A Method of Neutralizing: The Contentious Relationship Between Chemical Weapons Destruction and U.S. Environmental Law

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ABSTRACT

After the devastation that Chemical Weapons created in both World War I and World War II, world leaders sought to eliminate the gruesome weapon from warfare altogether. The Chemical Weapons Convention, which entered into force in 1997, not only banned the future possession and stockpiling of chemical weapons, but also required that all parties to the Treaty destroy any weapons already in the state's custody. While there were stringent requirements regarding when these weapons were to be eliminated, there was little to no guidance on how they would actually be destroyed. Many states succeeded in meeting their obligations; however, the continued use of chemical weapons in the recent past has highlighted the importance of eradicating any and all weapons remaining. As a world leader, it is important that the United States not only lead by destroying the remaining stock of its own chemical weapons, but also establish a way of destroying these weapons in a manner that is both mindful of the environment and in adherence with domestic and international environmental law. This Note argues that as a process of elimination, neutralization is the best practice available, as it allows adherence to international and domestic law. Neutralization should be used by the United States both domestically and abroad, and should be that which is encouraged to eradicate this gruesome weapon from the planet forever.

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INTRODUCTION

In World War I, a new weapon was introduced to warfare that brought complete and total devastation to all those that fought on the Western Front. As a "great cloud of green grey gas" leeched the countryside, it left only death in its wake: according to a German soldier who was present upon the chlorine gas release,

> [w]hat we saw was total death. Nothing was alive... When we got to the French lines the trenches were empty but in a half-mile the bodies of the French soldiers were everywhere. It was unbelievable. Then we saw there were some English. You could see where men had clawed at their faces, and throats, trying to get breath.[1]

This soldier is not alone in his grim account of what happened that day in April 1915.[2] By the end of World War I, chemical weapons, such as the chlorine gas used in this soldier's story, had caused upwards of 90,000 deaths, with over 1,000,000 casualties and injuries attributed to the airborne weapon.[3] Despite the fact that poisons such as these had been used as weapons since 600

1. WILLI SIEBERT, DIARY OF A GERMAN SOLIDER WHO PARTICIPATED IN THE FIRST CHLORINE GAS ATTACK (1919), *in* Sarah Everts, *100 Years of Chemical Weapons: First-Hand Accounts of the First Chlorine Gas Attack*, CHEM. & ENG'G NEWS (2015), http://chemicalweapons.cenmag.org/first-hand-accounts-of-the-first-chlorine-gas-attack/.

2. Sarah Everts, *100 Years of Chemical Weapons: When Chemical Weapons Become Weapons of War*, CHEM. & ENG'G NEWS (2015), http://chemicalweapons.cenmag.org/when-chemicals-became-weapons-of-war/.

3. David Koplow, *Train Wreck: The U.S. Violation of the Chemical Weapons Convention*, 6 J. NAT'L SEC. L. & POL'Y 319, 322 (2013).

B.C.,[4] that fateful April morning was the first large-scale weaponized use of chemical weapons, and unfortunately, it would not be the last.

The death and injuries left in the wake of poisonous gas and chemical weapons use was felt the world-round. Those that survived were left with gruesome disfigurements and diseases, such as blisters, or long-term skin, eye, and lung damage.[5] World leaders saw the destruction caused by chemical weapons and decided that future usage, at least in war, should be avoided. As a result, the Geneva Protocol was drafted and ratified in 1925, requiring that the parties to the Treaty "renounce the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials, or devices."[6] However, after a few years of compliance with the Protocol, drafters realized that this renunciation of a limited list of chemical weapons would not be enough: while the Protocol banned all uses of chemical weapons in warfare, countries party to the Treaty did not read it as such, seeing the Protocol instead as a no-first-use pledge that did not restrict the possession of lethal chemicals, "nor their application in retaliation for an enemy's opening chemical salvo."[7] In other words, while warring nations were not permitted to use lethal chemical weapons against one another on the battle front, they were not prevented from at least possessing the threatening substances, and could even use them first against those countries not party to the Treaty, or as a countermeasure against a prior chemical release offensive from an opponent that was party to the Treaty.[8]

"Overshadowed by concerns about nuclear war for much of the post-World War II period, chemical weapons did not receive serious consideration again until 1968, when discussions on biological and chemical weapons started at the Disarmament Conference in Geneva."[9] With renewed interest came a new convention that was also lacking: The Biological Weapons Convention of 1972.[10] Realizing that this Convention was still not enough, the Conference on Disarmament started a working group in 1980. It took thirteen years for their work to come to fruition.[11] In the hopes of further deterrence, the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction ("CWC" or "the Convention")) was

4. Harold Maass, *A Brief History of Chemical Warfare*, THE WEEK (Sept. 7, 2013), http://theweek.com/articles/460335/brief-history-chemical-warfare.

5. Virginia Murray, *Injuries from Chemical Weapons*, 5 NURSING STANDARD 52, 52 (1991).

6. Koplow, *supra* note 3, at 323.

7. *Id.*

8. *Id.*

9. *Origins of the Chemical Weapons Convention and the OPCW*, ORGANISATION FOR THE PROHIBITION OF CHEM. WEAPONS (Sept. 12, 2014), https://www.acs.org/content/dam/acsorg/events/program-in-a-box/documents/2016-global-security/cw-history.pdf.

10. *Id.*

11. *Id.*

opened for signature in 1993, and later entered into force in 1997.[12] This comprehensive Treaty "aim[ed] to erect a permanent, all-encompassing prohibition on chemical weapons," so as to avoid the horror faced by those who encountered the weapons in World War I.[13] The CWC achieves this by banning not only the use of chemical weapons, like the Geneva Protocol, but also the "production, acquisition, retention, use, preparation for use, and assistance to others for the use of chemical weapons."[14] Most importantly, it requires that those countries party to the Treaty destroy any stockpile of chemical weapons in their possession. Currently, the number of countries party to the Treaty are many–188 to be exact–with only six refusing ratification. Of these six, some have signed the Treaty, and as a result are held to some of the same standards as countries party to the CWC.[15]

The United States has undertaken its duty to comply with the Treaty, and has made significant strides towards the complete eradication and destruction of the country's chemical weapons arsenal. As of 2015, "[n]early 90 percent of the U.S. stockpile has been eliminated at depots in six states and Johnson Atoll in the Pacific, mostly by incineration."[16] However, the destruction of these weapons is not without challenges. Several different methods result in the destruction and disposal of chemical weapons that would allow for adherence to the CWC. Nonetheless, not all these disposal methods are environmentally friendly, nor do they comply with United States domestic environmental laws, such as the National Environmental Policy Act ("NEPA"), the Clean Air Act ("CAA"), the Clean Water Act ("CWA") and the Resource Conservation and Recovery Act ("RCRA"). As a result, there are competing challenges deriving from the adherence to international Treaty law, the CWC, which requires the elimination of chemical weapons in a quick and safe manner, and our own laws, which require the consideration of environmental impacts on activities undertaken by our government. The question then becomes: How do we best destroy these chemical weapons both within our country and abroad while keeping environmental stewardship and our own domestic laws in mind?

This Note will discuss and do its best to answer this question. Part I is an in-depth analysis into chemical weapons generally: both the history behind and the

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12. Koplow, *supra* note 3, at 324, 327; Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, *opened for signature* Jan. 13, 1993, 1974 U.N.T.S. 45, 32 I.L.M. 800, (entered into force Apr. 13, 1997) [hereinafter CWC].

13. Koplow, *supra* note 3, at 324–25.

14. *Id.*

15. Barak Ravid, *Israel Adamant It Won't Ratify Chemical Arms Treaty Before Hostile Neighbors*, HAARETZ (Sept. 12, 2013), http://www.haaretz.com/israel-news/.premium-1.546613 (stating that signatories have to commit to its intention to follow the Treaty, i.e. chemical weapons destruction, but in some cases, countries haven't agreed to submit themselves to international inspections).

16. Dan Elliot, *U.S. To Destroy Largest Remaining Chemical Weapons Cache*, USA TODAY (Feb. 4, 2015), https://www.usatoday.com/story/news/nation/2015/02/04/destroy-chemical-weapons-cache/22842915/.

current use of chemical weapons, as well as a more detailed description of the Treaty, which attempted to halt their proliferation, the CWC. Part II will analyze the methods used in the destruction process, which include rudimentary approaches such as dumping, burial, and open pit burning, and extends from the historically popular incineration to the more current environmentally friendly practice of neutralization. Part III will discuss the domestic environmental laws that are implicated with the various destruction and elimination processes discussed in Part II, namely, NEPA, the CAA, the CWA, and RCRA. The Note will then review these destruction methods, and apply each federal law and its implications to the specific processes. Part IV will combine the analyses from Part II and Part III into an overall suggestion as to what method would best serve international goals: to adhere not only to the CWC, but also to United States environmental laws. This Note will reach the conclusion that of all the methods, neutralization best fits the purposes and goals of the United States' environmental laws. Lastly, Part V will discuss why this topic, and the suggestion to pursue neutralization as a method for disposal, matters in the grand scheme of both domestic and international law. The Note posits the idea that not only does neutralization as a process for chemical weapon destruction best fit within our domestic environmental legal structure—and the United States should adopt it as its formal destruction process—but neutralization also has international implications, and in pursuing the worthy overall goal of chemical weapons destruction, the United States should encourage other countries to adopt a similar destruction scheme.

I. CHEMICAL WEAPONS THROUGHOUT HISTORY TO THE PRESENT

A. USE OF CHEMICAL WEAPONS HISTORICALLY AND TODAY

As discussed briefly in the introductory section of this Note, chemical weapons were first used for military purposes on a large scale in World War I by the Germans against the Allied troops.[17] However, the idea of chemicals used as a poisonous weapon had been around for centuries: "they were deployed in ancient Greece; the Chinese used them against Genghis Khan; and indigenous people in South America had long used plant extracts as poison on their darts."[18] Despite this history, the first grand-scale use of chlorine in WWI started an arms race, with super powers all over the globe (including China, the United Kingdom, and the United States) dashing to create and harness the power of chemical weapons.[19] Before President Nixon's 1969 renunciation of chemical weapons usage, the United States alone was thought to have at least 40,000 tons of chemical weapons stored in bulk throughout the country. The United States possessed

17. Everts, *supra* note 2.
18. *Id.*
19. *Id.*

40,000 tons even after the country had destroyed thousands of tons left over from World War II.[20]

Even though many countries have destroyed their chemical weapons caches, chemical weapons still pose a threat today. In the past century, state and non-state actors have deployed chemical weapons in explicit acts of aggression.[21] Most notably, the Germans used chemical weapons against prisoners in the Third Reich concentration camps, and more recently, terrorists used these weapons against commuters in a Tokyo subway, against antigovernment demonstrators and citizens alike in Syria, and throughout the Iran-Iraq War by both countries.[22]

Additionally, even in the United States, several law enforcement agencies have used chemical weapons such as tear gas and other riot control agents ("RCAs") to subdue potentially violent crowds or dangerous individuals.[23] Under the CWC, as it is now read, nation-parties are not required to destroy or even abstain from the use of chemical weapons, so long as they are not deployed in circumstances of war. As a result, despite the fact that their makeup and the harmful injuries that result from their deployment are almost identical to that of their wartime brethren, RCAs are actually legal under the CWC, at least to a certain extent.[24] In fact, "police continue to use these agents to restrict, intimidate, or punish those involved in nonviolent dissent the world over."[25] This practice is made worse by the "ongoing development, marketing, and subsequent deployment of a range of systems capable of delivering far greater amounts of riot control agent over wider areas or more extended distances than currently possible with standard law enforcement RCA dispersal mechanisms, such as hand held sprays, grenades, and single projectile launchers."[26]

The continued use of chemical weapons in the form of RCAs and as a militaristic tool by state and non-state actors alike, show that despite the worthy goals of the CWC, chemical weapons are still a very prevalent problem not only in the United States, but also around the world. As a result, to pursue the commendable

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20. Evelio Contreras, *U.S. to Begin Destroying Its Stockpile of Chemical Weapons in Pueblo, Colorado*, CNN (Mar. 17, 2015), http://www.cnn.com/2015/03/17/us/chemical-weapons-pueblo-debot/.

21. Everts, *supra* note 2.

22. *Id.*

23. Michael Crowley, *Perilous Paths: Weaponizing Toxic Chemicals for Law Enforcement*, ARMS CONTROL ASS'N (Mar. 2016), https://www.armscontrol.org/ACT/2016_03/Features/Perilous-Paths-Weaponizing-Toxic-Chemicals-For-Law-Enforcement.

24. *Id.* Most parties to the CWC agree that the use of RCAs in both international and non-international armed conflict is illegal under the Treaty. However, because the CWC does not specifically define "chemical weapons" or "clearly demarcate the boundary between warfare and law enforcement, states might develop varying interpretations of the convention's restrictions in these areas," meaning that the use of RCAs is not prevented outright by the Treaty. Among the nation-parties that have taken advantage of this ambiguity is the United States, which "has a national policy permitting use of such agents in certain non-offensive actions in armed conflict zones," like protests. *Id.*

25. *Id.*

26. *Id.*

aim of ridding the world of chemical weapons, it is necessary that the best method of destruction be analyzed and adopted by all those party to the Treaty.

B. THE CHEMICAL WEAPONS CONVENTION

Before diving further into an analysis of the best method of chemical weapons destruction, it is first necessary to analyze the Chemical Weapons Convention Treaty itself. In 1993, the CWC was opened for signing, and later entered into force on October 31, 1997 with the ratification by Hungary, who became the 65th state to sign the Convention. The purpose of the Convention, as ratified by the United States, was to completely ban not only the use of chemical weapons in warfare, but to stop the development, production, stockpiling, retention, and transference (either directly or indirectly) of chemical weapons to any other state or party.[27]

In furtherance of the goal to eliminate chemical weapons, the drafters of the Convention devised an enforcement agency called the Organization for Prohibition of Chemical Weapons ("OPCW").[28] The Organization's board is located in the Hague, and requires that of the 192 states that are now party to the Convention, those that possess chemical weapons must verify through inspections and data reporting that they are well on their way to destroying any chemical weapons stockpiled within their borders.[29] The methods of this destruction, however, with a few exceptions, are left up to the decision of each individual state, so long as the method of destruction is not reversible.[30] Among the limited requirements, the CWC necessitates that

> (1) each shall assign the highest priority to ensuring the safety of people and to protecting the environment; (2) each will avoid the simple but intolerable precedents of ocean dumping, land burial, or open-pit burning of the detritus; (3) each shall bear the costs of its destruction process; and (4) the entire operation must be undertaken in a transparent fashion, accessible to the international inspectorate, [which in this case, is the OPCW].[31]

Because of the "reversibility" requirement, even though the method of destruction is technically left up to the state, there are only a handful of processes that actually qualify as adequate under the CWC. Historically, countries that have signed the Treaty but have not yet ratified it, such as Syria, have attempted to misrepresent the dismantling and rendering of chemical weapons facilities inoperable as "irreversible" deconstruction methods—some which have undergone criticism and rejection from nation-parties and the OPCW.[32] As a result, methods had to be

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27. 15 C.F.R. § 710.3 (2017).
28. Koplow, *supra* note 3, at 326.
29. *Id.*
30. CWC, *supra* note 12, at Art. IV.
31. Koplow, *supra* note 3, at 327.
32. Nick Cumming-Bruce, *Syria Delivers Another Shipment of Chemical Weapons for Disposal*, N.Y. TIMES (Mar. 20, 2014), https://www.nytimes.com/2014/03/21/world/middleeast/syria-chemical-weapons.html?_r=0.

developed where the chemical weapons could not be reconstructed with the materials left over from their de-weaponization. A few scientifically proven irreversible approaches have been adopted by chemical-weapon-possessing countries adhering to the CWC throughout the years, including dumping, burial, open-pit burning, incineration, and neutralization, though some are preferable to others.

II. METHODS OF DESTRUCTION

A. DUMPING, BURIAL, AND OPEN-PIT BURNING

Prior to the addition of Article IV, which prohibited dumping, burial, and open-pit burning,[33] most countries undertook these methods as the primary means by which they disposed of their chemical weapons.[34] In regards to burning, while it did provide a method (albeit an unsafe and environmentally harmful one) where the destruction of chemical weapons was irreversible, there were still monumental consequences associated with the method. Among soldiers and military members that carried out orders to destroy chemical weapons in this fashion, the cancer rate is much higher.[35] Lives were lost trying to destroy these weapons without proper training or protocol due, not only to the weapons themselves, but their explosive capabilities.[36]

Dumping in the ocean was a prevalent method of disposal, however, reversibility problems arose as a result of this practice. Any chemical drum that was buried or dumped could easily be unearthed or fished out of the ocean, with its chemical agent remaining in a highly dangerous, reusable state. There is thought to be as much as 1 million tons of chemical weapons resting on the ocean floor, barrels of which have begun to wash ashore in places like Poland and Delaware.[37] Additionally, scientists also believe there are "thousands of metal containers" buried throughout the United States also containing similar chemicals.[38]

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33. CWC, *supra* note 12, at art. IV(A)(C)(13).

34. David Nield, *Chemical Weapons We Dumped Into the Ocean from 2 World Wars Are Coming Back to Bite Us*, SCI. ALERT (Nov. 15, 2016), http://www.sciencealert.com/piles-of-chemical-weapons-dumped-at-sea-threaten-marine-life-warn-researchers.

35. In a study undertaken by author Joseph Hickman, of the "thousands of military members [he studied] who say they were experiencing health effects from their exposure to burn pits in Iraq and Afghanistan. . . he found that five of the six bases that saw the worst health cases, such as cancers and untreatable bronchial illnesses, were located on or near documented chemical warfare sites. . . [a]nd of the 112 service members and contractors Hickman found who served [in those places], 31 suffered from different forms of cancers and brain tumors." Lauren Walker, *US Military Burn Pits Built on Chemical Weapons Facilities Tied to Soldiers' Illness*, THE GUARDIAN (Feb. 16, 2016), https://www.theguardian.com/us-news/2016/feb/16/us-military-burn-pits-chemical-weapons-cancer-illness-iraq-afghanistan-veterans.

36. *Id.*

37. *See* David Zucchino, *Deadly Chemical Weapons, Buried and Lost, Lurk Under U.S. Soil*, L.A. TIMES (Mar. 21, 2014), http://articles.latimes.com/2014/mar/21/nation/la-na-chemical-weapons-20140322.

38. *Id.*

In regard to the ocean, after being dumped at the end of World War II and spending over 50 years at ocean floor, scientists posit that the "bombs [have] rust[ed] away on the seafloor and potentially leak[ed] their deadly payloads."[39] In January of 1997, the crew of a fishing vessel came across a five- to seven-kilogram chunk of what looked like yellowish clay, which they handled without caution, resulting in blisters and burning skin. That clay turned out to be mustard gas, which had leaked from a previously dumped drum.[40] Not only are humans at risk from this practice, but researchers also warn that the chemicals remaining within the ocean "pose a significant threat to marine wildlife" as they release the chemicals they contain and poison underwater ecosystems.[41]

As a result of attempts at burial in Alabama, individuals who are cleaning up swamps are finding barrels of mustard gas and other relics from World War I and World War II buried beneath the surface and contaminating nearby land.[42] In D.C., entire neighborhoods were shut down as army engineers dug up "smoking" drums from "the hole called Hades," containing chemical weapons nicknamed "the dew of death" from land in people's backyards, which had been a testing site of chemical weapons from 1917 to 1920.[43] People that grew up in the area were later diagnosed with brain lesions, thyroid issues, and blood disorders—all symptoms that could be traced back to the chemical weapons tested and later buried in the area.[44] As evidenced, risks from burials and consequential outcomes jeopardize human life and ecological and environmental safety not only from their prevalence,[45] but also from the risk that any chemical leakage brought.

B. INCINERATION

Fortunately, after the discovery of dangers inherent in this manner of disposal, other methods of destruction have been adopted. Among these strategies is incineration. Until relatively recently,[46] within the United States, incineration was the Department of Defense's preferred method—a method which was employed by

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39. Andrew Curry, *Chemical Weapons Dumped in the Ocean After World War II Could Threaten Waters Worldwide*, SMITHSONIAN (Nov. 11, 2016), http://www.smithsonianmag.com/science-nature/decaying-weapons-world-war-II-threaten-waters-worldwide-180961046/.

40. *Id.*

41. Nield, *supra* note 34.

42. Zucchino, *supra* note 37.

43. Harry Jaffe, *The Toxic Waste Pit Next Door*, WASHINGTONIAN (Feb. 28, 2013), https://www.washingtonian.com/2013/02/28/the-toxic-waste-pit-next-door/.

44. *Id.*

45. *Id.*; Zucchino, *supra* note 37 (in this D.C. neighborhood alone, over 1,000 munitions that still contained or had contained chemical weapons in the past were dug up. This is one of at least 249 known sites across the U.S. alone where chemical weapons were previously buried).

46. As of January 2014, all but two of the original nine chemical weapons disposal sites in the United States have been closed. While the closed sites primarily used incineration as their method of disposal, the last two remaining (Blue Grass in Richmond, KY and Pueblo in Pueblo, CO) use incineration and detonation. *Closing U.S. Chemical Warfare Agent Disposal Facilities*, CTRS. FOR DISEASE CONTROL AND PREVENTION (Jan. 6, 2016), https://www.cdc.gov/nceh/demil/closing_facilities.htm; *Methods Used*

seven sites throughout the country to destroy around 90% of the United States' stockpile after the outdated and hazardous approaches of dumping, burial, and open-pit burning were abandoned.[47] Incineration of chemical weapons involves the "controlled ignition of materials that converts them to ash, water vapor, carbon dioxide, and other products formed by combustion." Effectively, according to the Army Corp. of Engineers, the method of incineration breaks down "any type of chemical agent to relatively harmless or controllable end products," though the "harmlessness" of these materials is often and rigorously debated.[48]

Before introducing the chemical agent to the high temperature, the weapons are broken down into the principal agent, the explosives, and the metal parts that were used to create the weapon itself.[49] After the rockets are drained of their liquid chemical agents, the agents themselves are transferred to a holding tank, and then moved to a large liquid furnace.[50] Any explosives left from the device are detonated in a special room or furnace built to withstand such blasts, and the metal casings that remain are melted down in a different furnace.[51] Any gaseous effluent that is left from this process is then scrubbed by multiple filters, and released into the atmosphere through a smokestack on the property.[52] Essentially, all parts of the chemical weapon—the shell casings, the explosives, the chemical weapons themselves, etc.—are dismantled and incinerated through different methods, but are incinerated all the same. What remains is then released from the property into the air through smokestacks on the facility grounds. To date, millions of pounds of chemical warfare agents have been destroyed using the incineration method.[53]

However, there are many environmental issues with incineration as a destruction method. According to Craig Williams of the Chemical Weapons Working Group, the "fundamental problem with incineration is that it requires air in and air out to function."[54] The issue with this procedure is that because there is always "air out" coming from the incineration chamber, the facilities that depended on incineration relied entirely on the "efficiency of the combustion to be pretty much perfect at every moment the waste stream is in the chamber in order to 'destroy

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to Destroy Chemical Warfare Agents, CTRS. FOR DISEASE CONTROL AND PREVENTION (May 31, 2013), https://www.cdc.gov/nceh/demil/methods.htm [hereinafter *Methods*].

47. *Methods*, *supra* note 46.

48. *Id.*

49. *Destruction Technologies*, ORGANISATION FOR THE PROHIBITION OF CHEM. WEAPONS, https://www.opcw.org/our-work/demilitarisation/destruction-technologies (last visited Mar. 23, 2017).

50. Paul Walker, *How to Destroy Chemical Weapons*, BULLETIN OF THE ATOMIC SCIENTISTS (Sept. 13, 2013), http://thebulletin.org/how-destroy-chemical-weapons.

51. *Id.*

52. *Id.*

53. Christopher T. DeLisi, *The Incineration of Chemical Warfare Agents by the United States Army: Is It the Best Method for Disposal?*, 7 DICK. J. ENVTL. L. & POL'Y 75, 85–86 (1998).

54. Telephone Interview with Craig Williams, Chemical Weapons and Fracking Program Director, Chemical Weapons Working Group (Apr. 3, 2017).

it.'"[55] Because the burning and incineration process is so rapid, a facility can release a live agent, or product of incomplete combustion ("PIC"), into the "air out" as it moves through the system if this efficiency and perfection is not met. These releases have occurred in the past, so this fear is not unfounded. Of the releases the Chemical Weapons Working Group ("CWWG")[56] was able to document,[57] there have been at least "eighteen live agent releases out of stacks in the incineration program," and there is data that suggests that there have been dozens more that went undocumented.[58] When these leaks occur, "even low levels of exposure can have impacts on public health, especially on children."[59] Even when incineration plants operate perfectly as designed, which is difficult, there is still toxic effluent coming out of the incineration outflow smokestack on a constant basis, and while the effluent is generally less harmful than the chemical agent itself, dangerous chemicals like mercury and lead are still released.[60] Exposure to these chemicals can lead to both short and long-term problems, including shortness of breath, changes in hearing or vision, coma, and even death.[61]

C. NEUTRALIZATION

There are other methods of elimination that do not involve high temperature destruction like incineration, but instead use something called "wet chemistry" at lower temperatures to neutralize the hazardous nature of the chemical warheads.[62] Developed because of citizen concern brought about by the incineration process and the justified fear of PICs, neutralization, similar to incineration, requires that the chemical weapons container be drained of its agent in order to start the process.[63] Also, like the incineration process, the weapon is dismantled into its different parts: the chemical agent, the shell casings, the explosives, etc. The metal parts are processed in a metal parts furnace, and the chemical agent is separated and placed into a mixing tank with either hot water or a caustic reagent

55. *Id.*

56. The CWWG was created "to protect citizens from toxic emissions that result from incinerating chemical weapons." They now urge the neutralization process as the preferred, safer, more environmentally friendly method of destruction. *Id.*

57. Facilities are required to document and store data in relation to any chemical leak or accident that has occurred on the premises. Craig Williams suggested that there could be many more that went undocumented throughout the years while the incineration plants were in operation. *Id.*

58. *Id.*

59. *Id.*

60. *Id.*

61. *Short- and Long-term Effects of Lead Exposure*, SAFETY, BLR: NEWS (Sept. 16, 2011), https://safety.blr.com/workplace-safety-news/hazardous-substances-and-materials/lead-regulation/11zaa02-Short-and-Long-Term-Effects-of-Lead-Exposu/.

62. Walker, *supra* note 50.

63. *Id.*

like sodium hydroxide, which bonds with the harmful chemical substances to destroy the toxicity of the agent.[64]

After the chemical agent is neutralized, a large amount of liquid remains, which must be either stored or further processed. While this liquid, called hydrolosate byproduct, contains some hazardous chemicals, it is much less dangerous and significantly safer to handle than the original chemical agent.[65] One option for processing this byproduct further to make it even safer is through the introduction of natural organisms into the solution, which breaks down the product into something almost completely harmless. This is known as biodegradation or biotreatment.[66] In comparison to other cleanup options such as incineration, biotreatment is "environmentally friendly, relatively simple, and cost effective."[67] The basic neutralization process[68] is currently being used at the two remaining chemical weapons facilities within the United States, and has been undertaken to destroy thousands of tons of mustard agents in projectiles.[69]

The benefits of neutralization over other methods, especially incineration, lie in the fact that there are various steps of the deconstruction process that all happen independently of each other.[70] When the chemical weapon is put in the mixing tank and processed with the hot water or caustic reagent, it is repeatedly tested throughout the procedure to determine whether the chemicals have been reduced to less hazardous components.[71] Throughout each step of the process (mixing, water oxidation, etc.) the solution is tested to make sure that the byproduct has reached the sought-after chemical levels of destruction before the next step is taken.[72]

> "At the end of the day, [the facility] has a salt cake that is left over, as well as liquid effluent, most of which is recycled to treat the next batch [of chemical agents]... it's a phased, hold, test and release process [where] nothing is moved [to the next step] until you test it."[73]

The end product is much less lethal than what the agent began as, and if the liquid byproduct were to escape or leak at any point throughout the process, the agent in liquid form "is not going to have the same dangerous effect it would have in its gaseous form."[74] Essentially, while neutralization may result in some

64. *Id.*
65. Williams, *supra* note 54.
66. *Destruction Technologies*, *supra* note 49; *Methods*, *supra* note 46.
67. *Methods*, *supra* note 46.
68. Without additions such as biotreatment, etc.
69. *Methods*, *supra* note 46.
70. *Id.*
71. Williams, *supra* note 54.
72. *Id.*
73. *Id.*
74. *Id.*

toxic substances, the byproducts are nowhere near as dangerous as those resulting from the incineration process.

D. OTHER ALTERNATIVES

Other alternatives exist that have either not been tested for their destruction capabilities, have been passed over for methods like incineration or neutralization, are only used on a necessary basis, or remain outside the scope of economic feasibility. Among these methods include practices such as steam and plasma reactors, and super critical water oxidation.[75] The Japanese, in their quest to eliminate their own arsenal of chemical weapons, use an entirely explosive destruction system, in which the chemical weapons are neutralized in a "bang box," or a reactor specifically designed to blow up and chemically treat each individual weapon.[76] This method is also used at the remaining United States facilities in Kentucky and Colorado for chemical munitions that are in such a fragile state, i.e. already leaking, that they cannot go through the more common processes such as incineration or neutralization.[77] Additionally, practices like electrochemical oxidation, catalytic extraction, and high temperature gas phase reductions are also used because of their environmentally-friendly processes.[78] Like biotreatment, these processes involve the combination of chemical agents with other compounds to reform the agents into less hazardous products.[79] The successes of these alternatives are limited, since many of them remain experimental. Regardless, a state party to the CWC conditions their decision on how to eliminate their chemical weapons cache based on safety, public health, local preferences, costs, and schedule.[80]

III. ENVIRONMENTAL LAWS IMPLICATED IN THE DESTRUCTION PROCESS

Because the destruction of chemical weapons results in chemical byproducts, which consequentially create environmental hazards and potentially harmful effects on the human population, such destruction implicates domestic environmental laws. While there are dozens of environmental laws that can be linked to the methods previously described, there are four major federal laws, NEPA, the CAA, the CWA, and RCRA that are implicated in the destruction processes.

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75. Walker, *supra* note 50.
76. *Id.*
77. *Methods*, *supra* note 46.
78. *See* Megan Garber, *How to Destroy a Chemical Weapon*, THE ATLANTIC (Sept. 16, 2013), https://www.theatlantic.com/technology/archive/2013/09/how-to-destroy-a-chemical-weapon/279717/.
79. *Id.*
80. Walker, *supra* note 50.

A. ENVIRONMENTAL LAWS, GENERALLY

Before discussing each process individually and how these federal laws apply, and eventually, conclude that neutralization is the best process for destruction, it is first necessary to have a general understanding of each individual law.

1. NEPA

The National Environmental Protection Act, or NEPA, was designed to protect the environment from agencies that "carry out their mandates at the expense of the environment."[81] In order to better understand the purposes of NEPA, one may look to the highway construction process. Before NEPA took effect, agencies in charge of creating long-distance expressways would often build them through environmentally threatened areas, like swamplands and ecologically rich wetlands, in order to cut costs and create more direct routes for drivers.[82] The destruction to these environmentally sensitive areas was downplayed by "overstress[ing] the benefits of development . . . and explor[ing] insufficiently the less environmentally damaging alternatives to current methods of meeting their programmed objectives."[83] In order to prevent this "downplaying," Congress created NEPA, which requires agencies to research the potential environmental harms that their actions may cause. Since these studies are made public for review, they often prompt changes in the governmental action, "encouraging" agencies to undertake more environmentally friendly and conscious options.

Generally, NEPA requires agencies to consider environmental values and impacts in their decision-making process, making environmental protection part of every federal agency and department's mandate.[84] Environmental Impact Statements ("EIS") are required on major federal actions significantly affecting the quality of the human environment, and assess whether there are extraordinary circumstances surrounding the proposed action.[85] In some instances, where it is not clear if an EIS is required, the agency must generate an Environmental Assessment ("EA") to resolve this ambiguity. An EA includes considerations for why this specific project is required, which alternatives are available, and the list of agencies and/or persons that were consulted during the environmental assessment process.[86]

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81. ROBERT L. GLICKSMAN ET AL., ENVIRONMENTAL PROTECTION: LAW AND POLICY 261 (7th ed. 2015).

82. *See id.*

83. *Id.*

84. Calvert Cliffs' Coordinating Comm'n v. U.S. Atomic Energy Comm'n, 449 F.2d 1109, 1112–15 (D.C. Cir. 1971).

85. *See* GLICKSMAN, *supra* note 81, at 261.

86. 40 C.F.R. § 1508.9 (2018).

2. CAA

The CAA was enacted in 1955 with the purpose of doing exactly what its title suggests: cleaning up the air.[87] The goal of the CAA was not only to clean up the dirty air to an acceptable, healthy level, but also to maintain high air quality where it already existed.[88] The CAA breaks polluters down into two categories: stationary sources, i.e. factories, power plants, or other structures or facilities that emit significant amounts of pollutant into the air, and non-stationary or mobile sources, who undertake the same polluting practices as stationary sources, but are also capable of movement – such as cars, airplanes, trucks, and planes.[89] The pollutants released from these sources are measured in quantities specified by the Environmental Protection Agency ("EPA"), known as National Ambient Air Quality Standards ("NAAQS").[90]

Stationary sources are required to obtain a CAA permit from the EPA to continue their emissions.[91] Under these permits, which are administered by both federal and state agencies, an operator is required to implement the most effective available technologies to reduce the amount of pollution released by the source. Cost is considered secondary to potential environmental harms.[92] These standards force the EPA to analyze all available and emerging technologies in order to determine which methods are most effective, and thus constitute the best system for emissions reduction.[93]

3. CWA

Aiming to protect and rehabilitate the nation's rivers, lakes, and streams, Congress passed the CWA in 1972.[94] Under the CWA, the EPA and the United States. Army Corporation of Engineers ("the Corps") permit possible polluters the ability to discharge into the nation's rivers and lakes. This "permitting program [is the main tenet of the CWA, which] Congress established in §402 [and §404] to regulate discharges of pollutants into the waters of the United States."[95]

This Note will focus on the process for obtaining a § 404 dredge and fill permit, which is extensive. Under § 404 of the CWA, the Corps has exclusive authority to issue dredge and fill permits.[96] In determining whether or not a permit should

87. 42 U.S.C. § 7401(b) (2012).
88. *Id.* § 7470.
89. *See id.* §§ 7411, 7521–7590. For the purposes of this Note, the focus will be on stationary sources, as the facilities undertaking the destruction of chemical weapons are considered as such under the CAA.
90. *Id.* § 7409.
91. *Id.* § 7410.
92. *See id.* § 7411(a)(1).
93. *See* GLICKSMAN, *supra* note 81, at 272.
94. *See* 33 U.S.C. § 1251 (1987).
95. GLICKSMAN, *supra* note 81, at 601.
96. *See* Coeur Alaska, Inc. v. Se. Alaska Conservation Council, 557 U.S. 261, 273–75 (2009).

be issued, the Corps must assess "whether a permit is in the 'public interest.'"[97] Public interest considerations include assessment of important public concerns, such as conservation, fish and wildlife values, land use, recreation, water supply and conservation, water quality, and the needs and welfare of the people.[98] The Corps also considers the public and private need for the project, the practicability of reasonable alternatives, and the extent of the beneficial or detrimental use for the project.[99] Most importantly, the Corps must determine whether or not there are any practicable alternatives to the proposed project.[100] This involves reviewing and evaluating documents and factors concerning the original permit application.[101] In addition, the Corps must consider the overall purpose of the project.[102]

4. RCRA

RCRA concerns hazardous substances, and primarily addresses sources that *may* pollute, but have yet to do so.[103] It "establishes a comprehensive 'cradle-to-grave' system for controlling the generation, transportation, and disposal or treatment of hazardous wastes."[104] Essentially, the EPA is granted the authority to manage and cleanup all solid, hazardous wastes.[105] Under RCRA, "solid" wastes include anything that is a solid, liquid, or gas.[106]

While the EPA has overall authority, states are delegated the power to create their own hazardous waste disposal programs and regulations, "provided that the standards are at least as stringent as Congress's."[107] In order to comply with RCRA on the federal and state level, a permit is required to discard or eliminate any solid hazardous wastes. "Under an ongoing permit system, anyone who generates hazardous wastes must keep detailed records, use and label appropriate containers, and either process the material on-site according to the best available technology, or suitably prepare it for off-site transportation."[108]

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97. GLICKSMAN, *supra* note 81, at 726.
98. 33 C.F.R. § 320.4(a)(1) (2016).
99. Nw. Envtl. Def. Ctr. v. Wood, 947 F. Supp. 1371, 1380 (D. Or. 1996).
100. *See id.*
101. *Id.* at 1377.
102. *Id.*
103. 42 U.S.C. §§ 6901–91 (1984).
104. David A. Koplow, *How Do We Get Rid of These Things?: Dismantling Excess Weapons While Protecting The Environment*, 89 NW. U. L. REV. 445, 501 (1995).
105. *Resource Conservation and Recovery Act (RCRA) Overview*, U.S. EPA (2017), https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview.
106. *Id.*
107. Koplow, *supra* note 104, at 502.
108. *Id.*

B. HOW U.S. ENVIRONMENTAL LAW IS AFFECTED BY THE DIFFERENT DESTRUCTION PROCESSES

With a background understanding of NEPA, the CAA, the CWA, and RCRA, this paper will now focus on how each method of disposal discussed previously implicates domestic environmental law.

1. Ocean Dumping, Burial, and Open-Pit Burning

These environmental laws are all implicated in each of the elimination and destruction processes used by the United States, both past and present.[109] Dumping, burial, and open-pit incineration violate all the laws discussed above. While some of these regulations did not exist nor apply during the period where these methods of destruction were undertaken, if these methods were to be readopted as the preferred process for destruction within the United States, they would violate NEPA, the CAA, the CWA, and RCRA. Under NEPA, an agency is required to consider the environment and any harms federal agency action may have on it. This practice did not occur in the case of chemical weapon disposal. The Army saw ocean dumping, burial, and open-pit burning as the quickest and most cost-effective method of chemical weapons disposal, and did nothing to acquire an EIS or an EA, and continued releasing toxic chemicals into the water and air.

This release not only violated NEPA, but also the CAA. With open pit burning, thousands of tons of chemicals were released into the atmosphere with no safety precautions.[110] As described earlier,[111] burial resulted in leaks, with dangerous chemicals like mustard gas and sarin flowing into the atmosphere. No permit was applied for or acquired in any of these instances.

Dumping chemical weapons into our oceans and rivers without care for the health and safety of the wildlife and communities surrounding the dumping sites violated the CWA. Here too, no permit was acquired, but had it been applied for, it almost certainly would not have been granted. A permit can only be granted if it is in the "public interest." In the public interest analysis, a consideration of conservation, the harmful effects on fish and wildlife in the area, and water supply would likely have prevented any permit from being granted. Also considered are the public and private need for the project, the practicability of reasonable alternatives, and the extent of the beneficial or detrimental use for the project.[112] It is

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109. Although some of these methods of disposal were undertaken before the implementation of the listed environmental laws.

110. *A New Book Links US Military Open-Air Burn Pits with Rare Cancers and Respiratory Diseases*, BUS. INSIDER (Feb. 16, 2016), http://www.businessinsider.com/military-open-air-burn-pits-with-rare-cancers-and-respiratory-diseases-2016-2.

111. Look to Part II, Subsection A for examples of leaks in places like D.C., where arsenic leaked into the air after discovery and unearthing.

112. Nw. Envtl. Def. Ctr. v. Wood, 947 F. Supp. 1371, 1380 (D. Or. 1996).

clear from the fact that the United States quickly moved on from these practices that there is a practicable alternative to essentially throwing deadly chemicals away with very little attention to protocol.

Lastly, the RCRA "cradle-to-grave" process was clearly overlooked through dumping, burial, and burning. The Army did not keep detailed records in their quest to haphazardly dispose of deadly weapons, as is evidenced by the fact that random caches are being found decades after they were buried.[113] Additionally, there was no use and labeling of appropriate containers before they were put ablaze, the best available technology was neither used nor employed, and off-site transportation was never considered.[114]

2. Incineration

Fortunately, the United States has phased out these harmful methods of eliminating chemical weapons in favor of incineration and neutralization. In regard to the former, however, environmental implications are still present. One general environmental issue that applies to all of the federal laws previously discussed is the fact that even if a leak occurs, it is hard to pinpoint where the chemical agent came from, due to the fact that it is in a gaseous state.[115] That alone makes it difficult to prove liability or point to a specific facility violating any environmental law.[116] Any destruction method that makes it easier for polluters to avoid liability and to carry on with environmentally harmful activities should be avoided.

Specifically, under NEPA, because "the operation of the destruction facilities will have enormous and diverse potential environmental consequences," any site that disposes of chemical weapons must take environmental protection into account.[117] Any decision made at a processing plant run by the military must consider environmental values and impacts in their decision-making process.[118] In compliance with NEPA, the Army undertook site specific EISs for each site throughout the United States designated to deal with the destruction of chemical weapons in the late 1980s and early 1990s.[119] However, NEPA also requires that alternative technologies be addressed as well, and here:

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113. Again, look to Part II Subsection A. In D.C. alone, a large stockpile of buried arsenic was stumbled upon during a construction project–evidence to the fact that the Army did not keep detailed records as they were allegedly destroying their cache of chemical weapons. Jaffe, *supra* note 43.

114. *See supra* Part II.A.

115. Williams, *supra* note 54.

116. *Id.*

117. Koplow, *supra* note 104, at 491.

118. Calvert Cliffs' Coordinating Comm'n v. U.S. Atomic Energy Comm'n, 449 F.2d 1109, 1112–15 (D.C. Cir. 1971).

119. Koplow, *supra* note 104, at 491–92. The EISs resulted in the creation of nine plants, instead of the originally conceived two or three sites, due to the desire to keep chemical weapons from being shipped across the country by rail. *See Closing U.S. Chemical Warfare Agent Disposal Facilities*, CENTERS FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/nceh/demil/closing_facilities.htm (last updated May 9, 2016).

> the Army ha[d] not, in these documents or elsewhere, adequately addressed the underlying determination that incineration, rather than any of the other candidate technologies (such as neutralization, bioremediation, and cryofracture), should be the mode of choice . . . This omission is all the more crucial because recently, additional information and analysis have independently surfaced that: (1) challenge the Army's conclusions about the safety, reliability, and effectiveness of the incineration process, and (2) suggest that other candidate technologies may be more promising (and closer to fruition) that the Army had previously determined.[120]

This lack of further investigation into emerging technologies seems to be at odds with the NEPA directive, and thus the incineration process, at least at the plants that practice it, such as those in Tooele, UT, Anniston AL, Umatilla, OR and Pine Bluff, AR.[121]

Incineration also runs the risk of dioxins being released into the environment surrounding the plant.[122] Carbon dioxide and other gaseous elements that result from the incineration process are released through a smokestack,[123] and as a result, the CAA is also implicated. Each site that disposes of chemical weapons must acquire a permit that allows the facility to comply with NAAQS levels.[124] Under these permits, an operator is required to implement the most effective available technologies in order to reduce the amount of pollution released by the source – something that was not done here.[125] Additionally, "when the [CWC] inspectors visit a chemical facility for routine or challenge inspection and demand the taking of samples or the execution of specified chemical operations, those disruptions in the plant's ordinary operations could lead to unanticipated discharges, not covered by the applicable permit."[126] While the Army facilities were able to obtain these permits at the time, if incineration were to be adopted as the preferred method of destruction for the last 10% of the United States weapons cache, permits would need to be reapplied for, and it is likely that they would be denied due to noncompliance with more current NAAQs levels.[127]

One environmental statute that the incineration process does not violate is the CWA. Currently, the "incineration-based model for destroying the CWC arsenal does not generate any liquid wastes that would be governed by CWA standards."[128]

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120. Koplow, *supra* note 104, at 492.
121. *Methods*, *supra* note 46.
122. *Safe Disposal of Chemical Weapons*, CENTERS FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/nceh/demil/articles/safedisposal.htm (last updated May 31, 2013).
123. *Id.*
124. *See* 42 U.S.C. § 7661(a) (1990).
125. *See id.* § 7411(a)(1).
126. Koplow, *supra* note 104, at 500–01.
127. Williams, *supra* note 54.
128. Koplow, *supra* note 104, at 505.

But it does implicate RCRA. Because the chemical agent in chemical weapons is deemed a solid, hazardous substance, in that it is a liquid that could easily harm individuals if they were to come into contact with it, the regulation applies, controlling the generation, transportation, and disposal or treatment of the substance.[129] For each site that undertakes the chemical weapon destruction process, a permit must be acquired, under which, "anyone who generates hazardous wastes must keep detailed records, use and label appropriate containers, and either process the material on-site according to the best available technology, or suitably prepare it for off-site transportation."[130] And because of the lack of research into other best available technologies, the incineration process seems to violate RCRA as well.[131]

3. Neutralization

In regards to general environmental concerns associated with the destruction process, unlike the incineration method, neutralization allows for a more accountable liability scheme.[132] Because the chemical agent is reduced to a liquid or "cake" form, any release is easier to trace back to the offender than if it were in gaseous form.[133] From both a general liability and an environmental standpoint, a method of destruction that creates a greater probability for culpability is preferable over one that creates a lesser one.

NEPA is implicated when neutralizing chemical weapons because similar to the incineration process, any site that uses neutralization to destroy chemical weapons has the capacity to affect the environment. However, the construction of neutralization plants in Colorado and Kentucky triggered a renewed look into the best available technology for chemical weapons destruction. According to the EIS for both facilities, this type of reexamination had not occurred with the dated plants that used incineration.[134] For example, within the impact statement for the Blue Grass site in Kentucky, the EIS noted that the neutralization process was the "marriage of the best science available while incorporating the concerns of the communities and the political realities of the disposal issue."[135] Today, the neutralization process far outstrips the incineration process in regards to the best science available.

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129. *See id.* at 501.

130. *Id.* at 502.

131. It is important to note that the United States has moved away from the incineration process towards the neutralization method for chemical weapons destruction. However, the possible violations of federal environmental laws as discussed above will be important in the analysis undertaken in Part V.

132. Williams, *supra* note 54.

133. *Id.*

134. *See* Calvert Cliffs' Coordinating Comm'n v. U.S. Atomic Energy Comm'n, 449 F.2d 1109, 1112–15 (D.C. Cir. 1971); Williams, *supra* note 54.

135. NAT'L ACAD. OF SCI., ENG'G, AND MED., REVIEW CRITERIA FOR SUCCESSFUL TREATMENT OF HYDROLYSATE AT THE BLUE GRASS CHEMICAL AGENT DESTRUCTION PILOT PLANT, app. A (2015), https://www.nap.edu/read/21771/chapter/11#70.

In addition to complying and posing fewer issues with NEPA, the neutralization process also has no risk of violating the CAA. Unlike the incineration procedure, neutralization does not create any gaseous effluent that must later be released into the atmosphere. Rather, neutralization results only in a liquid solvent that is easier to dispose of and recycle than that left from the incineration process. Further still, in their respective applications for CAA permits for regular operating emissions, all neutralization plants once more stated, per the permit requirement, that the operators were implementing the most effective available technologies to reduce the amount of pollution released by the source.[136]

As for the CWA and RCRA, while the neutralization process runs the risk of leakage in the form of liquid solvent into the nation's water, the fact that the liquid form can be more easily traced back to the original offender than its gaseous counterpart makes for a preferable method of destruction. And this accountability applies perfectly to RCRA's cradle-to-grave requirement – the liquid's traceability ensures that facilities cannot pass the buck if a leak occurs.

IV. WHAT METHOD OF DESTRUCTION IS THE MOST SUITABLE WHEN CONSIDERING UNITED STATES ENVIRONMENTAL LAW?

Because neutralization has the potential to violate fewer environmental laws than incineration, the neutralization process should be the primary method of chemical weapons destruction, barring any emergent new technology that does even less harm to the environment. Of the last two sites that remain open for chemical weapons destruction, neutralization is the preferred method, and it should remain this way. This is further evidenced by the fact that sites that used the incineration process in the past, rather than neutralization, have been fined upwards of $100,000 by the EPA for environmental harms, accidental releases of hazardous chemicals, and mishandling of hazardous materials.[137] Neutralization plants are expected to have far fewer issues.[138] With the introduction of biotreatment to a neutralized chemical agent, there is less harmful waste than from the incineration process: carbon dioxide and ash are not produced, but rather an easily disposable and harmless liquid results. While the neutralization process has the potential to violate the CWA if the resulting liquid is introduced into the waters of the United States, the process is preferable to incineration so long as the liquids are regulated and disposed of properly. Neutralization represents a closed-loop system, in which there is no release of harmful byproducts into the surrounding air or water.

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136. *See* Clean Air Act Air Permit Application from Blue Grass Army Depot to Ky. Dep't for Envtl. Prot. (Sept. 2004), https://www.peoacwa.army.mil/wp-content/uploads/acwa_bgcapp_air_permit_application.pdf.

137. Craig Williams discussed the eighteen releases that were documented. Williams, *supra* note 54.

138. *Id.*

V. WHY DOES IT MATTER?

A. DOMESTICALLY

It would be easy to assume that choosing the best method for disposal is an inconsequential analysis, due to the fact that the United States has already eliminated 90% of its chemical weapons.[139] However, it is predicted to be well over a decade before the United States fully eliminates the remaining 10% of its weapons cache, making the way agencies dispose of this final 10% important.[140] It is important that the United States continue in the final destruction of its chemical weapons cache with the neutralization process, and does not revert back to the incineration method, or even worse, the burial, dumping, or open-pit burning method. An adoption of the neutralization process as the official way to destroy these chemical weapons would be the best way to make sure that the practice of neutralization continues.

Additionally, there is an emerging convergence of biological and chemical disciplines, which has begun to blur the traditional lines between chemical weapons and biological weapons.[141] Essentially, "biological and chemical production methods, once distinct, are converging."[142] There are "biologically mediated methods of chemical production [that] are currently under development" and "chemical methods [being used] to synthesize biological molecules ... from scratch."[143] While the Biological and Toxic Weapons Convention ("BWC") and the CWC require the destruction of both biological and chemical weapons, there are gaps that the two treaties do not cover. For example, protein engineering could allow for the development of novel toxin agents and chemical microprocess devices, which could enable the large-scale production of chemical weapons agents in small, concealable plants, and could be hidden from the view of the CWC.[144] Additionally, while the CWC has verification measures, the BWC has none, "at present, the CWC verification system does not cover facilities that make Treaty-relevant chemicals by biologically mediated processes."[145] As the BWC and the CWC develop to cover these new threats,[146] which will presumably require their destruction or at least their regulation, it is important to establish which destruction method is the best for eliminating these new chemical weapons as they come to fruition in an environmentally friendly and lawful way.

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139. Drew Griffin & Kathleen Johnston, *The United States is Still Getting Rid of its Chemical Weapons*, CNN (Oct. 14, 2013), http://www.cnn.com/2013/10/11/us/u-s-chemical-weapons/.

140. *Id.*

141. Jonathan Tucker, *Growing Together: Biological and Chemical Threats*, SCI. PROGRESS (Feb. 2, 2011), https://scienceprogress.org/2011/02/growing-together/.

142. *Id.*

143. *Id.*

144. *See id.*

145. *Id.*

146. Or possibly the creation of a new Treaty that more holistically covers both, which is not the purpose of this Note.

Similarly, police and state actors have begun to increasingly use riot control agents like tear gas and other chemical agents to break up large crowds, stop protestors, and subdue dissidents. Currently, the CWC permits the use of chemicals for law enforcement, including domestic riot control purposes, but only if they are used in the type and quantity necessary and consistent with these purposes.[147] While most parties to the CWC believe that the use of riot control agents is not allowed, the United States, Russia, and other large powers do not follow this example.

While the states party to the CWC have not formally decided on whether the Treaty covers these agents and uses of chemical weapons, a growing number of states party to the CWC have begun to encourage OPCW to resolve these ambiguities. In 2018, there will be a CWC Review Conference, at which the Organization will review the long-term issues associated with riot control agents and pharmacological weapons.[148] If the states decide that these weapons and this specific use of them is to be banned under the CWC,[149] it is important that the United States adopt the neutralization method in order to eliminate the large amount of these specific agents the country has within its possession.

B. ABROAD/INTERNATIONALLY

Perhaps more topically, the United States must also consider the chemical weapons overseas. As stories of the use of chemical weapons against citizens in places like Syria proliferate throughout the media, there will likely be more of a push for countries like the United States to assist in the destruction of foreign countries' chemical weapons. This is especially true for places like Syria, who have signed the CWC and are thus required to begin the destruction process.[150] In the past, the United States has helped countries like Syria at least attempt to adhere to the CWC by taking some of their chemical weapons and destroying them at sea using the neutralization process.[151] If this practice continues, it is necessary that the United States adopt a formal policy that neutralization be used to destroy these chemical weapons, even abroad, in order to comply with domestic environmental laws.

There is also a theoretical reason behind the United States adopting neutralization as the official method of chemical weapons destruction. The justification

147. Crowley, *supra* note 23.

148. *See* John Hart, *Preparing for the 4th Review Conference of the Chemical Weapons Convention: Some Observations on Process and Outcomes*, CBW MAGAZINE (Jan.–June 2017).

149. States can do this by creating an amendment to the CWC, or even create a new Treaty that would cover RCAs as well as traditional chemical weapons.

150. *See* Scott Shane, *Weren't Syria's Chemical Weapons Destroyed? It's Complicated*, N.Y. TIMES (Apr. 7, 2017), https://www.nytimes.com/2017/04/07/world/middleeast/werent-syrias-chemical-weapons-destroyed-its-complicated.html.

151. Christine Jeavans, *Destroying Syria's Chemical Weapons*, BBC NEWS (July 2, 2014), http://www.bbc.com/news/world-middle-east-25810934.

behind the creation and implementation of the federal laws discussed in this paper are explicitly made: to protect the environment.[152] As other countries seek to destroy their chemical weapons around the world, one could argue that the United States has a moral obligation to encourage other countries to follow its example, and pursue a destruction method that best protects the environment.

CONCLUSION

The threat of chemical weapons is not a thing of the past—it is a very current and real problem the World still faces. In furtherance of the ideological and worthy goal of their elimination, it is important that the United States establish a way of destroying these weapons in a manner that is environmentally conscious, and follows the regulations set forth in order to protect the environment. Neutralization is this process, and the United States should continue to use this process both domestically and abroad, and encourage others do the same.

152. *See* Part III for a more in depth analysis.