WELCOME







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resiliency planning education outreach



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GLOBEVILLE UTAH-JUNCTION BASIN







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FLOODING CHALLENGES IN THE BASIN



South Platte River (Regional)





Stormwater Flooding (Localized)



PREVIOUS STUIDIES





COLLABORATIVE PARTNERS/PROJECTS





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ESTABLISHING A NEW APPROACH



PIPES (GRAY INFRASTRUCTURE)





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ESTABLISHING A NEW APPROACH





COMMUNITY APPROACH: PLANNING & URBAN DESIGN

(ENFOQUE COMUNITARIO: PLANIFICACIÓN Y DISEÑO URBANO)





PIPES (GRAY INFRASTRUCTURE)

COMMUNITY CONVERSATIONS OTHER COMMUNITY CONCERNS **NEW PERSPECTIVES** (GREEN INFRASTRUCTURE & WATER QUALITY)



NORTH DENVER CORNERSTONE COLLABORATIVE AN INITIATIVE OF MAYOR MICHAEL B. HANCOCK IRR



resiliency planning | education | outreach



SOLUTIONS WITH MULTIPLE COMMUNITY BENEFITS





Identify practical solutions to alleviate flooding, improve water quality and create multiple benefits for the communitywith the community



NORTH DENVER CORNERSTONE COLLABORATIVE AN INITIATIVE OF MAYOR MICHAEL B. HANCOCK













DEVELOP METHODS: To establish trust and partnership









RECOGNIZE: Today's flood resiliency and equity factors

BUILT ENVIRONMENT

- High impervious surface (53%)
- Urban heat island effect
- Undersized stormwater infrastructure
- Connectivity and mobility barriers





See the Existing Conditions Report for larger versions of these maps.



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Impervious Surface



RECOGNIZE: Today's flood resiliency and equity factors

NATURAL ENVIRONMENT

- Lack of park space (5%)
- Lack of tree canopy Sunnyside (26%) Chafee Park (17%) Globeville (12%)





City







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Plan for a Healthy City



HUMAN ENVIRONMENT

- Highest levels of inequity
- Low access to opportunity
- High vulnerability to displacement





Source: Denver Environmental Health, 2016. Data: 1. American Community Survey 2009-2013. 2. City and County of Deriver GIS, 2015. 3. Vital Statistics Deriver, 2007-2013. 4. Colorado BMI Monitoring Sustem 2013-2014. Kajing Institute for Health Research, 5.



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PLAN: to build community understanding



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teystemdystudy



Elevation



1874 - DENVER'S TOPOGRAPHY & DEVELOPMENT

17 AR

DEVELOPMENT ON EASTERN HILLS

A Sens marker to the

TOPOGRAPHIC CHANGE & DENVER PACIFIC RAILROAD

DEVELOPMENT STARTS TO FILL FIRST NORTH-SOUTH SUBDIVISIONS

CHERRY CREEK

CANTER THE

EFERENCES

action of the second second a second

SOUTH

SOUTH PLATTE RIVER

RIVER



BELLVIEW & CEMETERY



HISTORIC RELATIONSHIP WITH THE RIVER

1920s – Flood Control

The Taming of the Treacherous Platte

No More Floods for Globeville

Platte River Protection and a New Bridge

One of the parts of Denver most often subjected to the river's freaks is Globeville. A contract has been let to change the course of the Platte at Globeville and this spring a new bridge will go in at Globeville at a cost of approximately \$80,000.



1965 – Floods



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2008 – Levee





TODAY's SPILL LOCATION





UNDERSTANDING STORMWATER





NATURAL ENVIRONMENT - HISTORIC





BUILT ENVIRONMENT – RAILROADS (SILVER BOOM)



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BUILT ENVIRONMENT – HIGHWAYS





BUILT ENVIRONMENT/TOPOGRAPHY





LOCALIZED FLOODING





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GETTING TO RECOMMENDATIONS





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RIVER RELATED PROJECTS PLAN | LEVEE

LEVEE ANALYSIS



- Avoid FEMA floodplain designation
- Raise and extend the Levee to address flooding, coupled with ongoing Public Works efforts to address bridges along the river.







RECOMMENDATIONS

Community Education and Partners



51st and Zuni Park



Detention and Park Space

Truncated Project "L"





Flood Protection from South Platte River





COLLABORATIVE AN INITIATIVE OF MAYOR MICHAEL B. HANCOCK



RECOMMENDATIONS

Community Education and Support



51st and Zuni Park



Detention and Park Space





48th Ave Green Corridor



G

Flood Protection from South Platte River

Build Community Benefits and Connectivity

Community Connections





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IMAGINE: future neighborhood green streets







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IMAGINE: different river's edge







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IMAGINE: community green space







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IMPLEMENT: a holistic answer







River-related Projects Plan

Basin-wide Detention and Supporting Infrastructure

48th Avenue Corridor

Highlands/South Globeville System

Community Education and Supportive Programming



THANK YOU



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- Integation with heron pond/levee design/construction
- Stormwater prioritization of 48th ave outfall
- Integration with NWC bridges and Washington Street projects
- Ongoing Coordination with Globeville neighborhood connectivity interests along 45th "main street" and to 41st & Fox rail station







Support slides







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STUDY AREA LAND USE







Link to Story Map Presentation: https://storymaps.arcgis.com/stories/bf7dd5e6a0594aa08ace5fb0c6dea7fc



Link to FishView tour of Big Dry Creek: https://arcgis.earthviews.com/tour-admin.html?id=big-dry-creek-8-31#458



Rapid Baseline Assessments and Prioritization

A Case Study of the 2018 Westminster Drainageway Study

Colin Barry September 26, 2019

Rapid Baseline Assessments and Prioritization




Open channels, drainageways, and stream systems are a vital part of any municipalities:

- Stormwater Conveyance
- Flood Control
- Ecological Function and Habitat
- Recreational Use

Establishing and understanding existing baseline conditions can be difficult due to:

- Accessibility
- Vegetation
- Expertise
- Balance of Uses

What we need is to establish and catalog these baseline conditions and any changes over a planning time frame (~50 yrs).



Guiding Principles for the Rapid Baseline Assessment:

- Create a process that is REPEATABLE and UPDATE-ABLE
- Develop a SIMPLE attribute based data collection format
- Utilize EXISTING technical CRITERIA
- Implement quantitative and DATA DRIVEN decision making; let the DATA lead you!
- Connect the COMMUNITY to stream systems! FISHVIEWS TECHNOLOGY

Two Collection Technologies are used while walking the centerline of all open channels and drainageways:

1) A handheld mobile device or GPS unit to collect attribute based information and data on features within the river corridor.

2) FishViews Imagery Collection system used to collected time-lapse images.

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USDA FSA

Two types of data were collected using a mobile phone or GPS (for enhanced spatial accuracy). The first group are stream health and function factors, including:

- Stream Assessments
- Geomorphic Assessments
- Erosion Hazards
- Points of Interest (Obstructions, Property Issues, Trash, etc.)
- Water Quality Data (HydroLab)

A common organizing field is essential for the usability of the data. (Reach ID)

Priorities for each feature, assigned in the field and verified during post-processing allows for rapid prioritization and planning.

The Stream Visual Assessment Protocol (SVAP) (USDA and NRCS) were used as the base for the Stream Assessment criteria. SVAP is a form based protocol that requires intensive time and effort to compile data on



- Hydrologic Alterations
- Bank Stability
- Water Appearance
- Nutrient Enrichment

By selecting a few valuable metrics and using the detailed scoring criteria provided, we can reduce the level of effort to create a scale-able process that is based in peer reviewed criteria. Other metrics include:

Baseflow Width and Depth Channel Form Overbank Roughness Channel Roughness

Fluvial Geomorphology and associated metrics can provide key indicators for measuring a stream systems overall health and function. The effects of complex macro-level alterations, like urbanization, channelization, and encroachment, can be initially seen using simple geomorphic methods and measures.



Measured metrics include:

Bankfull depth and width Dominate soil type

Channel State

1% floodplain width

Calculated parameters include:

- Width to Depth Ratio (Bankfull Width / Bankfull Depth) (Rosgen et. al.)
- Entrenchment Ratio (Floodplain Width / Bankfull Depth) (Rosgen et. al.)

While geomorphic changes, including migration, downcutting, and avulsion, are natural processes that allow riparian systems to adapt to changes in the watershed, some of these processes can threaten people, property, and important existing infrastructure.

The erosion hazard feature catalogs these features and prioritizes them based their proximity to existing infrastructure and development. Minor priorities can point to areas that require monitoring and maintenance, while Moderate, Severe, and Urgent priorities will likely require more immediate intervention.



Length

Average Height

Average Width

Priority

Picture

Я

The second category of data collected using a mobile device is existing inline infrastructure, including:

- Grade Control
- Outfalls
- Crossings
- Storm Controls / Detention Facility

Grade Control, whether naturally formed or man-made, is an important part of a stream system in planning future projects, determining effectiveness of specific designs, and maintenance overtime.

Grade control metrics collected include:

- Type
- Elevation of Top
- Height
- Priority
- Images

Drainage Outfalls can be from public infrastructure or from private systems. They are important in understanding the hydrology and hydraulics of a system as well as water quality and pollutant influxes.

Drainage Outfall metrics collected during the rapid baseline assessment include:



- Discharge (Yes / No)
- Priority
- Images

Federal Highways Culvert Inspection criteria was used as the basis for the Crossing Inspection feature. FHWA designed these assessments to occur over a period of several hours or days, but by adapting a few key metrics these became an effective first glance at the conditions of bridges and culverts.

The scoring criteria is detailed within the FHA memorandum allowing for a detailed, rapid, and repeatable collection template.

Recorded features include:

- Rise
- Span
- Material
- Appurtenance Type
- Utilities present
- Invert conditions

Cracking



- BIOCKAGES (1/4, 1/2, 3/4, Fully)
- Photos of the Inlet or Outlet
- Priority

Inspecting Detention Facilities and Storm Controls is an important part of local municipalities inspection mandate. These are generally great existing examples of rapid assessments. Digitizing these forms for use on a mobile device and converting all the previously conducted inspections to jump start a data library is a great way to start applying these concepts.



A value-added option for these existing conditions assessments is a street-view style stream tour.



The Omni Collection System from EarthViews allows for the creation of a street-view style tour through a river corridor. This tour can be used to give everyone the feel of walking through their stream systems from the comfort of their desks,

as well as a view of any specific problems identified on the GPS.



Demo Map

Rapid Baseline Assessments and Prioritization

Data-Driven Prioritization

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At its simplest, priorities assigned in the field and verified during post-processing can help managers quickly identify hot-spots.

A data-driven approach is flexible, simple and easy to update because it is primarily based on counts of features, SVAP scores, or automated GIS workflows.

By developing a robust data-set across a large area of interest (City, County, and District scale), its possible to use specific features and subsets of features, summarized by reach or stream, to create prioritizes through a clear and transparent formula on a reach, stream, or project scale.

In addition, we can use different features and subsets to focus our priorities for different audiences and values:

Invasive species for Parks, crossing issues for Street, or water quality for permitting and grants.

A maintenance, monitoring, and small-scale restoration is shown here to help stop SMALL PROBLEMS from becoming BIG PROBLEMS.



Rapid Baseline Assessments are the most effective and efficent solutions to this issue. They allow for:

- Simple and fast attribute based collection,
- Repeatable results using existing detailed criteria,
- A wide range of personal in the collection efforts,
- An flexible collection schema that can be tailored to a communities needs,
- The use of cutting-edge technology to engage the community and managers.



Storytelling that resonates. Harness the power of maps to tell stories that matter.





September 26, 2019

Boulder Civic Area

Presented by:



Cody Gratny, P.E. Project Manger, Associate

What is the BCA and Why is it being changed?

- Boulder Civic Area is bound by 9th St, Canyon, 14th St, and Arapahoe (municipal campus)
- 2013 City Identifies need to have a Vision for the Boulder Civic Area
- 2014 voters approve a \$8.7M 2A Community, Culture, and Safety Tax
- 2015 Completion of Boulder Civic Area Master Plan



Anderson Consulting Engineers, Inc Civil • Water Resources • Environmental



Now that the Planning is done...the real design begins

- It's pretty and flat, so why change it?
- Life and Property Safety
 - Majority of Park in 100-yr and 500-yr
 - Meet or exceed flood standards
 - Educating the public about floodplains
- Limit access to specific areas of the Creek
 - Promotes long-term durability and wetland diversity



New Britain and Park Central Buildings Structural Flood

Assessment

Revised - March 18, 2013



What exactly do we implement?

- Let's give them options
- But let's focus in on some priority areas
 - Provide access
 - Through for commuters
 - To the water for recreation
 - Into the park
- ...but we all know that when you have options people like a bit from each one



So now we have a "hybrid" plan, what do we focus on?

- Floodplain
 - Mimic historic conditions
- Wetlands
 - Make it better
- Stormwater
 - Treatment
- Access
 - A mixture of options
 - Safety
- Maintenance
 - Simplify the design



...But what does this have to do with Floodplains?

- High Hazard, Conveyance Zone, and Floodplains
- Floodplains, floodplains, floodplains, and more floodplains
- Gregory Creek Canyon, Boulder Creek
 Floodplain, Canyon
 Boulevard Split Flows,
 Broadway Constriction
- And you want to change the whole park? It's an iterative process.
- When even the type of plantings matter...



Floodplains, we talk about them a lot, but do they really happen?

- 2013 really taught us some lessons
 - It doesn't take a 100-yr flood to significantly impact people and places
- Sediment transport
 - It's more than just the water
- Life safety
 - 300 households received assistance from Long-Term Flood Recovery Group
- Property damage
 - 365 city owned buildings damaged
- Resilient designs
 - How do we do better?



Wetlands aren't just about cattails

- Existing conditions
 - Poor / Degraded
 - Historic Storm System
- Designed Conditions
 - Limit access to specific locations
 - Education
 - Promote places where people can interact with water/wetlands
 - Reintroduce native and wetland plants



Why do we even need water quality?

- Reduce your parking in the floodplain
- Minimize your directly connected impervious areas
- Tuck water quality elements outside of paths and implement them to blend in
- The best designs are ones where you don't know engineering has occurred.



Access for everyone

- Bicycles
- Pedestrians
- Kids
- Maintenance
- ...Oh my!
- There are always competing interests and it is sometimes hard to define who takes priority



The Results

- The new "heart" of Boulder
- Improves use of space
- Promotes accessibility
- Mimics historic drainage/flood patterns
- Incorporates community gatherings
- Ecosystem improved
- Reduces highintensity maintenance needs



QUESTIONS?

Cody Gratny, P.E. cgratny@jvajva.com



303.444.1951 www.jvajva.com

BOULDER FORT COLLINS WINTER PARK GLENWOOD SPRINGS DENVER



CASFM | 2019 Conference | Crested Butte, CO

Bridging the Gap Between Planning & Performance: Stormwater Management

Presented by: Nicholas McMurtrey, PE





Nick McMurtrey, PE, LEED AP, ENV SP

Engineering Project Manager

- Bachelor of Science in Civil Engineering from Oregon State University
- Worked as a consultant for 16 years
- Serves a variety of planning, design, and construction roles on transportation and water projects for municipal clients.
- Experienced in project management and stormwater modeling & management



Presentation Goals

- 1. Provide background and context for the D Avenue Improvement Project
- 2. Highlight key challenges and how we countered them during design & construction
- 3. Recount the benefits, outcome and key project takeaways from project elements
- 4. Encourage audience participation (Q&A)






















14









Project Timeline



New Design Criteria + New CIP Project



20



\$6.2 million project cost





Needs: Comprehensive conveyance, address flooding, NPDES/SWMM permit compliance, and curbless streets



Needs:

- End of life cycle (12 < PCI < 21) due to deferred maintenance and construction traffic
- Inconsistent roadway widths
- Public complaints of high speeds



Benefit

Full Depth Reconstruction \rightarrow Create Custom Alignment



Benefit

Concrete banding for ACP → Supports edge of ACP, guides traffic, grade control during paving operations



Benefit

Conveyance upgrades

→ Provide drainage 'backbone'





Stormwater Design

Low Impact Development → Approaches (LIDA)

Benefit

Removes pollutants and maximized infiltration to maximum extent feasible





Stormwater Design



Benefit

Formalize on-street parking & continuous access to sidewalks

→ Organized/sight-distance mindful safe pedestrian access OR43-10th



Key Takeaways Planning = Parking gravel Performance = 3/4"-0 for

Planning = Parking gravel open-graded for SWMM

public involvement



Key Takeaways

Planning = Curbless streets



Performance = Wet weather erosion and rogue parking



Key TakeawaysPlanning = 43 new LIDAPerformance = Increased maintenance



Planning = Off-site mitigation



Key Takeaways mitigation Performance = Alley sediment and siltation



Key Takeaways



Stormwater Design

37

Clearing and grubbing & sensibly positioned landscaping



Benefit

 \rightarrow Obtain clearance standards



74 intersection sight distance triangles evaluated

Add Pedestrian Lighting & → Add/Relocate Exist. Overhead Lights



Benefit

Provide Consistent Lighting for Pedestrian and Vehicle Use





Key Takeaways

Incremental improvements are okay



Public Outreach & Right-of-way Preservation

Needs:

- Citizens are aware and heavily involved in local projects
- FAN Neighborhood Unique Character
- Many residents retired or working remotely
- Represented by local Board
- Stormwater and right-of-way education





Needs:

- Residents unaware of property limits
- Extensive private improvements in ROW
- Newer owner expectations due to previous owner's features in the ROW
- Protect mature trees



Multiple Site Walks with Residents \rightarrow Introduce Team, Project Goals,

Benefit

and Vet Alternatives



One-on-One Meetings with Residents

Benefit

Opportunity to voice individual



 \rightarrow

Regular Open Houses

Benefit

→ Highly Transparent Updates





46


D Avenue Improvement Project - Alley between 3rd and 2nd Streets to State Street

Benefit

Full Time Citizen Liaison \rightarrow Consistent Resource/Timely Responses



and storms.

expected lead times for materials.

to neighbors prior to the closure.

Design Feature

D Avenue

Regular Communications via \rightarrow website, email and newsletters

Improvement Project

There are a few outstanding items that remain, some of these are a result of longer than

Crews are expected to return for one more substantial activity - installing additional trench grate drains along the south side of the sidewalk on D Avenue between 4th and 5th streets. This is to make some adjustments and additional improvements to the drainage in this area. This work will likely require a block closure during work hours, for about week. We will send an update out

Designing for stormwater, pedestrian, and pavement needs

3/5/19

on the project!

Construction Update

Major construction is complete, and most punch-list activities are finished

Over the last two months, the project

tweaks and adjustments have been

particularly following the winter rains

made throughout the project area,

team has been monitoring and watching the new stormwater facilities, roadway, sidewalk and utilities. Small

Benefit

Highly Transparent Updates



EMERGENCY PREPAREDNESS FAIR



D AVENUE PROJECT



2017 GOALS -HOW DID WE DO?



ATURDAY, APRIL 28, 10 A.M. TO 2 P.M., AT THE ACC

**FCRWSS PONTAL CUSTOMFT











ECIAL EVENTS AND ACTIVITIES

COMMUNITY SHRED DAY

TURDAY, APRIL 21, 9 A.M. TO 12 P.M. for units rust

DRUG TAKE-BACK



49





- Know your audience
- Education is key
- Right-size your public involvement for your community
- Communicate 'dig-once' philosophy





Construction

Needs:

- Antiquated water main
- Stormwater conveyance and treatment
- Area wide construction surge stressing franchise utilities
- Dig once
- Minimize impacts to the community



Utility Coordination



Benefit

→ Coordinate improvements and schedule ahead of construction



Tree protection fencing Excavation specifications On-call arborist

Benefit

- \rightarrow Isolate critical root zone
- \rightarrow Triggers construction oversight
 - \rightarrow Address conflicts in real time





On-site full support inspector with dedicated office support



Benefit

 \rightarrow Manage conflicts in real time



Remain flexible – Beehive inlets



Construction

Planning = Maintain access

Performance = Gravel ramps



Remain flexible – Natural Gas disruption



Safety Performance

Safety Program Coordination

Continuous work at points during construction:

- Excavation
- Concrete flatwork
- Stormwater
- Electrical
- Traffic control



Over 19,000 hours worked on the project with no time lost due to injury and no injuries of note during construction.

Key Project Takeaways

- Right-size public involvement
- Education and safety are key
- Incremental upgrades are okay
- Stay flexible
- Communicate





Winner of Oregon APWA's 2019 Project of the Year Award

Transportation, \$5 Million to Less than \$25 Million division

ALLI



Q&A

Neighborhood Feedback

"The crew has been exceptionally courteous in making sure I was able to get in and out of my driveway for which I am very thankful. Their hard work just amazes me."

"We really appreciate your and the team's responsiveness and the finished quality, too. Everything looks great!"

"Fantastic job with the capital project on 'D' Street. The bioswales, plantings, sidewalk (detectable warnings), sidewalk, parking areas is a fantastic accomplishment!"

"As people walk by our house we hear numerous compliments...the City Of Lake Oswego has done a wonderful job!"

"Your attention to detail and customer service is outstanding. Thank you to you and your team for a job well done."





Thank you!

How to be more confident on a Construction Site?

CASFM ANNUAL CONFERENCE CRESTED BUTTE, COLORADO SEPTEMBER 26, 2019

Laura Kroeger, Mile High Flood District Jerry Naranjo, Naranjo Civil Constructors Richard Borchardt, R2R Engineers







CM Scenarios – 7 minutes Laura:

How many of you have seen one of these two scenarios play out? First you are asked or you have asked someone else to out to the field for pre-grout inspection. (Rich enters)

You have your plan set, spec book, camera and clip board and ready to inspect

When you arrive on site, you see this.



You start taking pictures and write some notes.

Because I know Rich really well this is what he writes down.

The cut-off wall is already poured which doesn't match the plans because the wall and the grouting of the boulders are to be placed monolithically.

Then he keeps walking to the next drop structure.



This is what he see at the next drop.

Again he takes good pictures and writes the following notes.

The cut-off wall trench has collapsed and boulders are falling in.

Inspection complete and Rich heads back to the office to send the contractor his notes.

Poor Frans hasn't even been acknowledged.



Do you think Rich felt comfortable on the project site?

What were the signs?

No interaction, saw problems instead of talking is going to send an email.

Was he influencing a better product or being a partner to Frans.

Lets try this again. Keep working Frans.

(Jerry enters)



Frans (in Contractor Outfit and playing with Toy Trucks) is Building Grouted Boulder Drop Structure

Jerry approaches with a swagger and looking very confident (too confident) and he has his plans, specs, camera and clipboard.

Jerry:

What happened! Why is the cut-off wall poured already! Did you even look at the plans? (we don't give Frans a chance to really answer before switching to the next slide)



Jerry – and this too. And this...it better be fixed by tomorrow, or you won't be placing anything! (walk off disgusted)



Laura:

Did Jerry look confident being on the job site? Maybe too confident? Covering up for being uncomfortable.

Did Jerry's approach work better? Most likely not.

Here is our point. When we are stressed and in situations that make us feel uncomfortable most people have two primary reactions.

Flight or Fight. Rich 's avoidance get out quick or Jerry's blame and fix it.

Neither are productive to building best value projects and developing strong long-term relationships.



Project Partners – 2 minutes

Laura:

Hopefully most of you are aware that we used an Alternative Project Delivery Option to the traditional design bid build process at the District.

We call this Project Partners it is about building goal-based projects at the best value with a team of partners. We do this by having the right team of experst involved from the on-set of a project to working collaboratively solving problems.

When we rolled this out 7 years ago, there was a lot of confusion of what we meant by partnering. I think the biggest miss-interpretation of this approach meant is we should all play nice and not makes waves with other team members.

It is true we want people to be respectful but we work in a complicated industry with numerous ways on how to do something. So we need everyone's to voice their opinions and then work in a collaborative manner to vet out the best option based on our project goals and available resources.

A fundamental idea of this approach is that everyone is comfortable in their role, so

they need to know the expectations and how they can bring out the best in others.

How many of you received a formal education or training on construction management? How many of you have had to fill that role?

So you probably didn't know what was expected of you or how to aid the team to influence a better project and process.

This is the gap we have seen and believe that we can help close through providing better resources, training and a better understanding of the construction process that includes knowing our contractors better.

Our intent today is to let you know that we are starting to work on this problem and we are looking for you involvement to help us develop a tool and training program that we will all benefit from.

Rich is going to put his clipboard away and talk about the CM Handy tool.

Construction Manager Resources and Training



CM Handy App – 6 minutes **Rich:**

Construction Management is critical to delivering high-quality projects at the best value to the client.

The scenarios we went through earlier showed some "project-busters" to avoid.

But...How can we find out what makes a confident construction manager? I suggest we start by looking at our experiences on projects...Let's try this out.

From Laura's previous questions several of you have construction experience. Did you have any problems or issues that came up on those projects? I'm seeing some heads nodding. Let's try and get a better feel.

Think of the project that stands out the most.

How bad were those problems or issues? Take your hand and indicate the level of severity (thumbs up –easily resolved/all parties were happy, half way – medium difficulty/some feelings carried through remainder of project, thumbs down – really difficult/hard feelings carried through project/you hope that you never have to go through again or work with that team again)

Thanks for participating...As you can see, rarely do things go smoothly, and often times there is room for improvement in construction. This demonstrates the need for this work.

Of course, if everything worked-out smoothly we could have wrapped up and went to Happy Hour early.



When we dig deeper into those experiences and their resolution, I believe that some common themes will start to pop out.

A confident construction manager will be skilled in technical expertise,

communication and partnering, and understanding roles and meeting expectations.

To test this hypothesis, a broader and deeper understanding is needed to identify the gaps between "knowing" and "doing" what is good for the project and team. Surveys can help us better understand: What we're doing? Why is it important? and What can be done better?

We feel it is important to get input from both contractors and construction managers (consultant, local government, MHFD).

The survey went out to the contractors a couple weeks ago. Guess what one of the questions was....



So what are your top 3 characteristics of a CM? Think about it; I will be asking you for them in a bit.

My top 3 were technical expertise, field experience, and ability to make decisions. In fact...I spent a large part of my career developing these skills, often at the sacrifice of some of the other skills on the list.

Ask the Audience - What are your top 3 characteristics of a Construction Manager?

How do you think the contractors surveyed responded?



The contractor's top 3 characteristics were: Responsive, Good Communicator, and Ability to Make Decisions.

Interestingly Even-Tempered was the lowest score. Where are my favorites?

How did your top 3 compare? Were you surprised?

Did anyone match up with all 3 of the contractor's picks?



We need your help to figure out the remaining gaps and shape the construction management resources and training.

The second survey just went out to the construction managers (local governments and consultants).

Please take the time to fill out the survey. The link is shown here.

If you're a contractor, haven't taken the contractor survey, and are interested...please e-mail Margaret. Up next is Jerry to provide the contractor's perspective.



Who are we and why are we here? Naranjo Civil Constructors, Inc.

- 100 employee company
- 15-20 Million Annual Revenue
- 37 years in business
- 20 years as a FD prequalified contractor
- We interviewed every employee to bring you a
- Behind the curtain look at the Contractor perspective...



SURVEY SAYS ...!

What is the one thing that matters the most to you when dealing with Owner-Client, Engineer and Construction Manager based on all of your experiences in this business

RESPECT (earned and reciprocated)

The tradesmen don't want your repsect unchecked – they want to earn it and deserve and receive it.

Dinner Party Analogy with billionaires

You receive an invitation from a friend of a friend to join them at a dinner party.

The party is only for billionaires and their guests.

Would you be intimidated?

Would you be guarded and careful with your words?
A tradesmen in the field and even superintendents have those similar feelings

It's more difficult than you might imagine .

CONCRETE TRADESMAN

NARANJO CIVILC



10TH 5% 35 5% have attended College Average education level 10th or equivalent grade high school 55K 65%

Majority (65% are Spanish speaking or bilingual)

Average Annual Wage = \$55,000

Average age 35 10%

Less than 10% have ever studied emotional intelligence, effective communication or self-awareness disciplines.

Review stats

NARANJ **EQUIPMENT OPERATOR** CIVILO **11**TH 5% 45 5% have attended College Average education level 11th Average age 45 or equivalent grade high school 72K 10% 40% Average Annual Wage = \$72500 Spanish/English = 40% Less than 10% have ever studied emotional intelligence, effective communication or self-awareness disciplines.

Review stats



Project Partnering means we have to step up in the contractor community.

The CM Handy app will also have outreach to the contracting world, it's time to get uncomfortable and make our system better.

The internal exercise I did also shows that the majority of people want this training.

Over half of the superintendents in our company have this training (over half of our superintendents in the field have a military background).

This is evidence that the path to career success is better realized by embracing this philosophy.

The numbers don't lie, the people with this training are the highest achieving people in our company. My questionnaire proves that.

This "portal" / "effort" / "initiative" will have an outreach arm to the contractor community. We have to embraces this from the contractors side as well.

I have to implement this training in a more formal and intentional way for the future success of our company. I will, I'll measure the results, and I hope to be able to share that information with you in the future.

| Search by Technical Topic | Search by Commun | nication Skill |
|---------------------------|------------------|-------------------------|
| Link technical spec: | Link summary: | |
| Link FAQ: | Link videos: | |
| Link videos: | | |
| Schedule Checklist: | | |
| | | |
| | | |
| | | |
| | | |
| | | MHEL |
| | | |
| | | MILE HIGH FLOOD DISTRIC |

MHFD is developing construction management resources and training (dubbed a Handy App) to improve confidence of construction managers.

It will be library located on MHFD's website and organized by topic.

Shown here are examples of landing page for the skill areas of Technical Expertise and Communication and Partnering.

You can search by topic and pull up a list resources.

You'll notice that the resources include various formats of written, pictures, and videos.

| Structural Concrete | | Defensive Beha | Defensive Behavior | | | | |
|---|--------------------------------------|--|------------------------------|------------------------------------|------------------|--|--|
| 03-21-00 Structural Steel 03-31-00 Structural Concrete | | Summary: How do you kn Review the list | ow when you below to iden | are becoming d tify your person | efensive? nal | | |
| FAQ: How important is the bar spacing from formwork? | and clear distance | Mile High Flood District | t Splash Don't Trash Wat | Chilater Share | | | |
| Subgrade Inspection Video Steel Inspection Video Day of Placement Video | | LORE VACOS | | Parliceren () Youliabe [3 | | | |
| Schedule Checklist: | Subgrade Formwork Truck Access | | | | | | |
| Special Details | Finishing | | | | | | |
| | | | | | | | |
| +4-8 weeks | +2-weeks | +1-2 Days | Pour | -2 days | -3 weeks | | |

Here are a couple examples of searched topics and the resources available.

Note the schedule bar to help with being proactive.

The topics and content will be informed by the surveys.

In addition to this CM Handy App, MHFD will provide a construction management training.

Let's try the previous scenario again...using some of the tools and tips that we've picked up on our projects.

To make it interesting...I'll play the contractor and Jerry can play the CM.



Jerry confident construction manager.

Rich working, Jerry comes out friendly with maybe only plans under his arm and phone in a pocket.

Jerry – Hey Rich...beautiful day, (extends his hand to shake it) looks like you have completed a lot of work. Your boulder placement looks great from here. Rich – The guys have been working pretty hard.

Jerry – I see that the cut-off wall is poured already, I thought we talked about how that needed to be poured with the grouting of the boulders?

Rich – We were making pretty good progress yesterday, so we thought we'd get ahead of the grouting for tomorrow.

Jerry – I appreciate the effort, unfortunately the intent of the cut-off wall is to prevent water from going under the drop structure. In the past, we have seen the cold joint in the cutoff wall cause long term problems down the road. With that in mind do you have any suggestions on how we can correct this?

Rich – We did a project on Sampson Gulch where we poured things separately. We ended up excavating a small trench upstream of the already placed cutoff wall. It looks something like this (sketching it out). That way the water-stop is both the keyway and wrap around. What do you think?

Jerry – It seems like a good approach.

Rich – Can we take a look at the next structure? We're having problems there.

Jerry – Glad to. Let's walk down there.



Rich – We had the cutoff wall trenched and ready to go last night. When we came out this morning it collapsed.

Jerry – Yeah. I can see that.

Rich – I was going to pull the boulder and cleanout the cutoff trench, but I'm not sure how to get the boulder back in place. Any suggestions?

Jerry – After you get the cutoff wall cleaned out...could you: form it up on the boulder side, pour the wall and the rest of the boulders, replace the boulder and grout it on the next pour?

Rich – We could probably make that work. I'm afraid it might happen again on the next 4 drop structures. Maybe we can come up with a better approach on the next structure.

Jerry – Maybe we can use multiple pour approach with the fix from the last structure to prevent this type of failure in the future. What do you think?

Rich – It's Worth a shot.

Jerry – We'll probably have it all figured out by the last structure.

Rich – Yeah...that's how it usually works.



Laura: Wrap up.

How to be more confident on a Construction Site?

Be confident on the Construction Site!

Be proud of your next project!



Rich:

The goal of MHFD is to provide construction management resources and training. A Handy App to boost your confidence, deliver the highest quality at the best value, and create project that we can all be proud of. Sometimes you may even get a cool log bench out of it.



Rich:

Only if we have time:

Who has worked and completed construction projects with me? (Raise your hands.)

1) Please show how many projects you've worked on with by the number of fingers you hold up (if you have done 5 or more hold up a fist)

Conclusion:

There are always problems in construction. Sometimes they turn into battles, and it is good to have a team to get through them. I've learned that some of the greatest challenges build the best projects.

VOLUME CRITERIA MANUAL

MANAGEMENT, HYDROLOGY, AND HYDRAULICS

Challenges with Creating Effective Local Drainage Criteria Manuals based on the Urban Storm Drainage Criteria Manual (USDCM)

by

Andrew Earles, Jane Clary and Hayes Lenhart Wright Water Engineers, Inc., Denver and Durango

Jeni Nicovich and Keith Dougherty City of Durango

&

Holly Piza Mile High Flood District

CASFM 2019 Annual Conference, Crested Butte, Colorado September 26, 2019

Presentation Objectives

- Discuss similarities and differences between USDCM and local criteria manuals
- Typical topics addressed in local manuals
- Strategies for creating a "living" document
- Experiences on the West Slope





Distinctions between Local Criteria & MHFD Criteria

- USDCM provides criteria applicable across MHFD jurisdiction
- USDCM provides the "why?" and serves educational role – many local manuals are more focused on "what do I have to do?"
- Local policies & criteria may vary from USDCM – USDCM criteria are not mandatory



Variability in Land Uses from One Municipality to Another





Typical Topics for Local Criteria Manuals

- Hydrology
- MS4 permit requirements
- Submittal requirements
- Enactment authority, revision process, enforcement, etc.
- Local-specific issues
 - Stormwater retention and water rights
 - Water quality practices for small sites
 - Land uses
 - Preferred details



0.36 - 0.40
 0.81 - 0.90
 1.31 - 1.40
 1.81 - 1.90
 0.41 - 0.50
 0.91 - 1.00
 1.41 - 1.50
 1.91 - 1.99
 0.51 - 0.60
 1.01 - 1.10
 1.51 - 1.60
 0.61 - 0.70
 1.11 - 1.20
 1.61 - 1.70
 0.71 - 0.80
 1.21 - 1.30
 1.71 - 1.80

Isopluvials of 2-year, 60-minute precipitation in inches

Reference: NOAA Atlas 14



CDPS GENERAL PERMIT COR090000 STORMWATER DISCHARGES ASSOCIATED WITH MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)

AUTHORIZATION TO DISCHARGE UNDER THE

COLORADO DISCHARGE PERMIT SYSTEM

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), this permit authorizes all discharges from municipal separate storm sewer systems certified under this permit, from those locations specified throughout the State of Colorado to specified waters of the state. Such discharges shall be in accordance with the conditions of this permit.

This permit specifically authorizes the entity listed in the certification to discharge as of the effective dates stated on the certification, in accordance with pollutant restrictions, prohibitions, and reduction requirements and monitoring requirements and other conditions set forth in Parts I, II and III hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

The applicant may demand an adjudicatory hearing within thirty (30) days of the date of issuance of the final permit determination, per the Colorado Discharge Permit System Regulations, 61.7(1). Should the applicant choose to contest any of the pollutant restrictions, prohibitions, and reduction requirements monitoring requirements or other conditions contained herein, the applicant must comply with Section 24-4-104 CRS and the Colorado Discharge Permit System Regulations. Failure to contest any such pollutant restriction, prohibition, and reduction requirement, monitoring requirement, or other condition constitutes consent to the condition by the Applicant.

This permit and the authorization to discharge shall expire at midnight, June 30, 2021.

Modified, Reissued and Signed this 30th day of March, 2018

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Ellipourel kutzr

Ellen Howard Kutzer Permits Section Manager Water Quality Control Division

PERMIT ACTION SUMMARY:

Modification 4 - Minor Amendment: Issued March 30th, 2018 Effective May 1, 2018 Modification 3 - Minor Amendment: Issued December 1, 2016 Effective January 1, 2017 Modification 2 - Minor Amendment: Issued July 26, 2016 Effective September 1, 2016 Modification 1 - Minor Modification: Issued May 16, 2016 Effective July 1, 2016 Originally Issued and Signed: April 15, 2016 Effective: July 1, 2016

Key Elements of Developing a Local Criteria Manual

- Collaboration between municipal staff, consultant, MHFD and stakeholders
- Reference versus repeat USDCM content, MS4 requirements, etc.
 - Streamlined approach of referencing has many benefits
- Integration of MS4 requirements will change multiple times before next criteria manual update

Key Elements of Developing a Local Criteria Manual

- Consistency with municipal code and design standards
- Requirements for water quality and detention – sites less than an acre
- Overlapping regulations
- Buy-in from municipal leadership – work sessions on controversial issues



Reference: Commerce City Engineering Construction Standards

| | I and Development | Land Development Wetland and | | MS4 Post-Construction Stormwater Quality Requirements | | |
|---|--|--|---|---|---|--|
| | Classification | Floodplain Requirements | Requirements | Outside of Cherry Creek Reservoir Basin ¹ | Cherry Creek Reservoir Basin ^{2,3} | |
| Greenwood Village | Tier 1 Development and Redevelopment (<500 sq. ft. imperviousness added) | | Flood attenuation not required. | Post-construction water quality not required. | Post-construction water quality not required. | |
| Examples Current MS4 Permit versus Cherry Creek Reservoir Control Regulation | Tier 2 Development and Redevelopment (<1-acre disturbance with impervious area increase > 500 sq. ft. and <5,000 sq. ft.) Tier 3 Development and Redevelopment (<1-acre disturbance with impervious area increase > 5,000 sq. ft.) | <u>Wetlands</u> No net loss of wetland functions and values. <u>Floodplain</u> Development restricted in Special Flood | Implement flood attenuation using UDFCD Manual runoff reduction practices and/or full spectrum detention for: 1) existing development to achieve release rates equal to discharge rates based on 1998 impervious area and 2) new development to achieve | Post-construction water quality control <u>is not</u> required for residential development/redevelopment. Post-construction water quality control <u>is</u> required for non-residential development/redevelopment. | Implement stormwater control measure that meets one or more of the following criteria: WQCV does not leave the site. Sheet flow over grass buffer area. Grass swale and minimize directly connected impervious area (MDCIA). Constructed wetland channel. Grass buffer meeting certain criteria. Hydrologic analysis showing adequate water quality protection. Alternative control measures with comparable or better nutrient removal characteristics. Implement stormwater quality control measure to provide the WQCV to treat, at a minimum, the 80th percentile storm event. Approved BMPs: Extended Detention Basin (EDB) | |
| Runoff Reduction for sites < 1 acre | Tier 3 Development and Redevelopment (≥ 1-acre disturbance) | Hazard Area (SFHA). | 90% of historic discharge rate. | Implement stormwater quality control measures to meet one of the following base design standards: Treat and/or infiltrate the Water Quality Capture Volume (WQCV). Treat the 80th percentile storm event to remove pollutants Infiltrate 60% of the WQCV to reduce runoff. Provide regional WQCV control measure. Provide a regional WQCV facility. | Retention Pond (RP) Constructed Wetland Basin (CWB) Porous Pavement Detention (PPD) Bioretention (BR) Sand Filter Extended Detention Basin (SFB) Runoff Reduction practices (MDCIA/LID) Constructed wetland channel plus EDB, RP, CWB, PPD, BR or SFB Grass swales plus PPD or BR Constructed wetland channel preceded by modular block pavement MDCIA plus EDB, RP, BR, SFB WQCV Alternatives: Other BMPs that do not use the WQCV or are in combination with WQCV with better or comparable nutrient reduction capabilities. | |

MHFD Criteria – We want your input



Stakeholders

UDFCD wants your input on a number of efforts. Please contact us if interested.



www.udfcd.org:

View what's up next for updating and let us know you want to be a stakeholder.

View

MHFD Criteria – Stay Current

Services Working With Us Resources About Us Open Records Copyright © 2019 Urban Drainage and Flood Control District.



Stay Informed Get recent news and developments from UDFCD right to your inbox. Sign Up For Updates



Durango Storm Drainage Design Criteria Manual

• Initiating update of 1982 Stormwater Master Plan – Why?



Durango Storm Drainage Design Criteria Manual

Initiating update of <u>1982</u> Stormwater Master Plan – <u>It's Old</u>



Blast from the past - 1982



Blast from the today - 2019



Durango Storm Drainage Design Criteria Manual

- Update from 1982 Stormwater Master Plan
 - Current industry standards in one place
 - Consistent submittal requirements
 - Limit proprietary software
 - Standards and requirements tailored to our area – Rainfall/Hydrology
 - C values
 - WQCV/P₁
 - Detention



Adapting MHFD Criteria to Durango, CO

- Hydrology
 - Pre-Development Unit Rates of Runoff
 - Utilized baseline MHFD values and interpolated for Durango

Pre-Development Unit Rates of Runoff

Scenario 1A - HSG A / S = 0.01 / Shp = 2



Adapting MHFD Criteria to Durango, CO

- Hydrology
 - EURV calculation
 - Utilized baseline MHFD values and interpolated for Durango





• The 25-year EURV was ultimately selected for Durango, CO

Positive Effects for Durango



- Following good/current engineering practice
 - Adapting MHFD criteria helps justify & push new standards
- Reference to documentation/practices in single location
 - More current data
 - Standardizing submittals

Positive Effects for Durango

| В | C D E F G H I J | KL | | |
|-------------------------------|--|------------------------|--|--|
| CITY OF | DURANGO DETENTION BASIN DESIGN WORKBOOK | | | |
| | Durango-Detention, Version 1.3 (October 2018) | | | |
| | ITY OF DURANGO DETENTION BASIN DESIGN WORKBOOK | | | |
| OURANGO M | Durango, Colorado http://www.durangogov.org/ | | | |
| <u>Purpose and Background</u> | 1: This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different BMP types and various outlet configurations can be sized. This workbook is based on the original UD-Detention workbook originally created by the Denver Urban Drainage and Flood Control District (UDFCD). The Durango-Detention workbook has been adapted specifically for use within the City of Durango. | | | |
| unction: | Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships. | | | |
| | 2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed. | | | |
| Content: | This workbook consists of the following sheets: | Click here for history | | |
| Basin | Tabulates stage-area-volume relationship estimates based on watershed parameters | this workbook | | |
| Outlet Structure | Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control). | | | |
| Reference | Provides reference equations and figures. | | | |
| User Tips and Tools | Provides instructions and video links to assist in using this workbook. Includes a stage-area calcula | ator. | | |
| BMP Zone Images | Provides images of typical BMP zone configurations corresponding with Zone pulldown selections. | | | |

- Public freeware that can be easily reproduced
 - Faster review time
 - Less fudge factors
- Alignment with MS4 permit

Challenges with Design/Development

- Change is hard.
 - New standards are more stringent/cost more
 - More in-depth analysis/submittal required
- Convincing developers to try infiltration/LID techniques
 - UIA not penciling out
- Increased Density & Infill Development (competition for space)
- Triggers for redevelopment sites



Challenges with Policy Implementation



- WQCV & EURV decreased, 100yr increased
- Complicated Spreadsheet
 - Confidence in technical support and code changes
- MHFD updates
- Public process for Adoption/Amendments
Conclusions

- Local storm drainage criteria manuals have important differences from the USDCM
- Creating an effective local manual is a collaboration between the consultant, the local government, the MHFD and other stakeholders
- Criteria manuals in 2019 are different from manuals in the early 2000's
 - Evolution of practices
 - Electronic platform
- Streamlined approach helps to keep local manual relevant as other criteria change
- Local manuals on west slope or other areas with differing hydrology and/or less familiarity with USDCM can have unique challenges with technical issues and acceptance by the local engineering community and public

VOLUME VOLUME VOLUME **Questions?** CRITERIA MANUAL Thank you for attending our presentation!

MANAGEMENT, HYDROLOGY, AND HYDRAULICS

RAGE, AND RECREATION