State Engineer's
27th Annual Report on Dam Safety
to the
Colorado General Assembly
Water Years 2010-11 and 2011-12

Prepared by
Colorado Division of Water Resources
Office of the State Engineer
Dam Safety Branch

Bill McCormick, P.E., P.G.
Chief, Dam Safety Branch

Mike King
Executive Director

Dick Wolfe, P.E.
Director and State Engineer

John Hickenlooper
Governor

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EXECUTIVE SUMMARY

This report is submitted in general compliance with Section 37-87-114.4, C.R.S., concerning the dam safety activities of the State Engineer and the Colorado Division of Water Resources relating to Sections 37-87-105 to 37-87-114, C.R.S. This report covers activities of the Dam Safety Branch (Branch) for a two year period from November 2010 through October 2012. The annual report reporting period generally follows the "water year" (WY) from November 1, through October 31, of a given year. This is consistent with other Division of Water Resources reporting activity requirements. Due to personnel changes at the end of WY 10-11 an annual report was not produced previously for that period. This report attempts to make up for that omission by presenting two WY's worth of information on Branch activities. However, in some cases information pertaining to WY 10-11 was not available.

Per Section 37-87-114.4, C.R.S., this report covers the following activities: Approval of plans and specifications for new dams, and alterations, modification and repairs of existing dams, the number of dam inspections performed and the results thereof, use of appropriated funds, receipts generated from inspections of dams and reservoirs, rules and regulations adopted or amended, enforcement orders and proceedings, dam failures and reasons therefore, and other available data regarding the effectiveness of the state's dam and reservoir safety program

Design review activities performed by the Branch per Section 37-87-105 C.R.S., include receiving plans and specification packages for a combination of projects including new dams, repairs, alterations and modification to dams; reviewing and approving plan sets, participating in start of construction activities, participating in periodic inspections of construction, and processing final construction documentation and providing final construction acceptance and project close-out. Since projects are in various stages of the design review and construction process at any given time, it should be noted that a given reporting periods numbers included projects previously received, approved and or started in previous WY's.

In WY 10-11 the Branch received a total of 58 sets of plans and specifications for a combination of new dams, repairs, alterations and modifications to dam. The total dollar value of the submitted plans was $63,386,809. During the same period 50 reviews resulted in approval for construction, 36 projects started construction, 43 projects completed construction and 40 projects were awarded final acceptance.

In WY 11-12 the Branch received a total of 49 sets of plans and specifications for a combination of new dams, repairs, alterations and modifications to dams. The total dollar value of the submitted plans was $22,356,806. During the same period 62 reviews resulted in approval for construction, 60 projects started construction, 53 projects completed construction and 64 projects were awarded final acceptance.

The Branch developed updated standards for design review memoranda and initiated a new peer review and collaborative design review process. The newly initiated process of collaboration and teaming is exemplified at the largest new dam construction project in the State, Long Hollow Dam in La Plata County near Durango. Dam safety engineer Matt Gavin led the design review efforts for the project and is now leading the construction inspection activities. Matt has assembled a team of west slope engineers including Garrett Jackson and Jason Ward and the

design review engineer Jeremy Franz, in an effort to capitalize on Branch expertise, knowledge and proximity to the project to meet the Branch's statutory obligations toward the success of this large, fast paced project. Future efforts such as these allow dam safety engineers to offer specialized expertise to projects, will allow them to learn from each other, will promote consistency in enforcement across the state, and will promote cooperation and cohesiveness of the group

Dam inspections encompass periodic inspections to determine dam conditions and to set the safe storage level, per Section 37-87-107 C.R.S.. Inspections are also performed as part of on-going construction projects, follow-up inspections, outlet works inspections and interim inspections.

In WY 10-11 engineers within the Branch performed 518 dam inspections. Dams inspected included 224 high hazard, 171 significant hazard, 122 low hazard, and one no public hazard dam. In WY 11-12 engineers within the Branch performed 538 dam inspections. Dams inspected included 237 high hazard, 137 significant hazard, 161 low hazard, and 3 no public hazard dams. Monthly reports provided by dam safety engineers indicate other inspections were completed; 15 interim, 249 construction, 165 follow up, 29 outlet works, 5 federal dam, 14 illegal dams and 61 other types of inspections were also performed for a total of 1076 total dam safety inspections.

The dam safety branch program staff, 12 FTE, 9.5 dam safety engineer FTE and 1.5 design review engineer FTE and one branch chief FTE, are supported by appropriations from the State General fund. In WY 10-11 two positions were vacant for some of the time, resulting in a net vacancy of one FTE for the reporting period. The total Branch FTE appropriations for WY 11-12 were $1,388,589.60. Dam Safety vehicle mileage and expenses account for another portion of program appropriations. In WY 11-12 $58,659.28 was appropriated for the cost of dam safety vehicles.

In addition to general fund appropriations, the Branch receives a Federal Emergency Management Agency (FEMA) National Dam Safety Program (NDSP) grant annually. In WY 10-11 the grant amount was $161,096, in WY 11-12 the grant amount was $167,260. The NDSP grant is used to assist the program with some operational funding such as in and out-of-state travel, dam engineer technical training, and field and office equipment support. The majority of the funding is utilized for emergency action planning (EAP) activities that help dam owners. In WY 11-12 the Branch utilized $65,825.68 of the FEMA NDSP grant toward Branch operations activities and $101,434.32 for dam owner EAP activities. In WY 11-12 the Branch also received a $92,000 grant from the Colorado Water Conservation Board (CWCB) for activities associated with verification and enhancement of the Extreme Precipitation Analysis Tool (EPAT).

Section 37-87-106, C.R.S. outlined the cost to dam owners for dam inspections performed by Branch personnel. However, that Section of the C.R.S. was repealed well before the reporting periods of this report and no receipts were therefore generated for inspections during this period. Fees are charged for design review activities based on the estimated cost of construction, in accordance with Rule 8 of the 2007 Rules and Regulations for Dam Safety and Dam Construction (the Rules). In WY10-11 a total of $37,415 was collected and in WY 11-12 $47,374 was collected.

The Branch currently utilizes the Rules promulgated in 2007 to regulate Branch activities. There were no modifications or amendments to the 2007 Rules in either WY 10-11 or WY11-12. In

WY 11-12 Section 18 of 37-80-102 C.R.S. was amended and revised to allow the State Engineer to receive and spend grant funds from the Colorado Water Conservation Board (CWCB).

Enforcement orders and proceedings in the context of dam safety in Colorado consist of orders drafted by Branch personnel and signed by the State Engineer. Orders generally consist of storage restrictions based on results of the dam safety inspections. Enforcement activities fall into four categories, (1) Restrictions imposed, (2) Restrictions modified, and (3) Restrictions lifted (4) Breach orders. At the end of WY 11-12, a total of 157 dams remained on the dam safety restricted storage list, amounting to a total 68,590 acre-feet of restricted storage statewide.

In WY 10-11, six new storage restrictions were imposed (978 ac-ft of storage lost), two restrictions were modified (53 ac-ft storage lost) and 16 restrictions were lifted (1572 ac-ft of storage returned to full use). The total activity resulted in a net gain of 541 acre-feet of storage statewide. No breach orders were issued during this period.

In WY 11-12, nine new storage restrictions were imposed (1337 ac-ft of storage lost), two restrictions were modified (23 ac-ft storage lost) and 18 restrictions were lifted (1089 ac-ft of storage returned to full use). The total activity resulted in a net loss of 271 acre-feet of storage statewide. No breach orders were issued in this period. In WY11-12 the largest historic storage restriction in the state at Cucharas #5 dam was removed when the dam owner excavated the spillway down to the restricted level. This was the result of actions detailed in a "Compliance Plan" order, an innovative agreement developed by the dam safety engineer and dam owner and signed by the State Engineer. This action removed 33,000 acre-feet of storage from the restricted storage quantity, but it does not result in returning any storage to use since the reservoir now has that much less storage. The action does however significantly reduce the dam safety risk to the downstream public.

No jurisdictional dam failures occurred in Colorado in WY 10-11 or WY 11-12. In WY 11-12 14 dam safety incidents were logged. Dam safety incidents are defined as situations at dams that require an immediate response by dam safety engineers. The response is typically a site visit and actions based on the situation, up to and including the activation of a dam's Emergency Action Plan (EAP). In WY 11-12 incidents occurred at seven high hazard dams. Incidents reported and acted upon included unusual seepage, embankment settlement and excessive upstream slope damage from wave action. Incidents also included on the WY 11-12 list were associated with the large and damaging wildfires that occurred, particularly the High Park fire and the Waldo Canyon fire. These fires were tracked to ensure no damage would occur on dams within or near the fire areas. No EAP's were activated for any of the WY 11-12 incidents.

Highlights of other dam safety activities that contributed to the effectiveness of the dam safety program include the following:

1. Emergency action planning activities in this report period included receiving updates to Emergency Action Plans (EAPs) for high and significant hazard dams. In WY 10-11 97 updates were received and in WY 11-12 86 updates were received. Efforts were made in WY 11-12 to more aggressively manage and update EAP's identified as being out dated.

2. In WY 11-12 Dam safety engineers participated in 12 dam owner initiated telephone drills for EAP notification lists and 14 federally (FERC, USBR, USACE) sponsored or initiated tabletop and functional EAP exercises.
3. The Branch began an Inundation Mapping Grant project in WY 10-11 to provide owners of high and significant hazard dams access to FEMA NDSP grant funds to create or update EAP's and inundation maps for EAPs. In WY 10-11 19 inundation mapping grants projects were completed using $97,175 of NDSP grant funds. In WY 11-12 the NDSP funding for the program was supplemented by CWCB and 37 projects were completed using $173,900 of NDSP funds and $64,400 of CWCB funds.
4. In WY 11-12 all Branch personnel took online training through the Emergency Management Institute to become certified at the awareness level in the National Incident Management Systems (NIMS) Incident Command System (ICS).
5. In WY 11-12 the Branch, with the help of DWR Records Section personnel, began efforts to scan (digitize) our portfolio of EAP's into our Laserfiche digital information environment. The effort is intended to allow ease of access to information contained in EAP's to not only members of DWR, but is also part of a future planned awareness and education activity for members of the public at large in an effort to reduce the consequences of dam failure floods in Colorado.
6. In the period of WY 11-12 engineers from within the Branch provided dam owner training at the Ditch and Reservoir Company Alliance (DARCA) in Colorado Springs in February, 2012, at the bi-annual Irrigationists Symposium held in Greeley in March, 2012, at small-scale dam owner training in Division 2 and Division 4 in April 2012. In October 2012 dam safety training was also provided to a group of water commissioners at the annual CWOA conference in Ouray.
7. A committee of dam safety engineers from within the Branch was assembled to provide a technical guide for dam safety engineers and the engineering community to determine appropriate hazard classification criteria for new and existing dams within the State of Colorado. The "Guidelines for Hazard Classification" document resulted and was adopted for use on November 15, 2010.
8. Dam safety engineers developed a series of 2-day technical workshops for dam owners, dam designers, and other interested dam safety professionals. The subject matter for the workshops included Dam Breach Analysis, Hazard Classification and Spillway Hydrology. The course was developed to highlight and present the recently adopted Guidelines for Dam Breach Analysis, Guidelines for Hazard Classification, and the Hydrologic Basin Response Parameter Estimation Guidelines for Hydrology studies in Colorado. The program was presented to 170 participants at three locations; March 15 – 16, 2011, Grand Junction; April 5 – 6, 2011, Loveland; April 19 – 20, 2011, Colorado Springs.
9. In WY 11-12 a CWCB funded project was let for $92,000 to continue development of the EPAT software to assist owners of high altitude dams reduce the overall cost of spillway improvements. This phase of the EPAT project was to develop documentation of the program for use in Phase 2, which will be a 3rd party review to ultimately gain confidence and widespread technical acceptance of this technology for use in Colorado.

10. Engineers participated in many ASDSO provided training opportunities including technical workshops, webinars, and hands-on workshops at the ASDSO National Convention held in Denver in September 2012. Additional training was provided to members of the Branch by the U.S. Department of Homeland Security, USACE, private consultants and a representative of the Colorado Attorney General's office.

11. Members of the Branch participated in numerous conferences and provided papers and presentations at the national, state and local levels. Presentations were made to audiences at conferences and meetings of CASFM, Colorado Water Congress, Ditch and Reservoir Company Alliance, Colorado Emergency Managers Association and the SEO annual Meeting. Branch activities were also discussed in presentations for visiting delegations from the Chinese Ministry of Water Resources and the Czech Republic.

12. The Branch was active in Dam Safety Information Management through instigation of a "paperless initiative", maximizing the use of email and digital information processes for transmittal of dam safety related communications and correspondence. Branch engineers processed about 52 separate requests from the public for dam safety information in accordance with Policy 01-05. The Branch responded to ASDSO and NID annual surveys and data calls and established procedures for doing so to foster repeatability and avoid misinterpretation of data. Branch engineers worked with our OIT representative to further progressive work on our DAMS database of statewide dam information and we worked to maintain our dam safety branch website with relevant program information of use to the engineering and dam owner community.

13. Members of the Branch were active in taking steps to improve communication and develop relationships with DNR sister agencies such as CPW, DRMS and CWCB and other State agencies such as the State Office of Architectural and Historic Preservation, (OAHP), Colorado Department of Public Health and Environment (CDPHE), and the Colorado Division of Homeland Security and Emergency Management (DHS&EM). Contacts and communication occurred regarding topics of mutual interest between the Branch and federal agencies including the U.S. Bureau of Reclamation (USBR), U.S. Army Corp of Engineers (USACE), U.S. Forest Service (USFS), Bureau of Land Management (BLM) and the National Park Service (NPS).

14. The Branch was actively represented at the Association of State Dam Safety Officials (ASDSO) through our newly appointed ASDSO State Representative, design review engineer Jeremy Franz.

1.0 INTRODUCTION

1.1 Statutory Basis

The Dam Safety Branch is managed by the State Engineer in accordance with his general duties as described in Section 37-80-102 C.R.S.. Sections 37-87-101 through 37-87-125 C.R.S. form the regulatory basis for dam and reservoir construction in Colorado. The Livestock Water Tank Act, Sections 35-49-101 C.R.S. through 35-49-116 C.R.S. describes the requirements for Livestock water tank dams and impoundments.

The "Rules and Regulations for Dam Safety and Dam Construction", 2007 edition (the Rules), and "Standard Specifications for Livestock Water Tanks and Erosion Control Dams" establish the procedures and requirements of the State Engineer in the implementation of these statutes.

1.2 Report Purpose

Per Section 37-87-114.4, C.R.S., this report covers the following activities: Approval of plans and specifications for new dams, and alterations, modifications and repairs of existing dams, the number of dam inspections performed and the results thereof, use of appropriated funds, receipts generated from inspections of dams and reservoirs, rules and regulations adopted or amended, enforcement orders and proceedings, dam failures and reasons therefore, and other available data regarding the effectiveness of the state's dam and reservoir safety program

This 27th annual edition report covers activities of the Dam Safety Branch (Branch) for a two year period from November 2010 through October 2012. The annual report reporting period generally follows the "water year" (WY) from November 1, through October 31, of a given year. This is consistent with other Division of Water Resources reporting activity requirements. Due to Branch personnel changes at the end of WY 2010-11 an annual report was not previously produced for that period. This report attempts to make up for that omission by presenting two WY's worth of information on Branch activities. However, in some cases information pertaining to WY 10-11 was not available.

1.3 Program Mission

The mission of the Colorado Dam Safety Branch is to prevent the loss of life and property damage, determine the safe storage levels of reservoirs, and protect the state's water supplies from the failure of dams through the effective and efficient use of available resources.

1.4 Program Overview

The Dam Safety Branch's program is firmly grounded in the use of periodic field observation of existing dams by our staff of highly qualified licensed professional engineers. Field observations, combined with requisite engineering analyses form a basis for determining the safe storage levels of reservoirs within the state. In the event a dam is found to be unsafe, the risk of the probability of failure and magnitude of adverse consequences due to failure of the dam are reduced by restricting the storage in the reservoir to a safe level.

The program strives to find and use new tools to help reduce the risk of dam failure floods on Colorado. The risk that dams and reservoir pose to the State of Colorado is a combination (the product) of the probability of failure and the consequences if that failure were to occur. As dam

safety professionals we must consider all ways to reduce the risk that those dams pose. Emergency action planning activities are currently the most powerful non-technical tool at our disposal to reduce consequence of dam failures. Reducing the probability of dam failure through regular dam safety inspections and reducing the consequences of failure through emergency action planning activities forms the backbone of the program.

1.5 Program Staff

The State Engineer, through the Dam Safety Branch, executes the Colorado Dam Safety Program. The Branch is overseen by the Deputy State Engineer for Public Safety and consists of a chief, 9.5 dam safety engineer FTE's, and 1.5 design review engineer FTE's. The staff are assigned as follows: The Chief resides in a Salida office; one design review engineer FTE resides in the Denver office, a 0.5 design review engineer and 0.5 dam safety engineer FTE resides in the Grand Junction Field office; three dam safety engineer FTE's are located in the Greeley office and one dam safety engineer FTE resides in each of the following offices; Colorado Springs, Pueblo, Durango, Montrose, Glenwood Springs, and Steamboat Springs. As is shown geographically in Figure 1, these work location assignments provides an even distribution of dam safety engineers throughout the state and allows the engineers to be in close proximity to the dams they are assigned to regulate.

WY 10-11 was a year of several staff changes within the Branch. In November 2010 the temporary employment of the retired dam safety engineer (DSE) in the Steamboat Springs office was completed. The Steamboat Springs DSE position was left vacant until it was filled in August of 2011.

In May of 2011 the design review engineer in Denver resigned, leaving that position vacant. In July 2011 the Chief of the Branch retired, resulting in a vacancy of that position. The chief position remained vacant from August 1, 2011 until October 18, 2011. During this time in WY 10-11 the Deputy State Engineer for Public Safety assumed the Role of Chief, facilitating design review approvals and processing of orders to be signed by the State Engineer. The remaining dam safety engineers assumed more design review responsibilities over and above their inspection duties to keep projects moving forward.

In August 2011 Dana Miller accepted the dam safety engineer position in Steamboat Springs, Water Division 6 office. Dana comes to the Branch after 14 years in consulting engineering on water projects in Colorado. The new chief, Bill McCormick, assumed supervisory and program responsibilities at the very end of WY10-11. The new chief established his office in an existing Colorado Parks and Wildlife (CPW) facility in the City of Salida. This work location allows efficiencies for execution of the chief role as supervisor of the statewide dam safety branch staff.

WY 11-12 began with a full staff of dam safety engineers, and a 0.5 FTE design review engineer, but with a vacancy in the design review engineer position in the Denver office. An attempt had been made to fill that position in the summer of 2011, but a suitable candidate was not selected. This end result had the effect that the position could not be re-advertised for a minimum of 6 months, leaving the position vacant for that period of time. After the mandatory wait period, the position was re-advertised. Testing and interviews followed and the position was filled on May 1, 2012. Good news that the position was filled, but bad news that it was filled by lateral transfer of existing dam safety engineer Jeremy Franz, from the Greeley office. Shortly after the design

review position was filled, a DWR hiring freeze took effect and as of the end of the WY 11-12, that and other factors resulted in a vacancy still existing in the dam safety staff in the Division 1 Greeley office. A summary of the branch organization, a personnel organizational chart and staff photo for WY 11-12 are included in Appendix A.

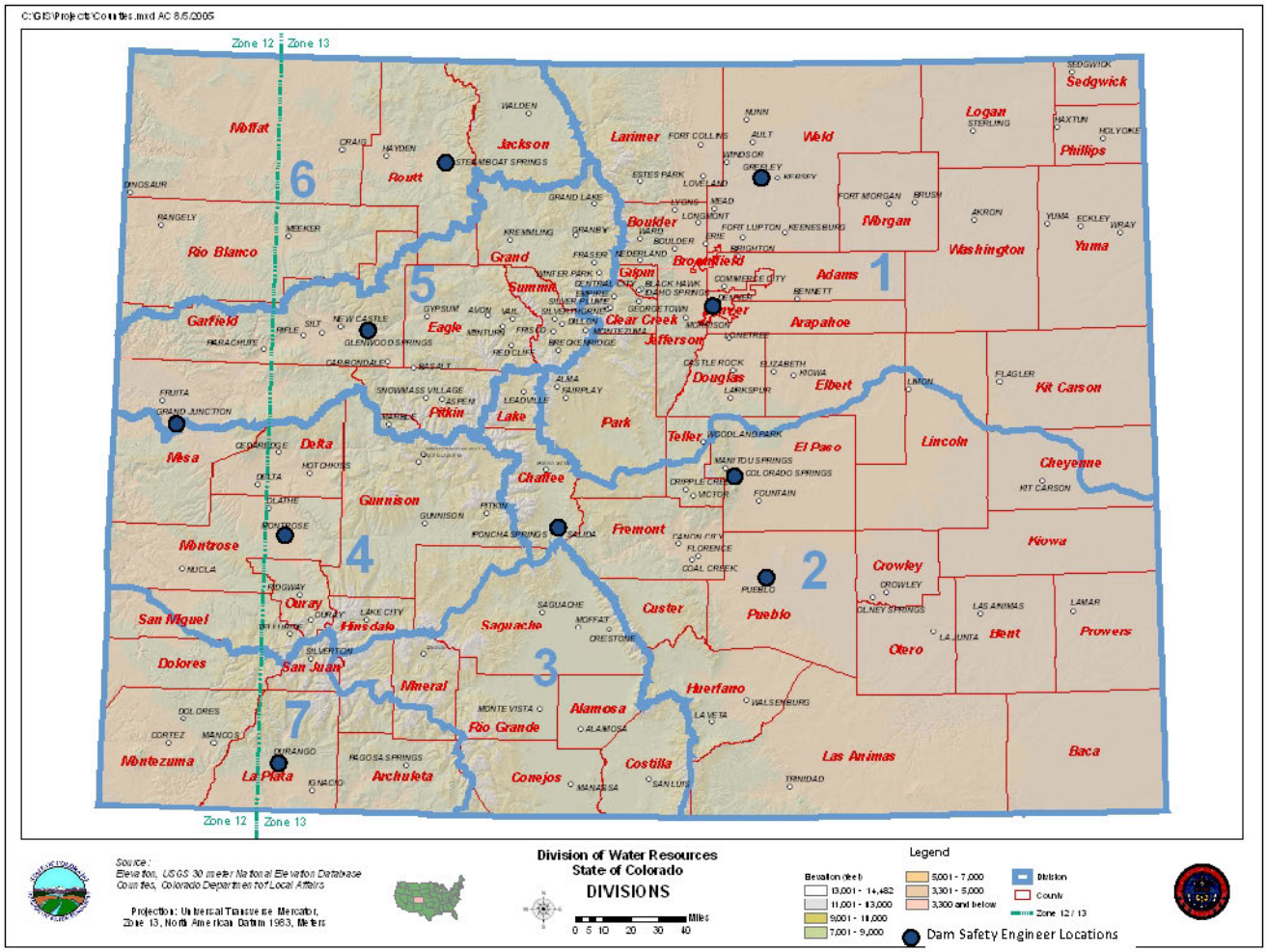


Figure 1 - Map of Colorado showing locations of dam safety branch personnel (at blue dots).

1.5.1 Roles and Responsibilities

The branch chief has program-wide responsibility for formulating the goals of the program, recommending policies for implementing the rules and regulations, preparing procedures for carrying out the policies, providing technical guidelines for conduct of the work, communication, training, and coordination. The branch chief directly supervises the dam safety engineers and design review engineers within the program.

The dam safety engineers' principal duties are to:

1. Respond to emergency situations.

2. Conduct scheduled dam safety field inspections of existing dams.
3. Set the safe storage level of reservoirs based in part on the results of field inspections and engineering analysis.
4. Perform design review and construction inspection of modifications, repairs and alterations in their areas when necessary and appropriate.
5. Assist dam owners in developing and updating their EAP's and inundation mapping.
6. Analyze, review and recommend changes to dam hazard classifications based on changes in downstream development.
7. Conduct engineering studies to assess spillway adequacy and structural stability of dams and appurtenant structures.
8. Manage existing original paper and digital files documenting inspections, design review and construction activities, engineering analyses and correspondence for all dams in their areas of responsibility.
9. Provide information and/or training on all aspects of the Branch dam safety program; Rules and Regulations, State Statutes, dam engineering principles and practices, and available resources to dam owners, consulting engineers, state and local emergency response personnel, other State employees and the general public.
10. Investigate complaints on the safety of dams.
11. Review and process applications for livestock water tanks and erosion control dams and notices of intent to construct non-jurisdictional water impoundment structures.

The design review engineer's primary duties are to review the design and construction documents for the construction, alteration, modification, repair, and enlargement of reservoirs or dams in accordance with Section 37-87-105, C.R.S. This involves comprehensive engineering reviews of the design and construction documents prepared by registered professional engineers experienced in the design and construction of dams. The reviews determine the adequacy of the design, compliance with the applicable state statutes, the current Rules and Regulations for Dam Safety and Dam Construction, and industry standards. The design review engineers recommend approval of the project for construction to the State Engineer once all conditions have been met. Design review engineers also perform periodic inspections during the construction phase of the projects to assure compliance with the approved plans and specifications and to evaluate proposed change orders. Upon successful completion of the projects, the design review engineers recommend acceptance of the projects.

The design review engineer in Denver acts as the coordinator of all design review functions statewide. He performs coordinating activities with dam safety engineers to accomplish the design review and construction inspection tasks efficiently, effectively and consistently. Through communication with dam safety engineers, he assesses workload issues and distributes statewide design review and construction inspection tasks among dam safety engineers and the ½- time design review engineer to accomplish those tasks within the defined statutory timeframes. The Denver design review engineer develops frameworks and procedures for standard documentation of design review activities including accepting and processing applications, entering projects in the DAMS database, providing for internal peer review of design review projects. This role also performs database maintenance as needed to ensure the DAMS database is current in real time with all project start-up, on-going and close-out activities.

The Denver design review engineer position also acts as a liaison between the Branch, DWR Records Section, DWR GIS Branch and OIT personnel for development of projects to utilize existing and future resources to benefit the mission of the Branch. Projects envisioned include archival of dam safety records in a searchable electronic format, enhancement and exploitation of existing dam information from the DAMS database through the use of Geographic Information System (GIS) processes and software; and identification, testing and utilization of emerging computer hardware and software technologies to the benefit of Branch field and office activities

1.6 Summary of Program Dams

The Dam Safety Branch maintains a database of approximately 2,900 jurisdictional and non-jurisdictional (NJ) dams within the state. To effectively and efficiently allocate available resources, the Branch concentrates regulatory activities on the jurisdictional dams and reservoirs as defined in Section 37-87-105, C.R.S., as "*Dams that are greater than ten feet high as measured at the spillway, that impound a reservoir with twenty acres or more in surface area, or one hundred acre-feet or more in reservoir capacity at the high water line qualify as Jurisdictional*." At the end of WY 11-12 the database contained 1965 jurisdictional dams, including one high hazard NJ dam and 18 significant hazard NJ dams. The remainder of the database entries are either dams that have been abandoned or breached, are NJ in size or are exempt per Rule 17 of the Rules.

Both jurisdictional and non-jurisdictional dams are classified by the estimated downstream consequences as a result of the failure of a dam absent of flooding conditions. Table 1 describes the State of Colorado Dam Hazard Classifications for jurisdictional and non-jurisdictional dams as stated in the Rules.

TABLE 1
STATE OF COLORADO DAM HAZARD CLASSIFICATIONS

Classification	Definition
High	Loss of human life is expected to result from failure of the dam.
Significant	Significant damage is expected to occur, but no loss of human life is expected from the failure of the dam.
Low	Loss of human life is not expected and significant damage to structures and public facilities is not expected to result from failure of the dam.
No Public Hazard (NPH)	No loss of human life is expected and damage will occur only to the dam owner's property will result from failure of the dam.

Table 2 summarizes the current number and distribution of dams by Water Division and hazard classification in Colorado. It should be noted that this is not a static number. Each year the number of dams changes due to new dams being built, existing dams being breached, abandoned, modified to non-jurisdictional height, or otherwise removed from the database. Changes in hazard classification also occur as dam safety engineers re-evaluate the consequences of dam failures based on changes in physical characteristics of the dam and reservoir, or due to changes in development downstream of a dam.

TABLE 2
SUMMARY OF DAMS BY HAZARD CLASSIFICATION AND WATER DIVISION

HAZARD CLASS	WATER DIVISION							NON FEDERAL DAMS	FEDERAL DAMS	TOTAL
	1	2	3	4	5	6	7			
High	173	53	13	44	54	13	23	**332**	**41**	**373***
Significant	139	55	16	34	53	14	22	**320**	**13**	**333***
Low	436	112	36	162	113	115	54	**973**	**55**	**1028**
NPH	54	100	18	4	24	24	7	**226**	**5**	**231**
TOTAL	**802**	**320**	**83**	**244**	**244**	**166**	**106**	**1851**	**114**	**1965**

*** - List contains 1 non-jurisdictional high hazard dam, and 18 non-jurisdictional significant hazard dams**

Tables 3 and 4 show a comparison of non-federal High, Significant and Low hazard dams in Colorado for the East and West slopes. Table 4 includes the land area on each side of the Continental Divide, and a calculation of the dams per square mile on both sides of the Divide and statewide. The tables show the physical areas of the east and west slopes and their percentage of the total statewide area. The tables show that dam construction has followed the geographic area percentage distribution. Tables 3 and 4 also show that the density or distribution of dams is consistent from east slope to west slope and does not vary from the statewide density.

TABLE 3

Colorado Non-Federal Dams East/West Slope Dam Numbers Comparison					
	High	**Significant**	**Low**	**Total Dams**	**% of Total**
East Slope	210	186	531	928	**57%**
West Slope	122	134	442	701	**43%**
Totals	332	320	973	1629	100%

TABLE 4

Colorado Non-Federal Dams East/West Slope Area and Dams per Area Comparison				
	Area (Sq Mi)	**% of Total**	**Total Dams**	**Dams/Sq mi**
East Slope	60140	**58%**	928	0.0154
West Slope	43957	**42%**	701	0.0159
Totals	104096	100%	1629	0.0156

As is noted, the list above contains only those NJ dams with a high or significant hazard classification. The Branch does not maintain a digital database specifically for non-jurisdictional dams in the state since in nearly all cases these do not pose a hazard to downstream life or property. Paper files documenting NJ dams are maintained in all dam safety staff offices. Since

NJ dams are more often a water administration issue, some Division offices maintain their own digital databases containing NJ dam information. A digital database of livestock water tank and erosion control dams is maintained by the Records Section of the DWR.

2.0 APPROVAL OF PLANS AND SPECIFICATIONS

Design review activities performed by the Branch per Section 37-87-105 C.R.S., include receiving plans and specification packages for a combination of projects including new dams, repairs, alterations and modification to dams; reviewing and approving plan sets, participating in start of construction activities, participating in periodic and final inspections of construction, and processing final construction documentation and providing final construction acceptance and project close-out. Since projects are in various stages of the design review and construction process at any given time, it should be noted that a given reporting periods numbers included projects previously received, approved and or started in previous WY's.

The roles and responsibilities of all dam safety engineers performing design review activities is described above in Section 1.5.1. The roles and responsibilities of the design review engineers are also described in Section 1.5.1. All engineers within the Branch are encouraged to participate in design review activities for projects in their areas of responsibility. The newly established peer review process (described later) also encourages formation of design review teams which allows collaboration within the Branch

2.1 Jurisdictional Dams

In WY 10-11 the Branch received 58 sets of plans and specifications for a combination of new dams, repairs, alterations and modification to dam in Colorado. The total dollar value of the submitted plans was $63,386,809. During the same period 50 reviews resulted in approval for construction, 36 projects started construction, 43 projects completed construction and 40 projects were awarded final acceptance. Table 5 and Figure 2 below show these data.

TABLE 5

DESIGN REVIEW AND CONSTRUCTION PROJECT
ACTIVITY SUMMARY for **WY 10-11**

DESIGN REVIEW ACTIVITY	NO. COMPLETED	ESTIMATED DOLLAR VALUE
Received	58	$63,386,809
Approved	50	$47,314,967
Construction Started	36	$52,080,289
Construction Completed	43	$17,780,456
As-Builts Accepted	40	$11,010,952
Total Projects	117	$98,652,843

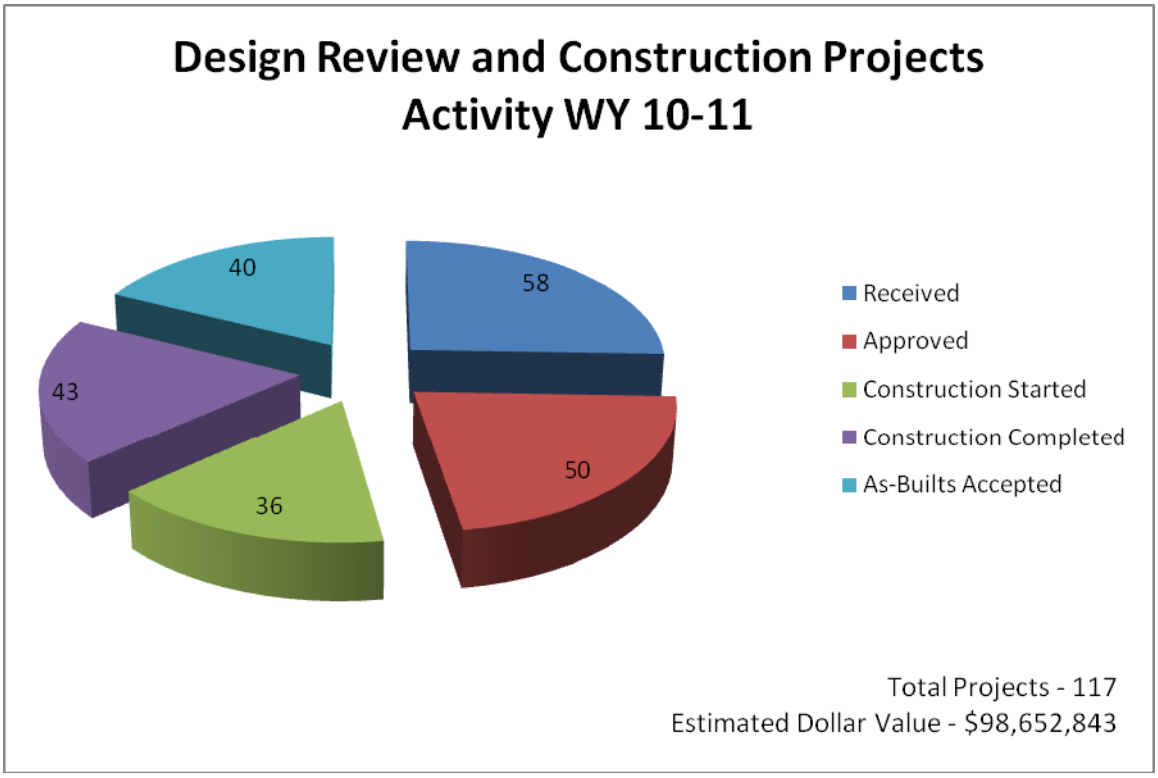


Figure 2 – Chart of design review and construction project activities for WY 10-11

It should be noted that from November 2010 until August 2011 the Steamboat Springs dam safety engineer position was vacant, from May 2011 until May of 2012 there was no Denver lead design review engineer, and from August 2011 until October 2011 there was no Branch Chief. The dam safety engineers who performed all design review functions during those periods of reduced staff should be commended for their efforts to maintain that critical dam safety function.

In WY 11-12 the Branch received 49 sets of plans and specifications for a combination of new dams, repairs, alterations and modification to dam in Colorado. The total dollar value of the submitted plans was $22,356,806. During the same period 62 reviews resulted in approval for construction, 60 projects started construction, 53 projects completed construction and 64 projects were awarded final acceptance. Table 6 and Figure 3 below show these data.

TABLE 6

DESIGN REVIEW AND CONSTRUCTION PROJECT
ACTIVITY SUMMARY for **WY 11-12**

DESIGN REVIEW ACTIVITY	NO. COMPLETED	ESTIMATED DOLLAR VALUE
Received	49	$22,356,806
Approved	62	$46,432,990
Construction Started	60	$46,362,225
Construction Completed	53	$24,295,972
As-Builts Accepted	64	$26,605,429
	136	$97,468,109

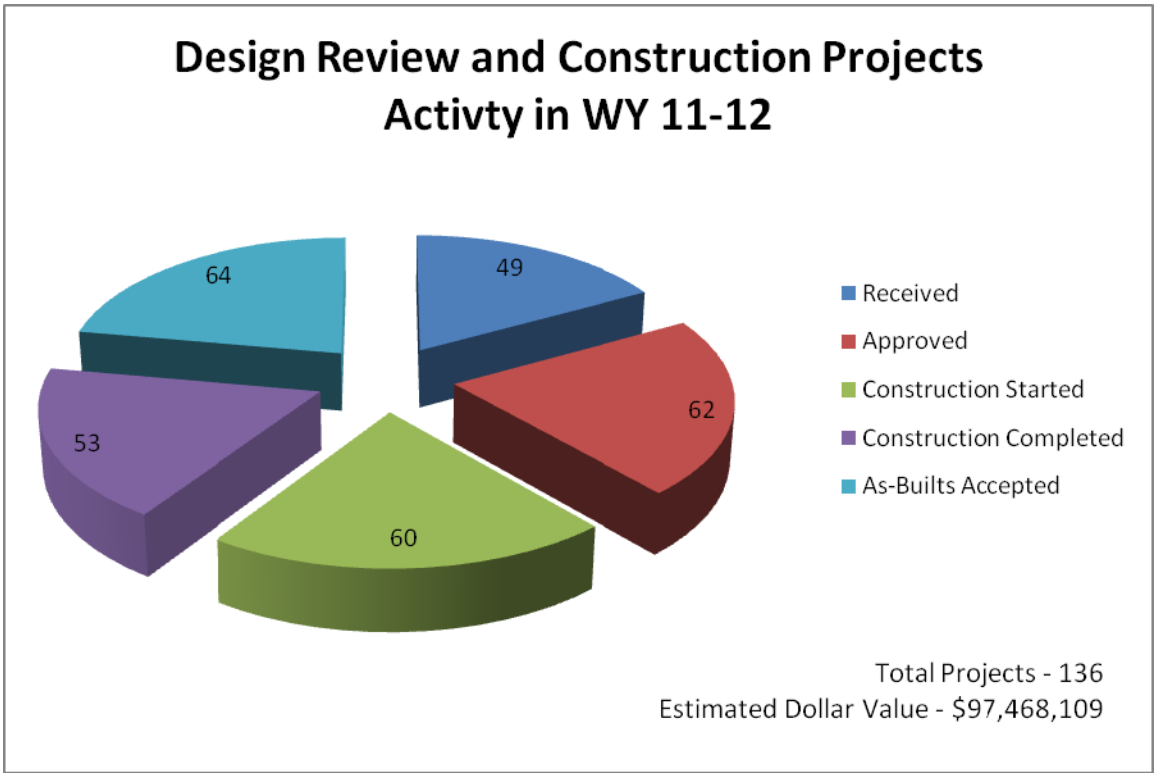


Figure 3 – Chart of design review and construction project activities for WY 11-12.

Complete listings of the plans submitted for review and approval in WY 10-11 and in WY 11-12, including a summary of project types and estimate costs are contained in Appendix B.

As previously stated, in May, 2012, a new lead design review engineer was hired and began work from the Denver office. Since that time significant changes in the design review activities have been initiated. The new design review engineer has begun a process of monthly review and updating of all design review logs and activities. A monthly conference call, open to all dam safety engineers with on-going design review and/or construction activities attend that call as do dam safety engineers with general interest. The calls include brief discussion of activities statewide with an emphasis on problem solving, heading off potential issues and ensuring design review projects are properly staffed and activities are being completed in a timely manner. The calls have also been useful as a vehicle to disseminate new standards or information on dam safety activities in general.

Design review engineers in Denver and Grand Junction have also developed a new standard "Design Review Memo" format that strives for clarity and consistency across all projects and all engineers. Further, the design review engineers have developed a written standard for "Peer Review" of design review activities. This new standard must be followed on all design review projects lead by any dam safety engineer. Lead reviewers must have a second set of "peer" eyes on the work that is performed before the design review comments can be presented to the design engineer or owner. This process encourages interaction and collaboration between engineers within the branch and more closely follows the engineering industry standard than previously was accomplished by the Branch.

The newly initiated process of collaboration and teaming to accomplish our statutory obligations under Rules 9 and 10 is exemplified at the largest new dam construction project in the State, Long Hollow Dam in La Plata County near Durango. Dam safety engineer Matt Gavin led the design review efforts for the project and is now leading the construction inspection activities. Matt has assembled a team of west slope engineers including Garrett Jackson and Jason Ward and the design review engineer Jeremy Franz, in an effort to capitalize on Branch expertise, knowledge and proximity to the project to meet the Branch's obligations toward the success of this large, fast paced project. Future efforts such as these allow dam safety engineers to offer specialized expertise to projects, will allow them to learn from each other, will promote consistency in enforcement across the state, and will promote cooperation and cohesiveness of the group

In addition to the monthly conference call and peer review process, in WY 11-12 a committee of design review engineers and dam safety engineers began the work of revising and updating the Project Review Guide. The Project Review Guide is a reference document developed by the Dam Safety Branch in the 1990's. It is a document used by the engineering community to efficiently present their designs to the Branch for review. It is outdated and does not represent the 2007 Rules, changes in practices of the Branch and changes in the state of the practice for dam design and construction. The updated and revised Project Review Guide is on schedule to be released by the committee for use in the summer of 2013.

Construction inspections are important to assure that the approved plans are being followed and to assure changed conditions encountered during construction do not jeopardize the safety of the project. The construction site visits are typically preceded by a review of the file for the history of the project. In addition, coordination with the dam owner, owner's engineer, division staff, and other interested parties is made so they also have an opportunity to take part in the inspections. During the WY 2011-12 a total of 249 construction inspections were conducted by engineers within the Branch.

Section 37-87-114.5, C.R.S., exempts certain structures from the State Engineer's approval. These are structures not designed or operated for the purposes of storing water, and include: mill tailing impoundments permitted under Article 32 or Article 33 of title 34, C.R.S. (Minerals or Coal Mines), uranium mill tailing and liquid impoundment structures permitted under Article 11 of Title 25 of C.R.S., siltation structures permitted under Article 33 of Title 34, C.R.S. (Coal Mines), and structures that only store water below the natural surface of the ground.

2.2 Non-Jurisdictional, Erosion Control Dam and Livestock Water Tank Applications

Owners of small size dams that do not meet the jurisdiction size category of the State Engineer are required to submit applications and notifications for dam safety review. Section 37-87-122, C.R.S. describes the requirements for Erosion Control Dams, Section 37-87-125, C.R.S. describes the Notice of Intent to Construct a Non-Jurisdictional Water Impoundment Structure (NJ dam), and Section 35-49-106, C.R.S., describes the requirements for Livestock Water Tanks.

Review of these small dams includes a check that the applications meet the requirements of the statutes and a check of the potential hazard posed by the proposed structure. Projects that meet the requirements and pose no hazard are forwarded to the Division Engineer for final processing and approval. Projects that do not meet the standards or that do pose a hazard are rejected and

returned to the owner with the requirements for submittal of engineered plans and specifications in accordance with Section 37-87-105, C.R.S..

At the end of WY 11-12 the Branch database for Erosion control dams and livestock water tanks contained 16,157 entries for livestock water tanks and 2,396 entries for erosion control dams. A statewide comprehensive database of non-jurisdictional dams does not exist. The best available records for WY 11-12 indicate Branch engineers processed 56 notices of intent to construct a non-jurisdictional water impoundment structure, 15 applications for livestock water tanks and 13 applications for erosion control dams during that period.

3.0 DAM SAFETY INSPECTIONS

Each dam safety engineer's highest priority is to perform periodic safety inspections of the dams in their territory of responsibility. Dams rarely fail without first showing visible signs of distress, which, when detected by a highly educated and trained eye, can be the difference between a catastrophic failure and prompt corrective action. Regular visual observation is, therefore, the most important tool available to each dam safety engineer.

3.1 Types of Inspections

The statutes specify that dam safety inspections consist not only of field inspections of the dam and appurtenant structures, but also include the review of previous inspection reports, drawings, and periodic monitoring reports provided by dam owners. Review for each dam safety inspection also includes a review of the current hazard classification, an evaluation of the adequacy of the spillway, and a review of the Emergency Action Plan (EAP) for high and significant hazard dams.

The hazard classification review accounts for changes in the development of the flood-plain below the dam. Recent suburban development below once rural dams may result in the potential for increased property damage or loss of life in the event of a dam failure. An increased hazard classification results in more diligence on the part of the dam safety engineer and dam owner, and may result in requiring safety modifications to the dam.

Rule 16 requires EAPs for high and significant hazard dams due to the potential for loss of life and/or extensive property damage in the event of a dam failure. EAPs must be kept up to date to be effective and yearly reviews and updates are required.

Periodic internal inspection of the outlet works and an annual evaluation of dam instrumentation monitoring data are also part of the workload as required by the Rules. Large diameter outlets can be inspected by man-entry using confined space procedures. Small diameter outlets are typically inspected by remote methods using video cameras designed for that purpose. The video inspection of outlets is the responsibility of the dam owner, with review of the videotape or DVD provided being performed by the dam safety engineers. In recent years several dam safety engineers have begun conducting internal outlet inspections for some dam owners utilizing Branch-owned equipment. The "sleds" were fabricated in the late 1980's and use had been discontinued for a period of a decade or so. With the advent of compact digital video cameras

and high performance lighting the combination of old and new equipment has provided for cost effective and timely outlet inspection capabilities in-house.

Dam safety engineers also perform a number of other types of field inspections that require additional, scheduling, time and resources to complete. Figure 4 shows that significant resources are allocated to inspections other than dam safety inspections. Field inspections are also required for construction projects, follow-up on previous issues identified during safety inspections, outlet works inspections, inspections of federal dams, investigating "illegal" dams constructed in violation of Section 37-87-105 (1) and (4), C.R.S., and performing field work for complaints of potentially unsafe dams in accordance with Section 37-87-109, C.R.S..

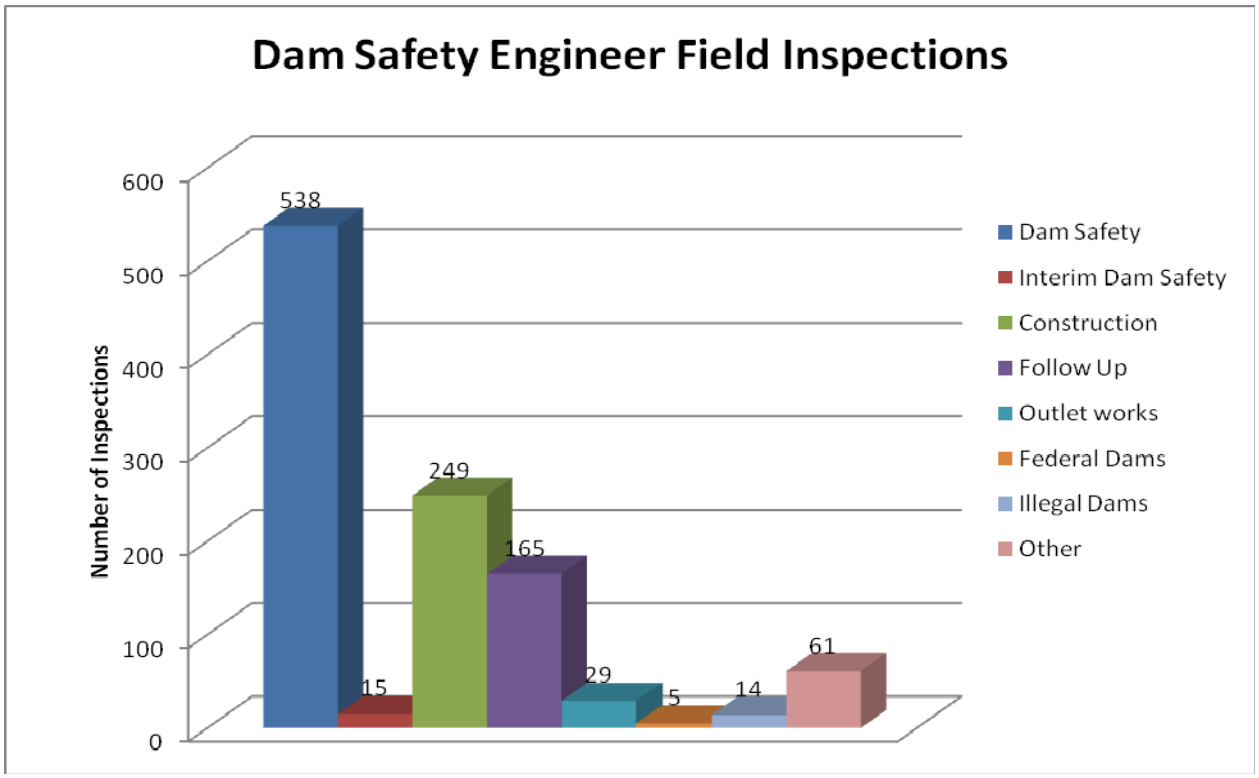


Figure 4 – Chart of dam safety engineer field inspection activities for WY 11-12.

Federally owned dams of agencies such as the U.S. Bureau of Reclamation (USBR), U.S. Army Corp of Engineers (USACE), the U.S. Fish Wildlife Service (USFWS), U.S. Forest Service (USFS) and the U.S. Bureau of Land Management (BLM) are typically regulated by the respective federal agency. In the late 1990's an audit of the Dam Safety Branch determined that since those agencies have dam safety programs, it is redundant and an inefficient use of State funds to duplicate efforts. Therefore dam safety engineers from the Branch do not typically participate in inspections of federal dams in Colorado. The Branch does however work to maintain Memoranda of Understanding (MOU) with the various federal agencies. The MOU's detail means to maintain open communication, exchange inspection reports and findings and receive regular emergency action plans and exercise information. Recent changes within both the Branch and federal agencies statewide have made the review of the MOU's both a challenge and a priority. Members of the Branch have also recently taken advantage of USBR and USACE expertise in Risk Assessment and emergency action planning exercises by participating in those

activities at those federal facilities throughout the State. This is an invaluable training activity that keeps Branch engineers current on the state-of-the-practice in these areas.

3.2 Frequency of Inspections

Periodic dam inspections are performed on a frequency determined by the hazard classification. Historically, high hazard dams are inspected annually, significant hazard dams are inspected every other year, low hazard dams are inspected every six years, and no public hazard (NPH) dams do not have a set inspection frequency. NPH dams are typically only inspected at the owner's request or in the event of a specific event such as a complaint or for a hazard classification review.

In the late 1990s, the Dam Safety Branch embarked on a program to utilize Risk-Based methods to rank dams according to potential failure modes. An Intergovernmental Agreement between the Bureau of Reclamation (USBR) and the Dam Safety Branch was issued to allow the USBR to revise their Risk-Based Profiling System (RBPS) to meet the needs of the Colorado Dam Safety Branch. The goal of the Colorado RBPS program was to develop a relatively simple (to the user) software tool to quickly score and then rank the relative condition of high and significant hazard dams in the state. The scores and rankings would then be used to prioritize resources to those dams determined to present the greatest relative risk to public safety.

After some deliberation, in 2008 a pilot program (policy 01-2008) was started to modify the historic inspection frequency based on the RBPS scores for high and significant hazard dams. The modified inspection frequency was based on ranges of RBPS scores as presented in the Table 7.

Shortly after the 2008 policy was issued, the functionality of the RBPS program was lost due to incompatibilities of the program with newer versions of computer operating systems on recently delivered dam safety branch computers. In addition, the USBR moved away from a score-based risk assessment system and no longer supported the tool. Attempts were made to re-create the program in-house in the newer OS mode, but were unsuccessful. Similar attempts to otherwise reverse-engineer an Excel-based tool were marginally successful and not widely used by members of the Branch.

TABLE 7
INSPECTION FREQUENCIES FOR HIGH AND SIGNIFICANT HAZARD DAMS

RBPS Scores	High Hazard	Significant Hazard	Restricted Dams
> 135	Each Year	Each Year	Each Year
76 to 135	Each Year	Every Two Years	Each Year
51 to 75	Every Two Years	Every Three Years	Each Year
0 to 50	Every Three Years	Every Three Years	Each Year

Since 2008 there has been little if any modification of the RBPS scores developed in 2005-2006, as was described by the pilot policy and intended by the procedures. There remains no objective way to do so in the absence of a working tool. In addition, there has been turnover within the

Branch such that only three out of the current 11 dam safety engineers who worked on development of the original RBPS scores are still dam safety engineers. With no training in the RBPS system it is difficult for the new engineers to understand what the RBPS scores mean for their dams. For these reasons, it is time to revisit the Pilot Program and although the underlying goals of the program remain unchanged; to objectively utilize risk-based decision making for prioritization of dam safety inspections, an interim policy is needed prior to the next inspection season.

3.3 Engineers Inspection Reports (EIRs)

The findings of the dam safety inspections are documented in an Engineer's Inspection Report (EIR) that rates the condition of the dam and appurtenant structures based on the field observations and document reviews. A copy of the Dam Safety EIR form is shown in Appendix C. The overall condition of the dam and reservoir is rated according to the categories defined in the report and shown below in Table 8. Finally, the report makes a recommendation about the safe storage level of the reservoir. The report also identifies repair and maintenance work the owner should perform to extend the useful life of the structure through normal annual activities. For items requiring more than a normal level of maintenance, and any engineering and monitoring requirements that are deemed necessary to assure the safety of the dam, the dam safety engineer may require the owner hire a Colorado licensed professional engineer to design and direct the work.

TABLE 8
OVERALL DAM CONDITON RATING DEFINITIONS

OVERALL CONDITIONS	DEFINITION
SATISFACTORY	The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.
CONDITIONALLY SATISFACTORY	The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.
UNSATISFACTORY	The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

The following tables show the dam safety inspections performed in WY 10-11 (Table 9) and WY 11-12 (Table 10) along with the condition rating and the recommended safe storage level.

Table 9

EIR Results WY 10-11

Hazard Class	Number Inspected	Condition Rating			Recommended Safe Storage			
		Satisfactory	Conditionally Satisfactory	Unsatisfactory	Full Storage	Conditional Full Storage	New Restriction	Continue Restriction
High	224	100	113	11	99	106	3	16
Significant	171	65	97	9	58	96	5	12
Low	122	36	64	22	37	61	5	19
NPH	1	1			1			
Totals	518	202	274	42	195	263	13	47
Percentages		39.0%	52.9%	8.1%	37.6%	50.8%	2.5%	9.1%

Table 10

EIR Results WY 11-12

Hazard Class	Number Inspected	Condition Rating			Recommended Safe Storage			
		Satisfactory	Conditionally Satisfactory	Unsatisfactory	Full Storage	Conditional Full Storage	New Restriction	Continue Restriction
High	237	104	122	11	104	111	1	21
Significant	137	57	73	7	57	70	1	9
Low	161	41	98	22	41	100	11	9
NPH	3		3			3		
Totals	538	202	296	40	202	284	13	39
Percentages	100%	37.6%	55.0%	7.4%	37.6%	52.8%	2.4%	7.2%

3.4 Dam Safety Engineer Field Safety

Dam safety engineers travel extensively to perform field inspections. They must be prepared for all weather conditions, watch for rattlesnakes and travel over rugged terrain. In addition, the appurtenant structures that must be inspected at some dams pose confined space hazards that must be safely addressed. Confined space entry is often required for inspections of outlet works facilities. In order for dam safety engineers to safety perform these inspections specific training and equipment are required. In WY 11-12 all dam safety engineers received Confined Space Awareness training. A qualified representative of Mine Safety Appliances (MSA), a major provider of training and equipment for the safety industry, presented the training and also inspected Branch air monitors. It was determined that the three air monitors maintained by the Branch we no longer serviced and could not be used. As a result of this training and air monitor inspection, the Branch utilized NDSP grant funds and purchase four state-of-the-art 4-gas air monitors and ancillary equipment. Modern and fully functional air monitors needed for safe confined space entry are now available in the Durango, Steamboat Springs, Pueblo and Greeley offices.

4.0 RECIEPTS FROM PROGRAM ACTIVITIES

4.1 Use of Appropriated Funds

Section 37-87-106, C.R.S. outlined the cost to dam owners for dam inspections performed by Branch personnel. However, that Section of the C.R.S. was repealed well before the reporting period of this report and no receipts were therefore generated for inspections during this period. Fees are charged for design review activities based on the estimated cost of construction. In WY 10-11 a total of $37,415 was collected and in WY 11-12 $47,374 was collected in accordance with the fee schedule described in Rule 8 of the Rules.

The dam safety branch program staff, 12 FTE, 10 dam safety engineers, one design review engineer and one branch chief, are supported by appropriations from the State General fund. In WY 2010-2011 two positions were vacant for some of the time, resulting in a net vacancy of one FTE for the reporting period. The total Branch FTE appropriations for WY 11-12 were $1,388,589.60. Dam Safety vehicle mileage and expenses account for another portion of program appropriations. In WY 11-12 $58,659.28 was appropriated for the cost of dam safety vehicles.

4.2 FEMA National Dam Safety Program (NDSP) Funds

In addition to general fund appropriations, the Branch receives a Federal Emergency Management Agency (FEMA) National Dam Safety Program (NDSP) grant annually.

The Chief of the Branch has the responsibility for all aspects of management of the FEMA NDSP Grant. Each August FEMA provides an announcement of the coming years NDSP grant allocations. In September the Chief develops a spending plan that details the programs and activities the Branch proposes to utilize the funds. Once approved, the spending plan is implemented and funds are utilized for the defined purposes. On a quarterly basis spending reports must be generated to account for those funds spent during each quarter and describe the use of the funds. Coordination with DWR and Department of Natural Resources (DNR) accounting and grants management groups is required to facilitate the spending reports. Distribution of the funds back to the DNR is contingent on approval of the quarterly spending reports. Occasionally deviation from an approved spending plan is desired. Prior to utilizing NDSP grant funds on unapproved activities, amendments to the spending plan must be developed, submitted and approved by FEMA. Coordination activities between the Branch and FEMA occur at the local level through the local FEMA Region VIII office representative, Brooke Buchanan, and through Washington D.C. office personnel. These activities of spending plan development, amendments and reporting utilize a federal website, ND GRANTS.

In WY 10-11 the grant amount was $161,096 and in WY 11-12 the grant amount was $167,260. The NDSP grant is used to assist the Branch with some operational funding such as in- and out-of-state travel, dam engineer technical training, and field and office equipment support. The majority of the funding is utilized for emergency action planning (EAP) activities that help dam owners.

4.3 Colorado Water Conservation Board (CWCB) Funds

In WY 11-12 the Branch also received a $92,000 grant from the Colorado Water Conservation Board (CWCB) for activities associated with verification and enhancement of the Extreme Precipitation Analysis Tool (EPAT). CWCB also provided $48,400 of direct aid to owners of high and significant hazard dams through the Inundation Mapping Grant program described in Section 8 of this report.

5.0 RULES AND STATUTE ACTIVITIES

The Branch currently utilizes the Rules and Regulations for Dam Safety and Dam Construction promulgated in 2007 to regulate Branch activities. There were no modifications or amendments to the 2007 Rules in either WY 10-11 or WY11-12.

In WY 11-12 Section 18 of 37-80-102 C.R.S. was amended and revised to allow the State Engineer to receive and spend grant funds directly from the CWCB. This will allow the Branch to have access to funding for selected projects that was previously not available.

6.0 ENFORCEMENT ORDERS

6.1 Reservoir Storage Restrictions

If a dam safety inspection reveals that the overall conditions of a dam are unsafe, and the dam is given an unsatisfactory rating, an order is written by the State Engineer restricting the storage of the reservoir to a safe level. Restriction letters are sometimes accompanied by orders to rehabilitate the dam to make it safe for full storage, or to breach the dam. In the event that conditions of any dam or reservoir are so unsafe as to not permit the time to issue or enforce a restriction, or a dam is threatened by a large flood, the State Engineer may immediately employ remedial measures to protect the public safety. State Engineer emergency authority and creation of an emergency dam repair cash fund are provided for by Section 37-87-108.5, C.R.S..

Enforcement orders and proceedings in the context of the dam safety in Colorado consist of orders drafted by Branch personnel and signed by the State Engineer. Orders generally consist of storage restrictions based on results of the dam safety inspections. Enforcement activities fall into four categories, (1) Restrictions imposed, (2) Restrictions modified, and (3) Restrictions lifted, (4) Breach orders issued.

Storage restrictions on dams provide risk reduction for the public and environment until the problems are corrected. The owners are responsible for following the restricted operating levels and the restrictions are enforced by the Division Engineers per Section 37-87-108, C.R.S.. Although dams are repaired and removed from the restricted list within a given reporting period, numbers of dams are also typically added to the list during the same time period.

In WY 10-11, six new storage restrictions were imposed (978 ac-ft of storage lost), two restrictions were modified (53 ac-ft storage lost) and 16 restrictions were lifted (1572 ac-ft of storage returned to full use). No breach orders were issued. The total activity resulted in a net gain of 541 acre-feet of storage statewide. This is shown in Table 11 below.

Table 11

WY 10-11 Storage Restriction Activity Summary			
ACTIVITY	# of Actions	Volume Lost	Volume Restored
Restrictions Imposed	6	978	
Restrictions Lifted	16		1572
Restrictions Modified	2	53	
Totals	24	1031	1572
Net Volume Change		Storage Restored	**541**

Figures 5 and 6 show the total number of restricted dams and the total volume of restricted storage at the end of WY 10-11. At the end of WY 10-11, a total of 161 dams remained on the dam safety restricted storage list, amounting to 102,466 acre-feet of restricted storage statewide.

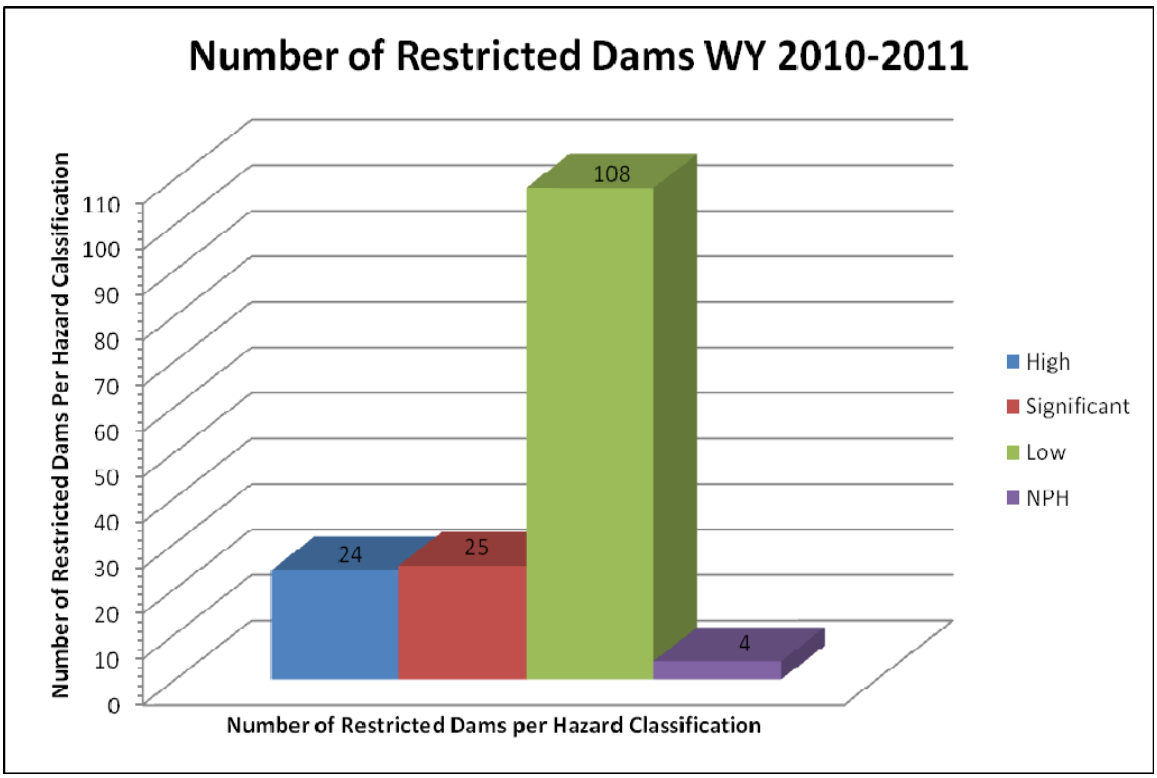


Figure 5 – Chart of restricted dams by hazard classification for WY 10-11.

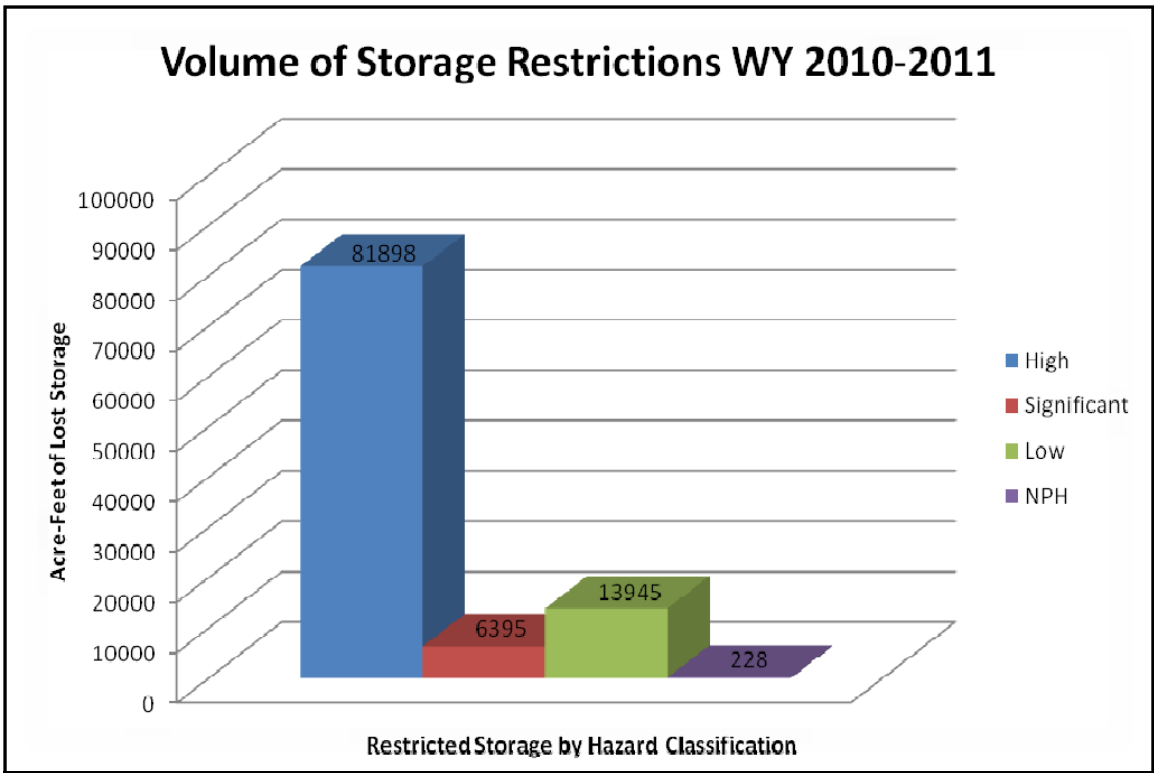


Figure 6 – Chart of volume of storage restrictions for WY 10-11.

In WY 11-12, nine new storage restrictions were imposed (1337 ac-ft of storage lost), two restrictions were modified (23 ac-ft storage lost) and 18 restrictions were lifted (1089 ac-ft of storage returned to full use). No breach orders were issued. The total activity resulted in a net loss of 271 acre-feet of storage statewide. This is shown in Table 12 below.

Table 12

WY 11-12 Storage Restriction Activity Summary			
ACTIVITY	# of Actions	Volume Lost	Volume Restored
Restrictions Imposed	9	1337	
Restrictions Lifted	18		1089
Restrictions Modified	2	23	
Totals	29	1360	1089
Net Volume Change		Lost Storage	**271**

In WY11-12 the largest historic storage restriction in the state at Cucharas #5 Dam was removed when the dam owner excavated the spillway down to the restricted level. This action removes 33,000 acre-feet of storage from the restricted storage quantity, but it does not result in returning any storage to use since the reservoir now has that much less storage. The owner has also greatly reduced the risk exposure to himself, and the downstream public through this action.

At the end of WY 11-12, a total of 157 dams remained on the dam safety restricted storage list, amounting to a total 68,590 acre-feet of lost storage statewide. This information is presented by

Water Division in Table 13 and graphically by hazard classification and volume of restricted storage in Figures 7 and 8, respectively. A complete list of the restricted reservoirs at the end of the WY 11-12 reporting period is included in Appendix D.

Table 13

WY 11-12 RESTRICTION SUMMARY		
Division	**Volume Lost (AF)**	**# of Dams**
1	25725	67
2	23571	20
3	12328	7
4	2159	26
5	2799	18
6	771	10
7	1237	9
TOTALS	**68590**	**157**

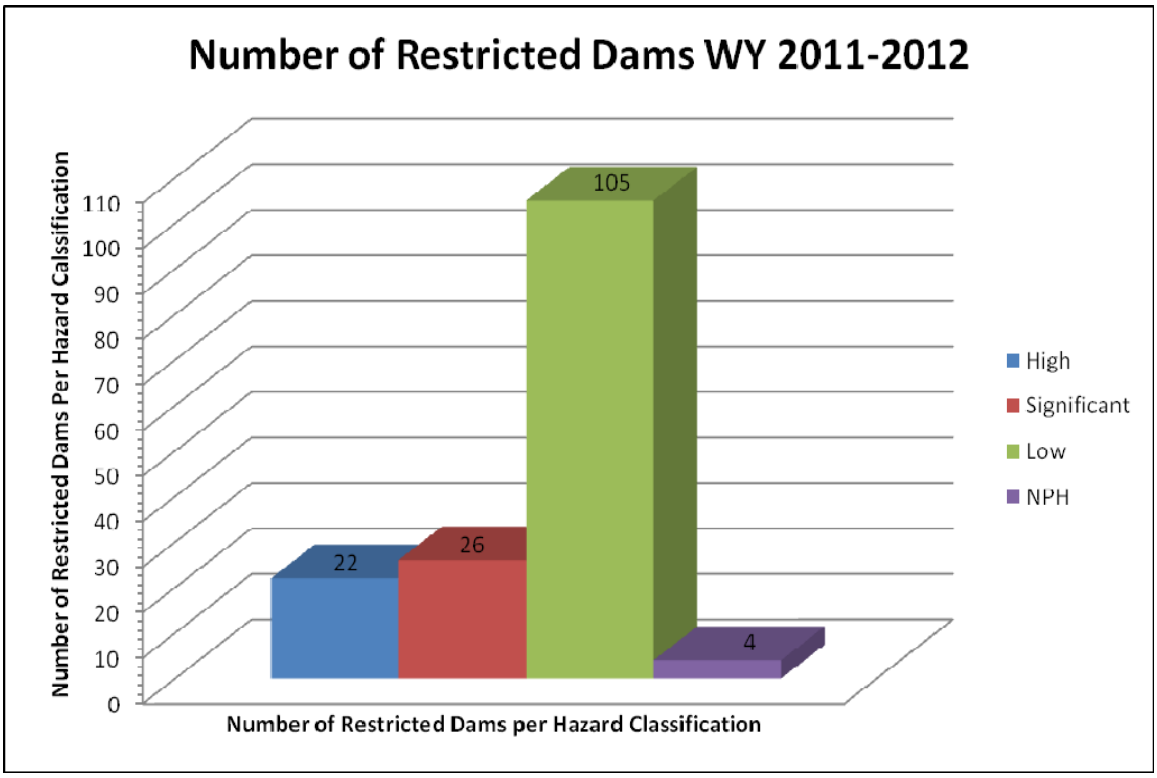


Figure 7 – Chart of number of restrictions by hazard classification for WY 11-12.

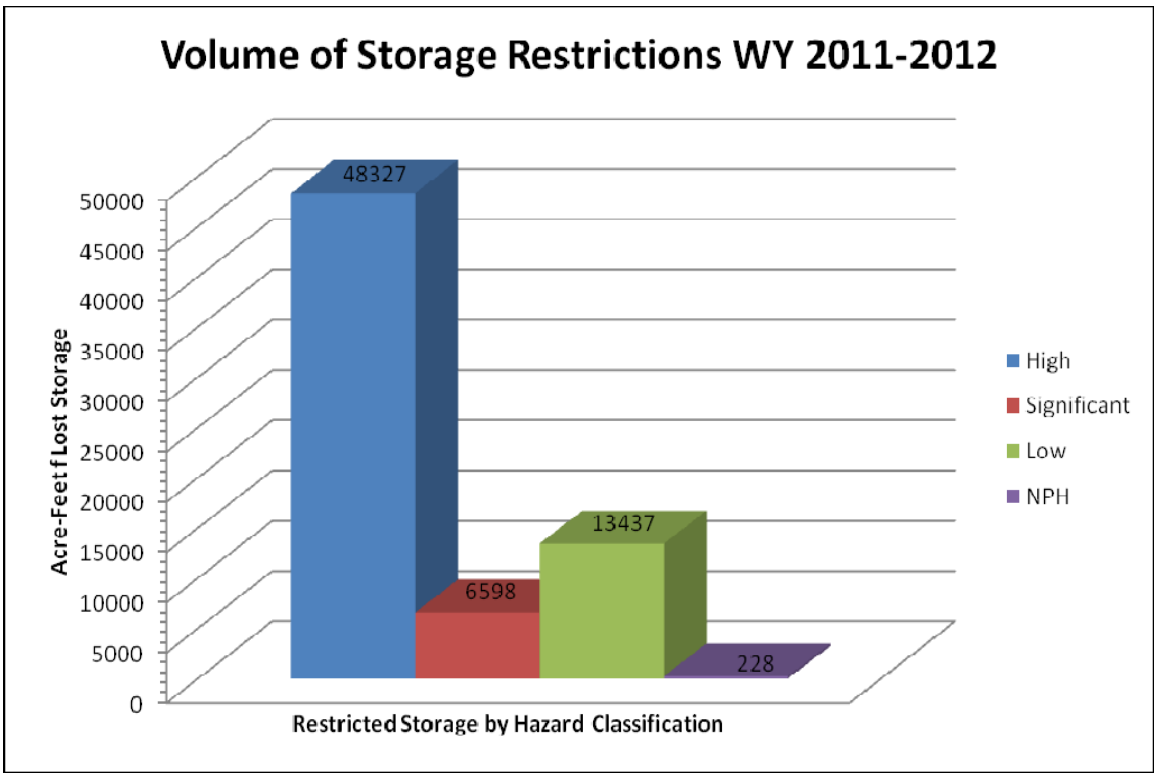


Figure 8 – Chart of volume of storage restrictions for WY 11-12.

As is seen on the restriction list contained in Appendix D, a number of dams have long standing restrictions/deficiencies. In many cases these have not been resolved due to the difficult nature of the problems and associated costs of addressing them. In an effort to move these projects forward towards full compliance with State regulations and full storage, the branch has begun utilized several innovative tools. One such tool is a formal Compliance Plan. The compliance plan as currently utilized is discussed and agreed to by the dam owner and dam safety engineer and signed in the form of an order by the State Engineer. The dam owner and dam safety engineer agree to specific required corrective actions, deadlines, and consequences for non-compliance. A compliance plan was implemented for the Cucharas No. 5 Dam in February 2012. So far it has resulted in the lowering of the spillway (which removed the long standing storage restriction described above), implementation of a monitoring program, and updating the EAP and breach inundation mapping. This compliance plan was considered a success since it resolved several issues and resulting in a reduction of the dam safety risk to the public downstream after many years decades) of inaction on the part of the dam owner.

7.0 DAM FAILURES AND INCIDENTS

No jurisdictional dam failures occurred in Colorado in WY 10-11 or WY 11-12. Dam safety incidents are situations at dam that require an immediate response by dam safety engineers. The response is typically a site visit and actions to determine if situations warrant further activities up to and including the initiation of a dam EAP.

Due to personnel changes in WY 10-11 (previously discussed) a full listing of incidents for that period was not available. However, one significant incident that is noteworthy was a swarm of

magnitude 3.0 to magnitude 5.3 earthquakes that occurred near Trinidad, Colorado between August 22 and 24, 2011. Earthquakes occur more frequently in Colorado than many realize, likely due in part to the fact that most are between 3.0 to 4.0 magnitude events. For most modern dams these magnitudes do not have a significant effect, with 5.0 magnitude earthquakes being a threshold above which some concern exists. Figure 9 shows the earthquake event information delivered via email immediately following the strongest of the earthquakes during that period.

Earthquake Details

This event has been reviewed by a seismologist.

Magnitude	5.3
Date-Time	**Tuesday, August 23, 2011 at 05:46:19 UTC** Monday, August 22, 2011 at 11:46:19 PM at epicenter Time of Earthquake in other Time Zones
Location	37.070°N, 104.700°W
Depth	4 km (2.5 miles)
Region	COLORADO
Distances	15 km (9 miles) WSW of **Trinidad, Colorado** 33 km (20 miles) NW of **Raton, New Mexico** 54 km (33 miles) S of **Walsenburg, Colorado** 290 km (180 miles) S of **DENVER, Colorado**
Location Uncertainty	horizontal +/- 12.5 km (7.8 miles); depth +/- 2.8 km (1.7 miles)
Parameters	NST=372, Nph=372, Dmin=18.9 km, Rmss=1.25 sec, Gp= 14°, M-type=centroid moment magnitude (Mw), Version=A
Source	**Magnitude:** USGS NEIC (WDCS-D) **Location:** USGS NEIC (WDCS-D)
Event ID	usc0005idz

Figure 9 – US Geological Survey summary of earthquake near Trinidad, CO on August 23, 2011.

Multiple high hazard dams are located near this location and significant efforts were made by the area dam safety engineer to ensure no damage had occurred as a result of these natural events. Immediate field inspections were performed at five dams in the vicinity. In the month following the events additional internal inspections of outlet works conduits were conducted at those dams. In addition, the local dam safety engineer also participated in the US Army Corps of Engineers (USACE) inspection at Trinidad Lake Dam, the largest facility in the area, located within a short distance to the earthquake epicenter. The dam safety engineer also coordinated with the Colorado Division of Emergency Management for post disaster response and mitigation

activities. A report detailing the events of the earthquake was produced and is in the files of the responsible dam safety engineer in the Division 2 office in Pueblo, Colorado.

In WY 11-12 14 dam safety incidents were logged with the complete list being shown below in Table 14. As is shown, in WY 11-12 incidents occurred at seven high hazard dams. Incidents reported and acted upon included unusual seepage, embankment settlement and excessive upstream slope damage from wave action. Incidents also included on the WY11-12 list were associated with the large and damaging wildfires that occurred, particularly the High Park fire and the Waldo Canyon fire. These fires were tracked to ensure no damage would occur on dams within or near the fire areas. No EAPs were activated as a result of any of the WY 11-12 incidents.

Figure 10 below shows a map of the limits of the Waldo Canyon fire on June 28, 2012, relative to the location of nearby dams. Information obtained from the USFS incident command website was downloaded and compared with information from the DAMS database to quickly identify all dams within a 5 mile buffer from the fire limits. This work was coordinated between the area dam safety engineer and the GIS section of DWR and transmitted to the CDEM for their information and use in planning activities.

Table 14 DAM SAFETY INCIDENTS WY 11-12			
No.	**Dam Name**	**Hazard Classification**	**Description**
1	Northglenn Terminal Storage	high	Unexpected seepage at dam toe near buried pipeline, video showed clogged toe drain, cleaning dried seepage
2	Beckwith Dam	High	Sudden, unexpected dam crest settlement
3	Spinney Mountain Dam	High	Previously unseen sand boil indicating change in seepage conditions
4	Tarryall Dam	High	Previously unseen seepage at DS toe of a concrete dam
5	Swede Reservoir	Low	Evidence of internal erosion (piping) along outlet conduit
6	Bonner Pond	Low	Sinkholes developed beneath recently placed reservoir liner
7	Dickinson Irrigation	low	Unreported dam breach since last inspection (2011)
8	Old Dillon Reservoir	High	Pnuematic fracturing of embankment during piezometer installation
9	Warren Lake	High	Unexpected seepage along buried roots from previously removed (1970's) trees
10	Prewitt	High	Severe wave action created voids under concrete slabs protecting upstream slope
11	Walker Ranch	LSWT	Unpermitted LSWT dam failed near end of runoff from a major storm event. Created political uproar at the County level, and lots of extra work for the local DSE
12	High Park Fire	various	Identified potential dams at risk during fire. Responded to NJ dam overtopping events caused by increased runoff after the fire
13	Waldo Canyon Fire	various	Identified potential dams at risk during the fire, participated in EOC activities regarding vulnerability of Rampart Dam, a large, High hazard dam in the center of the burned area. Responded to requests for information regarding impacts of increased runoff after the fire.
14	El Jebel Earthquake	various	August 21, 2012, 3.3 ML (Richter scale) earthquake near Basalt. Small earthquake but in an unusual location. The dams closest to this earthquake (within 10 miles) were as follows: · Von Springs #1 and #2 (high), 2.9 miles west · Consolidated (high) 5.6 miles, west · Spring Park (high), 5.8 miles south · Shoshone (high), 9.0 miles northwest · Lake Christine (significant), 9.5 miles south All dam owners were notified, asked to inspect their dams. No issues were reported.

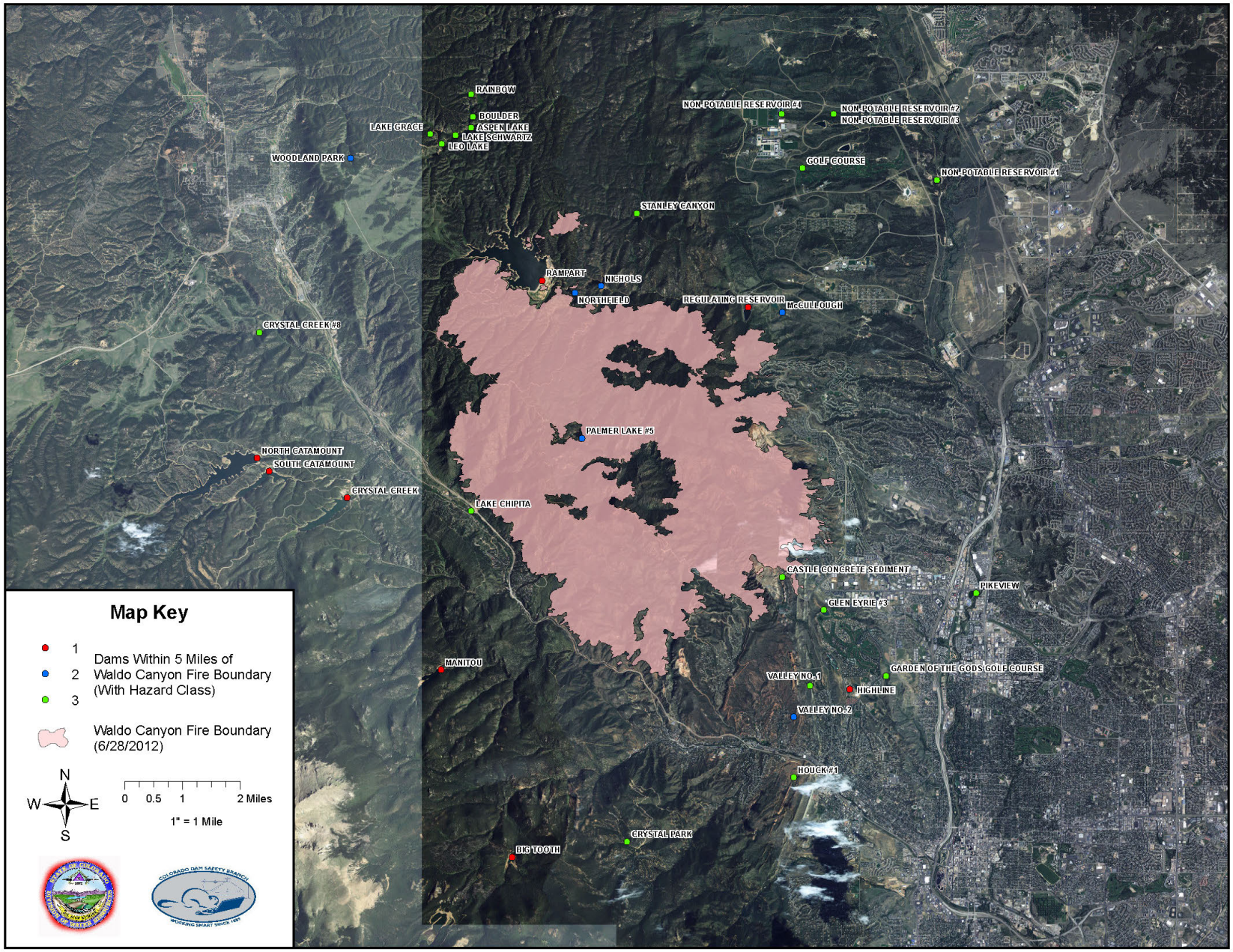


Figure 10 – Map of Waldo Canyon fire showing dams relative to the burned area limits as of June 28, 2012.

8.0 OTHER BRANCH ACTIVITIES

8.1 Emergency Action Planning Activities

Rule 16 of the Rules requires owners of high and significant hazard dams to have and maintain EAPs. Emergency preparedness for incidents at dams that jeopardize the public safety, including the failure of dams, is an integral part of all dam safety programs. EAP's are needed because as dam safety engineers we cannot guarantee that even our best efforts will prevent all dam failures. However, EAP's are only as useful as the information they contain, so updating to ensure the most accurate and useful information exists is a high priority. Exercising EAPs is also important to verify their effectiveness. The Branch has also recently begun more aggressive emergency action activities such as the inundation mapping grant program, emergency management incident command system training for Branch engineers and a new era of management of EAPs through the use of digital tools and information technology. These activities are described below.

8.1.1 Emergency Action Plan Updates

Per Rule 16.4 of the Rules, owners of high and significant hazard dams are required to review the information in their EAP's annually and make updates and revisions as necessary based on changes in their organization or changes to other responsible parties to the EAP. Tables 15 and 16 show the EAP updates recorded for WY 10-11 and WY 11-12.

Table 15

WY10-11 EAP UPDATE SUMMARY	
Hazard Classification	**# of Updates**
High	58
Significant	39
Total	**97**

Table 16

WY11-12 EAP UPDATE SUMMARY	
Hazard Classification	**# of Updates**
High	61
Significant	25
Total	**86**

8.1.2 Emergency Action Plan Exercises

Rule 16.5 of the Rules also requires the owners of high and significant hazard dams to test or exercise their EAPs to ensure their effectiveness. Exercises can take the form of notification chart telephone drills, EAP orientations, tabletop exercises and functional exercises. In WY 11-12 members of the Branch participated in dam owner initiated phone drill, FERC mandated orientations and table top and functional exercises and USBR and USACE initiated table top and functional exercises. Best available records of these activities indicate there were 12 dam owner initiated EAP telephone drills, two owner initiated EAP orientations, and one owner initiated table top exercise. Branch representatives participated in 14 FERC initiated and federal dam owner (USBR and USACE) initiated table top exercises in WY 11-12.

8.1.3 Inundation Mapping Grants

Starting with the FY 09 FEMA NDSP grant, the Branch has managed a grant assistance program for owners of high and significant hazard dams. The program utilizes a portion of the NDSP grant to cost share with dam owners to develop new or updated EAP's and inundation mapping for EAP's. Accurate inundation mapping is a key component of an EAP and provides first

responders and local law enforcement with critical information on the impacts a dam failure flood could have that can also be used for evacuation planning and planning for post-disaster mitigation and recovery operations.

This financial assistance is intended to be a cost-share with the dam owner for up to 50% of the cost of the inundation mapping. Higher cost share ratios are considered based on available funding and financial need of the applicant.

Requirements for dam owners to participate in this program include:

- Funding assistance is only available for high and significant hazard dams. Dams with inadequate EAP's and inundation mapping or dams with a high consequence (large population at risk) downstream have priority for financial assistance.
- Owner must obtain proposals for updating the inundation mapping from a minimum of two qualified professional engineers. The proposal that provides the most benefit at the lowest cost will be used as the basis for the cost share.
- The EAP and inundation mapping products must meet the requirements of Rule 16 of the Colorado Rules and Regulations for Dam Safety and Construction. A sample scope of work is provided which defines the minimum requirements and can be used as a basis for soliciting proposals.
- The owner is responsible for contracting with their engineer. The local Dam Safety Engineer will be available for technical oversight and will perform a review the EAP and/or mapping product deliverables to ensure the requirements of Rule 16 are met prior to authorizing final payment.
- To maximize grant funds and benefit to the public, the State Engineer's Office reserves the right to allow use of the hydraulic models developed with assistance from this grant program to be used for future mapping projects along common stream/river reaches. Joint projects with dams that share a common reach are encouraged.

Branch dam safety engineer John Batka has managed this project for the Branch. John has worked with Department of Natural Resources purchasing and contracting professionals to ensure all grant activities meet the requirements. FEIN numbers and D-U-N-S numbers are provided by all applicants and applicants are notified that they subject to audits relating to acceptance of federal grant dollars, beyond defined limits. John has also worked with other dam safety engineers within the Branch and CWCB representatives to ensure all grant activities meet the required schedules and budgets.

The results of the grant program for WY 10-11 (using Federal Fiscal Year (FFY) 09 NDSP funds) are shown in Table 17 below.

Table 17

WY 10-11 Inundation Mapping Grant Summary			
Hazard Classification	# of Dam Inundation Maps Created	FEMA NDSP Grants Funds Utilized	Total Project Costs
High	14	$72,275	$103,485
Significant	5	$24,900	$24,900
Totals	**19**	**$97,175**	**$128,385**

In WY 11-12 the Colorado Water Conservations Board (CWCB) became a funding partner in the program as well. Our inundation mapping program fits well with the CWCB functions in flood awareness and protection throughout the state. Branch personnel managed purchase orders through CWCB to facilitate the use of those funds. Table 18 below shows the results of the inundation mapping grant program for WY11-12. WY11-12 projects included funding from FFY10 and FFY11 NDSP grant funds and FY 11 CWCB funds.

Table 18

WY 11-12 Inundation Mapping Grant Summary				
Hazard Classification	# of Dam Inundation Maps Created	FEMA NDSP Grant Funds Utilized	CWCB Grants Funds Utilized	Total Project Costs
High	29	$169,900	$21,400	$287,850
Significant	8	$4,000	$43,000	$76,948
Totals	**37**	**$173,900**	**$64,400**	**$364,798**

Appendix E contains a graphic and spreadsheets showing all inundation mapping grant projects completed through WY 11-12 and their respective locations on a map of the State.

8.1.4 National Incident Management System (NIMS) Training

In WY 11-12 all Branch personnel took online training through the Emergency Management Institute to become certified at the awareness level in the NIMS Incident Command System. NIMS provides a consistent nationwide template to enable Federal, State, tribal, and local governments, nongovernmental organizations, and the private sector to work together to prevent, protect against, respond to, recover from, and mitigate the effects of incidents regardless of cause, size, location, or complexity in order to reduce the loss of life and property and harm to the environment.

8.1.5 Emergency Action Plan Scanning and Updating

In WY 11-12 the Branch, with the help of DWR Records Section personnel, began efforts to scan (digitize) our portfolio of EAP's into our Laserfiche digital information environment. The effort is intended to allow ease of access to information contained in EAP's to not only members of DWR, but also members of the public at large. The rational for that change in thinking regarding access to information contained in EAPs is:

It is the opinion of the Colorado Dam Safety Branch that greater risk reduction can be obtained by increasing citizen awareness and education of their objective hazards, thereby reducing the consequences of dam failure flooding, than can be obtained solely by efforts toward prevention of failures due to intentional acts of sabotage that may be related to unintended use of information gained from the Emergency Action Plan inundation maps.

Put another way, in our opinion, the probably of dam failure due to unintended use of information obtained from an Emergency Action Plan inundation map is no more than the probability of failure from an undetected structural weakness of the dam. Probability of failure being equal, the most effective means to achieve additional risk reduction is through consequence reduction based on public awareness and education.

It is hoped that the information contained within EAP's, inundation maps only, in digital and widely accessible format can ultimately be used in concert with an overall effort toward public awareness and education. An educated and aware general public will reduce the consequences of dam failure flooding by being able to get out of harm's way more effectively.

By the end of WY 11-12 approximately 170 of the 705 EAP's for high and significant hazard dams had been scanned and were available to DWR personnel in the DWR's intranet environment.

In an effort to increase efficiency and effectiveness with regard to emergency action planning the Branch also conducted a thorough inventory of the current state of emergency action plans within the States portfolio of high and significant hazard dams. Tables 19 and 20 show the results of that inventory. Based on this information, the Branch has increased its efforts in updating and improving the status of current EAPs. We hope to be able to report positively on the results of those efforts in the next annual report.

Table 19

EAP Age Inventory All In-State Dams (as of 1/16/13)			
EAP AGE	**# of EAPS**	**% of Total**	**Cumm %**
Less than 5 Yrs old (2013-2009)	298	42%	42%
5 to 10 years old (2008-2004)	156	22%	64%
10 to 15 years old (2003-1999)	92	13%	78%
15 to 20 years old (1998-1994)	96	14%	91%
Older than 20 years (> 1993)	38	5%	97%
Currently **NO** EAP	24	3%	100%
TOTALS	704	100.0%	

Table 20

EAP AGE Inventory All In-State Non-Federal Dams (as of 1/16/13)			
EAP AGE	**# of EAPS**	**% of Total**	**Cumm %**
Less than 5 Yrs old (2013-2009)	280	43%	43%
5 to 10 years old (2008-2004)	142	22%	65%
10 to 15 years old (2003-1999)	85	13%	78%
15 to 20 years old (1998-1994)	89	14%	91%
Older than 20 years (> 1993)	33	5%	96%
Currently **NO** EAP	24	4%	100%
TOTALS	653	100.0%	

8.2 Dam Owner/Engineer Training and Outreach

Providing regular dam safety training for dam owners, caretakers, engineers and water commissioners has been a high priority for the Branch for many years. Since our dam safety engineers can only visit dams so often, having additional, educated, sets of eyes looking at dams and the conditions thereon is critical to minimizing the risk of dams in Colorado.

In the Period of WY 10-11 engineers from within the Branch held a dam safety for dam owners class in Colorado Springs in February 2011 and a dam safety for water commissioners class in Division 3 in May 2011.

In the Period of WY 11-12 engineers from within the Branch provided such training at the Ditch and Reservoir Company Alliance (DARCA) in Colorado Springs in February, 2012, at the bi-annual Irrigationists Symposium held in Greeley in March, 2012, at small-scale dam owner training in Division 2 in March 2012 and Division 4 in April 2012. In October 2012 dam safety training was also provided to a group of water commissioners at the annual CWOA conference in Ouray.

Dam safety engineers regularly provide training to small groups such as this year's activities for the Harris Park Homeowners Association, Sanchez Ditch and Reservoir Company and Grand Mesa Water Users Association

8.3 Dam Safety Engineer Technical Activities

8.3.1 Guidelines for Hazard Classification

This document was developed to provide a technical guide for dam safety engineers and the engineering community involved with the design and safety evaluations of existing dams under the Rules. The guidelines were intended to establish consistency in the analysis and review of the hazard classification for dams in Colorado. The Hazard Classification Guidelines are not considered a design standard, but are for determining the hazard classification for each specific project which in turn sets the applicable design requirements and standards contained in the

Rules. The guidelines were developed by a small committee of dam safety engineers who worked on the guidelines for over a year. The Guidelines were adopted on November 15, 2010, and immediately became in invaluable reference document for engineers working on dam safety in Colorado.

8.3.2 Technical Workshops

Ten of the eleven dam safety and design review engineers within the Branch during WY 10-11 were involved with the process of developing a series of 2-day technical workshops for dam owners, dam designers, and other interested dam safety professionals. The subject matter for the workshops was Breach Analysis, Hazard Classification and Spillway Hydrology for dam projects in Colorado. The workshops were the culmination of several years worth of work to develop standards for hydrology studies (Sabol, 2008), standards for breach analysis through the development of the Colorado Guidelines for Dam Breach Analysis (2010), and a standard for consistent hazard classification analysis through development of the Guidelines for Hazard Classification (2010). The team of engineers from within the Branch worked tirelessly for several months to develop the program and presentation materials for the three 2-day workshops. The dates and locations of the workshops were March 15 – 16, 2011 Grand Junction; April 5 – 6, 2011 Loveland; April 19 – 20 Colorado Springs. Over 170 engineers from Colorado and several surrounding states participated in the workshops. Through the use of FEMA NDSP grant funds, the Branch was able to present these highly effective workshops at no cost to the participants.

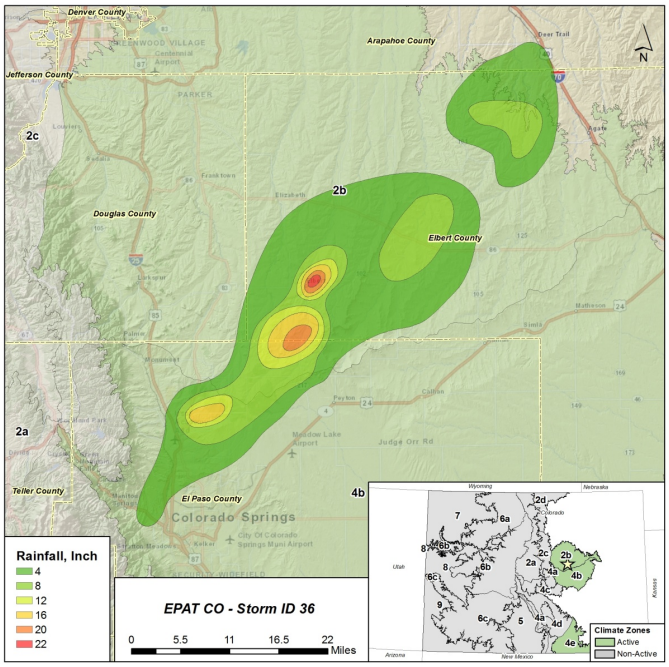
8.3.3 Extreme Precipitation Analysis Tool

In WY11-12 an initiative to further the knowledge base for use of the Extreme Precipitation Analysis Tool (EPAT) was advanced by a committee of dam safety engineers within the Branch.

EPAT was developed between 2004 and 2006 and is intended to advance the science of hydrometeorology specifically within Colorado. EPAT is allowed by the Rules as an alternate to the NOAA Hydrometeorological Report (HMR) series to develop extreme storm rainfall depths for determining the inflow design flood required for spillway sizing. At the time of the issuance of the Rules in 2007, EPAT had not been rigorously tested or reviewed in terms of software function or meteorology theory.

The creators of EPAT are recognized professionals in their industries, but after some use, the need for a comprehensive, independent third-party review of the software was desired. The independent third party review is intended to validate the functions and science within the tool, and will also be used to guide future development and enhancements. A fully vetted EPAT tool

will be of high value to Colorado dam safety regulator's and dam owners alike. EPAT has the potential to help resolve long standing questions regarding the potential over-prediction of extreme rainfall amounts by the HMR's in Colorado. The ability to fully utilize EPAT could have positive monetary impacts to owners of high and significant hazard dams in Colorado by reducing the potential for unnecessary overdesign of spillways and the costs associated therewith.



In WY 11-12 the Branch applied for a CWCB grant to fund the 3rd party review effort. Acceptance of the grant application for the Phase I-Technical Documentation, Code Debugging & File Preparation to Facilitate 3rd Party Peer Review, phase was announced by CWCB in May 2012 and in July, 2012 a contract with HDR, Inc, was signed to perform the defined scope of work. At the end of WY 11-12 HDR was over 60% complete with the scope of work in their contract and were on target to provide final results within the required contract period.

8.3.4 HBRPEG Rainfall Losses Spreadsheet

The Branch developed a spreadsheet application of the Hydrologic Basin Response Parameter Estimation Guidelines (HBRPEG) in an attempt to simplify and standardize implementation. The spreadsheet has been used in-house and distributed to consulting engineers. It is maintained and updated as needed (currently version is 1.3) and is available on the branch website.

8.4 Staff Training

In WY 10-11 dam safety engineers attended the 18th Annual National Dam Safety Technical Seminar: "Instrumentation and Remote Operations" held in February 2011 in Emmitsburg, MD, and the 2011 International Roller Compacted Concrete Dams Seminar held in September 2011 in Atlanta, GA.

In WY 11-12 dam safety engineers took advantage of the ASDSO provided Technical Seminars including Plans and Specifications Review and Construction Inspections for Dams, held in Jacksonville, Florida, in February, 2012, and Fundamentals of Reinforced Concrete Design, held in Phoenix, AZ, in March, 2012.

Engineers also participated in several ASDSO provided Webinars on topics such as Risk Assessment, Concrete Dams, HMR PMP history and development, and Foundation Grouting for Dams. A representative of the US Department of Homeland Security also provided a webinar for Branch engineers on the use of their Dam Safety Analysis Tools (DSAT).

The semi-annual Branch meetings (Spring and Fall) provide an opportunity for all dam safety and design review engineers to participate in common training. At the Fall Branch meeting in December 2011, Doug Boyer, Head of the USACE Risk Management Center (RMC) for the USACE, presented a lecture on the history, advances and current state of the practice for Risk Analysis in dam safety. At the Spring meeting in April 2012, three lectures were included during the two-day meeting. John Wickersheim, MSA, Inc., provided training on Confined Space Awareness, Guy Lund of URS Corporation spoke about Concrete Dams, and Scott Stienbracher of the Colorado Attorney General's office spoke about dam owner liability.

The Branch also acquired several new pieces of software for internal use and training was required for that. Software included Adobe Acrobat Pro for development of paperless processes within the Branch and FLO-2D, a two-dimensional model to simulate dam breach flows for hazard classification and inundation mapping efforts.

As part of the program for the ASDSO 2012 national convention held in Denver in September 2012, Branch engineers participated in training on drop inlet spillway design and in the use of NRCS WinDam B software.

8.5 Papers and Presentations

In September of 2011 engineers Jason Ward and Jeremy Franz prepared a paper and presentation for the CASFM conference held in Snowmass Village. As chairmen of the committees to develop Guidelines for Dam Beach Analysis and Guidelines for Hazard Classification, respectively, Jeremy and Jason presented a summary of those guidelines and how they fit with the mission of the Branch. Jason and Jeremy also coauthored an article entitled "Guidelines for Dam Breach Analysis and Hazard Classification in Colorado" published in ASDSO's Journal of Dam Safety, Volume 9, Issue 4, 2011.

Through the Spring of 2012 the Chief of Dam Safety delivered presentations on the Branch program and activities at the annual meetings of the Colorado Water Congress, Colorado Emergency Managers Association, for the State Engineers annual meeting, for a delegation of engineers from the Chinese Ministry of Water Resources (with John Hunyadi) and a delegation of water engineers from the Czech Republic (with Jeremy Franz)

In September 2012 the ASDSO 2012 National Convention was held in Denver. The Branch took advantage of this rare occurrence and a strong majority of dam safety engineers attended the conference. Division of Water Resources Director and State Engineer, Dick Wolfe (shown at left) provided an opening welcome address for the conference. Jeremy

Franz, Jason Ward and John Batka prepared a paper and presentation on Colorado Guidelines for Dam Breach, Guidelines for Hazard Classification and the Inundation Mapping Grant program, and Bill McCormick partnered with National Park Service Chief of Dam Safety Mark Baker, on a paper and presentation reviewing the events around the 1982 Lawn Lake Dam Failure, in honor of the 30th anniversory of that historic Colorado Event. Jason, Jeremy, and Bill also acted as session moderators for the conference. Garrett Jackson was a member of the program committee which reviewed abstracts and developed the sessions for the conference. Garrett also moderated a keynote session on the archeological findings during the Lake Deborah Dam (Ziegler Reservoir) Rehabilitation project near Snowmass.

8.6 Dam Safety Information Management

8.6.1 Paperless Initiative

At the beginning of WY11-12 the Branch embarked on an initiative to reduce the amount paper generated and also reduce the time and expense associated with mailing multiple copies of paper documents. NDSP grant funds were utilized to purchase Adobe Acrobat Professional, Version X to enable Branch personnel to develop and utilize enhanced digital document handling capabilities. During this period all engineers developed verifiable digital signatures to sign documents, and began issuing letters and correspondence "VIA EMAIL" to the greatest extent practicable. To date these methods have shown promise in efficient dissemination of Branch information, directives, approvals, acceptance and date-to-day correspondence.

8.6.2 Information Requests

All members of the Branch receive and process requests for information from Branch files. Requests for information come from many entities; engineers contracted for work with dam owners, engineers pursuing work for dam owners, historians researching information on water projects, realtor's investigating property ownership, insurance companies updating policies, lawyer's pursuing civil litigation, media outlets researching stories, etc.

The process for reviewing Branch files is defined in Policy 01-05. Per the policy, requests must start with a valid request letter that is approved through the Branch Chief. Beginning in WY 11-12 the approval process has followed the intent of the paperless initiative described above and nearly all requests have been approved through email with transfer of digitally signed request and approval letters. Once approved, the requests are processed by the dam safety engineer whose area of responsibility encompasses the dam defined in the request. Time must be allotted to reviewing and preparing files for review, meeting with the information requesters, making copies of desired information and processing any necessary fees.

Best available records indicate in WY 11-12 members of the Branch processed 52 separate requests for information from Branch files in this manner.

8.6.3 USACE National Inventory of Dams (NID)

The ASDSO annual State performance report uses information obtained, in part, from our annual information and data sharing activity with the USACE sponsored National Inventory of Dams (NID). NID information is utilized to assess dam safety programs across the nation and forms at least some of the basis for each states annual allocation of FEMA NDSP grant funding.

One discrepancy found during the latest update of the NID relates to the overall condition rating for dams. The NID utilizes 4 categories: Satisfactory, Fair, Poor and Unsatisfactory; the Branch program utilizes a 3-level condition rating system of: Satisfactory, Conditionally Satisfactory and Unsatisfactory. Unfortunately in the 2010 ASDSO performance report cycle the data for our Conditionally Satisfactory rated dams got lumped into the Poor category based on a different interpretation of the categories by previous Branch staff. As a result of that difference in rating systems, the information in the ASDSO report indicates a large number of "Poor" rated dams in Colorado. We believe that result is in error and have made strides to correct it. Rather than change our system to match theirs, we have made modifications to how our data are extracted and reported to NID such that during the next performance reporting cycle those conditionally satisfactory rated dams will be listed in the NID "Fair" condition category. We feel this is the correct way to handle this, as we do not see a distinction between a poor and unsatisfactory rating. In Colorado if a dam is rated unsatisfactory a storage restriction is imposed.

In WY 10-11 dam safety engineer Jason Ward became a member of the USACE NID working group. The group establishes the standards for the NID database and also works on the annual surveys and data call activities. Previous to WY 11-12, the chief of the Branch was responsible for the ASDSO and NID data call responses. Given the changes in personnel, Jason's involvement in NID and Jeremy's involvement in ASDSO, it now makes sense to develop this critical information as a more structured committee type activity. A standard has been established, and will result in delivery of well documented, consistent, reproducible responses to the program performance questions. Jason and Jeremy have taken on the responsible for developing the protocols and standard procedures for responding to the annual ASDSO and NID dam information Data calls. This work has included some modification to the DAMS database, a greater awareness of the importance of maintaining an accurate database and an enhanced understanding of the information in the database and how it might be best used internally to gage our program's performance.

8.6.4 DAMS Database

The branch maintains a database of information related to dams in Colorado. The DAMS database is a Microsoft Access database that is maintained, updated and upgraded as needed. Tables are maintained within the database for physical characteristics of the dams, ownership information, inspection histories, restrictions, emergency action plans, etc. This year dams safety engineers within the Branch were provided with access to an additional tool, the Dam Safety Custom Query Utility, which provides for enhance querying capabilities and greater access to the information contained with the database. The information provided in this report was based in part on those new custom query capabilities. These new functions are based in part on needs to provide information for ASDSO performance reviews and NID data calls which are described in this section.

8.6.5 Dam Safety Branch Website

A number of publications are available at no cost on the Dam Safety web page at http://water.state.co.us/damsafety/dams.asp. The documents are in a variety of common formats including Microsoft Word and Excel and Adobe Acrobat PDF. Documents available include the Revised Rules and Regulations for Dam Safety and Dam Construction, application forms, sample dam plans, Livestock and Erosion Control Dam Permits, Notice to Construct a non-jurisdictional Water Impoundment Structure form, the Guide to Construction and Administration

of Dams in Colorado, Guidelines for Dam Brach Analysis, Guidelines for Hazard Classification and Guidelines for Development of and Emergency Action Plan and a Sample EAP from. The Branch is always on the lookout for additional resources to upload to the website to better serve the dam owner and engineering community in Colorado.

8.6.6 Dam Safety File Archives

The State Engineer's Office maintains extensive archives on over 1900 jurisdictional dams in the State. These files include past inspections, performance histories, monitoring data, and records of design and construction (original and modifications). These records are invaluable for dam owner's, consulting engineers, and dam safety regulators. The files are maintained in each respective DWR Division Office and Branch field offices. Organizing and managing these files is an on-going effort of the dam safety engineers. In WY 11-12, special projects were initiated to better organize and overhaul files in Divisions 2, 3, 5, 6 and 7. FEMA grant money was used to purchase filing supplies. The result is much more efficient storage and access to this critical information.

8.7 Associate Agency Coordination

With recent changes in personnel within the Branch, new inroads have to be built between the Branch and various State and Federal agency partners. Although no formal declarations or MOU's were established with State or Federal agencies during this reporting period, contacts were established and general goals for partnerships and cooperative relationships were made.

8.7.1 In-State Agencies

The Branch met with several "sister" agencies from within the Department of Natural Resources (DNR) to discuss activities of common interest to the DNR mission. We met the Division of Reclamation, Mining and Safety (DRMS) and discussed ways to use the engineering capabilities of the Branch to assist the DRMS with technical reviews of tailings dams and impoundments. Members of the Branch also assisted with the interviews and selection process for the new Dam Operations Engineer with Colorado Parks and Wildlife (CPW) and made a commitment to assist CPW, and in effect help them with some form of "self-regulation" (per USBR or USACE) and prioritization of the backlog of projects on their large portfolio of dams. Members of the Branch have been working on cooperative relationships and projects with the Colorado Water Conservation Board (CWCB). Branch representatives were active this period on projects involving inundation mapping grants, providing technical review and comment on proposed dam projects utilizing CWCB loans and construction funds, funding and management of the EPAT project grant, and coordination activities with their flood hazards section personnel regarding flood plain management activities impacted by dam failure flooding.

Although contact was attempted but not made, representatives of the Branch gained a greater understating of evaporation ponds related to oil and gas development in the State and see opportunities to clarify the regulatory relationship with the Colorado Department of Public Health and Environment (CDPHE) to jointly regulate those facilities. Contacts were reestablished with the newly reorganized Colorado Division of Homeland Security and Emergency Management (CDHS&EM), formerly CDEM. Communication is now open with members of their Planning, Operations, and Mitigation Sections to allow for projects of common interest in the aspects of consequence reduction and dam safety risk management in Colorado.

Lastly, representatives of the Branch met with members of the State Office of Archeological and Historic Preservation (OAHP), which is a division of the Colorado Historical Society and serves as the Colorado State Historic Preservation Officer (SHPO). The meeting was held to gain a better understanding of "Section 106" review requirements that might affect dam projects in Colorado. Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider the effects of projects they carry out, approve or fund on historic properties. For dam projects in Colorado this manly affects projects that require approvals from FERC (power projects), the USACE (clean water act "404" permits), the USFS (land issues) and the BLM (land issues). The NHPA also requires federal agencies to provide the SHPO the opportunity to comment on such projects prior to the agency's decision on them. At our meeting with the SHPO, we shared information about dams throughout the state in an attempt to gain an understanding of which dams might be of historical significance or are located near historically significant sites. The Branch goal is to meet the requirements of Section 106 and SHPO review, and at the same time not unexpectedly (negatively) effect any projects in review, approved or currently under construction.

8.7.2 Federal Agencies

Like State agency coordination efforts, this year was an information gathering year with regard to Federal Agency coordination activities. Although no MOU's were updated, progress was made with personnel from the Bureau of Land Management (BLM) and United States Forest Service (USFS) exchanging contact and dam ownership and inspection information. We have exchanged draft MOUs and hope to formalize them with those agencies in the current reporting period.

John Hunyadi, dam safety engineer in the Colorado Springs office, facilitated updating the MOU for federally owned dams on the United States Air Force Academy (USAFA), as well as a draft MOU has been provided to the HQ office at Ft Carson for dams owned by the US Army at that facility.

Several members of the Branch attended Comprehensive Facility Review inspections, Risk Assessment workshops and emergency action plan tabletop and functional exercises for several United States Bureau of Reclamation (USBR) facilities in Colorado. Various activities occurred at Pueblo Dam, Ruedi Dam, Carter Lake Dam, Horsetooth Dam and the Granby Dams. Additional exercises and coordination efforts are planned for the coming year.

Similarly, member of the Branch participated in USACE activities at Chatfield Dam, Cherry Creek Dam and Trinidad Lake Dam. Dam safety engineer Mark Perry of the Pueblo office participated in a multi-day Comprehensive Risk Assessment exercise at the Albuquerque District offices of the USACE for Trinidad Lake dam.

Dam projects that generate power in Colorado are jointly regulated by the Branch and by the Federal Energy Regulatory Commission (FERC). This year the Chief of Dam Safety worked with the FERC Regional Engineer from the San Francisco office to help with communication and clarity of direction for activities at FERC dams in Colorado. The goal is to maintain the safety at those dams but not saddle those owners with conflicting sets of State and Federal regulations. FERC representatives traveled to Salida in the summer of 2012 to discuss our

common goals. A formal MOU was discussed but FERC resisted that suggestion on the basis that they would need one with every State and such an activity would be complicated and of limited value. We did however exchange staff information for FERC and Branch personnel assigned to FERC dams. In addition to this high level coordination activity, dam safety engineers participated in a number of FERC prescribed activities at many dams. Tabletop EAP exercises were held at Strontia Springs Dam, Rampart Dam, Taylor Draw Dam, Stagecoach Dam (Div 6), and Williams Fork Dam. Branch personnel participated in Potential Failure Modes Analysis (PFMA) at Humphreys Dam, Dillon Dam, Trout Lake Dam, and Terminal Dam

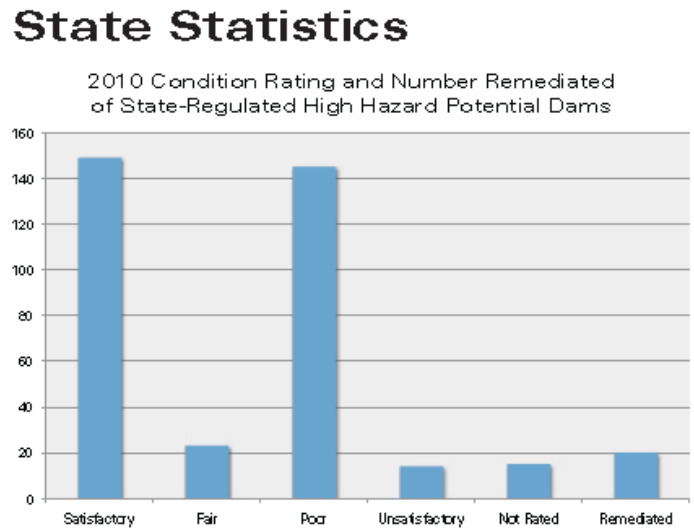
The National Park Service (NPS) owns several dams in and near Rocky Mountain National Park. Dam Safety Engineer John Batka participated in an EAP tabletop exercise at Lilly Lake Dam, a high hazard non-jurisdictional facility located within the Park.

8.7.3 Association of State Dam Safety Officials (ASDSO)

The purpose of ASDSO is to provide a forum for the exchange of ideas and experiences on dam safety issues, foster interstate cooperation, provide information and assistance to dam safety programs, provide representation of state interests before Congress and federal agencies for dam safety, and to improve the efficiency and effectiveness of the state dam safety program.

All of the dam safety engineers in the Dam Safety Branch are members of the Association of State Dam Safety Officials (ASDSO) and actively participate in its programs, presenting papers, serving on task groups and committees, and taking advantage of ASDSO-sponsored training opportunities.

In the past the Chief of the Branch acted as the State Representative for Colorado within ASDSO. In WY 11-12 the thinking on past practice changed and the idea of exposing other members of the Branch to the ASDSO range of activities was considered. The State Representative to ASDSO role is an important one because it comes with voting rights to ASDSO decision making. In November of 2011, Jeremy Franz, was nominated to act as the State Representative to ASDSO and accepted that role. This will be a 3-year revolving responsibility with a new nomination set for November 2014. At that time another member of the Branch will have the opportunity to participate in ASDSO at that level. To date Jeremy has participated in ASDSO activities including disseminating questions posed from ASDSO members to the states, sharing internal information regarding ADSO with Branch members, acting as the spokesperson for Colorado at ASDSO annual business meetings and regional caucuses, and coordinating communication and response for the annual ASDSO performance survey.



ASDSO requires member states to participate in an annual performance review survey and data sharing activity. Each year a state report is published

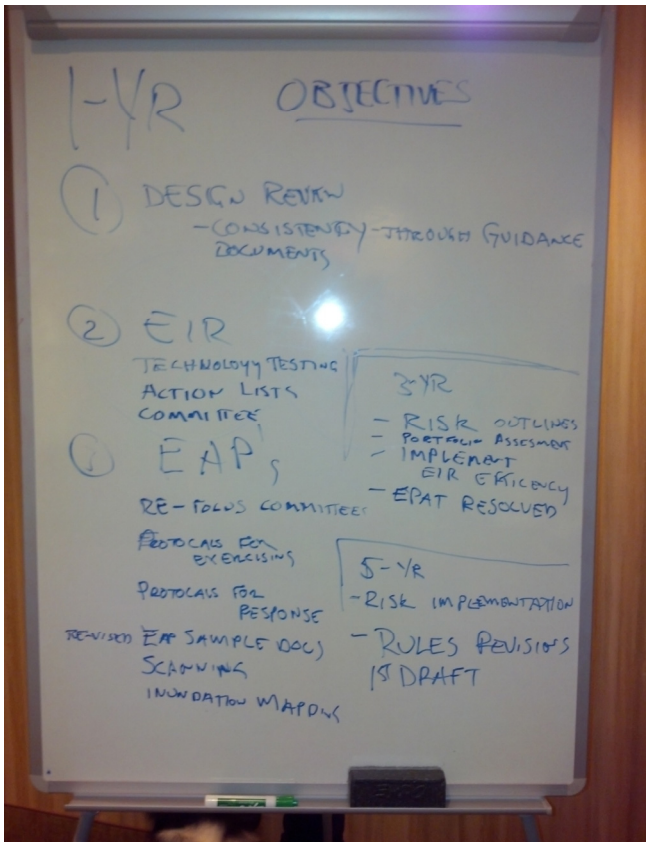
based on the answers to the survey questions as well as data that are extracted from our DAMS database and provided to ASDSO for review. In WY 11-12 the ASDSO performance review "Report Card" was published showing the results of NID data extracted from the DAMS database. As is shown in the histogram plot of that data shown on the previous page, our data indicated a high percentage of Colorado dams being in the "Poor" condition category. This categorization was based on a different interpretation by past Branch staff and has been corrected based on a revised interpretation of the overall conditions categories as described above in section 8.6.3 for future reports.

9.0 DAM SAFETY BRANCH 1-, 3- and 5-YEAR PROGRAM GOALS

In addition to the statutory requirement-driven activities previously detailed in this report, the Branch engineers recently developed sets of 1-, 3-, and 5-year program goals. The goals as described herein were established to assist the engineers focus activities that help advance the program through efficiency, innovation and education as a means to reduce the risk of dam failures to the citizens of Colorado. The team strived to set goals that are realistic, attainable and measureable.

1-Year Goals

- Design Review – Process and Guidance Document updating. Increase efficiency through streamlined and consistent written procedures.
- Engineers Inspection Reporting (EIR) – Technology testing, Action lists for owners, Committee to review process and procedures
- EAP's – Re-establish committee, develop protocols for EAP exercises, Protocols for EAP response, Updated EAP template and guidance documents, continue Inundation mapping grant program



3-Year Goals

- Outline of process to incorporate Risk Assessments in Dam Safety Program
- Conduct assessment of High and Significant Dam Portfolio, including consequences
- Implement EIR Efficiency protocols
- Resolve EPAT and High Altitude rainfall issues
- Determine protocols for digital storage/filling and access of Dam Safety Branch Records

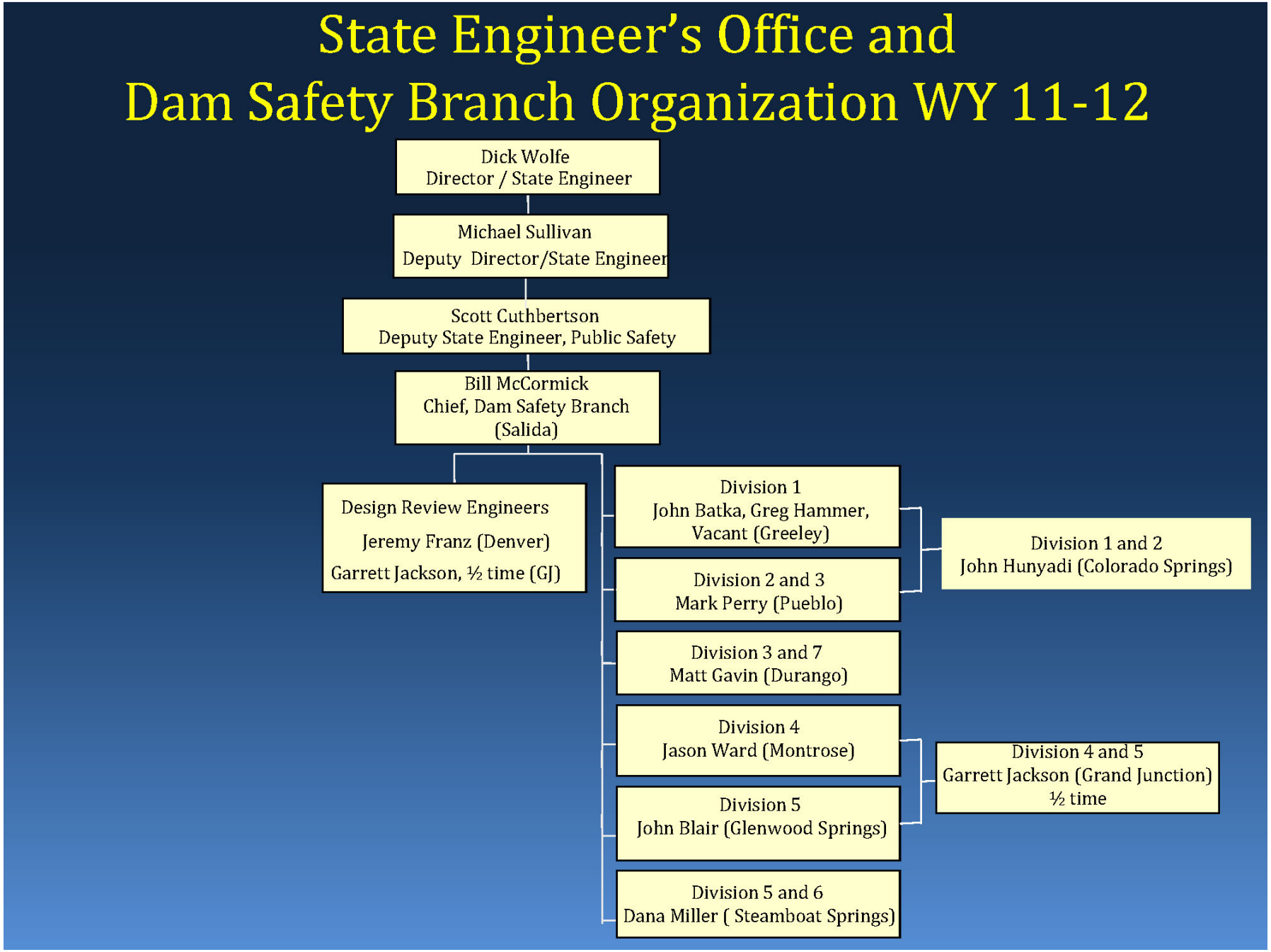
5-Year Goals

- Develop 1st Draft of Revised Rules for Dam Safety and Dam Construction
- Implement Risk- Based procedures into revised Rules

APPENDIX A

DAM SAFETY BRANCH ORGANIZATION AND PERSONNEL

DAM SAFETY BRANCH ORGANIZATION CHART



DAM SAFETY BRANCH PERSONNEL WY 11-12

NAME	LOCATION	GRADE	TITLE	RESPONSIBILITY
Scott Cuthbertson	Denver	PE IV	Deputy State Engineer	Oversight of Colorado Dam Safety Branch Program
Bill McCormick	Salida	PE III	Chief, Dam Safety Branch	Direct supervision of all dam safety engineer staff, dam safety branch program oversight and vision
Jeremy Franz	Denver	PE II	Lead Design Review and Construction Inspection Engineer	Oversight of statewide program for design review and construction inspections for dam projects.
Vacant	Greeley	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Division 1
John Batka	Greeley	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Division 1
Greg Hammer	Greeley	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Division 1
John Hunyadi	Colorado Springs	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Divisions 1, 2 and 5
Mark Perry	Pueblo	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Divisions 2 and 3
Matt Gavin	Durango	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Divisions 3 and 7
Jason Ward	Montrose	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Division 4
John G. Blair	Glenwood Springs	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Division 5
Garrett Jackson	Grand Junction	PE II	Dam Safety Engineer/ Design Review Engineer	Dam Safety Engineer duties (1/2 time) Divisions 4 and 5, and design review and construction inspection duties (1/2 time) on the Western Slope
Dana Miller	Steamboat Springs	PE II	Dam Safety Engineer	Dam Safety Engineer duties, Divisions 5 and 6

Members of the Colorado Dam Safety Branch, Spring 2012.
Front Row - Bill McCormick, Dana Miller, Jeremy Franz, Garrett Jackson and Mark Perry;
Back Row – John Clark (CPW), John Hunyadi, Matt Gavin, John Batka, Greg Hammer, Jason Ward and John Blair

APPENDIX B

APPROVED PLANS AND SPECIFICATIONS
WY 10-11 and WY 11-12

APPENDIX B - DESIGN REVIEW ACTIVITIES SUMMARY – WY 10-11

APPROVED PLANS AND SPECIFICATIONS FOR NEW DAMS, BREACHES, ENLARGEMENTS, REPAIRS AND HYDROLOGY STUDIES

no.	no.	Dam Name	DAMID	Construction File Number	Project Type	Approval Date	Review Fee	Estimated Project Cost
1	1	D.O.E. ROCKY FLATS A-3	020410	C-1409A	Breach	28-Jul-11		$100,000.00
2	2	D.O.E. ROCKY FLATS LANDFILL	020413	C-1453A	Breach	28-Jul-11		$100,000.00
3	1	LAKE DEBORAH	380222	C-1966	Enlargement	12-May-11	$3,000.00	$3,443,845.00
4	2	FORTUNE	020635	C-1784B	Enlargement	01-Mar-11	$3,000.00	$1,235,000.00
5	3	TWIN BASIN	720233	C-1996	Enlargement	17-Aug-11	$400.00	$132,094.00
6	1	HARRIMAN	090115	H	Hydrology	11-Oct-11		
7	2	HOMESTAKE PROJECT	370109	H	Hydrology	01-Sep-11		
8	3	TWIN BASIN	720233	H	Hydrology	17-Aug-11		
9	4	RED MESA WARD	330105	H	Hydrology	18-Aug-11		
10	1	DUNES	020651	C-1859A	Modification	15-Jun-11	$3,000.00	$3,100,000.00
11	2	MONTGOMERY	230134	C-0674C	Modification	01-Apr-11	$3,000.00	$1,663,000.00
12	3	BAUER LAKE #2 - MAIN DAM	340102	C-0345B	Modification	23-Sep-11	$300.00	$109,700.00
13	4	GOOSE PASTURE TARN	360105	C-1144F	Modification	02-Dec-10	$81.00	$26,300.00
14	5	LEONARD THOMAS RESERVOIR	380102	C-1118A	Modification	01-Apr-11	$1,843.20	$614,400.00
15	6	LOS LAGOS NO. 3	060133	C-1978	Modification	12-Jul-11	$100.00	$5,000.00
16	7	GARNET MESA	410107	C-0647C	Modification	09-Dec-10	$0.00	$20,000.00
17	8	AURORA-RAMPART	080104	C-1116B	Modification	20-Jan-11	$100.00	$23,895.00
18	9	KOSSLER	060130	C-1415A	Modification	09-Aug-11	$608.75	$202,917.00
19	10	CHEESMAN	800102	C-1310B	Modification	01-Apr-11	$3,000.00	$2,845,000.00
20	11	THOMAS	380138	C-1502C	Modification	14-Jun-11	$151.00	$50,300.00
21	12	ANDERSON	440101	C-1989	Modification	26-Aug-11	$150.00	$49,321.00
22	13	CRYSTAL CREEK	100116	C-0280E	Modification	31-May-11	$310.28	$100,000.00
23	14	RALSTON	070224	C-0296D	Modification	16-Apr-11		
24	15	UPPER BLUE	360102	C-0981C	Modification	07-Aug-11	$1,100.00	$370,200.00
25	16	SOUTH CATAMOUNT	100111	C-0285C	Modification	31-May-11	$310.00	$100,000.00
26	17	BERTHOUD	040103	C-0996B	Modification	29-Sep-11	$100.00	$32,200.00
27	18	MOWER	020606	C-1993	Modification	12-Jul-11	$137.70	$55,000.00
28	19	PROSPECT	010505	C-1439G	Modification	07-Oct-11	$1,350.00	$450,000.00
29	20	ST. CHARLES #2	150110	C-0101A	Modification	03-Oct-11	$1,825.81	$608,604.00
30	21	CLARKS LAKE	030116	C-0897B	Modification	28-Jul-11	$100.00	$30,000.00
31	22	DIXON	030510	C-1998	Modification	11-Oct-11	$183.00	$60,300.00
32	23	LEYDEN	070209	C-0317B	Modification	11-Oct-11	$531.00	$176,000.00
33	24	CLEAR CREEK	110102	C-0479E	Modification	12-Oct-11	$300.00	$100,000.00
34	25	CHAMBERS RESERVOIR	080451	C-1967A	Modification	19-Oct-11	$0.00	$350,000.00
35	1	PEAK RESERVOIR	400429	C-1964	New	24-Aug-11	$443.80	$144,597.00
36	2	HARRIMAN	090115	C-1689A	New	11-Oct-11	$3,000.00	$3,307,630.00
37	3	COLORADO BEEF	670405	C-1961	New	16-May-11	$3,000.00	$3,000,000.00
38	4	RANGELY POND 6	430221	C-1960	New	01-Apr-11		
39	1	BASELINE - NORTHWEST	060318	C-0605F	Repair	24-Feb-11	$600.00	$200,228.00
40	2	BURGESS #1	080406	C-1153A	Repair	01-Mar-11	$135.00	$45,536.00
41	3	PROSPECT	010505	C-1439F	Repair	22-Nov-10	$100.00	$31,000.00
42	4	THURSTON LAKE	670234	C-0214A	Repair	20-Jan-11	$36.00	$12,000.00
43	5	MARSHALL LAKE	060203	C-0491E	Repair	16-Dec-10	$310.37	$103,458.00
44	6	HOMESTAKE PROJECT	370109	C-1112A	Repair	29-Aug-11	$3,000.00	$23,723,142.00
45	7	STOCKING POND	230310	C-1925A	Repair	16-May-11	$214.50	$72,000.00
46	8	MOUNTAIN SUPPLY # 9	030230	C-1994	Repair	29-Sep-11	$374.00	$124,000.00

no.	no.	Dam Name	DAMID	Construction File Number	Project Type	Approval Date	Review Fee	Estimated Project Cost
47	9	POMONA NO. 2 AND NO. 3	070223	C-1357A	Repair	12-Jul-11	$100.00	$30,000.00
48	10	ISLAND LAKE	060127	C-1992	Repair	12-Jul-11	$729.00	$243,000.00
49	11	BILLS RANCH LAKE	360135	C-1997	Repair	29-Sep-11	$291.00	$96,300.00
50	12	BONNER POND	300150	C-1980	Repair	01-Dec-10	$100.00	$29,000.00
						TOTALS	***$37,415.41***	***$47,314,967.00***

Summary of Approved Projects WY 10-11	
4	New Dams
3	Enlargements
25	Modifications
12	Repairs
4	Hydrology Studies
2	Breaches

APPENDIX B - DESIGN REVIEW ACTIVITIES SUMMARY – WY 11-12

APPROVED PLANS AND SPECIFICATIONS FOR NEW DAMS, BREACHES, ENLARGEMENTS, REPAIRS AND HYDROLOGY STUDIES

no.	no.	Dam Name	DAMID	Construction File Number	Project Type	Approval Date	Review Fee	Estimated Project Cost
1	1	UPPER THREE MILE #1	470310	C-1886	Enlargement	06-Sep-12		$100,000.00
2	2	Brereton Pond	370208	C-1933	Enlargement	22-May-12	$630.00	$210,000.00
3	3	LAKE SAN CRISTOBAL	620110	C-1965	Enlargement	07-May-12	$1,618.50	$539,500.00
4	4	DAVIS #2	800133	C-1983	Enlargement	03-Aug-12		$1,239,000.00
5	5	DAVIS #3	800134	C-1984	Enlargement	03-Aug-12		$914,000.00
6	1	NORTHFIELD	100217	H	Hydrology	16-Jul-12		
7	2	L E D E	370105	H	Hydrology	01-May-12		
8	3	CUCHARAS #5	160108	H	Hydrology	05-Jan-12		
9	4	UTE CREEK	350104	H	Hydrology	23-May-12		
10	5	LONE PINE	030416	H	Hydrology	10-Aug-12		
11	1	JEFFERSON LAKE	230123	C-0588A	Modification	28-Dec-11	$3,000.00	$1,066,450.00
12	2	HERMIT #4	200223	C-1535B	Modification	19-Mar-12	$179.62	$19,050.00
13	3	FRANKTOWN PARKER FPE-8	080136	C-1104B	Modification	12-Jan-12		$25,000.00
14	4	NORTH LAKE	190116	C-1063C	Modification	23-Feb-12	$3,000.00	$1,697,530.00
15	5	UPPER THREE MILE #1	470310	C-1886A	Modification	06-Sep-12		$100,000.00
16	6	NORTHFIELD	100217	C-0745B	Modification	16-Jul-12	$3,000.00	$4,500,000.00
17	7	NICHOLS	100218	C-0383A	Modification	16-Jul-12	$3,000.00	$3,500,000.00
18	8	HAVANA STREET DAM	020615	C-1991	Modification	12-Nov-11	$1,353.00	$388,536.00
19	9	SUMMITVILLE TAILINGS	210103	C-1245C	Modification	17-Jan-12	$2,136.00	$712,000.00
20	10	WIND	230312	C-1999	Modification	12-Nov-11	$97.50	$32,500.00
21	11	UTE CREEK	350104	C-1340A	Modification	23-May-12	$797.00	$265,653.00
22	12	ROLLING	070226	C-1178B	Modification	12-Nov-11	$100.00	$10,000.00
23	13	TERRACE	210102	C-0875G	Modification	09-May-12	$3,000.00	$4,069,295.00
24	14	HOME LAKE	200227	C-2001	Modification	27-Feb-12		$60,000.00
25	15	LONE TREE	040138	C-1482C	Modification	01-Feb-12	$420.00	$140,000.00
26	16	JOHNSON	300128	C-1565B	Modification	13-Feb-12		$262,000.00
27	17	CHAMBERS RESERVOIR	080451	C-1967B	Modification	14-Jun-12	$3,000.00	$2,128,000.00
28	18	CUCHARAS #5	160108	C-1021C	Modification	01-Feb-12	$100.00	$33,500.00
29	19	MOUNT PISGAH	120129	C-1690A	Modification	10-Feb-12		$5,000.00
30	20	PARK CENTER L & W #8	120201	C-2005	Modification	13-Feb-12		$15,000.00
31	21	JONES #2	530116	C-1327B	Modification	04-May-12	$129.00	$42,600.00
32	22	CHEROKEE NW	070317	C-1825A	Modification	03-Aug-12	$3,000.00	$4,655,100.00
33	23	QUINCY	020406	C-1378A	Modification	15-Jun-12	$3,000.00	$1,500,000.00
34	24	NISSEN #2	020411	C-1431B	Modification	01-Oct-12	$100.00	$32,000.00
35	25	HANSON #2	400315	C-0185A	Modification	22-Oct-12	$126.00	$37,800.00
36	26	KIRKENDALL	720204	C-0623B	Modification	27-Sep-12	$100.00	$8,620.00
37	27	ROBINSON	370107	C-0411D	Modification	19-Oct-12	$150.00	$45,000.00
38	28	CHALK MOUNTAIN	370114	C-1486B	Modification	19-Oct-12	$150.00	$45,000.00

no.	no.	Dam Name	DAMID	Construction File Number	Project Type	Approval Date	Review Fee	Estimated Project Cost
39	1	LONG HOLLOW	330107	C-1987	New	08-Feb-12	$3,000.00	$13,432,763.00
40	2	TAYLOR	430222	C-2004	New	15-Jun-12	$3,000.00	$1,338,051.00
41	3	Upper Grand Creek Ranch Reservoir	510211	C-2007	New	06-Aug-12	$1,110.00	$370,000.00
42	4	LEACH CREEK DAM	720422	C-2010	New	03-Aug-12	$2,143.00	$714,400.00
43	1	HERMIT #2	200118	C-1533A	Repair	19-Mar-12	$179.02	$53,072.00
44	2	GARDNER PARK	580109	C-1968	Repair	15-May-12		$10,000.00
45	3	UPPER ZAPATA LAKE	350109	C-1995	Repair	29-Mar-12	$100.00	$23,066.00
46	4	WOHLER	530136	C-1240B	Repair	05-Apr-12	$471.60	$157,200.00
47	5	LAKE GRANT	590115	C-1754C	Repair	12-Nov-11	$108.00	$36,086.00
48	6	ORLANDO #2	160118	C-1333A	Repair	22-Nov-11	$1,009.00	$336,400.00
49	7	MOCK #1	410202	C-2000	Repair	07-Mar-12	$100.00	$6,000.00
50	8	SPRING RUN #2	100106	C-0441E	Repair	14-Nov-11	$619.00	$207,009.00
51	9	HIGHLAND #3	050135	C-2002	Repair	27-Feb-12	$360.00	$120,000.00
52	10	MEADOW LAKE	040229	C-2003	Repair	06-Aug-12	$417.93	$139,310.00
53	11	LESTER CREEK	580113	C-0968F	Repair	04-May-12		$161,000.00
54	12	LA VETA LAKE NORTH	160411	C-2006	Repair	24-Jul-12	$863.00	$287,466.00
55	13	GRAND MESA #1	420120	C-1843B	Repair	15-Jun-12	$114.07	$38,023.00
56	14	ALLEN LAKE	050102	C-0126A	Repair	16-Jul-12	$1,170.00	$389,100.00
57	15	RYAN	400508	C-2008	Repair	14-Jun-12	$100.00	$5,960.00
58	16	ASPEN LEAF	400101	C-0466A	Repair	23-May-12	$100.00	$31,350.00
59	17	FISH LAKE	400234	C-2009	Repair	12-Jun-12		$1,000.00
60	18	GRAND MESA #6	420121	C-1180A	Repair	21-Jun-12	$123.00	$37,000.00
61	19	MUDDY CREEK	500116	C-0671A	Repair	16-Aug-12	$0.00	$140,000.00
62	20	BOLEN	420108	C-1405A	Repair	08-Oct-12	$100.00	$600.00
						TOTALS	***$47,374.24***	***$46,432,990.00***

Summary of Approved Projects WY 11-12	
4	New Dams
5	Enlargements
28	Modifications
20	Repairs
5	Hydrology Studies
0	Breaches

APPENDIX C

DAM SAFETY ENGINEER INSPECTION REPORT (EIR) FORM

ENGINEER'S INSPECTION REPORT

INSPECTOR:

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME: T: R: S: COUNTY: DATE OF INSPECTION:
DAM ID: YRCompl: DAM HEIGHT(FT): SPILLWAY WIDTH(FT): PREVIOUS INSPECTION:
CLASS: DAM LENGTH(FT): SPILLWAY CAPACITY(CFS): NORMAL STORAGE (AF):
DIV: WD: CRESTWIDTH(FT): FREEBOARD (FT): SURFACE AREA(AC):
EAP: CRESTELEV(FT): DRAINAGE AREA (AC.): OUTLET INSPECTED:

CURRENT RESTRICTION: -- NONE --

OWNER: OWNER REP.:
ADDRESS: CONTACT NAME:
CONTACT PHONE:

INSPECTION PARTY : _____ _____ _____
REPRESENTING : _____ _____ _____

FIELD CONDITIONS OBSERVED	WATER LEVEL: BELOW DAM CREST _____ FT. Above Spillway _____ FT. GAGE ROD READING _____
	GROUND MOISTURE CONDITION: ☐ DRY ☐ WET ☐ SNOWCOVER OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

UPSTREAM SLOPE

PROBLEMS NOTED: ☐ (0)NONE ☐ (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☐ (2) WAVE EROSION - WITH SCARPS
☐ (3) CRACKS WITH DISPLACEMENT ☐ (4) SINKHOLE ☐ (5) APPEARS TOO STEEP ☐ (6) DEPRESSIONS OR BULGES ☐ (7) SLIDES
☐ (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED ☐ (9) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

CREST

PROBLEMS NOTED: ☐ (10) NONE ☐ (11) RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES
☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) IMPROPER SURFACE DRAINAGE ☐ (19) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED: ☐ (20) NONE ☐ (21) LIVESTOCK DAMAGE ☐ (22) EROSION OR GULLIES ☐ (23) CRACKS - WITH DISPLACEMENT ☐ (24) SINKHOLE
☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSIONS OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☐ (29) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

SEEPAGE

PROBLEMS NOTED: ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT
☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED / MUDDY
DRAIN OUTFALLS SEEN ☐ No ☐ Yes Show location of drains on sketch and indicate amount and quality of discharge. ☐ (37) FLOW INCREASED / MUDDY ☐ (38) DRAIN DRY / OBSTRUCTED
☐ (39) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE
☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☐ NO
INTERIOR INSPECTED ☐ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE
☐ (49) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

SPILLWAY

PROBLEMS NOTED: ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT
☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED
☐ (58) CONCRETE DETERIORATED / UNDERMINED ☐ (59) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☐ (111) GAGE ROD ☐ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS / FLUMES
☐ (114) SURVEY MONUMENTS ☐ (115) OTHER

MONITORING OF INSTRUMENTATION ☐ (116) NO ☐ (117) YES PERIODIC INSPECTIONS BY: ☐ (118) OWNER ☐ (119) ENGINEER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED: ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE
☐ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET, SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER

CONDITIONS OBSERVED: ☐ Good ☐ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

ENGINEER'S INSPECTION REPORT
DAM NAME: AGATE NO 1

DATE.: 10/23/2009
DAM I.D.: 010105

OVERALL CONDITIONS

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ (71) SATISFACTORY ☐ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

MAINTENANCE - MINOR REPAIR - MONITORING

☐ (80) PROVIDE ADDITIONAL RIPRAP:
☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE:
☐ (82) CLEAR TREES AND/OR BRUSH FROM:
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES:
☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE:
☐ (85) PROVIDE SURFACE DRAINAGE FOR:
☐ (86) MONITOR:
☐ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN:
☐ (88) OTHER
☐ (89) OTHER

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction.)

☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM:
☐ (91) PREPARE AS -BUILT DRAWINGS OF:
☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM:
☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE:
☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY:
☐ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS:
☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET:
☐ (97) OTHER:
☐ (98) OTHER:
☐ (99) OTHER:

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

☐ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION
☐ (104) CONTINUE EXISTING RESTRICTION

RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW →

FT. BELOW DAM CREST
FT. BELOW SPILLWAY CREST
FT. GAGE HEIGHT
NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL:

Engineer's Signature _____ INSPECTED BY

Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE

DATE: ___/___/___

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE
Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR
Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE
Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR
Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased without increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for Class I dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE
Monitoring includes movement surveys and leakage measurements for Class I 11 dams; leakage measurements for Class III dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR
All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE
Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR
Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY
The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY
The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE
Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE
Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION
Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

HAZARD CLASSIFICATION OF DAMS

CLASS High hazard
Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

CLASS Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

CLASS Low hazard
Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

Class NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

APPENDIX D

Listing of Dams under Storage Restriction Orders

Restricted Dams As of 12/31/2012

NO.	Div	DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Action Date	Action Type	Volume Lost
1	1	10506	1	RIVERSIDE	GH 33.55 FT.	no spillway; 33.55 is max decree	5/9/1984	I	0
2	1	30107	1	BLACK HOLLOW	4.2 FT. SPILLWAY	INADEQUATE SPILLWAY	10/22/1997	I	999
3	1	75311	1	SMITH	2.0 SPILLWAY	SEEAPGE	6/7/2010	R	200
4	1	80327	1	SKEEL	5.0 Feet Below Spillway Crest	Poor Condition, seepage	11/2/2007	R	75
5	1	90204	1	WILLOW SPRINGS #1	2.0 feet below spillway	Return to previously restricted storage	9/28/2012	R	16
6	1	230102	1	ANTERO	GH 18 FT.	STAB. BERM CONST. & NEW INSTR. MONITORING	2/4/1986	R	6500
7	1	640104	1	JULESBURG #4	GH 24 FT. FOR 90 DAYS, THEN GH 23 FT.	CONDITION OF OUTLET, EXCESSIVE SEEPAGE	5/2/1995	R	6964
8	1	640108	1	PREWITT	GH 26.5 FT.	NO SPWY & EXCESSIVE SEEPAGE	8/23/1990	I	2531
9	1	640212	1	JULESBURG #1	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	5/2/1995	I	
10	1	640213	1	JULESBURG #1A	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	5/2/1995	I	
11	1	640214	1	JULESBURG #2	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	5/2/1995	I	
12	1	640215	1	JULESBURG #3	GH 24 FOR 90 DAYS THEN GH 23	EXCESSIVE SEEPAGE	5/2/1995	I	
13	1	10115	2	BIJOU #2 DAM #1	GH 16; not > GH 15 for more than30 days	scarping, seepage, no spillway	6/1/1993	C	2400
14	1	20322	2	SIGNAL #1	5.0 CREST	CONCENTRATD SPG AREAS&QUESTNBLE COND OF OUTLET	6/21/1993	R	60
15	1	20411	2	NISSEN #2	2.0 FEET BELOW SPILLWAY CREST	RELAXED TO ALLOW WATER STORAGE THROUGH WINTER	10/1/2010	R	50
16	1	30122	2	CURTIS LAKE	GH 10 FT.	CREST, SLOPE, EXT. SEEP. AREA BELOW D/S TOE	7/2/1985	I	397
17	1	30129	2	EATON - LAW	6 Feet below Dam Crest	Excessive Seepage	8/26/2011	I	180
18	1	30138	2	GRAY #3	NO STORAGE	SINKHOLE OVER OUTLET	5/27/1997	I	100
19	1	30201	2	NORTH GRAY	GH 11 OR 3 FEET BELOW SPILL CREST	DETERIORATED SPILLWAY PIPE & INOPERABLE OUTLET	6/14/2011	I	120
20	1	30301	2	NORTH POUDRE # 4	GH 17 FT.	POOR U/S FACE, GENERAL CONDITION	4/17/1984	R	562
21	1	50101	2	AKERS & TARR	7.0 CREST OCT. 1 - APRIL 1	SLIDE ON D/S SLOPE, SPGE. IN AREA OF ABAND OTL	3/23/1989	R	34
22	1	50308	2	UNION	GH 28.0	spillway design based on GH=28.0	12/6/1977	C	0
23	1	70126	2	DEWEY NO. 1	3.0 CREST(NW)	POOR CONDITION	11/19/1990	I	15
24	1	90115	2	HARRIMAN	GH 19 FT.	EXCESSIVE SEEPAGE	11/12/1992	R	300
25	1	10104	3	ADAMS & BUNKER #3	6.0 CREST	INADEQUATE FREEBOARD, SEEPAGE	5/22/1975	C	150
26	1	10132	3	LINDIES LAKE	3 ft below top of headwall	provide minimum freeboard	5/6/1998	R	0
27	1	10138	3	DOVER	10.0 FT. CREST	POOR CONDITION	6/27/1996	I	60
28	1	10419	3	D.A. LORD #4	2.0 SPILLWAY	INADEQUATE SPILLWAY	9/19/1980	C	400
29	1	10612	3	NO NAME 1-1 #1	10 FT. CREST	SCOUR OF D/S SLOPE DUE TO FAILURE OF OUTLET	11/2/2000	I	100
30	1	10709	3	JOLLY JOHN	NO STORAGE	SCOUR HOLE FROM OUTLET	10/27/2000	I	297
31	1	10716	3	HOWARDS LAKE	3.0 FT. SPILLWAY	EROSION OF DAM AND CREST	6/3/1998	I	50
32	1	20113	3	CARLIN	5.0 CREST	NO SPILLWAY	7/29/1986	C	0
33	1	20115	3	LOWER CHURCH LAKE	3.0 FT CREST	INADEQUATE SPILLWAY	6/22/1999	I	0
34	1	20119	3	COLE	NO STORAGE	POOR CONDITION	6/30/1994	I	95
35	1	20314	3	NORTH STAR	5.0 BELOW DAM CREST	SINKHOLE ON DOWNSTREAM SLOPE	2/11/2003	R	
36	1	20333	3	THOMPSON	5.0 CREST	INADEQUATE FREEBOARD, GENERALLY POOR CONDITION	10/7/1987	R	30
37	1	20615	3	HAVANA STREET DAM	NO STORAGE	NO SPILLWAY	6/17/1987	C	0
38	1	30108	3	BOX ELDER #2	3.0 FT. SPILLWAY	EXCESSIVE SEEPAGE	8/8/1989	I	49
39	1	30128	3	DRY CREEK	GH 11.5 FT.	OUTLET DETERIORATION,SEEPAGE, INAD SW	1/17/1996	R	150
40	1	30214	3	LAW, JOHN	3.0 CREST	INADEQUATE SPILLWAY AND FREEBOARD	6/22/1987	C	45
41	1	30220	3	MATTINGLY	2.0 FT. SPILLWAY	EROSION/3-5 FT. SCARP ON U/S FACE	10/23/1997	I	99
42	1	30225	3	MOUNTAIN SUPPLY # 1	10 FT. CREST	POOR CONDITION	11/5/1997	I	500
43	1	30226	3	MOUNTAIN SUPPLY # 2	10 FT. CREST	POOR CONDITION	11/5/1997	I	300
44	1	30227	3	MOUNTAIN SUPPLY # 6	3.0 CREST	NO SPILLWAY	10/19/2000	C	120
45	1	30229	3	MOUNTAIN SUPPLY # 8	NO STORAGE	POOR CONDITION	10/3/1978	I	643
46	1	30309	3	PARK CREEK #2	Zero Storage Restriction	Inoperable Outlet - Dam Breached by Owner	1/23/2009	I	97
47	1	30512	3	RIST CANYON	3.0 CREST	SEEPAGE, INADEQUATE SPILLWAY	4/19/1983	I	33
48	1	45234	3	IDE AND STARBIRD #1	3.0 CREST	POOR MN, ERODED U/S FACE, QUES. SPILLWAY	7/3/1985	I	0
49	1	50132	3	HIGHLAND	3.0 BELOW TOP OF CONCRETE WALL AT	NO SPILLWAY OUTLET	11/26/1990	R	0
50	1	50206	3	KNOUTH	NO STORAGE	NEVER COMPLETED DAM	12/24/1985	I	204
51	1	50212	3	LITTLE GEM	10.0 CREST	EROSION ON U/S SLOPE & CRST,TREES ON U/S SLOPE	10/11/1985	I	60
52	1	50304	3	SWEDE	Zero Storage Restriction	PIPING OF EMBANKMENT ALONG OULTLET	9/7/2012	I	151
53	1	60307	3	LAKE MANCHESTER	2 feet below spillway, 6 feet below dam crest	Poor Condition of Dam and lack of maintenance	8/8/2012	I	36
54	1	60314	3	HODGSON-HARRIS	ZERO STORAGE	CONTINUAL DETERIORATION	7/8/2009	R	119
55	1	80101	3	ALLIS	15.0 CREST	SLOUGHING, SEEPAGE	8/25/1992	R	50
56	1	80105	3	BAIRD #1	7.0 CREST	SEVERE BEAVER ACTIVITY, PLUGGED OUTLET	1/8/1990	I	25
57	1	80306	3	WAKEMAN	NO STORAGE	SPILLWAY EROSION	10/17/1994	I	110
58	1	80422	3	RAINBOW FALLS #5	9.0 CREST	INADEQUATE SPILLWAY	9/11/1985	I	25
59	1	80424	3	GERLITS	NO STORAGE	DAM PARTIALLY BREACHED DUE TO OVERTOPPING.	11/13/1984	I	10
60	1	80445	3	FREDERICKSON LAKE	5 FEET BELOW DAM CREST	Continual Deterioration of Dam and Structures	4/6/2009	R	5

Restricted Dams As of 12/31/2012

NO.	Div	DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Action Date	Action Type	Volume Lost
61	1	230312	3	WIND	5.5 CREST	SATURATED D/S SLOPE	9/20/1985	C	3
62	1	480101	3	JOHNSON	4.0 CREST(3.0 CREST IRR. SEASON)	EROS. ON U/S FACE, IMPROPER FB., SEEP/D/S TOE	7/18/1994	C	68
63	1	650121	3	DUCK	4.0 SPILLWAY	NARROW CREST, STEEP SLOPES	3/23/1987	I	15
64	1	650123	3	HANSHAW	5.0 CREST	seepage, slide, overall poor	7/7/1987	I	12
65	1	800139	3	GREEN VALLEY RETENTION	Zero Storage	Scarp at Outlet, PoorCondition Inoperable Gate	1/28/2008	I	10
66	1	80110	4	CANTRILL	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	10/22/1987	I	37
67	1	80321	4	QUICK	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	10/22/1987	I	64
68	2	100459	1	STRATTON	Gage Height 10 Feet	Outlet Not Modified to Allow No Storage	1/28/2008	I	32
69	2	190116	1	NORTH LAKE	GH 60 FEET OR 5 FEET BELOW SPILLWAY CREST	HIGH PIEZOMETRIC PRESSURES AT DOWNSTREAM TOE	6/14/2011	I	500
70	2	670236	1	TWO BUTTES	GH 20 FT., ~35 ft below the dam crest	HYDRAULICALLY INADEQUATE SPILLWAY	1/24/1983	I	17177
71	2	100402	2	VALLEY NO. 2	NO STORAGE	INOPERABLE OUTLET, OBSTRUCTED SPILLWAY	9/21/2000	C	185
72	2	160411	2	LA VETA LAKE NORTH	2.5 FEET BELOW SPILLWAY CREST	SEEPAGE AND CONDITION OF OUTLET WORKS	3/4/2011	I	25
73	2	170233	2	CRYSTAL LAKE	ZERO STORAGE RESTRICTION	EXTENSIVE SEEPAGE & DAM OVERGROWN W/ TREES	8/6/2012	I	109
74	2	180206	2	APISHAPA	22.0 CREST	SPILLWAY, OUTLET SILTED IN	2/18/1994	I	260
75	2	100309	3	VALLEY NO. 1	15.0 CREST	INOPERABLE OUTLET & BLOCKED SPILLWAY	12/27/1984	I	50
76	2	120240	3	GILLETT RESERVOIR	ZERO STORAGE, MAINTAIN BREACH	BREACHED DAM	11/18/2006	I	12
77	2	160115	3	MC KINLEY CLAY	RESTR. TO 4' BELOW SPILL. CREST; 9'	SPILL. OBSTR., CORR. CMP COND.& WAVE BELOW DAM SCARP U/S	11/10/2011	I	40.6
78	2	160119	3	SHARPS ORCHARD	7 FEET BELOW THE DAM CREST	SEVERE EROSION OF U/S SLOPE & DAMAGED OUTLET	5/1/1972	I	
79	2	170118	3	CUDAHY #1	5.0 FT. BELOW DAM CREST	INADEQUATE FREEBOARD AND INOPERABLE OUTLET	7/15/1985	I	900
80	2	170137	3	HORSE CREEK AND BLACK DRAW	5-ft below the lowest point of the dam crest	Poor Condition of the Dam	4/24/1986	I	
81	2	170217	3	SWINK #1	5.0 CREST	IN DISREPAIR, ABANDONED	4/24/1986	I	500
82	2	170218	3	SWINK #2	5.0 CREST	IN DISREPAIR, ABANDONED	4/24/1986	I	600
83	2	170219	3	SWINK #5	5.0 CREST	IN DISREPAIR, ABANDONED	4/24/1986	I	750
84	2	170220	3	SWINK #6	5.0 CREST	IN DISREPAIR, ABANDONED	4/24/1986	I	650
85	2	170222	3	TIMPAS #3	10.0 CREST	IN DISREPAIR, ABANDONED	4/21/1986	I	500
86	2	180207	3	SEVEN LAKES	7.0 CREST	DILAPIDATED CONDITION OF DAM	5/6/1987	I	1200
87	2	160135	4	CLARK #1	8.0 CREST	ERODED UPSTREAM SLOPE	2/16/1994	R	80
88	3	200102	1	BEAVER PARK	20 FEET BELOW SPILLWAY CREST	SINKHOLE LEFT ABUTMENT AREA	5/7/2010	I	1700
89	3	200110	1	CONTINENTAL	GH 64.5	LEAKAGE	8/1/1995	I	7679
90	3	210102	1	TERRACE	7.0 SPILLWAY	DETERIORATED SPILLWAY	7/18/1984	I	2000
91	3	200114	2	FUCHS	3 Feet Below Service Spillway Crest	Stability concerns and lack of maintenance.	12/22/2008	I	73.4
92	3	350109	2	UPPER ZAPATA LAKE	0.5-ft above the gated outlet pipe invert	Seepage at d/s toe and saturation of hillside	8/18/2010	I	6
93	3	240101	3	EASTDALE #1	1.3 feet below spillway crest	Erosion of upstream slope	7/1/2004	I	420
94	3	260101	3	SAGUACHE	Zero storage	General neglect, inoperable U/S gate	6/28/2004	I	450
95	4	400608	2	YOUNGS CREEK #1 & 2	Gage Height 18 ft, 17 below spill	Sinkholes in left abutment	8/6/2012	I	595
96	4	420120	2	GRAND MESA #1	5 FEET BELOW SPILLWAY	EMBANKMENT REPAIR AND SPILLWAY ENLARGED	9/11/2009	R	180
97	4	590113	2	MERIDIAN LAKE PARK #1	2.0 SPILLWAY (PRIN SPWY LOWERED)	SEVERE EROSION OF THE EMERGENCY SPILLWAY	6/4/1987	I	10
98	4	280104	3	MCDONOUGH #1	5 feet below spillway crest	Deterioration of Spillway Walls	8/6/2012	I	150
99	4	400208	3	COLE #5	1.1 FT BELOW EMERGENCY SPILLWAY CREST,GH 16.4	ENLARGED RESERVOIR WITHOUT SEO APPROVAL	10/2/2008	I	19.1
100	4	400212	3	CYPHER #1	4.0 BELOW EMERGENCY SPILLWAY CREST	STUDY DAM UNSTABLE AT FULL RESERVOIR	4/26/2010	R	18
101	4	400219	3	DON MEEK #1	7-ft below the spillway crest	Beaver activity, inoperable outlet gate	8/25/2004	I	23
102	4	400330	3	KNOX	FULL STORAGE FROM 4/1 TO 8/15 IF MONITORED	EXCESSIVE SEEPAGE AT TOE AND ON EMBANKMENT	1/8/1988	R	0
103	4	400332	3	LEON PARK	Zero Storage	Sloughing U/S Slope & Deteriorated Outlet Work	8/9/2010	I	110
104	4	400404	3	LONE CABIN	20-ft below dam crest	Slide on downstream slope	8/18/2011	I	133
105	4	400405	3	LONE STAR #1	30.0 CREST	CRACKS ON CREST, UNAPPROVED PLANS, POOR CONSTR	7/31/1996	R	0
106	4	400419	3	OASIS	3 FEET BELOW NORMAL WATER SURFACE	UNCONTROLLED SEEPAGE	9/30/2003	I	40
107	4	400508	3	RYAN	Outlet Works Modifications completed		12/18/2012	L	0
108	4	400522	3	TODD	10.0 CREST	6FT ELEVATION DIFF ALONG CREST WITH NO SPLLWAY	10/19/1984	I	112
109	4	400524	3	TRIO	8.0 SPILLWAY	SLIDE ON DOWNSTREAM SLOPE	1/11/1989	I	75
110	4	400619	3	LONE STAR #2	10.0 CREST	CONSTRUCTION WITHOUT APPROVED PLANS & SPECS	6/2/1988	C	0
111	4	400705	3	WEBSTER #1	NO STORAGE	POORLY CONSTRUCTED	5/6/1987	C	15
112	4	400706	3	WEBSTER #2	ZERO STORAGE		5/6/1987	I	
113	4	400707	3	WEBSTER #3	NO STORAGE	POORLY CONSTRUCTED	5/6/1987	C	15
114	4	400712	3	GLORIA	3 FEET BELOW DAM CREST	NO SPILLWAY, EXCESSIVE SEPPAGE, NO FREEBOARD	6/7/2010	I	6
115	4	410201	3	COFFEY RESERVOIR	NO STORAGE	GENERAL POOR CONDITION,CONST. WO/APP. PLANS	7/21/1988	I	90
116	4	420135	3	REEDER	Zero Storage	EXTENSIVE SEEPAGE, SINKHOLES AND DISREPAIR	12/14/2005	R	299
117	4	600105	3	BLUE LAKE #1	5.0 FEET SPILLWAY	POOR CONDITION	11/21/2001	I	100
118	4	600126	3	CUSHMAN	6.0 CREST	OUTLET-INOP. SPWY-INAD. EMB. SEEPS	7/29/1975	I	36
119	4	630103	3	BURG	ZERO STORAGE	DAMAGED OUTLET CONTROLS	9/30/2003	I	91
120	4	630108	3	CASEMENT	2' below existing spillway crest	Inadequate freeboard	8/17/2009	I	42.2

Restricted Dams As of 12/31/2012

NO.	Div	DAMID	Haz. Class	Dam name	Restricted Reservoir Level	Reason for Restriction	Action Date	Action Type	Volume Lost
121	5	380219	1	POLARIS	16.5 FT BELOW DAM CREST	INADEQ SPWY & FB, BASIN SEEP, POOR FOUNDATION	11/1/2007	R	770
122	5	720115	1	BULL CREEK #4	6 feet below emergency spillway crest	Severely Eroded Spillway and Embankment	10/18/2012	I	184
123	5	360135	2	BILLS RANCH LAKE	ZERO STORAGE	SINKHOLES, POOR DAM COND.	11/1/2011	R	7
124	5	380204	2	CHRISTENSON	Zero Storage	Sloughing of Downstream Slope	7/6/2005	I	11
125	5	380231	2	VALANA K RESERVOIR NO. 1	ZERO STRORAGE	UNAPPROVED SPILLWAY AND POOR CONDITION	11/13/2008	I	19
126	5	500113	2	MATHESON	FULL STOR IN SPRING. DRAIN TO GH 30 BY 9/1	MONITORING DEVISE INSTALLED	10/30/2002	R	0
127	5	510114	2	LITTLE KING RANCH	GAGE HEIGHT 25 FEET	SINKHOLE AND EXCESSIVE SEEPAGE	2/8/2010	R	900
128	5	360117	3	OLD DILLON	ZERO STORAGE	CONTINUAL DETERIORATION OF DAM	7/17/2008	I	46
129	5	370116	3	G G LOWER	4.0 CREST	INADEQ FRBD., STABILITY OF DOWNSTREAM SLOPE	12/14/1992	R	7
130	5	380121	3	RALSTON #1	ZERO STORAGE	POOR CONDITION OF OUTLET CONDUIT	11/17/2009	I	60
131	5	450128	3	R-4 RODREICK RESERVOIR	4 FEET BELOW DAM CREST	ILLEGALLY CONSTRUCTE AND NO SPILLWAY	5/26/2009	I	10
132	5	450131	3	RIEGER POND	4.5 FEET BELOW DAM CREST	IILLEGALLY CONSTRUCTED AND NO SPILLWAY	5/26/2009	I	7
133	5	500126	3	MILK CREEK	15.0 CREST (AUG 1 THRU MAY 1)	EXCESSIVE LEAKAGE	5/10/1991	R	56
134	5	530114	3	HOLDEN	Zero Gage Height, No Storage	Seepage above serv Spwy on Downstream Slope	8/21/2006	R	31
135	5	530119	3	KELLY	3.5 FT BELOW SERVICE SPILLWAY	INCREASE IN SEEPAGE	6/29/2006	R	84
136	5	530125	3	NEWTON GULCH	GAGE HEIGHT 21 TO TEST REPAIR WORK	SINKHOLE REPAIRED	6/1/2009	R	339
137	5	720136	3	HAWXHURST	Zero Gage Height, No Storage	Hole in Outlet Conduit and Sinkholes	8/21/2006	R	207
138	5	720203	3	KENDALL	Zero Storage Restriction	Wave Erosion, Dam Instability & Blocked Spill	8/27/2007	I	61
139	6	430205	3	BAXTER	Breach or hire an engineer	Seepage , erosion, crest settling, lack of FB	3/7/2006	R	50
140	6	430212	3	WILSON #3	3.0 SPILLWAY	INOPERABLE OUTLET, INAD SPWY	9/30/1989	I	10
141	6	440120	3	DRESCHER	8.0 SPILLWAY	SEEPAGE & INSTABILITY	8/1/1988	R	159
142	6	440208	3	SHAFFER	ZERO STORAGE	INOPERABLE OUTLET AND POOR CONDITION OF DAM	1/15/2009	I	31
143	6	440213	3	FLAT TOP	10 FEET BELOW DAM CREST	CONTINUAL DETERIORATION OF DAM	3/2/2009	R	75
144	6	470308	3	LARSON #1	ZERO STORAGE	EROSION DAMAGE IN SPILLWAY & POOR MAINTENANCE	2/8/2010	I	8
145	6	570114	3	LAKE EMRICH	15 FEET BELOW CREST	SLIDES ON DOWNSTREAM SLOPE	8/30/1988	C	330
146	6	570124	3	NOFSTGER-ZEIGLER	9 FEET BELOW DAM CREST	POOR CONDITION OF DAM AND SEEPAGE	7/14/2009	I	40
147	6	570128	3	SEATON	Zero Storage Restriction	Slide on Downstream Slope & Inoperable Outlet	8/27/2007	I	21
148	6	470310	4	UPPER THREE MILE #1	No Storage, keep gate open.	Illegal Construction	6/29/2006	I	47
149	7	320107	1	TOTTEN	5 FEET BELOW EMERGENCY SPILLWAY	CRACKING OF EMBANKMENT CREST	10/7/2009	I	1000
150	7	340203	1	SUMMIT - MAIN DAM	NOT TO EXCEED 1.1 FT BELOW SPILL FOR > 3 WKS	EXCESSIVE SEEPAGE	6/3/1998	R	0
151	7	300140	3	JOHNSON #2	11' Below Crest - Open Outlet	Spillway Obstruction; General Neglect	11/4/2009	I	54
152	7	300144	3	UPPER RAILROAD	5 Feet below Dam Crest	Inadequate Spillway& Unstable Downstream Slope	9/8/2005	I	4
153	7	300150	3	BONNER POND	7.0 feet below spillway crest	Repair failure, new sinkhole	6/15/2012	I	12
154	7	320106	3	GRIMES	Zero-Storage Restriction	Inoperaable Outlet, Excessive outlet leekage,	5/2/2012	I	75
155	7	320202	3	E. G. MERRITT	Zero Storage	Deteriorated Outlet Conduit, Inoperable Outlet	6/13/2006	I	41
156	7	340106	3	HURST	NO STORAGE	OUTLET FAILURE	3/29/1999	I	35
157	7	340119	3	J. O. SPENCER	NO STORAGE	INOPERABLE OUTLET	5/8/2000	I	16

Action Type Description

C = Conditions of the dam have changes since the restriction was imposed, but the restriction remains the same

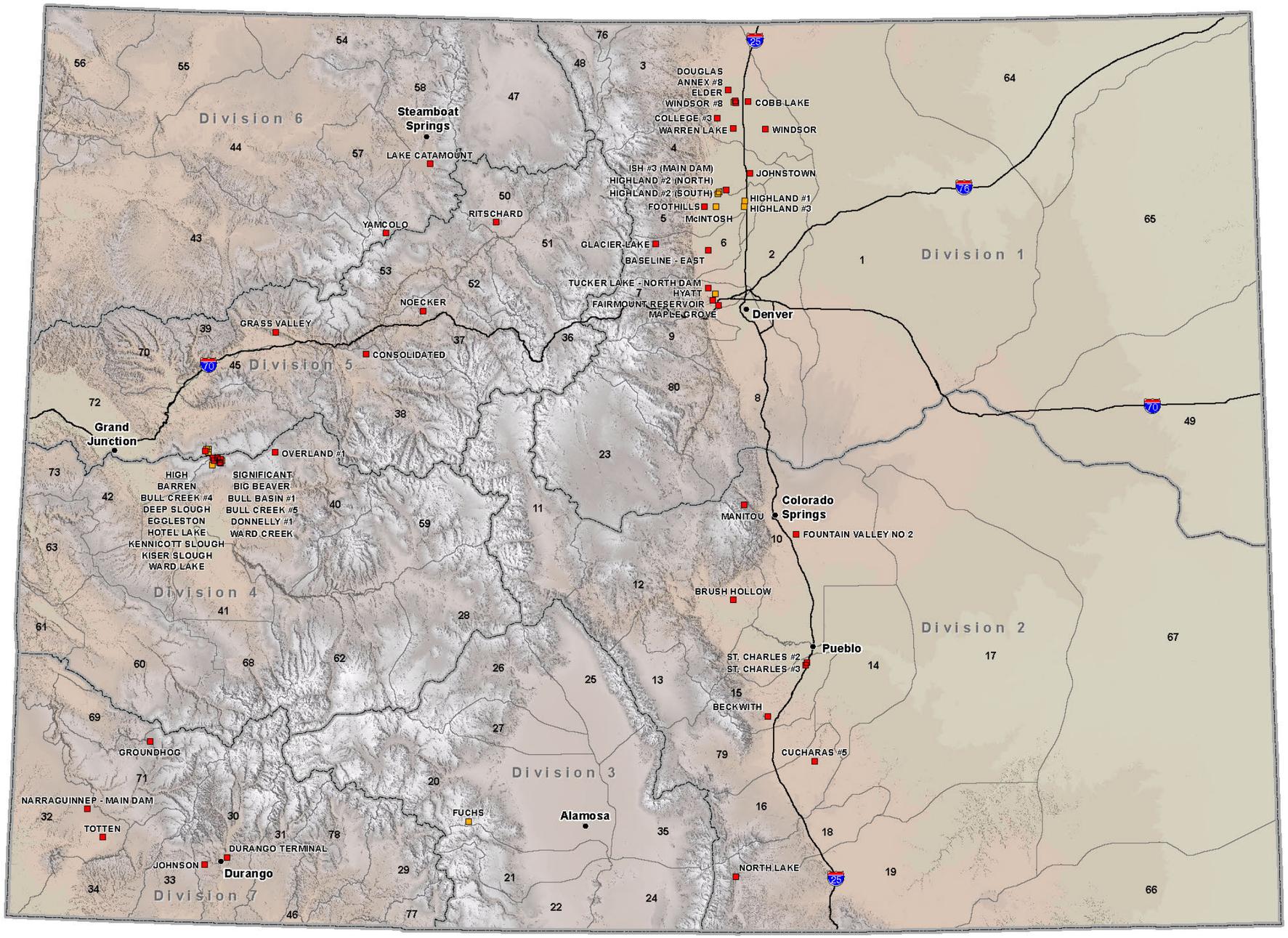
I = Restriction was first imposed

R = Restriction has been revised to to modifications or repairs to the dam

L = Restriction has been lifted

APPENDIX E

State Map of 2009-2012 Inundation Mapping Grant Projects
and
Summary Data for Projects Completed to Date



State of Colorado
Division of Water Resources

Completed Inundation Study Projects

Funded By

FEMA's National Dam Safety Program and The Colorado Water Conservation Board

Projects Completed Between Oct 2009 and Nov 2012

Map Key

- High Hazard Dam
- Significant Hazard Dam
- Water Division
- Water District

N
W E
S

Map Date : Dec 2012

FEMA NDSP FFY 09 Inundation Mapping Grant Projects

Inundation Mapping Funding Program
FEMA FY09 National Dam Safety Grant Fund No. 2009-RC-55-0041

Count	Dam Name	Division	Dam ID	Hazard	DSB Contact	Owner	Contact	Address	Phone No.	Engineer	Total Project Cost	FEMA Grant	PO Number	Completion Date
1	Warren Lake	1	030330	High	Jeremy Franz	Warren Lake Res Co.	Doug Evans	P.O. Box 506, Ft. Collins, CO 80522	(970) 221-6292	Anderson Cons	$8,650	$6,000		May-11
2	Ish#3	1	040131	High	John Batka	Boulder/Larimer	Cindy Befus	P.O. Box 582, Berthoud 80513	(970) 532-2313	Tessara Water	$9,200	$7,000		Jun-11
3	Glacier Lake	1	060119	High	Greg Hammer	Glacier Lake Propty	Jess Peterson	P.O. Box 717, Morrison 80465	(303) 697-6454	AMEC	$7,500	$7,500		Sep-11
4	St. Charles #2	2	150110	High	Mark Perry	Evraz, Inc.	Brad Zefas	1612 E. Abriendo, Pueblo 81004	(719) 561-6562	Nolte Asso.	$15,950	$7,500		Jun-11
5	St. Charles #3	2	150111	High	Mark Perry	Evraz, Inc.	Brad Zefas	1613 E. Abriendo, Pueblo 81004	(719) 561-6563	Nolte Asso.	$15,950	$7,500		Jun-11
6	Manitou	2	100211	High	John Hunyadi	City of Manitou Sprs	Bruno Pothier	101 Banks Place, Manitou Spr 80829	(719) 685-1573	Nolte Asso.	$18,460	$9,000		Aug-11
7	Hotel Lake	4	400318	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23060 U Road, Cedaredge 81413	(970) 268-5560	Buckhorn Eng.	$3,075	$3,075		Jul-11
8	Ward Lake	4	400533	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23061 U Road, Cedaredge 81413	(970) 268-5561	Buckhorn Eng.	$3,075	$3,075		Jul-11
9	Deep Slough	4	400213	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23062 U Road, Cedaredge 81413	(970) 268-5562	Buckhorn Eng.	$3,075	$3,075		Jul-11
10	Ward Creek	4	400532	Significant	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23063 U Road, Cedaredge 81413	(970) 268-5563	Buckhorn Eng.	$3,075	$3,075		Jul-11
11	Barren	4	400108	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23064 U Road, Cedaredge 81413	(970) 268-5564	Buckhorn Eng.	$3,075	$3,075		Jul-11
12	Eggleston	4	400224	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23065 U Road, Cedaredge 81413	(970) 268-5565	Buckhorn Eng.	$3,075	$3,075		Jul-11
13	Donnelly #1	4	400218	Significant	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23066 U Road, Cedaredge 81413	(970) 268-5566	Buckhorn Eng.	$3,075	$3,075		Jul-11
14	Kennicot Slough	4	400327	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23067 U Road, Cedaredge 81413	(970) 268-5567	Buckhorn Eng.	$3,075	$3,075		Jul-11
15	Kiser Slough	4	400329	High	Jason Ward	Surface Crk D&R Co.	Arlo Cox	23068 U Road, Cedaredge 81413	(970) 268-5568	Buckhorn Eng.	$3,075	$3,075		Jul-11
16	Bull Creek #4	5	720115	High	Gattett Jackson	Bull Creek Res. CO	Irv Johnson	P.O. Box 25 Molina, CO 81646	(970)268-5560	Westwater Eng.	$6,250	$6,250		May-11
17	Bull Creek #5	5	720116	Significant	Gattett Jackson	Bull Creek Res. CO	Irv Johnson	P.O. Box 25 Molina, CO 81646	(970)268-5560	Westwater Eng.	$6,250	$6,250		May-11
18	Big Beaver	5	720102	Significant	Gattett Jackson	Bull Creek Res. CO	Irv Johnson	P.O. Box 25 Molina, CO 81646	(970)268-5560	Westwater Eng.	$6,250	$6,250		May-11
19	Bull Basin #2	5	720110	Significant	Gattett Jackson	Ute Water Con. Dist.	Larry Clever	2190 1/4 Road, GJ, CO 81505	(970) 242-9189	Westwater Eng.	$6,250	$6,250		May-11
										Totals:	$128,385	$97,175		
										Average Cost Per Project:	$6,757			

FEMA NDSP FFY 10 Inundation Mapping Grant Projects

Inundation Mapping Funding Program
FEMA FY10 National Dam Safety Grant Fund No.

Count	Dam Name	Division	Dam ID	Hazard	DSB Contact	Owner	Contact	Address	Phone No.	Engineer	Total Project Cost	Funding Source: CWCB Grant	Funding Source: FEMA Grant	Funding Source: PO Number	Completion Date
1	Johnstown Reservoir	1	040132	High	John Batka	Town of Johnstown	John Franklin	P.O. Box 609, Johnstown, CO 80534	970-587-4664	Ayres Associates	$8,500		$8,500	120000000014	Sep-12
2	College lake	1	030120	High	Jeremy Franz	Colorado State University - Facilities	Susanne Cordery-Cotter	6030 Campus Delivery, Ft Collins, CO 80523-6030	970-491-0117	Smith Geotech	$13,775		$8,000	120000000021	Sep-12
3	Fairmount	1	070312	High	Greg Hammer	The Consolidated Mutual Ditch Co.	Dianna Reimer	P.O. Box 150068, Lakewood, CO 80215	303-274-7401	J&T Consulting, Inc.	$8,500	$4,000	$2,500	120000000031	Jun-12
4	Maple Grove	1	070219	High	Greg Hammer	The Consolidated Mutual Ditch Co.	Dianna Reimer	P.O. Box 150068, Lakewood, CO 80215	303-274-7401	J&T Consulting, Inc.	$8,500	$4,000	$2,500	120000000031	Jun-12
5	Tucker Reservoir (North and South)	1	070320	High	Greg Hammer	Denver View Reservoir and Irrigation Co.	Wendy Essert	8101 Ralston Road, Arvada, CO 80002	720-898-7763	GEI Consultants, Inc.	$8,000		$6,000	120000000041	Sep-12
6	Brush Hollow Dam	2	120101	High	Mark Perry	Beaver Park Water Company	Gary Ratkovich	P.O. Box 286	719-372-3664	Young Technology Group	$9,500		$6,000	120000000015	Jun-12
7	Beckwith Dam	2	150101	High	Mark Perry	Colorado City Metro District	David Valdez	P.O. Box 20229, Colorado City, CO 81019	719-676-3396	RJH	$8,500		$7,500	120000000018	Mar-12
8	North Lake Dam	3	190116	High	Mark Perry	City of Trinidad	Jim Fernandez	135 N. Aminmas Street	719-846-9843	W.W. Wheeler	$12,000		$10,000	12000000005	Nov-11
9	Fuchs	3	200114	Significant	Matt Gavin	Fuchs Ranches, Inc.	Michael Fuchs	36763 County Rd. 14, Del Norte, CO 81132	719-657-2519	Deere and Ault	$12,000	$8,000	$4,000	120000000036	Jun-12
10	Noecker	5	370111	High	John Blair	Highland Meadows Estate	Bill Andree	P.O. Box 1085, Eagle, CO 81631	970-323-9699	Grand River Consulting	$14,810		$10,750	12000000013	Jan-12
11	Grass Valley (Harvey Gap)	5	390108	High	John Blair	Silt Water Conservancy District	Jason Spualding	P.O. Box 8, Silt, CO 81652	970-876-2393	RJH	$7,000		$7,000	12000000016	May-12
12	Totten Dam	7	320107	High	Matt Gavin	Dolores Water Conservancy Dist	Ken Curtis	P.O. Box 1150, Cortez, CO 81321	970-565-7562	Stantec Consulting Services, Inc.	$16,360		$10,000	120000000017	May-12
13	Durango Terminal	7	300102	High	Matt Gavin	City of Durango	Gregg Boysen	949 East 2nd Avenue	970-375-4810	Goff Engineering	$9,950		$6,000	120000000020	Mar-12
										Totals:	$137,395	$16,000	$88,750		
										Average Cost Per Project:	$10,569				

FEMA NDSP FFY 11 Inundation Mapping Grant Projects

	Inundation Mapping Funding Program **FEMA FY11** National Dam Safety Grant Fund No.											Funding Source			
Count	*Dam Name*	*Division*	*Dam ID*	*Hazard*	*DSB Contact*	*Owner*	*Contact*	*Address*	*Phone No.*	*Total Project Cost*	*CWCB Grant*	*FEMA Grant*	*P.O. Number*	*Completion Date*
1	Baseline Reservoir (East)	1	060103	High	Greg Hammer	Base Line Land and Reservoir Co.	Brad Dallam	1290 S. Public Road, Lafayette CO 80026	303-665-5588	**$8,900**		***$7,000***	*120000000037*	**May-12**
2	Douglas Reservoir	1	030126	High	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$10,835**		***$7,200***	*130000000008*	**Sep-12**
3	Annex #8	1	030103	Significant	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$848**		**$560**	*130000000008*	**Sep-12**
4	Cobb Lake	1	030119	High	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$848**		**$560**	*130000000008*	**Sep-12**
5	Elder Reservoir	1	030131	High	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$848**		**$560**	*130000000008*	**Sep-12**
6	Windsor Reservoir	1	030335	High	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$848**		**$560**	*130000000008*	**Sep-12**
7	Windsor #8	1	030337	High	Jeremy Franz	Windsor Reservoir and Canal Company	Jeff Smith	P.O. Box 206, Eaton, CO 80615	970-454-3377	**$848**		**$560**	*130000000008*	**Sep-12**
8	Highland #1 Reservoir	1	050133	Significant	John Batka	Highland Ditch Company	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
9	Highland #2 Reservoir (North)	1	050323	Significant	John Batka	Highland Ditch Company	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
10	Highland #2 Reservoir (South)	1	050134	Significant	John Batka	Highland Ditch Company	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
11	Highland #3 Reservoir	1	050135	Significant	John Batka	Highland Ditch Company	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
12	Foothills Reservoir	1	050124	High	John Batka	Highland Ditch Company	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
13	McIntosh Reservoir	1	050220	Significant	John Batka	Lake McIntosh Reservoir Compnay	Jill Baty	4309 State Hwy 66, Longmont, Co 80504	970-535-4531	***$10,820***	***$5,400***			**Apr-12**
14	Hyatt Reservoir	1	070136	Significant	Greg Hammer	Farmers Highline Canal and Reservoir Co.	Curt Alstadt	725 Malley Drive, Northglenn, Co 80233	303-451-7604	***$10,000***	**$8,000**			**Apr-12**
15	Cucharas No.5 Reservoir	2	160108	High	Mark Perry	Huerfano-Curcharas Irrigation Company	Gary Barber	2000 S. Colorado Blvd., Annex Building Ste. 420	303-222-1000	**$18,168**		***$10,000***	*120000000044*	**Jun-12**
16	Fountain Valley #2	2	100128	High	John Hunyadi	Fountain Mutual Irrigation Company	Gary Steen	P.O. Box 75292, Colorado Springs, CO 80970	719-598-9913	**$10,800**		***$7,000***	*130000000004*	**Sep-12**
17	Overland Reservoir	4	400422	High	Jason Ward	Overland Ditch & Reservoir Company	Philip Ceriani	28444 Redlands Mesa Road, Hotchkiss, Co 81419	970-872-7373	**$15,000**		***$10,000***	*130000000003*	**Sep-12**
18	Consolidated Reservoir	5	380106	High	John Blair	Consolidated Reservoir II, Inc.	Scott Balcomb	P.O. Box 790	970-945-6546	**$9,600**		***$6,000***	*130000000013*	**Sep-12**
19	Ritschard Dam	5	500133	High	Dana Miller	Colorado River District	Ray Tenney	P.O. Box 1120, Glenwood Springs, CO 81602	970-945-8522	***$15,000***	**$8,000**			**May-12**
20	Lake Catamount	6	580214	High	Dana Miller	Catamount Metro District	Joel Anderson	34035 East US Hwy 40	970-871-6989	**$11,000**		***$6,000***	*120000000040*	**Aug-12**
21	Yamcolo Reservoir	6	580301	High	Dana Miller	Upper Yampa Water Conservancy District	Andy Rossi	P.O. Box 775529, Steamboat Springs, CO 80477	970-871-1035	**$11,000**		***$6,000***	*130000000005*	**Sep-12**
22	Narraguinnep Reservoir	7	320108	High	Matt Gavin	Montezuma Valley Irrigation Co.	Don Magnuson	P.O. Box 1056, Cortez, CO 81321	970-565-3332	**$13,075**		***$8,075***	*130000000010*	**Sep-12**
23	Groundhog Reservoir	7	710107	High	Matt Gavin	Montezuma Valley Irrigation Co.	Don Magnuson	P.O. Box 1056, Cortez, CO 81321	970-565-3332	**$13,075**		***$8,075***	*130000000010*	**Sep-12**
24	Johnson Reservoir	7	300128	High	Matt Gavin	Lake Durango Water Authority	Charles Smith	P.O. Box 657, Durango, CO 81302	970-799-2468	**$11,790**		***$7,000***	*130000000009*	**Sep-12**
										$227,403	**$48,400**	**$85,150**		
										$9,475				