Testimony of John S. Bresland
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U.S. Chemical Safety Board
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Committee on Energy and Commerce
Subcommittee on Oversight and Investigations
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Chairman Stupak, Ranking Member Walden, and distinguished members of the Committee: I am John Bresland, Chairman and Chief Executive Officer of the U.S. Chemical Safety Board, the CSB.

My testimony today is on my own behalf and not necessarily for my colleagues, the other three sitting board members.

I thank you for convening this important hearing. The explosion at Bayer CropScience[1] was a very serious accident. Furthermore, the security-related issues that have been raised in the aftermath of the accident can have major ramifications for future investigations by the CSB – and for the public's right-to-know about chemical accidents.

Mission of the Chemical Safety Board

The CSB is an independent federal agency that Congress established to investigate major chemical accidents at fixed facilities. We have only limited regulatory authority,[2] and our primary power is to recommend and to motivate positive changes in chemical process safety performance to save lives and better protect communities.

This we have done quite successfully over the past ten years. Our accomplishments include major recommendations on preventing fires and explosions involving combustible dust and reactive chemicals. We have successfully pushed for the modernization of the New York City fire code, and we have advocated the expansion of workplace safety protections for millions of public employees.

Our investigation of the tragic explosion that occurred at BP Texas City in 2005 – which was examined in this subcommittee two years ago – has led to significant changes in oil refinery safety and regulatory enforcement. The CSB's reports and especially our safety videos, which are based on actual investigations, are studied and used to educate operators, engineers, and managers throughout the world.

In West Virginia, our investigation of a deadly propane explosion in 2007 is paying tangible benefits for the safety of emergency responders, workers, and businesses. Following the blast that killed two firefighters and two propane technicians, we

[1] Referred to as "Bayer" throughout the testimony.
[2] The Board was directed under the Clean Air Act to develop a regulation on the reporting of accidental releases.

recommended regular hazardous materials training for West Virginia firefighters, training and certification for propane technicians, and improved 9-1-1 call procedures. We are very pleased with the progress on these recommendations, including recent proposals in the state legislature to require mandatory propane safety training.

Mr. Chairman, the only real tool we have to achieve this progress is the concern and interest of the American public, the Congress, and other stakeholders. We have no other power to order any business to improve its practices. That is why we take so seriously any effort that would potentially diminish our ability to make public the facts and circumstances concerning the major accidents we investigate.

Preliminary Findings of the CSB Investigation

Two days from now we will hold a hearing in Institute, West Virginia, to present to the public our preliminary findings on the explosion at Bayer, following seven months of the ongoing investigation.

Our investigative team spent more than a month at the accident site, interviewing dozens of witnesses and collecting many thousands of pages of evidence, all of which we have shared with the committee at your request.

Mr. Chairman, the explosion at Bayer was a very serious and very tragic event that could have had additional grave consequences.

Let me summarize what our investigative team has learned to date, and what we plan to discuss with the public on Thursday.

The Bayer plant in Institute is a large chemical complex of more than 400 acres that was first constructed in the 1940s. For four decades – until 1986 – it was owned by Union Carbide, which produced carbamate pesticides at the site. Bayer acquired the complex in 2002 and has more than 500 employees at the site.

The facility stands in a populated area along the Kanawha River, about 10 miles to the west of Charleston (see Figure 1). Chemical safety has been a major issue in the Kanawha Valley for decades, fueled in part by concerns about the number of major chemical plants, the density of settlement, the local geography, and the potential difficulty of evacuating the area in case of a chemical emergency.

The Bayer plant manufactures and handles very large quantities of some of the most toxic substances that are used in industry, including phosgene, a gas once used as a chemical warfare agent, and methyl isocyanate (MIC), the chemical that killed thousands of civilians in Bhopal, India, in 1984.

Explosion Occurred During Methomyl Unit Startup

On August 28, 2008, a powerful explosion occurred within the Methomyl/Larvin unit at the Bayer plant. The explosion occurred during the restart of the Methomyl section of the unit. The startup followed an extended maintenance shutdown of the entire unit. On the night of August 28, a vessel known as a residue treater experienced a runaway chemical reaction, which produced tremendous internal heat and pressure.

The residue treater was an eight-by-ten foot cylindrical steel pressure vessel with a capacity of about 4,500 gallons. When empty, it weighed more than 5,000 pounds. It stood vertically on steel supports, and it had just been replaced during the maintenance shutdown, although we do not believe that contributed to the accident.

About ten minutes prior to the explosion, two unit operators – Barry Withrow and Bill Oxley – were asked to go and check on the residue treater because of abnormally high pressure readings. They were in the vicinity of the treater at 10:35 p.m., when the emergency pressure relief valves opened.

However, the pressure relief system was not sized or designed for a runaway reaction involving large amounts of Methomyl, and pressure continued to build inside the vessel. Moments later, the vessel suddenly ruptured. The entire vessel was violently propelled in a northeasterly direction into the production unit – demolishing process equipment, twisting steel beams, and breaking pipes and conduits. The vessel finally came to rest about 50 feet away, grossly deformed and flattened. In its wake, it left a continuous swath of destruction.

Mr. Withrow and Mr. Oxley were caught by the explosion, chemical release, and fire and were both fatally injured. Mr. Withrow died at the scene; Mr. Oxley died after 41 days in a hospital burn center in Pittsburgh.

A blast wave propagated outward from the epicenter of the explosion, causing damage in the control room hundreds of feet away, breaking windows and cracking walls and ceilings at homes and businesses up to several miles away.

I will now discuss more details about why the explosion occurred.

Runaway Reaction of Toxic Methomyl Pesticide

Methomyl is a highly toxic substance that is sold as a pesticide and is also used as a feedstock to produce the pesticide Larvin. Methomyl can be highly reactive. When heated in solution, Methomyl breaks down chemically, producing heat. The residue treater was designed to decompose Methomyl at a concentration of less than 1% in solution. However, during the startup on August 28, the Methomyl concentration in the treater vessel reached a very high concentration, potentially as high as 20% or more.

In the production process, Methomyl is synthesized from MIC and other chemicals and then crystallized from a solvent solution. The solid Methomyl is separated out using centrifuges, leaving behind liquid residue that still contains some Methomyl. Most of the solvent is then recovered by distillation and reused, leaving behind a concentrated liquid waste stream that contains as much as 40% Methomyl. This liquid waste stream was sent to the residue treater, which was intended to decompose most of the Methomyl prior to incineration in a boiler.

The fact that high concentrations of Methomyl could cause a violent reaction or explosion in the residue treater was known to plant managers and operators and was described in the unit operating procedures. Bayer's process hazard analysis and the operating procedures for the unit warned against exceeding a Methomyl concentration of 0.5% in the residue treater, due to the danger of an explosion.

Significant Process Safety Deficiencies Set the Stage

Why then did the explosion occur? Our investigation has revealed significant lapses in process safety management that likely contributed to causing this accident.

Bayer had recently upgraded the computer control system for the unit, replacing an older Honeywell system with a more modern system purchased from Siemens. The control screens and commands were completely different with the new Siemens system; yet our investigation found that the unit operators received inadequate training on the new system. Furthermore, the written operating procedures for the unit were significantly out of date – still describing the use of the Honeywell control system – and were in some cases incorrect.

As early as October 2007 – ten months prior to the accident – Bayer assigned priority action items to correct deficiencies in the unit operating procedures, but the action items remained incomplete by the time of the explosion. The incorrect and inaccurate operating procedures are one example of a number of priority action items left undone by Bayer. In fact, Bayer's own process hazard analysis for the unit, which was prepared in 2004 to comply with OSHA process safety standards, contained some 25 action items that still remained open in August 2008, four years later.

In addition, we found that the steam heater used to heat the contents of the residue treater during startup was deficient: it was undersized and could not produce a sufficient amount of heat. As a result, it was simply impossible for operators to start up the residue treater in the way prescribed by the written operating procedures. The heater could not heat the solvent in the treater to the minimum temperature needed to ensure controlled decomposition of the Methomyl. Since the temperature always fell about 10 degrees Centigrade below the required value, a safety interlock would block the flow of Methomyl into the residue treater, making it impossible for operators to complete the startup of the unit.

Known Heater Deficiency Forced Routine Bypassing of Critical Safety Interlocks

The heater deficiency was a longstanding problem, was known to management, and had persisted throughout a number of previous startups. As a result of the heater problem, operators regularly performed a work-around to start up the residue treater. This involved defeating three safety interlocks controlling the operation of the Methomyl feed valve.[3]

Defeating the feed valve interlocks allowed Methomyl to be pumped into the vessel during the startup sequence even though the minimum operating temperature had not been reached. The Methomyl would begin to decompose and release heat, bringing the temperature up into the required range and allowing the startup to proceed, and thereby compensating for the known problem with the undersized heater.

The practice of bypassing the safety interlocks was longstanding and was known to Bayer managers and engineers. But bypassing the safety interlocks made it much more likely to overcharge the vessel with Methomyl, which could lead to a catastrophic runaway reaction.

On the night of the accident, not only were the three safety interlocks bypassed, but the residue treater was not properly filled with solvent and preheated to the maximum achievable temperature.

As the result of these multiple actions and omissions, the residue treater received hundreds or possibly thousands of pounds of excess Methomyl, which decomposed in a sudden and violent runaway reaction.

We also learned that a valve was missing from equipment related to the residue treater feed stream, causing abnormal conditions in a solvent distillation column. This and other column operational control issues diverted the attention of unit personnel, potentially making it more likely to inadvertently overcharge the residue treater with Methomyl.

The heater deficiency, routine procedural deviations, and routine bypassing of safety interlocks were never subjected to formal management-of-change reviews to assess their impact on safety – a key requirement of the OSHA process safety management standard.

These deviations likely contributed to the runaway reaction and the resulting explosion.

Understanding why all these factors came together on August 28 remains a focus of our investigation. We learned that unit operators had very high overtime levels during the three months prior to the accident, averaging almost 20 hours a week of overtime. Operators worked 12-hour shifts for many consecutive days, with few days off, and

[3] The three safety interlocks were activated by the minimum temperature, minimum pressure, and recirculation flow in the residue treater. If any of these were outside predetermined limits, the interlocks would cut off the flow of Methomyl solution into the residue treater.

sometimes worked up to 18 hours in a row. So we are concerned about the potential for fatigue, which can of course be an important factor in major accidents.[4]

Shortcomings in Emergency Response, Communications, and Reporting

When the explosion occurred at 10:35 p.m. on the night of August 28, the flammable and toxic contents of the residue treater, amounting to about 2,500 gallons, were suddenly ejected and a major fire erupted in the unit (see Figure 2). Chemical pipes and venting systems were broken open and their contents released to the atmosphere. Projectiles were hurled in all directions.

CSB investigators have examined the emergency response to the accident and interviewed many of the participants. At our public meeting on Thursday, we will present a detailed, minute-by-minute chronology of the emergency response.

I am very troubled by our observations of the inadequacy of Bayer's emergency response and emergency communications. For example, the county's 9-1-1 call center was told, fifteen minutes into the response, that no dangerous chemicals had been released. That information came from Bayer's incident commander and was relayed by the Institute volunteer fire chief, who was also a Bayer employee.

That statement is clearly incorrect, since Methomyl is toxic, and its uncontrolled decomposition may release highly toxic byproducts. According to publicly available material safety data sheets for Methomyl, those decomposition products may include highly toxic chemicals such as methyl isocyanate, hydrogen cyanide, acetonitrile, carbon monoxide, dimethyl disulfide, nitrogen and sulfur oxides, and methyl thiocyanate.

In addition, it is likely that hazardous substances were released from the broken chemical pipes and vent systems.

It was more than half an hour later that Bayer recommended to the 9-1-1 center to issue a shelter-in-place advisory for surrounding communities. This was actually some minutes after local authorities had already decided on a shelter-in-place order, after observing what they feared might be a hazardous chemical haze drifting from the plant.

It was more than two hours before Bayer reported the accident to the National Response Center, and that notification erroneously omitted the fatality and the critical injury. The report did state that "hazardous materials" exceeding the reportable quantities were likely released and noted that a shelter-in-place action was underway.

[4] In March 2007, the CSB's final report on the explosion at the BP Texas City refinery recommended new industry-labor consensus standards to prevent operator fatigue at petrochemical plants. The recommendation remains open.

Responders and Workers Exhibited Symptoms of Chemical Exposure

Of particular concern is the fact that apart from the two fatally injured workers, eight other people reported symptoms of chemical exposure following the accident. These include six outside volunteer firefighters and two rail contractors, who were on-site the night of the accident. Their symptoms included nausea, aches, and intestinal and respiratory disturbances.

The firefighters who reported those symptoms had approached the fire without full personal protective equipment – specifically self-contained breathing apparatus – apparently relying upon the fact that Bayer personnel at the scene were not using such equipment.

Finally, there were well-publicized problems with the content of Bayer's communications relayed by a front gate guard to the 9-1-1 center. For a period, the guard – evidently following instructions from Bayer – declined to identify to 9-1-1 officials even where in the 400-acre facility the explosion, release, and fire had occurred.

All of these observations point to serious deficiencies in internal communications, coordination, and emergency response planning on the part of Bayer.

Up to 18 Tons of MIC Stored Close to Explosion Site

As I have described, when the residue treater ruptured it was hurled with tremendous force in a northeasterly direction. This trajectory took the vessel through a highly congested section of process equipment, where it left a wide, long swath of destruction (see Figure 3).

As far as we can determine, the direction the residue treater traveled was a matter of random chance. The violent rupture of the vessel might have propelled it horizontally in any direction or upward on an arc-like trajectory.

Approximately 80 feet to the southwest of the location of the residue treater, there is a 37,000-pound capacity tank of methyl isocyanate (see Figures 4 and 5). This tank provides MIC feedstock to the Methomyl unit and to another pesticide unit located at the complex, a unit that is owned by FMC Corporation.

During normal production, this tank is filled once a day via pipeline with product from the MIC production unit, which is located several thousand feet away. The tank is actually a refrigerated pressure vessel that stands 19 feet tall and 8 feet in diameter.

At the time of the explosion on August 28, the tank was about 30% full, containing a total of 13,800 pounds of MIC.

In 1982, prior to the Bhopal disaster, then-owner Union Carbide equipped the tank with what the facility refers to as a "blast blanket." The blast blanket is a steel mesh that hangs from a steel framework and was presumably installed to try to protect the MIC tank from accidental process-related explosions (see Figure 6). In 1994, then-owner Rhone-Poulenc installed a second section of the blast blanket above the top of the MIC tank.[5]

On the night of August 28, 2008, the rupture of the residue treater sent metal projectiles in all directions. Some of these projectiles weighed up to a hundred pounds. When our investigators arrived at the site, they observed explosion debris near the base of the MIC blast blanket (see Figure 7).

We are still awaiting from Bayer any written documentation to indicate the design basis of the blast blanket, the standards to which it was constructed, and the scenarios it may be designed to withstand. Without that information, it is difficult to draw any conclusion about how much danger the tank might have been exposed to on August 28.

Subsequent to the August explosion, Bayer removed the blast blanket from the tank and installed a new blanket constructed from heavier steel cable.

MIC Tank's Existence and Siting Cause Concern

Although the MIC tank and the blast mat escaped serious damage on August 28, there is reason for concern. This was potentially a serious near miss, the results of which might have been catastrophic for workers, responders, and the public.

MIC is considered "immediately dangerous to life and health" (IDLH) at the extremely low concentration of three parts per million in air. At ordinary temperatures, MIC is a liquid but it evaporates very rapidly to form a heavier-than-air vapor cloud, which is obviously very dangerous.

Bayer's plant in Institute is the only manufacturing site in the United States that continues to produce and store more than 10,000 pounds of MIC, which is the EPA threshold under the Risk Management Program (RMP) rule.

There are hypothetical scenarios where the MIC storage tank could have been compromised during the August 28 explosion, either by powerful projectiles or by a collision with the residue treater vessel, had it traveled in that direction. Any release of MIC into the atmosphere is cause for great concern, even if it is far smaller than the 200,000-pound RMP worst-case scenario reported by Bayer to the EPA.

Speaking more broadly, there is the issue of whether it is necessary to keep large inventories of MIC in order to produce pesticides like Methomyl. Following the Bhopal

[5] In 1993, a serious process-related explosion occurred in the Methomyl/Larvin unit, fatally injuring two operators.

tragedy, DuPont and other companies moved promptly to eliminate the storage of MIC and develop manufacturing processes where this highly toxic intermediate is consumed as soon as it is made. In this manner, the maximum release is limited to the contents of a short length of pipe, instead of the thousands of gallons contained in a large storage tank. As Professor Trevor Kletz and other leading process safety authorities have frequently pointed out, "what you don't have, can't leak."

Mr. Chairman, the Chemical Safety Board will undertake a variety of steps to further the understanding of these issues. We have requested, or will request, from Bayer:

- the engineering design bases of the MIC tank and the blast blanket
- analyses of the appropriateness of siting of an MIC tank so close to a unit that has experienced two significant explosions since 1993
- any studies by Bayer or its predecessors of the feasibility and costs of eliminating MIC from the process or reducing its storage at the Institute site

The CSB will closely evaluate the suitability of the location of the MIC tank near a hazardous operating unit; the likelihood that the MIC tank could have been compromised on August 28; and the potential impact of such a release on workers, responders, and the public.

Our goal is that the community and workforce be as safe as possible from the risk of death or injury from a chemical release.

Impact of Security Regulations on CSB Investigations

Mr. Chairman, my testimony above describes what the CSB learned about this accident after about half a year of investigating. In January, we began planning for a public hearing in West Virginia to update the public and our stakeholders on our preliminary findings. We advised Bayer of our plans and the expected date of the public meeting, which was March 19.

In early February, Bayer officials and attorneys requested a meeting with the CSB to discuss concerns about the public meeting. That meeting occurred on February 12 at the CSB's headquarters in Washington. At the meeting, Bayer contended that a large number of documents they had already submitted to the CSB investigation should be treated as "sensitive security information" (SSI) under the Maritime Transportation Security Act (MTSA) of 2002. As a facility that operates a barge terminal, the security of the Bayer Institute complex is regulated under MTSA rather than under the Chemical Facility Anti-Terrorism Standards (CFATS), a program established by the Department of Homeland Security following Congressional action in 2006.

As a result, Bayer claimed that certain information should not be discussed or disclosed to the public. Bayer specifically cited documents relating to MIC use, storage, and process safeguards as potentially being SSI.

Following that meeting, I decided to postpone the CSB public meeting in order to evaluate Bayer's claims.[6] Following discussions with the Coast Guard and the Transportation Security Administration (TSA), we decided to proceed with the public meeting and to review our presentation in advance with the Coast Guard. The Coast Guard reviewed a draft of our presentation (in the form of a PowerPoint slide show), and determined that apart from one or two narrow issues, it did not contain any potential SSI.

On that basis, we are proceeding with our public meeting on Thursday.

Mr. Chairman, I would like to emphasize that the CSB and the United States Coast Guard have been cooperating, and both agencies are, in my opinion, working to protect what they believe to be the public interest, in accordance with their various mandates from Congress.

With that said, I have significant concerns about how current information protection rules may negatively impact this and future CSB investigations.

In response to recent requests from the CSB, Bayer has resubmitted all of its previously provided documents, marking those portions that Bayer believes to be SSI under the company's interpretation of current MTSA regulations. According to our initial estimates, Bayer has marked approximately two thousand pages of investigative information as containing SSI – a number that is likely to increase significantly as our investigation continues.

In addition, we have no real way of knowing whether the thousands of pages of interview transcripts, notes, and photographs generated in our investigation may later also be claimed to contain SSI.[7]

Bayer has provided us with a "protection log," which is merely a list of document titles that the company claims contain SSI. This log itself runs to 24 pages in length. It includes such items as process hazard analyses and standard operating procedures for the Methomyl/Larvin unit, surveillance videos that may depict the accident, insurance audits, and even a map of the facility.

As Bayer attorneys told me on February 12, the company believes that even documents that were originally prepared in order to comply with various OSHA and EPA safety regulations can be now protected from public disclosure or discussion, if those

[6] Disclosure of SSI by federal employees carries potentially heavy civil penalties.

[7] On March 13, 2009, Bayer requested access to the CSB's full investigation file, including investigators' notes, photographs, and interview transcripts to mark information as SSI. To preserve the integrity of the CSB's ongoing investigation and to protect the information provided by witnesses, the CSB denied the request.

documents are merely referenced in the facility's MTSA-required security vulnerability assessment.

Mr. Chairman, it requires little imagination to see the potential for misuse if such an interpretation prevails. In the future, companies may be able to delay our investigations for years while complex claims and counterclaims under MTSA or CFATS are painstakingly resolved between the CSB and various homeland security agencies. Public confidence in the independence, thoroughness, and efficiency of our critical life-saving work may be undermined.

For these reasons, I believe it is vital that Congress work with the CSB, the Coast Guard, the Department of Homeland Security, and other affected agencies to develop an efficient system for conducting public safety investigations while protecting legitimate security interests. The starting point for such a system should be a reaffirmation of the public's fundamental right to know about major accidents and about the safety of the communities in which we all live and work.

The security precautions at chemical plants are beyond the scope of the CSB's mission. We don't investigate how many guards a site has, how personnel access is controlled, or what type of fencing is used. We defer those and other more complex security issues to the experts at DHS.

We do, however, conduct critical investigations of process safety issues that are essential to saving the lives of workers and the public from chemical disasters. I ask your support, Mr. Chairman and members of the subcommittee, to preserve and strengthen that authority.[8]

Under the Clean Air Act, the mission of the Chemical Safety Board is, quite simply, to "investigate … determine and report to the public in writing the facts, conditions, and circumstances and the cause or probable cause of any accidental release resulting in a fatality, serious injury or substantial property damages."

In response to your request, Mr. Chairman, we recently submitted to the committee a list of such serious accidents since 2004 – a list that includes hundreds of accidents. As an agency with fewer than 40 employees and an annual budget of $10 million, we are hard pressed to perform in-depth investigations of even a fraction of these accidents.

Extensive secrecy claims from companies – which I believe are destined to occur unless the current issues are constructively resolved – have the potential to undermine the CSB's effectiveness as a public safety agency.

[8] The CSB authorizing statute has not been reviewed or changed since the enactment of the Clean Air Act Amendments of 1990. As my predecessor testified to the Senate in 2007 – and as I reiterated during my confirmation proceedings in 2008 – Congress should review the adequacy of the CSB's authorities to promptly access incident sites; to preserve and test evidence; and to obtain relevant records from regulatory agencies.

In taking up new chemical security legislation this year, I would ask Congress to consider three basic principles related to the security of information. I am offering these suggestions in my capacity as chairman of the Chemical Safety Board and not necessarily for my colleagues, the other three sitting board members.

First, requirements under both MTSA and CFATS should be clarified to ensure that federal safety compliance documents and other routine business records cannot be claimed as secret – particularly by companies that are under investigation due to major process-related accidents. Without this protection, companies will simply include every document they can within their vulnerability assessments as a shield against possible future investigations or litigation.

Second, the disparate information security requirements under MTSA and CFATS should be harmonized. I believe that industry as well as the CSB and other safety agencies will benefit from a single, coherent set of rules that provides clear guidance to companies and preserves the public's right-to-know about chemical hazards.

Third, in discharging its official, statutory responsibility to report on accidents, the CSB should not be subject to potential penalties and sanctions from homeland security agencies. We stand ready to work cooperatively with DHS, the Coast Guard, and other sister agencies to protect legitimate security information, as we already have. However, the prospect of sanctions against individual employees and board members has an unavoidable chilling effect.

If these principles are implemented, I believe that safety agencies like the CSB and homeland security agencies can and will continue to coordinate effectively to protect the well-being of the American public, a goal we all share.

Thank you for the opportunity to testify today.

Figure 1: The Bayer chemical manufacturing complex in Institute, West Virginia, indicating the location of the Methomyl/Larvin unit, site of the explosion.

Figure 2: Fire in the Methomyl/Larvin unit following the explosion of the Methomyl residue treater on the night of August 28, 2008 (photo courtesy of Tom Hindman, The Charleston Daily Mail).

Figure 3: Equipment destruction along the trajectory of the residue treater vessel; the deformed shell of the vessel is visible at the center of the photograph.

Figure 4. Overhead view showing the proximity of the 37,000-pound MIC storage tank (day tank) to the Methomyl residue treater, which exploded.

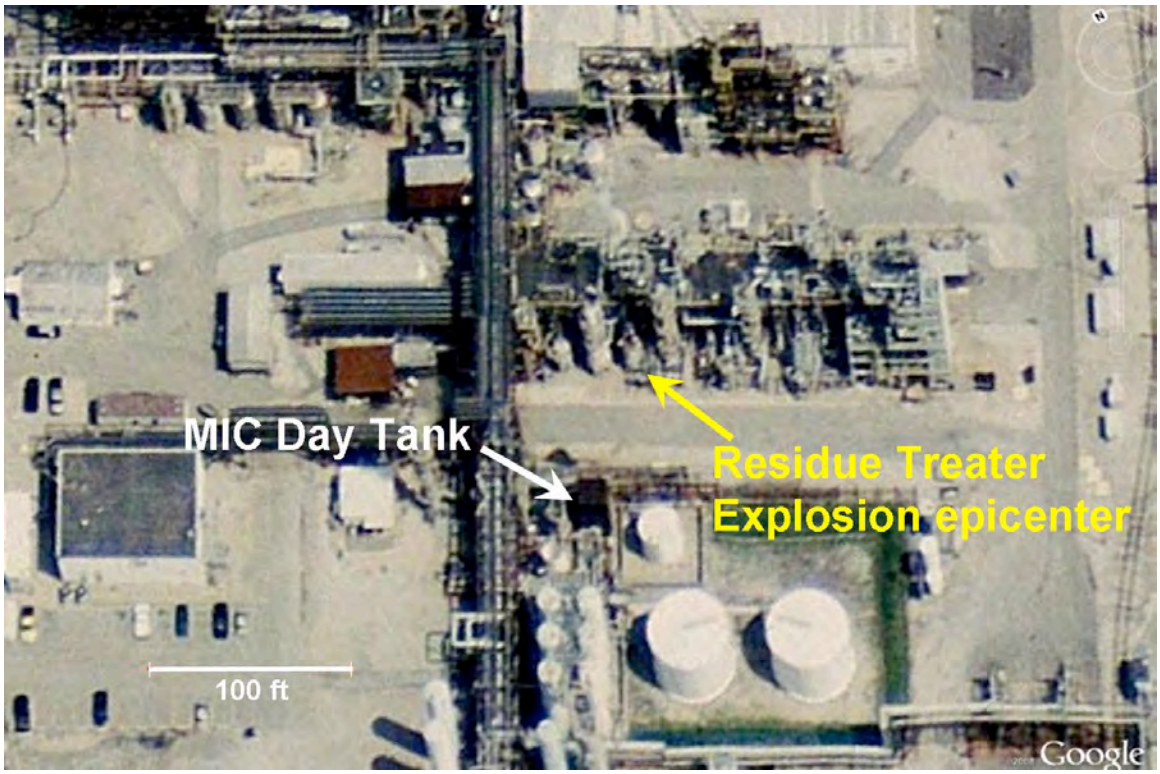

Figure 5: Ground-level view showing the proximity of the residue treater to the MIC storage tank, approximately 80 feet away across a roadway.

Figure 6: View of the MIC storage tank in the Methomyl/Larvin unit showing the blast blanket first installed in 1982 and then extended upward in 1994.

Figure 7: Explosion debris observed by CSB investigators at the base of the blast blanket surrounding the MIC tank.