2012

LARIMER COUNTY
COMMITTED TO EXCELLENCE
PUBLIC WORKS DIVISION

ENGINEERING

Engineering A Better Future For Larimer County

A Message from the Department Head

Unexpected Events

Everyday we come to work with a pretty good idea of what's on the work list for the day. We're busy planning, designing, and building various projects around the County. We address citizen inquiries and maintain floodplain records. We have development applications to review, and access permits to process.

But one day last summer, everything changed. Starting June 9th, the High Park Fire literally as well as figuratively changed the landscape and our jobs.

In the last eight months, the Engineering Department has deployed staff and re-prioritized work tasks to address a myriad of fire-related issues. We've spent more than 1,500 hours of staff time on fire related issues. This report chronicles the activities and efforts related to the fire and its aftermath.

The early work after the fire quickly determined the extent of the impact. Throughout the fall we turned to detailed analysis, determining mitigation and working with our agency partners. We also worked closely with citizens to keep them informed. This spring, we're focusing on construction in the area to be completed before the thunderstorms arrive in 2013.

You'll see on page 6 that it really does take a whole department and people with a wide range of experience, knowledge, and skills to be able to so quickly and confidently address the needs of the fire aftermath.

Yet while the fire so appropriately took precedence, not all the 'normal' work tasks could be delayed. A number of department staff continued to expertly do their jobs, and were willing to take on extra work due to fire needs.

I've said before and still believe that the strength of any organization is a function of its staff. I'm honored and privileged to work with a group of extraordinary professionals who do a tremendous job to *Engineer a Better Future for Larimer County* or in the case of the fire, to simply engineer things back towards where they were and address a variety of new needs.

Department head Mark Peterson is honored for work related to the High Park Fire. *Photo: Charlie Johnson*

Mark Peterson, PE
Engineering Department Head

High Park Fire By The Numbers

The High Park Fire burned over 87,200 acres and is the largest and most destructive fire in the history of Larimer County. The burned area is equivalent to 136 square miles, or more than twice the size of the City of Fort Collins.

The fire took 22 days to contain using as many as 2,000 firefighters at its peak.

It killed one person, destroyed 269 homes and cabins and disrupted the lives of hundreds of residents.

Estimated emergency restoration needs exceed $24 million dollars, and effects of the fire will be present for years to come.

On The Cover:

Falls Gulch was severely burned in the fire and the changed drainage patterns are clear. However, the beginning of regrowth is evident Photo: Mark Peterson

"The air pollution in Fort Collins [during the fire] rivaled some of the worst days seen in some of the worst cities across the planet."

Professor John Volckens, Ph.D.
Colorado State University Professor
Air Pollution Measurement Specialist

High Park Fire Air Pollution
Photo: Online-Coloradoan

Did You Know?

Comparing Fire Size

High Park Fire (2012)	**Larimer County**	**87,200 acres**
Waldo Canyon (2012)	**Colorado Springs**	**19,000 acres**
Fourmile Canyon (2010)	**Boulder**	**6,000 acres**
Hewlett Fire (2012)	**Larimer County**	**7,685 acres**

From Fires to Floods

Burned street name signs reflect the intense heat from the fire. 95 sign panels were replaced.
Photo: Todd Juergens

The western flank of the fire seen at night in the area of the Boy Scout Road on June 29, 2012.
Photo: Connor Wilkinson

Some areas in the burn area are entirely striped of ground cover and living trees. The soil becomes water repellent, and subsequent rains run off quickly. *Photo: Mark Peterson*

Construction Manager Todd Juergens evaluates a burned hillside during the Burned Area Emergency Response (BAER) team evaluation. *Photo: Mark Peterson*

A flash flood descends Falls Gulch on July 6th after just 1.1 inches of rain. Increased flows from thunderstorms will occur for years to come.
Photo: Local Resident

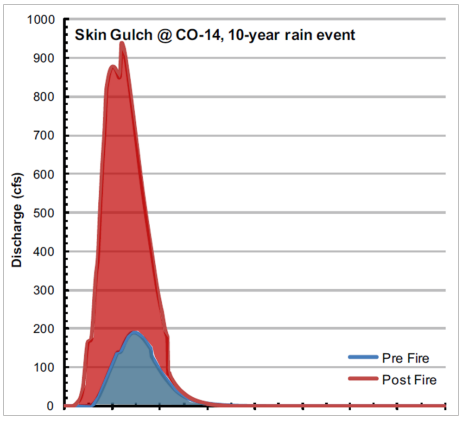
New drainage patterns are created with overland water flows following a rainstorm in late summer 2012.
Photo: file

Sediment, ash, and debris is carried downstream after minor rains.
Photo: Todd Juergens

Driveways can turn into rivers of mud and debris. *Photo: Mark Peterson*

The Challenges

The potential aftereffects of the High Park Fire include significant threats to human life, safety, property, transportation, water quality as well as natural and cultural resources.



This graph shows the change in runoff between pre-fire and post-fire conditions. In some areas more than 5 times as much water is now expected. . *Graphic: NRCS*

Debris and Mudflows

When rain falls on unprotected earth or burned areas, instead of soaking into the ground, the water runs off quickly. Soils become unstable, and water, soil, and debris flow down hillsides causing floods and mudflows.

Increased runoff will quickly overwhelm culverts, overtop roads, and may create washouts. *Photos: Top: Tony Simons Bottom: Todd Juergens*

Of the 136 square miles burned, almost half of the area is categorized as moderate or severely burned. Erosion potential in these areas and drainages are extremely high. *Photo: Mark Peterson*

Runoff from burned drainage basins now threatens a number of areas including driveways, homes in the Poudre Park area, and even non-burned downstream areas such as the community of Bellvue.

Roadway Overtopping and/or Undermining

The increased amount of water running off the hillsides coupled with debris, mud, and silt that reduces the capacity of culverts can result in water overtopping roads.

This can quickly undermine the roadways themselves and cause complete roadway washouts.

Sediment

The Poudre River is a source of drinking water to more than 300,000 people. 75% of the High Park Fire area drains to the Poudre river. Flowing ash and sediment from the fire prevents water utilities from drawing from the river during and after rain events.

A rock slide closes SH 14 in Poudre Canyon. Hillside stabilization will be a priority for years to come. *Photo: CDOT*

Addressing the Needs

The challenges in the High Park Fire area are immense and will remain significant for years to come. Addressing the needs requires a multi-facetted approach.

Land Stabilization — Aerial Mulching

More than 5,600 acres of non-federal land has been identified as good candidates for aerial mulching to stabilize the slopes. About 3,000 acres was completed in the fall of 2012. Additional mulching will be contracted in the spring of 2013 depending on the availability of funding.

Aerial mulching and seeding can cover large areas of burned property. The straw mulch provides erosion protection for the bare soil.
Photos: Left: City of Fort Collins - Right: Lynette Johnson

Dealing with Debris

Addressing the debris accompanying runoff in the burned area is a priority. The County is installing a number of 'debris racks' to intercept debris before it enters stream systems, and is moving forward with ditch cleaning and debris removal in other areas to restore the flow capacity of streams and roadside ditches.

Debris carried downstream by rain on unprotected slopes can quickly clog stream channels.
Photo: Todd Juergens

Monitoring and Evaluation

New LiDAR (Light Detection and Ranging) allows for detailed and more accurate analysis on the needs and challenges of the area. For instance, a detailed review of the Empire Gulch area serves as the foundation for a specific mitigation plan to protect structures from a nearby drainageway.

A federal grant was obtained to cover the partial cost of four rain gages to be installed in the Rist, Buckhorn , Redstone and Empire Gulch areas.

Culvert Replacements

Rist Canyon Road (CR 52E) crosses Rist Creek a number of times in the lower part of the canyon utilizing small culverts. Due to increased runoff from the burned areas above, there is the potential for significant water flows and debris that can overwhelm and/or clog the culverts. This can cause flooding, roadway overtopping, or in extreme cases the complete washout of this important transportation corridor.

The Engineering Department is using about 1.7 million dollars of County funding to replace seven culverts in the lower part of the canyon.

A series of seven old and small sized culverts passing Rist Creek underneath CR 52E (Rist Canyon Road) are being replaced with large box culverts. The new culverts have more capacity, are less susceptible to clogging by debris, and are designed to protect the roadway from washing out as much as possible.
Photo: Matt Johnson

The culverts are designed to accommodate additional capacity, minimize the chance for debris clogging the culverts, and the area around the culverts are armored to protect the road should overtopping occur.

The culverts were surveyed, designed, bid, and constructed in just 6 months.

It takes a Whole Department… .

The ability to quickly respond to High Park Fire needs highlights the benefit of skilled in-house staff. In addition to normal work duties, Engineering Department staff has spent more than **1,500 hours** working on fire-related issues in all disciplines of the department.

Land Agents

Land Agents and staff worked very quickly last fall to gain written permissions from about 100 property owners for aerial mulching. Work continues now on easements for rain gages and stream clearing.

Survey

The survey crews completed field work to develop base maps for the culvert replacement projects.

Engineering Design

The engineering design team is creating design plans for flood mitigation projects in extremely short time frames.

Flood Risk Technical Support

Staff that oversees flood risk in the county is providing as much information as available to residents.

Construction Management

The construction management staff is overseeing the improvement efforts as they are built, including inspection.

Development Review

The development review team is assisting residents in navigating the re-building process.

Coordination Efforts

A number of staff have been actively involved in coordination efforts among local communities, as well as a myriad of state and federal agencies.

Dealing With the Paperwork

The paperwork that is required on a large scale restoration project such as the High Park Fire is immense. Staff is tracking contracts, funding, expenditures and reporting on numerous efforts.

Photo: Mark Peterson

Photo: Martina Wilkinson

Photo: Engineering Staff

Photo: Clint Jones

Photo: City of Greeley

Photo: Charlie Johnson

Most, if not all members of the engineering department have played an important part of addressing fire-related needs.

Public Information/Outreach

A targeted effort by the staff was undertaken to communicate changed conditions to the public and citizens. This resulted in everything from pamphlets and posters to web information, individual mailings, workshops, and public meetings.

Engineering Department Major Service Areas:

- Asset Management
- Bridges
- Construction Management
- Development Review
- Engineering Design
- Improvement Districts
- Permitting
- Right of Way
- Stormwater and Floodplains
- Survey
- Traffic/Transportation Planning

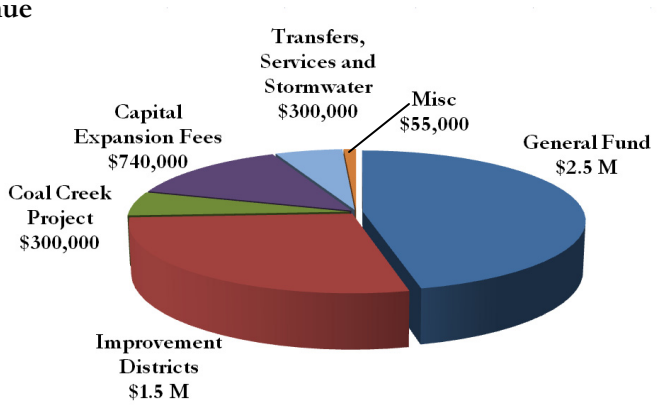
Summary of Finances

Engineering Department funding comes primarily from the County's general fund. As part of a County-wide budget reduction, the 2012 budget for Engineering Operations was reduced by about 4%. General funds covered 91% of the costs to operate the department.

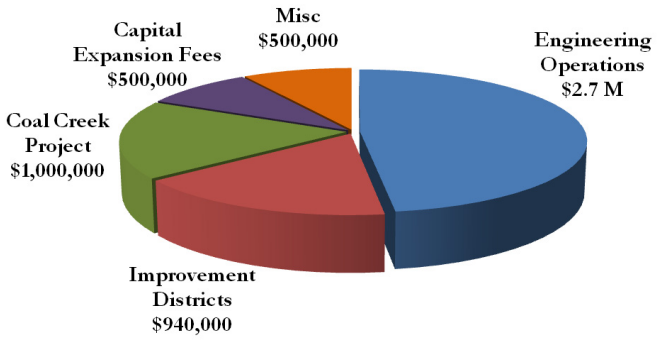
During 2012, the Engineering Department designed and managed the construction of approximately $10 million of improvements for roadways and bridges (including $940,000 of work in the 43 improvement districts). The department completed the Coal Creek Flood Mitigation Project as well as special projects for the Departments of Natural Resources and Solid Waste.

The large difference between revenue and expenses for Improvement Districts reflects decisions by road boards to save funding for future projects.

2012 Revenue
$ 5,395,000



2012 Expenses
$ 5,640,000



These figures are unaudited. Audit to be completed mid 2013.

Partnerships are Key

The effects of the High Park Fire, and the response to it involved a number of jurisdictions and agencies.

Partnerships among these entities are absolutely key to developing, funding and implementing restoration efforts.

State and Federal Support

The scope and scale of the fire required the assistance of state and federal sources—during and after the fire.

Multiple agencies contributed to the Burned Area Emergency Response Report, which was completed in the first few weeks after the fire, and provided a general overview of fire restoration needs.

The Natural Resource Conservation Service (NRCS) is a federal agency administering federal funding for restoration, and also supports efforts with technical and scientific staff.

The State's Department of Emergency Management is supporting restoration efforts in a number of ways, including providing grants to purchase and install stream gages for monitoring.

Whale Rock

The bridge over Rist Creek at Whale Rock was a significantly substandard structure and after the fire, it could not accommodate the construction equipment related to rebuilding efforts.

The Red Cross, private property owners, local businesses and Larimer County all partnered to construct a new crossing.

City Efforts

Both the City of Greeley and the City of Fort Collins are keenly interested in restoration efforts in the fire area because of their reliance on Poudre River water for their municipal water supply. Coordination efforts with them, especially for aerial mulching efforts, continue.

The Burned Area Emergency Response (BAER) report was completed by a multi-agency team of experts, including Larimer County Engineering staff. *Photo: Mark Peterson*

Other 2012 project completions

CR 29 bridge replacement west of Loveland. The old bridge had a severely deteriorated deck and older girders. *Photo: Darrell Morrell*

Hydromulching as final construction step on CR 27 as a safety project is completed. The application of seed, fertilizer and moisture retention encourages grass growth and reduces erosion. *Photo: Preston Pierson*

Two culverts were replaced on CR 43 and a minor realignment was completed. *Photo: Frank Kurtyka*

The asphalt overlay program included a new driving surface on CR 54G approaching the community of LaPorte. *Photo: Darrell Morrell*

Contact Information

Larimer County
Engineering Department

Address
200 West Oak Street
Suite 3000
Fort Collins, CO 80521

Mailing Address
PO Box 1190
Fort Collins, CO 80522-1190

Phone / Fax
(970) 498-5700
(970) 498-7986

Office Hours
8:00 a.m. - 4:30 p.m.
Monday - Friday

On The Web At:
www.larimer.org/engineering

The access to The Ranch and Budweiser Events Center was repaved in a routine maintenance project. The Engineering Department supports other county facilities with planning, design, and construction expertise. *Photo: Darrell Morrell*

LARIMER COUNTY
COMMITTED TO EXCELLENCE

This publication is printed on recycled paper.

Public Works Division

Engineering
Fleet
Natural Resources
Road and Bridge
Solid Waste
The Ranch