Five Years of Accomplishments:

The CSB as an Agent of Change for Preventing Catastrophic Chemical Incidents (2010 - 2015)

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Foreword

The following document, "Five Years of Accomplishments: The CSB as an Agent of Change for Preventing Catastrophic Chemical Incidents (2010-2015) is presented to the President of the United States, Members of Congress, the public and numerous CSB stakeholders, including industry associations, chemical companies and unions.

But most of all I want it to be a record the CSB responses to major Chemical Fires and Explosions in the U.S. This record is dedicated to the hard-working, risk-taking, day to day industrial workers, men and women for whom I have devoted my entire career ever since I emigrated to the U.S. in the 1960's. I was educated in chemical engineering in my native country of Colombia and the United States followed by Occupational Health and Safety sciences in the U.S.

This also includes having served for 15 years as an Industrial Hygienist Engineer with the national offices of two international unions: the Oil Chemical and Atomic Workers (OCAW) and the United Automobile Workers (UAW), and a long career in academia in Massachusetts deeply involved in improving the work environment and worker health and safety.

So it was with great pride and honor that I was appointed chairperson of the US Chemical Safety Board by President Barak Obama in June 2010. When I took the oath of office, I made a personal vow to work as hard as I could in the ensuing five years to influence workplace safety in the chemical industry. This I would do by insisting on high quality accident investigations with meaningful safety recommendations for which we would step up efforts to get the recommendations adopted by companies, the industry, standard-setting organizations, and regulatory agencies such as EPA and OSHA. We have accomplished that goal.

It has been an extremely satisfying five years and I depart with a sense that the agency has achieved more in this time than in any previous period in the agency's history, albeit brief (1998). Any objective reader of this document and subsequent examination of CSB investigations, recommendations successes and safety videos will conclude that the agency is high-performing and accomplished all of its objectives and benchmarks for success in achieving the mission: saving lives of workers and the public by preventing accidents.

Creating change can create internal conflict because not everyone accepts the change. I inherited an agency beset with a backlog of investigation cases and a governance system in which there was no clear authority to make key day-to-day decisions. I had to make some hard decisions on agency's issues regarding the quality and direction of certain accident investigations and the personnel handling them. Choices had to be made to move ahead, examine crucial issues, and make changes. And all this is done in the context of being a grossly underfunded

independent federal agency. Our budget of a mere $10-11 million dollars a year, and a total staff of about 40, 20 of whom are investigators, means that investigations must be delayed when other investigations must be started –often at the request of Members of Congress who couldn't deliver in the CSB's requests to provide increased resources to allow us to handle the additional load. The universe of mayor chemical fires and explosions is more than 200 per year. Only the ones with the most serious national implications can be investigated by the CSB.

The pressure to increase the quality of reports and to create a management structure that could move as efficiently as possible was at times resisted, even by some board members. Over time, I was frankly surprised at the critical reaction and public nature of some of the criticism from Board members, some of it quite personal. On the other hand, the support, loyalty, scientific/practical knowledge and commitment to the mission of Mr. Manny Ehrlich (Board Member since 2014) were a source of strength to me in my last four months as a Chairperson. His presence has grown to be a real asset for the agency's future.

But my core values –working to protect chemical workers and residents of surrounding communities -- told me we were on the right track. As we tackled some of the biggest chemical accidents ever, bore down on the root causes and effected key safety recommendations time and again. Our superb investigation staff persevered through tough work assignments and, at times, strong resistance from companies to complete a legacy of CSB reports that will stand up to history as they bring about safety improvements throughout the industry.

I commend to you this report of my tenure's CSB accomplishments. I thank with all my heart the work and commitment of the excellent CSB staff during this time, and I wish my successors all the best in furthering the mission of this great and important agency.

Rafael Moure-Eraso
CSB Chairperson June 2010- March 2015

1.0 Introduction

The last five years in the CSB have been a period of intense reassessment and change within an outside the agency. The CSB has undertaken some of the most challenging and important cases in its history. These include a major investigation, requested and supported by bipartisan leadership in the U.S. House of Representatives, of the Deepwater Horizon blowout and explosion in the Gulf of Mexico. The CSB has issued two reports on this investigation. The CSB report included original findings that accurately determined the cause of the Deepwater Horizon's blowout preventer failure to seal the well and stop the 87-day release of oil into the Gulf of Mexico. This key finding was missed –or not investigated --by the much costlier and better resourced investigations by other government agencies and research groups.

Other major recent CSB investigations include West Fertilizer in West, Texas, where a plant explosion killed 15 and devastated a town; the CSB was the first to call for stronger storage practices for ammonium nitrate, the fertilizer that caused the blast, leading Senate Environmental and Public Works (EPW) Chairwoman Barbara Boxer to call the CSB "heroes" in 2013. The CSB also recently completed an investigation at the Tesoro refinery in Anacortes, Washington, where a fire and explosion claimed seven workers' lives, revealing industry-wide problems in the mechanical integrity of key refinery equipment. The CSB called on EPA to require companies to use inherently safer technologies for materials and processes. In addition, the CSB has published three reports on the 2012 Chevron refinery fire in Richmond, California, which endangered the lives of 19 refinery workers and sent more than 15,000 community residents to the hospital for exposure to smoke and fumes. Following the CSB investigation, California has begun a complete overhaul of its process safety regulations for refineries and chemical plants (California alone has 14 refineries) and has tripled the number of state process safety inspectors.

Finally, in January 2014, the CSB initiated a major investigation of the chemical tank release at Freedom Industries in Charleston, West Virginia, which contaminated the drinking water supply for up to 300,000 residents, sent hundreds to emergency rooms, and shuttered businesses and schools. The CSB has been leading the federal investigation to determine why the accident happened - including overseeing the forensic examination of all the storage tanks - and has testified twice before Congress on its current findings. The CSB investigation will be essential for assuring the safety of chemical storage facilities located around the country near drinking water supplies or other critical infrastructure.

Through the past five years, there have been major actions and recommendations to stakeholders that accomplished long term changes. CSB recommendations have made improvements to State and local regulations; federal standards overseen by OSHA, EPA, DOI and the Treasury Department; general preventive guidelines from trade associations; and on specific preventive guidelines to the chemical industry and chemical production sites.

There were four mechanisms to effect these changes:

1. Issuing scientific investigation reports with specific findings and recommendations for prevention;
2. Issuing and advocating for recommendations to CSB stakeholders and recipients of CSB reports;
3. Outreach efforts to the safety community through CSB's videos, press releases, op-ed publications and public meetings; and
4. Launching of the *CSB Most Wanted Safety Improvements Program* to highlight key safety issues.

Finally, substantial efforts were made to streamline the administrative, financial and governance structure of the CSB. A discussion of those improvements is presented in Part 6 of this report.

2.0 Investigation Reports (2010-2015)

2.1 CSB Investigations

The key mission of the CSB is to prevent major chemical incidents that cause loss of life, injuries and negative economic impacts in communities. To accomplish this mission, the CSB initiates investigations aimed at finding root causes of major incidents and developing recommendations for accident prevention. Upon arrival as CSB Chairperson in June 2010, there were 22 ongoing, incomplete investigations, some more than 7 years old. One of my first tasks was to prioritize the orderly completion of pending investigations. Prior to my arrival at the CSB, past Chairpersons had administratively closed twelve of the legacy investigations (without a Board vote). Ten remained active and were reassigned for completion after June 2010 (see Table 1 marked "legacy"). In the last five years, 22 investigation products have been completed. The ten unfinished legacy investigations that I inherited were re-assigned and completed in the last five years, plus 12 newly initiated investigations (see Table 1). Many of these 22 reports were released in public meetings and voted for approval unanimously by the CSB board from June 2010 to January 2015. It is remarkable, that ten of these reports have been completed in the last nine months—the highest productivity rate in the agency's history. It is also important to note that after 2010, five investigations were initiated as direct requests of the Congressional delegation where the incident occurred. One, Deepwater Horizon investigation was also initiated by Congressional request but prior to my arrival to the agency. Copies of all completed reports can be found in the agency's website: www.csb.gov.

Table 2 shows the investigations initiated during my tenure as Chairperson after June 2010 and their current state of completion.

Table 3 shows investigations that were administratively closed before 2010 and three investigations administratively closed by CSB Board vote on January 28, 2015. The CSB produced reports with findings and recommendations in all these three closed investigations (see Table 3). This in contrast with the 10 previously initiated investigations (before 2010) that had been administratively closed without producing a report or any other product and without a CSB Board vote.

It has been a management challenge to address the backlog of investigations inherited from past administrations (22 investigations). The CSB staff, without any benefit of additional funds or personnel (our budget has been increased only 1% in the last five years), was able to finish 10 backlogged investigations (see Table 1), deploy to eighteen new sites (see Table 2), and complete (as of January 2015) 12 new investigations for a total of twenty two (22) reports (Table 1). It is remarkable that in five years CSB has been able to deploy to eighteen new sites at the same time that twenty two investigations were completed and approved by a Board vote. Only seven investigations are on-going at different levels of completion as of March 2015 (Table 2).

An additional pressure in managing the investigation load is the number of requests the CSB receives to deploy to major incidents from Congressional delegations representing the communities where the incidents occurred. The CSB has received ten Congressional requests for deployment in 7 locations (See Tables 1 and 2). The staff has managed to complete five of the investigations requested by Congressional delegations in three locations (see Table 1) and is in the process of completing investigations requested by Congress at four additional sites (see Table 2). Although those incidents fully met the criteria for CSB deployment, it required that the agency redistribute resources and personnel from ongoing investigations to the new sites, halting, curtailing of scaling back current work on another similarly important investigations where the CSB was already engaged. We asked our Congressional contacts to consider assisting the agency to secure additional founding to expand the investigations staff in order to conduct parallel investigations at various sites at the same time. However, no additional resources were allocated to the agency.

Nevertheless, the record number and the caliber of the investigations completed is a remarkable CSB accomplishment.

Table 1 Investigation Reports **Approved** by CSB Board in Public Meetings (2010-2015)		
Investigation	**Location**	**Remarks**
1. Bayer CropScience	Institute, WV	Legacy
2. Kleen Energy	Middletown, CT	Legacy
3. Xcel Energy	Georgetown, CO	Legacy
4. DuPont (3 incidents)	Belle, WV	Legacy
5. Veolia Environmental Services	West Carrollton, OH	Legacy
6. Goodyear	Houston, TX	Legacy
7. Oil Tank Storage	TX, MS, OK	Legacy
8. Hoeganaes (3 incidents)	Gallatin, TN	January 2012
9. DuPont	Buffalo, NY	April 2012
10. Texas Tech University	Lubbock, TX	Legacy
11. Donaldson Enterprises, Inc.	Waipahu, HI	January 2013
12. Carbide Industries	Louisville, KY	February 2013
13. Chevron Interim Report	Richmond, CA	**Congressional Request** August 2012
14. Tesoro	Anacortes, WA	Legacy
15. Deepwater Horizon Reports I and II	Gulf of Mexico	**Congressional Request** Legacy
16. NDK Crystal	Belvidere, IL	Legacy
17. AL Solutions	New Cumberland, WV	July 2014
18. Educational Lab Safety	Reno, NV/Denver, CO	September 2014
19. Chevron Regulatory Report	Richmond, CA	**Congressional Request** August 2012
20. US Ink	East Rutherford, NJ	**Congressional Request** October 2012
21. Millard Refrigerated Services	Theodore, AL	August 2010
22. Chevron Final Report	Richmond, CA	**Congressional Request** August 2012

- Legacy: Deployment before 2010
  - 10 Legacy Completed Investigations
- Congressional Requests: 5 completed investigations in 3 locations
- 22 Total Reports Completed after June 2010 (12 New deployments – 10 Legacy)

Table 2 Status of Investigations Initiated After June 2010 (2010-2015)			
Investigation	**Location**	**Remarks**	**Status**
1. Hoeganaes (3)	Gallatin, TN	January 2012	Completed
2. DuPont	Buffalo, NY	April 2012	Completed
3. Horsehead	Monaca, PA	July 2010	Completed Consultant Report
4. Donaldson Enterprises, Inc.	Waipahu, HI	January 2013	Completed
5. Carbide Industries	Louisville, KY	February 2013	Completed
6. Chevron I	Richmond, CA	**Congressional Request** August 2012	Completed
7. Deepwater I/II*	Gulf of Mexico	**Congressional Request**- Legacy-June 2010	Completed
8. AL Solutions	New Cumberland, WV	July 2014	Completed
9. Lab Safety	Reno, NV Denver, CO	September 2014	Completed
10. Chevron II - Regulatory	Richmond, CA	**Congressional Request** August 2012	Completed
11. US Ink	East Rutherford, NJ	**Congressional Request** October 2012	Completed
12. Millard	Theodore, AL	August 2010	Completed
13. Chevron III	Richmond, CA	**Congressional Request** August 2012	Completed
14. Active Current Investigations			
15. Caribbean Petroleum*	Bayamon, PR	Legacy October 2009	Final Report under Board Review April 2015
16. Deepwater III/IV*	Gulf of Mexico	**Congressional Request** Legacy- June 2010	Review Process
17. West Fertilizer	West, TX	**Congressional Request** Interim Public Meeting	Final Report under Board Review April 2015
18. Freedom Industries	Charleston, WV	**Congressional Request** Interim Public Meeting	Review Process
19. Williams Olefins	Geismar, LA	**Congressional Request**	Drafting
20. Tesoro	Martinez, CA	February 2014	Drafting
21. DuPont	La Porte, TX	November 2014	Field Work
22. Exxon	Torrance, CA	**Congressional Request** March 2015	Field Work

* Initiated before Tenure as Chairperson

- 10 Deployed (7 locations) after Congressional request
- 19 Deployed after June 2010 (11 completed -- 8 ongoing)

NOTE: *At the request of Congressman Ted Lieu and Congresswoman Maxine Walters the CSB deployed an investigation team to (to Torrance, CA) to investigate the explosion at the Exxon Torrance Refinery.*

Table 3 lists the investigations administratively closed since 2003.

Table 3 lists the investigations administratively closed since 2003. There is a precedent of former Chairpersons Carolyn Merritt and John Bresland to administratively closing 13 investigations without a Board vote from 2003 to 2009. After June 2010 –during my tenure -- three investigations were administratively terminated. However, it seemed more appropriate to accomplish these closings by a formal Board vote during my tenure. On January 28, 2015 the Board voted to close three investigations (see Table 3).

Table 3
Investigations Administratively Closed

Investigation	Location	Remarks	Status
Ten ** Deployments before June 2010	Various Locations	Investigations Administratively Terminated by former Chairs: C. Merritt and J. Bresland (2003-2009) No Board vote taken	All cases CLOSED No staff assigned. No Report Generated
Horsehead	Monaca, PA	Deployment July 2010 Plant Closed. No similar Technology in U.S. Consultant engaged.	Consultant report produced and published on CSB website. Board Vote to Close January 2015
CITGO Refinery	Corpus Christi, TX	Legacy CSB issued Urgent Recommendations. Second incident after 6/2010	Recommendations Advocated by CSB, Closed-acceptable. Board Vote to Close January 2015
Silver Eagle	Wood Cross, UT	Legacy CSB engaged consultant on metallurgic analysis of piping	Consultant Report produced and published on CSB website. Board Vote to Close January 2015

**No recorded CSB Board vote for the administrative closing of 10 deployments from 2003 to 2009

- CSB voted to administrative close three investigations on January 28th, 2015. Only one investigation (Horsehead) was initiated after June 2010
- Legacy: Deployment before 2010

2.1.1 Major Stakeholders Actions Generated by CSB Investigations Recommendations (2010-2015)

The major actions prompted by specific CSB investigations and recommendations are summarized below by category of recipients and by level of importance. The categories are:

1. Impacts at the State and Municipal level
2. Impacts at the Federal Level
3. Impacts on Voluntary Guidelines in the Chemical Sector

2.1.1.1 Regulatory Actions with Long Term Impact - State Level

Major Safety changes at the state level were driven by recommendations of CSB investigations in six states: California, Washington, Massachusetts, Mississippi, Connecticut and West Virginia. The details with the corresponding six CSB investigations are summarized below

- State of California- Department of Industrial Relations (DIR) –Legislature
    - CSB Chevron, Richmond, CA Explosion Investigation (2013-14)
      Among the CSB accomplishments with the highest potential impact is the decision of the California DIR/Cal OSHA to modernize Process Safety Management Regulations based on the recommendations from the August 2012 refinery explosion. The CSB's third and final report was approved on January 28, 2015. CSB recommendations are leading to significant reforms of California's regulatory process, which state leaders and safety officials determined were necessary after finding that old refineries have not been properly maintained, have run some equipment to the point of failure, and in some cases have not implemented recommended improvements from their own engineers. Workers have been exposed to dangerous conditions, lives have been lost, and communities have been threatened with toxic releases. Thus, following the CSB's Chevron investigation findings, the State of California has tripled the number of its refinery inspectors. The State is also in the process of modernizing process safety rules for its 14 refineries. The new regulations would require employers to prevent and eliminate to the greatest extent feasible health and safety risks to employees based on the CSB recommendations.

- Washington State-Division of Occupational Safety and Health (DOSH)-Legislature
    - CSB Tesoro, Anacortes, WA Investigation (2014)
      The analysis and recommendations of the CSB Tesoro Report to the Washington State governor and legislature is having a substantial impact.

Washington State's Division of Occupational Safety and Health (DOSH) has requested the legislature to fund six new technically qualified inspectors with five additional inspectors to be sought in future years. DOSH has also launched a workgroup to consider improvements and modernization of the Process Safety Management regulations in the state. All of these steps are based on the CSB investigation and report recommendations.

- Commonwealth of Massachusetts--Legislature
  - CSB CAI Inc. Danvers Investigation (2010)
    Massachusetts developed new stringent hazardous materials rules for plants, following the CSB investigation of a plant explosion that devastated a community in Danvers, MA
- State of Mississippi—Legislature
  - CSB Oil Tanks Investigation (2010)
    Mississippi enacted new rules increasing safety at thousands of oil sites, following an innovative CSB investigation conducted collaboratively with Mississippi students about the problem of teenagers being accidentally killed while "hanging out" near remote oil tanks containing explosive vapors
- State of Connecticut -- Governor and Legislature of the State of CT
  - CSB Kleen Energy, Middletown, CT Investigation (2010)

    Connecticut State legislature enacted legislation applicable to power plants in the state of Connecticut that prohibits the use of flammable gas that is released to the atmosphere to clean fuel gas piping
- State of West Virginia— Department of Public Health -- Legislature
  - CSB Bayer Crop Science, Charleston, WV Investigation (2008-11)

    Establish a *Hazardous Chemical Release Prevention Program* (HCRPP) (Contra Costa Model) that provides independent oversight to local chemical facilities. The HCRPP would provide continuous monitoring and safety oversight by local communities. It would be a practical complements to OSHA-PSM and EPA-RMP regulations and would oversee the enforcement of preventive strategies under OSHA PSM and EPA RMP.WV Department of Health embraced Contra Costa Model State legislature is considering action. Community organizations could be engaged successfully to promote HCRPP (Environmental organizations-Workers and workers organizations)

2.1.1.2 Regulatory Actions with Long Term Impact - Federal Level

Major safety changes at the federal level were driven by recommendations of CSB investigations. The five federal regulations directly affected by the CSB recommendations from 2010 to 2015 are listed below.

1. Presidential Executive Order 13650--Inherently Safer Processes
2. Presidential Executive Order 13673--Department of the Treasury/Department of Defense (DOT/DOD) –Contractor selection process with Safety as Criteria-- DOT/ DOD "Pre-Operational Safety Survey"

3. Department of Interior (DOI), Bureau of Safety and Environmental Enforcement (BSSE) BOP regulations for Offshore Drilling
4. OSHA--CSB Advocacy for a Comprehensive Combustible Dust Standard
5. OSHA--Changes in Laboratory Safety Standard

The details with the corresponding CSB investigations are listed below.

- Presidential Executive Order 13650—Inherently Safer Technologies --EPA and OSHA
    - CSB Tesoro Anacortes, WA (2010-2014)
      Based on CSB recommendations in these two investigations, the EPA and OSHA addressed Inherently Safer Technologies in the Executive Order 13650 Report for the President entitled *Actions to Improve Chemical Facility Safety and Security - A Shared Commitment.* EPA has expressed its belief that consideration of inherent safety plays an important role in chemical process safety. EPA and OSHA developed a plan to encourage chemical facilities to integrate safer technology and alternatives into a facility's process safety programs. The plan consists of three steps, including: 1) issuing a joint alert illustrating the concepts, principles, and examples of safer technology and alternatives; 2) developing voluntary guidance on how to reduce risks by employing safer technology, processes, and alternatives; and 3) considering regulatory options. On July 31, 2014, the EPA issued a Request for Information (RFI) on potential changes to the Accidental Release Prevention Requirements: Risk Management Programs under the Clean Air Act, Section 112(r) (7) (see 79 FR 44604, July 31, 2014). In the RFI, the EPA solicits feedback on a number of potential modifications to the Risk Management Program (RMP) regulations, including, among others, safer technologies and alternatives. In determining whether to make regulatory changes, the EPA would evaluate feedback from the alert, guidance, and RFI. The CSB submitted extensive commentaries to this RFI.

      EPA has also reiterated that actions on IST are already being taken under CAA 112(r) enforcement actions. There are specific examples of such actions. Listed below are several examples of facilities implementing inherently safer technology or practices as a part of their enforcement settlements.

- Presidential Executive Order 13673. U.S. Department of Treasure—"Fair Pay and Safe Workplaces" Contractor Safety
    - Donaldson Enterprises Inc., Hawaii Investigation (2012)
      Following CSB recommendations on the safety of contractors, the White House released Executive Order 13673 where the U.S. Department of the

Treasure instructs that solicitations for contracts dealing with the storage, handling, and disposal of explosive hazardous materials, including fireworks, incorporate rigorous safety-related contractor selection provisions such as those provided in the DoD's *Contractor's Safety Manual for Ammunition and Explosives*, Section C1.5, "Pre-Award Safety Survey". Contracts dealing with explosive or hazardous materials, including fireworks, should include a provision requiring that any subcontract (regardless of tier) for the storage, handling, and disposal of explosives (including fireworks) be selected based on rigorous safety-related contractor selection provisions such as those provided in the DOD's *Contractor Safety Manual for Ammunition and Explosives*, Section C1.5, "Pre-Award Safety Survey." Established a formal policy requiring that contracts and subcontracts dealing with the storage, handling, and disposal of explosive hazardous materials, including fireworks, incorporate rigorous safety-related contractor oversight provisions such as those provided in the DoD's *Contractor's Safety Manual for Ammunition and Explosives*, Section C1.6, "Pre-Operational Safety Survey" and C1.7, "Post-Award Contractor Responsibilities" to provide effective oversight of subcontractors handling and disposing of explosives and hazardous materials.

- EPA --Advocacy for Inherently Safer Technologies (IST) and As Low As Reasonable Permitted (ALARP)
    - CSB Tesoro, Anacortes, WA Investigation (2010-14)
      EPA is revising the Chemical Accident Prevention Provisions under 40 CFR Part 68 to require the documented use of inherently safer systems analysis and the hierarchy of controls to the greatest extent feasible when facilities are establishing safeguards for identified process hazards. The goal shall be to reduce the risk of major accidents to the greatest extent practicable, to be interpreted as equivalent to as low as reasonably practicable (ALARP).

- Department of Interior (DOI), Bureau of Safety and Environmental Enforcement (BSSE)
    - CSB Macondo Deepwater, Gulf of Mexico –Investigation—Volumes I and II
      In 2010, the CSB launched an investigation to examine the technical, organizational, and regulatory factors that contributed to the accident. During the investigation, the CSB made new findings about why a key piece of safety equipment – the Deepwater Horizon's blowout preventer – designed to stop "well fluids" in emergencies. In this case, it failed to seal the well during this "blowout." These new findings help explain why the accident was so devastating. And the CSB cautioned that blowout preventers currently in use could fail in similar ways. BSSE is considering incorporating

the CSB findings and recommendations on the BOP in future DOI regulations.

- OSHA—Advocacy for a Comprehensive Combustible Dust Standard(2011-12)
    - CSB Hoaganaes, Gallatin, TN, AL Solutions, New Cumberland, WV and US Ink, East Rutherford, NJ Investigations
      After a CSB recommendation in 2006, OSHA began rulemaking, in 2009, on a comprehensive standard to prevent combustible dust explosions in industry, which the CSB found had led to nearly 300 plant fires and explosions over a 25 year period. OSHA is actively considering standard after three national hearings on Combustible Dust and OSHA Area directors communications explaining the risk with worksites exposed. OSHA has also modernized its hazard communication standard to require companies to disclose combustible dust hazards through worker right-to-know programs. OSHA regulation for Combustible Dust became the CSB first Most Wanted Safety Improvement in the agency's program to advocate for safety improvements of national importance.
- OSHA—Changes in Laboratory Safety Standard (2011-12)
    - CSB Texas Tech University, Lubbock, TX -- Case Study

      Based in the recommendation of the CSB investigation, OSHA revised Appendix A of the Occupational Exposure to Hazardous Chemicals in Laboratories Standard to place more emphasis on the need to evaluate physical hazards present in laboratories.

2.1.1.3 Actions with Impact on Voluntary Guidelines from Private Chemical Sector Associations

Major safety changes in voluntary guidelines of national voluntary professional organizations that were driven by recommendations from CSB investigations. The organizations directly affected by the CSB recommendations from 2010 to 2015 are listed below.

1. National Research Council of the National Academies of Science (NRC/NAS)
2. National Fire Protection Association (NFPA)
3. International Code Council (ICC)
4. American Chemical Society (ACS)
5. American Institute of Chemical Engineers (AIChE)

The list of actions by recipient with is correspondent CSB investigations follows:

- National Research Council (NRC) of the National Academies of Science: Board on Chemical Safety Technologies (IST) --Committee on Inherently Safer Process. The Use of MIC at Bayer CropScience (2012)
    - CSB Bayer Crop Science, Institute, WV Investigation (2011)

After a CSB recommendation from the Bayer investigation and at the request of Congress, the CSB commissioned the National Research Council of the National Academies of Science to study the feasibility of reducing or eliminating the inventory of MIC stored at the Bayer plant. The NRC study explored how the concept of "Inherently Safer Design" could be applied at the Bayer plant. In their report, the NRC considered IST a tool that can allow companies, employees, engineers and corporate officials to take a fresh look at primary prevention activities. A report from NRC/NAS – Committee on Inherently Safer Processes based on the CSB Bayer Investigation recommendation entitled: "The Use of MIC at Bayer CropScience" was published in 2012.

- National Fire Protection Association (NFPA)
    - CSB Kleen Energy Investigation: The national fuel gas codes have been changed, and new codes have been developed, to prohibit unsafe natural gas handling practices (such as using natural gas under pressure for pipe cleaning operations) which had previously led to many accidents and fatalities, including Connecticut and North Carolina blasts investigated by the CSB. NFPA 56 was created after the CSB recommendations to developed and issue guidelines for safe cleaning of chemical piping.
    - CSB Con Agra Investigation: Revisions of NFPA 54 on safe gas purging
- International Code Council (ICC)
    - CSB Kleen Energy and Con Agra Investigations: Revision of ICC codes related to prohibition to use natural gas under pressure as a pipe cleaning agent and prohibits discharge of natural gas indoors during equipment purging
- American Chemical Society (ACS)
    - CSB Laboratory Safety Bulletin: The ACS develops an Laboratory Hazard Analysis Guidance for its thousands of affiliates responding to a CSB recommendation
- American Institute of Chemical Engineers (AIChE)
    - CSB Investigations and Investigation Videos: Recommended the American Board of Engineering Technology (ABET) --entity that defines university's College of Engineering curricula --- to incorporate CSB investigation videos and reports in engineering curricula across the nation as a requirement for program approval.

3.0 CSB Preventive Recommendations Outcomes (2010-2015)

CSB investigations have included over 700 new chemical safety recommendations to EPA, OSHA, state regulators, industry organizations, unions, and companies – our recommendations have been recognized to have a broad impact on safety. The CSB tracks recommendations to completion and has so far successfully closed 76% of its safety recommendations (533) based on acceptable actions by recipients. These actions make American businesses, workplaces, and communities safer.

The high rate of closing recommendations is remarkable, considering that the agency is by definition—non-regulatory – and cannot legally compel recipients to accept and comply with the CSB recommendations. CSB persuade recipients to accept its recommendations by two mechanisms. First, by calling for an open public response to the CSB requests –including why there might be a choice of not compliance. And Second, by the scientific and evidence based nature of the findings that are the basis of each recommendation. Figure 1 is a summary of the accumulated number of recommendation by year from the beginning of the agency.

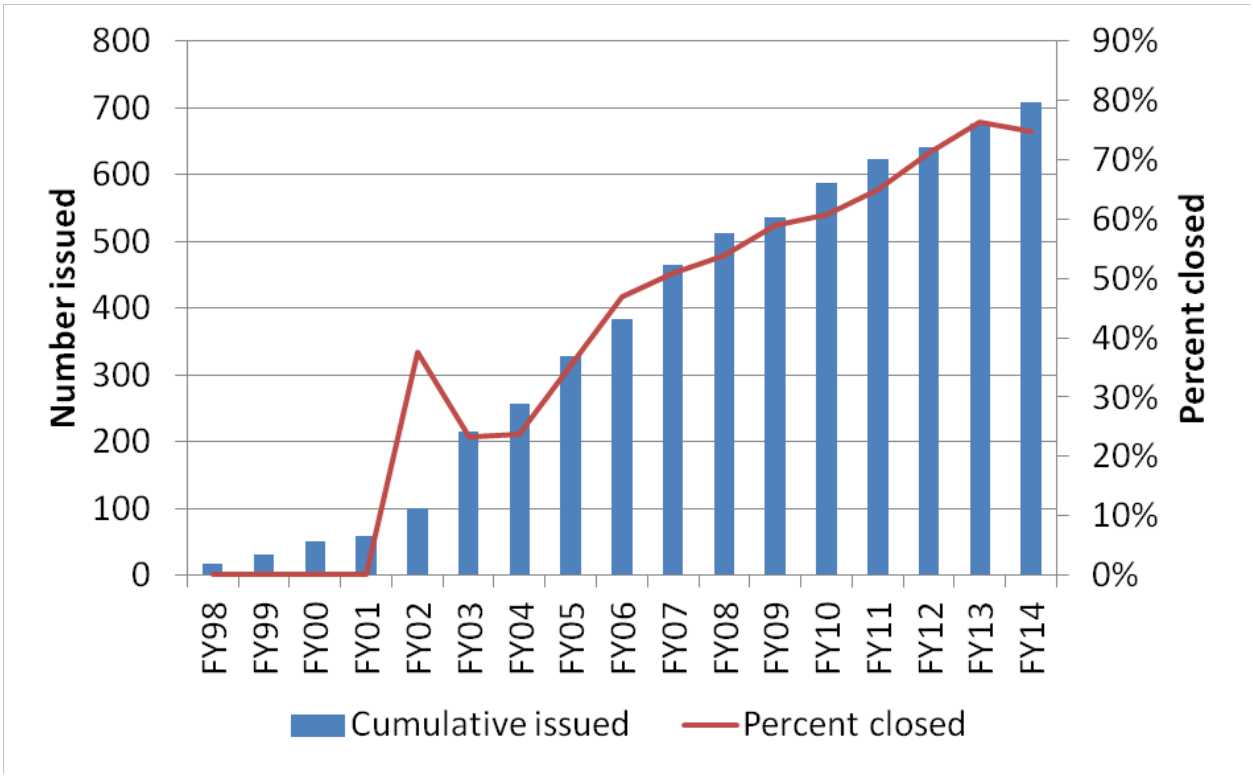
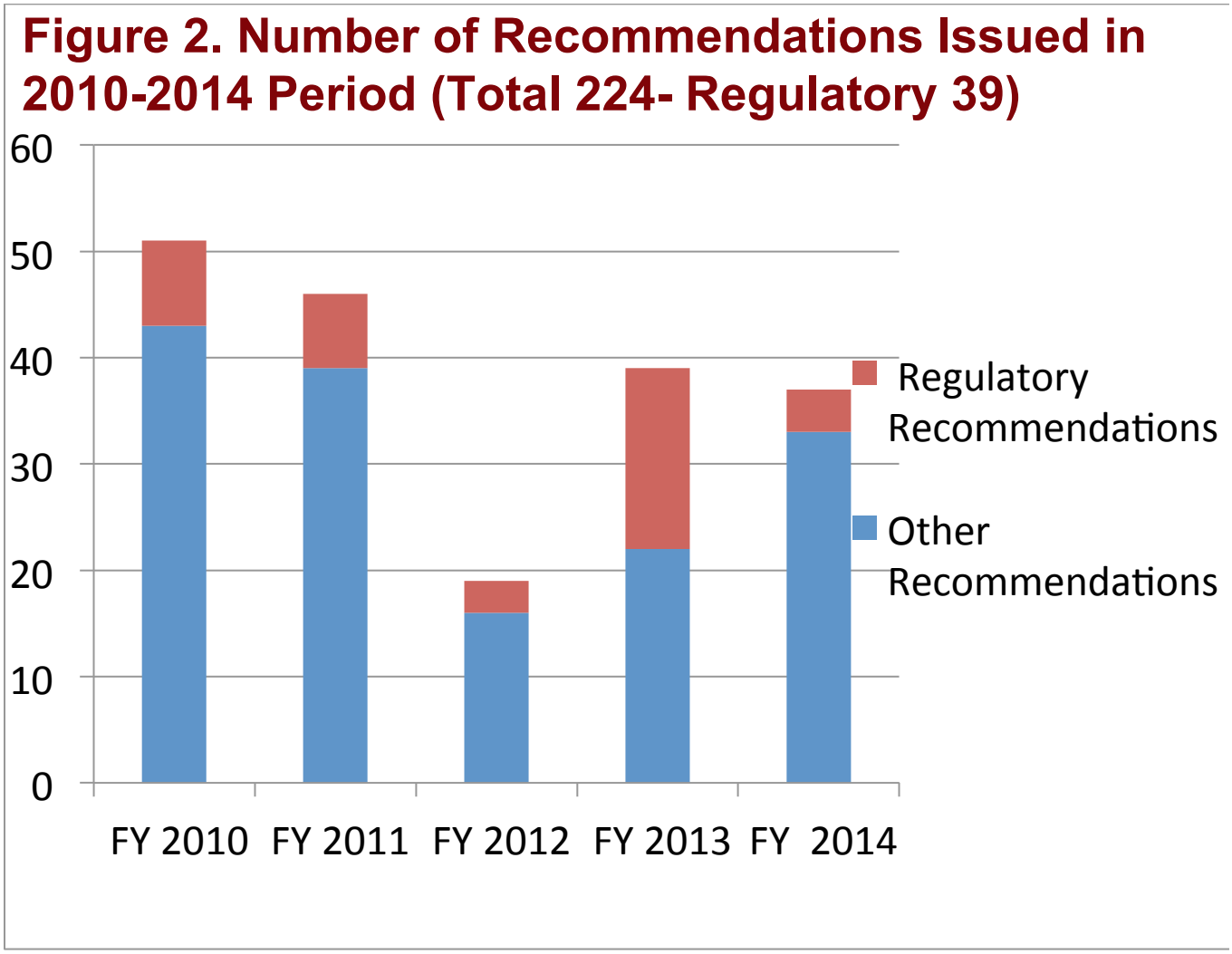


Figure 1 Cummulative Recommendations Issued by Year with Percentage Closed (1998-2015)

Figure 2 shows the total recommendations issued in the last five years. Only 17% are focusing in regulatory changes at the federal, state and local levels. The majority are aimed to improve voluntary standards, chemical sector guides, research and specific "fixes" at incident sites.



CSB recommendations are not dominated by a single purpose (e.g. regulatory, voluntary standard, corporate) or recipient type. A distribution of the recommendation by purpose appears in Figure 3.

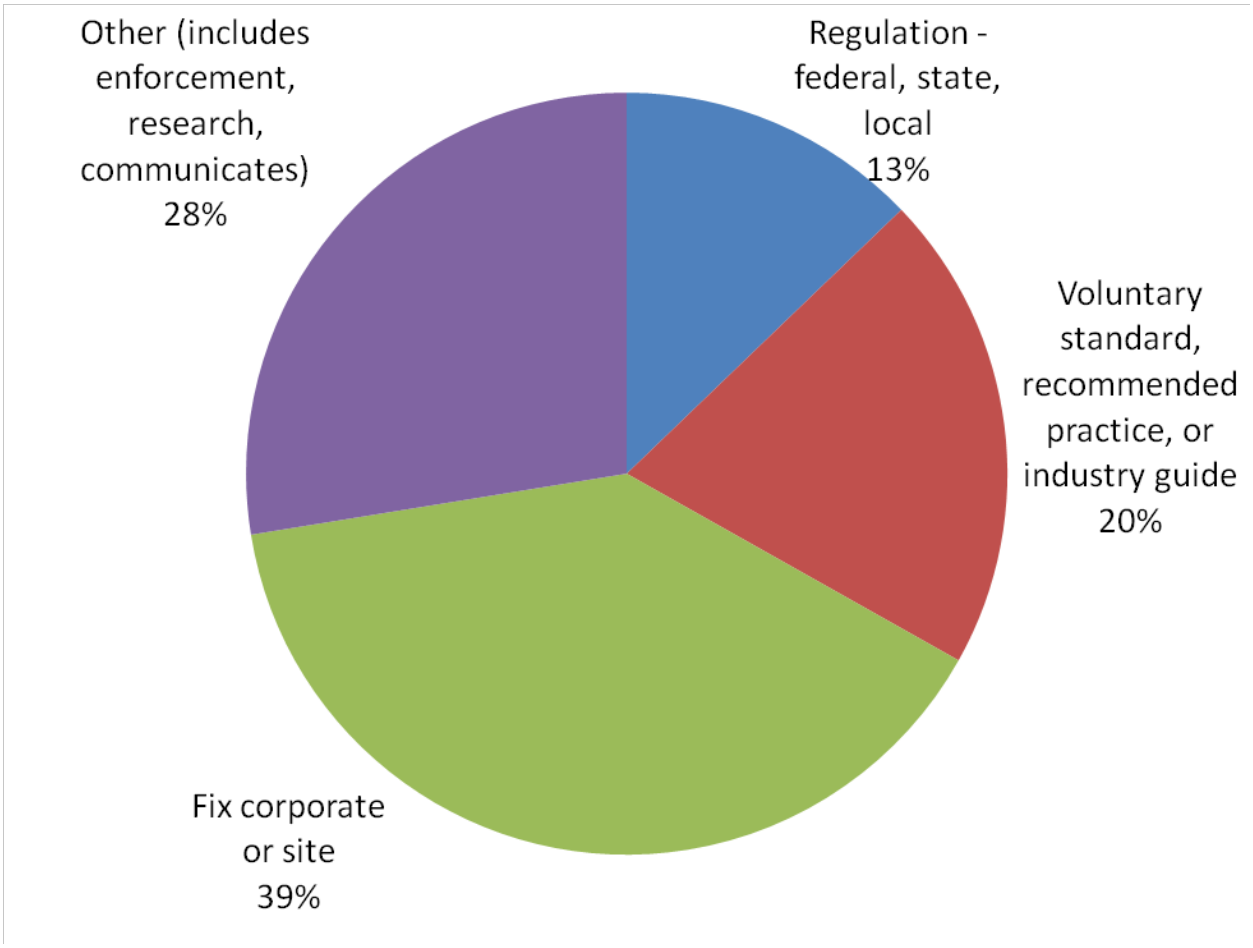


Figure 3 Recommendations by Recipient (1998-2015)

From 2010 to 2015, both the pace of generating recommendations (Figure 1) and the rate of closed-acceptable recommendations have increased. Recommendation numbers alone do not measure the impact of the CSB effect on prevention. Some recommendations – to government regulatory bodies and to professional and trade voluntary organizations -- have more of a long term national impact than the ones received from other recipients. Others are more focused to a particular problem and do not have a national impact.

Recommendations are the CSB's primary tool for achieving positive change. CSB's success depends on several factors, including:

- Evidence-based, effective, and actionable recommendations;
- Recipients implementing recommendations; and
- An entire agency enabling investigations and recommendations to be produced and implemented

4.0 CSB Outreach Actions (2010-2015)

The CSB has been in regular communication with its stakeholders by a comprehensive website and by the use of social media (Facebook, Twitter). In addition to hard copy publications of findings and recommendations of CSB investigations, the agency published all its material in the CSB website (www.csb.gov). The agency conducts public meetings to address safety issues generated by our investigations and to hold public votes on the board evaluation of the CSB investigations. In the last five years the CSB has produced and distributed 26 video products.

The CSB has a good relationship with the safety trade press and the general press. Both cover consistently the release of CSB products (reports and videos). The agency often broadcasts safety messages at anniversaries of major accidents or in response to national safety initiatives relevant to the agency's work. In the last five years the CSB has written Op-Eds about safety topics in ten major national newspapers. A summary of all these outreach activities is presented below.

4.1. CSB Website

The CSB maintains a website at www.csb.gov. In January 2014, the website was completely reorganized and the software was modernized. There are more than 7,000 page views daily in the CSB website. In October 2011 the agency experimented with a webinar on the CSB Texas Tech case study that attracted 800 viewers.

The average public use of the CSB webpage is 2,310 sessions per day, visiting 7,169 web pages per day. The number of different countries represented is over 190.

4.2 CSB Public Meetings

In the last five years the CSB has held 29 public meetings and one webinar. The summary by year appears on Table 4 below.

The 19 public meetings where board votes were taken to approve or disapprove reports were held after suggestions from the US Congress (Congressman G. Miller, CA, 2009) that instead of votes on report approvals being done in "notation items" (via e-mail) deliberations for votes should be made in public --in accordance with the Sunshine Act—Board Members should then justify their votes in public on approving or disapproving reports –with justifications --- rather than a Notation Item via e-mail (an internal vote) done in private by each voting member.

Public meetings –where the Board votes --are Sunshine Law meetings and must be formally announced in the Federal Register with at least two weeks anticipation. Formal invitations to stakeholders must be sent and an agenda should be printed in the Federal Register Notice.

Table 4. Public Meetings Held in 2010-2015				
Year	**Total Number of Public Meetings**	**Public Board Vote on Investigations**	**Scientific-Listening Public Meeting (Non-voting)**	**Other Public Meetings (Voting)**
2010	2	2	-	-
2011	4	3	1 Offshore Safety Case	-
2012	3	2	1 Combustible Dust	-
2013	8	4	1 Offshore Indicators 1 Sulfidation Corrosion	1 Launch CSB Most Wanted 1 OSHA Compliance with CSB Recs
2014	9	5	1 Tesoro Public Comment 1 West Fertilizer, Interim 1 Freedom Ind., Interim	1 Webinar Case Study Presentation
2015 (Up to March 2015)	3	3	-	-
TOTALS	**29**	**19**	**7**	**3**

Seven other public meetings were organized to inform the communities where accidents occurred about scientific issues and the progress of CSB investigations, as well as an opportunity to listen to the community concerns related to the chemical accidents and to learn about the community expectations of the CSB investigation. Three additional public "business" meetings (CSB Most Wanted Program Launching, OSHA Response to CSB Recommendations and a Webinar on Laboratory Safety) added to the total of 29 in the 2010-15 periods. The average of about 6 public meetings per year is withot precedent in the history of the CSB.

It is important to realize that the preparation of these public meetings (including business meetings) requires a tremendous investment of resources from the staff on preparation and on delaying of on-going investigations by staff teams currently engaged in active cases. Consideration has to be made of the substantial monetary costs to the agency to run public meetings (staff and board travels, renting of rooms preparation of materials, etc) and the costs of

delaying report production. The preference has been to reserve public meetings for the presentation of finished investigations by Board public votes.

Press releases have been issued in association with the approval by a Board vote of the CSB investigations. In addition, the CSB routinely announces all its public meetings by press release.

4.3 Production of Video Materials

Since 2010, the CSB has produced 29 video products that have been made available to the stakeholder's community via the CSB website and YouTube. Since January 2014, the videos have generated more than 400,000 cumulative views on YouTube. A summary of safety video production in the last five years is found in Table 5 below.

Ten of the videos produced (identified by *) have received awards from media organizations as noted in Table 5.

Table 5. CSB Video Production

(June 2010 to April 2015)

FV=Full Length Video SM=Safety Message AN=Animation AV=Aftermath Video

Date	Title		CSB Investigation	Remarks
08/2010	1. No Escape: Dangers of Confined Spaces	FV	Xcel Georgetown, CO	Methyl Ethyl Ketone
10/2010	2. Ban Natural Glass Blows	SM	Kleen Energy Middletown, CT	Methane-animation
02/2011	3. Deadly Practices: 4. Con Agra	FV	ConAgra Garner, NC	Ammonia*
03/2011	5. Fire in the Valley	FV	Bayer CropScience Institute, WV	Methyl Isocyanate*
06/2011	6. Iron Dust Testing	AV	Hoeganaes, Galatin, TN	Flash Fire/ Explosion
07/2011	7. Fatal Exposure: Tragedy at DuPont	FV	DuPont Belle, WV	Phosgene, Oleum, VC
09/2011	8. Experimenting with Danger	FV	Texas Tech University Lubbock, TX	Academic Lab*
10/2011	9. Oil Site Safety	FV	MS, TX, OK Oil Sites	Community Sites
01/2012	10. Hot Work: Hidden Hazards		DuPont Yerkes and 3 other investigations	CSB Study*
01/2012	11. Iron in the Fire	FV	Hoeganaes Gallatin, TN	Iron Dust* (3 incidents)
07/2012	12. Inherent Safety: Future of Risk Reduction	SM	Bayer, Institute, WV	CSB/NAS Study
01/2013	13. Deadly Contract	FV	DEI Inc., Waipahu, Hawaii	Fireworks *
04/2013	14. Hot Work	SM	DuPont, Yerkes, NY	Welding
04/2013	15. Chevron Refinery	FV	Richmond, CA	Crude Oil *
05/2013	16. Damage at West	AV	West, TX	Ammonium Nitrate
08/2013	17. Trevor Kletz	SM	Process Safety Management	In Memoriam
11/2013	18. Falling Through the Cracks	FV	NDK, Belvidere, IL	Silica
12/2013	19. After The Rainbow	SM	HS Academic Labs	Methanol *
01/2014	20. Tesoro Explosion and Fire	FV	Tesoro Refinery, Anacortes, WA	Naphtha
03/2014	21. The Human Cost of Gasoline	SM	Victim Interview Tesoro, WA	Naphtha
06/2014	22. Deepwater/Horizon	FV	BP-TO, Offshore Oil platform	Crude Oil *
07/2014	23. Combustible Dust: Solutions Delayed	FV	AL Solutions, Hoeganaes, Imperial Sugar	Combustible Dust

07/2014	24. Freedom Industries	AN	Charleston, WV	MCHM
10/2014	25. CSB Recommendations Program	SM	CSB Recommendations Department	CSB Mission
10/2014	26. Behind the Curve	FV	Tesoro, Anacortes, WA	Naphtha *
12/2014	27. Reflections on Bhopal	SM	Union Carbide, Bhopal, India	MIC
03/2015	28. Shock to The System	FV	Theodore, AL	Hydraulic Shock-Ammonia
03/2015	29. 10 Years After BP Texas City	SM	Texas City, TX	BP Refinery Explosion
** 10 Video Products received Media Awards in the category of Government and Education Categories from CINE and TIVA/DC				

4.4 Publication of CSB Safety Policy Issues in the Printed Press

In the last five years, the CSB Communications Department has approached major newspapers in locations where investigations have been completed to advocate for the recommendations related to national safety issues. A summary of the published Op-Eds on eleven different themes appear on Table 6.

Table 6. CSB's Opinion Editorials in Major U.S. Newspapers			
Date	Title	Newspaper	Subject
3/20/2015	Hazardous Work Takes Toll on Latinos	Houston Chronicle	Occupational Fatalities of Latinos
11/01/2014	New California Law on Refinery Maintenance Operations Can Prevent Accidents, Save Lives	The Contra Costa Times	PSM Reform in California
10/24/2014	President's Executive Order on Contract Worker Safety Will Save Lives	The Federal Times	Executive Order on Contract Worker Safety
10/23/2014	Effective Regulation of Chemical Industry Still Elusive since 1989 Accident	The Houston Chronicle	25 Year Anniversary of Phillips 66/PSM Reform
10/9/2014	California is Leading the Way on Oil Refinery Safety	The Sacramento Bee	PSM Reform in California
8/22/2014	The Danger of Combustible Dust	The New York Times	OSHA's Actions on Combustible Dust
2/18/2014	The Human Costs Paid at the Anacortes Tesoro Refinery	The Seattle Times	CSB Tesoro Investigation
1/28/2014	The Next Accident Awaits	The New York Times	West, Chevron
6/23/2012	It's Time for Government and Industry to Adopt Inherently Safer Technology	The Charleston Gazette	Bayer, IST
7/19/2012	Better Safety Data Could Help Prevent Oil Industry Disasters	The Houston Chronicle	Macondo, Safety Indicators
2/19/2012	Nine Years After Corbin Explosion, Still No Dust Regulations	Lexington Herald-Leader	Combustible Dust

5.0 The CSB Most Wanted Safety Improvement Program

5.1 Program Initiation

In June 2012, the Board voted unanimously to approve Board Order 46 that established a "Most Wanted Safety Improvement Program." (MWSIP) The program was intended to identify the CSB's most important chemical safety improvement goals strictly based on CSB investigation recommendations. The objective is to make efficient use of limited resources to achieve important national safety improvements. The Most Wanted program will focus special advocacy efforts by Board and staff and inform CSB deployment decisions and allocation of resources.

On December 2014, the CSB added a new page on the agency website to feature the Most Wanted program. The two approved issues are discussed below.

5.2 Board Roles in MWISP

The CSB board members have specific roles and responsibilities in this program. The Board will periodically vote to select the "Most Wanted List" and monitor the operation of the program. It will also consider additions or other changes to the List during the year as necessary. Board members and senior staff will take the lead in advocating specific "Most Wanted" issues through speeches, editorials, scientific and lay articles, interviews, contacts with potentially influential stakeholders, press conferences, videos, etc. Board members are expected to work with Recommendations and Communications staff to develop advocacy plans and identify advocacy opportunities and to select items for the MWSIP list annually with periodic additions/changes as needed.

5.3 Safety Issues in the Most Wanted List

In July 2013, the CSB Board voted unanimously to add an OSHA Combustible Dust Standard for General Industry as the first item on the list of Most Wanted Safety Improvements. Advocacy from Board Members has consisted of public presentations in technical forums on the need for a comprehensive combustible dust federal regulation. On November 2014, the CSB Board voted unanimously to list a second issue on the Most Wanted List: Modernize U.S. Process Safety Management Regulations. A series of activities in the States of California and Washington have been launched to promote PSM modernization.

5.4 Extended Goals of Most Wanted Safety Improvements Program

On March 2015, the CSB conducted a meeting to discuss the goals for upcoming one to three years and methodologies to engage board members to select items on the list to champion.

Another issue for the discussion is for the Board to consider adding some non-regulatory issues to the list.

6.0 Major Actions in 2010-2015 with Long Term Impact on the CSB Structure, Administration and Governance

6.1 Strategic Plan

In the fall of 2011, the agency published the CSB's Strategic plan for 2011-2016. The Strategic Plan is a visionary document that provides a pathway for the work of the agency for the next four years.

The plan includes an updated mission and vision statement. In addition, the plan contains 13 strategic objectives that succinctly show the purpose of the agency across all organizational functions. These outcome-oriented objectives clearly reflect how specific Agency activities help drive the success of the CSB strategic goals.

In addition, this plan includes tables of outcome-based performance measures for each strategic goal. The plan states that the CSB believes that evaluating agency practices by selecting and monitoring performance measures is the best way to show accountability to the American people. Despite challenges faced by the CSB in the areas of budget and an aging workforce, agency leaders will use this document to make critical decisions to maximize efficiency to achieve agency goals.

A copy of the Strategic Plan 2011-2016 can be found in the agency's website (www.csb.gov).

6.2 Upheld CSB Jurisdiction Claims

One of the essential issues for the functioning of the CSB is to have a clear definition of its statutory authorities, including jurisdiction or authority to investigate. This authority was reaffirmed by the U.S. Fifth Circuit Court of Appeals in March 2015 that upheld the jurisdiction of the U.S. Chemical Safety Board (CSB) to investigate the Deepwater Horizon/Macondo well blowout and explosion, turning down an appeal that the full court hear the case brought by Transocean, the owner of the drilling rig. This is a clear victory for the CSB.

The tireless work of the CSB Office of General Counsel and the CSB's Deepwater Horizon investigation team achieved final success in a four year legal battle to affirm the CSB jurisdiction on the investigation of the CSB Macondo/Deepwater fire and explosion investigation. The accident occurred in the Gulf of Mexico in April 2010. Eleven workers were killed when escaping hydrocarbons ignited and exploded. The blowout led to the nation's worst offshore oil spill.

This latest federal appeals court decision clearly affirms the CSB's statutory authority to investigate fires, explosions, and releases from fixed offshore facilities, including drilling units like the Deepwater Horizon. Although the Deepwater investigation has severely taxed the CSB's limited resources, the agency's independent investigation has had unique benefits, since it was the first to provide a complete explanation for why the Deepwater Horizon's blowout preventer failed and why the large oil spill occurred.

6.3 Management Changes and Governance Clarifications

Since 2010, I have worked very hard to improve the operations and management of the CSB. I reorganized lines of management to create clear lines of authority as well as accountability that were substantially weaker before 2010. Management improvements have been:

1. Establish the position of Managing Director along the lines of the NTSB. This position clarified the staff lines of authority and accountability in the agency that were undefined before 2010.
2. Reorganize the CSB Office of General Council (OGC) on lines compatible with the personnel practices described in 5 USC regarding Chairperson authorities and responsibilities.
3. Reorganize the CSB Office of Administration by creating the position of CSB Contracting Officers. The use of an outside agency to complete the contract process before 2010 has caused lapsing of substantial funds at the end of past fiscal years. The reorganization increased the efficiency of the contracting process substantially reducing the lapses. Another result from this reorganization is the streamlining of budget execution. Faster contracting time accelerated the speed of investigations by having results in a shorter time.
4. Restore and enhance three independent investigation teams prepared to deploy within 24 hours of a major accident.
5. Modernize and streamline the administrative Board Orders to make them compatible with federal administrative policies from the Office of Personnel Management (OPM) and MSPB. Legal inconsistencies of old board orders were in conflict with Federal Statutes, regulations and Executive Orders pertaining to the Chairperson's authority as the administrative head of an independent federal agency.

These management changes have enhanced the already high-quality of CSB reports and broadened the scope of the root cause investigations.

6.4 Worker Participation in CSB Investigations

The CSB considers it an essential feature of its investigations to attain full participation of all relevant stakeholders. One key stakeholder is the worker and its representative agency. In 2012 the CSB developed a policy for Worker participation in all the aspects of the CSB investigation process.

The key points of the policy are listed below.

(1) If the CSB initiates an investigation at a union-represented site, the CSB will promptly identify and notify facility unions of its plans to investigate. At non-union sites, the CSB will seek to identify other employee representatives, such as employee members of any established Health and Safety Committee, or other employee representatives, if possible.

(2) The CSB will seek participation by contract employees and their representatives, similar to facility employee.

(3) The CSB will establish direct, face-to-face communications with employee representatives from the outset of its investigations.

(4) The CSB will take measures to avoid interference by any party with the proper exercise of employee participation.

(5) CSB investigators will allow and encourage employee representatives to accompany the CSB team during site inspections and tours. Such participation is often critical for understanding complex processes and learning of important safety concerns and hazards.

(6) Where necessary to obtain information, CSB investigators will conduct separate meetings with employee representatives.

(7) During CSB interviews, any non-supervisory employee may be accompanied by another non-supervisory employee, a personal attorney, or a family member as described in 40 CFR 1610.

(8) The CSB will provide employee representatives with the opportunity to review and comment upon evidence and equipment testing protocols and to observe testing, similar to the opportunities for companies and other parties. Employee representatives will also have access to any test results, to an extent equivalent to other parties.

(9) The CSB will provide employee representatives with the opportunity to review and comment on the factual accuracy of CSB reports, recommendations, and interim statements of findings prior to public release, to a degree equivalent to any opportunities provided to company representatives.

(10) The CSB will monitor the implementation of the policy to ensure that participation by facility employees and representatives in CSB investigations does not result in prohibited whistleblower retaliation under 42 USC § 7622. Documented instances of retaliation will be referred to appropriate federal enforcement agencies.

6.5 Policy on Accident Victims

In 2012 the CSB voted to approve Board Order 047 organizing an Accident Victim and Family Communication Program (AVFCP) during CSB investigations that governs the activities of the CSB Members and employees involved in providing communication to victims and their families.

AVFCP is designed to help with broad dissemination of CSB findings through advocacy, outreach and preservation of the public trust. The AVFCP carefully takes into account the mental, physical, and emotional state of the accident victims and their families in communications during and after investigation deployments. The aim is to help to preserve the public trust by serving as a source of information concerning the root causes of an accident to victims.

During the course of an investigation, the CSB should communicate relevant public, factual information to the accident victims and their families through appropriate forums, such as Family Follow up Meetings, as deemed appropriate by the Investigator In-Charge (IIC). The

CSB may also seek to interview victims and their families to collect information pertaining to the investigation. This communication will help facilitate the CSB's goal of preserving the public trust through the dissemination of information to accident victims and their families. The CSB should provide accident victims and their families with the contact information of appropriate assistance organization(s) experienced in disaster and post traumatic communication, such as the American Red Cross or the Salvation Army. The CSB would also provide accident victims and their families with the contact information of an employee of the CSB who shall serve as the designated CSB point of contact for accident victims and their families.

7.0 Conclusion

In summary, the Chemical Safety Board has had an extremely productive five year period, completing major accident investigations with recommendations adopted or in the course of being adopted, that will affect the safety of workers and communities for decades. It is a record of accomplishment I am proud of and one that the superb CSB staff is proud of as well.

I leave the CSB with the knowledge that this agency is positioned to continue to conduct solid and effective investigations on behalf of the American people who deserve safer working conditions in an industry that has seen too many deadly accidents. I thank my fellow board members, the staff, and the President for the opportunity to accomplish this work.