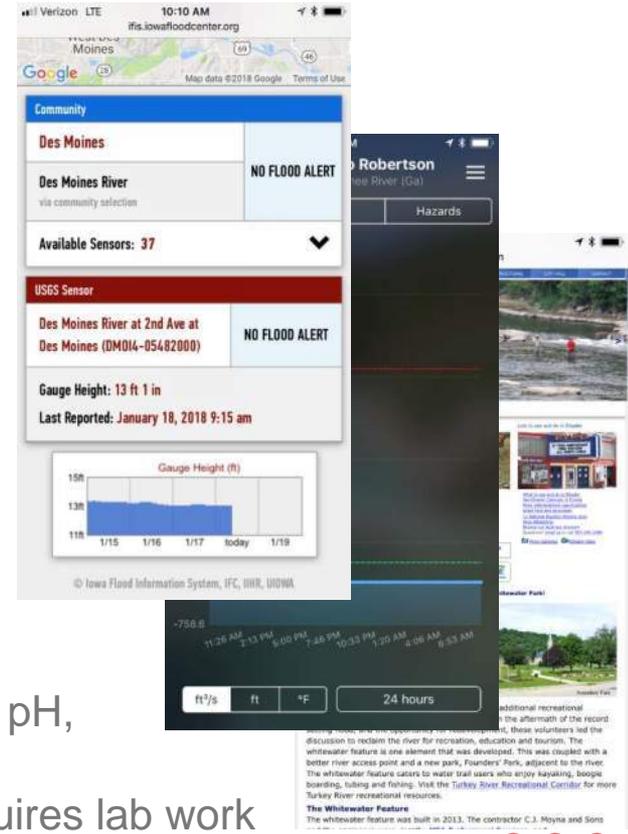


Design Aspects > Real-time Communications

Downtown Des Moines Water Trails Engineering Study

Communicate safety issues, river stages, water quality, recreational conditions, and other relevant news with the public

- Informational Websites:
 - Links to USGS Gage flow and stage
 - Live cameras, recorded videos
 - Social Media
- Iowa Flood Information System (IFIS)
 - Uses real-time stage sensors
 - Could provide stage, flows, velocities, available recreational features, water forecast, and warning info
- Iowa Water Quality Information System (IWQIS)
 - Currently at 77 sites monitored by USGS and IHR
 - Monitors nitrates, orthophosphates, dissolved oxygen, pH, conductivity, turbidity, temperature
 - Data such as bacteria is not available in real-time, requires lab work



Regulatory Permitting and Compliance

Downtown Des Moines Water Trails Engineering Study

Center Street



Section 408 - Alterations to Completed Federal Projects: Program that authorizes US Army Corps of Engineers to allow alterations to completed Federal Levee projects provided the changes are injurious to the public interest or will not impair the usefulness of the project.

Section 404 Wetlands - Clean Water Act: Program to regulate the discharge of dredge or fill material into waters of the US. National Environmental Protection Act (NEPA) compliance is required as a condition of the 404 permit. An Environmental Assessment will very likely be required for the project.

Section 401 Water Quality - Clean Water Act: Program to certify any discharge into waters of the US are compliant with applicable pollution standards. Required component of the Section 404 permit.

Endangered Species Act: Review of proposed actions impact on continued existence of any listed species or adverse impacts on their habitat. Impacts would need to be avoided or mitigated. Required component of the Section 404 permit.

Section 106 - National Historic Preservation Act: Program to identify type & magnitude of effects to the cultural & historic resources in the Area of Potential Effect; & require avoidance, minimize impacts and/or commensurate mitigation. Required component of the Section 404 permit. City of Des Moines Historic Preservation Commission action would be involved.

Flood Plain Construction: State floodplain construction permit program to regulate fill in the 100-year floodplain in compliance with National Flood Insurance Program ordinances & State of Iowa laws.

Dam Safety: Program requiring permit review & approval of construction of new dams, modifying existing dams, or the removal of dams in accordance with appropriate design criteria.

Sovereign Lands: Des Moines & Raccoon Rivers are classified under Iowa statutes as a meandered sovereign river. Construction on sovereign rivers or lands requires a Sovereign Lands Construction permit.

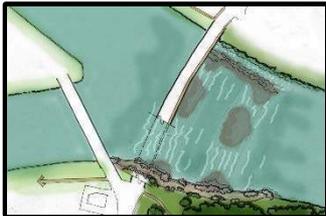
Flood Plain / Grading / Tree Mitigation / Urban Design Review Board / Planning and Zoning Commission: City permits, plans, reviews and approvals required for the project.

US Army Corps of Engineers
US Fish and Wildlife Service
City of Des Moines

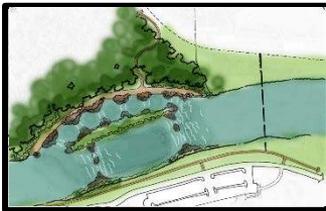
Iowa Department of Natural Resources
State Historic Preservation Office – Iowa



Scott Avenue



Fleur Drive



Design Aspects > Flashboards and Waveshapers

Downtown Des Moines Water Trails Engineering Study



- Maintains upstream pool elevations at Center Street and Fleur Drive
- Fundamental to meet “no-rise” criteria
- Navigate through Waveshaper
- Automated; Opens during high river flows



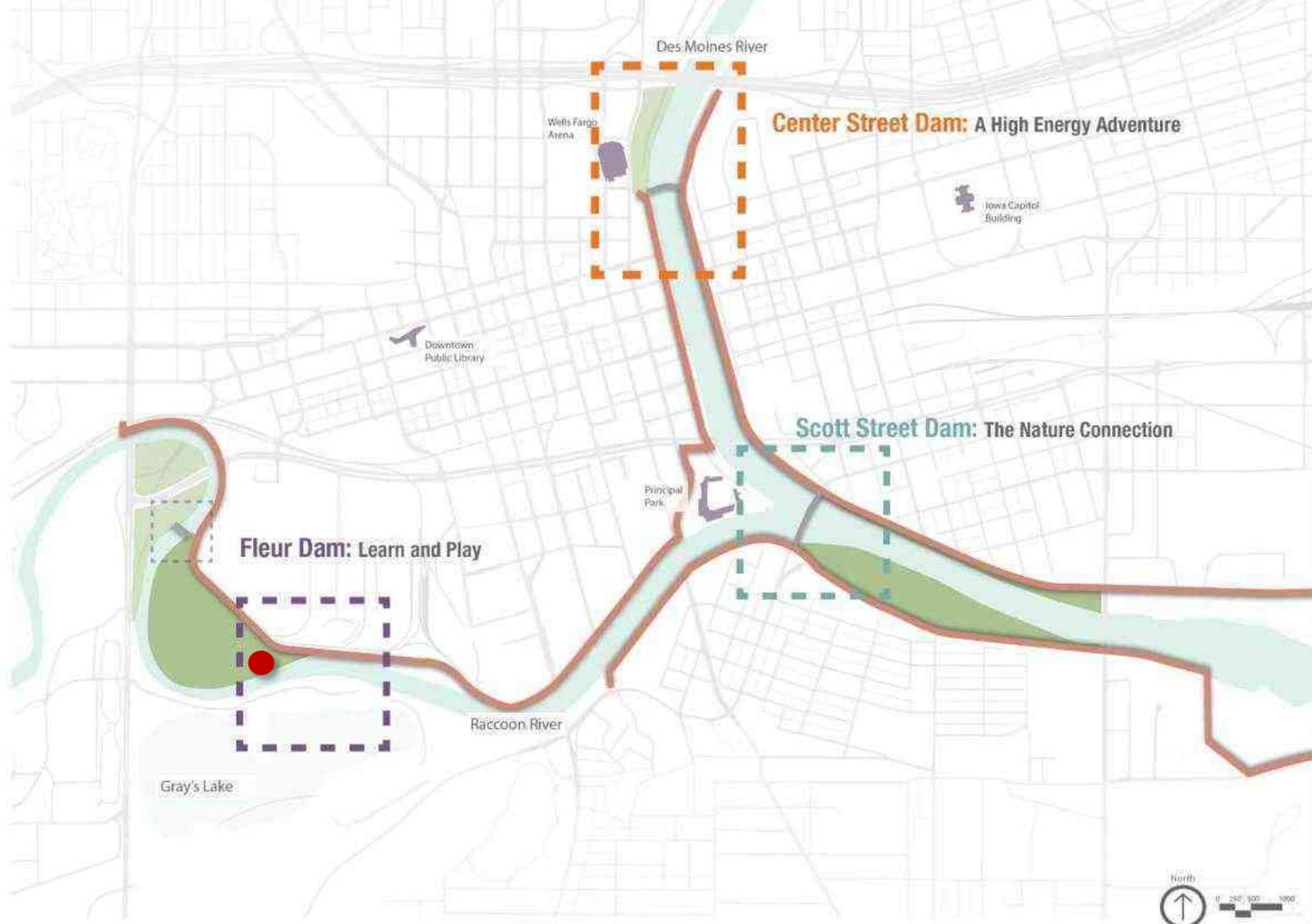
Design Aspects > Portage

Downtown Des Moines Water Trails Engineering Study



Portage paths available for any user to bypass whitewater

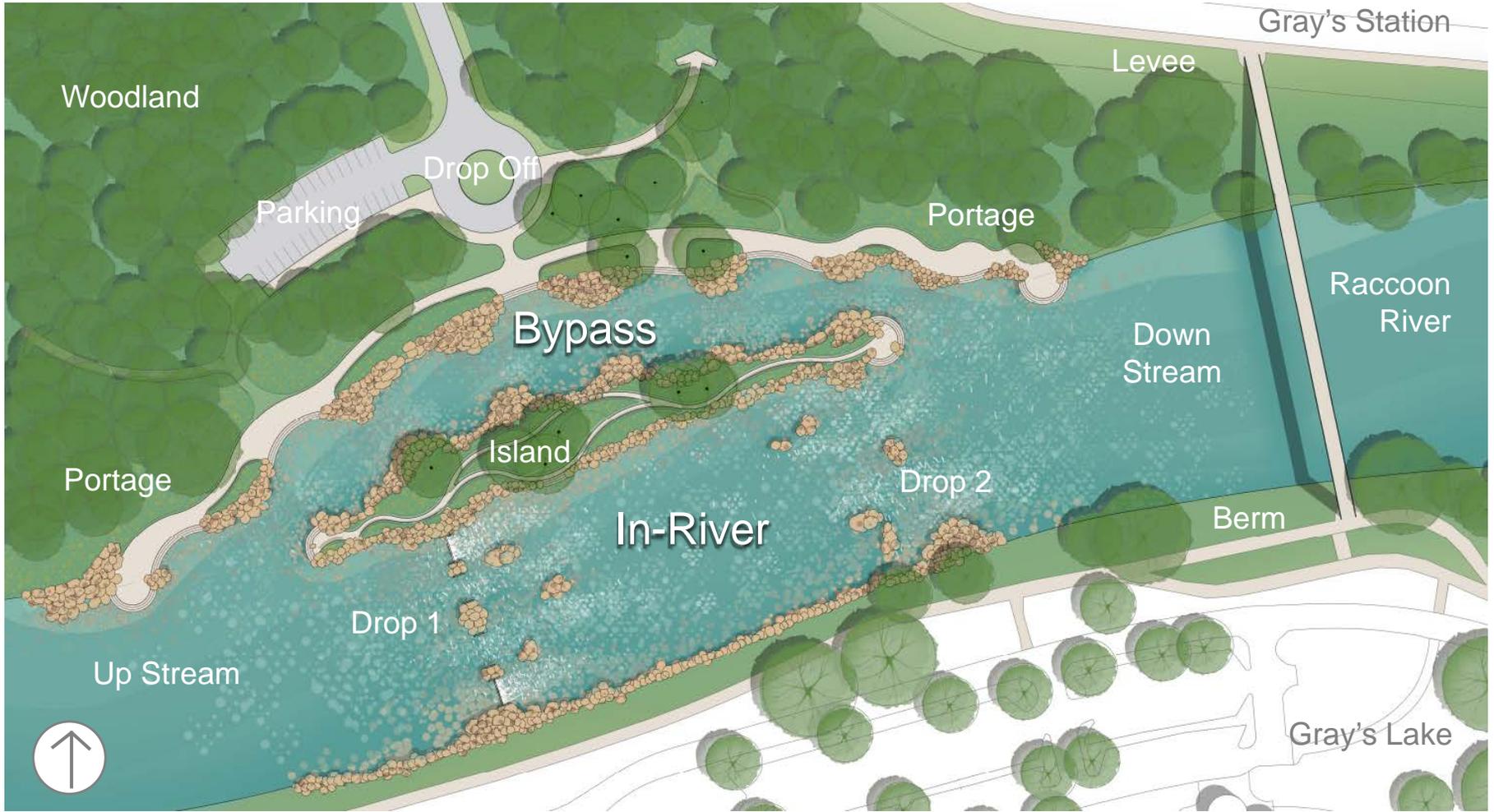




Fleur Drive Dam > Learn and Play



Fleur Drive Dam > Learn and Play



Fleur Drive Dam > Learn and Play



Fleur Drive Dam > Learn and Play

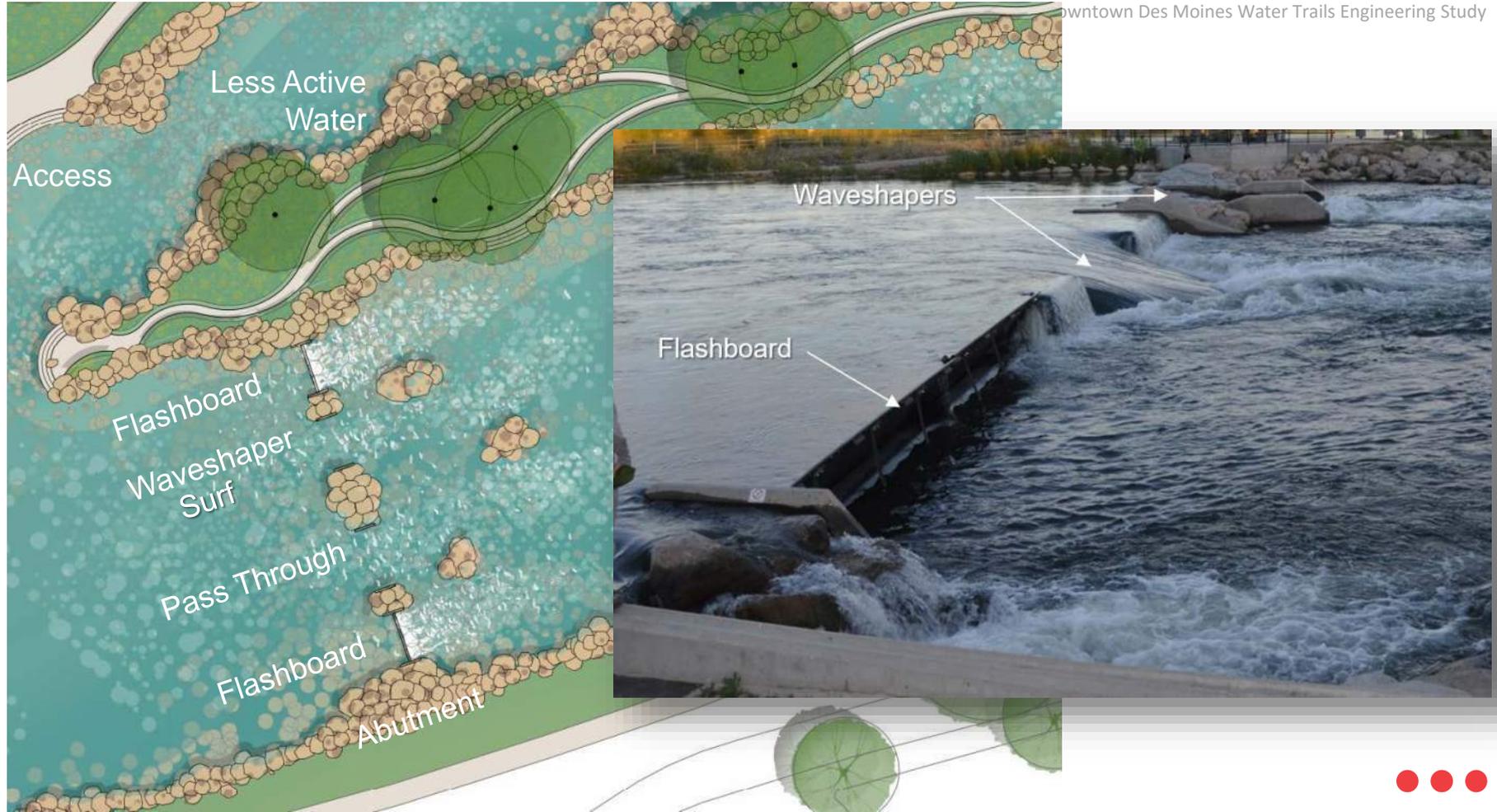


Fleur Drive Dam > Learn and Play

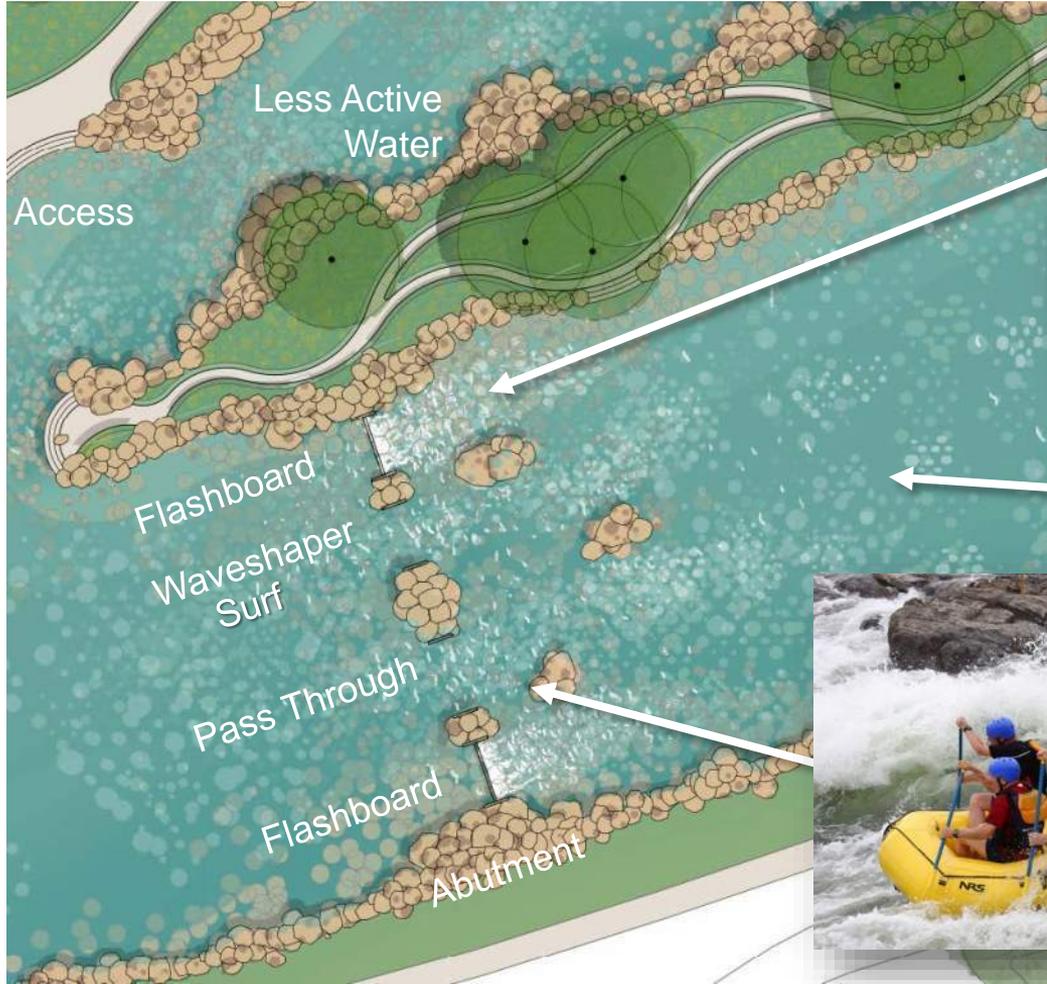


Fleur Drive Dam > Learn and Play

Downtown Des Moines Water Trails Engineering Study



Fleur Drive Dam > Learn and Play

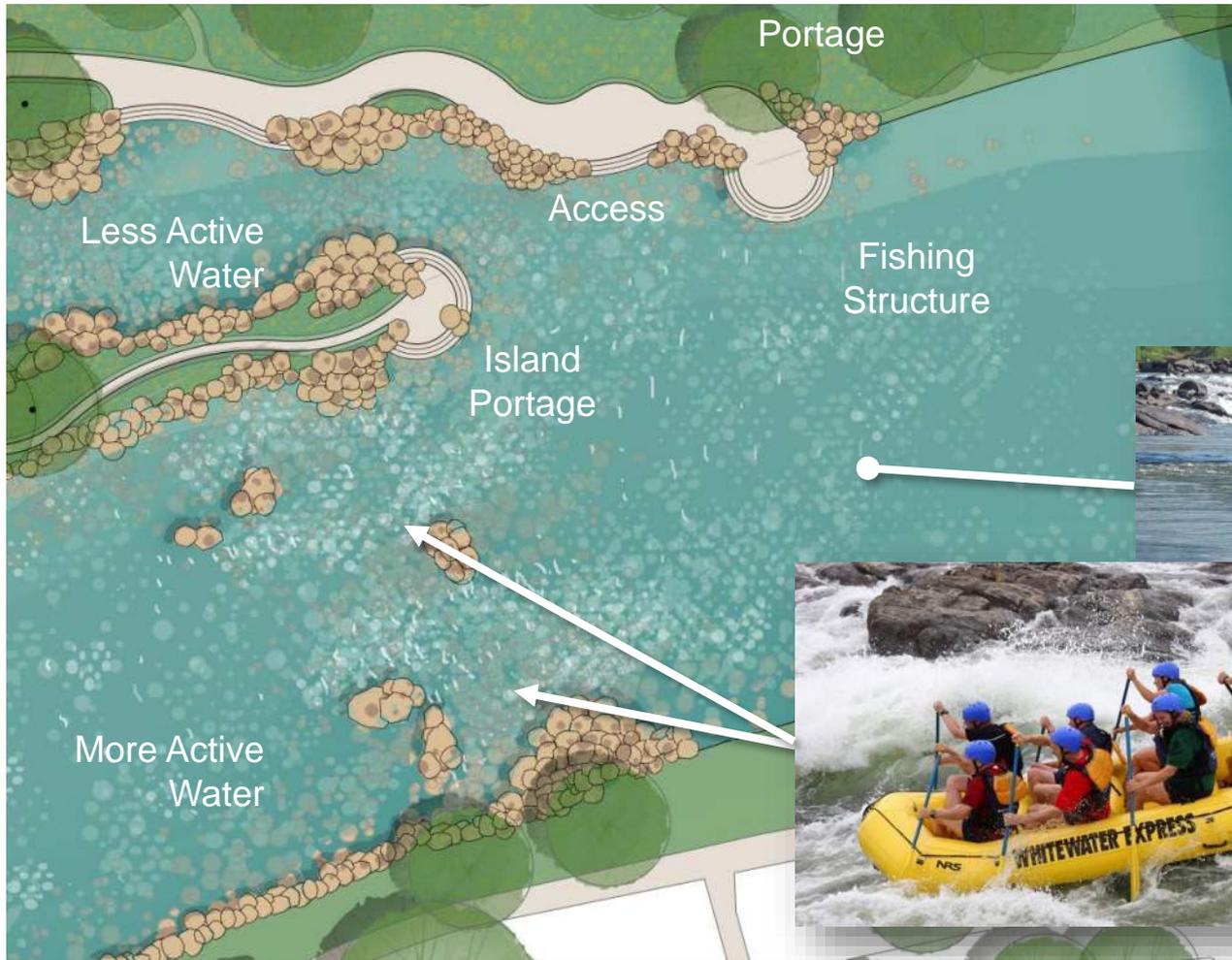


Fleur Drive Dam > Learn and Play



Fleur Drive Dam > Learn and Play

Downtown Des Moines Water Trails Engineering Study



Fleur Drive Dam > Flashboard Relocation

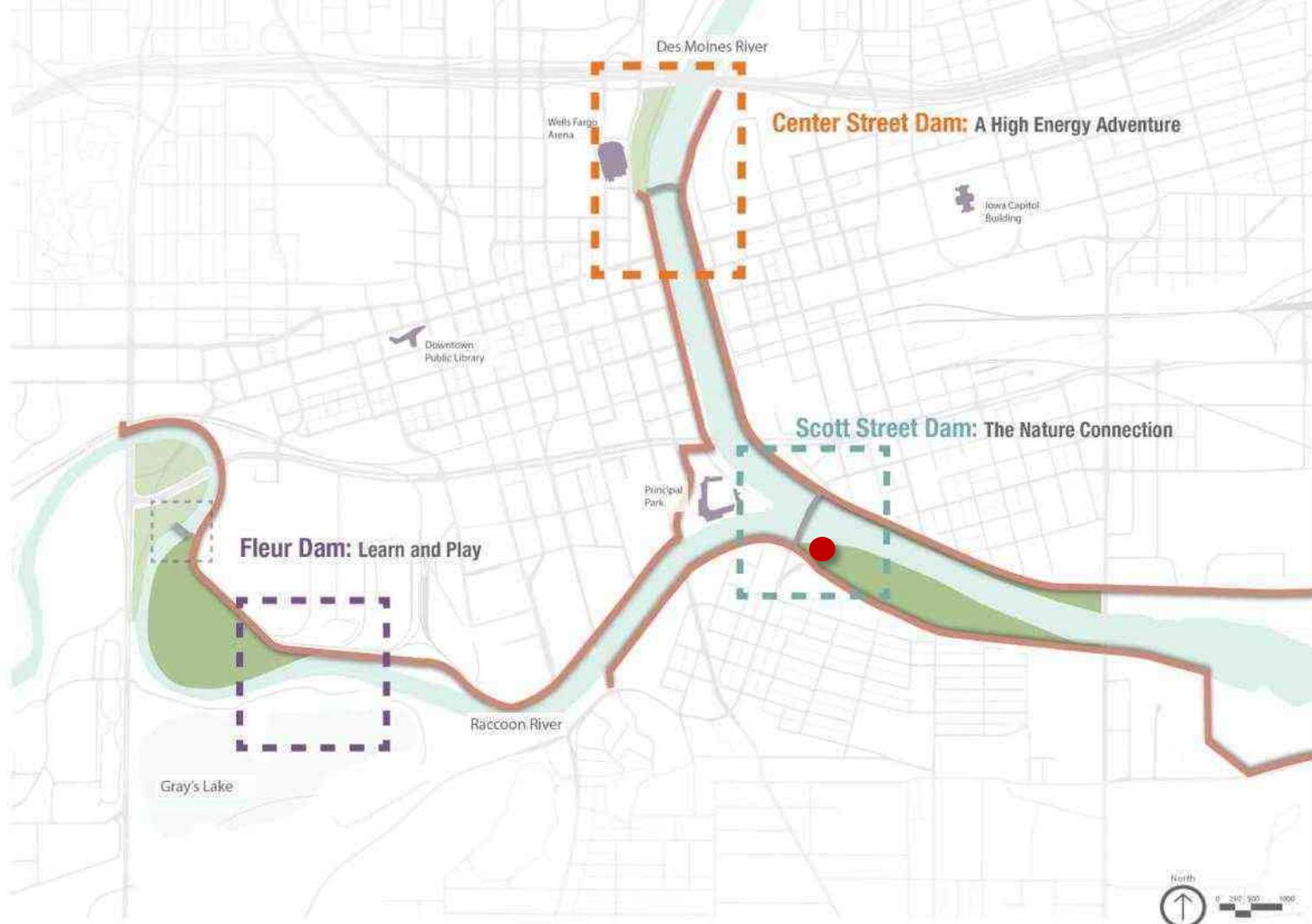
Downtown Des Moines Water Trails Engineering Study



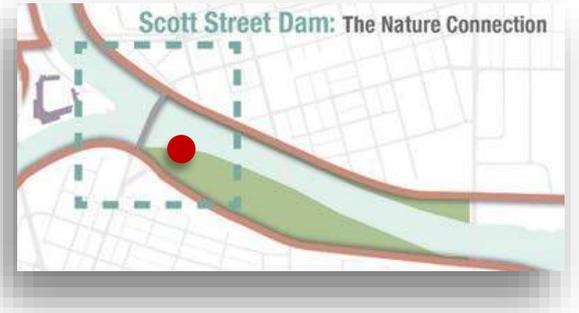
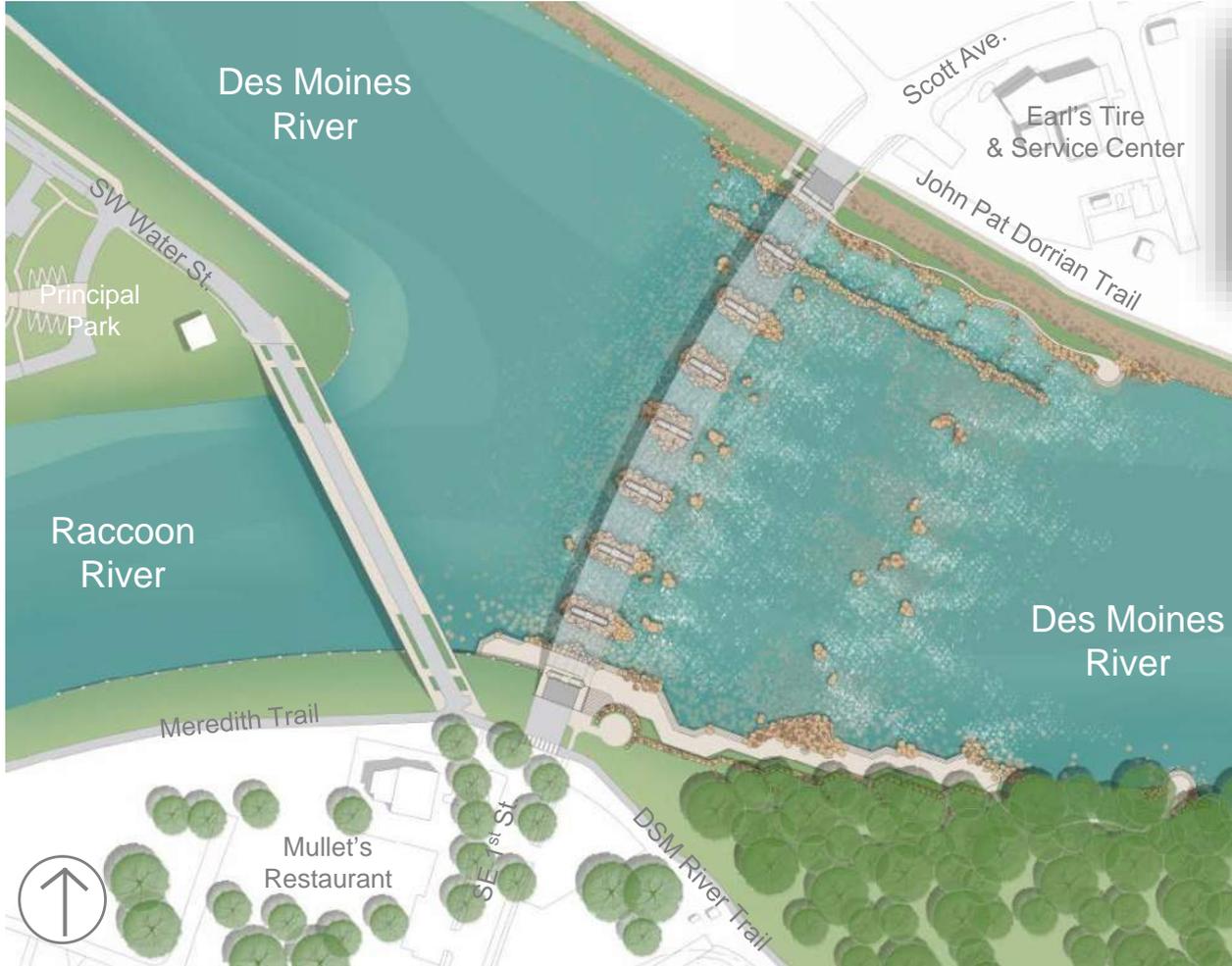
Fleur Drive Dam > Flashboard Relocation

Downtown Des Moines Water Trails Engineering Study



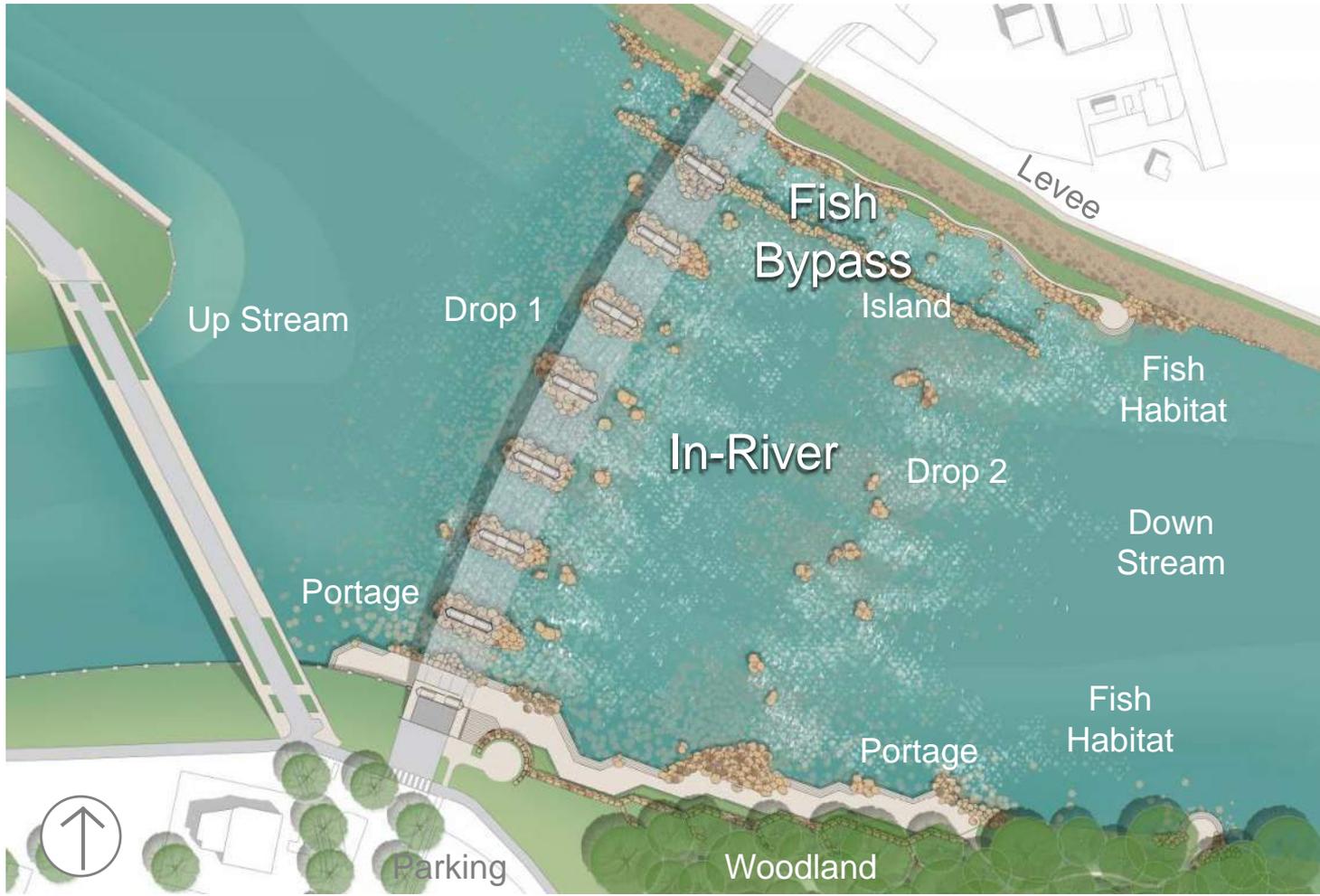


Scott Avenue Dam > The Nature Connection



Scott Avenue Dam > The Nature Connection

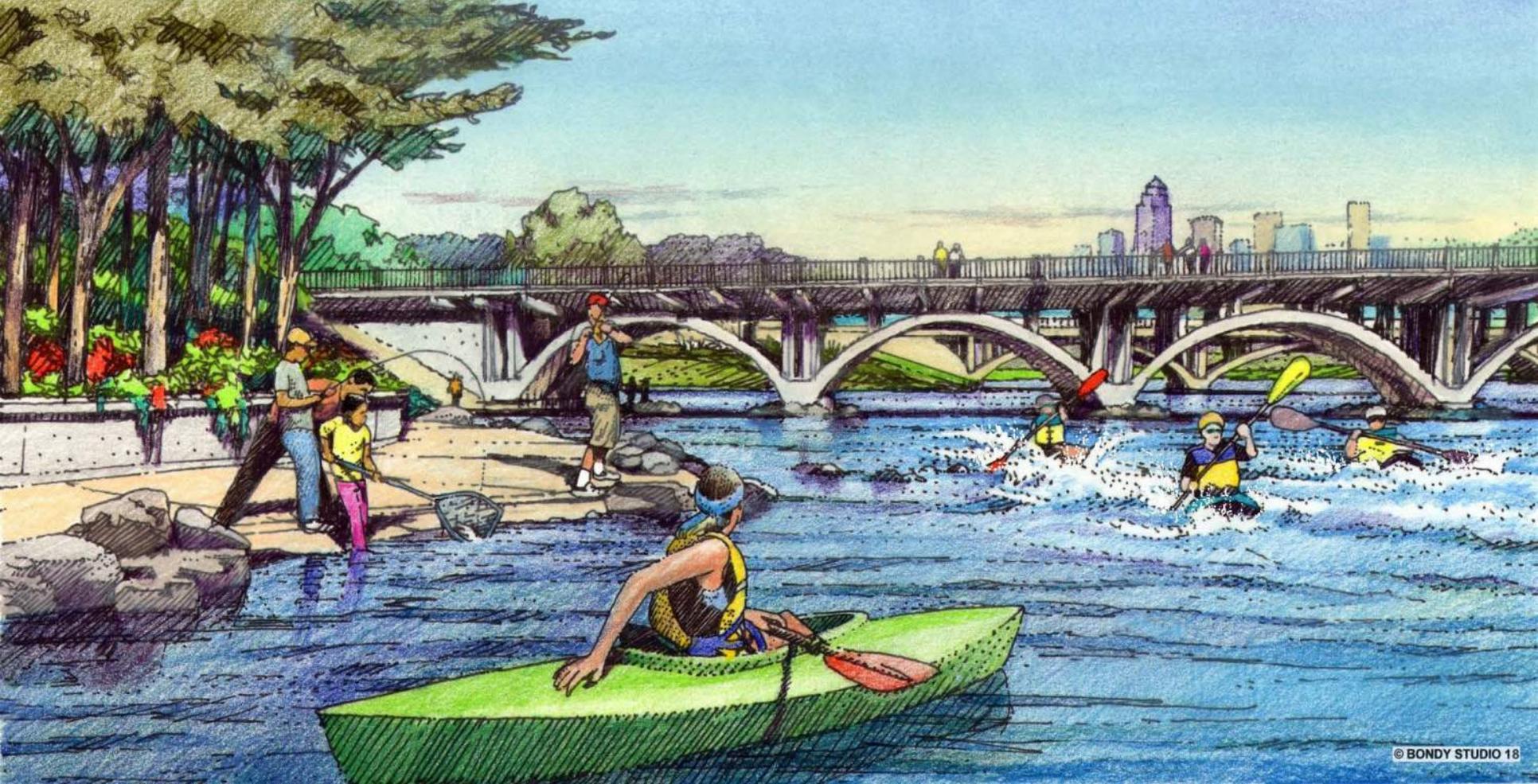
nes Water Trails Engineering Study



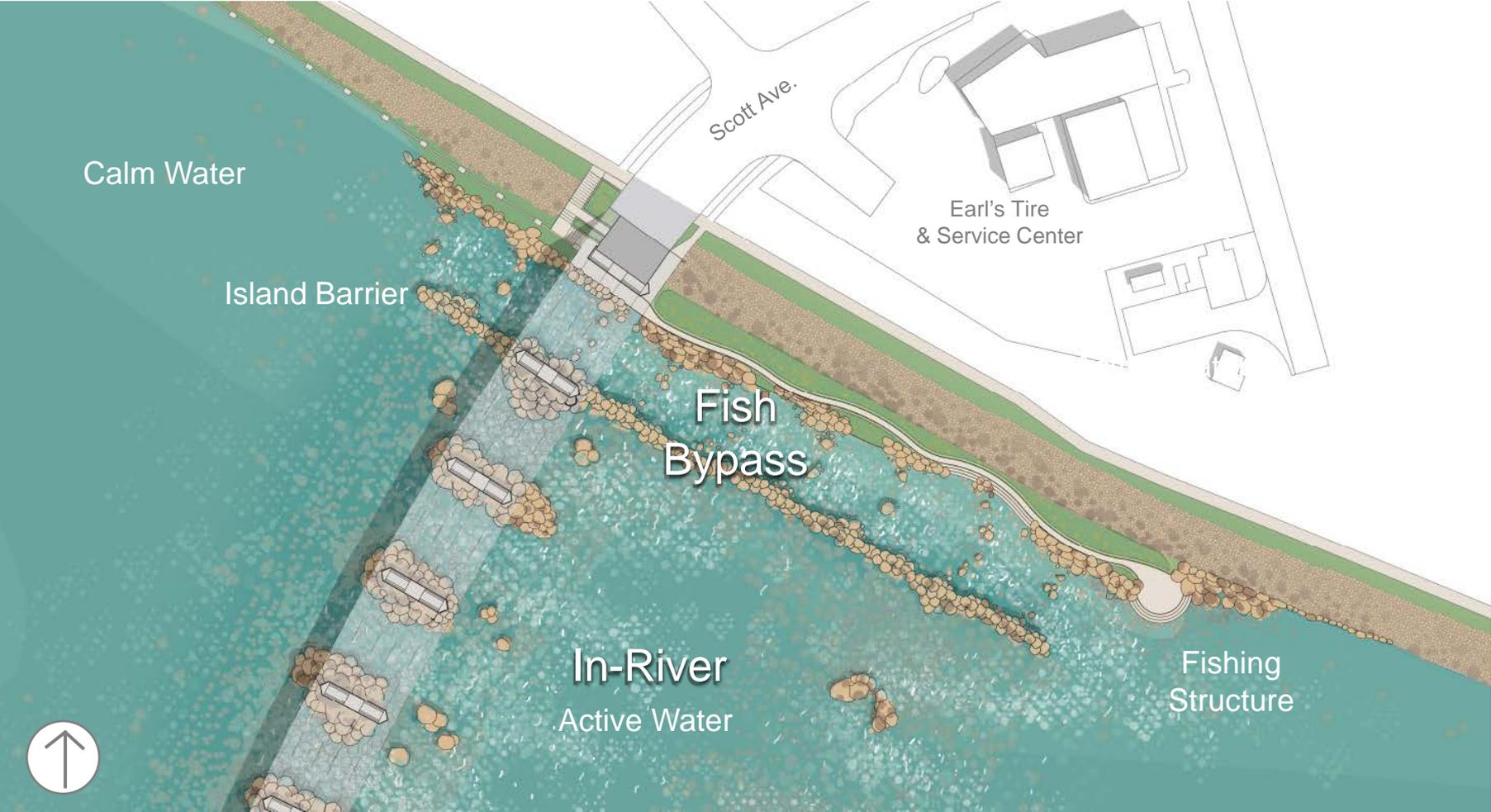
Scott Avenue Dam > The Nature Connection



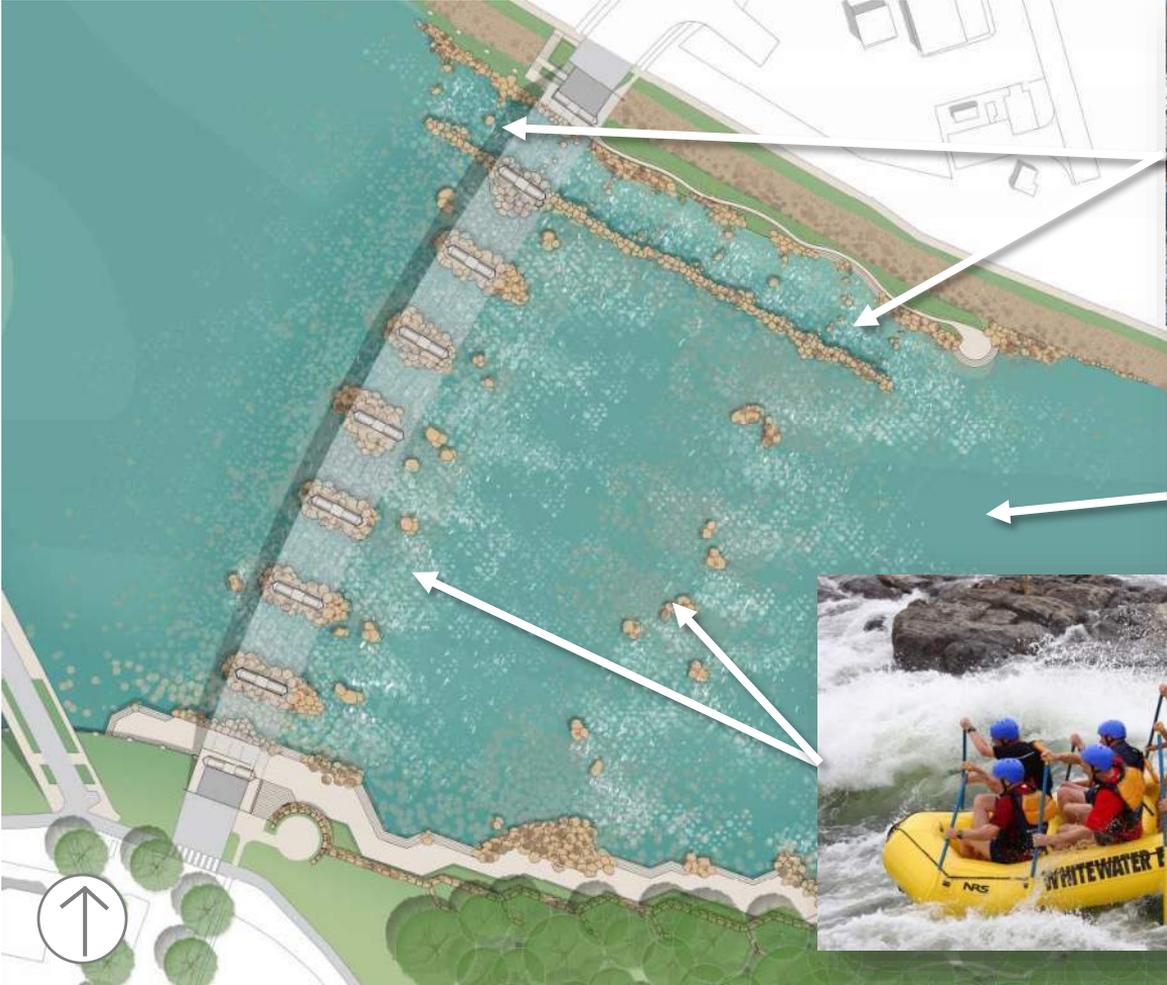
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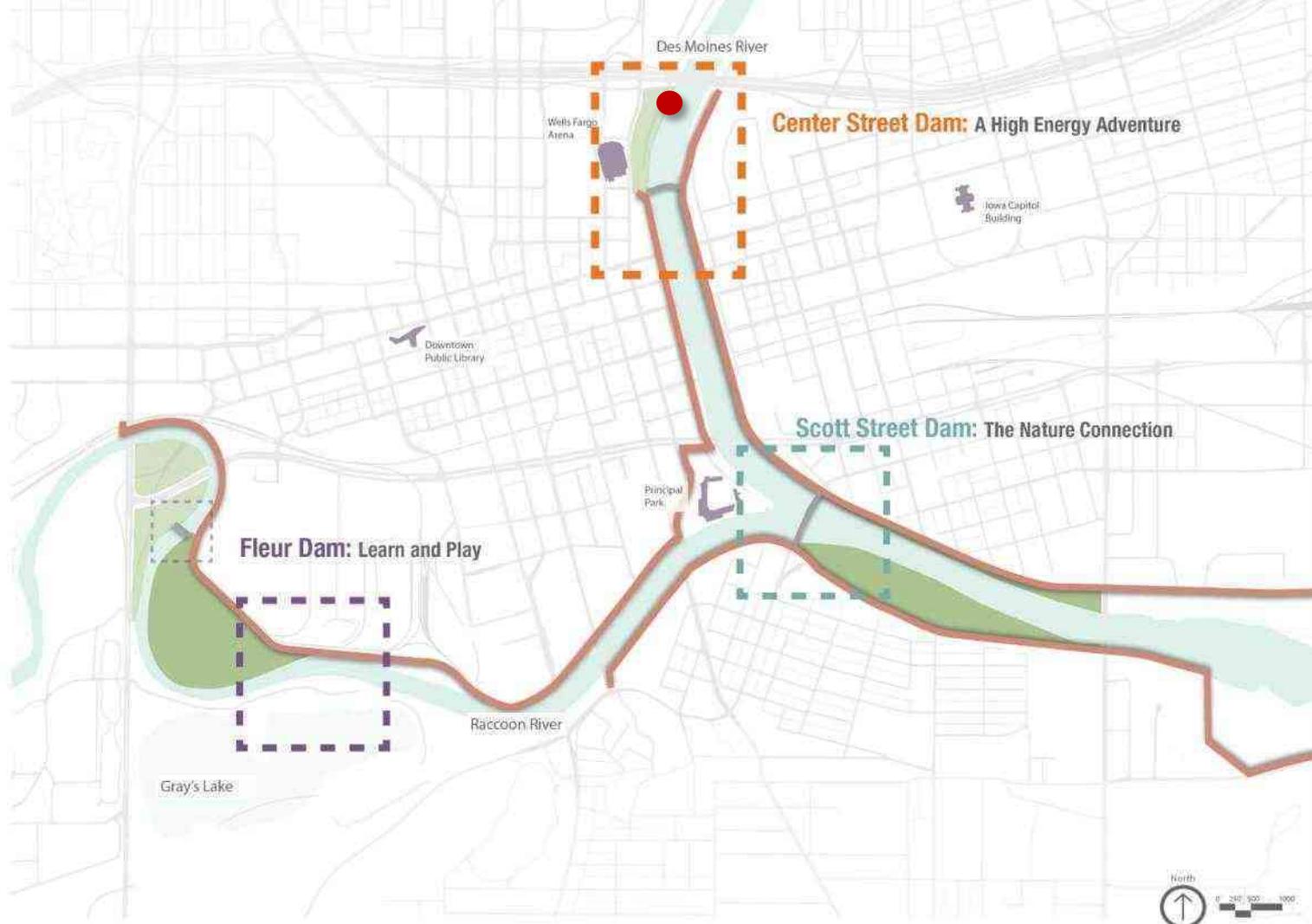


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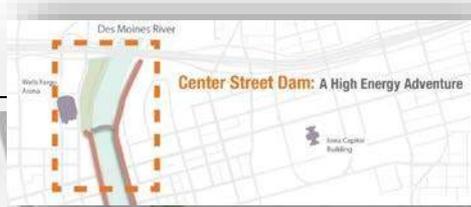


Scott Avenue Dam > The Nature Connection





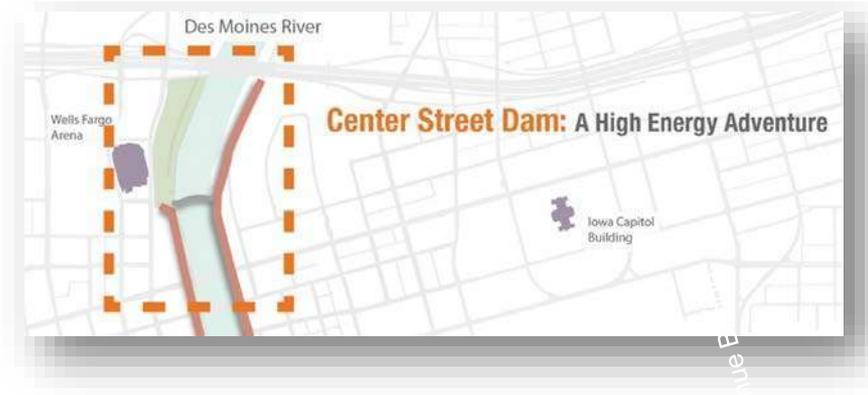
Center Street Dam > A High Energy Adventure



Center Street Dam > A High Energy Adventure

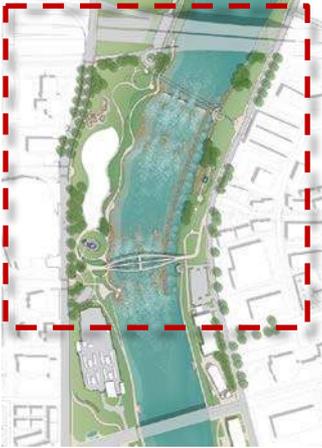


Downtown Des Moines Water Trails Engineering Study



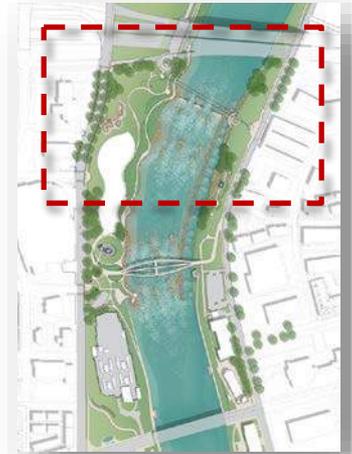
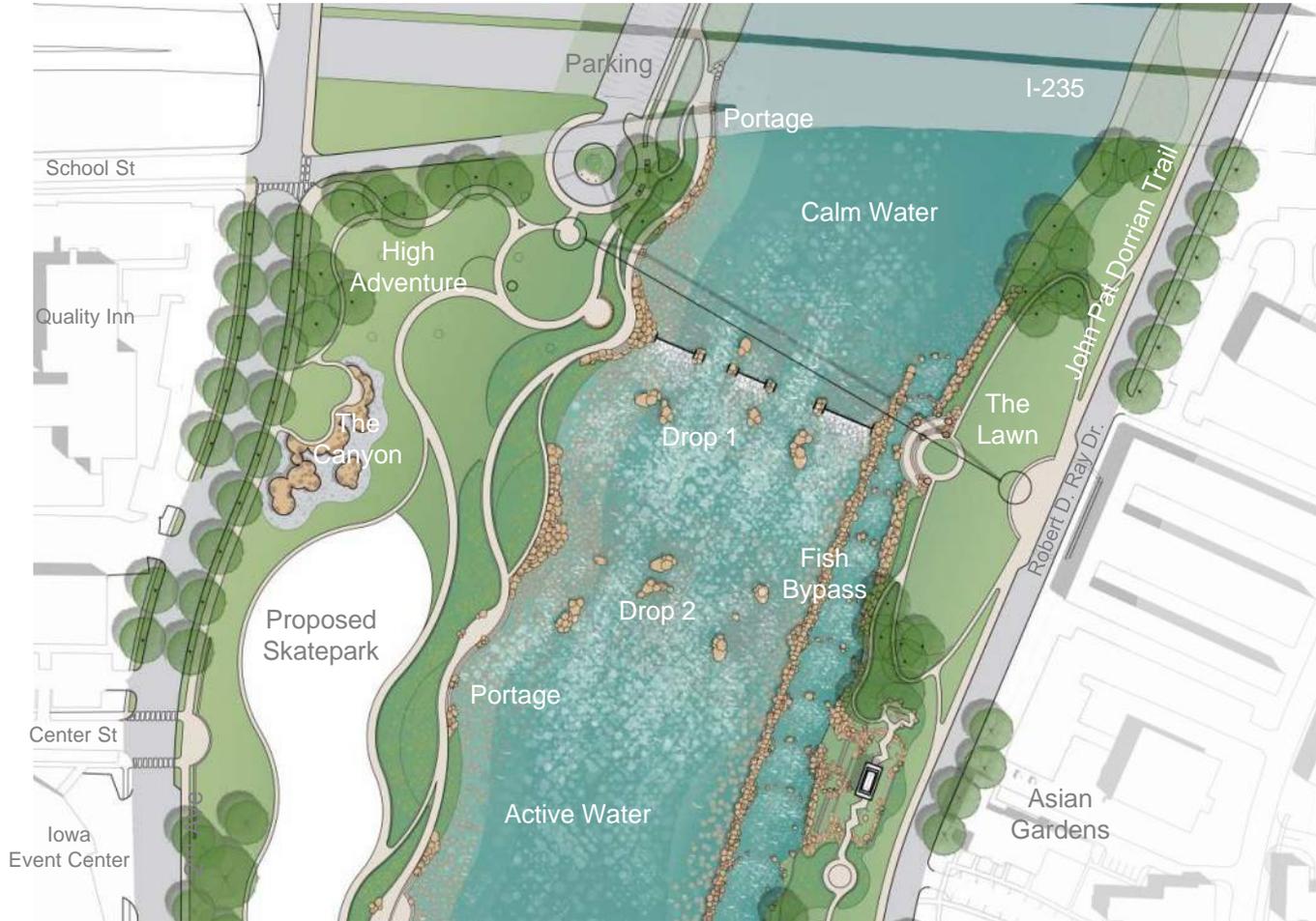
Center Street Dam > A High Energy Adventure

Downtown Des Moines Water Trails Engineering Study

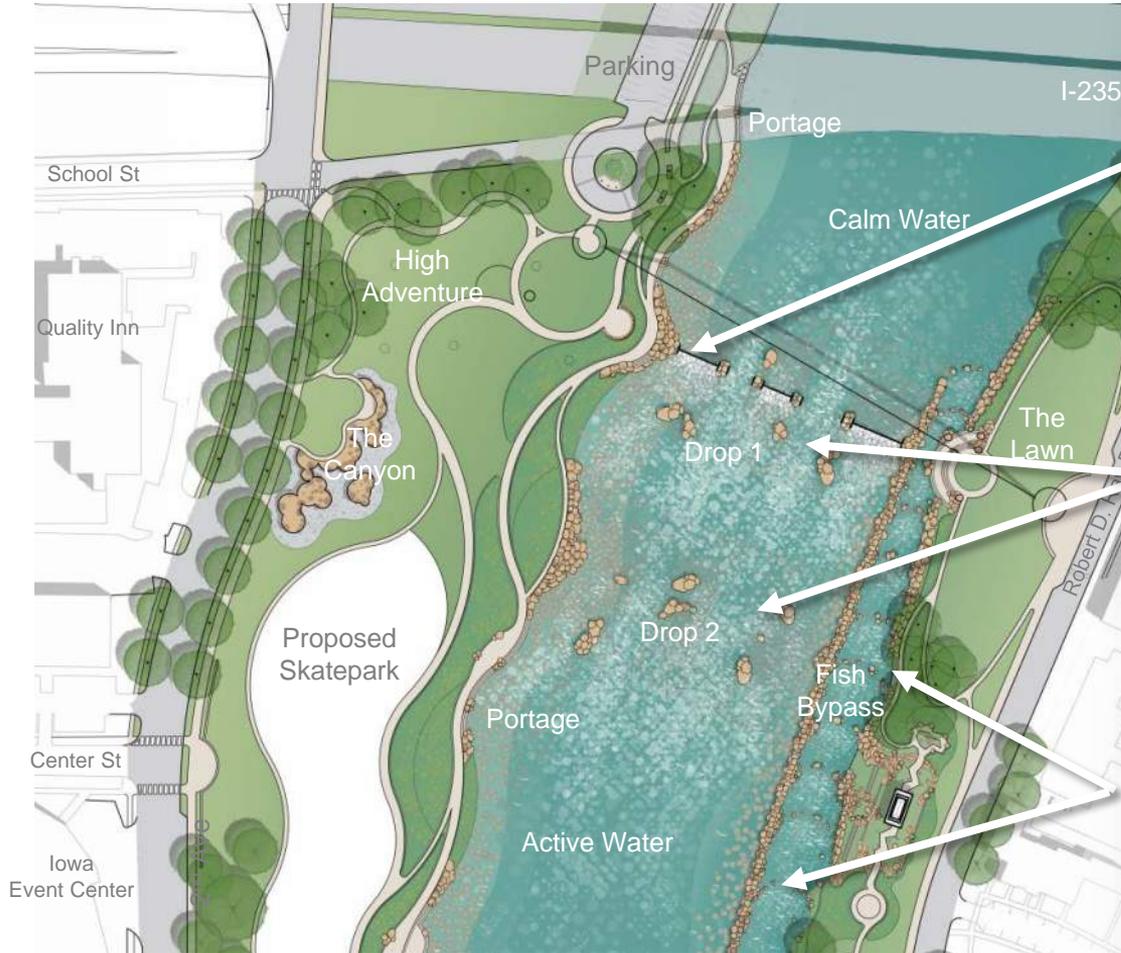


Center Street Dam > A High Energy Adventure

own Des Moines Water Trails Engineering Study

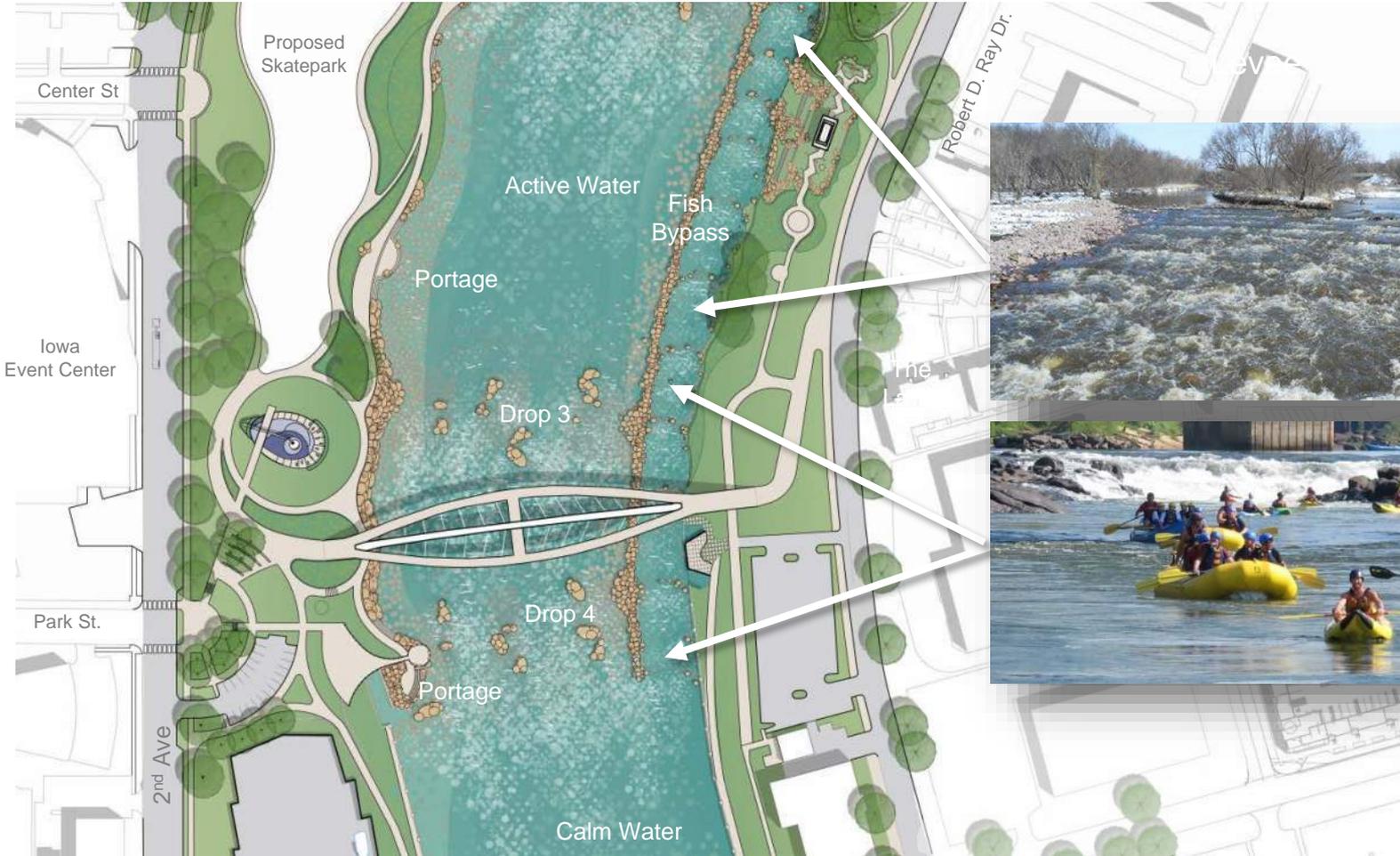


Center Street Dam > A High Energy Adventure



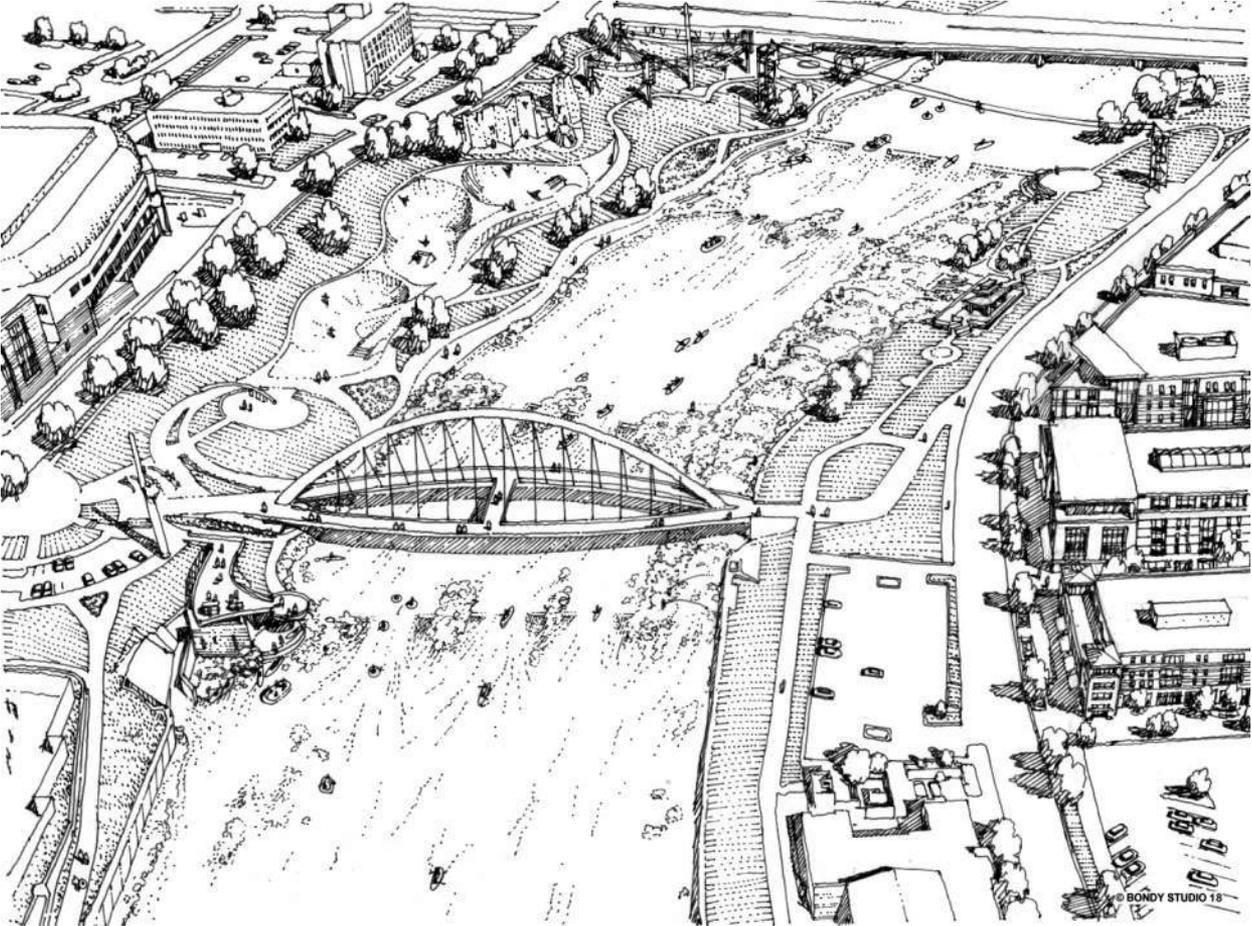
Center Street Dam > A High Energy Adventure

Trails Engineering Study



Center Street Dam > A High Energy Adventure

Downtown Des Moines Water Trails Engineering Study



TABLETOP DISCUSSION

REACHING CONSENSUS

Keeping Water Trails in the Public Eye

COMMUNICATIONS UPDATE

January 24, 2018 Agenda

1. Call To Order and Introductions
2. Approval of Agenda
3. Study Recap and Meeting Purpose
4. Regional Study Update
5. Downtown Study Update
6. Communications Update
7. Other Announcements or Non-Action Items
8. Next Meeting Date – TBD
9. Adjournment

D.7 – WORKSHOP #5 Q&A DOCUMENT

Downtown Water Trails Engineering Feasibility Study

Post Workshop #5 Q&A Document

**Provided by the Consulting Team to the Metropolitan Planning Organization for Distribution/Posting as Needed
March 2018**

This document captures questions and comments received at Workshop #5. Where these comments relate directly to the engineering feasibility work, we have attempted to address them in some way, but regardless, we wanted to document everything we heard for future discussion, planning, and design of this system.

Note: The sites in question here involve Center Street Dam, Scott Avenue Dam, and the Raccoon River Dam near Fleur Drive. Locations discussed in this document can be confirmed via the Workshop #5 power point, but they reflect locations selected by the steering committee at Workshop #4 for additional research, analysis and cost-estimation.

Consulting team includes representatives of McLaughlin Whitewater Group, HDR (Engineering) and RDG Planning & Design, working in partnership with the Metropolitan Planning Organization (MPO).

Part I: OF INTEREST AT ALL THREE LOCATIONS

Water Quality

- Water quality monitoring in real time, heeding bacteria, is a must!
- How do we leverage this project to get people to care about water quality?

This engineering feasibility assessment team (the team) recommends real time monitoring for all three downtown locations as well as throughout the 150-mile Central Iowa Water Trails network, although that is beyond this team's purview. The team further suggests leveraging the work of those already involved in water quality monitoring locally (e.g., Polk County Conservation) and statewide (e.g., Iowa Flood Center). Real time monitoring for readily measurable factors such as temperature, turbidity, etc. and development of correlations with e.coli and fecal coliform is desired. This plan recommends development of an application for public use that takes advantage of the developed correlation and provides an real time water quality risk assessment.

Many of the stakeholders have spoken to the need for access to the river and access to information to urge caring about water quality. Each of these locations as well as the entirety of the system has concepts allowing much easier access to both information and the river water itself. Additionally, we would hope programming, public art, and "water story" interpretation would further enhance the public's engagement and eventual advocacy.

Sediment Management

An important topic that needs to be factored in both technically and in terms of long-term maintenance. See HDR Preliminary Ecological Assessment Memo of January 2018. Additionally, project planners and funders are looking to better understand options for overall maintenance of these locations considering the regional aspect of this entire system, including the three dam locations addressed here. Alternatives at Center Street Dam and on the Raccoon River Dam near Fleur Drive include automated flashboards that which will be more readily lowered during higher flows and have a deeper invert. Both of these attributes will facilitate the transport of sediments and reduce accumulations.

Fishing

Maintain and enhance fishing access for ALL

Maintaining fishing opportunities and experiences for current anglers

- Not too fancy or intimidating
- Recognize importance of subsistence fishing
- Immigrant community uses of urban fishing

Accommodating fish mobility and fishing experiences are critical for these projects. Many users of these downtown dam sites fish to feed their families. It's not just sport and they cannot readily move their activities elsewhere. Consequently, the team is working closely with the DNR to try and accommodate or *enhance* fishing at these locations. At-the-banks conflicts with recreation users must also be addressed as well as fishing access for persons with mobility issues. This work continues and should continue as a top tier goal throughout all stages of the concept development and design process.

Habitat – Particularly Mussels and Eagles

- At Fleur concern over loss of woodland
- Eagles want open water in winter
- Questions of how dams affect mussels

Re: Fleur location and woodland loss. See below (Part II: Fleur Dam), but additional sites will likely need to be considered in part due to this important concern.

See HDR Preliminary Ecological Assessment Memo of January 2018. Additionally, these projects will go through more than ten different permitting processes including an environmental assessment to comply with Section 404 of the Clean Water Act, US Fish and Wildlife review of the projects for compliance with the endangered species act, and Iowa Department of Natural Resources review for compliance with Sovereign Lands and Dam Safety Permits which are directly related to wildlife/habitat.

Debris Removal/Operation/Maintenance

- Who will have responsibility for debris removal, operation and maintenance?

This is a question that will require ongoing work on the part of all stakeholders. The technical aspects of this question include: Post-flood cleanup, in channel maintenance, implementing capital improvements, Personnel to operate dams including recreation, sediment maintenance, and emergency flooding operations. Additionally, and just as critical, are the organizational, management, policy and funding issues related to this question. As mentioned elsewhere in this document, due to the regional nature of this 150-mile network, partners are beginning to try and “tease out” potential regional methods for maintenance of the entire Water Trails Network. The Great Outdoors Foundation is locating examples of regional partnerships elsewhere and the Greater Des Moines Partnership’s Governance Committee is assisting in helping the region look at these issues, along with the leadership of the MPO.

Emergency Access

- All three sites have access built into the design and cost.

Flood Mitigation

- Are we mitigating floods at these sites? Adding more pavement but not much wetland/flood plain pieces
- Using permeable paving?
- Who makes the call on flood conditions and water quality?

Flood Mitigation: Significant efforts related to flood mitigation have been made over a number of years. These include extensive levees and flood flow control through the Saylorville Reservoir. One of the primary goals of this study was to identify scenarios for each site that would NOT raise flood levels. After significant effort, this has been accomplished and all developed alternatives can meet this criteria.

Permeable Paving: Permeable paving is certainly a feature that can be included. We anticipate it will eventually be analyzed on a cost/benefit basis.

Water Quality: Water quality is most effectively addressed in the urbanized and agricultural developed portions of the tributary basins. Proposed improvements will have some positive impacts on water quality resulting from improved aeration, deeper pools resulting from deeper flashboards. Permitting agencies will weigh in on water quality and flood management including the U.S. Army Corps of Engineers and the Iowa DNR.

Restroom Facilities

At this time, the concept plan for the Center Street Dam includes a footprint for a restroom facility. The Fleur and Scott Avenue do not.

Where is emergency access for DMFD boats between the dams?

DMPD and DMFD will be given additional opportunities to review these plans for feedback on such access to help ensure their needs are accommodated. Initial conversations were quite positive with police and fire encouraging the projects and anticipating they would have the equipment and personnel required to address emergency situations.

Part II: FLEUR DAM

The site considered here is downstream of existing dam, west of a proposed pedestrian bridge from the planned Gray's Station development to Gray's Lake. The footprint for this location includes access and parking from the North (not using Gray's Lake facilities). This site and configuration have not yet secured consensus of the stakeholders as a "best fit" for a future project, but review of this site was undertaken for research/information purposes. Additional locations and/or configurations should be considered prior to preliminary design, but those options will benefit from the feasibility information gathered for this location.

Homeless Camp Impacts

- Reference to camping
- Impact on homeless camps
- Addressing current limited camping

This question has not been directly addressed in the engineering feasibility study. It pertains to a critical social concern that should be addressed in an effort focused on this broad and complex issue.

How do we address current limited parking?

The Fleur location studied for Workshop 5 includes parking and access to the North of the site but these facilities could potentially impact valuable woodland. This site would be connected to Gray's Station (via pedestrian bridge), Gray's Lake (in close proximity) and Water Works Park (accessed via underpass). In that regard, parking could prove adequate, but access and parking are among the reasons to consider alternate locations in future phases of this project.

Is the bridge lighted at night?

We assume this refers to the pedestrian bridge associated with Gray's Station. The City and Developer will need to address that question.

What happens to existing sewer box?

The function of the existing storm sewers will be maintained and will be incorporated into the project design in future phases of the project.

Encourage relocation

- Do not want the impact on the woodland area – known eagle nests and other natural resources are benefits to leave intact

- This seems overwrought for Fleur Drive
- More concerned about the fish passage at this one

Valuable information for future use has been captured in assessing this location however this effort is very broad and refinements and ecological assessments will be made in future efforts. Impacts to woodland areas are likely and minimization and mitigation will likely be focuses in future phases.

What about rock dam in Des Moines Water Works (near pump house)?

This team did not study that dam. We believe it is included in other documentation.

DICO Site

- What is impact of TCE on Raccoon River/people from DICO site?
- Will the increased depth downstream of the existing Fleur dam impact the outflow for the DICO mitigation system?

It is unlikely that the outflow for the outflow for the DICO mitigation system (or any stormwater outfall) will be negatively impacted due the low-flow increases in the water surface elevation. Note that at even moderately high flows, the proposed improvements would have negligible increases on the water surface elevations in the river. Under certain conditions, the water surface elevation would be reduced. A detailed investigation would be included in future design and planning efforts. If significant impacts are discovered, it is likely that they can be reasonably mitigated within allotted contingencies.

Access, Wading and Swimming

- Where are wading areas?
- Is there anywhere to swim?
- Can people at Gray's Lake walk down to the water?

This site is close to Gray's Lake Beach. And the "bypass" portion of the site layout includes wading opportunities and pockets for swimming, but most swimming would likely be better served at Gray's Lake. And yes, people will be readily able to walk down to and into the water. All of these answers, however, must be understood to depend somewhat on conditions/flows for any given day. City policy may need adjusting because the City currently has a code against swimming in the river.

Graphic showed portage of paving stones. Would not work with cart or wheelchair.

- Noted. We will be seeking opportunities to maintain a natural aesthetic without sacrificing access. Thank you.

Will the proposed island cause a collection/bottleneck for debris?

- We will consider alternative orientations of the island to minimize the collection of sediment.

PART III: SCOTT AVENUE DAM

Note: While fish passage configuration and location may need adjustment, this site/location and general approach appears to have some level of consensus. Many of the Scott Avenue Dam comments were applicable to all sites (see above).

Does this fill along the toe of the levee work?

The main components of each site have been hydraulically modeled and evaluated against project and floodplain criteria. At this point in the study the improvements at each site work without impacting flood levels negatively. This process will continue as the project design evolves in future phases.

Is it lighted at night?

That is potentially an option but will need to be decided by stakeholders.

PART IV: CENTER STREET DAM

Note: As the “world class” recreation site of this network of three dam mitigation projects, consensus seems to have developed for the overall approach here, but questions remain about specific logistics of importance in addition to comments related to all three locations. (Again, see above).

How do we manage night time use?

A management plan would need to be developed, but night time use at other urban venues has not been a significant (negative) issue. Rather, the venues are used and events held during the evenings.

Motor vs. non-motor signage [needed]

Noted and such signage is planned, although not detailed at this stage of concept development. Again, a management plan to best utilize this highly desirable venue would need to be completed.

Logistical questions re: parking/access with kayaks or other large equipment, ramps for access, general lack of parking, storage, accommodating recreators who want to do both dry and wet activities (e.g., lockers provided?)

These are all excellent points and will require further work down-the-line to nail the details. Currently, the concept calls for parking available from many different access points, but we recognize the importance of needing to potentially improve the ability to park and bring in personal larger-scale gear. Ramps for access to water have been considered, but not necessarily the transport of kayaks from parking to ramps. We will be looking at this. As for storage, this, too, will likely need additional thought/consideration. If we cannot quickly accommodate it in this current phase of study, we want to capture the note for the next phases of concept and design development. It should be noted that lockers have not usually been provided at other run-of-the-river venues.

Is access to all of the flat water downstream of the dam factored in?

Not sure what is meant by this question, but if it’s referencing increased recreational use and required additional amenities, we are attempting to provide accommodations. In general, the water surface elevation downstream of the dams or proposed improvements will not be altered.

[Are we] incorporating the Armory building after Des Moines vacates it?

It is not specifically accounted for in current development concepts except as a “redevelopment opportunity” which the team believes could provide a way to address some of the logistical challenges identified above.

Class V [rapids] will allow us to attract kayaking competitions.

The team shies away from referencing these features by whitewater “class” as these are not natural waves and their meaning could be misunderstood. Still, the Center Street Dam site affords a “world class” recreation opportunity for the City of Des Moines. As a side note, the best (freestyle) competitive venues, have been of much less difficulty than a natural Class V rapid.

Can we integrate [public] arts planning into the preliminary plans?

This is a good question that's beyond the scope of an engineering feasibility study. The team encourages the advisory committee to give this strong consideration as the project will greatly benefit from public art and creative, thoughtful interpretation of water and cultural features.

Is there a depth that will allow expansion of the Birdland Marina/lagoon?

Expansion of the Birdland marina was not a specific goal of this project. However, the function of the marina as it relates to maintaining the pool upstream from the center street dam was preserved. The removal of the current center street dam and replacement with a series of more gentle drops results in a Des Moines river that is safer for everyone, positively impacting the Birdland Marina users.

D.8 – FINAL PRESENTATION