DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
US ARMY ENVIRONMENTAL COMMAND
5179 HOADLEY ROAD
ABERDEEN PROVING GROUND, MD 21010-5401

REPLY TO
ATTENTION OF

April 16, 2012

IMAE-CDE

Joseph Gortva
Installation Restoration Manager
IMFD-SOE
Fort Detrick USAG
Environmental Management Office
1546 Porter Street
Frederick MD 21702

Dear Mr. Gortva

The U.S. Army Environmental Command is submitting the Archive Search Report Findings for Field Testing of 2, 4, 5 – T and Other Herbicides at Fort Detrick, Frederick, Maryland. This report was prepared in accordance with the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA) and should be placed in the installation's CERCLA Administrative Record file. There are no restrictions on the release of this document.

Sincerely,

Laurie B. Haines-Eklund
Environmental Restoration Manager
U.S. Army Environmental Command
Cleanup Division

Enclosure

US Army Corps of Engineers

Archives Search Report Findings for Field Testing of 2,4,5-T and Other Herbicides

Fort Detrick

Frederick, MD

4 April 2012

Prepared by
U.S. Army Corps of Engineers St. Louis District

Prepared for
U.S. Army Environmental Command (USAEC)
and
U.S. Army Garrison Fort Detrick

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

ASR Purpose and Scope: In August 2010, based on recent public concerns regarding past testing of Agent Orange at Fort Detrick, the U.S. Army Environmental Command (USAEC) and the U.S. Army Garrison Fort Detrick requested an Archives Search Report (ASR) to document the testing of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (a component of Agent Orange contaminated with dioxin) and related herbicides at Fort Detrick. The archive search was required as these records were not retained at Fort Detrick. In October 2010, the ASR team produced a preliminary findings report based on analyzing a number of previously identified published reports regarding field testing of 2,4,5-T at Fort Detrick. That preliminary findings report was finalized and released to the public in February 2011. Given the desire to respond to public concerns as quickly as possible, the preliminary findings report relied on analyzing readily located reports that had been identified as documenting the Fort Detrick field tests. While this methodology provided a history of those test results that had been published, it did not allow for the review of material at the various elements of the National Archives and Records Administration and a number of other record repositories. In order to provide as thorough an ASR as possible, USAEC and the U.S. Army Garrison Fort Detrick requested a comprehensive archive search to include all available records regarding the testing of 2,4,5-T at Fort Detrick including research regarding broader potential environmental releases that may have occurred on Fort Detrick. That investigation took significantly longer to complete. This ASR documents the findings of a detailed review of documents relating to the field testing of herbicides at Fort Detrick, quantifying the amounts of 2,4,5-T and arsenic related herbicides used and identifying the probable locations where those tests occurred. A companion ASR volume to be published separately will document the findings on the broader potential environmental releases.

Fort Detrick Crops Division Chemical Branch: Herbicides research at Camp Detrick, later Fort Detrick, began during World War II. In April 1944, the Chemical Warfare Service (CWS) gave the Plant Research Branch at Camp Detrick the mission of developing chemical herbicides to destroy or reduce the value of crops. These "Chemical Plant Growth Regulators" or inhibitors were studied under the code letters "LN". Initial work at Camp Detrick involved a series of screening tests conducted inside the laboratory involving seeds, a few plants and minute quantities of organic herbicides. The investigators determined that the halogenated phenoxy acetic acids appeared to be the best suited and more thorough studies began on selected LN herbicides. Of the herbicides tested, LN-8, 2,4-dichlorophenoxyacetic acid (2,4-D) proved the most effective against a wide variety of crops and was used as the common reference material in the plant growth regulating tests. Another herbicide identified during these tests was LN-14 or 2,4,5-T. Later, a 50/50 mix of the n-butyl ester of 2,4-D, also known as (a.k.a.) LN-143 and the n-butyl ester of 2,4,5-T, (a.k.a. LN-974) became known as the military defoliant or herbicide Agent Orange (a.k.a. Agent LNX). By the late 1960s, it became known that the manufacture of 2,4,5-T was contaminated with small amounts of the dioxin 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), and that TCDD was the main

concern related to possible adverse health effects from the use of 2,4,5-T, as well as Agents Orange and Purple which included it.

The Crops Division at Fort Detrick published the results of the 2,4,5-T field work in a series of reports, specifically Special Reports Nos. 79, 92, 105, 130, 153, 156, 201, 234, 256 and 262. Results of field work were also published in Status Report 53-6, Technical Reports 6, 16, 17; Technical Studies 11 and 15; Technical Memoranda 9-24 and 212; and Interim Reports 94 and 140. Unpublished field work was found in laboratory notebooks CD 331, 333, 482, 595, 677, 1775, 2081, 2504, 2886, 3053, 3153, 3155, and 3264.

Summary of Findings: The following findings are based on the details found in the documents reviewed for this ASR:

- From 1944 through 1968, the Chemical Branch of the Crops Division at Camp Detrick conducted small garden field plot experiments with plant growth inhibitors or herbicides.
- The primary objectives of the tests were to ascertain:
    - the most effective herbicide for reducing yield of various crops and causing defoliation of woody plants;
    - the best methods of application, and
    - the effects of the herbicides on plant growth during different stages of development.
- The described field trials on Fort Detrick were small-scale efforts involving test plots typically 6- by 18-feet in size
- Although application rates were frequently expressed in “pounds per acre”, because the field plots were small, the actual amounts applied are expressed in grams (i.e., a dollar bill weighs approximately one gram)
- The herbicides being tested were applied with handheld sprayers or in at least one instance a small bicycle-wheeled cart and for one test, a truck mounted sprayer.
- A movable, light-weight metal-framed shelter with wind resistant cloth was often used to prevent drift of spray onto adjacent test plots, which would have invalidated the test results for those plots,
- There is no indication that large-scale dissemination tests of herbicides involving aerial spraying occurred at Fort Detrick as the installation did not have the space or quantities of the vegetation required to do so. As early as World War II and into the 1950s and 1960s, Fort Detrick personnel did conduct or participate in the larger-scale aerial dissemination spray tests that occurred at locations other than Fort Detrick. These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf.

- Identified test locations of 2,4,5-T and arsenic-related herbicides on Fort Detrick were at or near Fields A, B, C, D, E and F, which consisted of small, garden plots of varied crops (see figure below). These areas also were referred to as the "Garden Area" or "Garden Plot". Other reported locations included Fields 11 and 13, the Nallin Farm Rice Paddy, and Area B (Also referred to as the Grid Area) or the non-specific "Garden Area" or "Garden Plot". Other test locations, which comprised approximately 5 percent of the total amounts tested, could not be specifically located from field test reports.

Likely locations for Fields A to F and other Field Plots through 1970 – Aerial Imagery 28 February 2008

- Records indicate that in 1955-56, the Crops Division acquired approximately two hundred 55-gallon drums of herbicides, apparently Air Force surplus of 2,4-D and 2,4,5-T, storing them outdoors at Fort Detrick. The Crops Division intended to use the material for dissemination trials at other non-Fort Detrick locations. In 1959, the Crops Division transferred the remaining stock to the U.S. Department of Agriculture. There are no other records of bulk herbicide storage at Fort Detrick. As previously reported in a 1977 Installation Assessment, Fort Detrick buried at least 4.18 drums and 100 pounds of 2,4,5-T related herbicides in a Fort Detrick disposal area (i.e. Pit 14, Area B) from 1965 to 1971. Fort Detrick partially capped Pit 14 in 1990 with the construction of a modern permitted, lined municipal landfill. The remaining area was covered with an impermeable cap in

2010. All groundwater testing to date indicates this herbicide disposal has not resulted in a groundwater contamination concern on or off post.

Total Estimated Amounts Tested at Fort Detrick: Although the records kept on herbicide use at Fort Detrick were not intended to report the amounts of herbicides disseminated during the field tests, these can generally be calculated based on the information provided and are detailed in Sections 5 and 6 of this ASR. Based on all existing records, it is estimated that the total amount of the 2,4,5-T related herbicides applied during field tests at Fort Detrick between 1944 and 1968 was approximately 9,870 grams (21.7 pounds). This is an increase from the estimate based on data from the preliminary reports (7,630 grams or 16.8 lbs). To place this amount in some context amongst general use of 2,4,5-T in the United States at the time, the U.S. Department of Agriculture reported the farm use rates of 2,4,5-T herbicides in 1969 averaged from 0.24 to 2 lbs per acres with a total farm use average of 0.48 lbs per acres (ex.: 100 acres farm would use 48 lbs in one year alone). The total amount of arsenic-related herbicides applied in field tests at Fort Detrick was approximately 5,690 grams (12.5 pounds). Although historical information is available on the testing of other herbicides, the ASR only calculated and reported amounts for 2,4,5-T and arsenic based herbicides, as they were ones specifically identified as being of primary environmental interest.

The actual amount of these herbicides tested could differ as a result of undocumented test data. While the ASR investigation team believes all applicable published reports have been located, laboratory notebooks found during the expanded archive search included experimental data not included in the published reports, and not all of the issued Crops Division notebooks are available. It is possible additional unpublished tests were documented in the unavailable notebooks; however, potential unconfirmed amounts would not be expected to be significantly different than those found in other records or substantially change the total amount of herbicides used.

1 INTRODUCTION

1.1 REPORT AUTHORIZATION

On 18 August 2010, the U.S. Army Environmental Command (USAEC) tasked the Ordnance and Technical Services Branch of the St. Louis District of the U.S. Army Corps of Engineers (CEMVS-EC-P) to provide research and analysis assistance regarding Fort Detrick, which will be documented in an Archives Search Report (ASR). The assignment included completion of a report regarding the field testing of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (a component of Agent Orange contaminated with dioxin) and related herbicides at Fort Detrick as quickly as possible. The archive search was required as these records were not retained at Fort Detrick. CEMVS-EC-P completed a Preliminary Archives Search Report Findings for Use / Testing of 2,4,5-T Compounds on 27 October 2010, and finalized it in February 2011 for release publically (see section 1.4.5). This current report supersedes those preliminary findings based on a review of additional documents located during a more extensive archival search and revision to the previous calculations regarding 2,4,5-T field testing at Fort Detrick as applicable. It also examines the field testing of other herbicides at Fort Detrick, including in particular arsenic based ones.

1.2 SUBJECT

Research with herbicides at Camp Detrick, later Fort Detrick, began during World War II. . In April 1944, the Chemical Warfare Service (CWS) gave the Plant Research Branch at Camp Detrick the mission of developing chemical compounds to destroy or reduce the value of crops. These "Chemical Plant Growth Regulators" or inhibitors were studied under the code letters "LN". Initial work at Camp Detrick involved a series of screening tests in the laboratory involving seeds, a few plants and minute quantities of synthetic organic compounds to determine the ones best suited for military purposes. They determined that the halogenated phenoxy acetic acids appeared to be the best suited and began studying selected LN compounds more thoroughly. Of the compounds tested, agent LN-8, 2,4-dichlorophenoxyacetic acid (2,4-D) proved the most effective against a wide variety of crops and was used as the common reference material in the plant growth regulating tests. Another compound was LN-14, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). Later, a 50/50 mix of the n-butyl ester of 2,4-D, also known as (a.k.a. LN-143) and the n-butyl ester of 2,4,5-T, (a.k.a. LN-974) became the military defoliant or herbicide Agent Orange (a.k.a. Agent LNX). By the late 1960s, it became known that the manufacture of 2,4,5-T was contaminated with small amounts of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), a dioxin and that TCDD was the main concern of the possible adverse health effects from the use of the herbicide and Agent Orange and Purple. TCDD formed in the manufacture of 2,4,5-trichlorophenol, a precursor in production of 2,4,5-T.[1] In April 1970, the US Department of Agriculture (USDA) announced the suspension of certain uses of 2,4,5-T and subsequently the Department of Defense suspended the use of Orange as well. In July 1974, the Army transferred the

Vegetation Control Division (i.e. chemical or herbicide group), to the USDA. The USDA remains an active presence on Fort Detrick as a tenant as the Agricultural Research Service (ARS), Foreign Disease - Weed Science Research Unit.

1.3 PURPOSE

This ASR compiles information obtained through historical research at various archives and records holding facilities. The investigation was primarily a textual, cartographic and photographic research and analysis effort. It also makes use of interviews with individuals associated with the property and its operations. No sampling or quantitative field assessment techniques were conducted to gather data. The research directed efforts towards determining potential presence of herbicides as a result of previous field testing of 2,4,5-T and other herbicides. The research places emphasis on establishing the types, quantities and locations of those activities. This process obtains information for use in developing recommendations for further action at Fort Detrick.

1.4 SCOPE

For this report, the ASR investigation team focused on field testing of 2,4,5-T and other herbicides on Fort Detrick. This report presents the following:

- A brief history of the Camp/Fort Detrick Crops Division, Chemical Branch, which becomes the Plant Sciences Laboratories, Plant Physiology Division
- A brief history of the Fort Detrick real estate and land use
- A review of herbicide related documents and previous related investigations
- Detailed review of the reports and documents relating to 2,4,5-T and arsenic based herbicide testing at Camp/Fort Detrick to determine quantities tested. Although historical information is available on the other herbicides tested, quantities were calculated and reported for only the 2,4,5-T and arsenic based herbicides as they were ones specifically identified of primary environmental interest.
- Discussion of the acquisition, storage, equipment handling and cleaning, disposal of any excess material and non-testing use of herbicides in facility maintenance at Fort Detrick
- Conclusions of the amounts and locations of 2,4,5-T and other herbicides field testing at Fort Detrick

Appendix A includes a detailed example of calculations involved with determining the amounts used based on available documentation. A description of the sources researched and a detailed listing of records reviewed are presented in Appendix B. A bibliography of the textual references is contained in Appendix C. Appendix D includes a summary table of the identified herbicides and defoliants field tested at Fort Detrick and a table of the all the herbicides tested, sorted by year, tests description, and herbicide code.

Concurrent to the research on herbicides documented in this ASR, research regarding broader potential environmental releases on Fort Detrick was also conducted and will be reported in a separate companion ASR volume. Community concerns relating to herbicides testing pressed for earlier release of this information prior to completion of the broader report. While complimentary, both ASRs are separate stand alone reports.

2 HISTORY OF FORT DETRICK CROPS DIVISION, CHEMICAL BRANCH

2.1 Crops Division, 1943-1945

The Chemical Warfare Service activated Camp Detrick in April 1943 and six months later in October, what would become the Crops or C Division was established to conduct anticrop research, development and engineering. Preliminary work on anticrop agents began in fall 1943 at Detrick and various agricultural research facilities around the country. Preliminary work consisted of planning and literature searches as it was not until early 1944, that a 12- by 25- foot laboratory facility became available for this work in Building 201. Crops Division also had "a 5 acre test field located near the present parking lot near Building 350". The limited facilities caused the researchers to work in two eight hour shifts until August 1944 when the Crops Division moved across the street into Buildings 321, with a pilot plant being housed in Building 325 to develop sufficient quantities of anticrop pathogens for laboratory and field testing use.[2]

The Crops Division work was divided into two branches working on anticrop agents: Biological and Chemical. The Biological Branch focused on investigating plant pathogens and the Chemical Branch investigated plant growth inhibitors or regulators, essentially herbicides. The Biological Branch investigated various plant pathogens, such as potato blight, wheat stem rust and rice blast. As these are not chemical herbicides, the work of that side of the Crops Division is generally not included in this history.

In April 1944, the CWS activated at Camp Detrick the mission of developing chemical compounds to destroy or reduce the value of crops. These Chemical Plant Growth Regulators or inhibitors were studied under the code letters "LN". During the war period, Camp Detrick examined and tested a total of 1,058 chemical compounds, with all but 226 of the compounds being prepared at Camp Detrick. The initial screening tests consisted of a series of laboratory and greenhouse tests involving seeds, a few plants and minute quantities of the synthetic organic compounds to determine the compounds best suited for military purposes. The second investigative phase consisted of small field plots or "garden plots" experiments with the most promising compounds and the third phase consisting of larger scale dissemination field trials with operational munitions or equipment (sprays). The researchers determined that the halogenated phenoxy acetic acids appeared to be the best and of the compounds tested, only a few were studied in depth including:

- LN-8 2,4-dichlorophenoxyacetic acid (2,4-D)
- LN-14 2,4,5-trichlorophenoxyacetic acid (2,4,5-T)[3]

Of the compounds tested, 2,4-D proved the most effective against a wide variety of crops and was used as the common reference material in the plant growth regulating tests. 2,4-D was also produced in bulk for the CWS under contract (Dow Chemical Corporation

and Sherwin-Williams Company) during the war. The bulk form of LN-8 came in three forms referenced as VK or Vegetable Killer:

- VKA Acid technical grade of LN-8
- VKL Liquid LN-8 in tributyl phosphate and oil
- VKS ammonium Salt of LN-8[4]

Dissemination and larger scale field testing of the VK varieties occurred at locations other than Detrick, including Bushnell, FL, the Granite Peak Installation of Dugway Proving Ground, UT, Terre Haute, IN and Beaumont, TX[i].

The purpose of the plant growth regulator effort differed from the chemical defoliant effort by the Crops Division Chemical Branch. The defoliant investigations were to determine chemical compounds for use in "marking, defoliating or increasing the flammability of forest vegetation". The Crops Division researchers designated the chemicals being investigated for defoliants as "D" agents as opposed to the LN agents for plant growth regulators. Although the compound might be the same substance, Crops Division assigned them different investigations numbers based on the investigation purpose, further indication the separation between the two efforts. For example, compound D-8 was benzoyl isothiocyanate, as opposed to LN-8, which is 2,4-D (similarly, anti-fungi laboratory investigations gave 2,4-D and 2,4,5-T numbers 71 & 72).[5] The scope of defoliant work during WWII was very limited in nature and generally did not include the LN agents, which would be used as defoliants in the decades that followed. During WWII, the Crops Division determined that ammonium thiocyanate and zinc chloride worked the best for defoliation purposes. Field trials of the WWII era defoliants dispersed aerially occurred at several known Formerly Used Defense Sites (FUDS) locations in Florida and at Fort Knox, KY but not at Fort Detrick.[6]

2.2 Crops Division – Chemical Branch, 1946-1958

Following the end of WWII, the Detrick researchers published much of the plant growth regulators information resulting in a revolution in weed control practice throughout the world. The commercial company Amchem first registered 2,4,5-T in March 1948, with Dow Chemical obtaining Federal registration a few months later in June. By 1951, four US companies were a source for 2,4,5-T.[7] In the years following the war, Crops Division continued screening additional compounds as potential LN agents for their inhibitory responses in plants in the laboratory and greenhouse investigations, following up with field plot experiments of the most promising plant growth inhibitors. This work was conducted with various agricultural research facilities around the country.[8] On Detrick,

[i] These locations, as well as other non-Fort Detrick test locations, have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

researchers conducted small field experiments to study the effects of: varying volume-concentration of the spray; varying size of spray droplets or particle size; effect of the compound on varying stages of plant development; comparisons of various aqueous and non-aqueous solutions; persistence in soil; agent comparison on various types of plants, among other effects. The Detrick field trials were small scale tests using hand held sprayers to apply the compound with a movable light weight metal framed chamber to prevent drift of spray or dust to adjacent plots and distorting the results on those plots. These experiments built on previous findings and the results were published in separate Detrick Special Reports through the 1951 growing season.[9] Tests results were frequently based on quantifying the variations in crops yields as a result of the application of the differing types or amounts of the plant growth regulators applied. In at least one instance, an experiment was ruined by employees caught picking lima beans in one of the garden plots, thus invalidating any crop yield determinations.[10]

In the late 1940s, researchers used radioactive tracers as part of their investigations of 2,4-D in a laboratory environment. Tests involved the effects of 2,4-D on plant uptake of Rubidium 86[11] and other tests used Carbon 14 labeled 2,4-D in investigations of how plants took up and distributed 2,4-D. These tests were conducted in Bldg T-321, the Crops Division Laboratory, but there is no evidence that these radioactive labeled chemicals were ever used in field tests.[12]

Between 1946 and 1952, Fort Detrick added approximately 660 acres to Area A or the main post portion of the installation beyond the WWII footprint of approximately 142 acres. On 23 July 1946, Detrick secured use of 80.71 acres, and added another 77.33 acres on 20 March 1947 both on the north side of the WWII post boundary.[13] In October 1952, Detrick expanded to the east between the former West 7th Street (current Ditto Ave) and Opossumtown Pike, acquiring seven tracts totaling 502.76 acres.[14] The purpose of these expansions was primarily for space to conduct crop research. As such the Crops Division had much larger areas available to conduct field trials on the post by the early 1950s, however by 1956, Detrick considered leasing out unused portions of the post for agricultural to reduce maintenance costs and gain funds and would do so over the next few decades (see additional details regarding the out leases in Section 3).

Beginning in spring 1951, Detrick researchers began aircraft dissemination (spray) trials at Avon Park, FL[ii] with undiluted agent in cooperation with the Air Force. These spray trials continued in the fall using undiluted technical grade of LN-143 butyl 2,4-dichlorophonoxyacetate and LN-974, butyl 2,4,5-trichlorophenoxyacetate separately (not as a mixture). In November-December 1952, the Crops Division conducted further aerial

[ii] This location has been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf.

spray tests at Eglin Air Force Base, FL[iii] using "a mixture of equal proportions of butyl 2,4-dichlorophenoxyacetate and butyl 2,4,5-trichlorophenoxyacetate." The 50-50 mixture of these two agents would later be called Agent Orange. These dissemination studies led to the design by the Air Force of the "Hourglass" large capacity spray system. The Crops Division led additional aerial spray tests in July 1953 near Bozeman, Montana using a 3:1 mixture of butyl 2,4-D and butyl 2,4,5-T and other compounds using a spray system with similar performance characteristics but in miniature because of the limited supply of agents.[15] Additional spray tests with jet aircraft occurred at Avon Park in 1954.[16] It would be a several years before additional aerial spray trials of LN agents were conducted. Concurrent to the dissemination trials, in March 1953, the Chemical Corps classified LNA (butyl 2,4-dichlorophenoxyacetate) and LNB (butyl 2,4,5-trichlorophenoxyacetate) as standard types of chemical anticrop agents with procurement specifications being developed subsequently.[17]

In the early-mid 1950s, the Crops Division began work with fluorophenoxy herbicides which proved more effective with cereal grains than LNA and LNB. In March 1958, the Chemical Corps standardized the compound butyl 2-chloro-4-fluorophenoxyacetate as anticrop agent KF or LNF, as it was ten times more effective in reducing rice yields than LNA and LNB.[18]

Work on defoliation and related target marking remained inactive from 1948 to 1954.[19] In June 1954, Detrick researchers once again began investigations regarding defoliants for target marking. These studies included field studies on Detrick with potential compounds being spread by a man-operated hand cart sprayer. The chemicals used did not include the standardized phenoxy compounds 2,4-D and 2,4,5-T but rather other compounds. Detrick researchers lead additional field defoliation investigations at Fort Ritchie[iv] and Avon Park in 1954 and 1955, though only the Florida trials included use of a mixture of butyl 2,4-D and 2,4,5-T as a mix, and 2,4,5-T alone, and these agents were not cited as most effective for defoliation. The Florida tests were aerial dissemination trials and the Ritchie trials were small scale studies with investigators using handheld sprayers applying herbicides to individual trees. The proximity of the U.S. Army controlled Fort Ritchie provided a ready source of additional trees beyond the limited supply and variety of those present at Fort Detrick.[20]

Prior to February 1956 and the completion of Building 1301 and the assorted new greenhouses, the Crops Division was located in building T-321 but also had offices and laboratories scattered in T-106, T-107, T-201, T-322, T-325 T-374 along with the greenhouses in buildings 318, 319, 323 and 324. The new facilities addressed the

[iii] This location has been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf.
[iv] This location has been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf.

overcrowding issue but the Crops Division retained use of T-321 and the old greenhouses from the WWII era.[21]

In 1955, Continental Army Command (CONARC) established the requirement for a chemical defoliant to "…rapidly clear vegetation in tactical situations…for clearing fields of fire, destroying enemy concealment, exposing enemy fortifications and installations to air and ground observations and marking targets" with the development being assigned to Detrick.[22] In January 1957, the Chemical Corps formally established a requirement for a rapid acting chemical defoliant, though a specific compound was not specified, only the desired military characteristics.[23] In support of this, the Crops Division conducted additional defoliation and desiccation experiments at Fort Detrick and Fort Ritchie in 1956 through 1957 using hand held sprayers to apply a variety of herbicides on small trees of various types (2,4,5-T or arsenic-related herbicides were not included in these tests at Detrick).[24]

In January 1957, the Army Research and Development Program determined that the Army did not have funds to carry on anticrop warfare in FY1958 and the Chemical Corps phased out the program by the end of 1957. On 31 December 1957, the Army terminated the research and development program of the Crops Division and the staff was reduced from 118 professionals to eight professionals and three non-professionals to complete the report work and carry on token research. The anticrop research and development program was reactivated by October 1958 and the Crops Division was reinstated in September 1959, though it took several years to staff back up.[25] The anticrop program reestablishment appears to have been completed in part due to CONARC's continued requirement for defoliants for military use.[26]

At approximately the same time, use of 2,4,5-T as a general herbicide in the government occurs with the Federal Government developing Federal Specification for 2,4-D and 2,4,5-T in 55-gallon drums and listed under Federal Stock Numbers (FSN). In February 1959, the Chemical Corps Technical Committee approved use of 2,4,-D and 2,4,5-T as herbicides for distribution in five gallon cans as an expendable supply item to be available to all users as appropriate. These items were meant for use by facility engineers as an herbicide for grounds keeping (i.e. brush and weed control) and not for operational or tactical use. The Federal Specification for 2,4,5-T differed from the military specifications for LNB.[27] As standardized items, the government's supply and logistics organizations and its various supply depots would handle acquisition, storage and distribution of the material, as that was not part of Fort Detrick's research and development mission.

2.3 Crops Division – Chemical Branch, 1959-1967

Although the research funding had not yet been restored, in the summer of 1959, Detrick provided technical assistance in aerially disseminating undiluted LNA and LNB (i.e.

what would later be called Agent Orange) by helicopter at Camp (Fort) Drum[v] to control vegetation on an artillery impact area. This has been cited as the first extensive aerial application of chemicals for defoliation of forest vegetation.[28]

A couple years later, under the direction of the Department of Defense Advanced Research Projects Agency (ARPA, currently renamed DARPA), Detrick researchers conducted a series of developmental aerial spray trials in South Vietnam and elsewhere in southeast Asia[vi]. The first trials beginning in November 1961 used a variety of mixtures of 2,4-D and 2,4,5-T, including commercial herbicides that contained 2,4-D and 2,4,5-T (e.g. Dinoxol and Trinoxol). This test series first provided color code names to herbicide mixtures: Purple (50% n-butyl 2,4-D, 30% n-butyl 2,4,5-T & 20% iso-butyl 2,4,5-T), Pink (60% n-butyl 2,4,5-T & 40% iso-butyl 2,4,5-T), Green (100% n-butyl 2,4,5-T) and Blue (65% cacodylic acid). There was no Orange in that test series. It is uncertain when the term "Orange" is first used, however, by July 1963 field tests with a mixture called "Orange" occurred at Fort Ritchie, though the mixture had been field tested in the past.[29] This research supported the deployment of the herbicides in combat operations in Vietnam beginning in January 1962 under the Air Force Operation RANCH HAND.[30]. The following years would see an increase in Detrick investigations to meet the ARPA defoliation needs.

Preliminary screening of potential chemicals for herbicidal activities continued in 1962, with those showing defoliation or desiccation activity being placed in the defoliant screening program.[31] In July 1963, Fort Detrick hosted the First Defoliation Conference which brought government researchers together with academic and commercial researchers to discuss the state of defoliation for military purposes and exchange ideas relating to the problems. Concurrently, Crops Division conducted field screening defoliation tests on trees at Fort Ritchie and Fort Meade[vii] and those efforts were discussed at the conference. That fall, the Crops Division established a tree nursery on Detrick consisting of 8,000 trees from 18 species. In 1964 and 1965, Detrick held two additional defoliation conferences, where additional field screening tests at Fort Meade and those in Georgia and Tennessee along transmission right of ways[viii] were discussed. [32]

The mid-1960s also saw the Crops Division establishing contracts with the principal agricultural chemical companies for synthesis of new compounds and analogues of known herbicides and defoliants. Thousands of new compounds went through

[v] This location has been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf
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[vii] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf
[viii] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

preliminary screenings, with comprehensive field testing and evaluation of the promising ones. As before, the preliminary screening in the laboratory and greenhouses continued at Detrick but the field dissemination trials occurred at other locations within the United States. These field dissemination spray tests primarily occurred at military installations (e.g. Eglin Air Force Base, Aberdeen and Dugway Proving Grounds, Fort Gordon and Camp Chaffee[ix]) but also at US Department of Agriculture (USDA) or state agricultural experiment stations. Testing occurred at OCONUS (Outside Continental United States) locations as well, in cooperation with other countries (e.g. Base Gagetown in Canada and Pranburi Military Reservation in Thailand[x]).[33]

In July 1963, the Chemical Corps developed military specifications for 55-gallon drums of both n-butyl 2,4-dichlorophonoxyacetate (LNA) and n-Butyl 2,4,5-trichlorophenoxyacetate (LNB). The specification for LNB included the caveat that the 2,4,5-T not be diverted to domestic use (i.e. not for grounds keeping maintenance on installations) citing that the use Federal Specification O-H-210 be used for that purpose as would subsequent revisions of the specification. On 30 December 1965, the formal specification for Defoliant, LNX (i.e. Orange) (MIL-D-51239) was established. The specifications were revised later in the 1960s and also included specifications for Orange II (50% n-butyl 2,4-D and 50% isooctyl ester of 2,4,5-T) and Orange III (66.6% n-butyl 2,4-D and 33.3% n-butyl 2,4,5-T) (see Section 7 for further discussion regarding acquisition).[34]

During this period, another ARPA program involved the development of an anticrop weapon system of bomblet cluster assemblies for aerial delivery. Testing of the E138 bomblet and the associated E155 & E156 clusters occurred at Detrick using simulants. Tests with the herbicide fill, Purple in this case, occurred in the Edgewood section of Aberdeen Proving Ground, MD in 1963[xi].[35]

2.4 Plant Sciences Laboratories and Vegetation Control Division, 1967-1974

In October 1967, the Crops Division became the Plant Sciences Laboratories, with the Chemical Branch becoming the Plant Physiology Division and the Biological Branch becoming the Plant Pathology Division. Although the name changed, it did not affect the mission or nature of the work being conducted relating to chemical anticrop agents. The preliminary screening, greenhouse and small garden plot field work continued at Detrick. The field tests, consisting primarily of aerial dissemination trials, occurred elsewhere.

[ix] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf
[x] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf
[xi] This location has not been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

One non-aerial spray test did occur at Fort Detrick in 1968 . The test included investigating the lateral and vertical movement of four herbicides through soil as applied with a hand-held sprayer, including Orange and was conducted in the Area B portion of Fort Detrick.[36]

What did affect the program was the growing controversy over the US application of chemical herbicides in Vietnam, as the North Vietnamese accused the US of using Chemical Warfare and Biological Warfare weapons. This and other factors lead to increasing international pressures including the United Nations acceptance of a report urging a halt to production, development, and stockpiling of BW and CW agents in July 1969. At the same time, increasing Congressional interest and a pull back of the Army activities relating to BW culminated with President Richard Nixon's announcement of a major shift in US policy relating to CW and BW on 25 November 1969, which was made at Fort Detrick. In regard to CW, President Nixon renounced the first use of lethal and incapacitating chemicals. Relating to BW, President Nixon renounced the use of lethal biological agents and weapons and all other methods of BW, directing the DoD to dispose of existing BW weapons. He further directed that the US would confine its BW research to defensive measures, such as immunization and safety measures.[37] The statement left out discussing the use of chemical herbicides but that did not last much longer.

In April 1970, the Secretaries of Agriculture; Health, Education and Welfare, and the Interior jointly announced the suspension of certain uses of 2,4,5-T based on the concerns of the health effects of a contaminant in the manufacture of 2,4,5-T, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Subsequently, the Department of Defense suspended the use of Orange.[38]

As a result of the 1969 BW policy change, Fort Detrick entered a period of demilitarization, downsizing and reorganization in the early 1970s. The reorganization included the splitting of the U.S. Army Garrison, Fort Detrick and the U.S. Army Biological Defense Research Laboratory (USABDRL) into two separate entities in September 1971. The garrison served as a facilities manager or landlord for the USABDRL, which was a tenant organization among a growing group of tenant entities from different organizations. Prior to that, referencing Fort Detrick was essentially synonymous with the organization operating there: Chemical Corps or U.S. Army Biological Laboratories, U.S. Army Biological Warfare Laboratories and variations of the names of these organizations. Another element of the reorganization occurred earlier in March 1971 when the Army transferred the Plant Pathology Division (i.e. biological anticrop group) to the USDA, including facilities, buildings and personnel. The Army transferred the Plant Physiology Division, renamed as the Vegetation Control Division (i.e. chemical or herbicide group) to the USDA later in July 1974, including additional land and facilities. After that, the USDA had a total of $\pm$189 acres permitted of unimproved land at Fort Detrick for field studies.[39]

2.5 USDA Agricultural Research Service (ARS), 1974-2011

The USDA Agricultural Research Service (ARS) Northeastern Region operated the facilities at Fort Detrick as the Weed Physiology & Growth Regulator Research unit. The agricultural research activities essentially continued the previous efforts with no significant ecological change or impact. The need for the additional unimproved land lessened and in 1996 the Army reduced the permitted amount to 18 acres, a tenth of what it was previously. The plant pathogen laboratory and greenhouse containment facilities remain in use by the USDA ARS as part of the Foreign Disease - Weed Science Research Unit. The Foreign Disease - Weed Science Research Unit has two distinct missions:

- "develop techniques for the rapid detection and identification of new and emerging crop pathogens"
- "collect foreign pathogens overseas from weeds in their native habitat, and to evaluate, characterize and release the pathogens in the U.S. for biological control of introduced weeds, leading to improved, sustainable weed control practices in agricultural systems with reduced dependence on chemical herbicides".[40]

3 FORT DETRICK REAL ESTATE HISTORY

3.1.1 General

Fort Detrick consists of a total of 1,153.13 acres of real estate but it started out as a much smaller facility. On 9 October 1940, the Army Air Forces acquired use of the Frederick Municipal Airport, Detrick Field, by lease (W-977-ENG-1288) with the City of Frederick for use as an airfield. Prior to this Maryland National Guard had leased the property for two weeks each year to train the 104th Aero Squadron. The 1940 lease included 92.364 acres. On 9 March 1943, the Chemical Warfare Service acquired use of the airfield for construction of Camp Detrick. On 17 December 1943, Secretary of War Stimson authorized acquisition of 145.334 acres. This included the airfield land and another 52.97 acres (Robert Bright Estate) acquired through a condemnation Declaration of Taking proceedings (Civil 2125) filed on 24 April 1944. The City deeded the airfield to the War Department on 12 April 1944, though based on a survey at time the area was reduced to only 89.65 acres.[41]

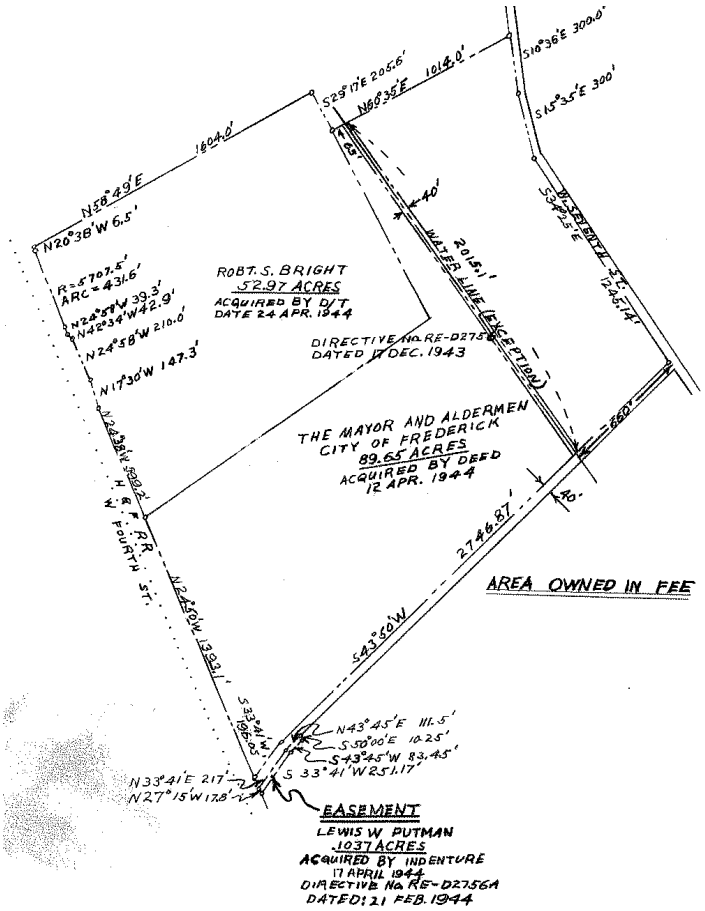


Figure 1 –*Real Estate Map – Camp Detrick - Owned in Fee in WWII*[42]

On 27 December 1943, the War Department authorized additional acquisition nearby for use as a proofing grounds (i.e. Grid Area or Area B) and the six parcels were under lease

within a week (1 January 1944) totaling approximately 398.23 acres. In May 1946, a real estate directive authorized permanent acquisition of this land including the constructed improvements. The deeds for the proofing grounds were executed in late 1946.[43]

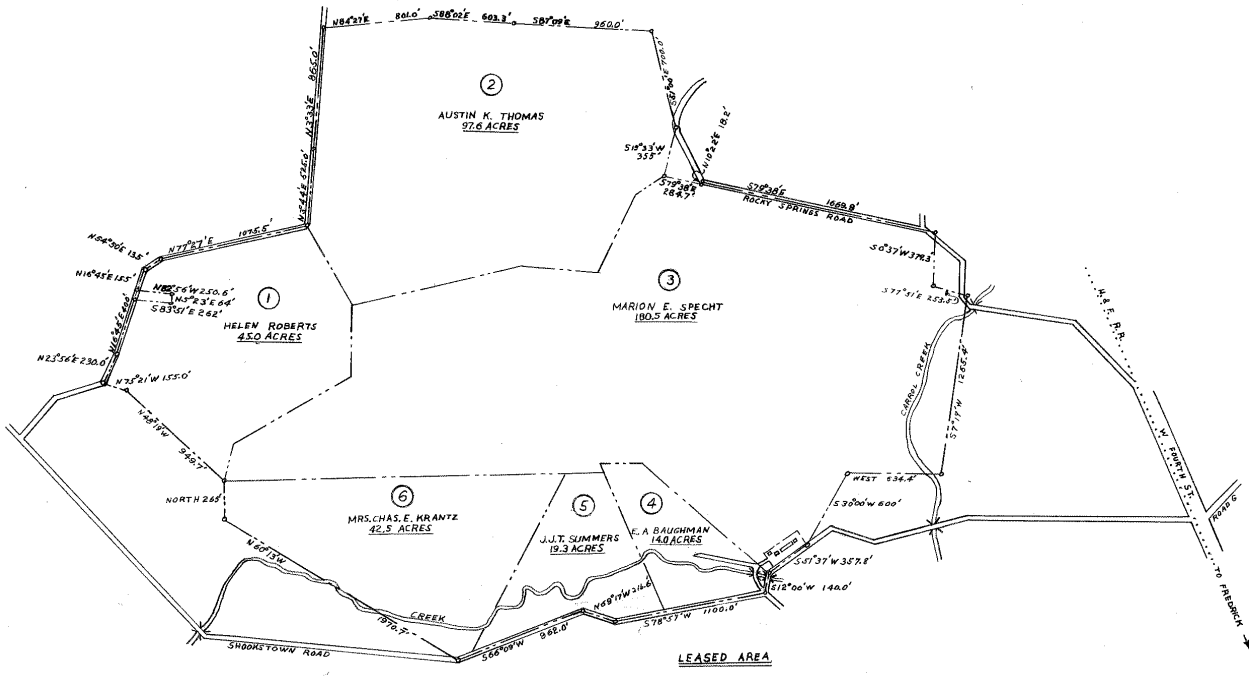


Figure 2 – *Real Estate Map – Camp Detrick Grid Area (Area B) - Leased in WWII*[44]

Detrick acquired also land in WWII for sewer and water facilities a couple miles to the east at the Monocacy River, including 4.84 and 7.31 acres respectively, acquired by deed on 1 December 1944. Detrick also secured various utility easements, permits and licenses for electric, sewer and water lines to the main camp. In December 1960, Detrick acquired an additional 4.02 acres around the sewage disposal plant to eliminate an encroachment of that land.[45]

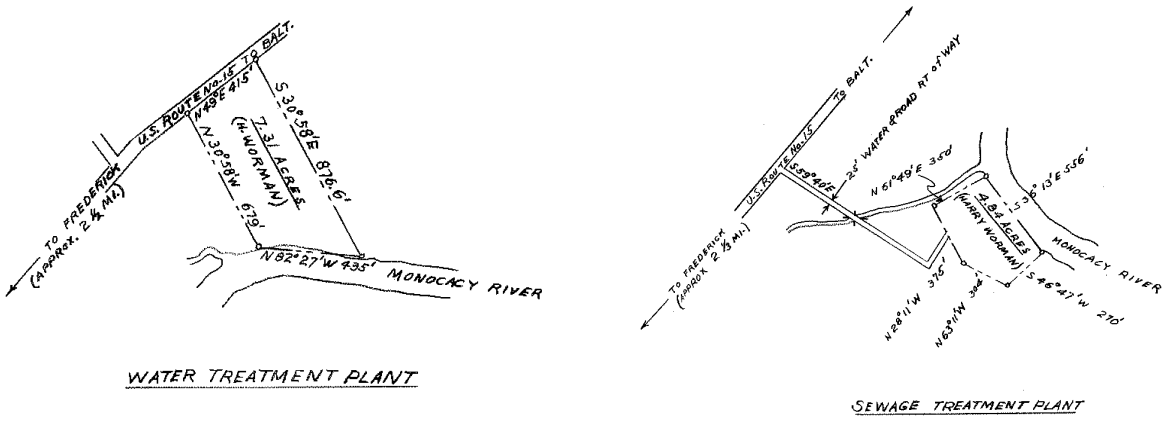


Figure 3 – *Real Estate Map – Camp Detrick Monocacy Sewer and Water Facilities – Owned in Fee in WWII*[46]

Following the war, Real Estate Directive RE-D-4547 authorized an additional 80+ acres of land to the north of the WWII Camp Detrick primarily to conduct crop research. Condemnation proceedings (Civil 3123) filed on 23 July 1946 secured use of three tracts totaling 80.71 acres, later acquired in fee. Detrick acquired another tract to the north the following year consisting of 77.33 acres by condemnation proceedings (Civil 3505) filed on 20 March 1947.[47]

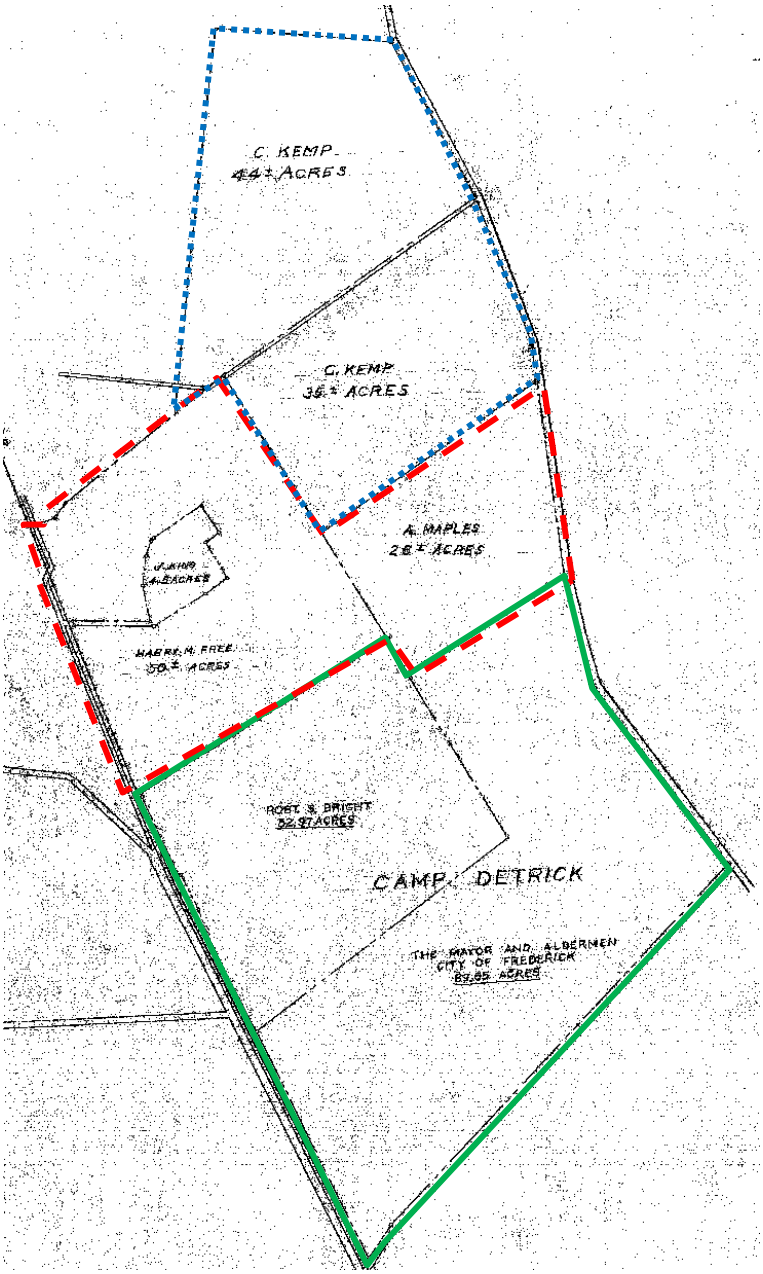


Figure 4 – *Real Estate Map – Camp Detrick 1946 & 1947 additions*[48]
Note: ***Green Polygon*** *– WWII Boundary of Camp Detrick,* ***Red Dashed Polygon*** *– July 1946 Addition and* ***Blue Dotted Polygon*** *– March 1947 Addition*

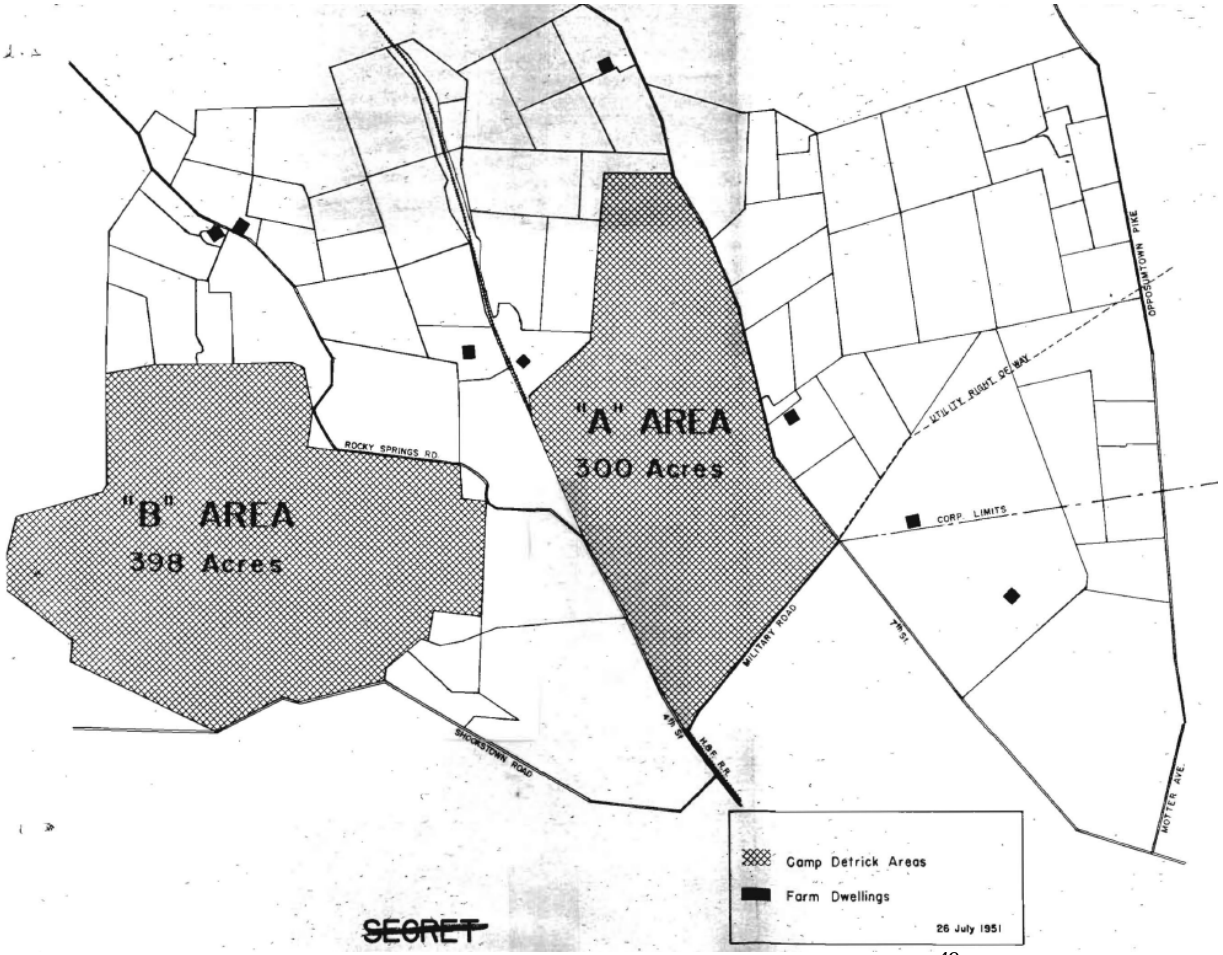


Figure 5 – *Areas A & B - Camp Detrick July 1951*[49]

By August 1951, Detrick identified over five hundred acres to the east of installation, between the former West 7th Street (current Ditto Ave) and Opossumtown Pike for expansion. The expansion was authorized on 14 January 1952 and acquired in fee by condemnation proceedings (Civil 6131) filed on 8 October 1952, or by deed at the same time. The expansion included seven tracts totaling 502.76 acres and is referred on contemporary documents as Area "C" for the next few decades. This original Area “C” designation should not be confused with the current Area C designation which refers jointly to the non-contiguous Water Treatment Plant and the Wastewater Treatment Plant for Fort Detrick along the Monocracy River that have been part of the installation since WWII.[50]

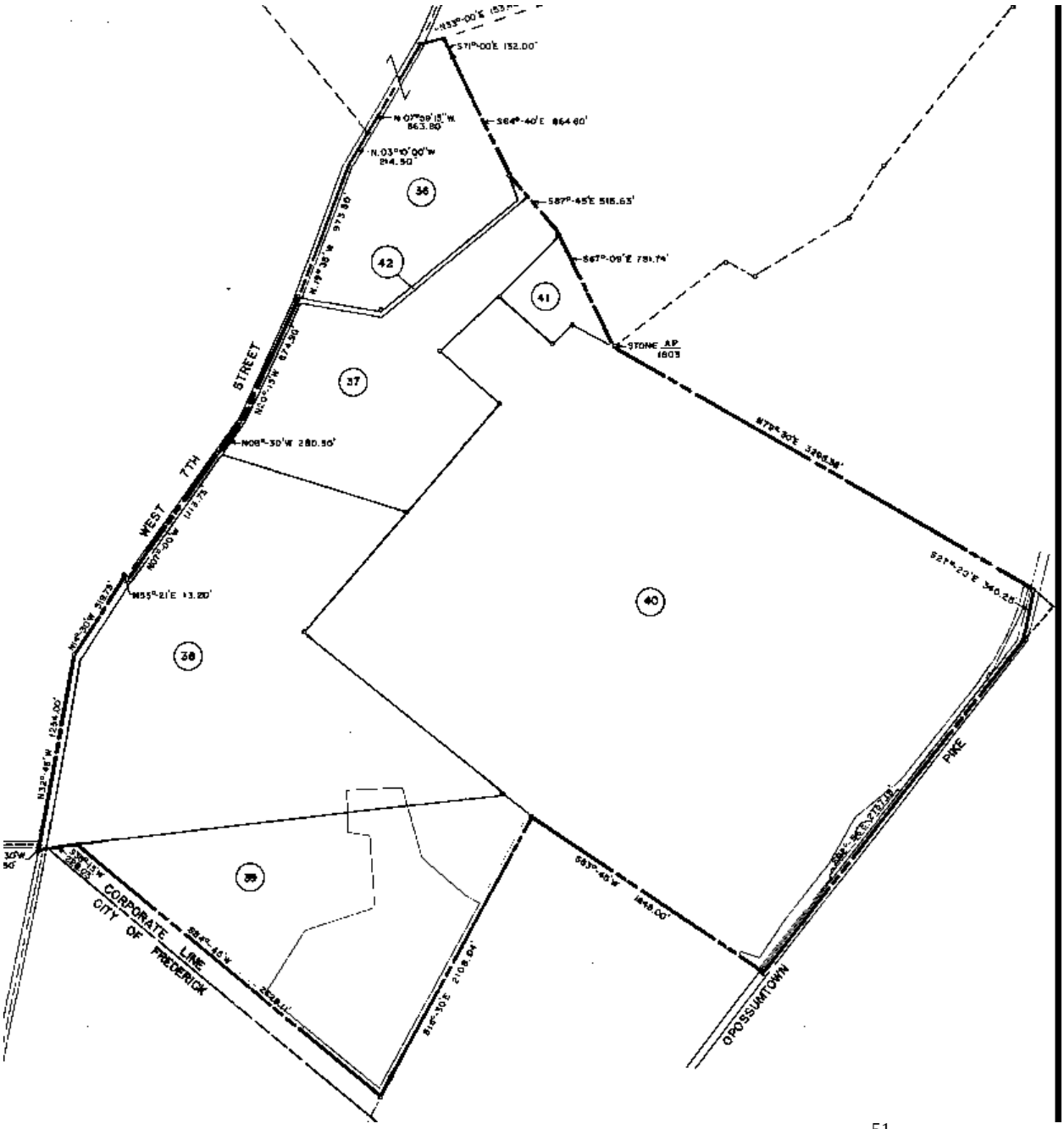


Figure 6 – *Real Estate Map – Camp Detrick 1952 addition*[51]

On 19 December 1956, the Judge Advocate General disapproved the request for exclusive Federal jurisdiction on Area C as had been granted to Areas' A and B earlier in part by the separation of Area C by 7th Street (current Ditto Ave) which had remained operating as a public road for a period.[52] In 1957, the State of Maryland rerouted the public road northward along the western extension of 4th Street, or the current Rosemont Avenue and Yellow Spring Road, which when completed allow for the closing the easement of 7th Street through Detrick at a cost of $137,569.[53] Also as a result of the rerouting, on 4 October 1957, Detrick exchanged an 8.43 acre parcel for two parcels consisting of 1.75 acres and 5.65 acres at the north end of the installation with a private

landowner. Later, Detrick added minor parcels, less than 1 acre, along Rosemont Ave (aka MD Route 73 or Rocky Springs Road). These tracts were later reported excess in 1973 and conveyed to the City of Frederick on 30 January 1974 as part of 7.6 acres for a road relocation project. An addition of 4.02 acres adjacent to the sewage treatment plant occurred in December 1960, to rectify additional area used there. The most significant disposal of land was the 68.61 acres reported excess to and conveyed to the National Institutes of Health effective 30 August 1977. The total Detrick property disposed of over the years is 89.89 acres including 85.07 acres in fee, 2.72 in easement and 2.10 acres in license. This would be the Formerly Used Defense Site (FUDS)[xii] eligible property.[54]

By 1956, Fort Detrick provided 5.8 acres of land in the northeast corner of Area B to the Maryland Military District for use as the Fort Detrick Army Reserve Training Center.[55] In November 1956, the Maryland Military District requested use of land to the south of Fort Detrick Army Reserve Training Center in Area B for training units at the for field training, such as driver training, signal construction, panel bridge construction and field fortifications. The post approved this use by a Memorandum For Record on 21 November 1956.[56] This location is later renamed the Pfc. Raymond Flair U.S. Army Reserve Center.

3.1.2 Out Leases - Agricultural

Detrick sporadically expanded to meet growing needs of the Chemical Corps Biological Laboratories, particularly the Crops Division in 1952. However, by the mid-1950s, Detrick temporarily out leased underutilized parcels. In late 1955, Detrick identified a number of tracts in Area "C" (i.e. 1952 expansion area east of West 7th Street/Ditto Avenue) "proposed for lease with no immediate contemplated use" or had projected use in later years (see hatched areas in following Figure). The northern portion of the expansion area is clearly designated as "Crops Division Area", with smaller other portions designated portions for use "Animal Farm Alfalfa" or "Small Animal Pasture".[57]

[xii] FUDS is real property that was formerly owned by, leased by, possessed by, or otherwise under the operational control of the Secretary of Defense, that was transferred from DoD control prior to 17 October 1986. The Corps of Engineers manages the FUDS program under the Defense Environmental Restoration Program (DERP) for the DoD.

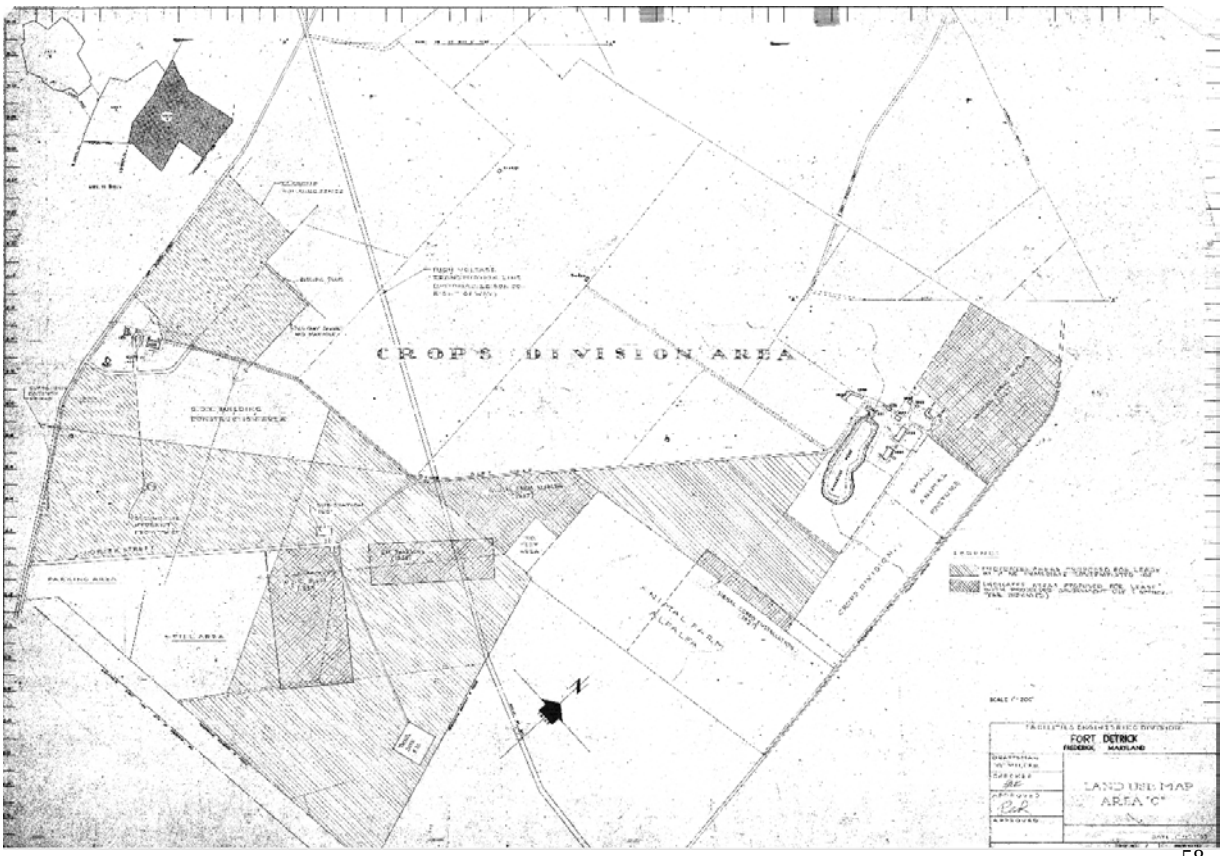


Figure 7 – *Land Use Map with Areas Proposed for Out Lease – 11 November 1955*[58]

In January 1956, the Planning Board at Detrick proposed leasing out these unused portions of in order to reduce maintenance costs and gain funds. At the time, the recommendation was for 150 acres to be leased for five-year periods, though it is unclear if any out-leasing occurred at that time.[59]

In 1958, Fort Detrick had four leases covering nine parcels of land covering 367.2 acres (see following Figure). The Jenkins Brothers' leased Areas Nos. 1, 2, 3, 6, 7, & 9, all in Area A, under lease DA-4128. Also in Area A, Detrick out leased Areas Nos. 4 & 5 to Kelly (DA3541) and the eastern parcel to Clark (DA-3070). The only portion of Area B out leased at the time was Area 8 to Treeland Nurseries (DA-4129). The specific boundary, starting and termination dates and other terms of these leases are unknown but the acreage includes:[60]

Section	Acres
1	67.6
2	100.2
3	53.2
6	46.3
7	32.8
8	27.9
9	39.2
Total	**367.2**

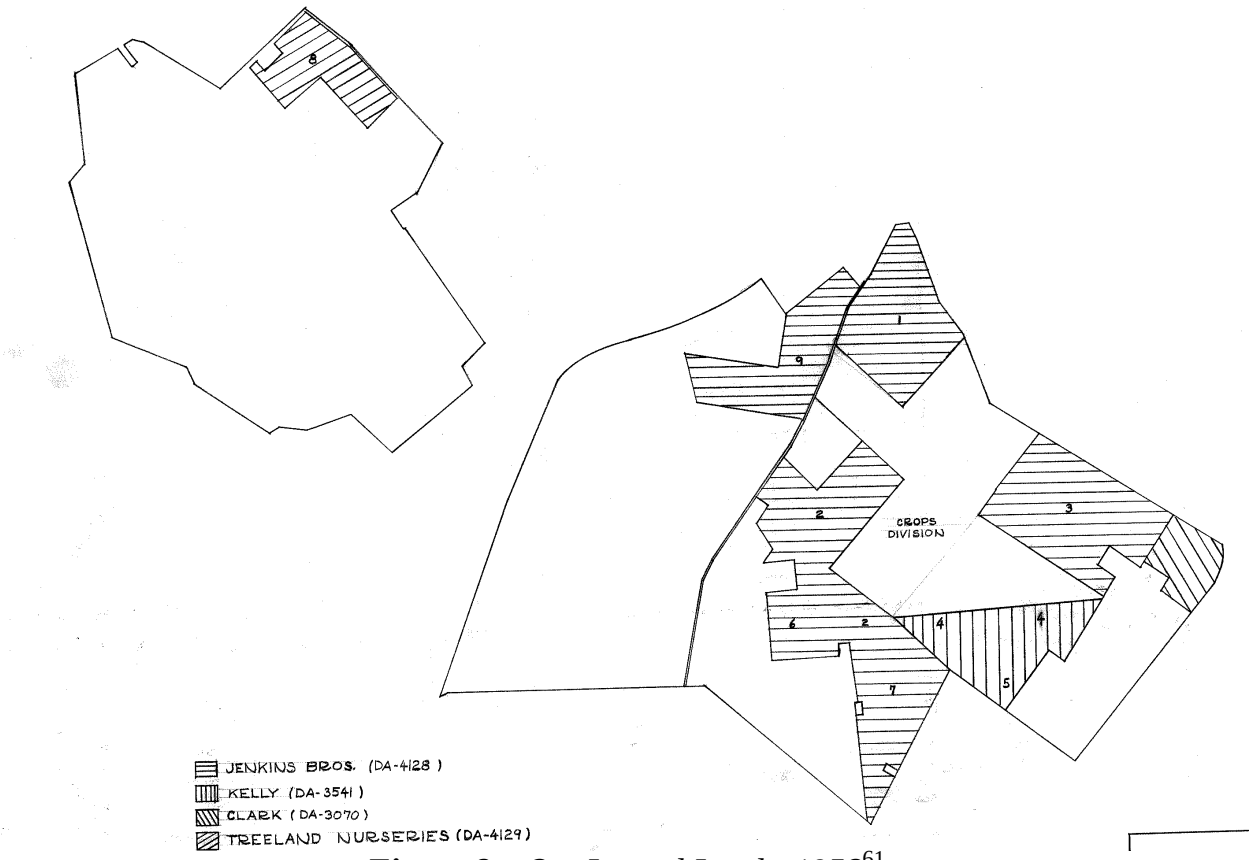


Figure 8 – *Out Leased Land - 1958*[61]

In 1962, Detrick reported 39.66 acres of the northern part of the installation (specifically all of Real Estate Tract 95 and portions of Tracts 10, 36, 37, 42 and 96) as excess real property. Detrick out leased the land for farming with Jenkins Brothers Inc. Lease No. 4128. The Department of Interior Bureau of Mines expressed interest in acquiring the land but the transaction did not occur for unclear reasons. It is unclear if the Bureau of Mines used the land temporarily under some agreement as it is denoted on a site plan from 1963 (see following Figure).[62] In September 1963 (see following Figure), similar amounts of land to the 1958 amount are available for lease, though only Area No. 4 with 25.58 acres to Jenkins from January 1962 through January 1967 and Area No. 8 with 23.9 acres to Free from April 1959 to March 1967 are under lease. Six other areas are

"available" for leasing in Area A. Other portions of Area A are indentified for use by the Crops Division or the Bureau of Mines.[63]

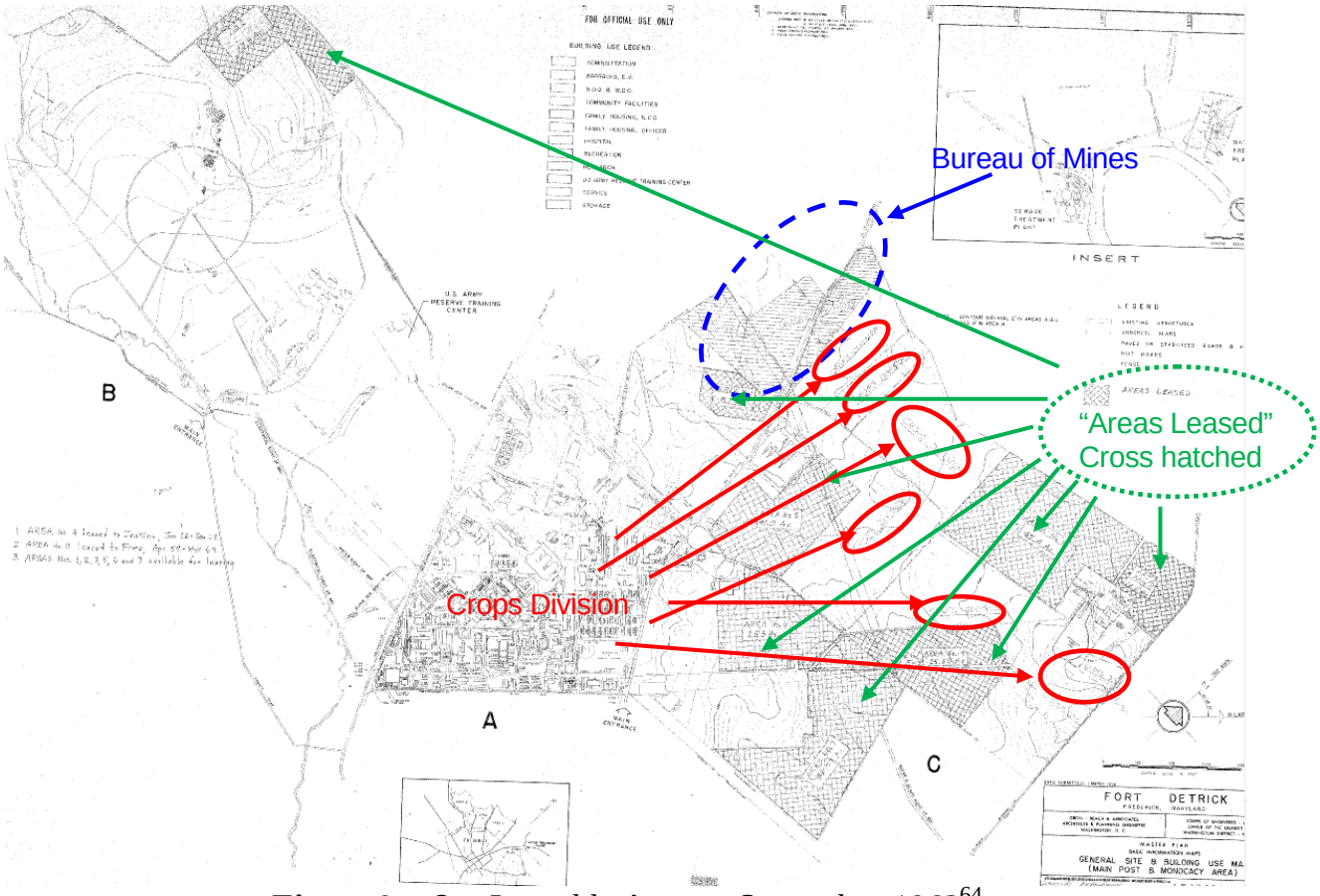


Figure 9 – *Out Leasable Areas – September 1963*[64]

Note: ***Green Dots*** *– cross hatched "Areas Leased",* ***Red*** *–areas in use by Crops Division and* ***Blue Dashes*** *– Bureau of Mines area*

By 1967 (see following Figure), Detrick sought to seed three of the leased areas for grass (Area Nos. 3, 5 & 8 on the 1963 site plan above), though it is unclear if any of the areas are under lease at the time. In May 1972, Areas 3, 5 & 8 along with two parcels of Area 4 are available for agricultural lease on Area A of Detrick. In Area B, Area 8 is available for agricultural lease and 280 acres of Area 9 is available of grazing. The Crops Division lands are no longer delineated.[65]

Figure 10 – *Out Leasing Areas – May 1972*[66]
Note: ***Green Dots*** *– Out Lease Areas – Grazing,* ***Red*** *– Out Lease Areas – Agricultural*

By December 1973 (see following Figure), a Detrick site allocation map shows the same parcel in Area B available for agricultural lease along with similar portions of Area A, with an expansion of southern area around the helipad. The acreage in Area B available of grazing out lease is reduced from the 1972 depiction. The map depicts two USDA areas on land previously occupied by the Crops Division. A 1974 version of this map indicates there is an existing USDA permit for the western parcel and that the eastern portion, labeled USACC [United States Army Communications Command] MARS Antenna, will be added to the USDA permit on or about 1 August 1974. The USDA lands would than total 189 acres.[67]

An August 1973 installation survey reported five agricultural out leases as noted below[68]:

Grantee	**Acreage**	**Term**	**Expiration**
James Montgomery	34.21 acres	5 years	31 December 1975
Norman Clark	56.5 acres	4.5 years	31 December 1976
Joseph Free	19.9 acres	5 years	31 December 1976
C. Wm Krantz	23.9 acres	5 years	31 December 1976
C. Wm Krantz	40.0 acres	5 months	30 November 1972

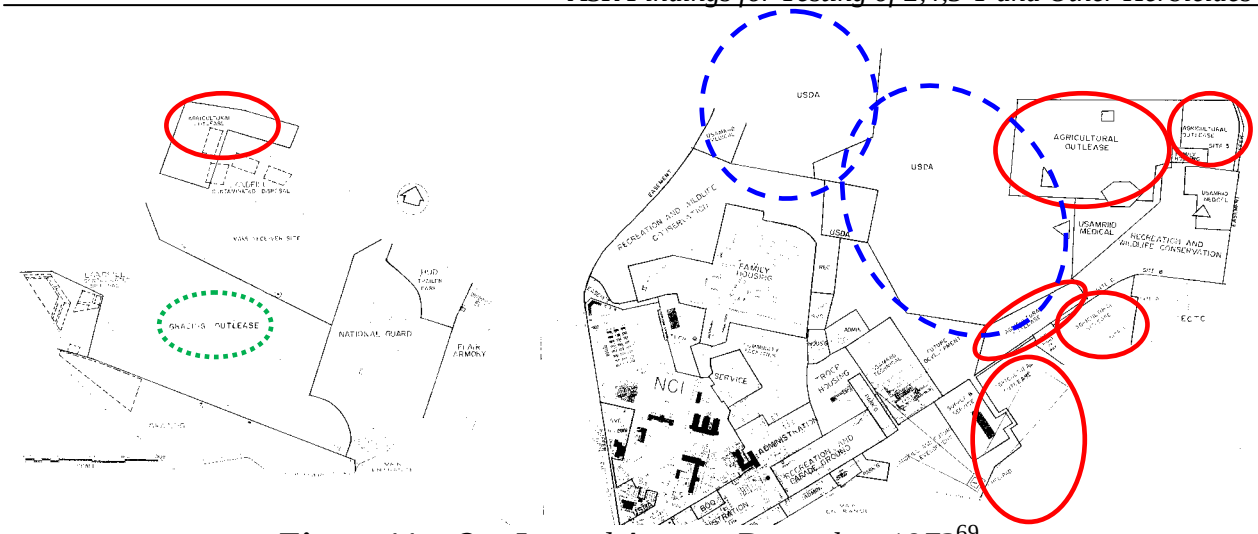


Figure 11 – *Out Leased Areas – December 1973*[69]

Note: ***Green Dots*** *– Out Lease Areas – Grazing,* ***Red*** *– Out Lease Areas – Agricultural;* ***Blue Dash*** *– Out Lease Areas – Agricultural*

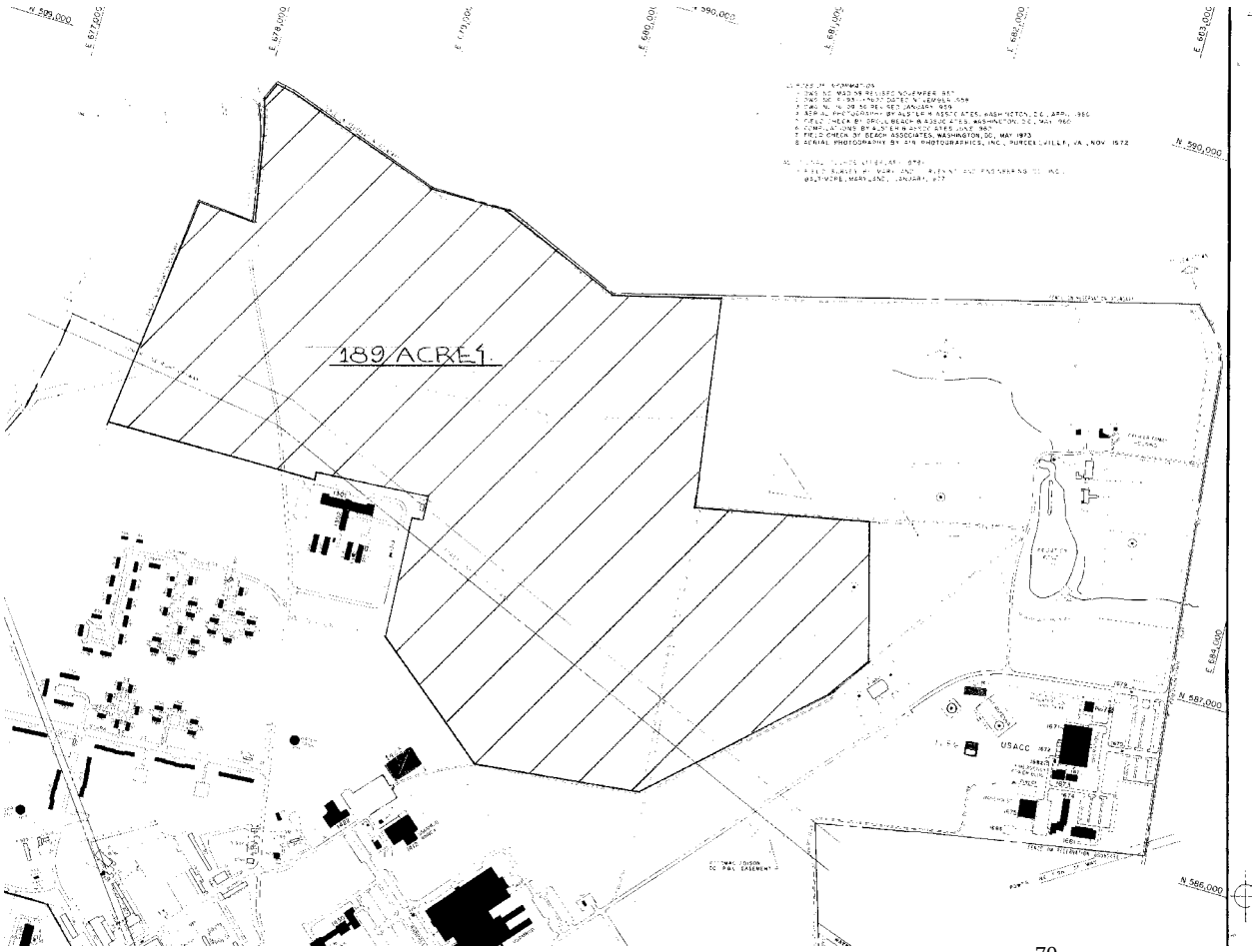


Figure 12 – *USDA Research Land – 189 acres – circa 1975*[70]

Circa 1975, the former out lease area in the northeast portion of Detrick are delineated as "Pasture Areas for Research". It is unknown what organization is using the area for

research or if its only be offered for that. However, it no longer appears to be out leased.[71]

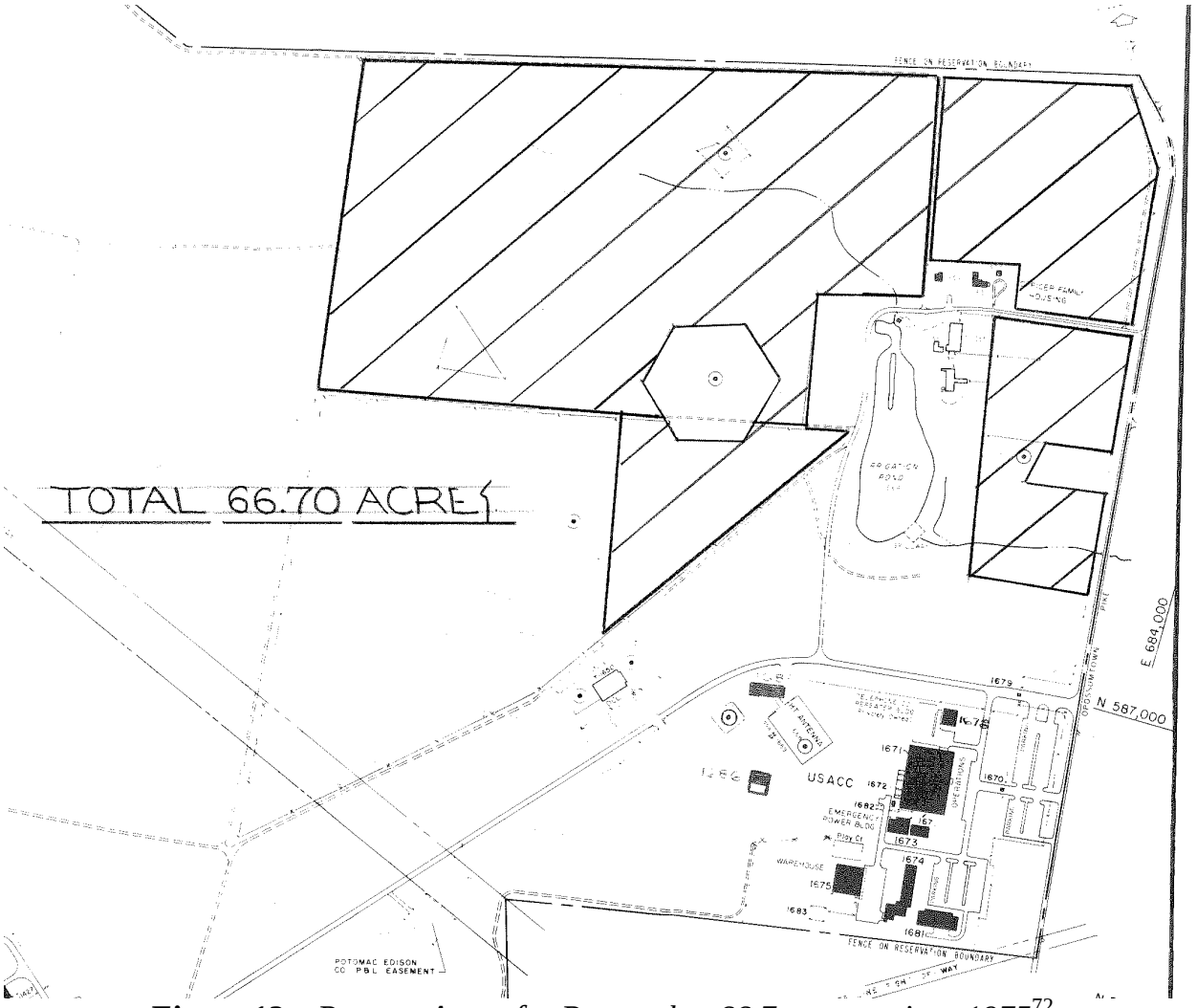


Figure 13 – *Pasture Areas for Research – 66.7 acres – circa 1975*[72]

Out leasing agricultural lands continued into the 1980s. In 1980, a 25.45 acre parcel in Area A is "leased crop land" with 192 acres in Area B noted for grazing but "not included in lease". In 1985, 188.92 acres in Area B are identified as "Farm Lease Pasture Area"

Figure 14 – *Leased Areas – October 1981*[73]
Note: ***Green Dots*** *– Grazing,* ***Red*** *– Leased Crop Land*

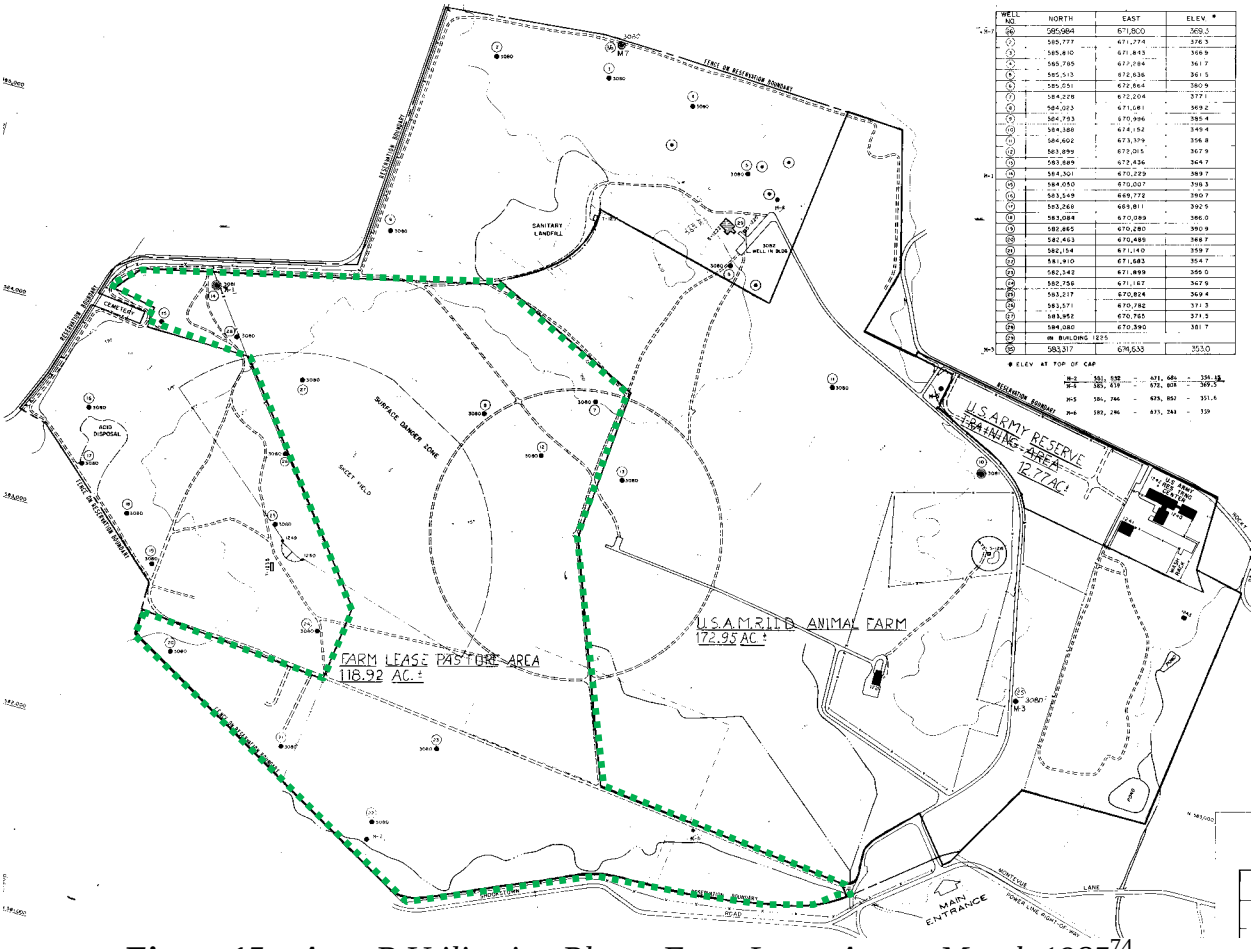


Figure 15 – *Area B Utilization Plan – Farm Lease Area – March 1985*[74]
Note: ***Green Dotted Polygon*** *– Farm Lease Pasture Area*

3.1.3 Out Grant Permits - General

Acquisition of land for Detrick included retention of existing utility right-of-ways or corridors through the property despite the military ownership of the land, most notably Right-of-Ways for the City of Frederick Water and Potomac Edison Electric.
The US Army Corps of Engineers Baltimore District Real Estate Division (CENAB-RE) maintains the permanent real estate records for Fort Detrick on behalf of the Army. The real estate office also assists in the management of any in-grant and out-grants leases or permits. General records management procedures dictate that only active or current files are retained and earlier ones that have expired or canceled are destroyed (i.e. the agricultural out leases between 1950s through the 1980s were not retained).

3.1.4 Permit - USDA-Agricultural Research Service

In 1971, the Army transferred the Plant Pathology Division of the US Army Biological Defense Research Center at Detrick to the USDA, including facilities, buildings and personnel. This did not include the Vegetation Control Division (i.e. chemical or herbicide group), which would transfer later. As such, the Army issued permit DACA-31-4-71-413 to the USDA effective 1 March 1971 for ±48 acres of fields and 10 buildings: S-319, S-323, 374, 378, 390, 1301, 1302, 1305, and 1306.[75]

Figure 16 – *USDA Permitted Land ± 48 Acres – March 1971 and today*[76]

With the personnel transfer of the Vegetation Control Division to the USDA in July 1974 additional land and facilities were permitted by the Army to the USDA effective 1 August 1974. The new permit DACA-31-4-75-157 amended and superseded the earlier on, extending the terms to 31 July 1979. Among the changes with the new permit was the addition of ±141 acres of experimental field (total ±189 acres); 11.72 acres of improved land (lawn and pavement around buildings 374 and 1301 complexes); and additional buildings: S-318, S-323, 326, T-391, S-1234, 1303, 1304, 1307, T-1312, T-1313, 1315 and T-1316. The facilities covered under the permit included an integrated complex of research laboratories, greenhouses, test fields and ancillary structures that had been in use for approximately 20 years.[77]

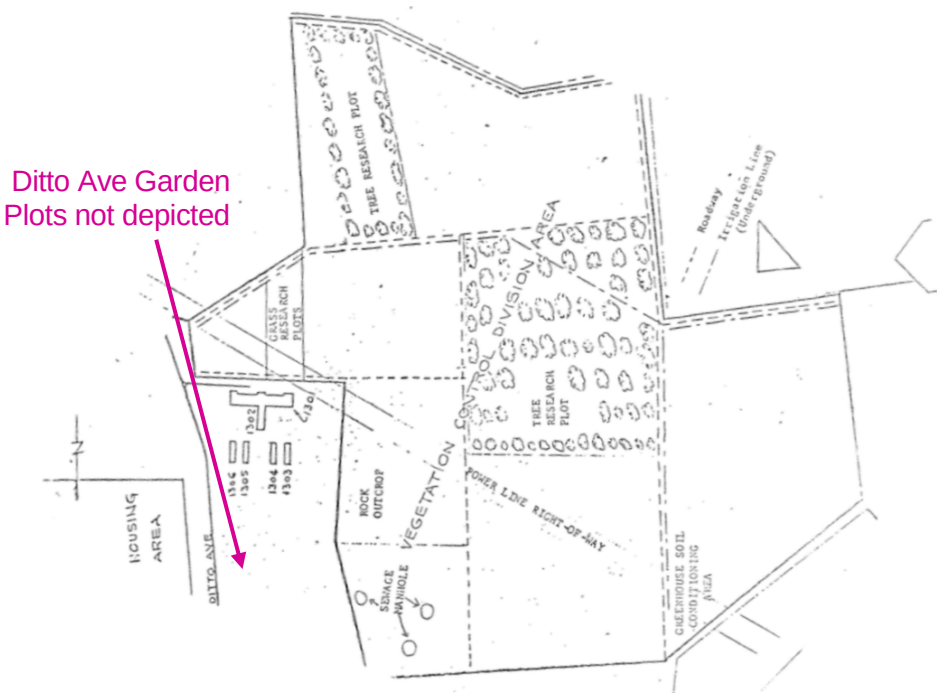


Figure 17 – *USDA Permitted Land ±141 Acres Addition – August 1974*[78]
Note: this represent's the former US Army Biological Defense Research Center Vegetation Control Division Area. Also note that the Ditto Avenue Garden Plots (see Figure 34) located south of Building 1301 are not included within the USDA permit, indicating it was not part of the test locations in 1974.

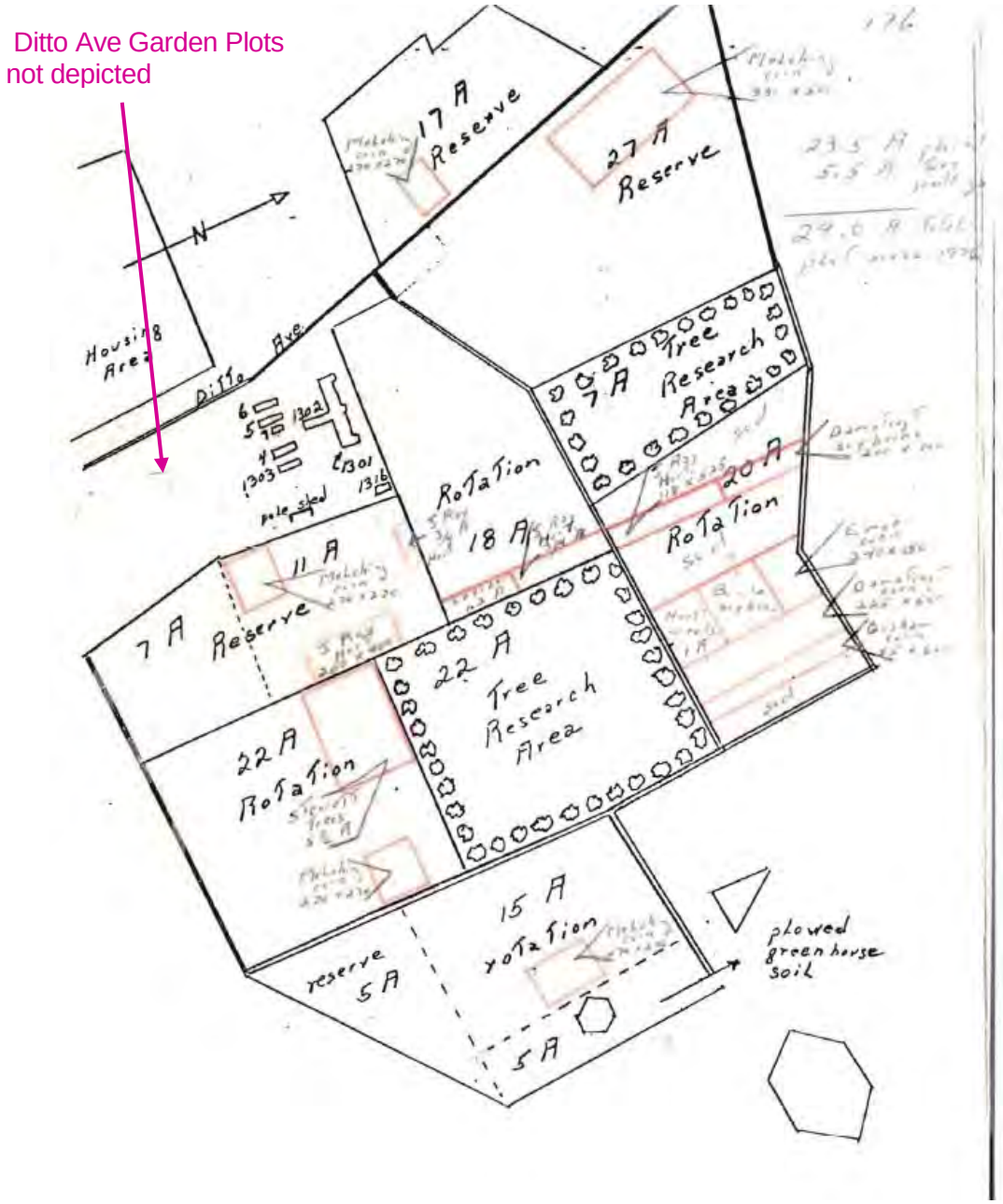


Figure 18 – *USDA Permitted Land +189 Acres Addition Planned for 1976*[79]
Note that the Ditto Avenue Garden Plots (see Figure 34) located south of Building 1301, are still not included within the USDA permit, indicating it was not part of the test locations in 1976.

Between 1975 and February 1996, permit DACA-31-4-75-157 was amended 14 times as noted below.

Table 3.1.4 - Amendment to Permit DACA-31-4-75-157 with USDA[80]

Amendment	Date	Reason
1	13 March 1975	Delete Building 378, Cooling Tower and add Building 379, Cooling Tower

Table 3.1.4 - Amendment to Permit DACA-31-4-75-157 with USDA[80]		
Amendment	**Date**	**Reason**
2	7 November 1975	USDA assumes full responsibility for application of pesticides and animal damage control on lease premises in accordance with NEPA
3	24 December 1975	Delete building S-1234, Storage, demolished by wind
4	13 August 1976	Provide for placing of survey monuments
5	22 March 1977	Correct conflict with a current Army regulation
6	14 June 1977	Add Building ~1308 (1800 SF) which replaced S-1234
7	3 January 1978	Add Building 378, Cooling Tower
8	30 July 1979	Extend term to 31 July 1984 and change SF to 320 SF for Building 1307
9	30 September 1981	Delete Buildings: S-318, S-319, S-324 and T-391
10	14 September 1982	Add Building 1309
11	2 August 1984	Extend term to 31 July 1989
12	11 August 1989	Extend term to 31 July 1994
13	30 January 1995	Extend term to 31 July 1999
14	7 February 1996	Delete Building: 1306; change to 18 acres of unimproved land and reduce space in Building 1301 to 36,448 SF

On 18 September 1998, Army granted a new permit, DACA-31-4-98-1123, to the USDA Agricultural Research Service superseding and ending permit DACA-31-4-75-157. The new permit lasts 15 years (expiration on 17 September 2013) and covers the following buildings: 326, 374, 379, 383, 390, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1312, 1313, 1315 and 1316.[81] As of this writing, the facilities remain in use by the USDA Agricultural Research Service (ARS) as part of the Foreign Disease - Weed Science Research Unit.

4 PREVIOUS DOCUMENTATION RELATING TO HERBICIDES AT FORT DETRICK

4.1 HERBICIDE TESTING DOCUMENTATION

4.1.1 Background

As discussed in Section 2, between 1944 and 1974, Fort Detrick served as the center of the U.S. military's plant or crops research program. The group's mission included investigating chemicals to destroy or reduce the value of crops, which led to expertise in herbicides and later defoliation of plants. The Crops Division conducted preliminary tests of various chemicals in the laboratories and greenhouses of Fort Detrick. Outdoor field experiments with the most promising chemicals followed on a very limited scale with "garden plots" on Fort Detrick (e.g., 6- by 18-foot field of a single crop). Investigators applied the chemicals being tested with handheld sprayers, with the spray being limited by movable shelters from drifting onto adjacent garden plots.

The documents found during the ASR research included a number of handwritten laboratory notebooks that augment the contemporary Fort Detrick published reports on the tests, as discussed in detail in ASR Sections 5 and 6. The contemporary published reports by Fort Detrick have been reported on by the U.S. Government between 1971 and 2011, as discussed in ASR Section 4.2. The laboratory notebooks provide additional details regarding the testing, as well as new information describing herbicide investigations.

4.1.2 Fort Detrick Laboratory Notebook Accession at WNRC

In spring 2011, the ASR research team located a group of boxes (Accession 338-80-0413), at the Washington National Records Center (WNRC) containing laboratory notebooks associated with Fort Detrick. This is a 192 box accession of laboratory notebooks from Camp and later Fort Detrick, with handwritten notes primarily on investigations and tests conducted from 1943 thru December 1971. Based on an index for the accession, there were originally approximately 6,150 notebooks; however, only about three-fourths of the notebooks remain in this unclassified accession. As stated in the index cards, in some cases, Fort Detrick destroyed the notebooks and in other cases, the investigators withdrew the notebooks and did not return them to the central Fort Detrick repository. Hence, those notebooks are not in the collection sent to the record center. Using the index, the ASR research team identified the notebooks associated with the Crops Division (the group conducting herbicide and defoliation investigations), identified 476 notebooks, of those only 306 notebooks remained in the record center accession (i.e. one third of the notebooks checked out by Crops Division are not in the collection). The ASR team reviewed the notebooks and copied the portions dealing with outdoor field testing that occurred on Fort Detrick, as well as other locations.

4.1.3 Laboratory Notebook Analysis

Fort Detrick assigned laboratory notebooks to specific researchers who recorded their notes on the tests. As opposed to the published reports, the notebooks normally contained a brief test objective but did not include a lengthy description of the test purpose and background. They also do not generally have any analysis or conclusions of the tests recorded. Furthermore, the investigators did not necessarily record things of interest to this ASR investigation like a specific location of field tests. It appears clear that when defoliation greenhouse or field testing occurs and no location is noted, the test is occurring on Fort Detrick. If the field tests occurred elsewhere, such as Fort Ritchie, it is noted but not a specific location. Another limitation of the laboratory notebooks, as well as the contemporary published reports, is that the test parameters are not stated in a format desired for this investigation (i.e., x grams of y chemical were applied at z location) and hence, this needs to be calculated based on application and concentration rates with solution volumes, which is tedious. Furthermore, amounts of active herbicide, volumes, area sprayed, etc., provided in these analyses are not exact. This ASR generally provides to the nearest meaningful decimal place, and does not include analysis of variation.

4.1.4 Published Fort Detrick Reports

Fort Detrick personnel reported the results of most of the tests recorded in the laboratory notebooks in published reports distributed by the standard installation procedures. The report names such as Interim Report, Technical Report, and Technical Memorandum depended on how formal the analysis was and whether it was meant for rapid dissemination of current Research, Development, Test & Evaluation (RDT&E) efforts or fully evaluated RDT&E technical information. The purpose of the published reports may have been to provide details of the tests or in many cases when the test methods and procedures were similar to provide an overview of the test results, as is frequently the case with the Crops Division work.

In most of the cases, distribution was usually “limited to U.S. Army Biological Laboratories and supporting or cooperating agencies” and not cleared for release to the public at the time. These Fort Detrick installation reports covered all topics of research on the post and were sequentially numbered as they were published. For example, Interim Report 140 on Defoliation testing meant that there were 139 previous Interim Reports, but not necessarily on that topic. Although these reports were not distributed publically, various technical libraries on post or within the larger Chemical Corps and military community received a copy. These technical libraries have consolidated and were renamed over the years, but most of their holdings remain available to the military community through the Chemical, Biological, Radiological, Nuclear Information Analysis Center (CBRNIAC) and its parent Defense Technical Information Center

(DTIC). Based on the continued access, the information in the published reports served as the basis of earlier analysis of herbicide testing; however, not all the herbicide investigations conducted at Fort Detrick were published by Fort Detrick. Hence the laboratory notebooks are the only source of information regarding these tests and they were not located prior to this ASR investigation.

4.2 SUMMARY REPORTS REGARDING AGENT ORANGE HERBICIDES AT FORT DETRICK

4.2.1 General

The Department of Defense (DoD) has prepared summary reports regarding the use of Herbicide or Agent Orange that include information about testing involving Fort Detrick. The following paragraphs discuss the information released in these documents.

4.2.2 Joint CB Data Source Book Volume VII Anti-plant Agents Part One: Agent LNX – December 1971

The report summarizes the findings from field and laboratory test data for the herbicide LNX or Agent Orange, including large scale aerial and ground dispensers (i.e. sprayers) used for LNX dissemination. Appendix A noted that in mid-1963, Fort Detrick conducted field trials regarding calibration trials for C-123/MC-1 Spray Systems as reported in TR [Technical Report]-46, June 1964.[82] Review of TR-46 indicates that while the U.S. Army Biological Laboratories Fort Detrick oversaw the work, the tests occurred at Eglin Air Force Base in Florida.[83]

4.2.3 U.S. Army Activities in the U.S. Biological Warfare Programs, 1942-1977, February 1977

This public accounting or review of the US Biological Weapons (BW) program noted that Fort Detrick conducted anti-crop research with BW pathogens as well as chemical herbicides and defoliants. The chemical based herbicides and defoliants were not included in the 1977 BW accounting as they were not part of the BW pathogen program.[84]

4.2.4 DUSD(I&E) Herbicide and Agent Orange Response to Congressman Evans – 23 September 2003

On 23 September 2003, Principal Assistant Deputy Under Secretary of Defense (Installations and Environment) (DUSD(I&E)) responded to a request by Congressman Lane Evans regarding use, storage and testing of herbicides including Agent Orange.

That study noted the following reports relating to Camp (Fort) Detrick (see Section 5 of this report for detailed discussion of these reports):[85]

- "Special Report No. 92, Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons, Camp Detrick, MD-Fields A, B, and C; Herbicides: 2,4,5-T, 2,4,5-T triethanolamine, tributylphosphate, ethyl 2,4-D, butyl 2,4,5-T triet 2,4-D,"

The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays to crops or to the soil in the solid form to be taken up by the roots."

- "Special Report No. 105, Field Plot Experiments with Plant Inhibitors 1948 Season Camp Detrick, MD-Fields C, D, and E; Herbicides: 2,4,5-T, isopropyl phenol carbamate, LN-2426, 2,4-D

The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays to crops or to the soil in the solid form to be taken up by the roots."

- "Special Report No. 130, Field Plot Experiments with Plant Inhibitors 1949 Season Camp Detrick, MD-Fields C, D and E; Herbicides: triethelyne[xiii] [sic]. 2,4,5-T, carbamates

The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays to crops or to the soil in the solid form to be taken up by the roots."

- "Special Report No. 153, Field Plot Experiments with Plant Inhibitors, 1950 Season Camp Detrick, MD-Fields A, B, D and E[xiv]; Herbicides 2464, butyl 2,4-D, 974, butyl 2,4,5-T, q:q 143 and 974

The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays to crops or to the soil in the solid form to be taken up by the roots."

- Special Report No. 156, Field Plot Experiments with Plant Inhibitors, 1950-51 Season Camp Detrick, MD-Field F; Herbicides 2464, carbamate, butyl 2,4-D, 143 and 974, 2,4,5-T, 2,4-D, Orange[xv]

The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays to crops or to the soil in the solid form to be taken up by the roots."

- "Abstracts of Technical Publications April 1965-June 1965, July 1965, Technical Report 50, Defoliation Studies: Screening of Defoliants, Herbicides, and Desiccants Fort Detrick, MD; Herbicides: 1410 compounds

[xiii] Special Report 130 does not include tests of "triethelyne" or triethylene.
[xiv] Field B was used in testing in 1950, however none of them included 2,4,5-T compounds. Field F also was in use though it is not noted in this 2003 summation.

From 8/1961 to 6/1963, compounds were spray-tested in the greenhouse to evaluate them as effective defoliants, and herbicides."

- "Special Report No. 201, Field Development of Chemical Anticrop Agents, Response of Field Grown Crops to Chemical Anticrop Agents Released from Experimental Spray tower Area B, Camp Detrick, MD; Herbicides 3:1 mixture 2,4-D and 2,4,5-T

Personnel at Camp Detrick tested the feasibility of using an experimental spray tower for applying a mixture of chemical anti-crop Herbicides to broad-leaf crops."

4.2.5 Preliminary Archives Search Report Findings for Use / Testing of 2,4,5-T Compounds, 27 October 2010

In August 2010, based on recent public concerns regarding past testing of Agent Orange at Fort Detrick, the U.S. Army Environmental Command (USAEC) and the U.S. Army Garrison Fort Detrick requested an Archives Search Report (ASR) to document the testing of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) (a component of Agent Orange contaminated with dioxin) and related herbicides at Fort Detrick. The archive search was required as these records were not retained at Fort Detrick. In October 2010, the ASR team produced a preliminary findings report based on analyzing a number of previously identified published reports regarding field testing of 2,4,5-T at Fort Detrick. That preliminary findings report was finalized and released to the public in February 2011. Given the desire to respond to public concerns as quickly as possible, the preliminary findings report relied on analyzing readily located reports that had been identified as documenting the Fort Detrick field tests. While this methodology provided a history of those test results that had been published, it did not allow for the review of material at the various elements of the National Archives and Records Administration and a number of other record repositories. The Preliminary findings also depended on review of a limited amount of readily available historical aerial imagery for assisting in the location of field plot experiment locations. Additional historical aerial imagery was acquired subsequently for this ASR effort.

[xv] Mixture of LN-8 and LN-14 was not tested in SR156, nor was "orange".

5 REPORTS RELATING TO HERBICIDE FIELD TESTING AT CAMP/FORT DETRICK

5.1 History of the CWS in WWII. Vol. 2 - Biological Warfare Research in the United States – November 1947[86]

This massive historical report summarizes the United States BW efforts during World War II, detailing the organizations and operations used in those efforts including Camp Detrick, the center of BW efforts during the war and afterwards. Of particular interest to this study is Chapter XXIII, Plant Growth Regulators. In April 1944 during WWII, the Chemical Warfare Service (CWS) gave the Plant Research Branch at Camp Detrick the mission of developing chemical herbicides to destroy or reduce the value of crops. These Chemical Plant Growth Regulators or inhibitors were studied under the code letters "LN". The U.S. Department of Agriculture (USDA) at Beltsville, MD and Ohio State University undertook related efforts. Camp Detrick examined and tested a total of 1,058 chemical herbicides, with all but 226 of the herbicides being prepared at Camp Detrick. The initial screening tests consisted of a series of laboratory and greenhouse tests involving seeds, a few plants and minute quantities of the synthetic organic herbicides to determine the herbicides best suited for military purposes. They determined that the halogenated phenoxy acetic acids appeared to be the best and of the herbicides tested, only a few were studied at any length including:

LN-8	2,4-dichlorophenoxyacetic acid (2,4-D)
LN-14	2,4,5-trichlorophenoxyacetic acid (2,4,5-T)
LN-379	Chloride of LN-14[87]

Of the herbicides tested, 2,4-D proved the most effective against a wide variety of crops and was used as the common reference material in the plant growth regulating tests. 2,4-D was also produced in bulk for the CWS under contract (Dow Chemical Corporation and Sherwin-Williams Company). The bulk form of LN-8 came in three forms:

VKA	Acid technical grade of LN-8
VKL	liquid LN-8 in tributyl phosphate and oil
VKS	ammonium salt of LN-8

This report also includes Chapter XXIV, Chemical Defoliants (see Section 3.1 for further discussion).

5.2 Special Report No. 79, Crop Destruction By Chemical Agents - 1947[88]

5.2.1 Estimated Amount of 2,4,5-T Herbicides Tested in Special Report No. 79-1944-45

The total amount of **2,4,5-T herbicides applied for the field plots tests described in Special Report No. 79 (SR79) is approximately 2,004 grams**. This amount differs slightly from the previous preliminary estimates reported in the October 2010 report of 2,411 grams. The differences primarily result from the more detailed analysis of the report and from the analysis of recovered laboratory notebook CD 333. In the interest of time, an aggregate estimate was previously made for this lengthy list of tests. The laboratory notebook data provided additional details that allowed for a more accurate assessment.

The following sub-paragraphs describe the 1944 through 1945 field plot tests of SR79 in which 2,4,5-T and its variants were tested.

5.2.2 Overview of Special Report No. 79

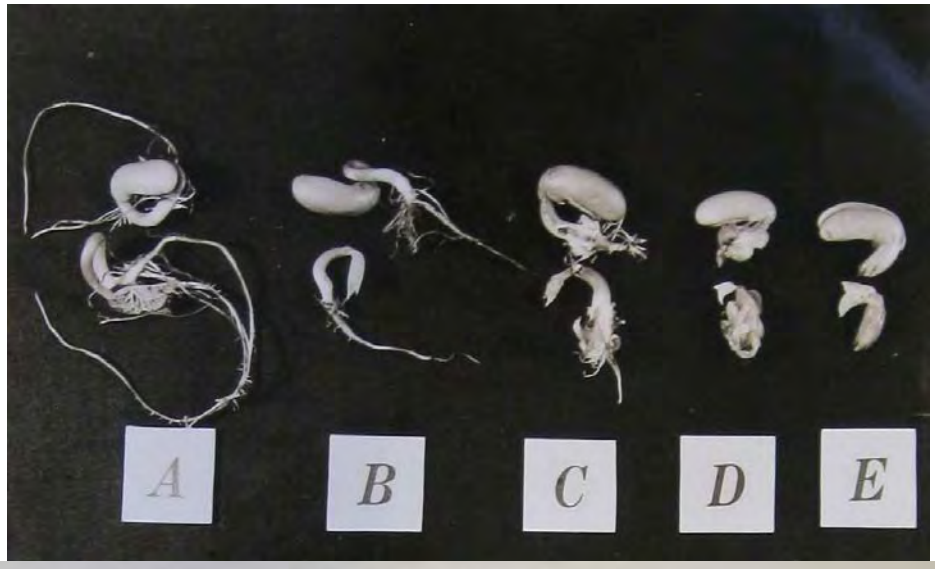
Completion of Special Report No. 79 occurred after August 1947 when the WWII history discussed above was being written[89], however the report summarizes "C" Division of Camp Detrick efforts regarding Chemical Plant Growth Regulators, code letter LN, between April 1944 and August 1946 as noted in that report. This work was in coordination of other efforts previously started by the allies, the USDA at Beltsville, MD and Ohio State University. With completion of the laboratory and greenhouse facilities at Camp Detrick in July 1944, work expanded rapidly. Small plot experiments at Fort Detrick commenced in June 1944. This required extensive studies to determine the proper herbicide to use for specific crops, the amount required, the most effective and easiest method of application and the most susceptible stage of the plant development for application.

SR79 covers herbicide investigations both in the greenhouse, in pots located both indoors and outdoors, and in the field at unrecorded locations and in the garden and Grid Area (i.e., Area B). The field plot work consists of 67 herbicide applications (some replicated) with eight herbicides and several mixtures thereof. The investigators did not record the amount of herbicide used but rather the application rates, and in most but not all cases, the area treated. The analysis here is based upon the methods described in the published report (and in any associated laboratory notebooks) to calculate the total amount of LN-14 and related herbicides (LN-379 and LN-835) tested. See Appendix D for a listing of the herbicide names.

Among the compilation of tests published in Special Report No. 79, there are 15 field test applications relating to 2,4,5-T herbicides. These and 52 other field test applications relating to non-2,4,5-T related LN herbicides are included in Special Report No. 79 and are listed in Appendix D. Amounts tested of non-2,4,5-T related herbicides were not analyzed here. Tests conducted in pots or in the greenhouse are not described here. The most frequently applied herbicides of SR79 were LN-8 (34 times), LN-32 (11 times), and LN-14 (12 times).

5.2.3 Screening LN Herbicides Overview

The chemical substances investigated as LN herbicides were synthetic organic (i.e. man-made carbon-based) compounds as opposed to inorganic (non-carbon based) as were typical conventional herbicides of the period, which required relatively high concentrations to be used. Preliminary work involved screening of these organic substances as potential LN herbicides for their inhibitory responses in plants. The screening involved a battery of tests of each chemical substance comparing their effectiveness against herbicide LN-8 in the same test. The LN-8 results were designated as 100% standard with other herbicides scoring above or below this standard. For example, the Corn Germination Test involved the treatment of corn seeds with solutions of 1 or 10 parts per million (ppm) of the potential LN herbicide to be tested, and subsequent measurement of the effect of this herbicide on elongation of the primary root. The test involved 25 seeds per dish, with three dishes run per herbicide. Other tests were the Kidney Bean Single Droplet Test, the Kidney Bean Spray Test, Kidney Bean Soil Test, the Barley Soil Test, and the Rice Irrigation Water Test. In all, approximately 1,060 substances were screened for activity as LN herbicides. Of these, approximately 336 were not sufficiently water-soluble to be tested by either the corn germination or rice irrigation methods. Approximately 223 were oil-insoluble and could not be checked by the oil single droplet method on kidney bean plants, even with the use of a co-solvent.



Effect of LN-8 on germination of kidney beans. The beans were placed in 25 ml water or LN-8 solution five days previously. Neg. #5120
A- Control (water)
B- 0.1 p.p.m. LN-8
C- 1.0 p.p.m. LN-8
D- 10.0 p.p.m. LN-8
E- 100.0 p.p.m. LN-8

Figure 19 *–Example of Primary Screening - Effect of LN-8 on Germination of Kidney Beans*[90]

The primary screening procedures established the relative inhibitory effectiveness of the LN herbicides in terms of LN-8. The rates used; however, were of an order which would be ineffective on well established plants since the plants and stages of development utilized in the screening tests were those which responded most readily to very low concentrations of herbicides. Therefore, it was necessary to develop and perfect methods of application which would permit a more critical evaluation of LN herbicides when used in amounts which would cause death or severe inhibition to a variety of crops at all stages of development and would be practical for relatively large scale green house and small scale field tests.

The primary screening for additional potential chemical plant growth inhibitors continued through at least 1950, by which point over three thousand potential LN herbicides had been screened.[91]

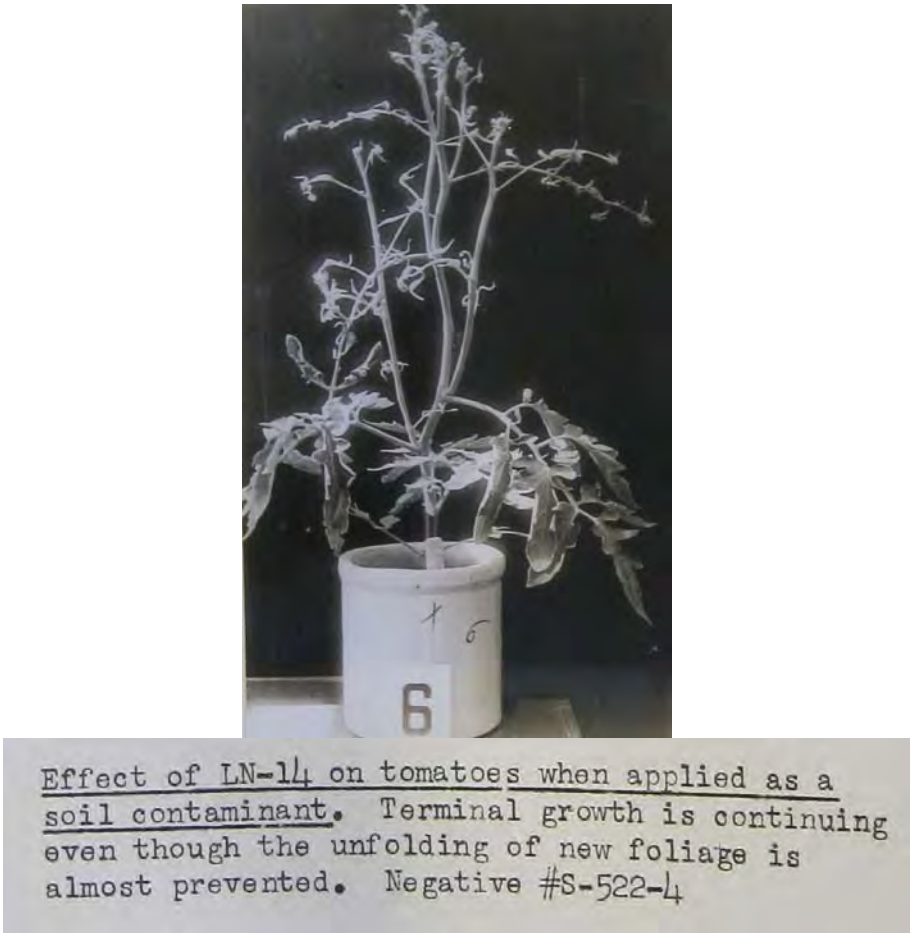


Figure 20 –*Example of Secondary or Greenhouse Screening - Effect of LN-14 on Tomatoes When Applied as Soil Contaminant*[92]

5.2.4 Contact Applications – Spraying – Overview

Developing and investigating the means to disperse the LN, required a number of trials on spraying and dusting for contact (leaf) applications, as well as additional tests for soil

irrigation contamination methods. Development issues with spray apparatus included determining concentrations required, droplet size, diluting media and amount, etc. The reported tests of the various LN herbicides at Camp Detrick were conducted on potted plants and on small field plots with the spraying of individual plants or rows of plants primarily by hand. Eventually these methods would be translated into military applications such as using the M10 airplane smoke tanks for herbicide spraying in large scale trials. Dissemination and larger scale field testing of the selected LN herbicides (and the VK varieties) occurred at other locations than Detrick, such as Bushnell, FL, the Granite Peak Installation of Dugway Proving Ground, UT, Terre Haute, IN and Beaumont, TX[xvi] and are detailed in Special Reports Nos. 12, 14, 25, 64, 78, and 200.[xvii] Large-scale dissemination tests of herbicides involving aerial spraying did not occur at Fort Detrick as the installation did not have the space or quantities and types of the vegetation required to do so.

The diluting media or carrier used for the solution of the LN is an important factor effecting herbicide delivery. Since many of the LN herbicides are not readily soluble in water, various other carriers and solvents, such as lanoline, oils, or dilute aqueous solutions of ethyl alcohol have been used to facilitate their application and possibly increase their effectiveness. Tributylphosphate was found to be a good solvent for herbicides LN-8, LN-14, LN-32 and LN-33. Irish potatoes when sprayed at the bud stage produced significantly lower yields of tubers when sprayed with LN-14 in an oil-tributylphosphate carrier at a rate of 1 pound per acre (0.09 grams per square yard) than potatoes sprayed at a comparable herbicide rate with an aqueous carrier. Application rate should not be confused with the total amount of herbicide applied. Application rates were frequently expressed in “pounds per acre”, but because the field plots were small, the actual amounts applied are expressed in grams (i.e., a dollar bill weighs approximately one gram). Although not specified in this document, it is assumed that multiple tests were conducted with each herbicide being considered at this stage of program development in various carrier solutions or media.

[xvi] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

[xvii] The corporate author of these reports was the Special Projects Division, CWS, which included Camp Detrick personnel. Detrick personnel participated, and in some instances conducted these field trials. This arrangement would continue as the WWII era Special Project Division became the “Biological Department, Chemical Corps” and later the “Chemical Corps Biological Laboratories, Camp Detrick”. In other words, just because Detrick personnel are writing the reports, the testing did not necessarily occur at Fort Detrick. When tests did not occur at Fort Detrick, they are outside the scope of this investigation

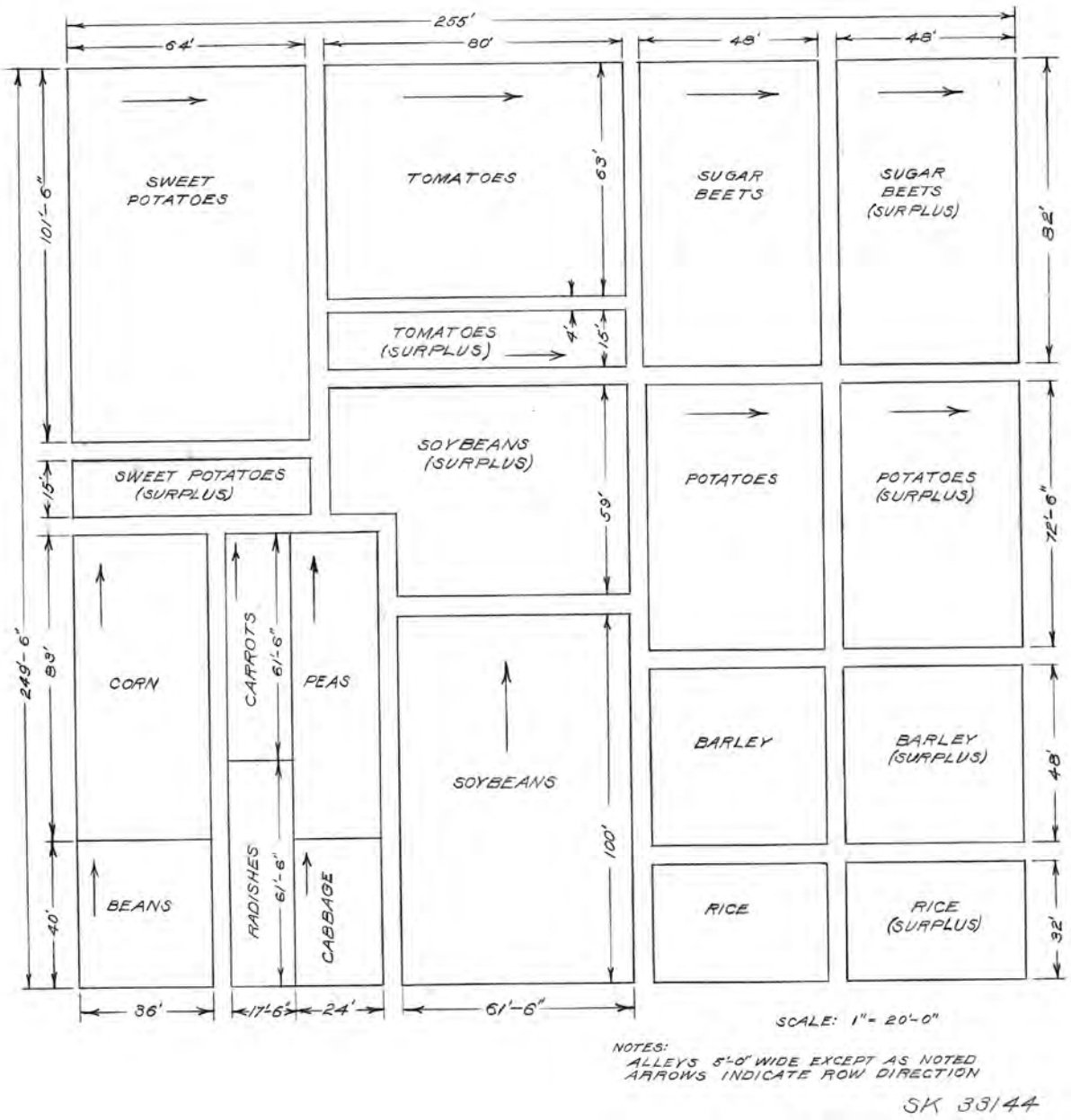


Figure 21 *–General Layout of Field Crops Trials – Camp Detrick – 31 March 1944*[93]
Note: figure does not appear in report but found within the Fort Detrick Map vault sketches. Specific location on installation is probably Field A given the date and shape.

5.2.5 Field Test of LN-14, Spraying Contact Applications, Volume Test on Irish Potatoes, 1945

According to Special Report (SR) No. 79, page 35, Detrick conducted in the summer of 1945 an experiment on several 9- by 12-foot test plots of Irish potatoes (the specific plot locations were not provided). LN-14 in three volume rates: 5, 10, and 20 milliliters (ml) per square yard (SY) and at three herbicide concentration rates (0.5, 1.0 and 5 pounds per

acre or 0.05, 0.09, and 0.47 grams per square yard) were compared plus one control plot with no herbicide use, with quadruplicates (i.e. four replicates) of all the tests. Application rate should not be confused with the total amount of herbicide applied. This implies a total of forty 9- by 12-foot test plots, thirty-six with herbicide sprayed on them. Results of this testing and in general all the small scale plot testing are expressed in crops yield, in this case potatoes tubers per acre. Given this information, **approximately 88 grams**[xviii] **of LN-14 were applied for this test.** The test location was not recorded by the researchers.

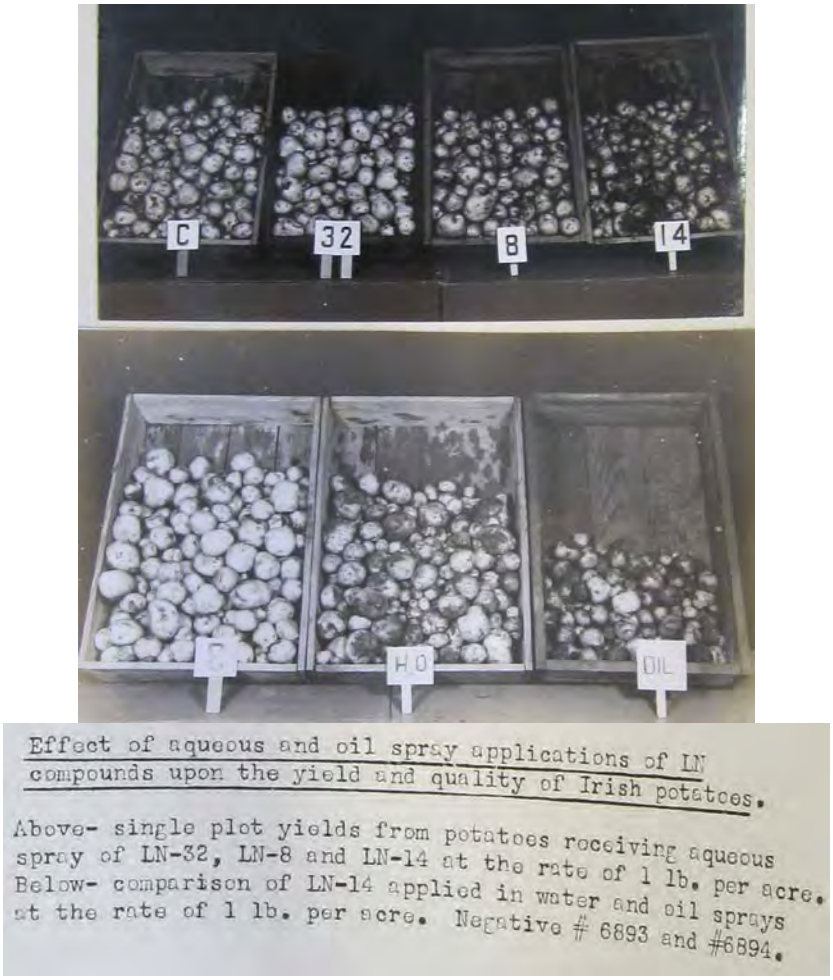


Figure 22 –*Example of Yield Volume Comparisons of Aqueous and Oil Spray Applications of LN Compounds on Irish Potatoes*[94]

5.2.6 Field Test of LN-14, Spraying Contact Applications, Herbicide Carriers Test on Irish Potatoes, 1945

[xviii] The purpose of Special Reports is not to report on the total amounts of herbicides applied and as such it is not clearly stated. Appendix A of this report includes a sample calculation of the amount used for one test, with similar methods used for subsequent tests.

Detrick personnel conducted a second test on Irish potatoes in 1945 as described on page 47 of SR 79 in order to compare the effect on crop yield of aqueous and non-aqueous carriers of the herbicide LN-14 at a rate of one lb/acre. The non-aqueous carrier was more effective. Because the plot size was not recorded by researchers, the amounts applied were calculated based upon the plot size (9- by 12-foot) and replicates (four) used for the potato test described on page 35 of SR79. Based on these assumptions, **approximately 9 grams of LN-14 was applied**. The location of the test was not recorded.

5.2.7 Soil Contamination – Overview

Another avenue for testing of LN herbicides involved soil contamination. Because of the relatively large root systems of most plants and their great absorbing powers, it seemed feasible that plants could similarly be injured by the application of inhibitory herbicides to the soil.

5.2.8 Field Test of LN-8, LN-14, Soil Contamination, Persistence in Soils on Soybean, 1945

Camp Detrick conducted an experiment (page 68 of SR79) to compare the persistence of herbicides LN-8 and LN-14 in soil by applying granular forms of the herbicide in 3, 10, and 20 pounds per acre (or 0.28, 0.94, 1.88 grams per square yard) rates[xix] on the Irish Potato plots, disking the plots and then replanting them with soybeans. Application rate should not be confused with the total amount of herbicide applied. Other details regarding the tests are not stated, such as the plot size and if it included replicates, though presumably they remained the same with 9- by 12-foot test plots and quadruplicate (i.e. four replicates) of all the tests. Given these assumption, **approximately 445 grams of LN-14 was applied for this test.** The test location was not recorded by the researchers.

5.2.9 Crop Susceptibility - Overview

Camp Detrick conducted a series of tests in the field, greenhouse, and in pots (page 195-267 of SR79) designed to evaluate the relative effectiveness of LN herbicides in aqueous solutions versus oil solutions against nine crops (i.e. soybeans, tomatoes, sweet potatoes, sugar beets, Irish white potatoes, rice, oats, winter rye, and corn). Tests conducted in the field are described here, but not those conducted in the greenhouse or pot tests. The preliminary ASR included 1 gram 2,4,5-T herbicide from one greenhouse test described on page 96 of SR79 that is not included here.

[xix] The rates of herbicide applied in soil contamination test are significantly higher for these tests and for similar testing in subsequent years.

5.2.10 Field Test of LN-14, LN-379, LN-835, LN-44, LN-8, LN-32, and their mixtures, Crop Susceptibility, Large Plant Test on Soybeans, 1944-1945

Camp Detrick conducted this experiment (page 200 of SR79) with LN-14, LN-379, LN-835, LN-44, LN-8, LN-32, their mixtures, and TBP on 6- by 9-foot test plots of soybeans 40-48-inches in height at a rate of 0.05 g/SY with aqueous and non-aqueous carriers to evaluate the effect of the herbicides upon crop yield. LN-379 and LN-835 were tested in mixtures with LN-44 and with each other. The date (August 7, 1945) and location of the test (garden area) were recorded in laboratory notebook CD 331, page 192. LN-14 and related herbicides had a greater effect upon crop yield than the others tested. **Approximately 1 gram of LN-14, and less than 1 gram each of LN-379 and LN-835 (overall total less than 2 grams) were applied.**

5.2.11 Field Test of LN-8, LN-14, LN-32, Crop Susceptibility Stage of Development on Tomato, 1944-1945

Camp Detrick conducted this experiment (page 207 of SR79) with LN-8, LN-14, and LN-32 on a 12- by 12-foot test plot of tomatoes at a rate of 0.05 g/SY to evaluate the effect of the herbicide upon crop yield at two stages of development. The date and location of the test were not recorded. Herbicide application at earlier stages of development had a greater effect upon crop yield than upon early stages. **Approximately 5 grams of LN-14 was tested.**

5.2.12 Field Test of LN-8, LN-14, LN-33, Crop Susceptibility Soil Contamination on Beets, 1944-1945

Camp Detrick conducted this experiment (page 215 of SR79) with LN-8 and a 1:1:1 mixture of LN-8, LN-14, and LN-33 on the soil of test plots of beets at a rate of 3, 10, and 20 lb/acre to evaluate the effect of the herbicide upon crop yield at three stages of development. The date and location of the test were not reported. Yield results were not obtained by researchers. Observations suggested LN-8 performance was similar to that when tested upon soybeans. This experiment correlates well with one recorded in laboratory notebook CD 333 page 14 where researchers recorded an aggregate amount of herbicide tested on a group of 9 garden crops at the Grid Area (i.e., Area B), likely including this experiment on beets. The ASR account of that test includes the amount of LN-14 for this experiment.

5.2.13 Field Test of LN-8, LN-14, LN-32, Crop Susceptibility Spray Application on Potato, 1944-1945

Camp Detrick conducted this experiment (page 218 of SR79) with LN-8, LN-14, and LN-32 on 12- by 12-foot test plots (four replicates) of potatoes at a rate of 0.1 g/SY to evaluate the effect of the herbicide in aqueous and non-aqueous carriers upon crop yield.

The date and location of the test were not recorded. Herbicides applied with oil sprays had a greater effect upon crop yield than aqueous sprays. LN-14 had more effect upon crop yield than the other two herbicides. **Approximately 13 grams of LN-14 was applied.**

5.2.14 Field Test of LN-8, LN-14, LN-32, Crop Susceptibility Spray Application, Stage of Development on Potato, 1944-1945

Camp Detrick conducted this experiment (page 222 of SR79) with LN-8, LN-14, and LN-32 on 10- by 10-foot test plots (two replicates) of potatoes at a rate of one and three lb/acre to evaluate the effect of the herbicide upon crop yield when applied at three stages of development. The date and location of the test were not recorded. LN-14 had more effect upon crop yield than the other two herbicides, and was more effective when applied to early stages of plant growth. **Approximately 25 grams of LN-14 was applied.**

5.2.15 Field Test of LN-8, LN-14, LN-33, and mixtures, Crop Susceptibility Soil Contamination Stage of Development on Potato, 1945

Camp Detrick conducted this experiment (page 226 of SR79) with LN-8, LN-14, LN-33, and their mixtures on 15- by 18-foot test plots (four replicates) of potatoes at rates of three, 10, and 20 lb/acre to evaluate the effect of the herbicide upon crop yield when applied at two stages of development. The date (May 15, 1945 first treatment) and location, Grid Area (i.e., Area B) of the test was recorded in laboratory notebook CD 333, page 56. Researchers recorded a larger plot size (15- by 18-foot) in the laboratory notebook than was reported in SR79 (12- by 16-foot). LN-14 had more effect upon crop yield than the other two herbicides, and was more effective when applied to early stages of plant growth. **Approximately 1,364 grams of LN-14 was applied.**

5.2.16 Field Test of LN-8, LN-14, LN-33, Crop Susceptibility Spray Application, Stage of Development on Corn, 1944-1945

Camp Detrick conducted this experiment (page 267 of SR79) with LN-8, LN-14, and LN-33 on 12- by 12-foot test plots (no replicates) of corn at a rate of two and 10 lb/acre to evaluate the effect of the herbicide upon crop yield when applied at three stages of development. The date and location of the test were not recorded. LN-33 applied at a late stage of plant development had more effect upon crop yield than the other two herbicides. **Approximately 54 grams of LN-14 was tested.**

5.3 Laboratory Notebook CD 333 Soil Contamination Tests, 1945[95]

Laboratory Notebook CD 333 covers six 1945 field experiments on the effects of soil treatments with herbicides on the yield of crops. All tests match those reported in SR79

except for one unreported observational soil contamination test of LN-8 and a mixture of LN-8, LN-14, and LN-33 upon 9 crops (oats, Irish potatoes, cabbage, corn, sweet potatoes, beets, tomato, kidney beans, and soybeans) in a variety of plot sizes ranging from 4- by 15-feet to 15- by 15-feet. Other than the fact that the Detrick researcher noted that not all plots were harvested for this test. Herbicides were tested at the Grid Area (i.e., Area B), at rates of 3, 10, and 20 lb/acre. Researchers observed crop damage resulted from herbicide application. **Researchers recorded that 407 grams of LN-14 were required for this test.** This amount was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.4 Laboratory Notebook CD 331 Plant Growth Inhibitor Tests, 1945[96]

Laboratory Notebook CD 331 includes three unreported 1945 field experiments on the effects of herbicide on the yield of crops – experiments 618, 624, and 625. **A total of approximately 19 grams of LN-14 and related herbicides were applied.** Approximately 12 grams were applied at the garden area, and 7 grams at an unreported location.

In this series of tests, LN-14 and related herbicides were tested 23 times, LN-33 was tested 16 times. All other herbicides were tested 30 times. See Appendix D for a complete list of herbicides tested.

5.4.1 Field Test of Herbicides, Growth Inhibitor on Potatoes, 1945

Camp Detrick conducted this unreported experiment (No. 618, page 100 of CD 331) with 20 herbicides on 9- by 10-foot test plots (no replicates) of potatoes at a rate of one lb/acre to evaluate the effect of herbicides upon plant growth. The first treatment was applied on June 9, 1945; and the tests were conducted at the garden area. The experiment included 22 herbicide applications. All herbicides affected crop yield, with LN-14 having the greatest effect. **Approximately 5 grams total of LN-14 and related herbicides (LN-379, 694, 773)** were applied. Researchers noted LN-694 and LN-773 "possess the 2,4,5-trichlorophenoxyacetic configuration". This amount was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.4.2 Field Test of Herbicides, Growth Inhibitor on Millett, 1945

Camp Detrick conducted this unreported experiment (No. 624, page 136 of CD 331) with 9 herbicides in 16 test applications on 5- by 5-foot test plots (no replicates) of millet at rates of two and five lb/acre to evaluate the effect of herbicides upon plant growth. The first treatment was applied on July 4, 1945; and the tests were conducted at the garden area. No effect was noted from the treatments, and plots were not harvested. It is possible that researchers did not report this test because of this result. **Approximately 8 grams total of LN-14 and related herbicide LN-379** were applied. This amount was

not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.4.3 Field Test of Herbicides, Growth Inhibitor on Sudan grass, 1945

Camp Detrick conducted this experiment (No. 625, page 142 of CD 331) with 12 herbicides in 30 test applications on 5- by 6-foot test plots (no replicates) of sudan grass at rates of one, four and five lb/acre to evaluate the effect of herbicides upon plant growth. The first treatment was applied on July 7, 1945. The location of the tests was not recorded. No effect was noted from the treatments, and plots were not harvested. It is possible that researchers did not report this test because of this result. **Approximately 7 grams total of LN-14 and related herbicide LN-379** were applied in 15 test applications. This amount was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.5 Laboratory Notebook CD 482 Field Experiments, 1946[97]

Laboratory Notebook CD 482 covers 8 herbicide field experiments in 1946 at Fort Detrick. All but one of these tests were reported. The remaining experiment of LN-8 on garden crops did not include 2,4,5-T or related herbicides. This test was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.6 Laboratory Notebook CD 595 LN-8 and LN-14 Demonstration Test, 1947[98]

Laboratory Notebook CD 595 includes seven reported experiments and at least one unreported 1947 field demonstration of the destructive effects of LN-8 and LN-14 herbicides on 9 broadleaf crops at the Garden Plot. LN-14 was applied two different times at rates of 2% and 5%. LN-8 was applied at least once. The researcher recorded that 35 grams LN-14 was used to prepare the 5% mixture but did not clearly record the plot sizes. The amount for the 2% mixture was not recorded, and here is calculated proportional to the 5% mixture. While researchers noted plants were killed by the herbicide. **Approximately 49 grams total of LN-14** was applied in this experiment (page 10 of CD 595). This amount was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.7 Special Report No. 86, Plant Growth Inhibitors (LN Herbicides) for Crop Destruction – July 1947[99]

Special Report No. 86 discusses in brief the findings regarding on LN herbicides based on the work completed to date but does not provide any specific details regarding the testing as is included in the other SRs of the period. In regards to 2,4,5-T little is noted except its usefulness against broadleaf crops like Irish potatoes and that it is not in good supply commercially because of little demand as opposed to 2,4-D.

5.8 Special Report No. 92, Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons – 24 February 1948[100]

5.8.1 Estimated Amount of 2,4,5-T Herbicides Tested

The total amount of **2,4,5-T and related herbicides tested for the 1946-47 Field plots tests is approximately 4,213 grams.** This includes:

- 3,722 grams LN-14 (2,4,5-trichlorophenoxyacetic acid (2,4,5-T))
  - ~407 grams in Field A
  - ~28 grams in Field B
  - ~2,865 grams in Field C
  - ~422 grams "area to the northwest of Field B"
- ~407 grams LN-951 (pentachlorophenyl 2,4,5-trichlorophenoxyacetate) in Field C
- 49 grams LN-974 (butyl 2,4,5-trichlorophenoxyacetate)
  - ~41 grams in Field A
  - ~8 grams in Field C
- 17 grams 2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate
  - ~10 grams in Field A
  - ~7 grams in Field C
- ~17 grams 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetic acid and 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetate
  - ~10 grams in Field A
  - ~7 grams in Field C

Alternately this breaks out as approximately the following amounts in the following areas:

- ~467 grams in Field A
- ~28 grams in Field B
- ~3,296 grams in Field C
- ~422 grams "area to the northwest of Field B"

The overall amount is higher than the previous preliminary estimates reported in the October 2010 report of 2,761 grams. The differences primarily result from revised calculation application rates in several soil application experiments. See Appendix D for amounts applied by experiment.

The following sub-paragraphs summarize the 1946 through 1947 field plot tests in general and specifically those that deal with 2,4,5-T and its related herbicides. Of the 162 test instances of all herbicides in this report, there were 51 instances of 2,4,5-T and related herbicides tests, 18 of LN-8, 10 of LN-33, and 84 of other herbicides. See Appendix D for complete herbicide list.

5.8.2 Overview of Special Report No. 92

In 1946-47, Crops Division of Camp Detrick continued conducting field plot experiments with plant inhibitors. The experiments were an extension of the previous field work published in Special Report No. 79 described above and conducted in 1944 through 1945. The development of plant inhibitors is described as occurring in three phases. Phase one involves evaluating and selecting potential herbicides in laboratory and greenhouse studies. The second phase consists of small field plot experiments with the most promising herbicides which was done at Fort Detrick. The third phase, consisting of larger scale field trials with operational munitions or equipment, was done at other locations, not Fort Detrick. Special Report No. 92 summarized the field plot experiments completed in 1946 and 1947 seasons.

The tests occurred in three main locations: Fields A, B (and an area 150 feet northwest of Field B) and C. Field A consisted of approximately 2 acres of Frankstown silt loam soil with the soil classifications delimitation based on the 1919 Soil Survey of Frederick County, Maryland (see following Figure).

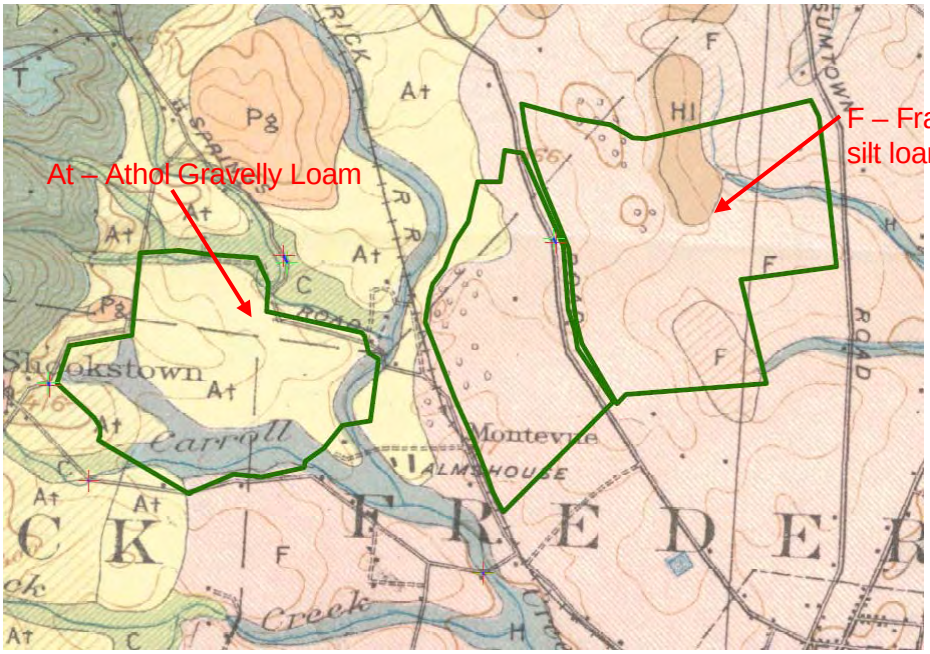


Figure 23 *–Excerpt of 1919 Soil Survey of Frederick County, MD 1919 with Fort Detrick Boundaries*[101]

Note: 1919 soil classifications do not directly correlate to the current ones included on the USDA Natural Resources Conservation Service Soil Survey classifications.[102]

Field A was "located within the restricted areas and is 100 yards north of the C Division building". The 1940s Crops Division Building was Building 321, which places Field A across the street where a parking lot currently exists northeast of Building 350 (see following Figure).[103] This was one of the first fields used for small plot experiments and was in use in 1946 and 1947. Field B consisted of approximately 3 acres of Athol gravelly loam soil "located near the northeastern corner of the Grid area" (i.e., Area B). It was one of the first three fields used for small plot experiments and was in use in 1946 and 1947.[104] Field C consisted of approximately 5 acres of Frankstown silt loam soil "located north of the coal trestle on the railroad". This was one of the first three fields used for small plot experiments and was first used in 1946 and 1947.[105] The location for the railroad coal trestle and hence, Field C can be determined.

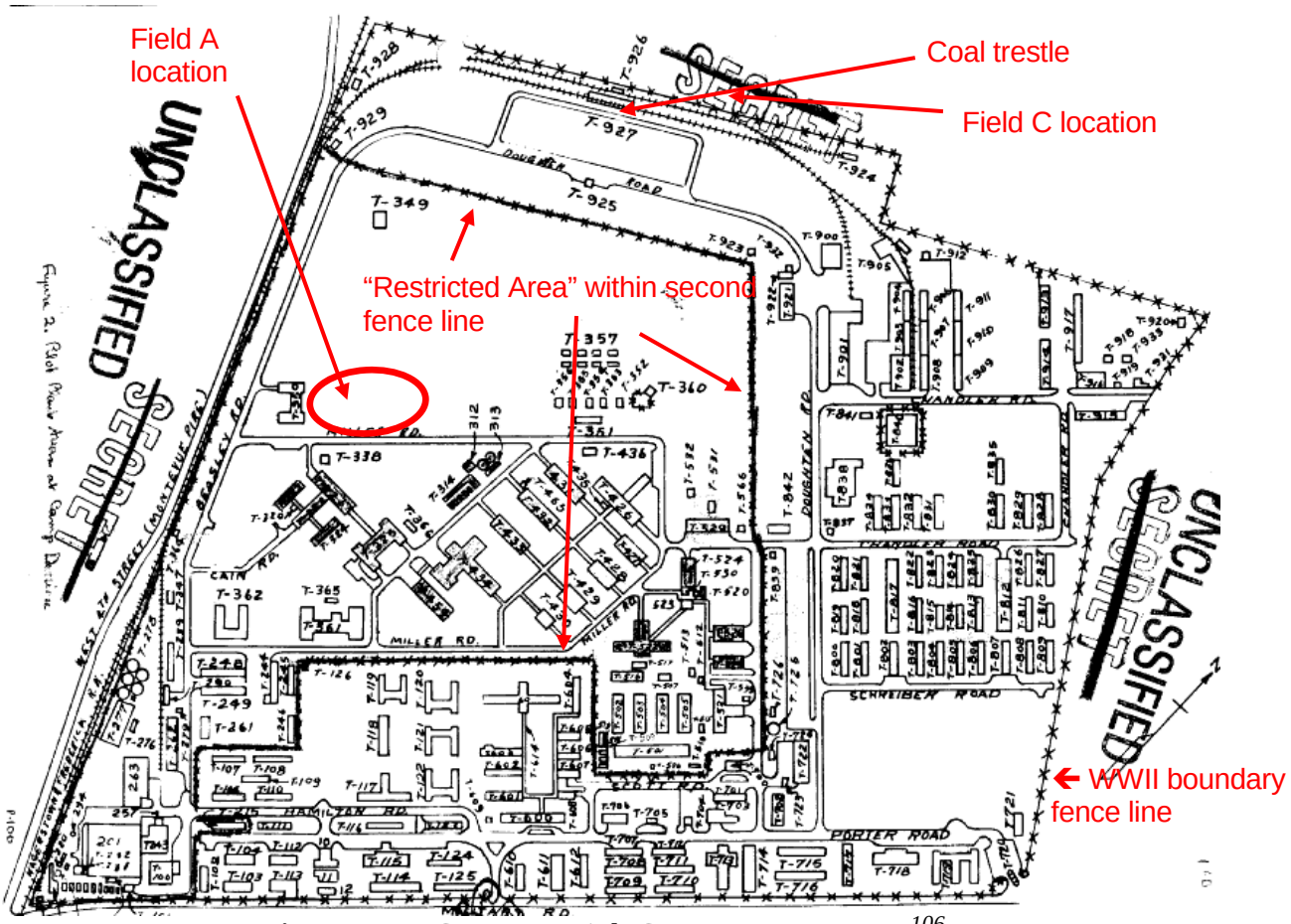


Figure 24 – *Camp Detrick Cantonment - WWII*[106]

NOTE: WWII-era cantonment covers on the southwestern fifth most portion of the current Fort Detrick Area A.

The equipment used to apply the herbicide was handheld sprayers, specifically an atomizer spray gun or a DeVilbiss types MBC spray gun, which was used in all the 1947 experiments (see following Figure).

Figure 25 – *DeVilbiss types MBC spray gun*[107]

In 1946, a 4- by 5-foot cloth covered shield was used to prevent drift of spray to adjacent plots. In 1947, a special movable light metal framed chamber five feet in height with wind resistant cloth was used (see following Figure).

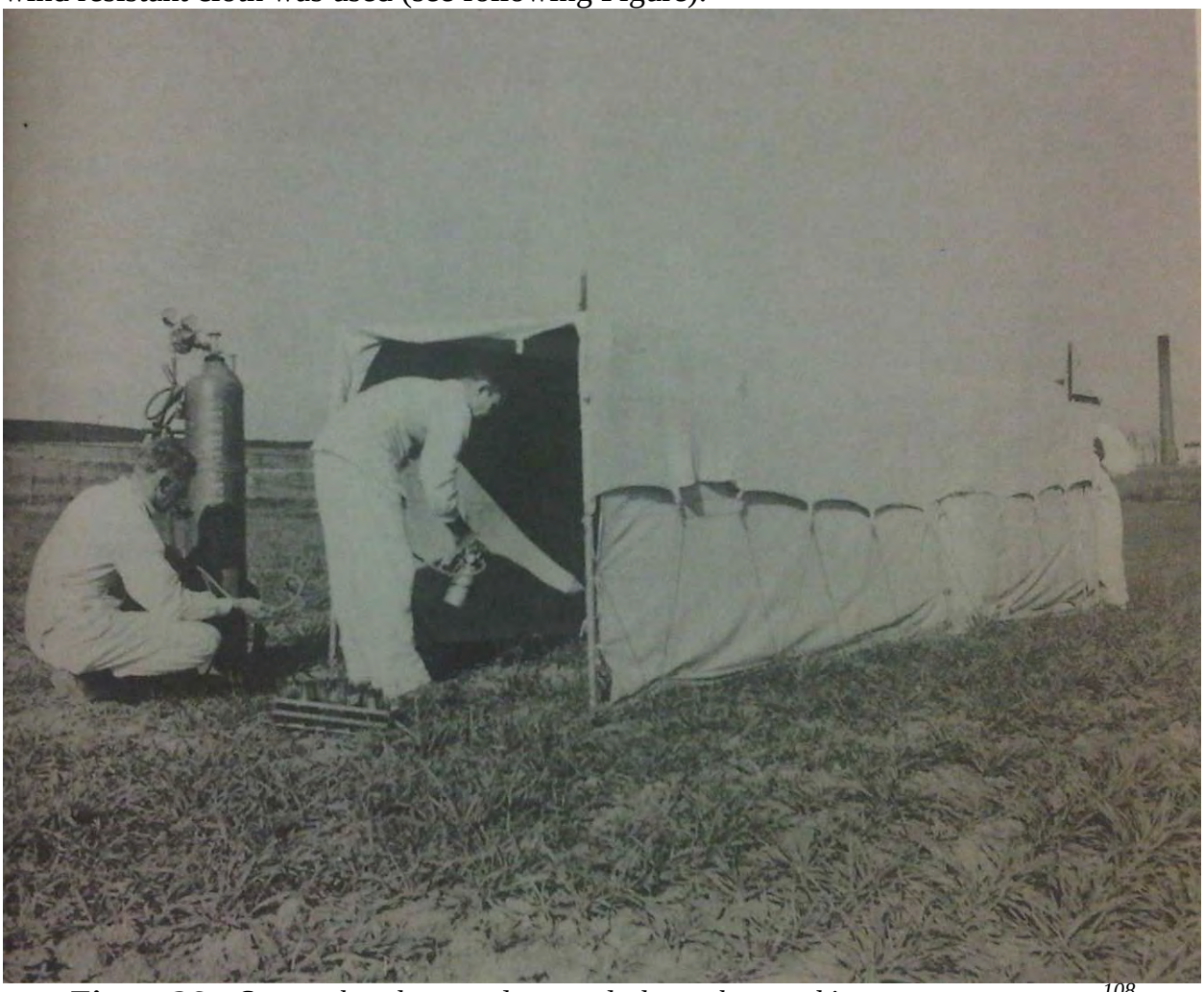


Figure 26 – *Spray chamber used around plots when making spray treatments*[108]
Note: DeVilbiss types MBC spray gun

5.8.3 Field Test of LN-14, Volume-Concentration Spray Studies, Experiment 1 on Potatoes, 1946

Camp Detrick conducted this experiment (page 19 of SR92) on 12- by 15-foot (i.e. 180 SF or 20 SY) test plots of Irish potatoes in Field A to test volume of spray on growth inhibiting qualities of oil-based LN-14 and aqueous LN-14 (TEA) (Triethanolamine 2,4,5-trichlorophenoxyacetate) in concentrations of 0.1 and 0.5 grams per square yard and at three different spray volumes (5, 10 and 20 ml/SY), with four replicates of these tests against control plots. Oil-based herbicide was more effective in reducing crop yield than aqueous-based, and varying volumes of spray had little relative effect. Given this information, **approximately 288 grams of LN-14 were applied for this test.**

Figure 27 – *Irish potatoes 26 days after spraying with* LN-14 (TEA) *– 24 June 1946*[109]

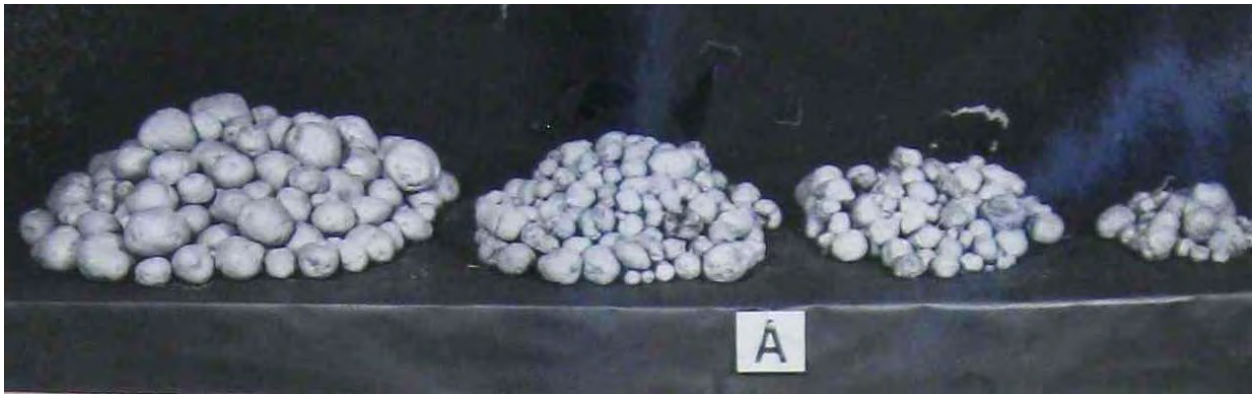


Figure 28 – *Comparison of relative effects of LN-14 in aqueous spray on tubers when applied a constant rate of 0.1 grams/SY but at different volumes - 1946*[110]
From Left to right: untreated, 5, 10 and 20 ml/SY respectively.

5.8.4 Field Test of LN-14, Volume-Concentration Spray Studies, Experiment 1 on Soybeans, 1947

Camp Detrick conducted this experiment (page 36 of SR92) on 6- by 18-foot (i.e. 108 SF or 12 SY) test plots of soybeans in Field C to test volume of spray on growth inhibiting qualities of LN-14 and LN-14 (TEA) in a concentration of 0.008 and 0.020 grams per square yard respectively and at three different spray volumes, with four replicates of these tests against control plots. Treatment differences were not significant to reductions in crop yield. Given this information, **approximately 4 grams of LN-14 were applied for this test.**

5.8.5 Field Test of LN-14, LN-974, Size of Droplet Studies, Experiment 1 on Potatoes, 1946

Camp Detrick conducted this experiment (page 39 of SR92) on 12- by 15-foot (i.e. 20 SY) test plots of Irish potatoes in Field A to test the effect of droplet size using LN-14 (TEA) (Triethanolamine 2,4,5-trichlorophenoxyacetate) and butyl 2,4,5-trichlorophenoxyacetate (LN-974) in a concentration of 0.05 and 0.2 grams per square yard respectively with two different droplet sizes, with four replicates of these tests against control plots. Given this information, **approximately 40 grams of LN-14 TEA and approximately 40 grams of LN-974 were applied for this test (total of 80 grams).**

5.8.6 Field Test of LN-14, LN-951, Stage of Development Spray Studies, Experiment 2, 1947

Camp Detrick conducted this experiment (page 73 of SR92) on 6- by 18-foot (i.e. 108 SF or 12 SY) test plots of soybeans in Field C with LN-14 and pentachlorophenyl 2,4,5-trichlorophenoxyacetate (LN-951) in concentrations of 0.005, 0.025 and 0.050 grams per square yard respectively and at four different plant growth stages with four replicates of these tests against control plots. LN-14 was more effective than LN-951. Given this information, **approximately 15 grams of LN-14 and approximately 15 grams of LN-951 were applied for this test (total of 31 grams).**

5.8.7 Field Test of LN-974, Stage of Development Spray Studies Experiment 3 on Sweet Potatoes, 1947

Camp Detrick conducted this experiment (page 79 of SR92) on 7.5- by 18-foot (i.e. 135 SF or 15 SY) test plots of Sweet Potatoes in Field C with butyl 2,4,5-trichlorophenoxyacetate (LN-974) in concentrations of 0.0025, 0.010 and 0.050 grams per square yard respectively and at two different plant growth stages with four replicates of these tests with two control groups. Higher concentrations applied earlier in development had the most effect upon plant development. Given this information, **approximately 2 grams of LN-974 were applied for this test.**

5.8.8 Field Test of LN-8, LN-14, LN-32, Plant Inhibitor Comparisons in Aqueous and Non-Aqueous Solutions Experiment 1 on Soybeans, 1946

Camp Detrick conducted this experiment (page 82 of SR92) on 6- by 10-foot (i.e. 6.67 SY) test plots of soybeans in Field A to compare the effectiveness of low volume sprays using LN-8, LN-14 (2,4,5-T), and LN-32 in a concentration of 0.025 grams per square yard, with four replicates. LN-14 decreased crop yield more than did the other herbicides tested. Given this information, **approximately less than 1 gram of LN-14 was applied for this test.**

5.8.9 Field Test of LN-8, LN-14, LN-44, LN-974, LN-2076 Plant Inhibitor Comparisons in Aqueous and Non-Aqueous Solutions Experiment 2 on Soybean, 1946

Camp Detrick conducted this experiment (page 85 of SR92) on 6- by 10-foot (i.e. 6.67 SY) test plots of soybeans in Field A to compare the effectiveness of low volume sprays using LN-14, LN-974 and three non 2,4,5-T related herbicides LN-8, LN-44, LN-2076 in a concentration of 0.025 grams per square yard, with four replicates. LN-14 and LN-974 were more effective in reducing crop yield than the other herbicides. Given this information, **approximately less than 1 gram each of LN-14 and LN-974 were applied for this test (total of less than 2 grams).**

5.8.10 Field Test of Plant Inhibitors in Aqueous and Non-Aqueous Solutions Experiment 1 on Soybeans, 1947

Camp Detrick conducted this experiment (page 91 of SR92) on 6- by 18-foot (i.e. 12 SY) test plots of soybeans in Field C to compare the effectiveness of low volume sprays using 2,4,5-T and related herbicides LN-14, LN-974 and LN-951 against other herbicides LN-8, LN-458, isopropyl 2,4-dichlorophenoxyacetic acid, and isopropyl 2-methyl 4-chlorophenoxyacetate in concentrations of 0.005 and 0.020 grams per square yard, with four replicates. LN-14 and LN-974 were the most effective herbicides for reducing crop yield. Given this information, **approximately 1 gram each of LN-14, LN-974, and LN-951 were applied for this test (total approximately 4 grams of 2,4,5-T herbicides).**

5.8.11 Field Test of LN-14, LN-951, LN-974, Plant Inhibitor Comparisons in Aqueous and Non-Aqueous Solutions Experiment 2, 1947

Camp Detrick conducted this experiment (page 96 of SR92) on 7.5- by 20-foot (i.e. 16.7 SY) test plots of Irish potatoes in Field C to compare the effectiveness of low volume sprays using, LN-14, LN-974, LN-951 against a control in concentrations of 0.010 and 0.050 grams per square yard, with four replicates. LN-14 was more effective in reducing crop yield than was other herbicides. Given this information, **approximately 8 grams**

LN-14 and 4 grams each of LN-951, and LN-974 were applied for this test (total 16 grams of 2,4,5-T herbicides).

5.8.12 Field Test of LN-14, LN-974, Plant Inhibitor Comparisons in Aqueous and Non-Aqueous Solutions on Soybeans, Experiment 3,1947

Camp Detrick conducted this experiment (page 101 of SR92) on 6- by 18-foot (i.e. 12 SY) test plots of soybeans in Field C to compare the effectiveness of low volume sprays using LN-14 in three carriers and two solvents, and LN-974 in two carriers against two controls, with four replicates. Oil carriers were more effective than aqueous in reducing crop yield when rainfall occurred post-application. Given this information, **approximately less than 2 grams of LN-14, and approximately 1 gram of LN-974 , were applied for this test (total of 3 grams).**

5.8.13 Field Test of LN-14 and Eight Other Herbicides, Observational Spray Experiment on Potatoes, Experiment 2,1947

Camp Detrick conducted this experiment (page 106 of SR92) on 7.5- by 9-foot (i.e. 7.5 SY) test plots of Irish potatoes in Field C to compare the effectiveness of one herbicide, 4 herbicidal and 3 commercial oils (see Appendix D for list) in controlling vegetation versus LN-14 in a concentration of 0.1 grams per square yard on two plots with no replicates. Two herbicidal oils were as effective as LN-14 in reducing yield, but due to high volumes of oil required, were not considered practical for use. Given this information, **approximately less than 2 grams of LN-14 were applied for this test.**

5.8.14 Field Test of LN-8, LN-14, LN-458, Ammonium 2,4-dichlorophenoxyacetate Observational Spray Experiments on Crops, Experiment 3, 1947

Camp Detrick conducted this experiment (page 109 of SR92) with LN-8, LN-14, LN-458, and ammonium 2,4-dichlorophenoxyacetate on one to three rows six feet long on a wide variety of broadleaf plants (i.e. potatoes, carrots, garden beets, bush beans, soybeans, okra, peanuts, Swiss chard, cabbage, tomatoes, peppers, and sweet potatoes) in Field C to compare the effectiveness of plant growth inhibitors. LN-14 in particular was tested at 0.5 and 1.0 pounds per acre (or rather 0.47 and 0.094 grams per square yard) on plants at two different growth stages (blossom versus well formed fruit) and at 1.5 pounds per acre (0.14 grams per square yard) on mature plants. Application rate should not be confused with the total amount of herbicide applied. Assuming "1-3 rows" equates to an average 4.5 feet and given that 6 feet of 12 types of vegetables were tested this equates to a 324 square feet (SF) (or rather 36 SY) per test group. No replicate plots were conducted for this test. Herbicides effectively inhibited the plants tested. Given this information, **approximately 15 grams of LN-14 was applied for this test.**

5.8.15 Field Test of LN-14 and Other Herbicides, Observational Spray Experiment on Soybeans, Experiment 4, 1947

Camp Detrick conducted this experiment (page 113 of SR92) on 3- by 21-foot (i.e. 7 SY) test plots of soybeans in Field C to observe growth of progeny plants treated at sub-lethal levels using a variety of herbicides and LN-14 in concentration of 0.025 grams per square yard. No formative effects were noted in plants grown from the harvested seeds in 1947. Given this information, **approximately less than 1 gram of LN-14 was applied for this test (previous ASR reported 1.8 grams, a math error).**

5.8.16 Field Test of LN-14, LN-951, LN-8, Soil Application – Plant Inhibitor and Stage of Development Study of Soybeans, Experiment 1, 1947

Camp Detrick conducted this experiment (page 116 of SR92) on 6- by 18-foot (i.e. 12 SY) test plots of soybeans in Field C to compare the effectiveness of plant growth inhibitors at different plat growth stages. LN-8, LN-14, and LN-951 in concentrations of 3, 6, and 12 pounds per acre (i.e. 0.28, 0.56 and 1.12 grams per square yard) were used at three different growth stages with four replicates. Application rate should not be confused with the total amount of herbicide applied. The LN-14 used was a commercial product by Dow Chemical, while the Chemical Branch of the B.S. Division prepared the LN-951 used. LN-14 was more effective than the other herbicide tested. Given this information, **approximately 283 grams each of LN-14 and LN-951 were applied for this test (total of 566 grams).**

5.8.17 Field Test of Herbicides, Soil Application – Plant Inhibitor Comparisons on Tomatoes, Experiment 1, 1947

Camp Detrick conducted this experiment (page 120 of SR92) on 1 SY test plots of tomatoes (single plot) in Field C to study effects of 18 plant growth inhibitors applied as dusts in soil. 2,4,5-T products tested were 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetic acid and 2,4-dichlorophenyl-2,4,5-trichlorophenoxyacetate applied in concentrations of 5 and 20 pounds per acre (i.e. 0.47 and 1.87 grams per square yard). Application rate should not be confused with the total amount of herbicide applied. Phenoxyacetic acids were more effective than other herbicides. Given this information, **approximately 2 grams each 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetic acid and 2,4-dichlorophenyl-2,4,5-trichlorophenoxyacetate were used for this test (5 grams total).**

5.8.18 Field Test of LN-14, LN-33, Soil Application – Plant Inhibitor Comparisons on Wheat, Experiment 2, 1947

Camp Detrick conducted this experiment (page 122 of SR92) on 3- by 18-foot (i.e. 6 SY) treated test plots of wheat in Field A to ascertain effects of LN-14 and LN-33 on

established wheat. LN-14 was applied in concentrations of 5, 10, and 15 pounds per acre (i.e. 0.47, 0.94 and 1.41 grams per square yard) with four replicates. Application rate should not be confused with the total amount of herbicide applied. LN-33 was more effective than LN-14, although there was great variation. Given this information, **approximately 67 grams LN-14 were used for this test.**

5.8.19 Field Test of Herbicides, Soil Application – Plant Inhibitor Comparisons on Soybeans, Experiment 3, 1947

Camp Detrick conducted this experiment (page 124 of SR92) on 1- by 9-foot (i.e. 1 SY) treated test plots of soybeans in Field C to compare the effectiveness of 19 LN herbicides including three 2,4,5-T: LN-951, 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetate and 2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate applied in concentrations of 0.5 and 2 grams per square yard with two replicates. 2,4-D was a more effective plant inhibitor than other herbicides. Given this information, **approximately 5 grams of each LN-951, 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetate and 2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate were applied for this test (total 15 grams of 2,4,5-T herbicides).**

5.8.20 Field Test of LN-14, Soil Application – Particle Size and Agent Percentage, Experiment 1 on Soybeans, 1947

Camp Detrick conducted this experiment (page 131 of SR92) on 6- by 18-foot (i.e. 12 SY) test plots of soybeans in Field C to ascertain the effect of the percent of herbicide and particle size using LN-14 in a commercial form produced by Dow Chemical. LN-14 herbicide was applied in four forms of extruded materials. The test used small pellets, large pellets, impregnated sawdust and impregnated Fuller's earth (clay) in concentrations of 25%, 50%, 75%, and 97% with application rates of 0.5, 1.0 and 2.0 grams per square yard with four replicates and three controls. Large pellet applications were more effective than other treatments. Given this information, **approximately 2,352 grams of LN-14 were applied for this test (previously reported as 1,416 due to interpretation of application rate as being reduced by the treatment concentration percentage).**

5.8.21 Field Test of Herbicides, Soil Application – Persistence in Soil, Experiment 1 on Soybeans and Oats, 1946

Camp Detrick conducted this experiment (page 136 of SR92) on 10- by 10-foot (i.e. 11.1 SY) test plots of half soybeans and half oats in Field B to study persistence of herbicides, including LN-14, in concentration of 0.5 and 2.0 grams per square yard (no replicates). LN-14 was more effective and persistent in the soil than were other herbicides. Given this information, **approximately 28 grams of LN-14 were applied for this test.**

5.8.22 Field Test of Herbicides, Soil Application – Persistence in Soil, Experiment 1 on Kidney Beans, 1947

Camp Detrick conducted this experiment (page 138 of SR92) on 5- by 9-foot (i.e. 5 SY) treated test plots of red kidney beans in Field A to compare the effectiveness of 21 herbicides including three 2,4,5-T and related: LN-14, 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetic acid, and 2,4-dichlorophenyl-2,4,5-trichlorophenoxyacetate applied in concentrations of 2 grams per square yard with no replicates. LN-8 did not persist as well in the soil as did other herbicides tested. Given this information, **approximately 10 grams of each LN-14, 2,4,6-trichlorophenyl 2,4,5-trichlorophenoxyacetic acid and 2,4-dichlorophenyl-2,4,5-trichlorophenoxyacetate were applied for this test (total 30 grams of 2,4,5-T herbicides, previously reported at 20 grams due to 2,4-dichlorophenyl-2,4,5-trichlorophenoxyacetate being not included).**

5.8.23 Field Test of LN-14 and LN-33, Soil Application – Observational Soil Application Studies, Experiment 1, 1947

Camp Detrick conducted this experiment (page 147 of SR92) on five crops (i.e. oats, barley, millet, sorghum and corn) in Field C to observe the effectiveness of LN-33 versus LN-14 applied in extruded particles containing 50% herbicide at an herbicide rate of 10 lb. per acre and observing the effects at five different plant growth stages. Researchers reported no results for LN-14 stages four and five, and did not include LN-14 in the conclusions. LN-33 reduced yield of oats and barley but not millet, corn, nor sorghum. The size of the plots is not stated but if one assumes an 18 SY plot, an **estimated 84 grams of LN-14 was applied for this test (previously reported as 42 grams due to rate error).**

5.8.24 Field Test of LN-14 and LN-951 Soil Application – Observational Soil Application Studies, Experiment 2, 1947

Camp Detrick conducted this experiment (page 149 of SR92) on 10 crops (i.e. potatoes, carrots, beans, beets, soybeans, peanuts, chard, cabbage, tomatoes, and sweet potatoes) in Field C to observe the effectiveness of LN-14 and LN-951 applied in extruded particles containing 50% herbicide at a herbicide rates of 3, 12, and 20 lb. per acre and observing the effects at two plant growth stages. The size of the plots is not stated but if one assumes as similar sized areas to the Observational Spray Experiments, 1947 Experiment 3 (page 109 of SR92) discussed previously, which had a similar variety of crops tests, an average 4.5 feet and given that 6 feet of 10 types of vegetables were tested this equates to a 270 SF or 30 SY per test group. No replicate plots were conducted for this test. Researchers indicated LN-14 was more effective than LN-951. Given this information, an **estimated 98 grams of each LN-14 and LN-951 was applied for this test (total 197 grams of 2,4,5-T herbicides, previously reported as 98 grams due to rate error).**

5.8.25 Firebreak Vegetational Control Studies, 1947

Camp Detrick conducted this experiment (page 152 of SR92) on broadleaf and grassy weeds on 9- by 9-foot (i.e. 9 SY) plots "laid out in the area to the northwest of Field B" to observe the effectiveness of LN-8, LN-14 and LN-33 in control of vegetative firebreaks. LN-14 was applied as impregnated Fuller's Earth dust at rates of 10, 20, and 50 lb. per acre containing 13.3% herbicide on plowed and unplowed plots at two stages of growth. Additionally, there were plots with split applications at rates of 5, 10, and 25 lb. per acre with half the plot receiving a second dose and half not receiving the second application. Plots of a 50/50 mix of LN-14:LN-33 at rates of 20 and 40 lb. per acre containing 13.3% herbicide were also applied at only the second stage. No replicate plots were conducted for this test. Researchers concluded that at least 10 lb/acre of LN-14 was needed for control of firebreak vegetation. Given this information, **approximately 422 grams of LN-14 were applied for this test (46 grams previously reported due to rate error).**

5.9 Special Report No. 105, Field Plot Experiments with Plant Inhibitors 1948 Season – 16 August 1949[111]

5.9.1 Estimated Amount of 2,4,5-T Herbicides Applied in 1948

The total amount of **2,4,5-T herbicides applied for the 1948 Field plot tests is approximately 2,030 grams** (higher than previous ASR 1,545 grams due to revised calculations for two tests). This includes:

- 1,891 grams LN-14 (2,4,5-trichlorophenoxyacetic acid (2,4,5-T))
  - ~757 grams in Field D
  - ~630 grams in Location B
  - ~504 grams in Location A
- 12 grams 43% isopropyl 2,4,5-T (isopropyl 2,4,5-trichlorophenoxyacetate, LN-2777) in Field D
- 10 grams LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field D
- 117 grams LN-2426 (2,4,5-trichlorophenoxyacetic anhydride) with in Field D

The following sub-paragraphs summarize the 1948 field plot tests in general and specifically those that deal with 2,4,5-T and its related herbicides. See Appendix D for comprehensive list of other herbicides tested. The most frequently tested herbicides were LN-14 (14 times), LN-8 (11 times), and LN-33 (11 times). All other herbicides comprised 78 instances of testing.

5.9.2 Overview of Special Report No. 105

In 1948, Crops Division continued conducting field plot experiments with plant inhibitors at Camp Detrick. The experiments were an extension of the previous field work published in Special Report Nos. 79 and 92 described above and conducted in 1944 through 1947. The primary objectives were:

"a) ascertain the most effective agent for causing yield reductions for various crops
b) to ascertain the best methods of application
c) to determine the effect of stages of development on plant response"

The test locations are identified as Fields C, D, and E with two additional locations of unplowed grasses also used (A& B, 115 feet north and 570 feet east of Field C respectively). Though the specific field locations are not specified, Field D is about 4 acres in size and west of Field C. Field E is about 6 acres in size and approximately 1,400 feet northwest of the Commanding Officer's Quarters.

The described field trials were not large scale tests, such as spraying by aircraft. The equipment used to apply the herbicide was handheld sprayers, specifically the DeVilbiss types MBC spray gun to the tops of the plants. In the vegetation control experiments and for application to the soil surface, a CWS three gallon sprayer (M1) originally designed for decontaminating was used. As before, to prevent drift of spray or dust, a movable, five-foot high, light metal framed chamber or shelter with wind resistant cloth was used.

5.9.3 Field Test of LN-14, Volume-Concentration Spray Studies, Experiment 1 on Soybeans, 1948

Camp Detrick conducted this experiment (page 6 of SR105) on 4.5- by 18-foot (i.e. 81 SF or 9 SY) test plots of soybeans in Field D to test volume of spray on growth inhibiting qualities of LN-14 in a 1% Tween 20 (a commercial polysorbate surfactant) aqueous solution. LN-14 in a concentration of 0.0025 and 0.0075 grams per square yard and at three different spray volumes were compared, with four replicates of these tests. Researchers concluded the higher application rate was more effective, but volume comparisons were inconclusive due to rainfall after application of the 5 ml volume test. Given this information, **approximately 1 gram of LN-14 was applied for this test.**

5.9.4 Field Test of LN-14, Volume-Concentration Spray Studies, Experiment 2 on Soybeans, 1948

Camp Detrick conducted this experiment (page 10 of SR105) on 4.5- by 18-foot (i.e. 9 SY) test plots of soybeans in Field D to test volume of spray on growth inhibiting qualities of LN-14 in a 1% Tween 20 (a commercial polysorbate surfactant) aqueous

solution. The tests used LN-14 in a concentration of 0.0025 and 0.005 grams per square yard and at three different spray volumes, with four replicates of these tests. Given this information, **less than gram of LN-14 was applied for this test**.

5.9.5 Field Test of LN-14, LN-2426, Stage of Development Spray Studies, Experiment 2 on Soybeans, 1948

Camp Detrick conducted this experiment (page 22 of SR105) on 4.5- by 18-foot (i.e. 9 SY) test plots of soybeans in Field D to compare LN-14 and LN-2426 (2,4,5-trichlorophenoxyacetic anhydride) at three different concentrations (0.0025. 0075 and 0.025 grams per square yard) and at three different stages of development of the plant, with four replicates of these tests. Given this information, **approximately 4 grams each of LN-14 and LN-2426 were applied for this test, a total of approximately 8 grams of 2,4,5-T and related herbicide**.

5.9.6 Field Test of Herbicides, Agent Comparison Spray Experiments, Experiment 1 on Soybeans, 1948

Camp Detrick conducted this experiment (page 37 of SR105) on 4.5- by 18-foot (i.e. 9 SY) test plots of soybeans in Field D to compare the effectiveness of LN-14 versus LN-8, LN-143 (butyl 2,4-dichlorophenoxyacetate, normal butyl ester of LN-8), LN-719 (triethanolamine 2-bromo- 3,5-Dichlorobenzoate), and two commercial formulations in both water and diesel oil carriers: Esteron 44 (isopropyl 2,4-dichlorophonoxyacetate) and 43% isopropyl 2,4,5-T (isopropyl 2,4,5-trichlorophenoxyacetate, elsewhere identified as LN-2777) in concentrations of 0.005 and 0.020 grams per square yard, with four replicates of these tests. Researchers found that herbicides with oil carriers were more effective than water carriers. Herbicides LN-14 and LN-2777 had the most effect upon crop yields, and were not significantly different from each other. Given this information, **approximately 1 gram of LN-14 was applied for this test and twice that amount of 43% isopropyl 2,4,5-T (isopropyl 2,4,5-trichlorophenoxyacetate, LN-2777), or 3 grams of 2,4,5-T herbicides were applied** (previous ASR reported 1.8 g due to a math error)**.**

5.9.7 Field Test of LN-14, LN-8, Agent Comparison Spray Experiments, Experiment 2 on Beets, 1948

Camp Detrick conducted this experiment (page 42 of SR105) on 4.5- by 18-foot (i.e. 9 SY) test plots of sugar beets in Field D to compare the effectiveness of LN-14 versus LN-8 in three different aqueous and non-aqueous carriers in concentrations of 0.010 and 0.025 grams per square yard, with four replicates of these tests. Researchers concluded LN-8 was more effective than LN-14 in reducing yield. Given this information, **approximately 4 grams of LN-14 were applied for this test**.

5.9.8 Field Test of LN-14, LN-974, LN-2777, Agent Comparison Spray Experiments, Experiment 3 on Potatoes

Camp Detrick conducted this experiment (page 53 of SR105) on 7.5- by 20-foot (i.e. 150 SF or 16.67 SY) test plots of Irish potatoes in Field D. LN-14 in a concentration of 0.015 grams per square yard was compared with two versions each of LN-974 (butyl 2,4,5-trichlorophenoxyacetate) and LN-2777 (isopropyl 2,4,5-trichlorophenoxyacetate) in a concentration of 0.015 or 0.060 grams per square yard, with four replicates of these tests. Researchers concluded LN-974 and LN-2777 (commercially available) were not different in reducing yield. Given this information, **approximately 1 gram of LN-14, approximately 10 grams each of LN-974 and LN-2777 were applied for this test (total of 21 g 2,4,5-T and related herbicides)**.

5.9.9 Field Plot Technique-Sampling of Treated Plots, Soybeans, 1948

Camp Detrick conducted this experiment (page 58 of SR105) with the materials and methods "precisely the same as" Volume-Concentration Spray Studies, Experiment 2 noted above (page 10 of SR105). The purpose of the study was to look for spraying bias within plots. As demonstrated by the identical yield figures, experimental data previously collected was analyzed for this study. Researchers concluded that field personnel applied more spray to their right than to the other two rows in the plot. The previous ASR reported approximately 1 gram LN-14 was applied; however, this amount was already accounted for in the analysis of Volume-Concentration Spray Studies, Experiment 2, and is not counted here.

5.9.10 Field Test of LN-14, LN-719, LN-2426, Soil Application - Agent Comparison-Stage of Development on Soybeans, 1948

Camp Detrick conducted this experiment (page 62 of SR105) on 4.5- by 9-foot (i.e. 4.5 SY) test plots of soybeans in Field D to compare the effectiveness of LN-14, LN-719 (triethanolamine 2-bromo- 3,5-Dichlorobenzoate) and LN-2426 (2,4,5-trichlorophenoxyacetic anhydride). Researchers applied herbicides at concentrations of 5 and 15 lbs. per acre (0.47 and 1.41 grams per square yard) at three stages of plant growth, with four replicates of these tests. They compared results with untreated control groups. Researchers concluded LN-719 was less effective than the other herbicides tested. Given this information, **approximately 101 grams each of LN-14 and LN-2426 were applied for this test (total of 202 g 2,4,5-T and related herbicide)**.

5.9.11 Field Test of LN-14, Soil Application – Comparison of LN-14 on Soybeans, Experiment 1, 1948

Camp Detrick conducted this experiment (page 66 of SR105) on 6- by 18-foot test plots, with only the middle 4.5 feet treated (i.e. 9 SY) test plots of soybeans in Field D (plot

split by rate) to compare the effectiveness of LN-14 at concentrations of 5, 10, and 20 lbs. per acre (or 0.4686, 0.9372 and 1.8743 grams per square yard) at three stages of plant growth, with four replicates of these tests. Researchers concluded large amounts of herbicide as a soil contaminant are required to reduce yields. Given this information, **approximately 354 grams of LN-14 were applied for this test.**

5.9.12 Field Test of LN-14, Soil Application – Comparison of LN-14 on Soybeans, Experiment 2, 1948

Camp Detrick conducted this experiment (page 69 of SR105) on 6- by 18-foot test plots, with only middle 4.5 feet treated (i.e. 9 SY) test plots of soybeans in Field D (plot split by rate and form of herbicide). The objective was to compare differing solubilities of LN-14 in three forms (acid, Na salt and triethanolamine [TEA] salt) at concentrations of 5, 10 and 20 lbs. per acre (or 0.4686, 0.9372 and 1.8743 grams per square yard) and at two different stages of plant growth versus three controls, with four replicates of these tests. Researchers concluded LN-14 is not very effective in reducing yields when applied as a soil contaminant of mature plants. Given this information, **approximately 236 grams of LN-14 were used for this test** (less than previous ASR of 354 grams due to revised number stages treated)**.**

5.9.13 Field Test of Herbicides, Soil Application – Agent Comparison on Soybeans, 1948

Camp Detrick conducted this experiment (page 73 of SR105) on 4.5- by 9-foot (i.e. 4.5 SY) test plots of soybeans in Field D (split plot design) to compare effectiveness of LN-14 with 8 benzoic acid herbicides. Researchers applied two concentrations of 5 and 20 lbs. per acre (or 0.4686 and 1.8743 grams per square yard) versus one control, with four replicates of these tests. Researchers concluded that the higher application rate was necessary to reduce crop yield, and that LN-14 and LN-2387 were the most effective. Given this information, **approximately 42 grams of LN-14 were applied for this test.**

5.9.14 Field Test of Herbicides, Soil Application – Persistence Study on Kidney Beans, 1948

Camp Detrick conducted this experiment (page 96 of SR105) on a series of 4.5- by 6-foot test plots (i.e. 3 SY) test plots of kidney beans in Field D to compare the persistence of LN-14 and a variety of other LN herbicides including LN-2426, at a concentration of 20 lbs. per acre (or 1.8743 grams per square yard), with only two replicates of these tests. Researchers stated that 6 grams/plot (two plots per herbicide) were used. Researchers concluded LN-14 and LN-2426 persisted the longest and had the most effect on plants. Given this information, **approximately 12 grams each of LN-14 and LN-2426 were applied (total of 24 grams 2,4,5-T and related herbicides applied).**

5.9.15 Field Test of Herbicides, Vegetation Control of Unplowed Areas, 1948

Camp Detrick conducted this experiment (page 98 of SR105 and page 3 of laboratory notebook CD677[112]) at Locations A & B, 115 feet north, and 570 feet east of Field C. Location A & B contained broadleaf and annual grasses and Kentucky bluegrass, respectively. Tests were conducted on 9- by 9-foot test plots (i.e. 9 SY) with a dust form of LN-14 and other herbicides at rates of 20 and 50 lbs. per acre (or 2 and 5 grams per square yard) with two replicates, on four dates. Plots in Location B also received a single spray application of LN-14 and other herbicides, with two replicates, at 20 and 50 lb per acre. Researchers concluded none of the herbicide treatments were satisfactory for firebreak use due to plant debris build-up. Given this information, **approximately 630 grams of LN-14 in Location B and 504 grams in Location A were used for this test for a total of 1,134 grams (**higher than previous ASR of 531 grams due to revised interpretation of replicates based on information contained in laboratory notebook CD677**).**

5.10 Laboratory Notebook CD 677 Plant Inhibitors for Soil or Water Contamination, Field Experiments, 1948[113]

Laboratory Notebook CD 677 covers 14 1948-1949 field experiments on the effects of plant inhibitors on crop yield. Three tests were analyzed; two were reported by researchers, one was not. The unreported test was of four herbicides including LN-14 and LN-2426 on 12 crops (page 47 of CD677) in two applications of 5 lb/acre and 20 lb/acre at Field D. Researchers treated six-foot strips of row length and did not record the width, but did discuss preparing herbicide in units of 2 SY units, therefore width of three feet was used for analysis. Researchers recorded their observations of plants four times, and recorded yields of potatoes and peanuts, and noted crop damage and failure resulted from herbicide application. **Assuming 24 SY application per herbicide with no replicates, approximately 56 grams each LN-14 and LN-2426 were applied for this test, for a total of 112 grams 2,4,5-T related herbicides.** This amount was not previously reported in the ASR because the notebook was recovered subsequent to the last report. Researchers did not indicate why this test was not included with the published reports. See Appendix D for comprehensive list including other herbicides tested.

5.11 Special Report No. 130, Field Plot Experiments with Plant Inhibitors 1949 Season – 14 April 1950[114]

5.11.1 Estimated Amount of 2,4,5-T and Arsenic-related Herbicides Applied

The total amount of **2,4,5-T herbicides applied for the reported 1949 Field plots tests is approximately 186 grams**. This includes:

- 115 grams LN-14 (2, 4, 5-trichlorophenoxyacetic acid)
  - 7 grams in Field C
  - 108 grams in area located 150 feet north of Field C
- 71 grams LN-974 (Butyl 2,4,5-trichlorophenoxyacetate) in Field C

In addition, **approximately 5,409 grams arsenic trioxide was applied** during a firebreak vegetation experiment located 150 feet north of Field C.

The following sub-paragraphs summarize the 1949 field plot tests in general and specifically those that deal with 2,4,5-T and related herbicides, and arsenic trioxide. See Appendix D for comprehensive list including other herbicides tested. The most frequently tested herbicides were LN-974 (29 times), LN-143 (25 times), LN-33 (10 times), and LN-14 (6 times). All other herbicides comprised 20 instances of testing.

5.11.2 Overview of Special Report No. 130

Crops Division continued conducting field plot experiments with plant inhibitors in 1949 at Camp Detrick. The experiments were an extension of the previous field work published in Special Report Nos. 79, 92, and 105 described above and conducted in 1944 through 1948, with the primary objectives remaining the same. The test locations are identified as Fields C, D, and E. As before, the described field trials were small scale tests using hand held sprayers (i.e. DeVilbiss types MBC spray gun) or a glass droplet-sizer with a movable light metal framed chamber to prevent drift of spray or dust.

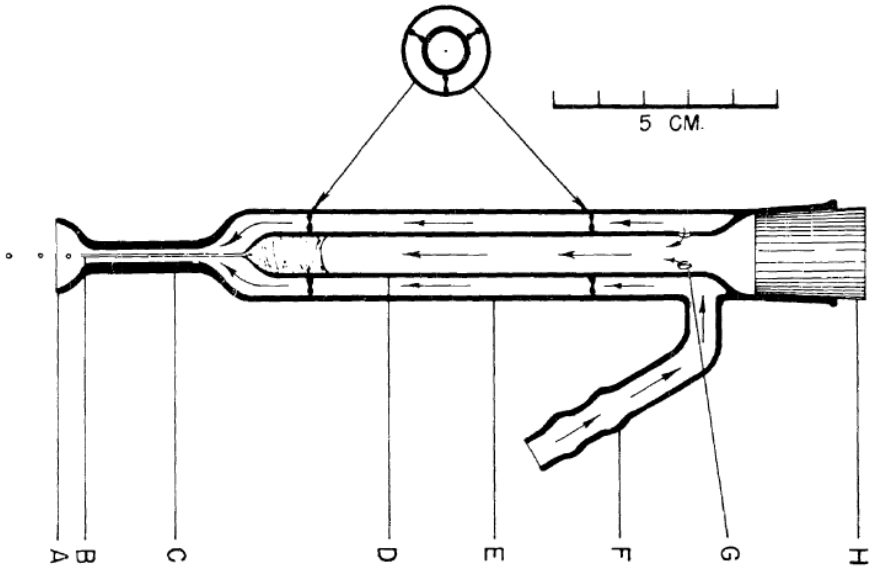


Figure 29 – *Drawing of glass droplet-sizer used in applying extremely low-volume top treatments and in making droplet-size applications*[115]

5.11.3 Field Test of LN-14, Volume-Concentration Spray Studies, Experiment 1 on Soybeans, 1949

Camp Detrick conducted this experiment (page 5 of SR130) on 4.5- by 18-foot (i.e. 81 SF or 9 SY) test plots split by rate of soybeans in Field C to test three volumes of spray on growth inhibiting qualities of LN-14 in three different carriers: water, 1% Tween 20 and 5% oil emulsion at two different concentration of 0.004 and 0.008 grams per square yard, against two controls, with four replicates for each test plot. Researchers found more reduction in yield with increasing spray volumes for the Tween treatments only. Given this information, **approximately 4 grams of LN-14 were applied for this test.**

5.11.4 Field Test of LN-14, LN-974, Volume-Concentration Spray Studies, Experiment 2 on Soybeans, 1949

Camp Detrick conducted this experiment (page 11 of SR130) on one row (presumably 18-inches wide) by 18-foot (i.e. 3 SY) test plots of soybeans in Field C to test three rates of volume of spray on growth inhibiting qualities of LN-14 and LN-974 (butyl 2,4,5-trichlorophenoxyacetate) at a concentration of 0.008 grams per square yard, against a control, with four replicates for each test plot. Researchers concluded LN-974 was more effective than LN-14. Given this information, **approximately less than 1 gram each of LN-14 and LN-974 were used for this test (total of less than 1 gram 2,4,5-T and related herbicide).**

5.11.5 Field Test of LN-14, Carrier Spray Experiment, Experiment 1 on Soybeans, 1949

Camp Detrick conducted this experiment (page 21 of SR130) on 4.5- by 18-foot (i.e. 9 SY) test plots of soybeans in Field C (split by rate) to compare the effectiveness of LN-14 in two different carriers and LN-14 (TEA) in three carriers at concentrations of 0.0045 and 0.0090 grams per square yard, with four replicates of these tests. Researchers found less effect from aqueous carriers than oil carriers. Given this information, **approximately 2 grams of LN-14 were applied for this test**.

5.11.6 Field Test of LN-143, LN-974, Agent Comparison Spray Experiments, Experiment 2 on Onions, 1949

Camp Detrick conducted this experiment (page 33 of SR130) on 1.5- by 18-foot (i.e. 2 SY) treated test plots of white onions in Field C to compare the effectiveness of LN-974 (butyl 2,4,5-trichlorophenoxyacetate), LN-143 (butyl 2,4-dichlorophonoxyacetate, normal butyl ester of LN-8) and a 1:1 combination of the two in concentrations of 0.025, 0.1, and 0.20 grams per square yard at two plant growth stages, with three replicates of these tests. Researchers concluded LN-143 was more effective than LN-974, with intermediate results from the mixture of the two herbicides. Given this information, **approximately 6 grams of LN-974 were applied for this test**.

5.11.7 Field Test of LN-143, LN-974, Agent Comparison Spray Experiments, Experiments 3-14, 1949

Camp Detrick conducted a series of experiments (page 36-59 of SR130) following the same methods and materials as in Experiment 2 above except the test plots were of different crops and design as noted below. Researchers concluded that yield of all crop plants tested could be reduced by tactical application of the herbicides tested.

Experiment No., pg	Crop	Approx. g LN-974	Comments
3, 36	Flax	**6**	LN-974 more effective
4, 38	Peanuts	**3**	one plant growth stage tested, LN-974 more effective
5, 40	Kale	**6**	At lower rate, LN-143 more effective
6, 42	Rutabaga	**6**	Both herbicides were effective
7, 44	Rutabaga	**6**	At lower rate, LN-143 more effective
8, 47	Mangel	**6**	LN-143 more effective
9, 49	Sugar Beet	**6**	LN-143 more effective
10, 51	Garden Beet	**6**	LN-143 more effective
11, 53	Cabbage	**6**	Both herbicides were effective
12, 55	Eggplant	**6**	Both herbicides were effective
13, 57	Rape	**3**	only one plant growth stage was tested
14, 59	Tobacco	**5**	one plant growth stage tested, 10 SY plot, no replicates (was 3 g in prelim. ASR)

5.11.8 Field Test of LN-14, LN-974, Droplet Spray Studies, Experiment 1 on Soybeans (Droplet Size), 1949

Camp Detrick conducted this experiment (page 64 of SR130) on 18-inch by 18-foot (i.e. 3 SY) test plots of soybeans in Field C (experiment design split between rates) to

compare the effectiveness of LN-974 (butyl 2,4,5-trichlorophenoxyacetate) and LN-14 (TEA) (Triethanolamine-2,4,5-trichlorophenoxyacetate) in concentrations of 0.005 and 0.0167 grams per square yards. Each test was conducted with a spray of large droplets and of small droplets, with four replicates of each test. Researchers concluded small droplet sprays with LN-974 were most effective. Given this information, **approximately 1 gram total of LN-974 and LN-14 were applied for these tests**.

5.11.9 Field Test of LN-974, Droplet Spray Studies, Experiment 2 on Soybeans (Minimum Number of Droplets per Unit Area, 1949

Camp Detrick conducted this experiment (page 68 of SR130) on 18-inch by 18-foot (i.e. 3 SY) test plots of soybeans in Field C (split between rates) to compare various concentrations of LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in #2 diesel oil. Concentrations of 0.005 and 0.0167 grams per square yards were sprayed using herbicide/diesel mixtures of 1.5, 3, 7.5, and 15%, with four replicates of each test. Researchers concluded herbicide applied with more droplets per unit area was more effective. Given this information, **approximately 1 gram of LN-974 was applied for these tests**.

5.11.10 Field Test of LN-8, LN-14, Ammonium sulfamate, Arsenic trioxide, Firebreak Maintenance, 1949

Camp Detrick conducted this experiment (page 138 of SR130) on 9- by 9-foot (i.e. 9 SY) test plots of annual grasses located 150 feet north of Field C to compare herbicides LN-8, LN-14, Ammonium sulfamate, and Arsenic trioxide applied as dusts with a shaker in two treatments. LN-14 was applied at 1 and 2 grams per square yard. Arsenic trioxide was applied at 30 and 120 grams per square yard. Researchers concluded LN-8 and LN-14 were more effective than the other herbicides tested. Given this information, **approximately 108 grams of LN-14 and 5,409 grams Arsenic trioxide were applied for these tests** (This test was not included in the preliminary ASR).

5.12 Special Report No. 153, Field Plot Experiments with Plant Inhibitors, 1950 Season[116]

5.12.1 Estimated Amount of 2,4,5-T and Related Herbicides Tested

The total amount of **2,4,5-T and related herbicides applied for the reported 1950 Field plots tests is approximately 316 grams** (less than previously reported due to revised rate calculations)**.** This includes:

- 164 grams LN-14 (2,4,5-trichlorophenoxyacetic acid (2,4,5-T))
  - ~80 grams in Field D

  - ~84 grams in Field E
- 153 grams LN-974 (butyl 2,4,5-trichlorophenoxyacetate)
  - ~7 grams in Field A
  - ~145 grams in Field D
  - ~less than 1 gram in Field F

Alternately this breaks out as approximately the following amounts in the following areas:

  - ~7 grams in Field A
  - ~225 grams in Field D
  - ~84 grams in Field E
  - ~less than 1 gram in Field F

The following sub-paragraphs summarize the field plot tests in general and specifically those that deal with 2,4,5-T and related herbicides. See Appendix D for comprehensive list including other herbicides tested. The most frequently tested herbicides were LN-974 (17 times), LN-143 (10 times), LN-33 (10 times), LN-2464 (9 times), and LN-14 (9 times). All other herbicides comprised 22 instances of testing.

5.12.2 Overview of Special Report No. 153

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued conducting field plot experiments with plant inhibitors in 1950 through 1951 as an extension of the previous field work published in Special Report Nos. 79, 92, 105, and 130 described above and conducted in 1944 through 1949, with the primary objectives remaining the same. The test locations for the small plot experiments in this period were conducted Fields A, D and E, described in the previous reports and a single test in Field F, a location that was not described in Special Report No. 153 (however, it is in No. 156). As in previous years, to prevent drift of spray or dust during the applications of herbicidal materials, a movable chamber having a light metal frame and covered with a wind resistant cloth, was placed around the plots. The chamber was five feet tall and could be adjusted to fit the various size plots used in the experiments.

Contemporary documents describe the amount of acres planted for field testing in 1950 as: *"…27 acres wheat, 9 acres oats, 1 acre rye, 14 acres cowpeas, 5 acres sweat clover, 5 acres soybeans, 1 acre Red Kidney beans, 1 acre Black Valentine beans, and smaller plantings of Irish potatoes, sweet potatoes, fiber flax, oil flax, tomatoes, sweet corn, sugar beets, millet, sorghum, sunflower, cotton, and Russian dandelion. In these planting 3150 plots were established, maintained, harvested and the yields determined. The remainder of the plantings were used either for larger scale field size experiments or green manure purposes."*[117] How this divided between Fields A, D, E, and F is not documented.

5.12.3 Field Test of LN-974, LN-143, Stage of Development Spray Studies, Experiment 3 on Wheat, 1950

Camp Detrick conducted this experiment (page 13 of SR153) on 3- by 18-foot (i.e. 6 SY) test plots of wheat in Field A to compare the effectiveness of LN-974 against LN-143 (butyl ester of 2,4-D) at two plant growth stages in concentration of 0.1 and 0.2 grams per square yard, with two replicates of these tests. Researchers concluded herbicides were more effective when applied at the boot stage of development. Given this information, **approximately 7 grams of LN-974 was applied for this test** (lower than previous ASR of 22 grams due to revised plot size).

5.12.4 Field Test of LN-974, Minimum Volume Spray Studies, Experiment 1 on Flax, 1950

Camp Detrick conducted this experiment (page 20 of SR153) on 6- by 18-foot (i.e. 12 SY) test plots of flax in Field D to determine the minimum volume of highly concentrated formulations of herbicide on growth inhibiting qualities of LN-974 in concentrations of 0.0096, 0.024, 0.048 and 0.096 grams per square yard, with three replicates of these tests. Researchers concluded small droplet, low volume treatments of LN-974 were inhibitory to flax. Given this information, **approximately 6 grams of LN-974 were applied for this test.**

5.12.5 Field Test of LN-974, Minimum Volume Spray Studies, Experiment 2 on Potato, 1950

Camp Detrick conducted this experiment (page 23 of SR153) on 7.5- by 18-foot (i.e. 15 SY) test plots of Irish potatoes in Field D to determine the minimum volume of highly concentrated formulations of herbicide on growth inhibiting qualities of LN-974 in a 96% volume concentration. Researchers stated materials applied were same as Experiment 1 (page 20 of SR153) except herbicide volumes were applied at 0.025, 0.050, 0.075, and 0.1 ml per SY, with two replicates of these tests. Given that the rates applied in Experiment 1 were proportionate to volumes applied, rates for Experiment 2 were 0.024, 0.048, 0.072, and 0.096 grams per square yard. Researchers concluded that 484 ml/acre herbicide would be required to reduce crop yield. Given this information, **approximately 7 grams of LN-974 were applied for this test** (lower than previous ASR of 13 grams due to revised rate calculation)**.**

5.12.6 Field Test of LN-974, Minimum Volume Spray Studies, Experiment 5 on Soybeans, 1950

Camp Detrick conducted this experiment (page 29 of SR153) on test plots of soybeans in Field D (split between stages) to determine the minimum volume of highly concentrated

formulations of herbicide on growth inhibiting qualities of LN-974 in a 90% volume concentrations of herbicide applied at 0.005, 0.010, 0.020, 0.030, and 0.050 ml per SY, with three replicates of these tests applied at two stages of plant growth. Researchers did not record the gram/SY rates of herbicide applied for this experiment. Given that herbicide concentration for this experiment (90%) is less than Experiment 1 (96%), a worst case estimate would be to use the rates recorded for Experiment 1, proportionate to volume applied. The test plot size was not specified but the area harvested is noted as 3 rows 16.5 feet long with an 18-inch row spacing, which should equate to 7.5- by 18-foot (i.e. 15 SY). Researchers concluded volume applications of 0.010 ml/SY and above effectively reduced crop yield. Given this information, **approximately 10 grams of LN-974 were applied for this test** (more than previous ASR estimate of 8 grams due to one stage of development application not included)**.**

5.12.7 Field Test of LN-974, Droplet-Size Spray Studies, Experiment 2 on Potatoes, 1950

Camp Detrick conducted this experiment (page 36 of SR153) on 7.5- by 18-foot (i.e. 15 SY) test plots of Irish potatoes in Field D to determine effect of large and small droplets on 0.1 and 0.2 ml/SY volume of applications of a 96% volume concentration of LN-974, with two replicates of these tests. Researchers did not record the gram/SY rates of herbicide applied for this experiment. Given that herbicide concentration for this experiment (96%) is the same as Experiment 1, the rates recorded for Experiment 1 were use for this analysis, proportionate to volume applied. Researchers concluded small droplets were more effective in reducing yields than were large droplets. Given this information, **approximately 17 grams of LN-974 were applied for this test** (less than previous ASR estimate of 47 grams due to revised rate calculation and corrected number of replicates)**.**

5.12.8 Field Test of LN-974, Droplet-Size Spray Studies, Experiment 3 on Flax, 1950

Camp Detrick conducted this experiment (page 38 of SR153) on 4.5- by 18-foot (i.e. 9 SY) test plots of flax in Field D to determine effect of three droplet sizes on low volume of applications of a 96% volume concentrations of LN-974 at application rates of 0.025 and 0.050 ml per square yard, with four replicates of these tests. Researchers did not record the gram/SY rates of herbicide applied for this experiment. Given that herbicide concentration for this experiment (96%) is the same as Experiment 1, the rates recorded for Experiment 1 were use for this analysis, proportionate to volume applied. Researchers concluded small droplets were more effective in reducing crop yield. Given this information, **approximately 8 grams of LN-974 were applied for this test** (lower than previous ASR of 47 grams due to rate revision)**.**

5.12.9 Field Test of LN-974, Droplet-Size Spray Studies, Experiment 5 on Soybeans, 1950

Camp Detrick conducted this experiment (page 44 of SR153) on 6- by 18-foot (i.e. 12 SY) test plots of soybeans in Field D (split between rates) to determine effect of four droplet sizes on low volume of applications of a 90% volume concentrations of LN-974 at application rates of 0.02 and 0.040 ml per square yard, with four replicates of these tests,. Researchers did not record the gram/SY rates of herbicide applied for this experiment. Given that herbicide concentration for this experiment (90%) is less than Experiment 1 (96%), a worst case estimate would be to use the rates recorded for Experiment 1, proportionate to volume applied. Researchers concluded small droplets were more effective in reducing crop yield. Given this information, **approximately 11 grams of LN-974 were applied for this test** (lower than previous ASR estimate of 19 grams due to revised rate calculation)**.**

5.12.10 Field Test of LN-974, LN-143, Agent Comparison Spray Study, Experiments 1-7, 1950

Camp Detrick conducted these experiments (pages 48-66 of SR153) on test plots of seven crops in Field D (plot layout split by stage except where noted) to compare the effectiveness of LN-974 versus LN-143 and a 1:1 combination of the two in concentrations of 0.010, 0.025 and 0.50 grams per square yard at two plant growth stages, with three to four replicates of these tests at the noted test plot size. Experiment 7 included seven additional herbicides. Given this information, the following table provides the approximate amounts of LN-974 applied for each of these tests.

Experiment No., pg	Crop	Test Plot Size (additional comments)	Replicates	Approx. of LN-974 (grams)
1, 48	Fiber Flax	3- by 18-foot (i.e. 6 SY)	3	**5**
2, 52	Oil Flax	3- by 18-foot (i.e. 6 SY)	3	**5**
3, 55	Sunflowers	3 SY	3	**2**
4, 56	Sweet Corn	7.5- by 18-foot (i.e. 15 SY) 0.1 and 0.25 grams/SY (no LN-974 mix tested)	4	**42 (was 53, dbl counted test removed)**
5, 60	Sorghum	7.5- by 18-foot (i.e. 15 SY) three plant stages at 0.1 grams/SY and 1 at 0.25 (no LN-974 mix tested)	3	**8**
6, 63	Irish Potatoes	7.5- by 18-foot (i.e. 15 SY) one plant stage at 0.025 and 0.1 grams/SY(no LN-974 mix tested)	4, complete plot	**7.50**
7, 66	Soybeans	3- by 18-foot (i.e. 6 SY) one plant stage at 0.05 lbs/acre (0.0047 grams/SY)	4, complete plot	**0.1**

Experiment No., pg	Crop	Test Plot Size (additional comments)	Replicates	Approx. of LN-974 (grams)
		(no LN-974 mix tested) Field F		

This equates to **approximately 86 grams of LN-974 applied for this test in Field D and less than 1 gram in Field F** (lower than previous ASR estimate of 97 grams due to removal of a double-counted test)**.**

5.12.11 Field Test of LN-14, LN-8, LN-719, Persistence of Plant Inhibitors in Progeny of Treated Plants, Experiment 1 on Kidney Beans, 1950

Camp Detrick conducted this experiment (page 79 of SR153) on 1.5- by 18-foot (i.e. 3 SY) test plots of red kidney beans in Field D to compare the effectiveness of LN-14 versus LN-8 and LN-719 (triethanolamine 2-bromo- 3,5-Dichlorobenzoate) at five different plant growth stages applied in concentrations of 0.001 (four stages), 0.005, and 0.015 grams per square yard with four replicates. Researchers concluded LN-14 was the most effective yield-reducing herbicide, but noted that the experiment was incomplete because seed harvested had not yet been planted and observed. Given this information, **approximately 1 gram of LN-14 was applied for this test.**

5.12.12 Field Test of LN-14, LN-8, LN-719, Persistence of Plant Inhibitors in Progeny of Treated Plants, Experiment 2 on Kidney Beans, 1950

Camp Detrick conducted this experiment (page 83 of SR153) on 2- by 10-foot (i.e. 2.2 SY) test plots of red kidney beans in Field D to compare the effectiveness of LN-14 versus LN-8 and LN-719 at five different plant growth stages in concentrations of 1, 5, and 9 lbs/acre (equivalent to 0.094, 0.47, and 0.84 grams per square yard) with four replicates. Researchers concluded LN-14 was the most effective yield-reducing herbicide, but noted that the experiment was incomplete because seed harvested had not yet been planted and observed. Given this information, **approximately 62 grams of LN-14 were applied for this test.**

5.12.13 Field Test of LN-14, Top Application Dust Study, Agent Rate Comparison, Soybeans, 1950

Camp Detrick conducted this experiment (page 88 of SR153, page 19 of CD1155[118]) on test plots of soybeans in Field D to ascertain effects of various rates of LN-14 upon yield of soybeans applied at 0.01, 0.025, 0.050 and 0.1 grams per square yard with diatomaceous earth carrier, four replicates. The test plot size was specified in the laboratory notebook as 9 SY. Given this information, **approximately 7 grams of LN-14 were applied for this test** (less than previous ASR estimate of 11 grams due to revised plot area)**.**

5.12.14 Field Test of LN-14, Top Application Dust Study, Minimum Amount of Dust Study, Soybeans, 1950

Camp Detrick conducted this experiment (page 90 of SR153, page 25 of CD1155[119]) on test plots of soybeans in Field D to ascertain effects of various rates of LN-14 upon yield of soybeans applied at 0.05, 0.1 and 0.2 grams per square yard with three replicates. The test plot size was specified in the laboratory notebook as 9 SY Researchers compared these results with the dust carrier experiment (page 88) and concluded pure herbicide was more effective in reducing yield than when applied with a carrier. Given this information, **approximately 9 grams of LN-14 were applied for this test** (less than previous ASR estimate of 16 grams due to revised plot area)**.**

5.12.15 Field Test of Herbicides, Vegetation Control Studies, 1950

Camp Detrick conducted this experiment (page 124 of SR153) on 22-inches by 10-foot (i.e. 2 SY) test plots of plowed bare earth and mowed annual grasses in Field E (split between rates) to compare the effectiveness LN-14, three 1:1 mixes of LN-14 and 6 other growth inhibitors at concentration of 0.3, 0.6 and 1.2 grams per square yard on plowed and unplowed plots with four replicates. Researchers concluded LN-14 and its mixtures with other herbicides provided the best control. Given this information, **approximately 84 grams of LN-14 were applied for this test**.

5.13 Special Report No. 156, Field Plot Experiments with Plant Inhibitors, 1950-51 Season – 25 August 1952[120]

5.13.1 Estimated Amount of 2,4,5-T Herbicides Applied

The total amount of **2,4,5-T and related herbicides applied for the Field plots tests is approximately 131 grams** (less than previously reported of 461 grams due to corrections). This includes:

- 13 grams LN-14 (2,4,5-trichlorophenoxyacetic acid (2,4,5-T)) in Field F
- 106 grams LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field F
- 6 grams LN-1856 (alpha-(2,4,5-trichlorophenoxy)-propionic acid) in Field F
- 6 grams LN-2426 (2,4,5-trichlorophenoxyacetic anhydride) in Field F

The following sub-paragraphs summarize the 1950 through 1951 field plot tests in general and specifically those that deal with 2,4,5-T and its related herbicides. See Appendix D for comprehensive list including other herbicides tested. The most

frequently tested herbicides were LN-974 (26 times), LN-143 (20 times), and LN-14 (8 times). All other herbicides comprised 86 instances of testing.

5.13.2 Overview of Special Report No. 156

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued conducting field plot experiments with plant inhibitors in 1950 though 1951 as an extension of the previous field work published in Special Report Nos. 79, 92, 105, 130, and 153 described above and conducted in 1944 through 1950, with the primary objectives remaining the same. The test locations for the small plot experiments in this period were conducted in the 16 acres Field F, which is reported as at the northern most area of Camp Detrick. As in previous years, to prevent drift of spray or dust during the applications of herbicidal materials, a movable chamber, having a light metal frame and covered with a wind resistant cloth, was placed around the plots.

5.13.3 Field Test of LN-974, Application of Four Different Droplet Sizes of LN-974 to Soybeans, 1951

Camp Detrick conducted this experiment (page 12 of SR156) on 4.5- by 18-foot (i.e. 81 SF or 9 SY) test plots of soybeans in Field F to test effect of droplet size on growth inhibiting qualities of LN-974 in a 90% solution of Velsicol AR-55 saturated with Du Pont oil red dye. LN-974 was applied in a concentration of 0.01675 grams per square yard with four different droplet sizes, with four replicates of these tests. Researchers concluded smaller-size droplets were more effective in reducing yield than larger-size droplets. Given this information, **approximately 2 grams of LN-974 were applied for this test.**

5.13.4 Field Test of LN-974, Application of 100% LN-143 and 96% LN-974 to Various Agricultural Crops, 1951

Camp Detrick conducted the following series of experiments (pages 26-52 of SR156) on test plots of agricultural crops to determine the effectiveness of LN-143 (100% solution) and LN-974 (96% solution). These tests involved spraying LN-974 in three different concentrations: 0.00937, 0.023429, and 0.046859 grams per square yard with four replicates for each test. The plot size represents one 18-foot long row of each crop. The following table summarizes this series of tests.

Crop	Plot Size	Approximate Amount of LN-974 Applied
Lima Beans	2.5- by 18 feet	**2 grams**
String Beans	2.5- by 18 feet	**2 grams**
Kale	2- by 18 feet	**1 gram**

Crop	Plot Size	Approximate Amount of LN-974 Applied
Sunflower	2.5- by 18 feet	**2 grams**
Sweet Peppers	2.5- by 18 feet	**2 grams**
Tomatoes	3- by 18 feet	**2 grams**
Eggplant	2.5- by 18 feet	**2 grams**
Hemp	2- by 18 feet	**1 gram**
Peanuts	3- by 18 feet	**2 grams**
Rutabaga (Swede)	2- by 18 feet	**1 gram**
Mangels	2- by 18 feet	**1 gram**
Sugar Beets	2- by 18 feet	**1 gram**
Sweet Potatoes	3- by 18 feet	**2 grams**
Tobacco	3- by 18 feet	**2 grams**

This equates to **approximately 22 grams of LN-974 applied for this test.**

5.13.5 Field Test, Application of 96% LN-974 to Oil Flax, 1951

Camp Detrick conducted this experiment (page 57 of SR156) on 2- by 18-foot (i.e. 36 SF or 4 SY) test plots of oil flax in Field F to test effectiveness on growth inhibiting qualities of LN-974 in a 96% solution, with Tributylphosphate as the solvent, in concentrations of 0.0094, 0.023, and 0.047 grams per square yard with four replicates of these tests. Researchers concluded the lowest concentration was sufficiently effective to reduce crop yield. Given this information, **approximately 1 gram of LN-974 was applied for this test.**

5.13.6 Field Test, Application of 96% LN-974 to Irish Potatoes at Three Stages of Development 1951

Camp Detrick conducted this experiment (page 59 of SR156) on 2.5- by 18-foot (i.e. 45 SF or 5 SY) test plots of Irish potatoes in Field F to test effectiveness on growth inhibiting qualities of LN-974 in a 96% solution, with Tributylphosphate as the solvent. LN-974 was applied at three stages of plant development in four concentrations of 0.023, 0.047, 0.094, and 0.19 grams per square yard, with six replicates of these tests. Researchers concluded that lower concentrations were most effective at earlier stages of plant development, and higher rates were necessary to reduce yields at later stages. Given this information, **approximately 32 grams of LN-974 were applied for this test** (lower than previous report of 316 grams due to a math error)**.**

5.13.7 Field Test, Application of Three Rates of LN-143, LN-974, LN-1700, and LN-2464 to Winter Wheat at Three Stages of Plant Development, 1951

Camp Detrick conducted this experiment (page 67 of SR156) on 3.5- by 18-foot (i.e. 63 SF or 7 SY, notebook CD1243[121] page 16 records plot size of 4.67 SY used for this analysis) test plots of winter wheat in Field F (split between rates) to test effectiveness on growth inhibiting qualities of LN-974 versus LN herbicides 143, 1700, and 2464. LN-974 was applied at three stages of plant development in concentrations of 0.05, 0.1, and 0.3 grams per square yard, with four replicates of these tests. Researchers concluded LN-2464 was most effective in reducing yield. Given this information, **approximately 25 grams of LN-974 were applied for this test** (less than previous report of 38 grams due to revised plot area reported in the laboratory notebook)**.**

5.13.8 Field Test, Application of LN-620, LN-658, LN-761, and LN-14 to Soybeans at Two Stages, 1951

Camp Detrick conducted this experiment (page 87 of SR156) on 2- by 18-foot (i.e. 36 SF or 4 SY) test plots of soybeans in Field F to test effectiveness on growth inhibiting qualities of LN-14 versus LN herbicides 620, 658, and 761. LN-14 was applied at two different times in two concentrations of 0.015 and 0.005 grams per square yard, with four replicates of these tests. Researchers concluded LN-14 was most effective in reducing crop yield. Given this information, **approximately 1 gram of LN-14 was applied for this test.**

5.13.9 Field Test, Application of LN-14, LN-1856, and LN-2426 on Irish potatoes at Two Stages, 1951

Camp Detrick conducted this experiment (page 106 of SR156) on 7.5- by 18-foot (i.e. 135 SF or 15 SY) test plots of soybeans in Field F to test effectiveness on growth inhibiting qualities of LN-14 versus LN herbicides 1856, and 2426. LN-14, 1856, and 2426 were applied at two stages of plant development at 0.047 grams per square yard, with four replicates of these tests. Researchers concluded LN-14 and LN-2426 were most effective in reducing crop yield. Given this information, **approximately 6 grams each of LN-14, LN-1856, and LN-2426 were applied for this test (total of 17 grams 2,4,5-T and related herbicides).**

5.13.10 Field Test, Application to Potatoes of Various Organic and Inorganic Compounds Alone and in Combination with LN-974, 1951

Camp Detrick conducted this experiment (page 110 of SR156) on 2.5- by 18-foot (i.e. 45 SF or 5 SY) test plots of Irish potatoes in Field F to test effectiveness on growth inhibiting qualities of LN-974 and LN-974 mixed with organic and inorganic herbicides. LN-974 was applied in concentrations of 0.05, 0.075, and 0.125 grams per square yard,

unmixed and mixed with each of five different herbicides, with four replicates of these tests. Researchers concluded additions of these herbicides to LN-974 did not improve LN-974 effectiveness in reducing crop yield. Given this information, **approximately 18 grams of LN-974 were applied for this test.**

5.13.11 Field Test, 45 Compounds on Irish potato, 1951

Camp Detrick conducted this experiment (page 119 of SR156) on 2.5- by 18-foot (i.e. 45 SF or 5 SY) test plots of Irish potatoes in Field F to screen 45 herbicides and compare their yield-reducing effectiveness with that of LN-974. LN-974 was applied in concentration of 0.047 grams per square yard, with two replicates of these tests. LN-974 was the only 2,4,5-T related herbicide applied in this test. Researchers concluded that only one herbicide (LN-93) was as effective as LN-974 in reducing crop yield. Given this information, **approximately 1 gram of LN-974 was applied for this test** (this test was not included in the previous report)**.**

5.13.12 Field Test, Application of 0.5 and 1.5 pounds per acre of LN-1856, LN-1999, and LN-14 to Soybeans, 1951

Camp Detrick conducted this experiment (page 123 of SR156) on 4.5- by 18-foot (i.e. 81 SF or 9 SY) test plots of soybeans in Field F (split between rates) to test effectiveness on growth inhibiting qualities of LN-14 versus LN herbicides 1856, and 1999. LN-14 and LN-1856 were applied at 0.005 and 0.015 grams per square yard, with four replicates of these tests. Application rate should not be confused with the total amount of herbicide applied. Researchers concluded that LN-14 and LN-1856 were effective in reducing crop yields. Given this information, **approximately 1 gram each of LN-14 and LN-1856 were applied for this test (total of less than 2 grams total 2,4,5-T and related herbicide,** LN-1856 not included in previous report)**.**

5.13.13 Field Test, LN-14 (TEA) with Additives on Black Valentine Beans, 1951

Camp Detrick conducted this experiment (page 129 of SR156) on 2 SY test plots of Black Valentine Beans in Field F to test effectiveness on growth inhibiting qualities of LN-14 and LN-14 mixed with phosphoric acid (H_3PO_4), LN-539, and LN-1999. LN-14 for all applications was applied in a concentration of 0.0058 grams per square yard, with three replicates of these tests. Researchers concluded that the additives did not increase effectiveness of LN-14 in reducing crop yield. Given this information, **less than 1 gram of LN-14 was applied for this test.**

5.13.14 Field Test, LN-8 and LN-14 with Additives on Sweet Potatoes, 1951

Camp Detrick conducted this experiment (page 134 of SR156) on 2.5- by 18-foot (i.e. 45 SF or 5 SY) of sweet potatoes in Field F to test effectiveness on growth inhibiting

qualities of LN-14 and LN-14 mixed with potassium thiocyanate (KSCN) and LN-539. LN-14 for all applications was in two concentration of 0.0047 and 0.0094 grams per square yard (mixtures used different application rates to equate to the LN-14 dose rates), with two replicates of these tests. Researchers concluded that the additives did not increase effectiveness of herbicides in reducing crop yield. Given this information, **approximately less than 1 gram of LN-14 was applied for this test.**

5.13.15 Effect of LN-143 and LN-974 Applications on the Progeny of Wheat

Camp Detrick conducted this experiment on progeny of plants from 1- by 18-foot (i.e. 18 SF or 2 SY) plots of wheat in Field F to test effectiveness on growth inhibiting qualities of LN-974 on early growth stages (Boot and Milk). LN-974 for all applications was in two concentrations of 0.094 and 0.19 grams per square yard, with one replicates of these tests. No additional herbicides were applied for this study because researchers were interested in the yield of progeny of treated plants. Herbicide amount of 1 gram is included in the account of SR153, page 13 but was reported separately in the preliminary ASR.

5.13.16 Effect of LN-8, LN-14, and LN-719 on the Emergence and Yield of Progeny of Kidney Beans

Camp Detrick conducted this experiment on progeny of plants from 6- by 18-foot (i.e. 9 SF or 1 SY) plots of kidney beans in Field F to test effectiveness on growth inhibiting qualities of LN-14 on four different growth stages. LN-14 was applied in three dosages (0.00094, 0.0047, and 0.014 grams per square yard). It was applied by spray and by dust (same dosage for both), with three replicates of these tests. No additional herbicides were applied for this study because researchers were interested in the yield of progeny of treated plants. Herbicide amount of less than 1 gram is included in the account of SR153, pages 78 and 89 but was reported separately in the preliminary ASR.

5.13.17 Field Test, Top Application Dust Studies with LN-2, 14, and 974 on Soybeans, 1951

The last test reported (page 149 of SR156) in Special Report No. 156 had Camp Detrick conducting an experiment on the application of spray suspensions of herbicides LN-2, 14, and 974 on two different stages of growth of soybeans. The experiment was conducted on 6- by 18-foot test plots (i.e. 108 SF or 12 SY) in Field F with herbicides dispersed with a dosage of either 0.0094 or 0.047 grams per square yard with four replicates of the tests. Researchers concluded LN-974 applied as a dust was effective in reducing crop yield. Given this information, **approximately 5 grams each of LN-14 and LN-974 were applied for this test (total of 11 grams 2,4,5-T and related herbicides**, less than previous report of 43 grams due to corrected number of tests**).**

5.14 Laboratory Notebook CD 1775 Soil Application Field Tests, 1953-1954[122]

Laboratory Notebook CD 1775 covers 18 field experiments 1953-1954 at Fort Detrick in at least seven locations on the effects of herbicides on yield of seven crops and grasses. Published equivalents of these tests have not been found. 2,4,5-T or related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the notebook was recovered subsequent to the last report.

5.15 Status Report No. 53-6, Development of Biological Warfare Anticrop Agents Status, 1953[123]

Status Report No. 53-6 contains a summary of field crop experiments with fluorophenoxy herbicides, maleic hydrazide, carbamates, and ureas in 1952 at Fort Detrick. Researchers were in the process of preparing the report of these experiments at the time of the status report, and was cited therein as "Field Plot Experiments with Plant Inhibitors. 1952 Season. Special Report ____ (in preparation)". These experiments may have been conducted at Fort Detrick. Detailed reports of these tests have not been found. Laboratory notebook CD 1775 above contained 1952 field tests of carbamates and ureas at Fort Detrick locations and may represent a portion of the 1952 "in preparation" experiments. 2,4,5-T or arsenic-related herbicides were not included in this reference to unpublished tests.

5.16 Laboratory Notebook CD 2081 Ontogeny of Cereal Crops, Effect of Inhibitors Field Tests, 1953[124]

Laboratory Notebook CD 2081 contains a brief summary of field experiments in 1953 at Fort Detrick on nine crops. Published equivalents of these tests have not been found. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the notebook was recovered subsequent to the last report. Researchers did not indicate the location of the experiments.

5.17 Classification of LNA & LNB as BW Anticrop Agents - 5 March 1953[125]

In March 1953, the Chemical Corps submitted butyl 2,4-dichlorophonoxyacetate (herbicide 143) and butyl 2,4,5-trichlorophenoxyacetate (herbicide 974) to the Chemical Corps Technical Committee (CCTC) to be the first two standardized chemical plant growth inhibitors as herbicides LNA and LNB respectively. The CCTC subsequently approved them and they were adopted for use in Air Force spray missions. As the standard, the effectiveness of potential chemical anticrop herbicides were compared to LNA and LNB.

5.18 Special Report No. 201, Field Development of Chemical Anticrop Agents, Response of Field Grown Crops to Chemical Anticrop Agents Released from Experimental Spray Tower – 15 January 1954[126]

On 28 July 1953, Camp Detrick conducted a series of anti-crop field tests using a truck-mounted experimental spray tower (see following Figure) on broad-leaf (i.e. soybean and sweet potatoes) test plots in Area B (specific location not stated). The herbicide tested was a "three to one mixture of butyl 2,4-dichlorophonoxyacetate (agent 143) and butyl 2,4,5-trichlorophenoxyacetate (agent 974)", which was the same mixture as the Air Force is using in the "MCI spray systems" tests. The sweet potatoes were planted on 30 May 1953 and the soybeans on 30 March and 15 June, with the spraying being conducted on 28 July. The spray tower applied the anti-crops herbicides mixture at a rate of 0.062 gallons/minute as the tower moved four miles/hour (or 352 feet/minute) across an approximate 240+ foot distance as seen on the general depiction for the test area (see following Figure). To cover the 240 feet, the spraying tower would need to be on 41 seconds but it appears likely that sprayer worked for longer, presumably a minute. In that time, 0.062 gallons would be dispersed, a quarter of which was LN-974 resulting in about 0.0156 gallons used or 59 ml (3,785 ml to a gallon), which at a density of 1.8[127] roughly this equates to **approximately 106 grams of LN-974 were applied for this test**.

Figure 30 – *Spray Tower mounted to ½ ton pick-up truck in Special Report No. 201*[128]

The specific location of the test plots in Area B is not stated but is at least 240 feet wide and 340 long based on the sketch below and the stated scale.

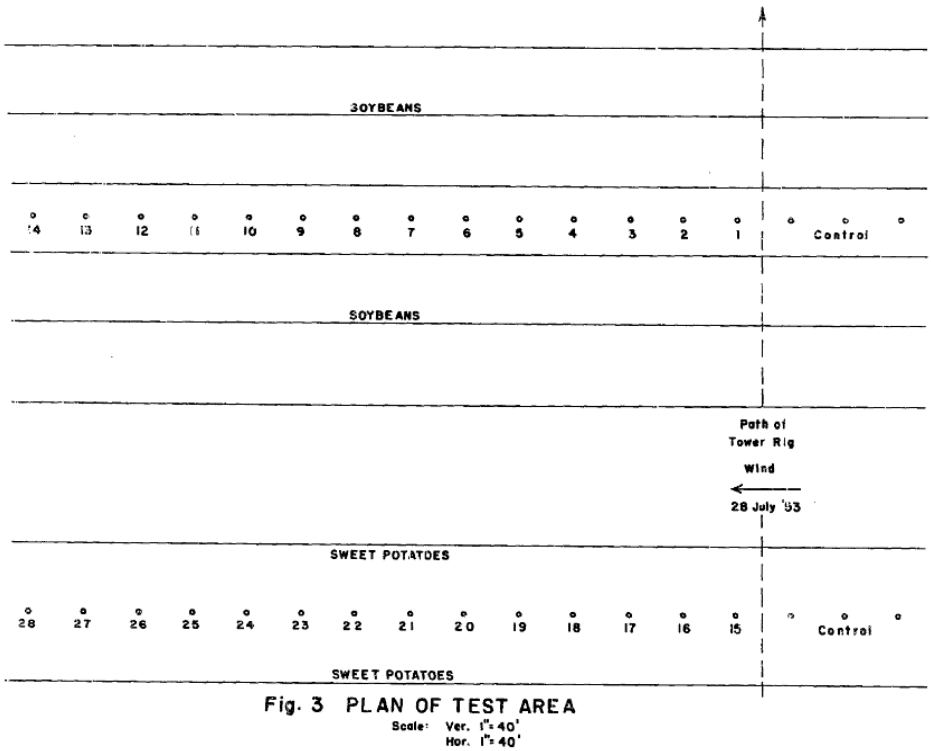


Figure 31 – *Plan of Test Area as reported in Special Report No. 201*[129]

Figure 32 – *Oblique Aerial Photo of Area B – 10 June 1953 with probable test location noted*[130]

5.19 Special Report No. 234, Fluorophenoxyacetic Acids As Chemical Anticrop Agents, December 1954[131]

5.19.1 Estimated Amount of 2,4,5-T Herbicides Applied

The total amount of **2,4,5-T and related herbicides applied for the field plots tests is estimated to be 22 grams.** Researchers did not report the location of the tests. Experiments with rice are presumed to have taken place at the Nallin Farm rice paddy near the irrigation pond. This test was not reported in the previous ASR because this special report was recovered after the ASR report was written.

The following sub-paragraphs summarize the 1951 through 1953 field tests in general and specifically those that deal with 2,4,5-T and its related herbicides.

5.19.2 Overview of Special Report No. 234

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing fluorophenoxy herbicides during 1951-1953. In contrast with previous special reports, this report presents only summary information of the tests conducted, and no laboratory notebooks or other reports were found that correlate to these tests to provide more information about the tests. Researchers reported field tests conducted in small plot tests sprays on cereals; herbicides disseminated by aircraft on fields at Bozeman, MT in 1953 in small plot tests (specific location not recorded but apparently at Detrick, see section 5.19.3 below) 1953; in greenhouse tests (location and date not recorded but apparently at Detrick); in field tests with rice irrigation water (at Fort Detrick and Beaumont TX, date not recorded); in field tests with dusts applied to soil 1953 (location not recorded). 2,4,5-T related herbicide LN-974 was tested in this series and is described in the following section.

The most frequently tested of the 24 herbicides in this series of 177 tests were LN-1661 (26 times), 4-Fluoro-2-methylphenoxyacetic acid (15 times), LN-1662 (14 times), LN-4119 (11 times), and isopropyl 2,4-difluorophenoxyacetate (10 times). Researchers did not indicate which of these tests may have been conducted at Fort Detrick. Because of the summary manner in which the data was presented in SR234, the number of tests here may not be comparable to other reports. See Appendix D for a complete list of herbicides tested.

5.19.3 Field Tests, Evaluation on Small Field Plots, 1951-1953

Researchers recorded test locations of Fort Detrick, Belle Glade FL, and Beaumont TX[132] but did not record which herbicides were tested at which locations. In small field plot tests, researchers applied 21 herbicides (page 2 of SR234) in spray form in 111 tests on seven cereal crops. Researchers did not indicate which of these tests were conducted at

Fort Detrick. One of the herbicide tests reported was 2,4,5-T related (LNB, aka LN-974), in 11 tests at rates of 0.5-5 pounds per acre (or 0.05-0.47 grams per square yard), tested alone and mixed with LN-143. Application rate should not be confused with the total amount of herbicide applied. The total amount of **2,4,5-T and related herbicides applied for the field plots tests is estimated to be 22 grams.** Approximately 16 grams was applied in experiments on rice, presumably located at the Nallin Farm rice paddy near the irrigation pond. The location of the remaining 7 grams herbicide applied is undetermined. Tests were not reported in the previous ASR because this special report was recovered after the ASR report was written.

Researchers did not report the location of the test, the area tested or number of tests conducted. This estimate is based on an assumption of 6 SY per plot with four replicates, which is typical of plot sizes reported in SR 156, and the estimate presumes that all tests were conducted at Fort Detrick. It is possible that some or all of the tests were conducted at one of the other two locations, and if so the amount assumed tested at Detrick is overestimated. Because researchers indicated that lack of materials and personnel precluded extensive tests, this estimate is based upon herbicide application at only one stage of plant development. Researchers concluded that several herbicides were effective in reducing yield of crops. See Appendix D for a complete list of herbicides tested.

5.20 Special Report No. 256, Fluorophenoxyacetic Acids As Chemical Anticrop Agents on Rice, December 1955[133]

5.20.1 Estimated Amount of 2,4,5-T Herbicides Applied

The total amount of **2,4,5-T and related herbicides applied for the field plots tests is estimated to be 41 grams.** This test was not reported in the previous ASR because this special report was recovered after the ASR report was written.

The following sub-paragraphs summarize the 1951 through 1954 field tests in general and specifically those that deal with 2,4,5-T and its related herbicides.

5.20.2 Overview of Special Report No. 256

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing fluorophenoxy herbicides of rice. Like Special Report No. 234 and in contrast with previous special reports, this report presents only summary information of the tests conducted, and no laboratory notebooks or other reports were found that correlate to these tests to provide more information about the tests. Researchers referenced four unrecovered laboratory notebooks in the bibliography of SR256 (CD 1560, CD 1871, CD 2259, CD 2198).

Researchers reported small-plot field tests on rice were initiated in Beaumont, Texas in 1951, then continued in subsequent years at Belle Glade, Florida, Stuttgart, Arkansas[134], Beaumont, Texas, and at Fort Detrick. Researchers reported testing 45 herbicides, of which 25 were listed in SR256, including one 2,4,5-T related herbicide, LN-974.

The most frequently tested of the 24 herbicides in this series of 41 tests was LN-1661 (10 times). Because of the summary manner in which the data was presented in SR256, the number of tests here is not comparable to other reports. See Appendix D for a complete list of herbicides tested.

5.20.3 Field Tests, Relative Activity of 4-Fluorophenoxyacetic acid and Standard-type Anticrop Agents LNA and LNB, 1954

Researchers applied three herbicides (page 25 of SR256) to rice at three stages of development. One of the herbicides tested was 2,4,5-T related (LNB, aka LN-974), at rates of 1 and 5 pounds per acre (or 0.09 and 0.47 grams per square yard). Application rate should not be confused with the total amount of herbicide applied. In other sections of the report, researchers noted test locations of Fort Detrick, Florida, Arkansas, and Texas, but did not record which herbicides were tested at which locations.

Researchers did not report the location of the test, the area tested or number of tests conducted. This estimate is based on an assumption of 6 SY per plot with four replicates, which is typical of plot sizes reported in SR 156, and the estimate presumes that all tests were conducted at Fort Detrick. It is possible that some or all of the tests were conducted at one of the other three locations, and if so the amount assumed tested at Detrick is overestimated. This experiment with rice presumably took place at the only rice paddy identified at Fort Detrick, located near the irrigation pond at Nallin Farm. Researchers concluded that LN-974 was the most effective herbicide in reducing yield of rice. Given this information, **approximately 41 grams of 2,4,5-T related herbicide LN-974 were applied for this test**. This test was not reported in the previous ASR because this special report was recovered after the ASR report was written. See Appendix D for a complete list of herbicides tested.

5.21 Special Report No. 262, 3 Amino - 1 2 4 Triazole, A Potential New Chemical Anticrop Agent for Wheat and Rye, 1956[135]

Special Report 262 contains four series of field experiments conducted in 1954 at Fort Detrick on three crops. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the Special Report was recovered subsequent to the last report.

5.22 Laboratory Notebook CD 3155, Field Tests of Herbicides, 1956[136]

5.22.1 Estimated Amount of 2,4,5-T and Arsenic-related Herbicides Applied

The total amount of herbicides applied for the field plots tests is estimated to be **5 grams 2,4,5-T related and less than 1 gram arsenic related.** The 2,4,5-T and arsenic herbicides were applied in Field 11. This test was not reported in the previous ASR because this laboratory notebook was recovered after the ASR report was written.

The following sub-paragraphs summarize the field tests in general and specifically those that deal with 2,4,5-T and arsenic-related herbicides.

5.22.2 Overview of Laboratory Notebook CD 3155

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in field testing herbicides, including 2,4,5-T and arsenic-related herbicides. Some of the laboratory notebook tests correlated to published report TR015. The unreported 2,4,5-T and arsenic-related tests recorded in notebook CD 3155 are discussed here.

The most frequently tested herbicide in this series of 17 unpublished tests was LN-10778, tested 13 times, and LN-143, tested eight times. There were 47 instances of unpublished herbicide tests. See Appendix D for a complete list of herbicides tested.

5.22.3 Field Test, Herbicides on Potatoes, 1956

Researchers reported (page 11 of CD3155) an experiment on the application of spray suspensions of 11 herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on one stage of growth of potatoes. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicides dispersed with a dosage of 0.009 grams per square yard with four replicates of the tests. Researchers recorded yields that would indicate that LN-4595 and 4599 were more effective in reducing crop yield than the other herbicides tested. Given this information, **less than 1 gram 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.4 Field Test, Herbicides on Soybeans, 1956

Researchers reported (page 19 of CD3155) an experiment on the application of spray suspensions of two herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on four stages of growth of soybeans. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicides dispersed with a dosage of 0.024, 0.009, and 0.005 grams per square yard with

four replicates of the tests. Researchers noted very large variations in results among replicates of the same treatment due to competition from nearby untreated plots, which may have been why results of this experiment were not published. Given this information, **approximately 3 grams 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.5 Field Test, Herbicides on Soybeans, 1956

Researchers reported (page 35 of CD3155) an experiment on the application of spray suspensions of 10 herbicides including one arsenic-related herbicide LN-12962 (cacodylic acid) in Field 11 on one stage of growth of soybeans. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with a dosage of 0.024 grams per square yard with two replicates of the tests. Researchers recorded yields that would indicate that LN-10778 was more effective in reducing crop yield than the other herbicides tested. Given this information, **less than 1 gram arsenic-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.6 Field Test, Herbicides on Beets, 1956

Researchers reported (page 64 of CD3155) an experiment on the application of spray suspensions of nine herbicides including one arsenic-related herbicide LN-12962 (cacodylic acid) in Field 11 on one stage of growth of beets. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with a dosage of 0.047 grams per square yard with two replicates of the tests. The recovered notebook did not include pages that may have included experiment results. Given this information, **less than 1 gram arsenic-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.7 Field Test, Herbicides on Tobacco, 1956

Researchers reported (page 92 of CD3155) an experiment on the application of spray suspensions of two herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on one stage of growth of tobacco. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with a dosage of 0.047 and 0.01 grams per square yard with four replicates of the tests. Researchers recorded yields that would indicate that LN-10778 was more effective in reducing crop yield than the other herbicides tested. Given this information, **approximately 1 gram 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.8 Field Test, Herbicides on Green Beans, 1956

Researchers reported (page 129 of CD3155) an experiment on the application of spray suspensions of two herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on one stage of growth of green beans. The experiment was conducted on 30--inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with dosage of 0.005 and 0.001 grams per square yard with four replicates of the tests. Researchers recorded yields that would indicate that LN-10778 was more effective in reducing crop yield than the other herbicide tested. Given this information, **less than 1 gram 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.9 Field Test, Herbicides on Oil Flax, 1956

Researchers reported (page 136 of CD3155) an experiment on the application of spray suspensions of two herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on one stage of growth of oil flax. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with dosage of 0.005 and 0.001 grams per square yard with four replicates of the tests. Researchers recorded yields that would indicate that LN-10778 was more effective in reducing crop yield than the other herbicide tested. Given this information, **less than 1 gram 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.22.10 Field Test, Herbicides on Fiber Flax, 1956

Researchers reported (page 143 of CD3155) an experiment on the application of spray suspensions of two herbicides including one 2,4,5-T-related herbicide LN-974 (butyl 2,4,5-trichlorophenoxyacetate) in Field 11 on one stage of growth of fiber flax. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with dosage of 0.01 and 0.005 grams per square yard with four replicates of the tests. Researchers did not include yield data. Given this information, **less than 1 gram 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.23 Technical Report No. 6, The Potentialities of Cacodylic Acid as an Anticrop Agent, 1957[137]

5.23.1 Estimated Amount of Arsenic-related Herbicides Applied

The total amount of **arsenic related herbicides applied for the field plots tests is estimated to be 40 grams.** Approximately 31 grams were applied in Field 13, 8 grams

in Field 11, and 1 gram at unreported locations. The experiments with rice presumably took place at the only rice paddy identified at Fort Detrick, located near the Nallin Farm irrigation pond. This test was not reported in the previous ASR because this report was recovered after the ASR report was written.

The following sub-paragraphs summarize the 1956 through 1957 field tests in general and specifically those that deal with arsenic-related herbicides.

5.23.2 Overview of Technical Report No. 6

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing the arsenic-related herbicide cacodylic acid (aka LN-12692). Like Special Report No. 234 and in contrast with previous special reports, this report presents only summary information of the tests conducted. A laboratory notebook CD 3153 was recovered that provided correlating detail to this report. In addition, this notebook contained unreported field tests of arsenic-related herbicides, described in a following section of this report. Unreported field tests of other non-arsenic and non-2,4,5-T related herbicides can be found in Appendix D.

Researchers reported small-plot field tests on rice were initiated in Puerto Rico[xx] in 1957, at Beaumont, Texas in 1957, and at Fort Detrick in 1956 and 1957. Researchers reported testing three herbicides at Fort Detrick. The most frequently tested herbicide in this series of 11 tests was LN-12692, tested eight times. See Appendix D for a complete list of herbicides tested.

5.23.3 Field Test, Biological Activity of Cacodylic Acid on Wheat, 1956

Researchers reported (page 24 of TR006) an experiment on the application of spray suspensions of herbicides LN-10052 (3-amino-1,2,4-triazole) and 12692 (cacodylic acid) in Field 13 on seven different stages of growth of wheat. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), plots split on stages, with herbicides dispersed with a dosage of 0.047, .023, and 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-10052 was more effective in reducing crop yield at most stages of plant development, while both were effective at the reproductive stage of development. The location of the test was recorded in laboratory notebook CD 3153 but not in the technical report. Given this information, **approximately 13 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.4 Field Test, Biological Activity of Cacodylic Acid on Wheat, 1957

[xx] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

Researchers reported (page 25 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) in Field 13 on five different stages of growth of wheat. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY) with herbicide dispersed with a dosage of 0.023 grams per square yard with four replicates of the tests. Researchers concluded LN-12962 was effective in reducing crop yield. Given this information, **approximately 3 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.5 Field Test, Biological Activity of Cacodylic Acid on Rye, 1956

Researchers reported (page 25 of TR006) an experiment on the application of spray suspensions of herbicides LN-12692 (cacodylic acid) and LN-10052 (3-amino-1,2,4-triazole) in Field 13 on four different stages of growth of rye. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), plots split on stages, with herbicides dispersed with a dosage of 0.047, .023, and 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-10052 was more effective in reducing crop yield. Given this information, **approximately 8 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.6 Field Test, Biological Activity of Cacodylic Acid on Oats, 1956

Researchers reported (page 32 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) in Field 13 on four different stages of growth of oats. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), with herbicide dispersed with a dosage of 0.047, .023, and 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-12692 was more effective in reducing crop yield when applied at the reproductive stage of plant development. Given this information, **approximately 8 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.7 Field Test, Biological Activity of Cacodylic Acid on Sorghum, 1957

Researchers reported (page 34 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) in Field 11 on two different stages of growth of sorghum. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with a dosage of 0.047 and .023 grams per square yard with four replicates of the tests. Researchers concluded LN-12692 was more effective in reducing crop yield when applied at the reproductive stage of plant development. Given this information, **approximately 3 grams LN-12692 was applied**

for this test (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.8 Field Test, Biological Activity of Cacodylic Acid on Corn, 1957

Researchers reported (page 34 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) in Field 11 on two different stages of growth of corn. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicide dispersed with a dosage of 0.094 and. 0.047 grams per square yard with four replicates of the tests. Researchers concluded LN-12692 was more effective in reducing crop yield when applied at the vegetative stage of plant development. Given this information, **approximately 5 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.9 Field Test, Biological Activity of Cacodylic Acid, Dosage Rate Study on Rice, 1957

Researchers reported (page 22 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) on one stage of growth of rice. Researchers reported the experimental design was similar to that used in the Puerto Rico and Texas tests which were conducted on 40-inch by 6-foot test plots (i.e. 27 SF or 3 SY), with herbicide dispersed at 0.023, 0.009, 0.005, and 0.002 grams per square yard with four replicates of the tests. This experiment with rice presumably took place at the only rice paddy identified at Fort Detrick, located near the Nallin Farm irrigation pond. Researchers concluded that higher application rates were more effective in reducing crop yield. Given this information, **less than 1 gram LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.23.10 Field Test, Biological Activity of Cacodylic Acid, Droplet Size Study on Rice, 1957

Researchers reported (page 22 of TR006) an experiment on the application of spray suspensions of herbicide LN-12692 (cacodylic acid) on two droplet sizes, and one stage of growth of rice. Researchers reported the experimental design was similar to that used in the Puerto Rico and Texas tests which were conducted on 40-inch by 6-foot test plots (i.e. 27 SF or 3 SY), with herbicide dispersed at 0.023, 0.009, 0.005, and 0.002 grams per square yard with four replicates of the tests. This experiment with rice presumably took place at the only rice paddy identified at Fort Detrick, located near the Nallin Farm irrigation pond. Researchers concluded that larger droplet sizes were more effective in reducing crop yield. Given this information, **less than 1 gram LN-12692 was applied**

for this test (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.24 Laboratory Notebook CD 3153, Field Tests of Herbicides, 1956-1957[138]

5.24.1 Estimated Amount of Arsenic-related Herbicides Applied

The total amount of **arsenic related herbicides applied for the field plots tests is estimated to be 21 grams.** Approximately 10 grams were applied in Field 13, 7 grams in Field 11, and 5 grams in an unreported location. This test was not reported in the previous ASR because this laboratory notebook was recovered after the ASR report was written. No 2,4,5-T related herbicides were tested in this laboratory notebook.

The following sub-paragraphs summarize the 1956 through 1957 field tests in general and specifically those that deal with arsenic-related herbicides.

5.24.2 Overview of Laboratory Notebook CD 3153

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in field testing herbicides, including arsenic-related herbicides. Not all tests in notebook CD 3153 were correlated to published reports. The unpublished arsenic-related tests recorded in notebook CD 3153 are discussed here. Unreported field tests of other herbicides can be found in Appendix D. The experiments did not include 2,4,5-T related herbicides.

The most frequently tested herbicide in this series of 16 unpublished tests was LN-10778, tested six times, and LN-10052, tested five times. There were 58 instances of unpublished herbicide tests. See Appendix D for a complete list of herbicides tested.

5.24.3 Field Test, Herbicides on Wheat, 1957

Researchers reported (page 33 of CD3153) an experiment on the application of spray suspensions of 6 herbicides including 4 arsenic-related herbicides LN-13805 (Phenylarsonic acid), 14918 (Methylarsine oxide), 14968 (1-propyl arsonic acid), 14969 (1-butyl arsonic acid) in Field 13 on one stage of growth of wheat. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), with herbicides dispersed with a dosage of 0.094 grams per square yard with two replicates of the tests. Researchers recorded yields that would indicate that LN-10052 was more effective in reducing crop yield than the other herbicides tested. Given this information, **approximately 1 gram each arsenic-related herbicide was applied for this test, for a total of 4 grams** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.24.4 Field Test, Herbicides on Rye, 1957

Researchers reported (page 51 of CD3153) an experiment on the application of spray suspensions of six herbicides including three arsenic-related herbicides LN-13805 (Phenylarsonic acid), 14918 (Methylarsine oxide), 12964 (Methylarsonic acid) in Field 13 on one stage of growth of rye. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), with herbicides dispersed with a dosage of 0.094 grams per square yard with two replicates of the tests. Researchers recorded yields that would indicate that LN-10052 was more effective in reducing crop yield than the other herbicides tested. Given this information, **approximately 1 gram each arsenic-related herbicide was applied for this test, for a total of 3 grams** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.24.5 Field Test, Herbicides on Oats, 1957

Researchers reported (page 63 of CD3153) an experiment on the application of spray suspensions of four herbicides including two arsenic-related herbicides LN-14918 (Methylarsine oxide) and 12964 (Methylarsonic acid) in Field 13 on one stage of growth of oats. The experiment was conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), with herbicides dispersed with a dosage of 0.094 grams per square yard with two replicates of the tests. Researchers recorded yields that would indicate that LN-12964 was more effective in reducing crop yield than the other herbicides tested. There is a 61% higher yield compared to the control for herbicide LN-12976. Given this information, **approximately 1 gram each arsenic-related herbicide was applied for this test, for a total of 2 grams** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.24.6 Field Test, Herbicides on Sweet Corn, 1957

Researchers reported (page 82 of CD3153) an experiment on the application of spray suspensions of two herbicides including one arsenic-related herbicide LN-12962 (cacodylic acid) in Field 11 on two stages of growth of sweet corn. The experiment was conducted on 30-inch by 18-foot test plots (i.e. 45 SF or 5 SY), with herbicides dispersed with a dosage of 0.094, 0.047, and 0.023 grams per square yard with four replicates of the tests. Researchers recorded yields that would indicate that LN-12962 was more effective in reducing crop yield than the other herbicide tested. Given this information, **approximately 7 grams of arsenic-related herbicide were applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.24.7 Field Test, Herbicides on Millet, 1957

Researchers reported (page 140 of CD3153) an experiment on the application of spray suspensions of arsenic-related herbicide LN-12962 (cacodylic acid) on three stages of

growth of millet at two application rates. Researchers did not record the plot size, location, or application rate. For purposes of this estimate, the same plot size was used for analysis as was used for other tests in this series of experiments. Most other experiments were conducted on 35-inch by 18-foot test plots (i.e. 52.5 SF or 5.8 SY), with herbicides dispersed with a dosage of 0.094 and 0.047 grams per square yard with four replicates of the tests. Researchers noted that there was no apparent effect of treatments at harvest time and that the crop was not harvested. Given this information, **approximately 5 grams of arsenic-related herbicide were applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

5.25 Technical Report No. 17, TR017 Cacodylic Acid, An Agent of Choice, 1959[139]

5.25.1 Estimated Amount of Arsenic-related Herbicides Applied

The total amount of **arsenic related herbicides applied for the field plots tests is estimated to be 19 grams.** Researchers did not record the location of these tests. This test was not reported in the previous ASR because this report was recovered after the ASR report was written. No 2,4,5-T related herbicides were tested in this report.

The following sub-paragraphs summarize the 1958 field tests in general and specifically those that deal with arsenic-related herbicides.

5.25.2 Overview of Technical Report No. 17

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing the arsenic-related herbicide cacodylic acid (aka LN-12692). Like Special Report No. 234 and in contrast with previous special reports, this report presents only summary information of the tests conducted. No laboratory notebooks were recovered that correlate to this technical report. The location of these tests at Fort Detrick, other than "BW Laboratories" is unknown.

Researchers reported field testing three herbicides at BW Laboratories, Fort Detrick in this series of four tests. See Appendix D for a complete list of herbicides tested.

5.25.3 Field Test, Biological Activity of Cacodylic Acid on Millet, 1958

Researchers reported (page 25 of TR017) a field experiment on the application of spray suspensions of three herbicides including LN-12692 (cacodylic acid) at "BW Laboratories" on three different stages of growth of millet. Researchers reported the experiment was conducted on five rows 18-feet in length but did not report the row spacing. For analysis here, the row spacing is estimated to be 8-inches (i.e. plots 60 SF or 6.7 SY). Herbicides were dispersed with a dosage of 0.047 and 0.01 grams per square yard with five replicates of the tests. Researchers concluded LN-12692 was more

effective than the other herbicides tested in reducing crop yield. Given this information, **approximately 6 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.25.4 Field Test, Biological Activity of Cacodylic Acid on Peanut, 1958

Researchers reported (page 25 of TR017) a field experiment on the application of spray suspensions of three herbicides including LN-12692 (cacodylic acid) at "BW Laboratories" on three different stages of growth of peanuts. Researchers reported the experiment was conducted on one row 18 feet in length but did not report the row spacing. For analysis here, the row width is estimated to be the same as the 1951 test on peanuts reported in SR 156[140], page 42, 36-inches (i.e. plots 54 SF or 6 SY). Herbicides were dispersed with a dosage of 0.047 and 0.01 grams per square yard with five replicates of the tests. Researchers concluded LN-10778 was more effective than the other herbicides tested in reducing crop yield. Given this information, **approximately 5 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.25.5 Field Test, Biological Activity of Cacodylic Acid on Sorghum, 1958

Researchers reported (page 25 of TR017) a field experiment on the application of spray suspensions of three herbicides including LN-12692 (cacodylic acid) at "BW Laboratories" on three different stages of growth of sorghum. Researchers reported the experiment was conducted on one row 18 feet in length but did not report the row spacing. For analysis here, the row width is estimated to be the same as the 1957 test on sorghum reported in TR 006[141], page 34, 30-inches (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.047 and 0.01 grams per square yard with five replicates of the tests. Researchers concluded LN-12692 was more effective than the other herbicides tested in reducing crop yield. Given this information, **approximately 4 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.25.6 Field Test, Biological Activity of Cacodylic Acid on Soybean, 1958

Researchers reported (page 25 of TR017) a field experiment on the application of spray suspensions of three herbicides including LN-12692 (cacodylic acid) at "BW Laboratories" on three different stages of growth of soybean. Researchers reported the experiment was conducted on one row 18 feet in length but did not report the row spacing. For analysis here, the row width is estimated to be the same as the 1956 test on soybeans reported in CD 3155[142], page 19, 30-inches (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.047 and 0.01 grams per square yard with five replicates of the tests. Researchers concluded LN-10778 was more effective than the other herbicides tested in reducing crop yield. Given this information, **approximately 4**

grams LN-12692 was applied for this test (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.26 Technical Study 11, Anticrop Agents, 1958[143]

Technical Study 11 describes biological and chemical anticrop herbicides. The advantages of chemical anticrop herbicides were discussed including their certain and rapid action, non-specificity, non-persistent effects, and stable-storage characteristics. The report included status of herbicide development and detailed discussions of four of the most promising herbicides. The development of a large-capacity aerial spray method (Hourglass project) and a smaller-capacity jet-mounted spray system were also reported. Crop field tests with LNB (Butyl 2,4,5-trichlorophenoxyacetate), cacodylic acid (arsenic-related), and other herbicides were described in general terms, but did not include dates or locations of the tests and are therefore not analyzed here.

5.27 Anticrop Phase Out and Reinstatement – 1957 through September 1959[144]

Early in 1957, the Army's Chief of Research and Development determined that the Army did not have funds to carry on anticrop warfare experimentation in FY1958 and the Chemical Corps phased out the program by the end of 1957. On 31 December 1957, the Army terminated the R& D program of the Crops Division and the staff was reduced to less than dozen to complete the report work. The anticrop research and development program was reactivated by October 1958 and the Crops Division was reinstated in September 1959, though it took several years to staff back up.[145] With the reestablishment, Detrick developed a layout of small field plots or "garden plots" in March 1959 on an area along Ditto Avenue for 25- by 25-foot and 25- by 50-foot plots (see following Figure).

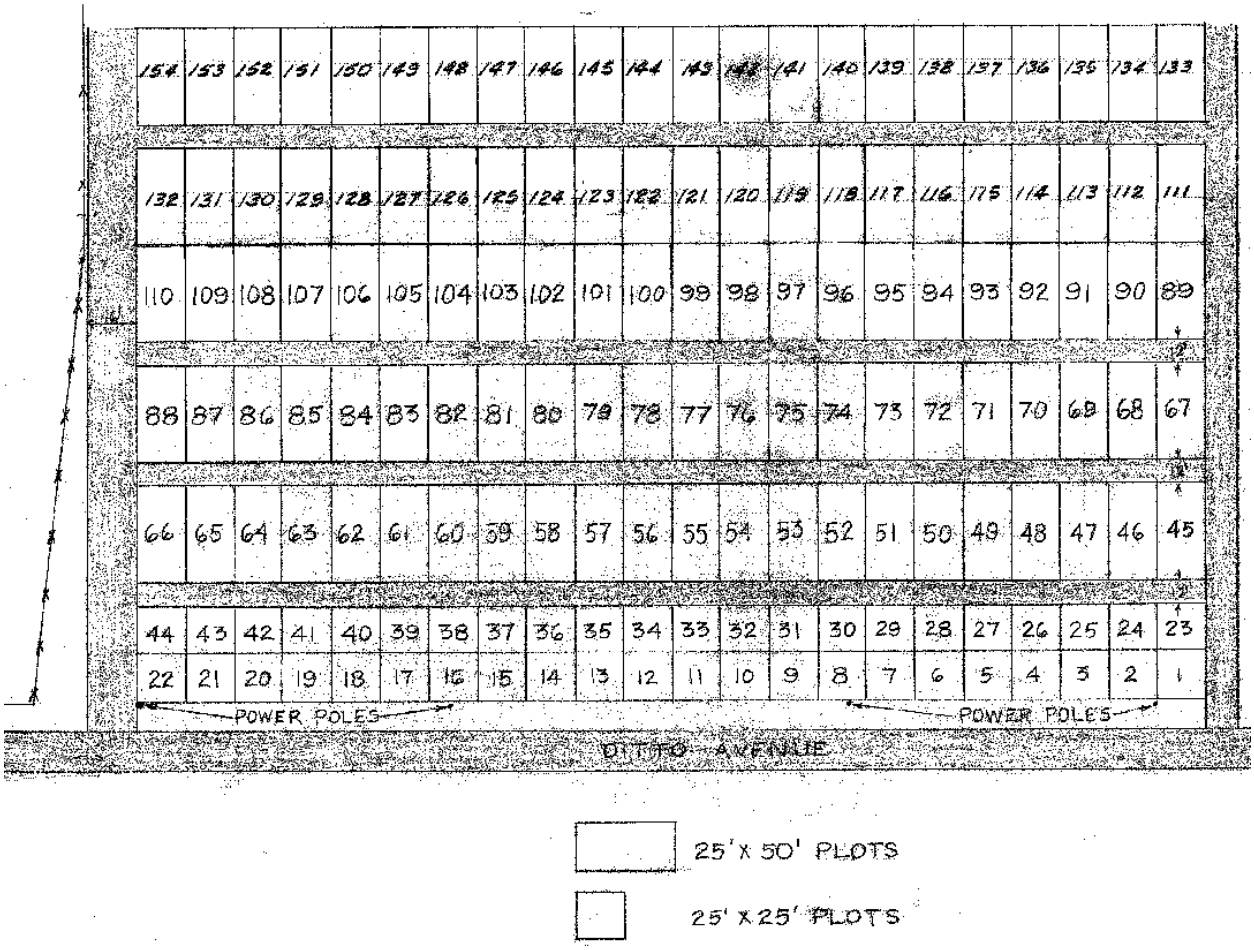


Figure 33 –*Garden Plots –March 1959*[146]

The location of these plots is readily visible on aerial imagery from 1964 and later imagery about 750 feet south of the main Crops Research Building 1301.

Figure 34 *– Ditto Ave Garden Plots - Aerial Image 30 June 1964*[147]

5.28 Technical Report BWL 15, 2,4-Dicloro-5-Fluorophenoxyacetic Acid, A Potential Chemical Anticrop Agent – July 1959[148]

Fort Detrick conducted comparison tests of a newly discovered herbicide, 2,4-Dicloro-5-Fluorophenoxyacetic Acid (LN-10778), against butyl versions of 2,4-D (LN-143) and 2,4,5-T (LN-974), and of esters of LN-10778. Although researchers considered the herbicide LN-10778 "newly discovered", it first appeared in the Crops Division Special Report 234[149] 1951-53 with two tests on rice irrigation water. Researchers went on to test LN-10778 again on rice in 1954 (Special Report 256[150]), and on millet, peanuts, sorghum, and soybeans in 1958 (Technical Report 17[151]).

5.28.1 Estimated Amount of 2,4,5-T-related Herbicides Applied

The total amount of **2,4,5-T related herbicides applied for the field plots tests is estimated to be 3 grams.** Except for one test at Field 11, researchers did not record the location of these tests. This test was not reported in the previous ASR because this report was recovered after the ASR report was written.

The following sub-paragraphs summarize the 1956-58 field tests in general and specifically those that deal with 2,4,5-T-related herbicides.

5.28.2 Overview of Technical Report No. 015

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing the herbicide 2,4-dichlorop-5-fluorophenoxyacetic Acid (aka LN-10778). Researchers reported this herbicide was as effective as standardized herbicides (LN-974 and LN-143) on many economically important crops. This report presents only summary information of the tests conducted. Laboratory notebooks CD3153 and CD3155 contained several tests that correlate to this technical report and were conducted in 1956 and 1957 at Field 11.

Researchers did not report when or where the tests in this report dated July 1959 were conducted. The location of the field tests is assumed for this analysis to have been conducted at Fort Detrick. Given the laboratory notebook correlations and the report date, tests were likely conducted in the 1956, 1957, or 1958 seasons as there would not have been time to conduct field tests in the 1959 season and complete the report by July 1959. Researchers reported tests were conducted on single rows but did not report the size of plots tested. This analysis uses plot sizes similar to previous tests. The most frequently tested herbicides reported were LN-10778 (22 times), LN-974 (9 times), and LN-143 (8 times). All other herbicides accounted for the remaining 12 test instances. See Appendix D for a complete list of herbicides tested.

5.28.3 Field Test, Screening on Soybeans, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of five herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of soybeans. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.047 and 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicides in reducing crop yield. Given this information, **approximately 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.4 Field Test, Comparison Test on Potato, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of potato. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective

as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.5 Field Test, Comparison Test on Peanut, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of peanut. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.01 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.6 Field Test, Comparison Test on Tomato, 1956

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of tomato. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.01 grams per square yard with four replicates of the tests. The year tested (1956) and location (Field 11) is recorded in laboratory notebook CD3155, page 114. Researchers reported in the notebook an additional dosage of 0.05 grams per square yard for this test, included here. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **approximately 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.7 Field Test, Comparison Test on Soybean, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of soybean. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.005 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.8 Field Test, Comparison Test on Oil Flax, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of oil flax. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.005 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.9 Field Test, Comparison Test on Sesame, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of sesame. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.005 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.10 Field Test, Comparison Test on Lima Bean, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of lima bean. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.005 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.28.11 Field Test, Comparison Test on Green Bean, 1956-58

Researchers reported (page 14 of TR015) a field experiment on the application of spray suspensions of two herbicides including LN-974 (butyl 2,4,5-trichlorophenoxyacetate) on one stage of growth of green bean. The plot size is estimated to be 30-inches by 18 feet (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.005 grams per square yard with four replicates of the tests. Researchers concluded LN-10778 was as effective as the standardized herbicide LN-974 in reducing crop yield. Given this information, **less than 1 gram LN-974 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.29 Engineering Command Report No. 34, Cacodylic Acid, 1959[152]

Engineering Command Report No. 34 contains a summary of field crop experiments with cacodylic acid and fluorophenoxy herbicides on rice. Researchers did not report dates or locations of experiments. These experiments may have been conducted at Fort Detrick. Detailed reports of these tests have not been found. Tests with 2,4,5-T or arsenic-related herbicides were not included in this report.

5.30 Technical Memorandum No. 9-24, TMEM009-024 Cacodylic Acid Investigations, 1961[153]

5.30.1 Estimated Amount of Arsenic-related Herbicides Applied

The total amount of **arsenic related herbicides applied for the field plots tests is estimated to be 202 grams.** Researchers did not record the location of these tests. These tests were not reported in the previous ASR because this report was recovered after the ASR report was written. Tests with 2,4,5-T or related herbicides were not included in this report.

The following sub-paragraphs summarize the 1960 field tests, all of which deal with one arsenic-related herbicide.

5.30.2 Overview of Technical Memorandum No. 9-24

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in developing the arsenic-related herbicide cacodylic acid (aka LN-12692). Like Special Report No. 234 and in contrast with previous special reports, this report presents only summary information of the tests conducted. Researchers reported no statistical analyses for this series of experiments and instead relied upon a graphical presentation of results. No laboratory notebooks were recovered that correlate to this technical memorandum. Researchers did not report the locations of the tests, assumed here to have taken place at Fort Detrick.

Researchers reported field testing one herbicide, cacodylic acid (LN-12692) in this series of 12 tests. A boom-type four-nozzle bicycle-mounted sprayer was used to apply herbicides to crops. Interim Report 94 of marking trials in conducted in 1954 included a photograph of a bicycle-type sprayer, below. Row crops were treated with one or two of the four nozzles on the boom, while cereal crops were treated with all four nozzles. When crops were taller than 40-inches, the herbicides were applied by a hand-operated boom sprayer.

Figure 35 –*Spray Cart used in 1954 vegetation marking trials*[154]

5.30.3 Field Test, Effect of Cacodylic Acid on Wheat, 1960

Researchers reported (page 10 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of wheat. Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. None of the dosages were effective at the last stage of development, and all were effective at the third and fourth stages. Given this information, **approximately 20 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.4 Field Test, Effect of Cacodylic Acid on Oats, 1960

Researchers reported (page 11 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of oats. Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023

grams per square yard with three replicates of the tests. None of the dosages were effective at the last stage of development, and all were effective at the third and fourth stages. Given this information, **approximately 20 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.5 Field Test, Effect of Cacodylic Acid on Rye, 1960

Researchers reported (page 12 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on four different stages of growth of rye. Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. All of the dosages were effective at the third and fourth stages of development. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.6 Field Test, Effect of Cacodylic Acid on Barley, 1960

Researchers reported (page 14 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on four different stages of growth of barley. Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. None of the dosages were effective at the last stage of development, and all were effective at the third stage. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.7 Field Test, Effect of Cacodylic Acid on Kaoling, 1960

Researchers reported (page 15 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of kaoling. Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. The higher two dosages were effective at all stages of development. Given this information, **approximately 20 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.8 Field Test, Effect of Cacodylic Acid on Millet, 1960

Researchers reported (page 16 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of millet.

Researchers reported the experiment was conducted on 4 by 18-foot test plots (i.e. plots 72 SF or 8 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. All dosages were effective at the last two stages of development. Given this information, **approximately 20 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.9 Field Test, Effect of Cacodylic Acid on Corn, 1960

Researchers reported (page 17 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of corn. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with four replicates of the tests. The higher two dosages were effective at all but the last stage of development. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.10 Field Test, Effect of Cacodylic Acid on Sweet Potato, 1960

Researchers reported (page 18 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on four different stages of growth of sweet potato. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with four replicates of the tests. The highest dosage was effective at all but the last stage of development. Given this information, **approximately 13 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.11 Field Test, Effect of Cacodylic Acid on Potatoes, 1960

Researchers reported (page 19 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of sweet potato. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with three replicates of the tests. The highest dosage was effective at the second and third stages of development. Given this information, **approximately 12 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.12 Field Test, Effect of Cacodylic Acid on Beets, 1960

Researchers reported (page 20 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of beets. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with four replicates of the tests. The highest two dosages were effective at the second, third, and fourth stages of development. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.13 Field Test, Effect of Cacodylic Acid on Snap Beans, 1960

Researchers reported (page 21 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of snap beans. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with four replicates of the tests. The highest two dosages were effective at all but the last stage of development. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.30.14 Field Test, Effect of Cacodylic Acid on Soybeans, 1960

Researchers reported (page 22 of TM09-24) a field experiment on the application of spray suspension LN-12692 (cacodylic acid) on five different stages of growth of snap beans. Researchers reported the experiment was conducted on 30-inch by 18-foot test plots (i.e. plots 45 SF or 5 SY). Herbicides were dispersed with a dosage of 0.094, 0.047 and 0.023 grams per square yard with four replicates of the tests. The highest dosage was effective at all but the last stage of development. Given this information, **approximately 16 grams LN-12692 was applied for this test** (was not reported previously due to report recovery after the preliminary ASR was written)**.**

5.31 TM212 The Lateral and Vertical Movement of Four Herbicides Applied to a Grassland Soil – October 1970[155]

In 1968, Fort Detrick began an investigation into the lateral and vertical movement of four herbicides through soil, including Agent Orange. Detrick conducted this experiment on 20- by 20-foot (i.e. 400 SF or 44.4 SY) test plots with a vegetative cover of Kentucky bluegrass and several species of broadleaf weeds. There were two Herbicide Orange plots both on a 3-5% slope, which differed by rate of herbicide applied, specifically 3 or 6 gallons per acre, applied in a liquid form with a hand-held sprayer. The herbicide was diluted with diesel fuel. The plot applications occurred on 21 May 1968 and observations were made two months later. Residue samples were taken at various depths six months and one year after the application. Residues of Agent Orange appeared in the samples

taken. Based on the WWII era research on decomposition rates and bioassay of 2,4-D and 2,4,5-T, the researchers assumed the residue was composed primarily of 2,4,5-T. The test plots were on the "grid area" of Fort Detrick (i.e. Area B) but the specific location was not identified in the test report. Based on the reported application rates and the stated herbicide acid equivalent of 8.6 pounds per gallon, and 50% 2,4,5-T composition of Herbicide Orange , the amount tested was **approximately 162 grams of 2,4,5-T related herbicide**.

6 REPORTS RELATING TO DEFOLIANT TESTING AT CAMP/FORT DETRICK

6.1 History of the CWS in WWII. Vol. 2 - Biological Warfare Research in the United States – November 1947[156]

This massive historical report summarizes the United States BW efforts during World War II, detailing the organizations and operations used in those efforts including Camp Detrick, the center of BW efforts during the war and afterwards. Of additional interest to this study is Chapter XXIV, Chemical Defoliants which describes the activities by Crops Division in determining chemical herbicides for use in "marking, defoliating or increasing the flammability of forest vegetation", determining that ammonium thiocyanate and zinc chloride were the best. The scope of this work during WWII was limited in nature and does not include the LN herbicides, which would be used as defoliants in the decades that followed. Field trials of the WWII era defoliants occurred at several locations in Florida.

6.2 Interim Report 94, Defoliation Target Marking And Its Implications[157]

This report acknowledges the WWII work on defoliants conducted by Camp Detrick personnel, specifically noting ammonium thiocyanate. In October 1954, the Crops Division at Camp Detrick completed a series of evaluations on four different herbicides. The chemicals were applied with a spray cart with nozzles delivering 20.9 gallons per acre, with an appropriate inert diluent added. The chemicals selected were commercially available compounds: dinitro ortho secondary butyl phenol, (DNOSBP) at 9 and 18 lb/acres were applied; tributyl phosphate (TBP) at 10.5 and 20.9 lb/acres were applied; 3-(p-chlorophenyl) 1,1 -dimethyl urea (CMU) at 5 and 10 lb/acres were applied; and 3-amino 1,2,4-triazole at 1 and 2 lb/acres were applied. The target marking tests were made on: 50% Alfalfa; 15% Timothy; 10-15% Chicory; 3-5% Ragweed; 3-5% Crab grass; 3-5% Foxtail; and 2-5% Wood sorrel. Researchers concluded TBP and 3-amino-1,2,4-triazole were most promising of herbicides tested for use in target marking. Interim Report 94 included aerial images of farm buildings located near the Nallin Farm irrigation pond at Detrick for one of the trials, an amino triazole test .

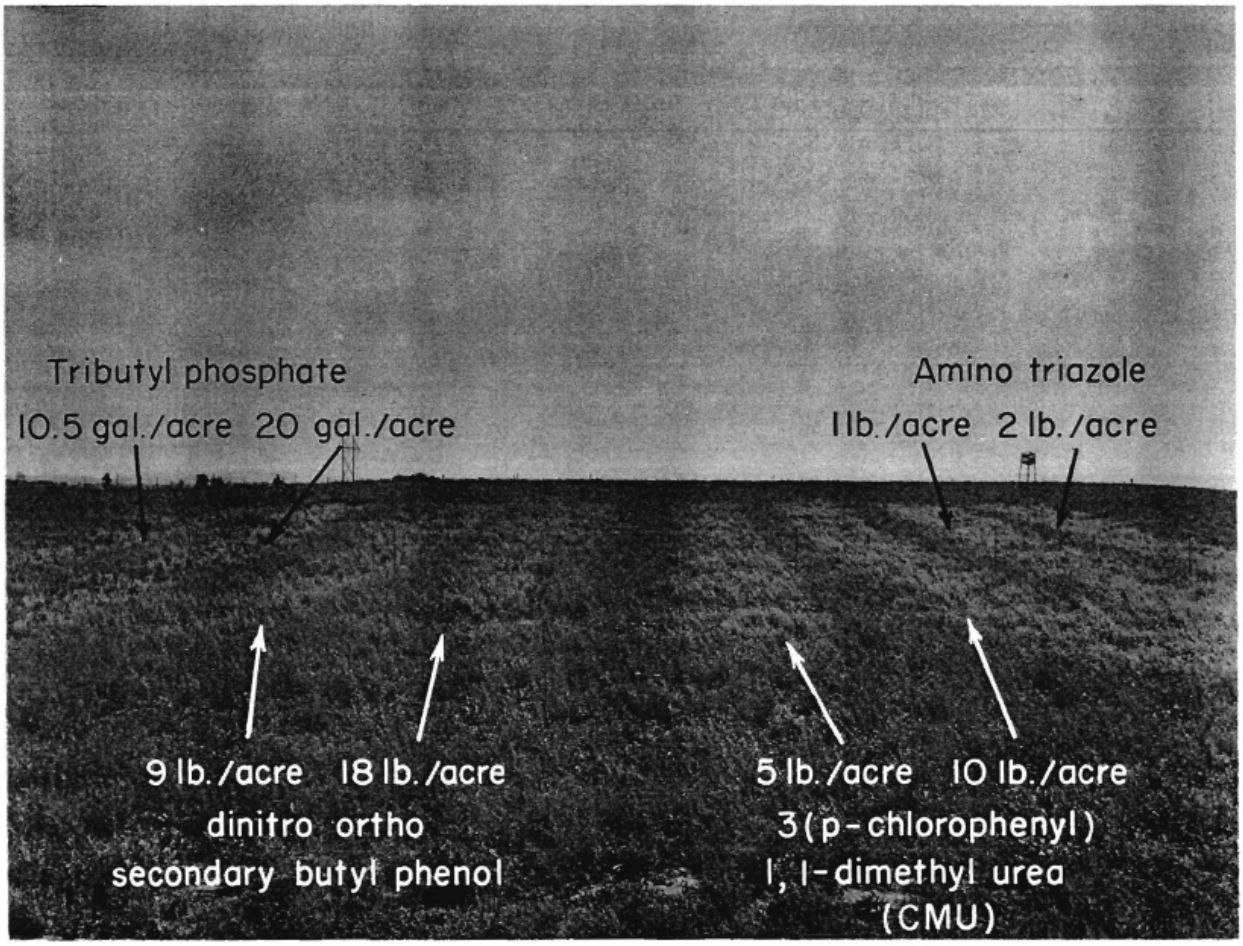


Figure 36 – *Comparison of marks produced by four chemicals five days after treatment in 1954 marking trials using a hand pushed spray cart*[158]

6.3 Interim Report 140 Defoliation Investigations During 1954 and 1955, 1956[159]

Interim Report 140 contains a field experiment conducted in 1954 or 1955 at Fort Detrick on eight tree species. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the Special Report was recovered subsequent to the last report.

6.4 Laboratory Notebook CD 2504, Field Defoliation Tests, 1955[160]

6.4.1 Estimated Amount of 2,4,5-T-related Herbicides Applied

The total amount of **2,4,5-T related herbicide applied for the field plots tests is estimated to be 13 grams.** Researchers did not report the locations of the tests. This test was not reported in the previous ASR because this laboratory notebook was recovered after the ASR report was written.

The following sub-paragraphs summarize the 1955 field tests in general and specifically those that deal with 2,4,5-T-related herbicides.

6.4.2 Overview of Laboratory Notebook CD 2504

The Crops Division of the Chemical Corps Biological Laboratories at Camp Detrick continued progress in field testing herbicides in this series of six experiments, including one experiment involving a 2,4,5-T-related herbicide. Tests were not correlated to published reports. The unpublished 2,4,5-T-related test recorded in notebook CD 2504 is discussed here. Unreported field tests of other herbicides can be found in Appendix D.

The most frequently tested herbicide in this series of six unpublished tests was endothal (LN-1626), tested five times, and Butynediol (LN-12959), tested four times. There were 40 instances of unpublished herbicide tests. See Appendix D for a complete list of herbicides tested.

6.4.3 Field Test, Defoliation, 1955

Researchers reported (page 48 of CD2504) an experiment on the application of spray suspensions of 15 herbicides including one 2,4,5-T-related herbicide LN-380 (2,4,5-trichlorophenoxyacetamide) on six tree species. Researchers did not report the area to which herbicides were applied or the location of the tests. For this analysis, 100 square feet (11 SY) per tree was used to calculate estimated amount. Herbicides were dispersed with a dosage of 0.19 grams per square yard with no replicates of the tests. Given this information, **approximately 13 grams 2,4,5-T-related herbicide was applied for this test** (was not reported previously due to notebook recovery after the preliminary ASR was written)**.**

6.5 Laboratory Notebook CD 2886 Defoliation Field Screenings, 1956[161]

Laboratory Notebook CD 2886 records two field experiments in 1956 at Fort Detrick on elm and locust trees. Published equivalents of these tests have not been found. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the notebook was recovered subsequent to the last report.

6.6 Laboratory Notebook CD 3053 Defoliation Field Screenings, 1956[162]

Laboratory Notebook CD 3053 records three field experiments in 1956 at Fort Detrick on trees in the "grid area" (i.e., Area B). Published equivalents of these tests have not been found. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the notebook was recovered subsequent to the last report.

6.7 Laboratory Notebook CD 3264 Defoliation Field Screenings, 1956[163]

Laboratory Notebook CD 3264 records one field experiments in 1957 at Fort Detrick on trees in the "grid area" (i.e., Area B). Published equivalent of this test has not been found. 2,4,5-T or arsenic-related herbicides were not included in this test. See Appendix D for a complete listing of herbicides tested. This test was not previously reported in the ASR because the notebook was recovered subsequent to the last report.

6.8 Technical Report 016 Defoliation and Desiccation, 1959[164]

Technical Report 016 contains eight field experiments conducted in 1956-57 at Fort Detrick on tree species. 2,4,5-T or arsenic-related herbicides were not included in these tests. See Appendix D for a complete listing of herbicides tested. These tests were not previously reported in the ASR because the Technical Report was recovered subsequent to the last report.

7 ACQUISITION, STORAGE, EQUIPMENT CLEANING AND DISPOSAL AND FACILITY MAINTENANCE USE

Available documentation provides only intermittent details regarding the acquisition, storage, equipment handling and cleaning, disposal of any excess material and non testing use of herbicides in facility maintenance at Fort Detrick. The following paragraphs discuss what is documented about each topic (see Section 2 for complementary historical details).

7.1 ACQUISITION

During the World War II, Camp Detrick examined and tested a total of 1,058 chemical compounds, with all but 226 of the compounds being prepared at Camp Detrick. Of the compounds tested, 2,4-D (LN-8) proved the most effective against a wide variety of crops and was the only the only one produced in bulk for the CWS under contract (Dow Chemical Corporation and Sherwin-Williams Company) during the war. The three bulk forms of LN-8 or VK [Vegetable Killer] are:

- VKA Acid technical grade of LN-8
- VKL Liquid LN-8 in tributyl phosphate and oil
- VKS ammonium Salt of LN-8[165]

Dissemination and field testing of the VK varieties occurred at other locations than Detrick.

In the post-war period, it appears that the in-house Basic Sciences Division at Camp Detrick developed most of the substances used in the laboratory tests (< five grams) as well as the larger amounts used in greenhouse and field studies by the Crops Division (5 grams to 3.5 pounds), though occasionally commercial sources were also used.[166] Trials of commercial herbicides products and compounds remained part of Crops Divisions screening efforts for potential LN agents.

In 1951 and 1952, Detrick researchers once again began aircraft dissemination (spray) trials in cooperation with the Air Force with undiluted technical grades of LN-143 butyl 2,4-dichlorophonoxyacetate and LN-974, butyl 2,4,5-trichlorophenoxyacetate and other compounds.[167] How the Crops Division acquired sufficient material to do conduct these tests is undetermined (i.e. whether in-house preparation or contracted out for the material). The Chemical Corps classified LNA (butyl 2,4-dichlorophonoxyacetate) and LNB (butyl 2,4,5-trichlorophenoxyacetate) as standard types of chemical anticrop agents in March 1953 with procurement specifications being developed subsequently.[168] Evidently this allowed for the contracted acquisition of the larger amounts required for further dissemination trials in 1953 and 1954 but documentation regarding the specifics of any potential Crops Division acquisition was not located. The Air Force acquired

significant quantities, which they surplused later in the 1950s. Confirmation regarding the amounts and suppliers of the Air Force acquired LNA and LNB were not located.[169]

In 1955, the Crops Division spent $9,000 to purchase approximately 900 gallons (~16 drums) of "Liquids A &B". The specific material is unspecified but apparently is LNA and LNB or rather the butyl esters of 2,4-D and 2,4,5-T based on the nomenclature. By September 1956, the Crops Division obtained another 10,000 gallons (or approximately 181 drums) of "Liquids A &B" for Research and Development purposes. The Crops Division acquired the 10,000 gallons without cost but noted it had a value in excess of $100,000. With the 10,000 gallons, the Crops Division planned to conduct a series of dissemination studies to be carried out over Fiscal Years 1957-1959. The material is cited as "…a good simulant for KF material [butyl 2-chloro-4-fluorophenoxyacetate] and can be used in defoliation studies…[and]…basic studies in spray atomization and dissemination." The 1956 amount was compared to an "…amount of material was used in a six week period during the course of the B-29 studies in 1952" which refers to the November-December 1952 aerial spray tests at Eglin Air Force Base, FL using 50-50 mixture 2,4-D and 2,4,5-T.[170] The Crops Division schedule of major investigations from October 1956 through June 1957 included plans for a "massive release of pure agent trials" at Avon Park, FL over six weeks in November and December 1956 and additional screening and development trials at Fort McClellan, among other tests.[171] No documentation was recovered regarding whether these tests were actually conducted or not (i.e. no laboratory notebooks and no published reports), so it is undetermined if they were completed or not. The time frame when the reports would have been completed (circa 1958) aligns with the period when the Crops Division funding and staffing had been slashed, so potentially the findings were never written up for publication. The use of "Liquids A &B" is unconfirmed but if they were LNA and LNB, the tests apparently occurred as by summer 1959, neither the Crops Division, Army nor Air Force had any significant stocks of LNA and LNB (2,4-D and 2,4,5-T). The existing government stock belonged to the USDA, which they acquired as surplus from previously acquired Air Force material. These stocks were exhausted in helicopter dissemination trials at Camp Drum[xxi], which used a total of approximately 2330 gallons (or approximately 42 drums) of LNA and LNB and included technical support from Crops Division personnel.[172] A decade afterwards, the Plant Physiology Division (formerly the Crops Division, Chemical Branch) recounted that in 1955 the vegetation control agent stockpile was reduced and that the Crops Division obtained 200 drums (apparently the 10,000 gallons noted above) and placed it in open storage at Fort Detrick. After four years, that "entire stock" was given to the USDA Beltsville, MD a couple months before the Fort Drum dissemination trials in 1959.[173] As the Fort Drum trial only used about 42 drums and it is unclear what happened to the remaining inventory (e.g. roughly 158 drums). The herbicide trials at Detrick before, during and after this period used amounts most readily measured in grams and would not use anywhere near that amount of agent. No identified tests from that

[xxi] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

period required anywhere near that quantity of material. As noted above, Detrick planned on large "pure agent trials" at Avon Park, FL over six weeks in November and December 1956 and later trials at Fort McClellan, however research to date cannot confirm these occurred.

At approximately the same time, 2,4,5-T became a general herbicide for use by the government. On 5 September 1958, the Federal Government developed Federal Specification O-H-210 for 2,4,5-trichlorophenoxyacetic Acid and it is listed under Federal Stock Number (FSN) 6840-577-4201 for a 55-gallon drum. The specification for 2,4-D occurred earlier in 1958 (FSN 6340-577-4195). In February 1959, the Chemical Corps Technical Committee approved use of 2,4,-D and 2,4,5-T as herbicides for distribution in five-gallon cans (FSN 6840-616-9161 and 6840-616-9159 respectively later replaced by low volatile ester versions by 1962 as FSN 6840-616-4194 and 6840-616-5440). They were expendable supply items to be available to all users as appropriate. It was a Corps of Engineers requirement, meaning they were meant for use by facility engineers as an herbicide for grounds keeping (i.e. brush and weed control) and not for operational or tactical use. On 16 September 1960 the Federal specifications for both 2,4-D and 2,4,5-T in 55-gallon drums were amended to switch to a Low Volatile Liquid Ester version at 4 lb. acid per gallon (FSN 6340-577-4195A and 6340-577-4201A respectively). By April 1962, 55 gallon drums of a mixtures of 2,4,-D and 2,4,5-T Low Volatile Liquid Ester (2 lb. acid each per gallon) is available, as FSN 6840-825-7729A. The A at the end of the stock number indicates an amended version of an existing item.[174] The Federal Specification for 2,4,5-T differed from the military specifications for LNB. The Federal Specification required a low volatile ester of 2,4,5-T (i.e., less than four on a relative scale) and the highly volatile butyl ester of 2,4,5-T or LNB would not meet it (i.e., a nine on the relative scale).[175] As standardized items, the government's supply and logistics organizations and its various supply depots would handle acquisition, storage and distribution of the material, as that was not part of Fort Detrick's mission.

It is undocumented as to whether the Crops Division at Fort Detrick directly acquired the herbicides used for the Advanced Research Projects Agency (ARPA) aerial spray trials in South Vietnam and elsewhere in Southeast Asia beginning in 1961[xxii]. The US Army Chemical Procurement Districts acquired at least part of that material, if not all of it. No documentation was located that any of the herbicidal stocks required for the Southeast Asia dissemination trials or the combat operations in Vietnam beginning in January 1962 under the Air Force Operation RANCH HAND passed through Fort Detrick. Detrick did receive a 100 gallon shipment of a larger 5,000 gallon October 1962 procurement of Purple with the balance going to Eglin AFB. It is undetermined how much, if any, Detrick used on site. The LNA and LNB defoliants used during these trials came from commercial sources (e.g. Monsanto and Dow), which had acquired the material from the Air Force who declared their stocks surplus and sold the surplus material back to

[xxii] These locations have been publically listed by the Department of Veterans Affairs web site since at least 2008: http://www.publichealth.va.gov/docs/agentorange/dod_herbicides_outside_vietnam.pdf

industry. The material used was manufactured between 1952 and 1954 and repackaged in new drums. The Army reacquired the last of the stocks in January 1963, though Dow had resold balances in 1961 and apparently manufactured new quantities to meet Army contracts in 1962.[176]

In July 1963, the Chemical Corps developed military specifications for 55-gallon drums of both n-butyl 2,4-dichlorophonoxyacetate (LNA) and n-butyl 2,4,5-trichlorophenoxyacetate (LNB), with a caveat on the n-butyl 2,4,5-T specification that it not be diverted to domestic use (i.e. not for grounds keeping maintenance on installations). The specification noted that Federal Specification O-H-210 be used for domestic needs. The Defense Supply Agency, established in 1961, handled acquisition, storage and distribution of this material and its later variants. In October 1963, Detrick ordered 15 drums (approximately 825 gallons) of a 50-50 mix 2,4-D and 2,4,5-T following the July military specifications. This is Orange though the procurement document does not use that term.[177]

On 30 December 1965, the formal specification for Defoliant, LNX (i.e. Orange) (MIL-D-51239) was established, also stipulating that it not be diverted for domestic use. On 7 November 1966, the specifications for both 55-gallon drums of LNA and LNB were revised and included the stipulation that both not be diverted to domestic use. The Specification for LNX was revised on 20 September 1967 and was called Orange. That same specification also included the specifications for Orange II (50% n-butyl 2,4-D and 50% isooctyl ester of 2,4,5-T) and Orange III (66.6% n-butyl 2,4-D and 33.3% n-butyl 2,4,5-T). In 1968, the Army Supply Bulletin on herbicides includes a listing for Herbicide, 2,4-D and 2,4,5-T (Orange) FSN 6840-926-9095 based on the military specs for LNA and LNB. Though listed among domestic use herbicides, such use would have been precluded by the military specifications cited. In May 1968, Defense General Supply Center, procured 20 quarts or 5 gallons of n butyl 2,4-D and n butyl 2,4,5-T for Fort Detrick[xxiii]. Documentation exists indicate denial of Orange for brush control on a base in New Mexico in 1969. The Army modified the specification for Vegetation Control Agent Orange on 27 October 1969, though acquisition would end as the DOD ceased use of Orange the following year.[178]

In April 1970, the Secretaries of Agriculture; Health, Education and Welfare, and the Interior jointly announced the suspension of certain uses of 2,4,5-T based on the effects resulting from the concerns of the possible health effects of a contaminant in the manufacture of 2,4,5-T, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Subsequently, the Department of Defense suspended the use of Orange, although the Air Force had large inventory Orange, as well as bulk 2,4,5-T in South Vietnam and at the Naval

[xxiii] It is undetermined how much, if any, of the 1962 Purple procurement and the 1963 and 1968 Orange procurements Detrick used on site. During the 1960s Detrick investigators participated or led a number of aerial dissemination field trials at other locations. It is also undetermined how complete these three procurements are of the herbicides shipped to Detrick during that period but it not thought to be comprehensive.

Construction Battalion Center (NCBC), Gulfport, Mississippi. In September 1971, the Department of Defense directed that the inventory be disposed of in and the stocks were transferred to Johnston Island/Atoll in the South Pacific Ocean. Destruction of the remaining military stocks at sea incineration was conducted as Project PACER HO (Herbicide Orange) and was conducted on a ship off of Johnston Island in the summer of 1977.[179] Disposal of remaining stocks at Fort Detrick occurred by burial at the on base landfill (see section 7.4).[180]

7.2 **STORAGE**

The Crops Division had limited storage space in the various buildings at Fort Detrick, which provided holding space for the materials required for the laboratory and small field trials that occurred on post but not bulk or depot storage As discussed in section 7.1 Acquisition above, the CWS acquired bulk quantities of 2,4-D herbicides under contract during World War II and tested them elsewhere (see section 2) but there is no clear indication the Detrick served as a depot or holding facility for that material. Following the standardization and development of procurement specifications of the butyl esters of 2,4-D and 2,4,5-T in 1952-53, the Air Force acquired significant quantities of this material as part of the dissemination program that was occurring through 1954, but no indication that this material was stored at Detrick either. However, in 1955-56, the Crops Division acquired approximately 181-200 drums of vegetation control agents (apparently was LNA and LNB) and placed it in open storage at Fort Detrick. After four years, that "entire stock" was given to the USDA Beltsville, MD. [181] The specific open storage location of this material is uncertain, however there is a five acre open storage area visible on the 1958 imagery on the east side of Area A (see following Figure). As typical of military open storage, the ~800- by 275-foot area has material stacked in an orderly pattern, in four rows separated by access corridors. The imagery resolution is not such to readily distinguish individual two-foot diameter drums. This is the only confirmed storage at Detrick of the larger amounts of material as would be required for aerially dissemination trails that occurred elsewhere.

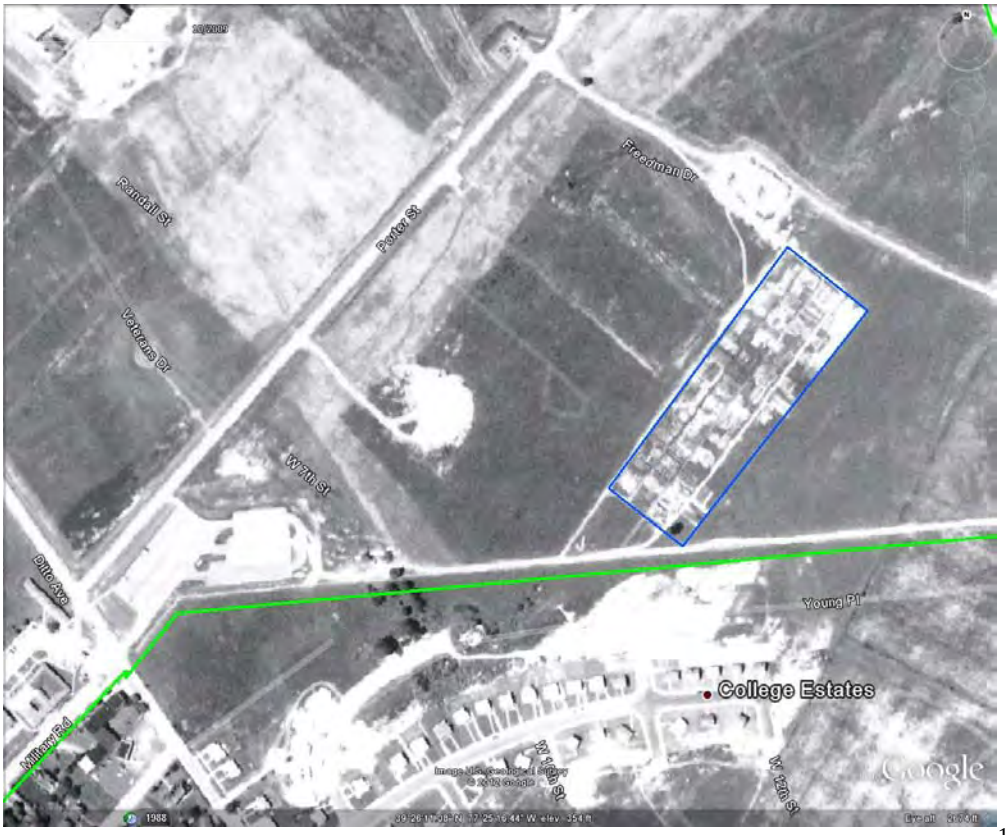


Figure 37 – *Area A – Open Storage Area – Aerial Imagery 9 August 1958*[182]

Storage of bulk 2,4-D and 2,4,5-T, once they have Federal Stock Numbers or Military Specifications was also outside of Fort Detrick's mission. The government's supply and logistics organizations, such as the Defense Supply Agency, and the various supply depots would handle acquisition, storage and distribution of the material, not a research and development and engineering facility.

7.3 EQUIPMENT CLEANING

This investigation did not locate documentation, such as Standard Operating Procedures (SOP), regarding the cleaning of equipment or what to do with any residual amounts of material that remained following test procedures in the laboratory, greenhouse and garden plot trials. Assuredly the test sprayers and other apparatus would have been cleaned or flushed in between applications of different herbicides to prevent distorting the test results but the specific methods used to do so is undetermined. How the resulting flushing or cleaning materials or any potential residual unused test quantities were disposed is similarly undetermined.

7.4 DISPOSAL

Accounts regarding the disposal of any remaining supplies of 2,4,5-T or other herbicides were not located for the 1940s, 1950s and most of the 1960s. By 1969, Fort Detrick

Regulations[xxiv] specify that n**o** herbicides will be disposed of through the installation's drainage system and that "Excess quantities of these chemicals will be placed in containers with an identifying label attached, and will be disposed of by Decontamination Branch by burial at the Grid Area" (i.e., Area B). In 1977, the US Army Toxic and Hazardous Materials Agency (USATHAMA) Installation Assessment of Fort Detrick[183] reported the burial of herbicides and insecticides in disposal Pit 14 at Area B from 1965 to 1971. Historical aerial photos do not necessarily confirm the extent of disposal pit 14 as depicted on available site plans (see following Figures). The site map notes that there was no specific area for the herbicide material in disposal pit 14 and "it was taken care of on a routine basis at the landfill." In 1990, installation of the bottom linear of the Fort Detrick municipal landfill partially capped disposal pit 14. The remaining portions of that pit were capped with an impermeable liner emplaced in 2010.[184]

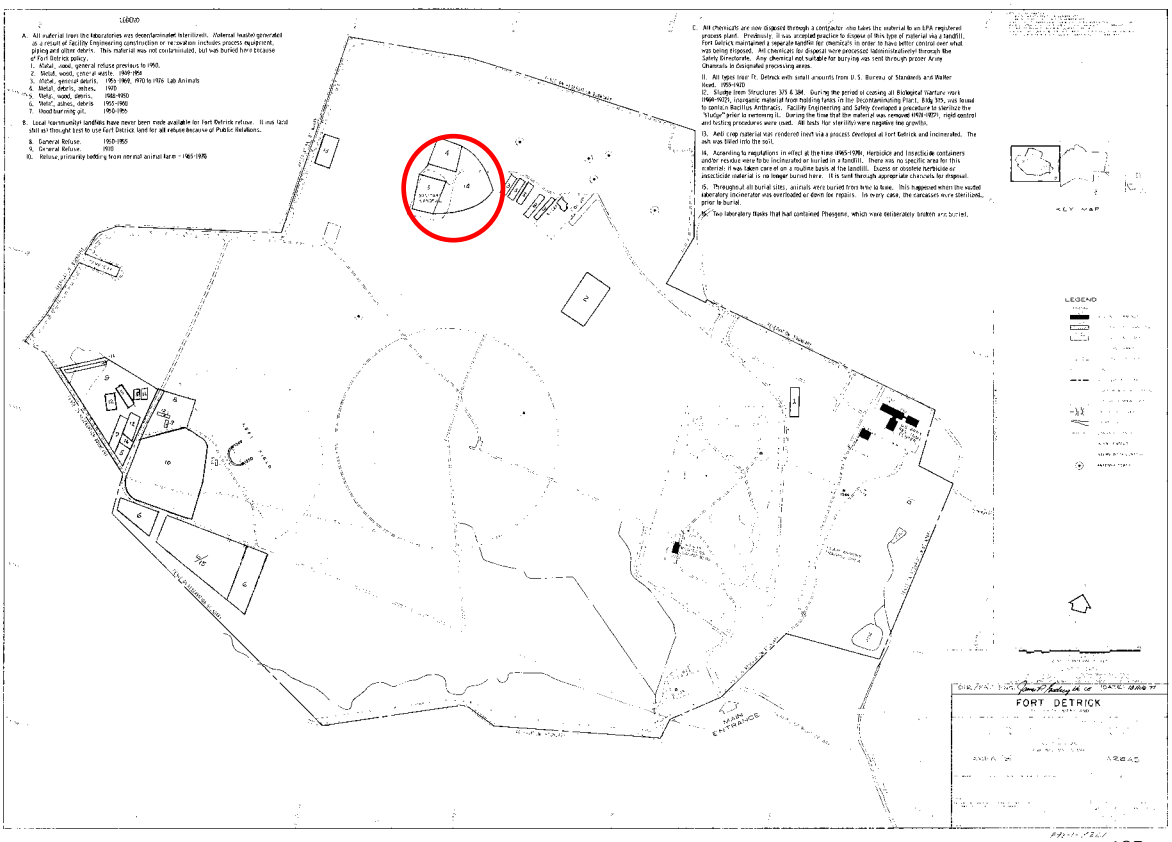


Figure 38 – *Master Plan - Area B Disposal Areas with Pit 14 - 18 August 1977*[185]

[xxiv] The 1963 Fort Detrick Safety Regulations do not mention herbicides.

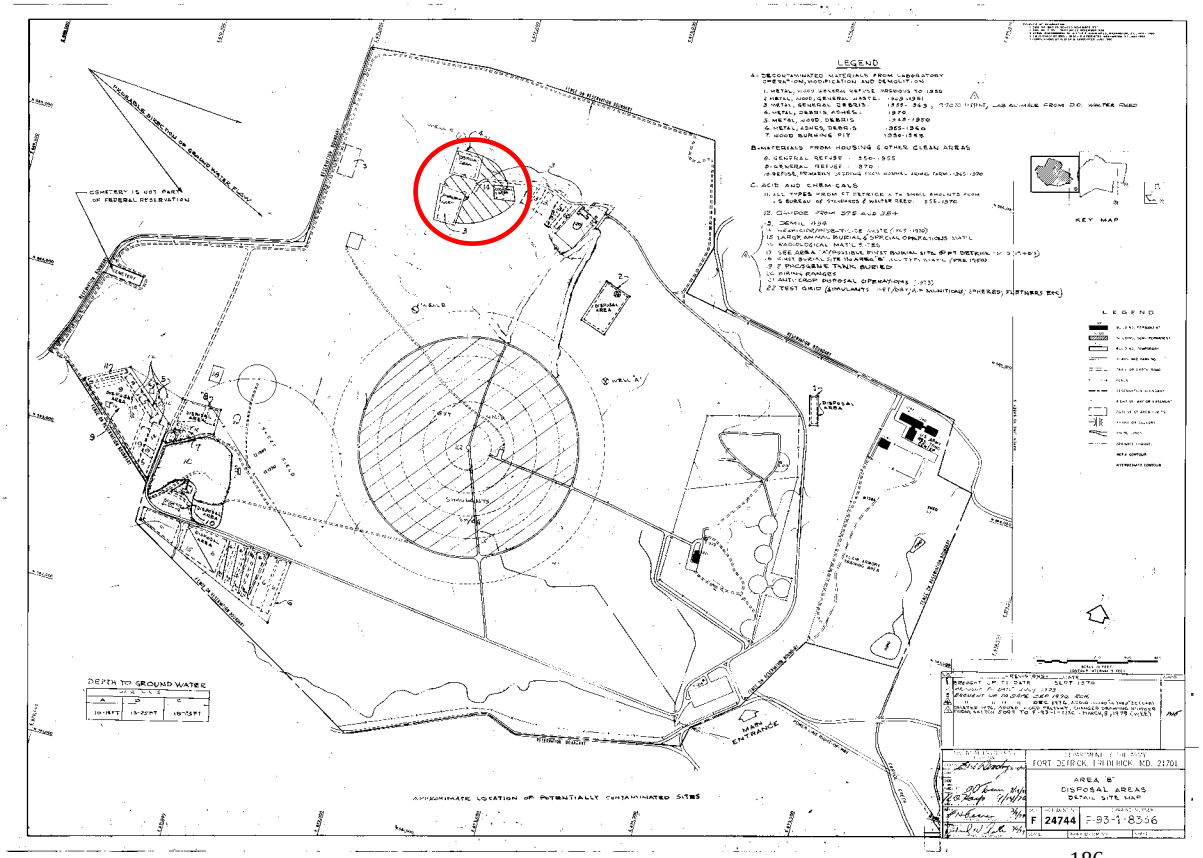


Figure 39 – *Area B Disposal Areas Detail with Pit 14 – 9 March 1979*[186]

In 1970 and 1971 following the closing of the Biological Research Center, herbicides from the Plant Sciences Laboratory and Vegetation Control Division were also buried in Pit 14 in Area B and the reported herbicide buried in 1970 and 971 are listed in the following table (2,4,5-T related herbicides are bolded).

Surplus Herbicides Disposed at Sanitary Landfill, Area B Fort Detrick[187]	
Herbicide	**Amount Buried**
Fall 1970	
Dalapon	350 lbs in 50-lb fiber drums
Diquat	24 gal in 30-gal drum
2,3,6-trichlorobenzoic acid	60 gal in 30-gal drums
2,4-D n-butyl ester	105 gal in three 55-gal drums
2,4,5-T butyl ester	**75 gal in two 55-gal drums**
FenuronTCA (URAB)	20 gal in four 5-gal cans
MonuronTCA (UROX)	5 gal in one 5-gal can
MonuronTCA	20 gal in 55-gal drum
2,4,5-T amine	**55 gal in 55-gal drum**
Silvex (KURON)	**25 gal in 55-gal drum**
2,4-D isobutyl ester	20 gal in 55-gal drum
2,4,5-T isobutyl ester	**20 gal in 55-gal drum**

Surplus Herbicides Disposed at Sanitary Landfill, Area B Fort Detrick[187]	
Herbicide	**Amount Buried**
Picloram (TORDON 40)	20 gal in 55-gal drum
Orange (50/50 mix of isobutyl esters of 2,4-D and 2,4,-5T)	**20 gal in 55-gal drum**
Naptha	55 gal in 55-gal drum
Fall 1971	
2,4-D acid	30 lbs in fiber pack
2,4,5-T acid	**100 lbs in fiber pack**
Diuron (KARMEX)	80 lbs in fiber drums
Dichlorprop	4 gal in 5-gal can
2,4,5-T isobutyl ester	**5 gal in 5-gal can**
Diquat	5 gal in 5-gal can
Endothall technical grade	20 lbs in fiber pack
TRITAC-D	10 gal in 5-gal cans
2,4-D n-butyl ester	15 gal in 5-gal cans
2,4-D isobutyl ester	5 gal in 5-gal can
2,4,5-T butyl ester	**5 gal in 5-gal can**
Phosphine oxide	5 gal in 5-gal can
MSMA (ANSAR 529)	5 gal in 5-gal can
FenuronTCA (URAB)	15 gal in 5-gal cans
Simazine	10 gal in 5-gal cans
Cacodylic acid, Na salt	3 gal in 5-gal can
Orange (M3140, M3142), (50/50 mix of isobutyl esters of 2,4-D and 2,4,-5T)	**70 gal in 5-gal cans**
Cacodylic acid, Na salt	3 gal in 5-gal can
MonuronTCA (UROX)	5 gal in 5-gal can
Dalpon (KENAPON)	5 gal in 5-gal can
SINOX PE	5 gal in 5-gal can
TANDEX 10% granules	15 lbs in fiber drum
Pyroclor (DAXTRON)	35 gal in 5-gal cans
Picloram (TORDON 225)	35 gal in 5-gal cans

The total reported 2,4,5-T related herbicides herbicide buried in 1970 and 1971 equate to 4.18 drums and 100 pounds of material.

In 1976, the Resource Conservation and Recovery Act (RCRA) defined regulations for waste disposal and since then all hazardous waste, including excess or obsolete herbicide material is no longer buried at the Fort Detrick landfills but is shipped offsite for appropriate disposal.[188]

7.5 FACILITY MAINTENANCE USE

Use of herbicides on military posts preceded the existence of Camp Detrick. The facility engineers on most military installations used herbicides to control weed and brush growth, such as along fence lines and on lawns and to "sterilize" ground where required for fire control, such as around explosive storage and handling areas. Chartered in 1956 as the Armed Forces Pest Control Board, and renamed the Armed Forces Pest Management Board in 1979, the AFPMB recommends policy, provides guidance, and coordinates the exchange of information on all matters related to pest management throughout the Department of Defense (DoD) including herbicide use for facility management.

Weed and brush control at Fort Detrick had additional considerations beyond a typical military base however. Detrick had increased needs to control weeds to support the control of pests (i.e. insects and rodents), which could act as vectors for the spread of disease. Another consideration unique to Detrick regarding herbicide use was avoid distorting any field tests by use of herbicides in typical base locations, such as along fence lines or on the landscaped grounds surrounding buildings. Only very sporadic documentation of such grounds keeping maintenance for Fort Detrick was located. The lack of such documentation is typical of military installations, as these are not permanent records and standard records management protocol would dictate non-retention.

On 31 August 1951, the Post Engineer personnel sprayed the fence line of the Grid Area (Area B) with an unspecified arsenic based weed killer, resulting in the killing of eight cows grazing on adjacent lands and the farmer sought compensation for his losses.[189] Later Army guidance acknowledged that arsenicals were relatively long lasting soil sterilants and were typically used in such applications but that some, such as sodium arsenite, were toxic and could kill livestock that ate treated forage.[190] By 1955, the post is using VKL or (i.e. 2,4-D), sprayed in a mixture of one part VKL to 55 parts motor oil for control of weeds on the installation that might harbor insects.[191]

Details concerning use of other herbicides in the Army's general supply inventory are unknown, but as described in section 7.1 Acquisition above, 2,4,-D and 2,4,5-T were approved for use as herbicides with distribution in 5-gallon cans and 55-gallon drums as an expendable supply items. By 1965, the military references USDA Handbook No. 269 – Herbicide Manual for Non-Cropland Weeds which precedes the Army's 1970 TM 5-629 – Herbicide Manual.[192] These guidance documents provide contemporary listing of possible herbicides in use, though it is undetermined which were used by the facility engineers on Camp/Fort Detrick.

Application of weed control on the lawns surrounding the buildings occurred in 1958, 1979 and probably at other times as well (see following Figures). The specifics of herbicide types and applications rates are generally undetermined but it appears clear that weed control for facility maintenance was a continuing process. The types of herbicides undoubtedly changed to meet the contemporary regulatory requirements. By 1977, the herbicides used by Facilities Engineering were in accordance with Department of Army

and EPA regulations and the following herbicide were reported in use: Diquat, Paraquat, Monuron, Amitrol T and Copper Sulfate.[193]

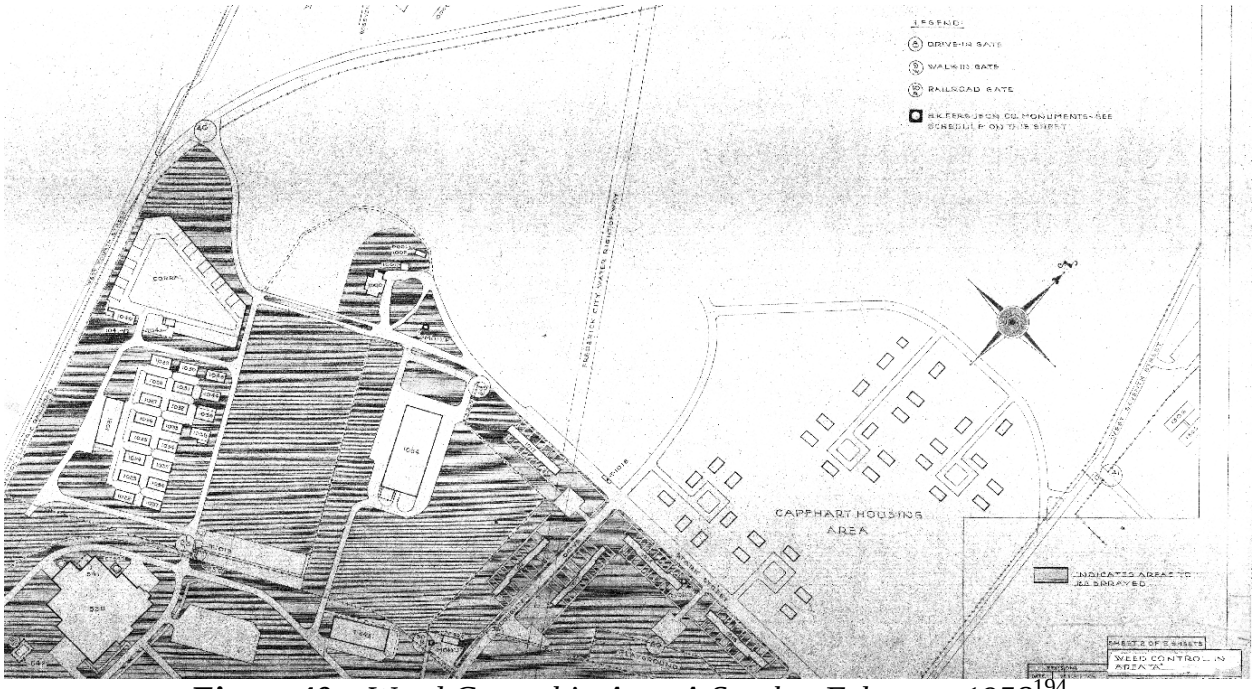


Figure 40 – *Weed Control in Area A South – February 1958*[194]

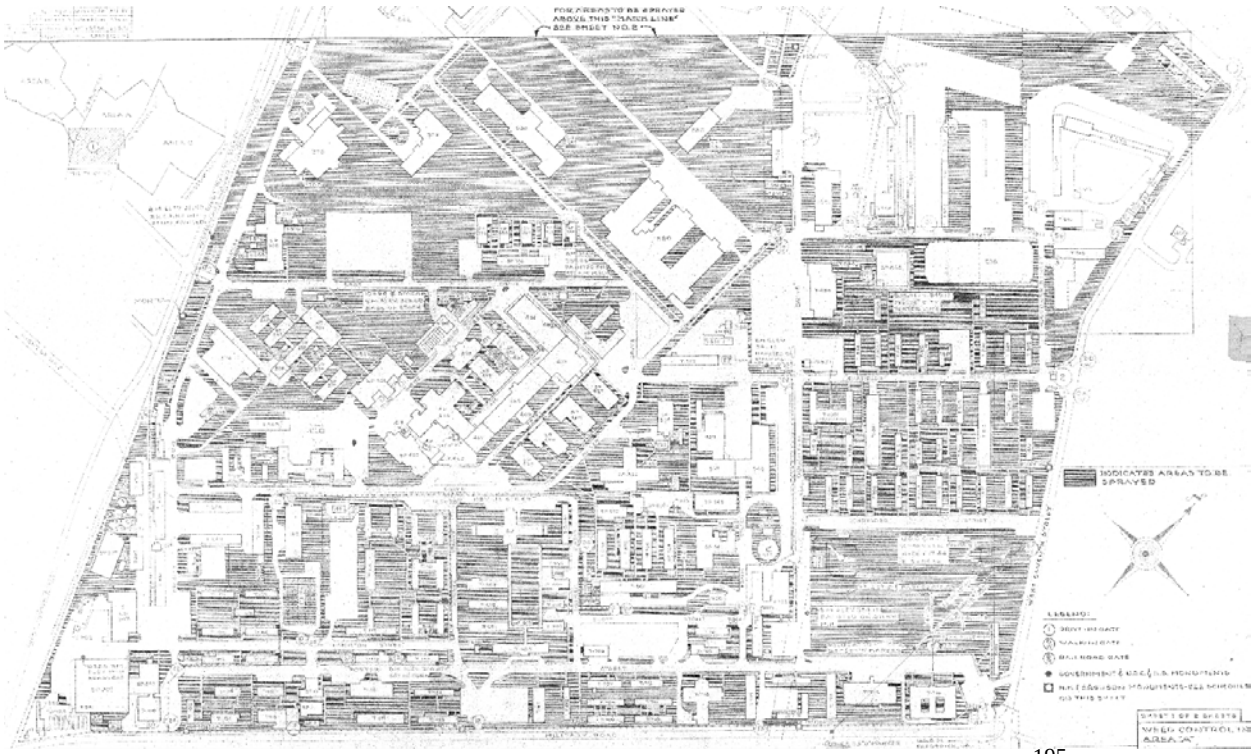


Figure 41 – *Weed Control in Area A South – February 1958*[195]

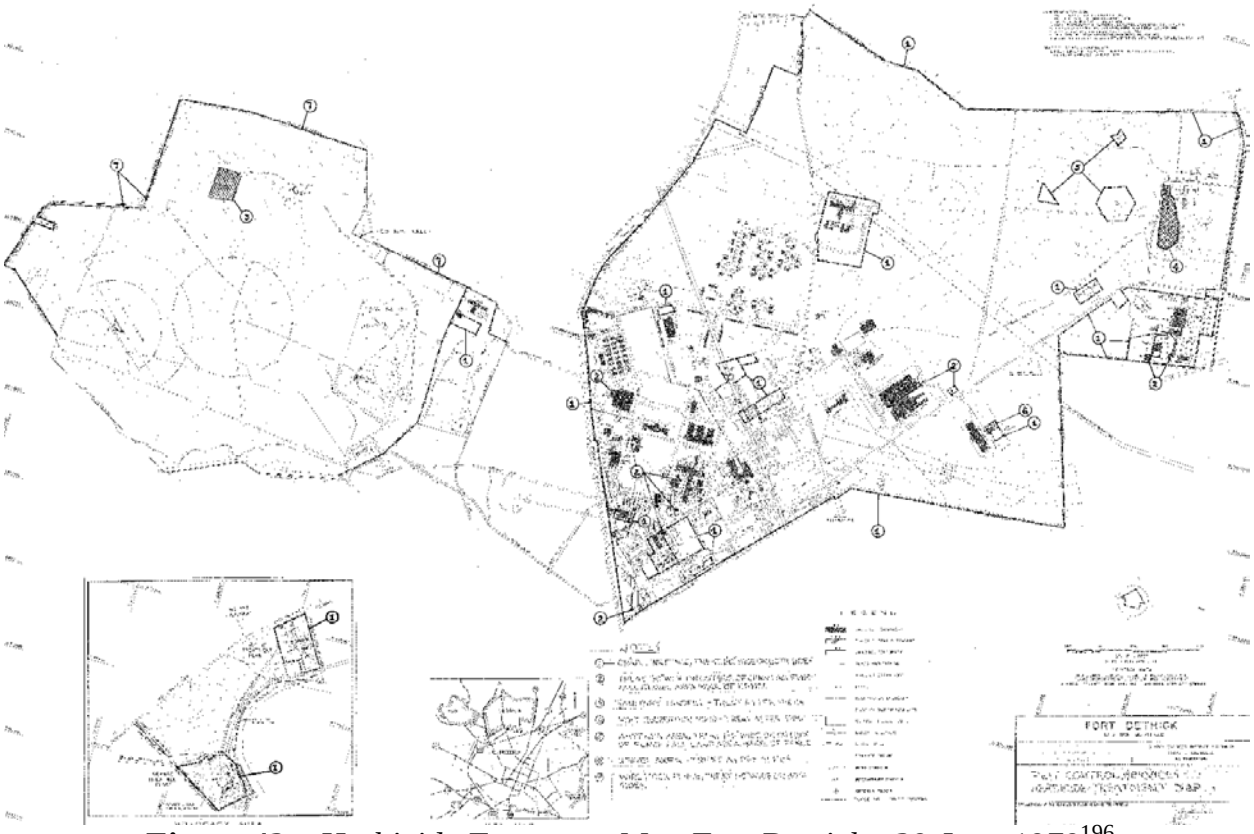


Figure 42 – *Herbicide Treatment Map Fort Detrick - 29 June 1979*[196]

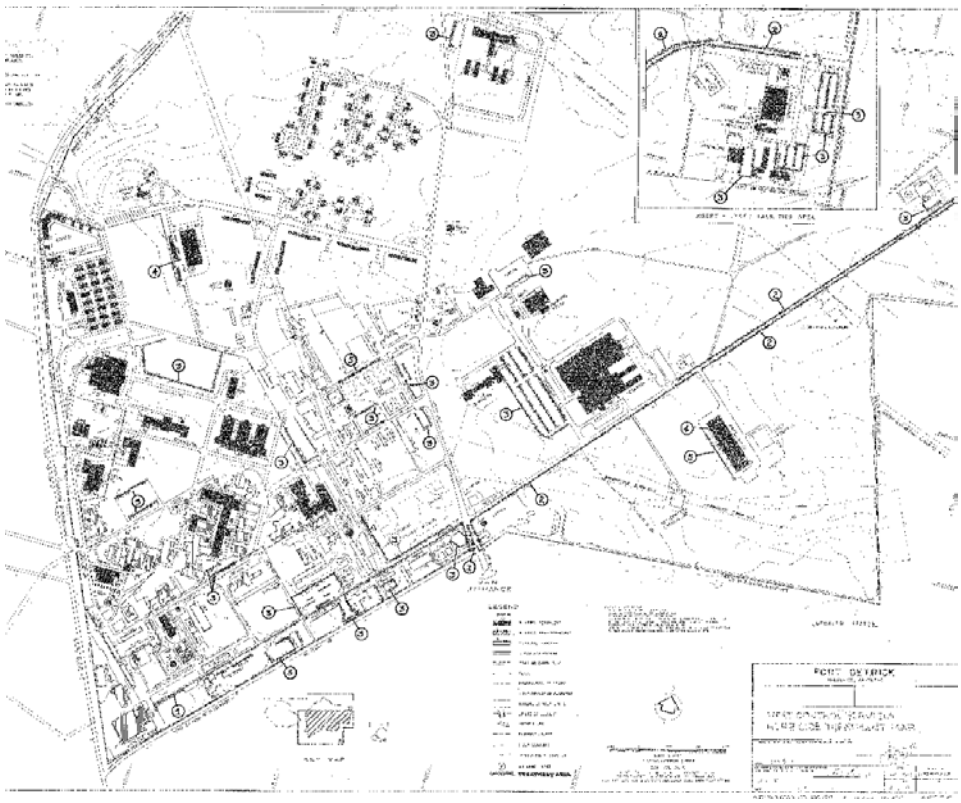


Figure 43 – *Herbicide Treatment Map Fort Detrick Area A Southwest- 29 June 1979*[197]

A 1969 map of Area B (see following Figure) indicates areas to be disced and sterilized around the existing munition storage buildings and the demolition pit. As before, the specifics of herbicide types and applications rates are undetermined. Review of historical aerial imagery for these areas shows them to be devegetated, indicating this was not a singular application of soil sterilants. Army ammunition guidance back as far as World War II, required a fire break at least 50 feet wide around each above-ground magazine.[198]

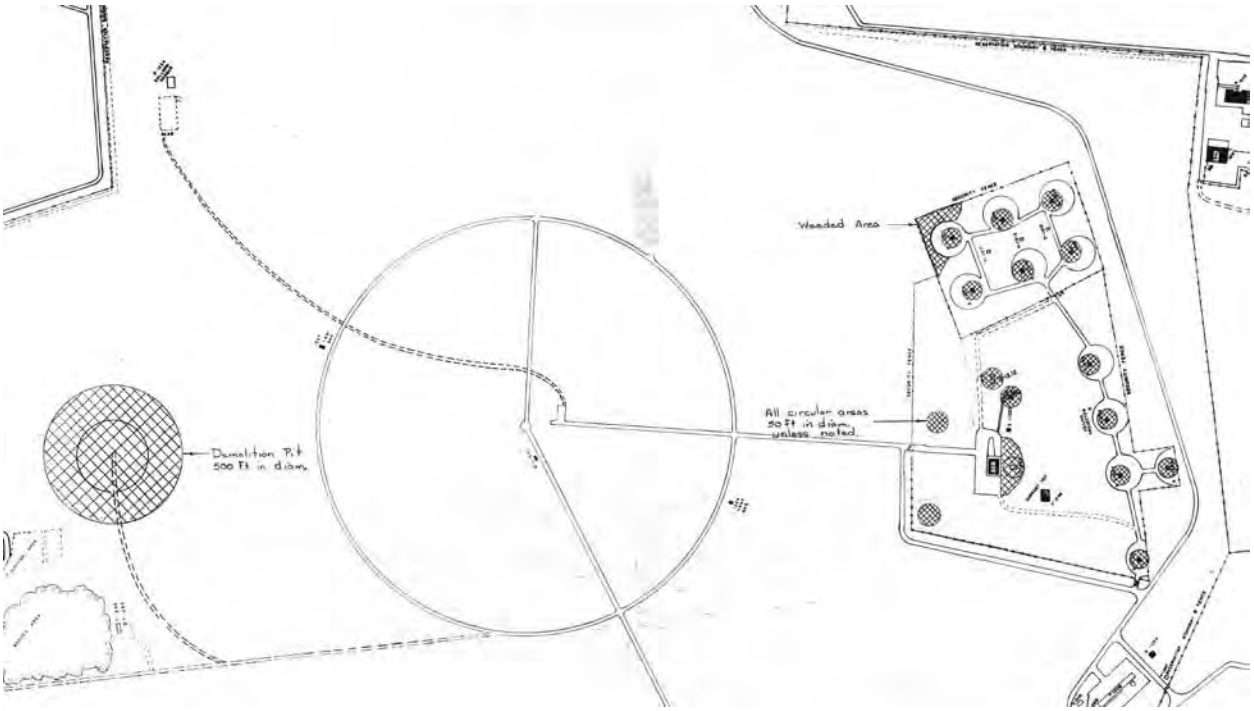


Figure 44 – *Grid Area (i.e., Area B) Disking and Sterilization of Soil Map – 9 May 1969*[199]

It is perhaps worth noting that use of approved herbicides in facility maintenance is excluded from CERCLA. The EPA considers herbicides under the broader "pesticides" category which also include insecticides, fungicides, antimicrobials and other substances and pest control devices used to control insects, weeds or microorganisms such as bacteria and viruses. The EPA's interpretation of the pesticide exemption in CERCLA section 103 covers the normal application of registered pesticides in ways that are consistent with the pesticides' purpose. CERCLA section 101(10) defines federally permitted releases in terms of releases permitted under a number of other environmental statutes. Releases that are federally permitted are exempt not only from CERCLA section 103 and EPCRA section 304 notification requirements, but from CERCLA liability as well. However, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) the EPA interprets that improper or rather non-standardized applications are within the scope of the release notification provisions of CERCLA. Therefore the fielding testing of herbicides would fall under CERCLA, regardless of whether the application rates are the same, or less than, the normal application of those herbicides.[200]

8 CONCLUSIONS

8.1 TOTAL ESTIMATED AMOUNT OF 2,4,5-T AND RELATED HERBICIDES AND DEFOLIANTS TESTED

Camp Detrick conducted field plot experiments with herbicides and defoliants from 1944 through 1970 on herbaceous and woody plants and recorded the results of this field work in reports and in laboratory notebooks. The Crops Division at Fort Detrick published the results of the 2,4,5-T field work in a series of reports, specifically Special Reports Nos. 79, 92, 105, 130, 153, 156, 201, 234, 256 and 262. Results of field work were also published in Status Report 53-6, Technical Reports 6, 16, 17; Technical Studies 11 and 15; Technical Memoranda 9-24 and 212; and Interim Reports 94 and 140. Unpublished field work was found in laboratory notebooks CD 331, 333, 482, 595, 677, 1775, 2081, 2504, 2886, 3053, 3153, 3155, and 3264.

The herbicide field trials were not large scale tests but were smaller efforts involving test plots typically a few rows wide by 18 feet in size, with the herbicide applied with handheld sprayers. To prevent drift of spray on adjacent test plots and distorting the results on those plots, a movable light weight metal framed shelter with wind resistant cloth was often used. Defoliant experiments were similarly small-scale, with defoliants applied to single trees with hand held sprayers. Many different herbicides and defoliants were field tested. The 2,4,5-T or related herbicides and defoliants were analyzed here to estimate amounts tested. Based upon the documents recovered to date, the total amount of the 2,4,5-T and related herbicides tested from 1944 through 1970 at Fort Detrick confirmed **is approximately 9,870 grams (22 pounds).** The amount reported in the preliminary ASR in October 2010 was 7,630 grams (16.8 pounds).

The actual amount tested could be somewhat different as a few reports summarize tests which occurred but do not include enough detail to quantify the amounts without making a few reasonable assumptions about the experiment (e.g., actual size and number of plots). These variances associated with the assumptions would as likely cause the amount to go up as go down, and in either case would not significantly change the total amount. Another possible variance relates to undocumented test data. While the ASR investigation team believes the applicable published reports have been located, this investigation confirmed that the laboratory notebooks included additional experimental data that was not included in published reports. Furthermore it is known that not all the laboratory notebooks are available. Therefore, it is reasonable to conclude that the unrecovered laboratory notebooks could contain unreported experiments for which tested amounts are not included herein. While it is not possible to know what such potential unconfirmed amounts would be, they are not expected to change the total significantly. The order of magnitude of amount reported would remain the same because the method used to test herbicides at Fort Detrick on the small garden plots remained consistent

through time (i.e. the rates tested were on very small plots which therefore required very small amounts of herbicides to conduct the tests).

8.2 TOTAL ESTIMATED AMOUNT OF ARSENIC-RELATED HERBICIDES

Camp Detrick also conducted field plot experiments with arsenic-related herbicides in 1949, 1956-58, and in 1960 on herbaceous plants and recorded the results of this field work in reports and in laboratory notebooks. The arsenic-related herbicides were analyzed here to estimate amounts tested. Based upon the documents recovered to date, the total amount of the arsenic-related herbicides tested from 1944 through 1960 at Fort Detrick **is approximately 5,690 grams (12.5 pounds).** Arsenic-related herbicide amounts were not included with the preliminary ASR. The same caveats apply to the arsenic based compounds regarding the actual amount tested potentially being somewhat different as were noted for 2,4,5-T or related herbicides above.

8.3 ESTIMATED TEST FREQUENCY OF HERBICIDES AND DEFOLIANTS

Appendix D includes a comprehensive list of herbicides and defoliants field tested at Fort Detrick and a table of the all the herbicides tested, sorted by year, tests description, and herbicide code. It also includes a table of the numbers of tests conducted for all herbicides and mixtures of herbicides. The smallest unit of frequency measure is the test instance. For example, one experiment with four herbicides is counted as four test instances. Of the approximately 1,347 test instances overall, the 10 most frequently tested herbicides/defoliants found from 1944-1970 in this analysis and the number of times they were tested alone and in mixtures with other herbicides are as follows:

Tem Most Frequent Herbicides Field Tested on Fort Detrick	
Herbicide	**Tests**
LN-974, Butyl 2,4,5-trichlorophenoxyacetate (aka LNB)	109
LN-143, Butyl 2,4-dichlorophonoxyacetate (aka LNA)	95
LN-8, 2,4-dichlorophenoxyacetic acid	93
LN-14, 2,4,5-trichlorophenoxyacetic acid	86
LN-33, Isopropyl n-phenyl carbamate	77
LN-10778, 2,4,Dichloro-5-fluorophenoxyacetic Acid	55
LN-1661, 4-Fluorophenoxyacetic Acid	44
LN-12962, Cacodylic acid	28
LN-2464, Isopropyl n-(3-chlorophenyl) carbamate	23
LN-32, 2-methyl-4-chlorophenoxyacetic acid	22

LN-974 and LN-14 are 2,4,5-T related herbicides. LN-12962 is an arsenic-related herbicide. Overall, there were approximately 251 instances of 2,4,5-T related and approximately 66 instances of arsenic-related herbicide field tests. The top 10 herbicides

most frequently tested represent 632 instances or 47% of all test instances recorded in the documents analyzed.

As included in Sections 5 and 6 of this report, the detailed analysis of the quantities tested focused on only the categories identified as being of specific interest to the community. Quantities of other herbicides used can be determined from each test instance as required. A very rough, order of magnitude estimate of the amounts used for other herbicides can be estimated by taking the total amount of 2,4,5-T related herbicides (9,870 grams) divided by the total number of test instances (251), to determine a rough amount per test instance (39 grams), and multiplying that times the number of test instances for that herbicide in question. In comparison, for the arsenic-related herbicides which were typically applied to the soil in greater amounts than those herbicides applied to the plants themselves, the average amount applied resulting from 66 test instances totaling 5,960 grams applied overall was approximately 86 grams per test instance.

8.4 LOCATIONS

8.4.1 General

The locations of the Crops Division field experiments are generally noted in the test reports and laboratory notebooks but are not specifically located on available installations site plans. Of the approximately 317 instances of field testing of 2,4,5-T and arsenic-related herbicides, approximately 3/4 had reported locations. Most of those tests (169) were conducted at or near Fields A, B, C, D, E and F, which consisted of the small varied garden plots. Other reported locations included Fields 11 and 13, Area B, Grid Area or the non-specific "Garden Area" or "Garden Plot". In the case of the experiments with rice, the location is not noted but undoubtedly occurred at the Crops Division rice paddy developed at Nallin Farm after Fort Detrick acquired the land in 1952. Although the specific fields are not delineated on site plans except for the rice paddy, analysis of contemporary historical aerial imagery allows along with the textual descriptions of most of these fields to be located with confidence, as the patchwork pattern of the garden plots are readily discerned. However, test locations using plowed and unplowed grasses, such as "Locations A", "Location B" and "the area to the northwest of Field B", which occurred in Area B, are not distinguishable amidst much larger and similar ground cover / land use on aerial imagery. There is approximately 667 grams 2,4,5-T and 226 grams arsenic herbicides (comprising approximately 5 percent of the total amounts tested) were applied in locations at Fort Detrick which researchers did not describe well enough to establish an experiment location. The following paragraphs, Sections 8.4.2 through 8.4.11 discuss each noted field test location, based on the field test descriptions and analysis of the historical imagery. The probable locations of Fields A to F and the other probable field test locations can be delineated on current imagery as depicted on the following Figure.

Figure 45 – *Probable Locations for Fields A to F and other Field Plots through 1970 – Aerial Imagery 28 February 2008*[201]

8.4.2 Field A

Field A consisted of approximately 2 acres of Frankstown silt loam soil "located within the restricted areas and is 100 yards north of the C Division building".[202] The 1940s Crops Division Building was Building 321, which places Field A across the street where a parking lot currently exists northeast of Building 350 (see following Figure).[203] Post war development of the area, available aerial imagery dates and quality do not provide a more specific delineation of Field A.

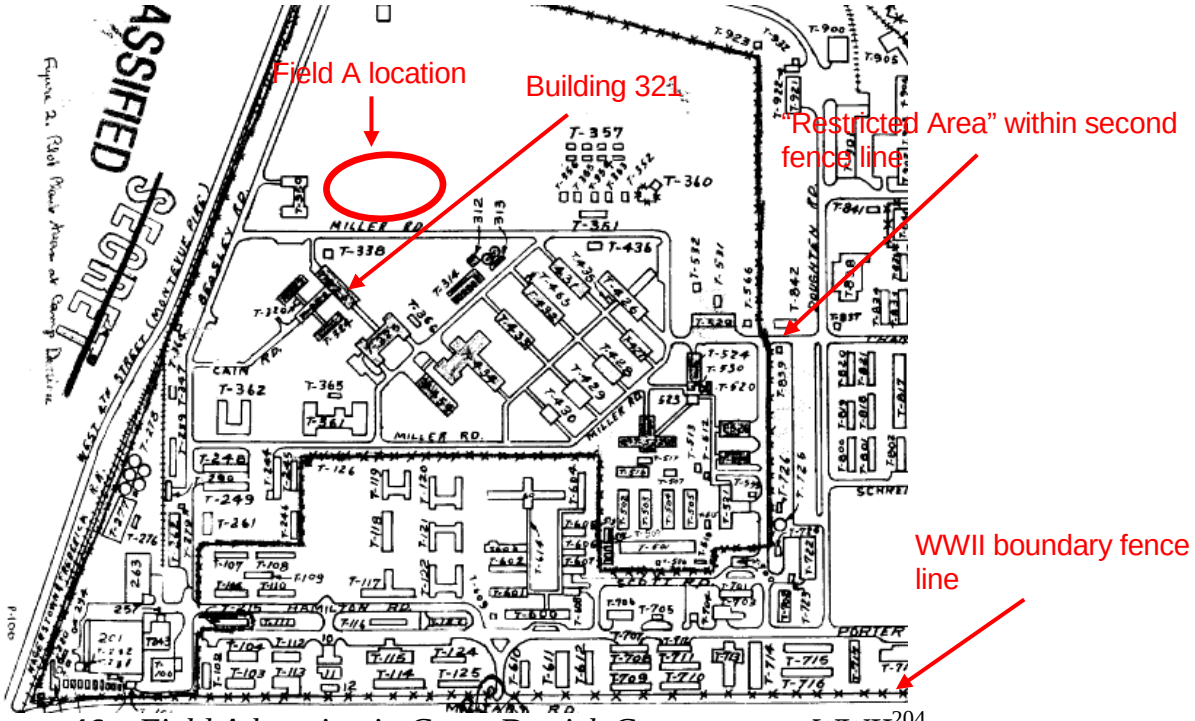


Figure 46 – *Field A location in Camp Detrick Cantonment - WWII*[204]

NOTE: WWII-era cantonment covers on the southwestern fifth most portion of the current Fort Detrick Area A.

This was one of the first fields used for small plot experiments and was specified in use for tests in 1946, 1947 and 1950.[205] Approximately 475 grams of 2,4,5-T related herbicides were applied during experiments on Field A. This amount is slightly lower than the preliminary ASR (489 grams) due to several individual analysis corrections.

Field A is also one of two probable location of additional tests conducted in the "Garden Area" in 1944 and 1945 (see also *Figure 21 – General Layout of Field Crops Trials – Camp Detrick – 31 March 1944*). Approximately 14 grams 2,4,5-T herbicides were applied at the "Garden Area" in 1945 in three experiments described in Special Report 79 (page 200) and notebook CD331 (pages 100, 136). The SR79 experiment (approximately 2 grams 2,4,5-T herbicides applied) took place in 1945 with twelve 6- by 18-foot test plots. The laboratory notebook CD331 page 136 experiment (approximately 8 grams 2,4,5-T herbicide applied) took place in 1945 with twenty-one 5- by 5-foot test plots. The laboratory notebook CD331 page 100 experiment (approximately 5 grams 2,4,5-T herbicide applied) took place in 1945 with six 9- by 10-foot test plots. The only garden plots active in 1945 was Field A, and Field B described below.

8.4.3 Field B

Field B consisted of approximately 3 acres of Athol gravelly loam soil "located near the northeastern corner of the Grid area" (i.e., Area B). It was one of the first three fields used for small plot experiments and was in use in 1946 and 1947. It was used again for

testing in 1950 but not for 2,4,5-T herbicides.[206] It also appears to be the location of the 1945 experiments with cultivated garden crops described as being held at the "Grid Area" (i.e., Area B) in SR79 page 226 (1,364 grams, 1945) and notebook CD333 page 14 (407 grams, 1945). The 1945 experiments were, with at least 72 plots sized 15- by 18-foot each. Field B is identifiable on 1948 aerial photography (closest time available to 1945) of the grid area only shows cultivation in the area previously described as Field B. Therefore, the 1945 experiments at the "Grid Area" could have been located at Field B. A few parcels of the northeast end of Area B (i.e. the Grid Area) appear to be in agricultural use in September-October 1947 based on crop rows discernible on imagery from that time.[207] The parcels exhibiting signs of disking and crop rows, as opposed to the unplowed fields surrounding them in Area B, include roughly 5 acres, 4 acres and 1/3 of an acre as delineated in gold on the aerial imagery on (see following Figure). This is considered the location of Field B and the 1945 Grid Area tests.

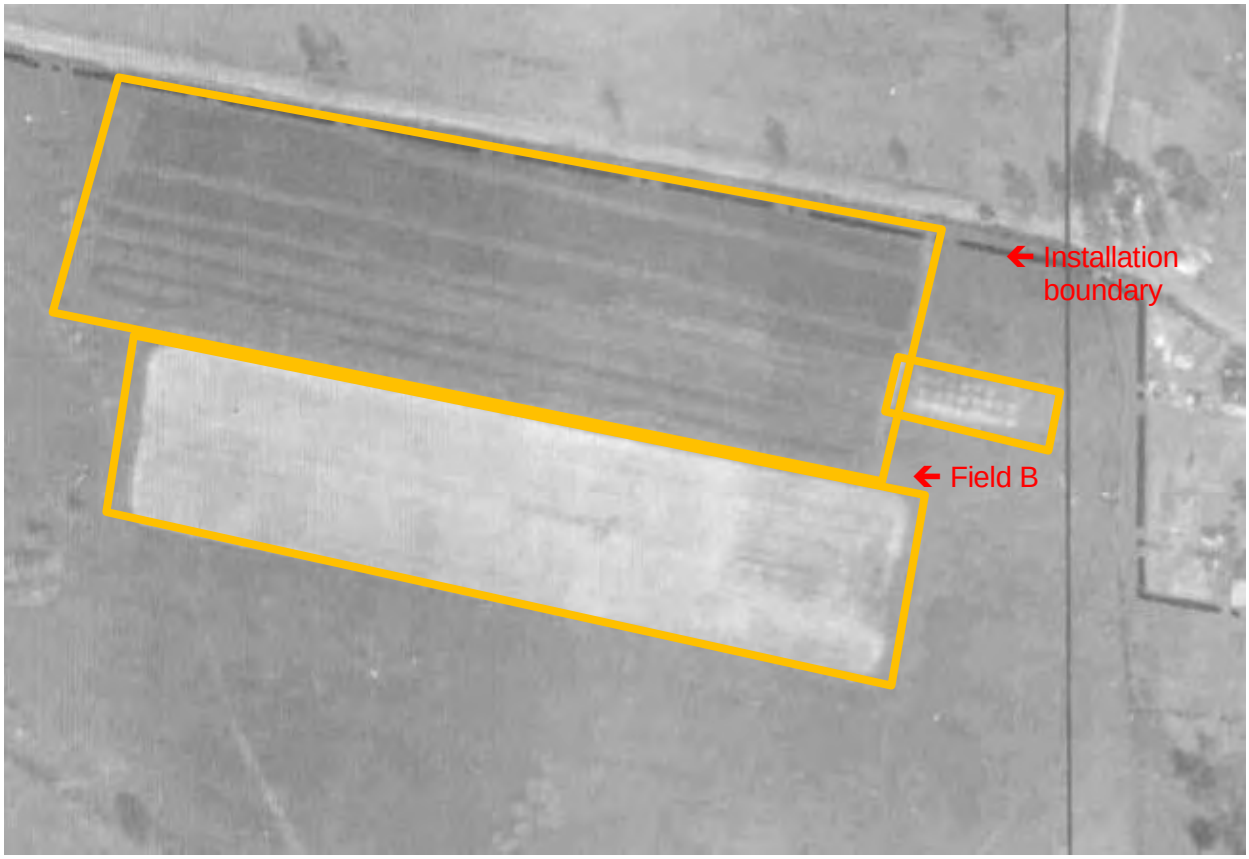


Figure 47 – *Northeast of Area B Aerial Imagery Sept.-Oct. 1947 - Field B Possible location.*[208]

Approximately 1799 grams of 2,4,5-T related herbicides were applied in experiments on the identified Field B area (versus 28 grams noted in the preliminary ASR).

8.4.4 Field C

Field C consisted of approximately 5 acres of Frankstown silt loam soil "located north of the coal trestle on the railroad". This was one of the first three fields used for small plot experiments and was first used in 1946 with continuing use in 1947, 1948, and 1949.[209] Approximately 3,374 grams of 2,4,5-T herbicides were applied during experiments on Field C, the most of any of the Fields and at a cumulative rate per acre higher than the others as well (~675 grams/ acre). This amount is higher than the preliminary ASR (2,296 grams) due to a correction in concentration rates for three soil application experiments.

The location of Field C can be discerned based on the description, the location of the rail line and coal trestle on various site plans and on available aerial imagery from September-October 1947.[210] Field C lies on land immediately northwest of the WWII installation boundary on land Detrick acquired in July 1946 (see Section 3.1.1 and following Figure).

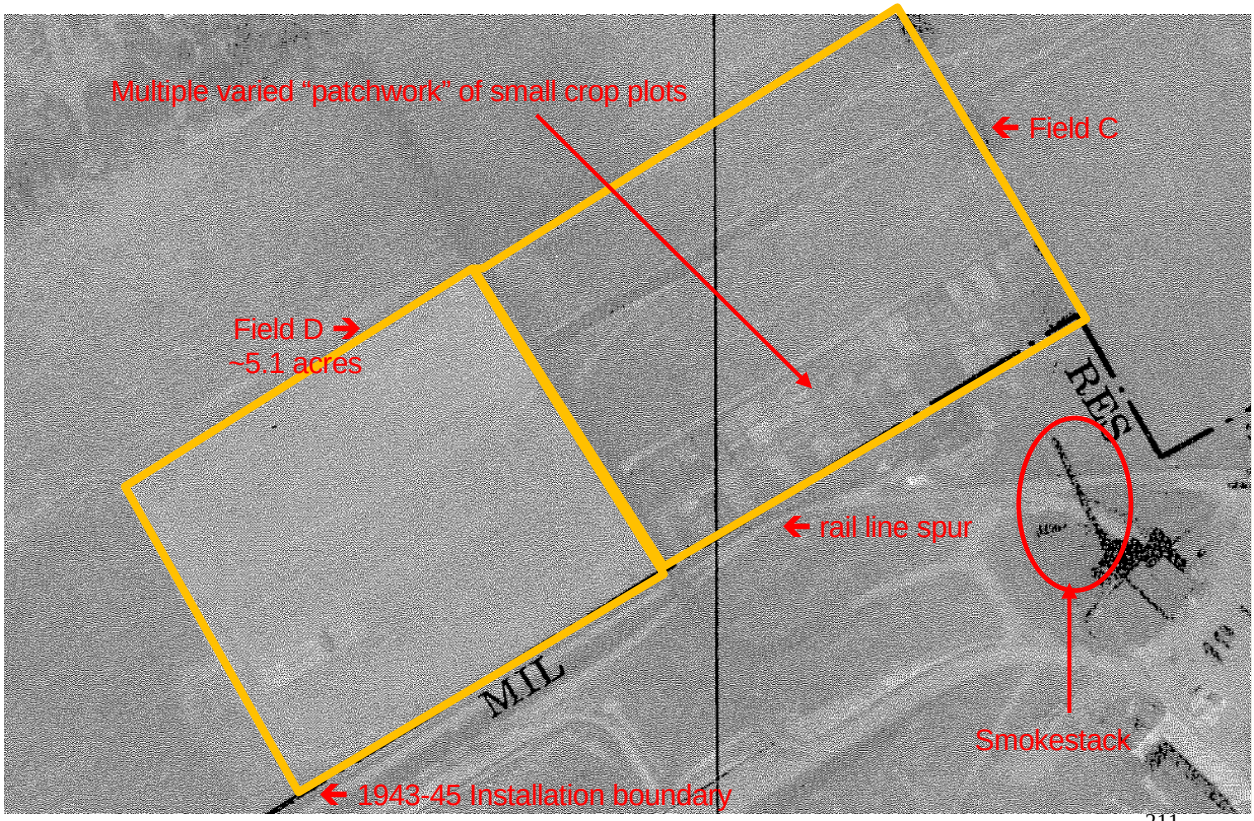


Figure 48 – *Field C and D – Probable locations - Aerial Imagery Sept.-Oct. 1947*[211]

Of particular note on the aerial imagery is a tract roughly 150- by 575 feet, that includes multiple varieties of small crop plots in a "patchwork" pattern readily visible immediately north of the installation boundary. The mini-plots are no bigger than 32- by 75-feet, with many appearing to have multi-crops growing within them. Such varied planting would be highly atypical of a farmer but is exactly the variety expected for the test series described at Camp Detrick and depicted in the imagery. This multi-crop parcel appears to be part of a parcel immediately to the northwest, which as a whole is approximately

5.7 acres, correlating to the size noted for Field C (see previous Figure). The roughly 5 acre tract to west of this Field C corresponds to Field D as described subsequently.

Field C is also one of three probable location of an additional test conducted on the "Garden Plot" in 1947. Approximately 49 grams 2,4,5-T herbicides were applied at the Garden Plot in two experiments described in notebook CD595. Plot sizes were not clearly indicated in the laboratory notebook but the active garden plot fields in 1947, are Fields A, B, or C. These 1947 experiments were not described in the preliminary ASR.

Two additional locations near Field C were used in 1948 for a single test of Vegetation Control of Unplowed Areas: "Locations A & B" were noted as 115 feet north and 570 feet east of Field C, respectively. Researchers applied approximately 504 grams at Location A and 630 grams at Location B of 2,4,5-T herbicides. There were sixteen 9- by 9-foot test plots at Location A, which had broadleaf and annual grasses and 20 plots at Location B which had Kentucky bluegrass.[212] Amount (previously reported as 531 grams in preliminary ASR) and number of plots were revised (previously six plots Location A and 26 plots Location B) based on recovered laboratory notebook and revised interpretation of the Special Report 105, page 98. In addition, approximately 5,409 grams of arsenic-related and 108 grams of 2,4,5 T herbicides were applied during firebreak experiments in 1949 located "150 feet north of Field C".[213] This experiment was not included with the preliminary ASR.

If aerial imagery were available immediately after these three tests, specific locations outside of Field C might be discernible. However, the earliest available imagery is from September 1952 and while the remnants of the garden plots in Field C are distinguishable, specific tests in the grasses are not. Land grading has devegetated large areas for construction of new facilities in the surrounding area obscuring any clearly visible traces of the previous tests (see following Figure).

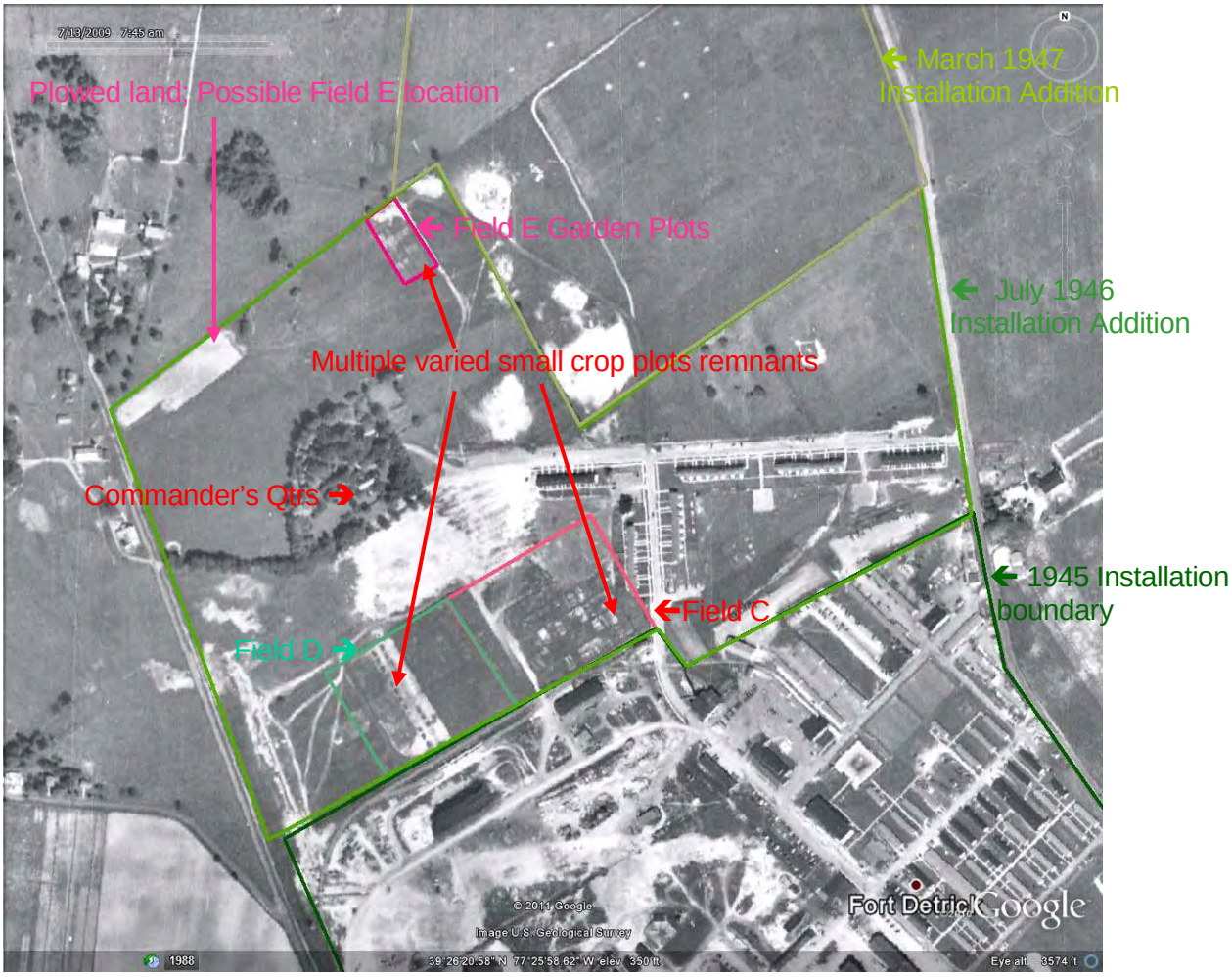


Figure 49 – *Fields C, D & E locations in July 1946 Detrick expansion area – Aerial Imagery 12 September 1952*[214]

8.4.5 Field D

Field D consisted of about 4 acres of Frankstown silt loam soil located "adjacent to and west of Field C". It was one of the fields used for small plot experiments with use beginning in 1948 and continuing in 1949 and 1950.[215] Approximately 1,234 grams of 2,4,5-T herbicides were applied during experiments on Field D, the second most of Fields A-F and at a cumulative rate per acre second highest as well (~308 grams/acre). The amount is slightly lower than the preliminary ASR (1,307 grams total) due to several individual analysis corrections and recovery of a laboratory notebook CD677 with unpublished results. The probable location of Field D can be discerned based on the description of its proximity to Field C identified on aerial imagery from September-October 1947 (see Figure 47). By 1952 only remnants of the former garden plots are visible (see previous Figure).

8.4.6 Field E

Field E consisted of about 6 acres of "Frankstown very fine sandy loam soil to Frankstown silty clay loam" soil "located approximately 1,400 feet northwest of the Commanding Officer's Quarters". It was one of the fields used for small plot experiments with use beginning in 1948 and continuing in 1949 and 1950.[216] Approximately 84 grams of 2,4,5-T herbicides were applied during experiments on Field E (no change vs. preliminary ASR). Precisely locating Field E is hampered by the described location, which is wrong in part. The Commander's quarters at the time of testing is Building 1000, a former mansion on a rocky knoll acquired in July 1946 with the surrounding fields.[217] Building 1000 sat 900 feet southeast of the northwestern most corner of Detrick at the time. In other words, "1,400 feet northwest" of this building would be off the installation and amidst a private farm home, barn and orchard based on 1952 aerial imagery (see following Figure). In the northwestern most corner of Detrick in 1952, about 1.25 acres of plowed land are visible, though this is less than the stated size of Field E. About 800 feet north**east** of the Commander's quarters, remnants of a garden plot patchwork are discernible. This appears to be the probable location for Field E but the area covers only about ¾ of an acre. Possibly Field E included the plowed area, the garden plots and the area in between, which is approximately 6 acres. Another possibility for the location of Field E is an approximately 6.5-acre area about 2,200 feet northeast of Building 1000 exhibiting a number of small garden plots, though this is the probable location of Field F, garden plots as discussed below.

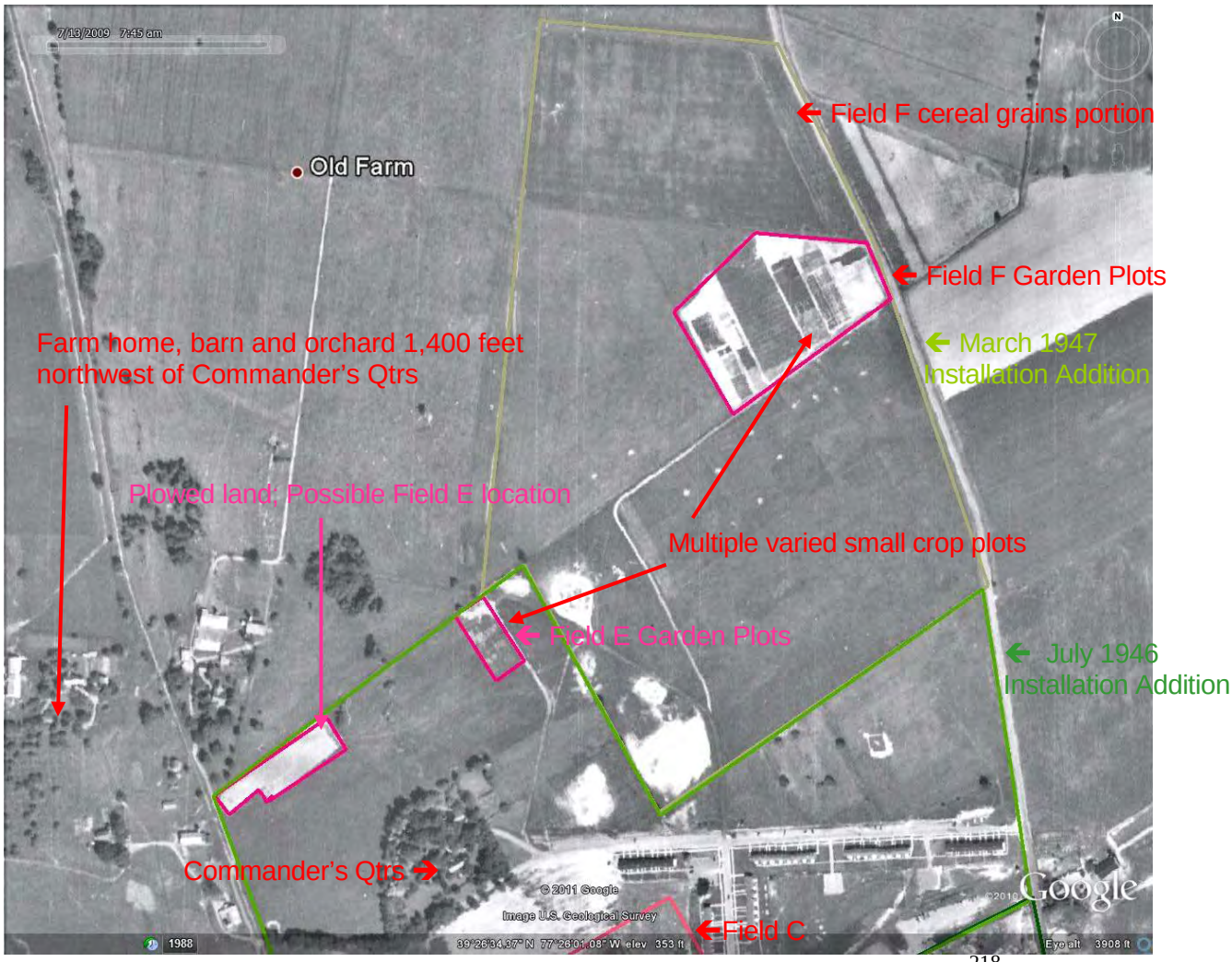


***Figure 50** – Fields E & F – Aerial Imagery 12 September 1952*[218]

8.4.7 Field F

Field F consisted of 16 acres of "Duffield silt loam" soil located "in the northern-most area of Camp Detrick" and used for small plot experiments beginning in 1950-51. It had been pasture prior to fall 1949, when it was plowed. In 1950, it was planted with cowpeas and plowed in September to be partially planted in rye and winter wheat the next month. In spring 1951, the remainder planted in spring oats and broadleaf crops.[219] Approximately 131 grams of 2,4,5-T herbicides were applied during experiments on Field F. This amount is lower than the preliminary ASR (461 grams) due to several individual analysis corrections and recovery of a laboratory notebook CD1243 with additional plot size information. The "Duffield silt loam" is not a soil classification on the 1919 Soil Survey of Frederick County, Maryland (see Figure 23) but represents a reclassification or refinement of the 1919 Frankstown soil type based on comparison with recent soil survey maps.[220] The locations the broadleaf crops or garden plots of Field F are readily discernible on 1952 aerial imagery (see previous Figure) and consist of about 6.5 acres. To the north at the northern most extreme of Detrick at the time, there lies

another field in production that would correlate to the cereal grains noted as grown in Field F.

8.4.8 Nallin Farm Rice Paddy

A 1953 site plan map delineates boundaries of a "Rice Paddy C Division" at the Nallin Farm area on the east side of Fort Detrick near a "Reservoir for Crop Irrigation,"[221] currently known as Nallin Pond. As this was part of the 1952 Detrick expansion and the irrigation pond is not present in 1952 based on review of the aerial imagery, it appears the pond was created to create the rice paddy experiment area in 1953. Researchers reported field experiments on rice with approximately 57 grams 2,4,5-T and 1 gram arsenic herbicides 1953-1957. Approximately 16 grams 2,4,5-T related herbicide was applied to eight rice plots size 6 SY each apparently in 1953 (SR234 page 2), and 41 grams applied to 24 rice plots size 6 SY each in 1954 (SR256, page 25). Approximately 1 gram arsenic-related herbicide was applied to 16 plots size 4.5- by 6-feet each of rice in 1957 (TR6, page 22). This location was not reported in the preliminary ASR.

Figure 51 – *Crops Division Rice Paddy at Nallin Farm – map extract June 1953*[222]

8.4.9 Other Area B Locations

An "area to the northwest of Field B" was used to observe the effectiveness of LN herbicides in control of vegetative firebreaks on broadleaf and grassy weeds during one test in 1947.[223] Approximately 422 grams (was 46 grams preliminary ASR) of 2,4,5-T herbicide was applied to a total of twenty-eight 9-foot by 9-foot plots at this location (Special Report 92, page 152). Test plots northwest of Field B are not readily discernible on the September 1947 and 1948 aerial photography. However, on the 1952 imagery, there is an approximately 150- by 475-foot area that is formerly cleared and possibly served as a test plot location in the past. This area was identified as CA-1 [Cleared Area 1] in the 2001 EPA Aerial Photographic Analysis report of Area B.[224].

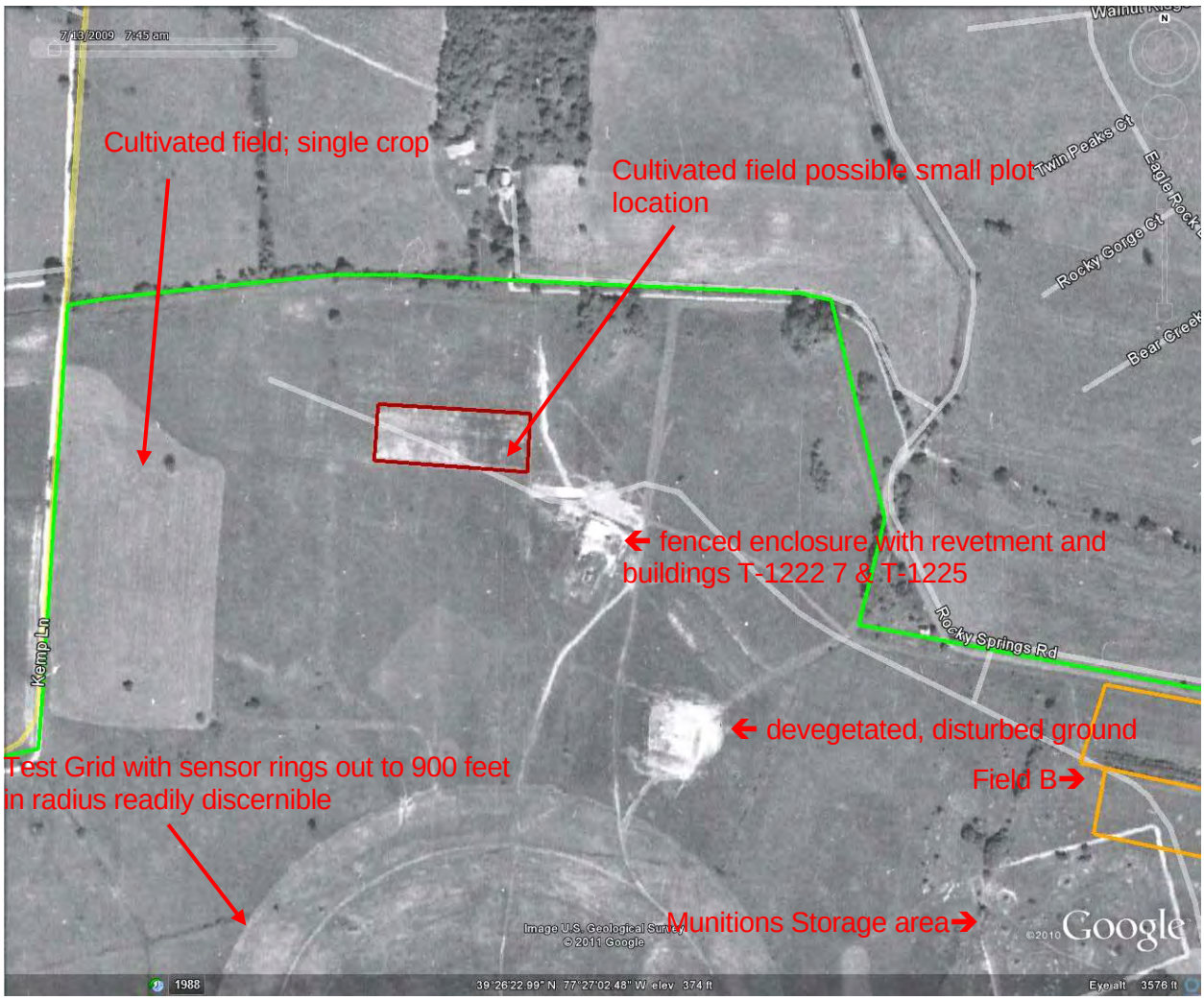


Figure 52 – *Area B - Possible "area to the northwest of Field B" used in 1947 field tests – Aerial Imagery 12 September 1952*[225]

Approximately 106 grams 2,4,5-T herbicides were applied at Area B in 1953 described in Special Report 201, an experiment involving a truck-mounted spray tower on broad-leaf (i.e. soybean and sweet potatoes) test plots in Area B. The specific location of the test plots in Area B is not stated but the vegetable plots are at least 240 feet wide and 340 long based on the sketch and the stated scale in the test report. Based on a review of the subsequent available aerial imagery in 1958, the most likely potential location for the 1953 tests is indentified as south of the test grid (see following Figure).

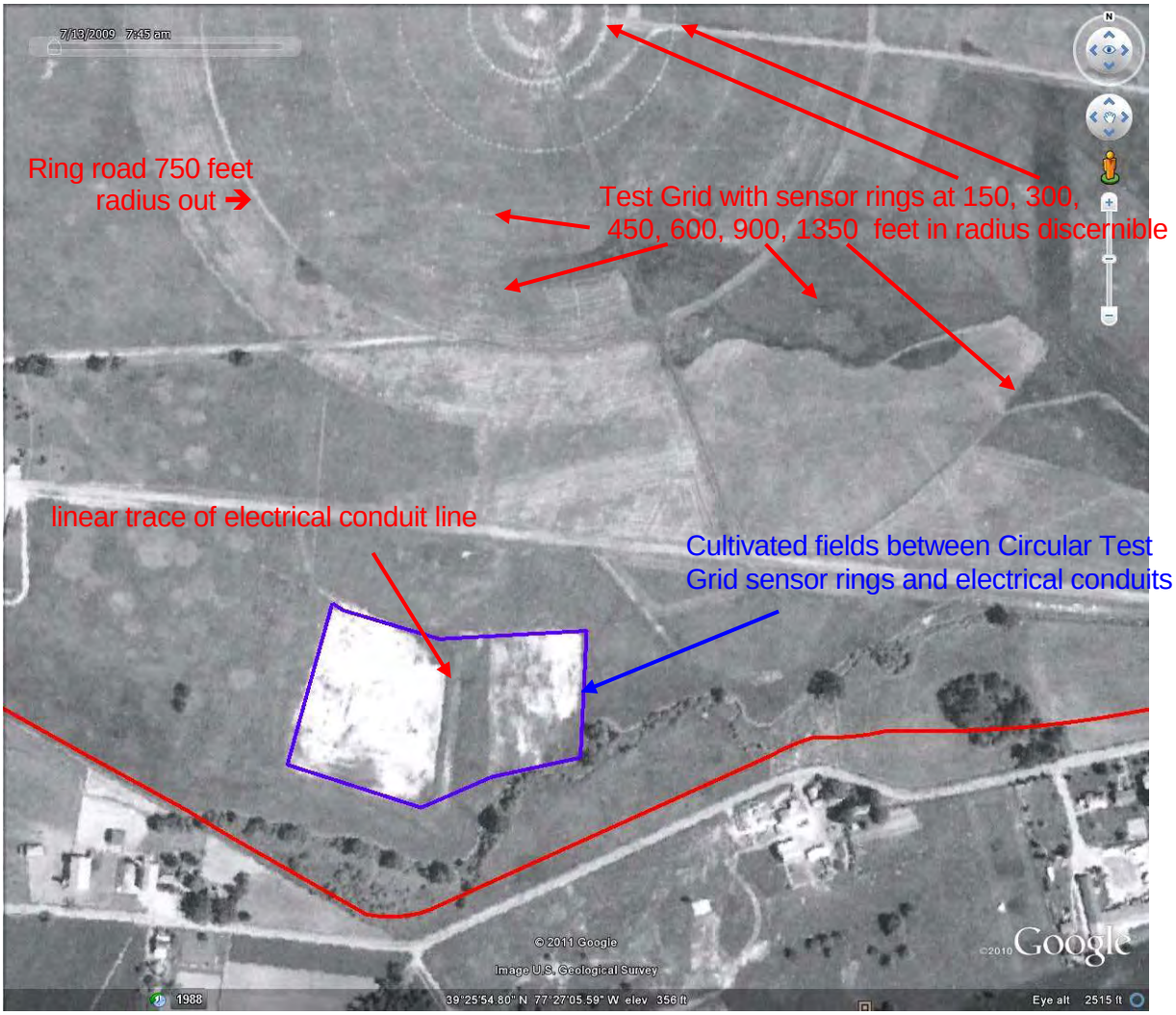


***Figure 53** – Area B - Possible location of truck-mounted spray tower tests – Aerial Imagery 30 May 1958*[226]

As non-rectangles, the location and shape of the cleared fields may appear odd at first glance. However, the tilled fields are placed between the sensors and electrical conduits for the Area B Test Grid. The Area B Circular Test Grid is composed of rings with 60 sensor nodes evenly placed along concentric circles 150, 300, 450, 600, 900, 1350 and 1800 feet radiating out from the center of the grid. A circular road rings the center at about 750 feet radius out. There are 30 electrical conduits arms radiating out from the grid center evenly spaced at six degrees apart (see following Figure).[227] The fields lie just beyond the 1350 radius sensor ring of the Area B Grid with the eastern one truncated by the creek channel. The fields in question lie in-between two of the conduit arms and are divided by another linear conduit line, clearly visible. The conduit line between the fields is much clearer defined than any other possibly indicating a recent retrenching or replacement of the line at that location.

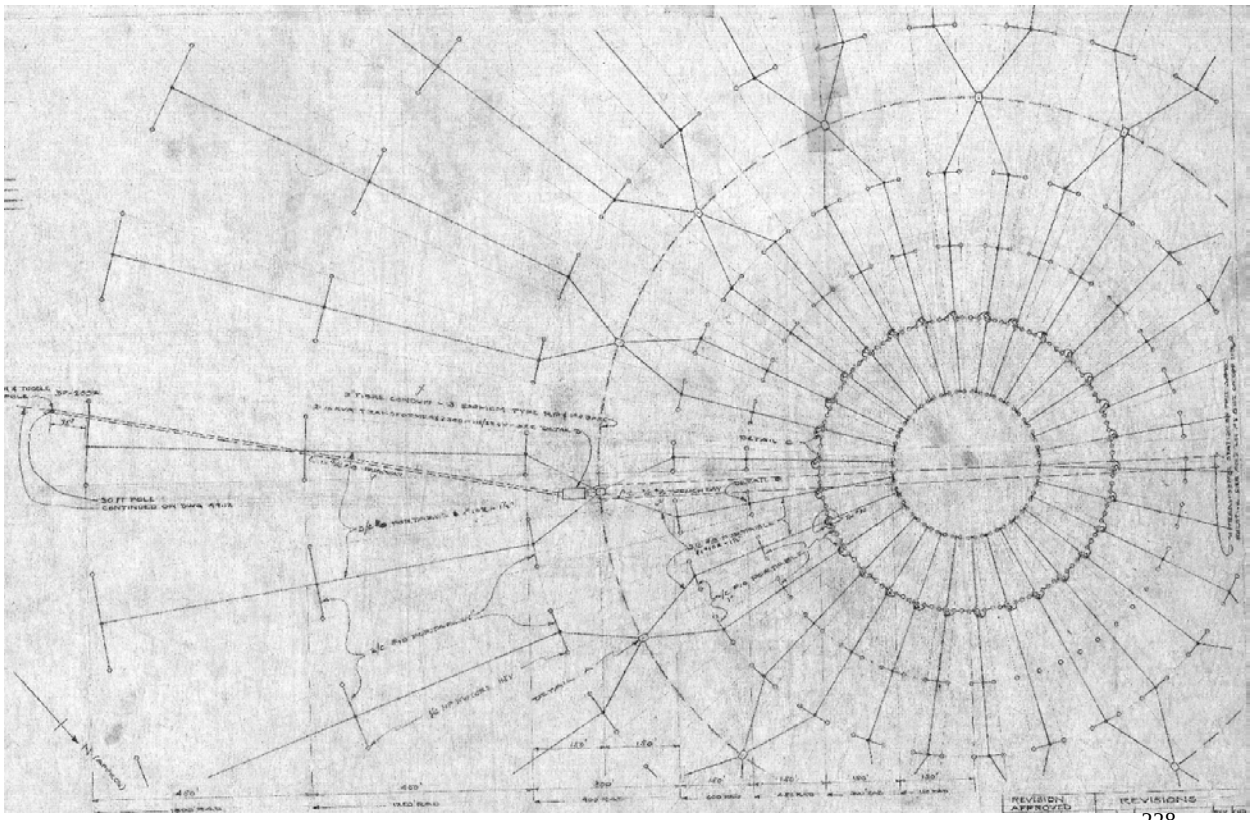


Figure 54 – *Area B – Munitions Grid Electrical Layout – 23 February 1943*[228]

A 1968 experiment at the Grid Area was conducted on 11 plots of bluegrass and broadleaf weeds, each 20-foot square. Herbicides were applied with hand-held sprayers and hand-applied pellets and included 162 grams of 2,4,5-T related herbicides. No specific small plots are readily discernible on the available 1970 aerial photography of Area B. However, since Area B is primarily comprised of pasture grasses and broadleaf weeds, specific plots would not stand out from the surrounding areas. As a result the exact location of 1968 "Grid Area" experiments at Area B is undetermined.

8.4.10 Field 11 and 13

Researchers reported field experiments with 2,4,5-T and arsenic herbicides at "Field 11" and "Field 13" in 1956 and 1957. These locations were not discussed in the preliminary ASR because the reports in which they were described were recovered at a later date. Approximately 6 grams of 2,4,5-T and 40 grams of arsenic-related herbicides were applied in experiments at Fields 11 and 13 between 1956 and 1957. The 2,4,5-T experiments were described in laboratory notebook CD3155 (pages 11, 19, 92, 114, 129, 137, and 143) and took place at Field 11 in 1956 with eighty-eight 30-inch by 18-foot test plots. The arsenic herbicide experiments at Field 11 were described in Technical Report 6 (page 34) and in laboratory notebooks CD3153 (page 82) and CD3155 (pages 35 and 64). The TR6 experiments (approximately 8 grams arsenic herbicides applied) took place in 1957 with thirty-two 30-inch by 18-foot test plots. The laboratory notebook CD3153

page 82 experiments (approximately 7 grams arsenic herbicide applied) took place in 1957 with twenty-four 30-inch by 18-foot test plots. The laboratory notebook CD3155 pages 35 and 64 experiments (less than 1 gram arsenic herbicide applied) took place in 1956 with four 30-inch by 18-foot test plots. The arsenic herbicide experiments at Field 13 were described in Technical Report 6 (page 25) and in laboratory notebook CD3153 (pages 33, 51, and 63). The TR6 experiments (approximately 31 grams arsenic herbicides applied) took place in 1957 with two-hundred 35-inch by 18-foot test plots. The laboratory notebook CD3153 experiments (approximately 10 grams arsenic herbicide applied) took place in 1957 with eighteen 35-inch by 18-foot test plots.

As was the case with the earlier garden plot test series, the locations of Fields 11 and 13 are not delineated on available site maps. However, site maps from the time frame show that the Crops Division controlled area covers much of the 500+ acre 1952 installation expansion between the current Ditto Avenue (former West 7th Street) and Opossumtown Pike as denoted on a 1955 Land Use plan (see following Figure). This undoubtedly includes the locations for Field 11 and 13.

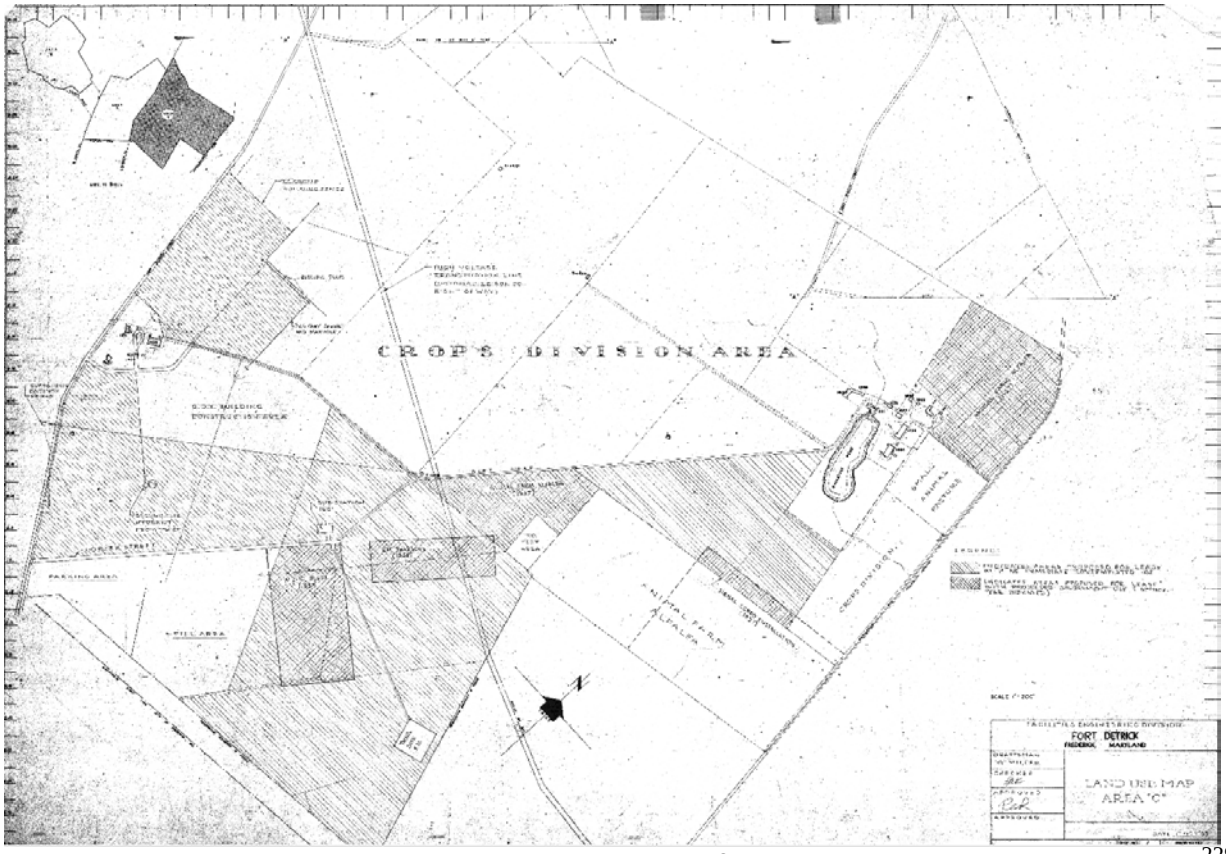


Figure 55 – *Land Use Map with Areas Proposed for Out Lease – 11 November 1955*[229]

Analysis of August 1958 aerial photography, during the period when the Crops Division had less than a dozen staff, indicates a few potential locations of where a patchwork pattern of small garden plots are visible or the remnants of earlier plots are distinguishable (see following Figure).

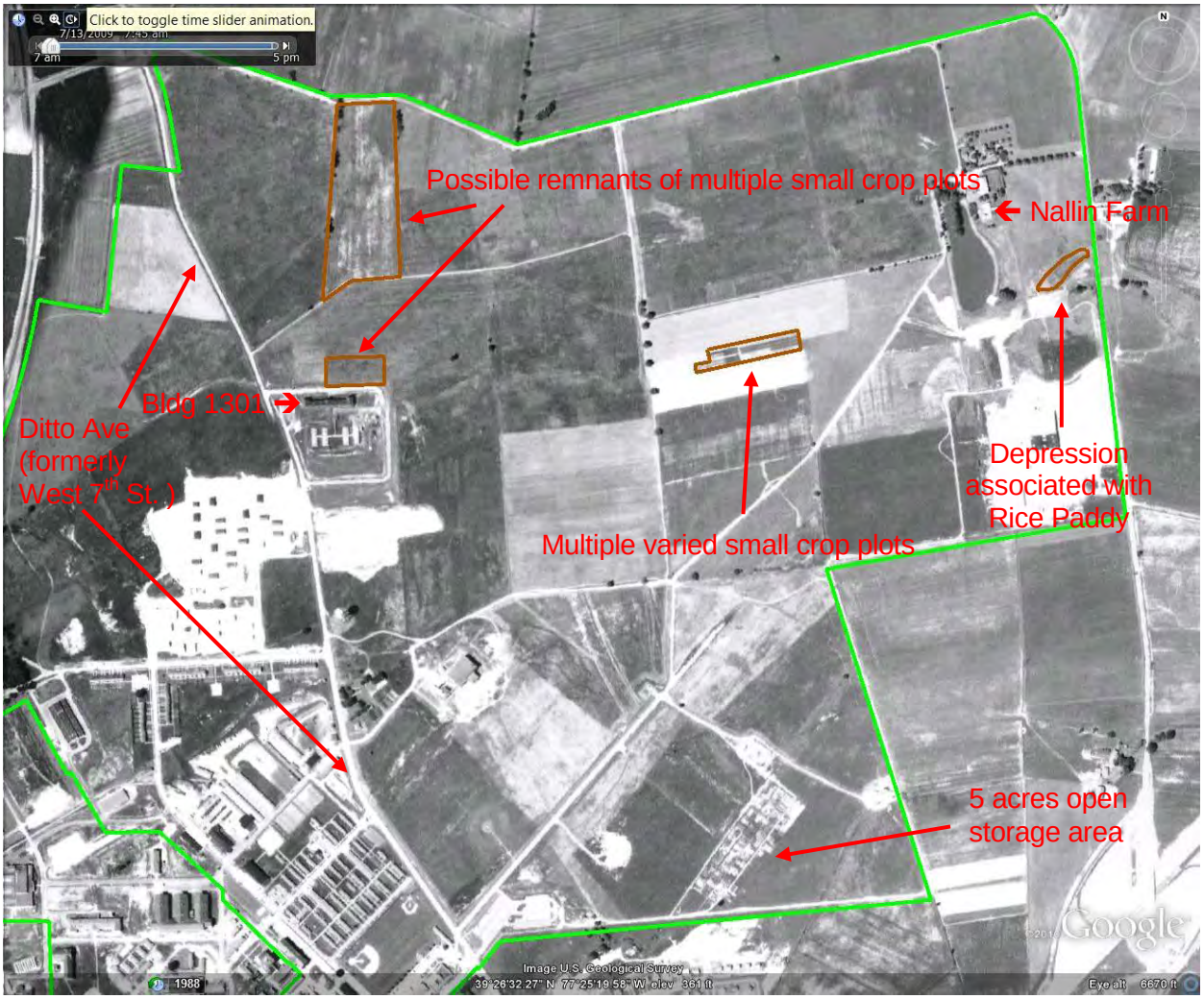


Figure 56 – *Area A - Possible locations of Field 11 and Field 13 – Aerial Imagery 9 August 1958*[230]

Note: Other surrounding fields are clearly in agricultural production. Fort Detrick land use maps confirm this and occasionally denote the types of cereal grains and grasses (including Timothy, Alfalfa, Orchard Grass, Red Clover, Blue Grass, etc.) planted at specific times and locations.[231]

8.4.11 Other Area A Locations

By late 1955-early 1956, Detrick proposed leasing out unutilized portions of the installations to reduce maintenance costs and gain funds on the out leases. Available site plans between 1958 and 1985 sporadically depict the tracts leased to private local farmers (see Section 3.1.2 Out Leases – Agricultural for detailed discussion). Although comprehensive information on the out leases is not available, enough exists to eliminate areas from potentially being used for testing as they were leased to others. Additional areas can be eliminated for consideration by review of installation mowing schedules

completed on site plans.[232] However, most beneficial to locating other areas of garden or small crops plots is analysis of historical aerial imagery.

In June 1964, the Ditto Avenue Garden Plots planned in 1959[233] (see following Figure) are distinctly visible south of the main Crops Division building 1301. To the east, an approximately 900-foot by 350-foot section has trees planted across it. Nearby there are two smaller fields that display a faint trace of the patchwork pattern indicative of previous garden plots. These three small plot areas may have been the locations of Cacodylic Acid tests done in 1960.

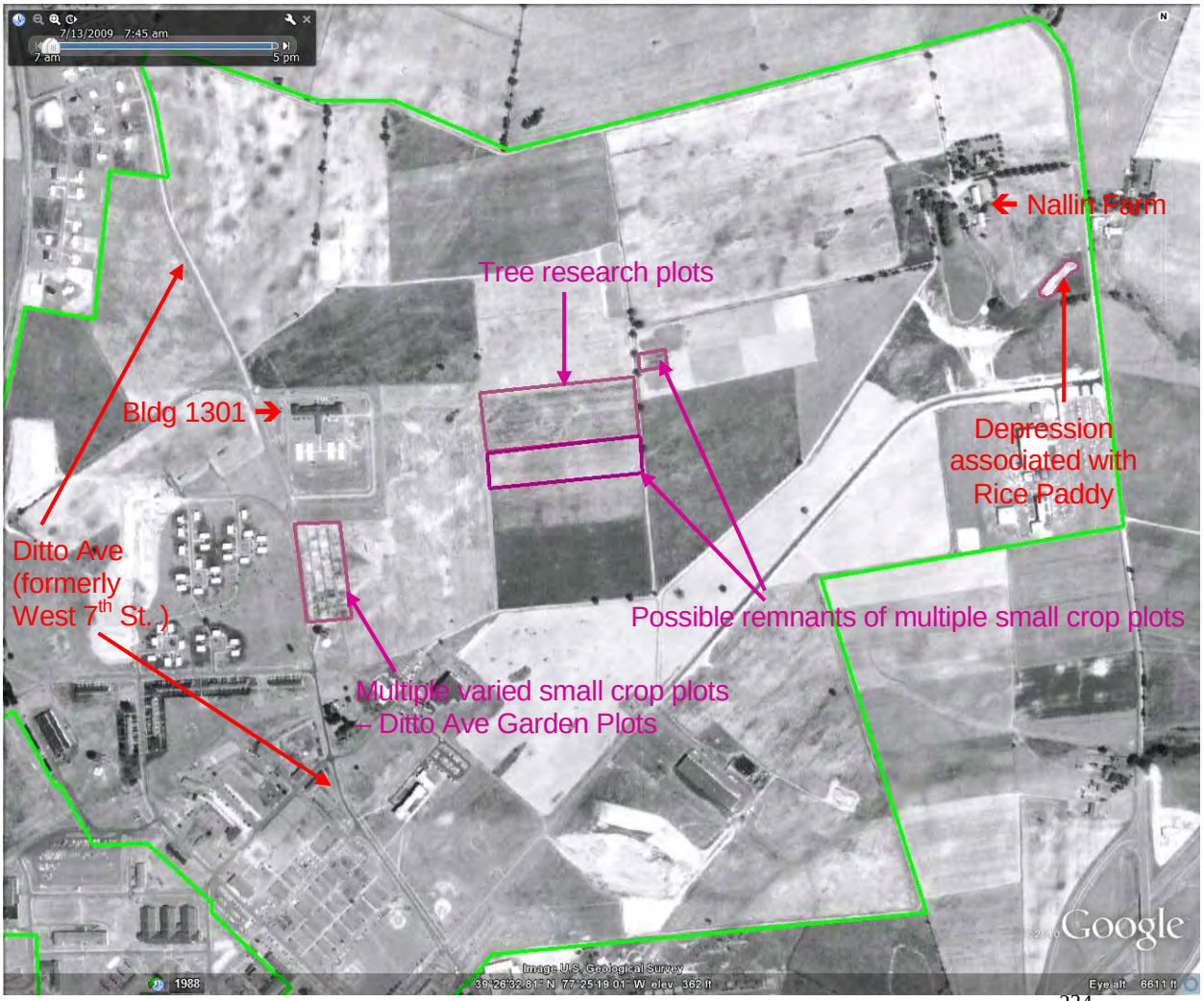


Figure 57 – *Area A – Small Crop Plots – Aerial Imagery 30 June 1964*[234]

Latter imagery shows the continuation of small garden test plots on Fort Detrick, though continued testing of 2,4,5-T or arsenic related herbicides in that period at Detrick is undocumented. In July 1970 (see following Figure), the Ditto Avenue Garden Plots remains the same size as in 1964 but the tree research plot to the east of the building 1301 has been enlarged to approximately 900- by 600-feet. A second tree research section has been added north building 1301 (~300- by 1,075-feet) in a location that displayed

possible remnants of small crops plots trials in 1958 (see Figure 55). South of the eastern tree research section, there is a second tract of small crops plots approximately 900- by 375-feet in size that was not used for that purpose in 1964.

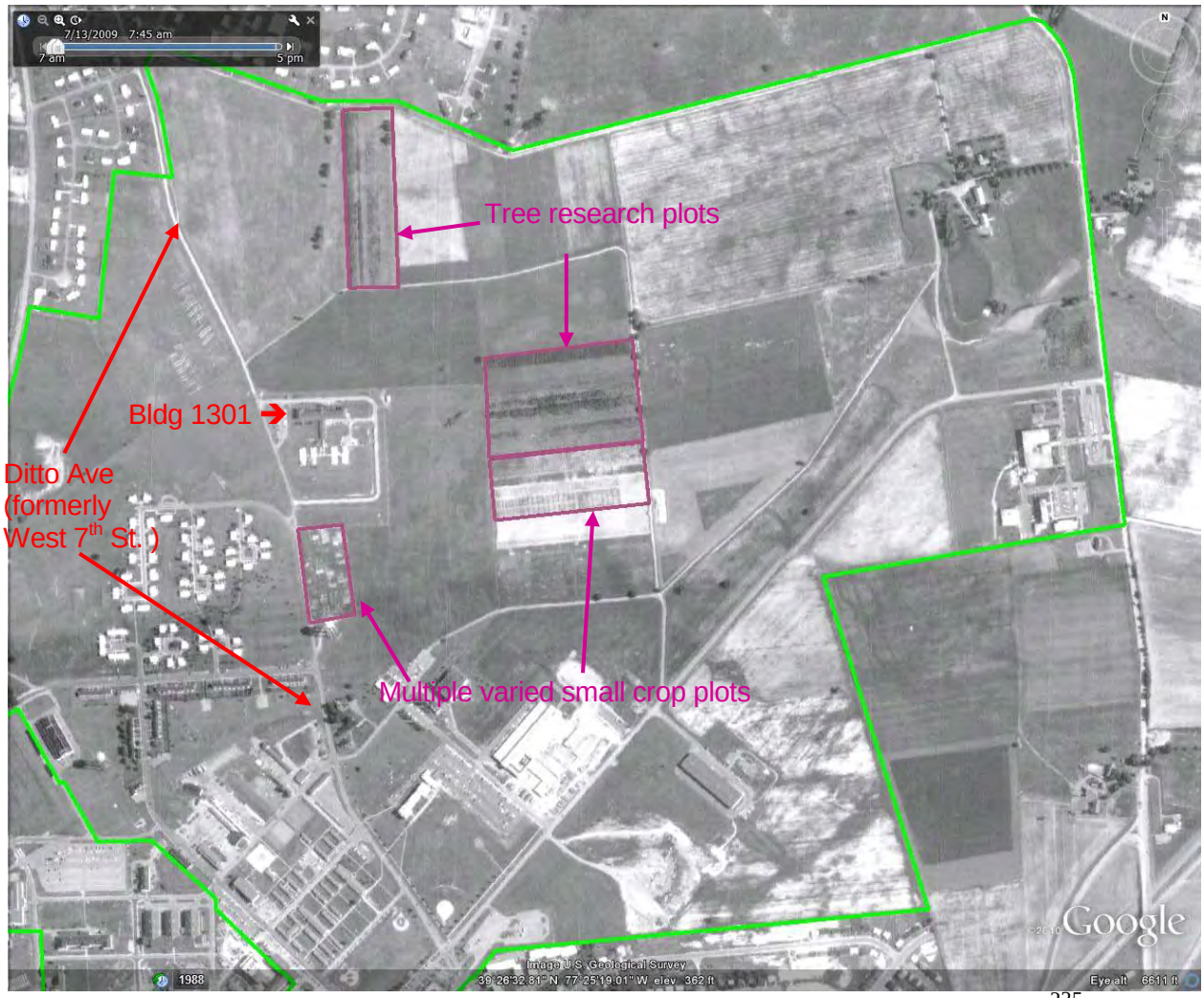


Figure 58 – *Area A – Small Crop Plots – Aerial Imagery 6 July 1970*[235]

Between 1970 and 1972, there are no additional research plots discernible and what is present is less distinct, potentially indicating disuse (see following Figure).

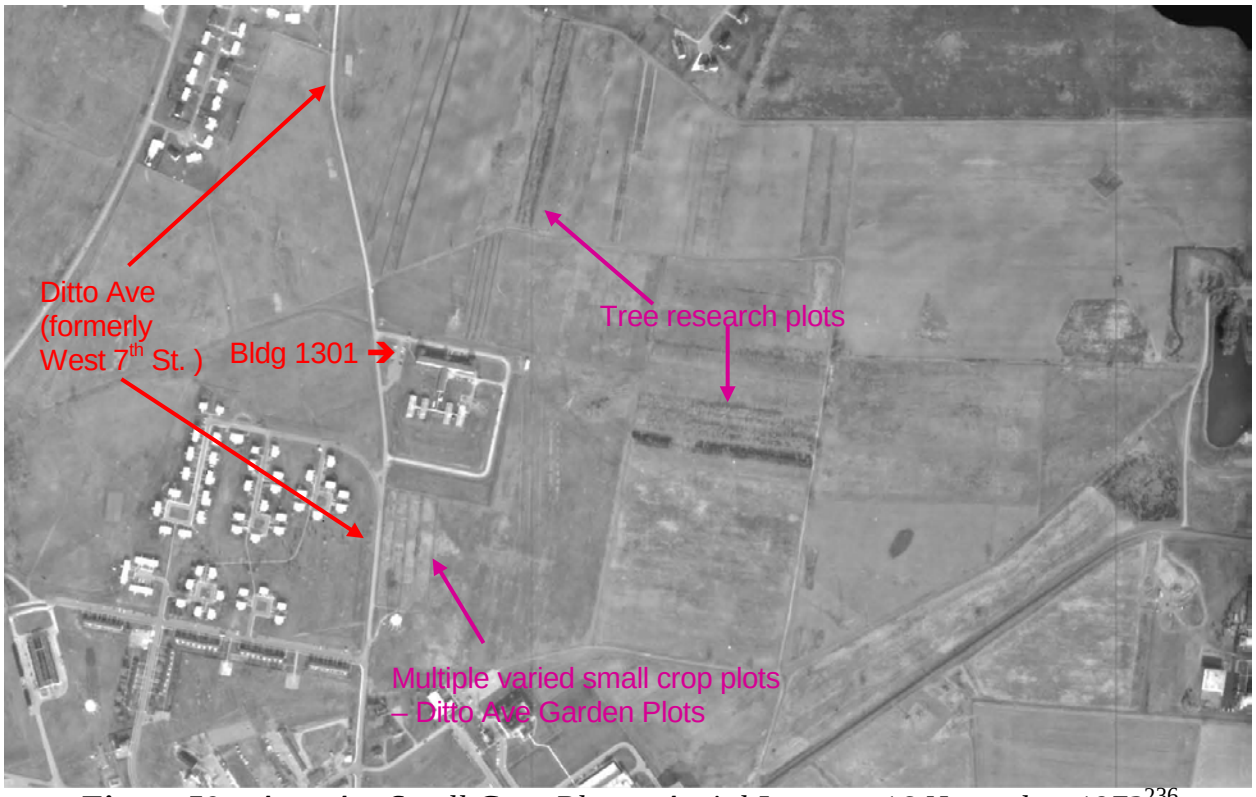


Figure 59 – *Area A – Small Crop Plots – Aerial Imagery 16 November 1972*[236]

After the USDA Weed Physiology & Growth Regulator Research unit took over in July 1974, additional small crops test locations are added to the east of Ditto Avenue (see following Figure) and the Ditto Ave Garden Plots area is widened 100 feet (note: the Ditto Ave Garden Plots are not within the footprint of the USDA permit area see Figures 17 and 18, and appear to have been in use by residents at Fort Detrick for personal use). Although there are additional small plot areas for testing, the continued testing of 2,4,5-T or arsenic related herbicides at Detrick is undocumented.

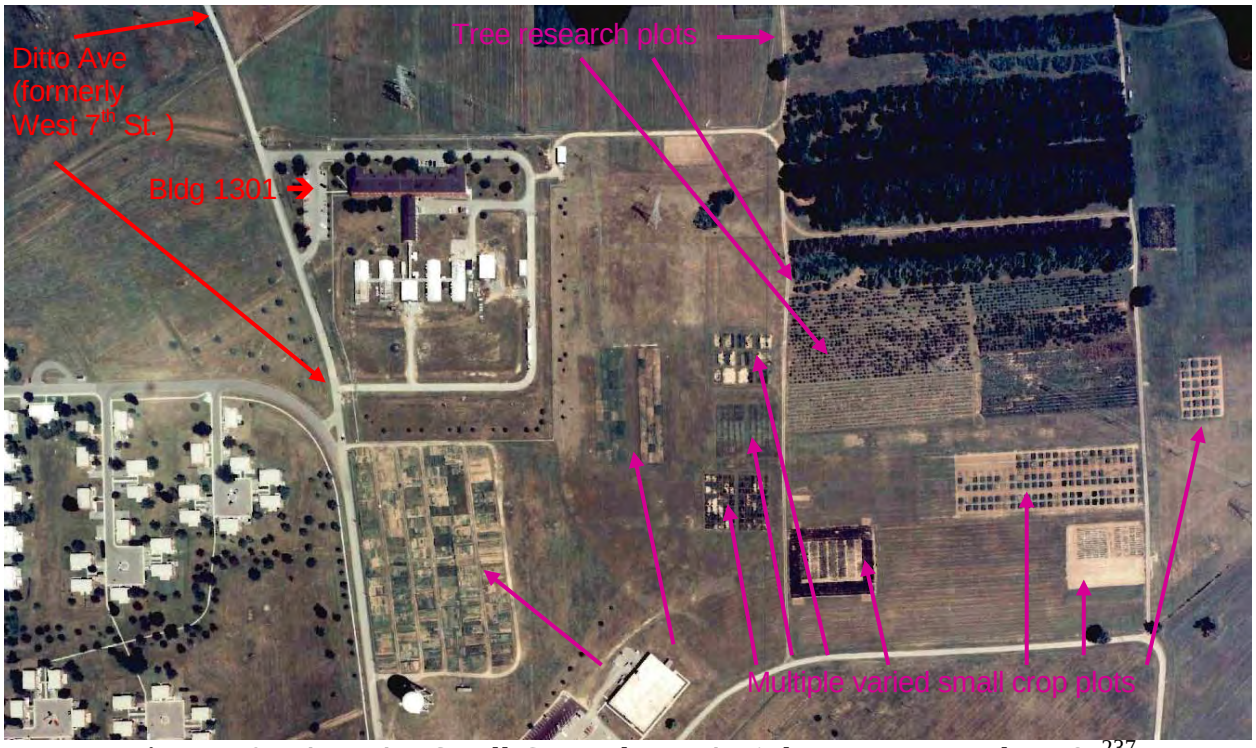


Figure 60 – *Area A – Small Crop Plots – Aerial Imagery 21 July 1982*[237]

8.5 DOMESTIC USE of 2,4,5-T OF THE TIME PERIOD

It is beyond the scope of this investigation to determine historic testing and use of 2,4,5-T herbicides by the military at other locations not on Detrick, within other government agencies (unless conducted at Detrick), at State universities and agricultural experiment stations or in the general agricultural practices of the period. However, it is worth placing the use and testing of 2,4,5-T at Detrick in context among general use in the United States. In 1971, the USDA reported on the domestic use of 2,4,5-T noting: *"About 3.4 million acres of farmland and 4.5 million acres of non-farmland were treated with an estimated 8.9 million pounds of the phenoxy herbicide 2, 4, 5-T in 1969."* The report further stated that in 1969, farm use rates averaged from 0.24 to 2 lbs per acres with a total farm use average of 0.48 lbs per acres (ex.: 100 acres farm would use 48 lbs in one year).[238]

Appendix table 1.--Cost of 2,4,5-T and application, all domestic uses, United States, 1969

Use category	Acres treated	Materials			Application		Total cost of material and application
		Pounds per acre	Cost per pound	Total cost	Cost per acre	Total cost	
	1,000 acres	Pounds	Dollars	1,000 dollars	Dollars	1,000 dollars	1,000 dollars
Farm use:							
Hay, pasture, and rangeland	2,441	0.24	2.75	1,611	1.00	2,441	4,052
Other crops	671	1/.59	2.75	1,093	1.00	671	1,764
Other farm use	339	2.00	2.75	1,865	1.00	339	2,204
Total farm use	3,451	.48	2.75	4,569	1.00	3,451	8,020
Nonfarm use:							
Federal Government	296	2.22	2.75	1,807	5.00	1,480	3,287
Lawn and turf	1,200	.50	2.75	1,650	1.00	1,200	2,850
Rights-of-way	2,175	2.01	2.75	12,022	10.00	21,750	33,772
Private nonfarm forests	430	2.07	2.75	2,448	3.00	1,290	3,738
Aquatic areas	81	2.00	2.75	446	2.00	162	608
Other uses	306	1.91	2.75	1,607	2.00	612	2,219
Total nonfarm use	4,488	1.62	2.75	19,980	5.90	26,494	46,474
Total all uses	7,939	1.12	2.75	24,549	3.77	29,945	54,494

1/ Calculated weighted average of individual crops and crop groupings (0.59233).

Figure 61 – *USDA reporting of Costs of 2,4,5-T and application, all domestic use, United States 1969*[239]

Based on the cumulative grams identified placed on site at Detrick, the highest was the 3.4 Kg (or about 7.4 pounds) on the 5-acres Field C from 1946 through 1949.

APPENDIX A

SAMPLE CALCULATION

A SAMPLE CALCULATION

With Special Report No. 92 covering the 1946 and 1947 Seasons[240], Crops Division of Camp Detrick begin reporting on the testing procedures used for the field plot experiments with plant inhibitors in a fairly regular manner, which is generally followed in subsequent iterations of the Special Reports from 1948 through 1952 (Special Reports Nos. 105, 130, 153 and 156). The purpose of Special Reports is not to report on the total amounts of herbicides used and as such it is not clearly stated how much is applied and it must be calculated based on the information provided. Using the first test of 2,4,5-T herbicide in report No. 92 as example (i.e. section 2.3.3 Volume-Concentration Spray Studies, 1946 Experiment 1), the Material and Methods section includes the general test parameters (see Extract, Figure 10 below).

IV TOP APPLICATION STUDIES

A. Volume-Concentration Spray Studies.

1. Objective:

Certain greenhouse studies carried out at Camp Detrick during the war indicated that the same quantity of 2,4-dichlorophenoxyacetic acid produces varying degrees of inhibition when applied in different volumes of spray. With improved spray equipment available for static field applications, these experiments were designed to test the influence of volume of spray upon the growth inhibiting qualities of various sprays as measured by the yield of crop plants grown to maturity under field conditions.

2. 1946: Experiment 1.

(a) Materials and Methods:

Location: Field A
Test plant: Irish potatoes. Variety: Irish Cobbler
Date planted: 3 April 1946 Planting rate: "seed" pieces 12" apart, rows 3' apart.
Experimental design: Randomized complete block (4 reps)
Plot size: 12' x 15' (3 rows 15' long, treated)
Date treated: 29 May 1946 Stage: bud stage (1 lb. tubers/plot)
Weather conditions at time of treatment: Fair sky, no rainfall for several days.
Date harvested: 26 and 27 July 1946
Area harvested: 3 rows 15' long (9' x 15')
Preparation of solutions: See III, B.
Special technique in spraying: Each solution was applied uniformly to plots (15 sq. yds.) with a modified atomizer spray gun (fig. 1) operated under 10 or 20 lbs. constant air pressure from an oxygen cylinder (1800 lb. capacity) for the aqueous and oil sprays, respectively. The plots were protected from the effect of wind during the spray operation with canvas-covered shields 4 ft. high. Due to the extremely fine atomization produced by the spray apparatus, some drift of spray over the protecting screens was noted. Subsequent injury to the buffer rows, however, was only slight.

***Figure 62** – Extract Material and Methods – Special Report No. 92, Volume-Concentration Spray Studies, 1946 Experiment 1.*[241]

The Plot Size is "12' x15'" or rather 12- by 15-foot. This equates to 12 feet* 15 feet = 180 Square Feet (SF) or 20 Square Yards (SY) per test plot based on 1 SY equaling 9 SF (1 yard/3 feet * 1 yard/3 feet). There are "4 reps" meaning four replicates[xxv] or specifically that the test plot was repeated four times, for a total of 80 SY (4 reps * 20 SY).

In this test, two 2,4,5-T herbicides are being tested, LN-14 and LN-14 (TEA) (Triethanolamine 2,4,5-trichlorophenoxyacetate) in two concentrations of herbicide applied per SY in grams: 0.1 and 0.5 grams per SY as noted below (see Extract, Figure 10 below).

Composition of materials applied:

Chemical	Solvent	Carrier	% Chemical	Total vol per sq yd(ml)	Compound per sq. yd. (g)
2,4,5-trichlorophenoxy-acetate	TBP*	#2 fuel oil	0.4	25	0.1
			1.0	10	0.1
			2.0	5	0.1
			2.0	25	0.5
			5.0	10	0.5
			10.0	5	0.5
triethanolamine 2,4,5-trichlorophenoxyacetate	TEA**	water	0.4	25	0.1
			1.0	10	0.1
			2.0	5	0.1
			2.0	25	0.5
			5.0	10	0.5
			10.0	5	0.5
tributylphosphate (control)		#2 fuel oil	0.8	25	--
			2.0	10	--
			4.0	5	--
			4.0	25	--
			10.0	10	--
			20.0	5	--

* tributylphosphate
** triethanolamine

Figure 63 *– Extract Composition of Materials Applied – Special Report No. 92, Volume-Concentration Spray Studies, 1946 Experiment 1*[242]

[xxv] On occasion the replicates are described as "split plot". This typically refers to a particular experimental design describing how plots are arranged within a field. If the field is not homogeneous in slope or aspect or soil conditions for example, plots are located within the field to minimize variation in the test variable contributed by variation in the condition of the field and to maximize differences due to treatment. The term does not typically infer that individual test plots are split into sub-plots, which is demonstrated here by the fact that crop yields are reported by treatment replicate, with a mean value reported. Therefore, the replicates are interpreted to mean four separate plots of the stated size.

Perhaps confusing this, is that the herbicide is not in a pure form but diluted in a solvent or carrier to assist with distribution and that three different volumes of spray are tried (5, 10, 25 ml/SY). This necessitates the % chemical being sprayed to be different. However, since the goal of this exercise is to only determine the amount of herbicide applied, it is important only to note that concentration of 0.1 and 0.5 grams per SY were tried three different times:

0.1 grams/SY * 3 tests *20 SY test plot*four replicates = 24 grams
0.5 grams/SY * 3 tests *20 SY test plot*four replicates = 120 grams

Or 144 grams total for herbicide LN-14 and the same amount of approximately 144 grams of herbicide LN-14 TEA, for this test.

On occasion the test application rates are noted as occurring in pounds of herbicide applied per acre, which would be the more common agricultural way of expressing application rates. In these instances, the amounts are converted to a rate of herbicide applied in grams per square yard using a conversion factor of 0.094 is used to convert lbs/acre to grams/SY, based on 43,560 SF = 1 acre, 9 SF = 1 SY and 1 kg = 2.2 pounds.

Another conversion is required when the application rate is announced in a volume dispersed per SY (i.e. ml per square yard) as opposed to a weight. In this case, the rate is converted to grams using a density of 2,4,5-T = 1.803 g/cm^3 (20 Celsius) and a 1 cm^3 = 1 ml[243].

APPENDIX B

REFERENCE SOURCES AND RECORDS REVIEWED

APPENDIX B

B REFERENCE SOURCES AND RECORDS REVIEWED

The research team searched at the following locations for records relating to activities at Fort Detrick. At these repositories, the research team used finding aids and records managers to assist in locating documents relevant to the research topic. The investigation team also accumulated complementary documents reviewed on Fort Detrick, but not specifically used. These complementary documents are stored with the original PA back-up documents. Appendix B contains the References of all in text endnote citations. Appendix J lists additional repositories and/or personnel contacted which reported no pertinent information. The following subparagraphs described the research team's efforts at the noted archival repositories:

TABLE OF CONTENTS

B.1 TEXTUAL AND CARTOGRAPHIC REPOSITORIES

The following repositories were consulted for primarily for textual and cartographic information regarding this investigation.

B.1.1 American Biological Safety Association
1200 Allanson Road
Mundelein, IL 60060-3808
Historic Resources Committee
USDA ARS National Program Staff
Animal Production & Protection
5601 Sunnyside Ave. , Room 4-2174, Mail Stop 5148
Beltsville, MD 20705-5148
http://www.absa.org/

The research team contacted this group regarding their potential records pertinent to this investigation and was informed they had information on the early biosafety conferences as well as a collection of the Fort Detrick Safety Bulletins. The research team located this material at U.S. Department of Agriculture National Agricultural Library, Special Collections under the American Biological Safety Association Records-Manuscript Collection 359 (11 boxes in total) (see notes for that repository).

B.1.2 Air Force Historical Research Agency (USAFHRA)
600 Chennault Circle
Maxwell AFB AL 36112-6424
http://www.au.af.mil/au/afhra/

The research team queried the IRIS database for records relating to the Detrick Field and the later Camp/Fort Detrick. Once the airfield became Camp/Fort Detrick under the Chemical Warfare Service, the Air Corps/Air Force units stationed there were related to meteorological studies. No units were identified with an aerial dispersal mission.

Corps of Engineers Boxes	Detrick 02018390-02018394
K381.212	Eastern Communications Region 1966
526.01	Division/0002/Air June 1942-June 1945
215.81-2	Unit/0072/Army Air Forces Base 1946
WG-2-HI V. 1	Wing/0003/Bombardment 1942-1943
K360.4-1	Squadron/0001/Weather 1950
K360.3-4	Group/0004/Weather 1954
SQ-WEA-12-HI	Squadron/0012/Weather 1947
SQ-AB-312-HI	Squadron/0312/Base HQs and Air Base 1942-1944
K360.3-4 to K360.3-4 V. 1	Group/0004/Weather 1953-1955

B.1.3 Alvin L. Young Consulting, Inc.
Cheyenne, WY 82009
Alvin (Al) L. Young, Ph.D., Environmental Toxicologist

Since 1968, Dr. Alvin L. Young has gathered documents, reports, and photographs of the use of Agent Orange and other herbicides. A retired Colonel in the US Air Force he has also been affiliated with the Epidemiology Division of the School of Aerospace Medicine; the Environmental Epidemiology Unit of the Department of Veterans Affairs; Science Advisor for the United States Department of Agriculture; Director, Center for Risk Excellence, United States Department of Energy; and a Visiting Professor and Senior Fellow with the Institute for Science and Public Policy at The University of Oklahoma. He maintains a special collection on Agent Orange at the National Agricultural Library: http://www.nal.usda.gov/speccoll/findaids/agentorange/index.htm The research team did not locate any additional documentation at this repository relating to the specifics of Fort Detrick testing than available from the DoD technical information centers/libraries (i.e. DTIC and CBRNIAC) but did locate other documents of use to the investigation.

B.1.4 Armed Forces Pest Management Board (AFPMB)
U.S. Army Garrison - Forest Glen
2460 Linden Lane, Building 172
Silver Spring, MD 20910

The research team supplemented their research efforts using the Armed Forces Pest Management Board, Defense Pest Management Information Analysis Center Literature

Retrieval System (LRS) http://lrs.afpmb.org/rlgn_app/ar_login/guest/guest to locate documents not available through DTIC.

B.1.5 Chemical, Biological, Radiological, Nuclear Information Analysis Center (CBRNIAC)
Building E3330, Room 150,
Aberdeen Proving Ground – Edgewood Area, MD 21010-5423
http://www.CBRNIAC.apgea.army.mil/

Formerly CBIAC, the CBRNIAC is a full service Department of Defense (DoD) Information Analysis Center (IAC) under contract to the Office of the Secretary of Defense, Director of Defense Research and Engineering and administratively managed by the Defense Technical Information Center (DTIC see below. The CBRNIAC serves as the focal point for DoD Chemical, Biological, Radiological and Nuclear (CBRN) Defense scientific and technical information. It provides services to DoD organizations, other government groups, and their approved contractors.

Of primary interest to this research is the CBRNIAC Bibliographic Database (CBRNIAC BD). DPG's Technical Information Center's (i.e. library) former UNIX system search engine was converted and provided the basis of much of the information on the CBRNIAC BD. Formerly CBIAC, the CBRNIAC is a full service Department of Defense (DoD) Information Analysis Center (IAC) under contract to the Office of the Secretary of Defense, Director of Defense Research and Engineering and administratively managed by the Defense Technical Information Center. The CBRNIAC serves as the focal point for DoD Chemical, Biological, Radiological and Nuclear (CBRN) Defense scientific and technical information. It provides services to DoD organizations, other government groups, and their approved contractors.

Of primary interest to this research is the CBRNIAC Bibliographic Database (CBRNIAC BD). Dugway Proving Grounds' (DPG) Technical Information Center's (i.e. library) former UNIX system search engine was converted and provided the basis of much of the information on the CBRNIAC BD. The scanning in of DPG TIC collection provides the core of the CBRNIAC collection. Locating documents is most readily completed by using DTIC online search engine to locate unclassified (generally available as PDF) and classified documents at this location.

B.1.6 Defense Technical Information Center (DTIC)
8725 John J. Kingman Road Ste. 0944
Fort Belvoir, VA 22060-6218
http://www.dtic.mil/dtic/

The Defense Technical Information Center (DTIC) is the largest central resource for DoD and government-funded scientific, technical, engineering, and business related

information. It is a DoD Field Activity within the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L), reporting to the Director, Defense Research & Engineering (DDR&E). DTIC provides ready access to relevant information formerly contained in their various Technical Information Centers or libraries located throughout the DoD (e.g. scanned PDFs of reports). DTIC's origins date back to WWII and a shared Air Corps and Navy document center (i.e. library) to collect process and distribute scientific and technical reports. DTIC sponsors a number of additional Information Analysis Centers (IACs) including most relevantly to this investigation CBRNIAC (formerly CBIAC). A DTIC information query accesses not only the information catalogue / database within the DTIC holdings but also within the IACs as well, allowing a search for a report in multiple different repositories. The unclassified material is available on-line, though much of the material has distribution restrictions limiting it with DoD. Classified documents are available as well but are distributed in hard copy form.

The research team located the published Fort Detrick reports regarding the herbicide testing at Fort Detrick from DTIC and its sub-installation CBRNIAC.

B.1.7 Department of Defense (DoD) Military Health System
Force Health Protection & Readiness Policy & Programs
Skyline 4, Suite 901
5113 Leesburg Pike
Falls Church, VA 22041
http://fhp.osd.mil/CBexposures/index.jsp

The DoD and the Department of Veterans Affairs (VA) play distinct roles in dealing with chemical and biological (CB) exposures. DoD identifies and validates veteran's exposure to CB agents and provides the names of these individuals along with their exposure information to the VA. The VA then notifies individuals of their potential exposure, provides treatment, if necessary, for these individuals and adjudicates any claim for compensation. The Department of Defense (DoD) Military Health System maintains databases regarding these exposures and web page: Chemical-Biological Warfare Exposures Site, http://fhp.osd.mil/CBexposures/index.jsp. Included is a page regarding the Human Subject Research at Fort Detrick: 1943 - 1973 regarding the Project CD-22 and Operation Whitecoat.

B.1.8 Fort Detrick, US. Army Garrison – Environmental Management Office
1546 Porter Street, Suite 304A
Fort Detrick, MD 21702-5000
262 Beasley Drive
Fort Detrick, MD 21702

The research team meet with Environmental and Restoration Managers numerous times over the course of this investigation, coordinating the findings and research effort.

The research team contacted the former Garrison Radiation Protection Officer (RPO), Safety and Occupational Health Specialist at Fort Detrick and determined that the files previously maintained by the RPO office were in boxes stored in building 261. The holdings consisted of approximately 20 boxes of various sizes. The team reviewed these documents, copying documents pertinent to the report being prepared. The documents copied included NRC licenses and amendments, radiation closure files for various buildings and licenses, and similar materials. The files also contained shipping documents for the shipment of radiation waste from Fort Detrick from the 1980s which were not copied.

B.1.9 Fort Detrick, US. Army Garrison – Directorate of Information Services (DIS)

201 Beasley Drive
DIS Engineering and Contracting Division, Room 247-C
Fort Detrick, MD 21702
http://www.detrick.army.mil/dis/

The research team reviewed the contents of the 452 flat files or map drawers in the Engineering Drawing/Blueprint Vault in on the 2nd floor of Building 201. The copied numerous drawings, maps and sketched of the installation as catalogued in the spreadsheet Fort Detrick Maps Spreadsheet 2010-11-08.xls.

B.1.10 Fort Detrick, US. Army Garrison – Network Enterprise Center

Building 1422
Fort Detrick, MD 21702

The research team reviewed the approximately four linear feet of Transfer Record forms for Fort Detrick (i.e. SF 135s) beginning back in 1953. Currently they send all their files to Washington National Records Center (WNRC) in Suitland, MD

B.1.11 Fort Detrick, US. Army Garrison – Public Affairs Office

810 Schreider Street
Fort Detrick, MD 21702
http://www.detrick.army.mil/

The research team coordinated with the elements of the Fort Detrick Garrison regarding any material they might have from previous requests for information on this topic. As the former Detrick Technical Library had been disbanded and dispersed, they are no longer the DoD repository for this information did not have any pertinent material that was not acquired from other sources. The Garrison Public Affairs Office provided the research team with a hard copy of the 4th Edition of "Cutting Edge, A History of Fort Detrick, Maryland: October 2000. This document can also be found online at: http://www.detrick.army.mil/cutting_edge/index.cfm

B.1.12 Former Fort Detrick Public Affairs Officer
Frederick, MD 21702-4143

The research team contacted the Public Affairs Officer and Command Historian at Fort Detrick between October 1977 and May 1999. He still lives in Frederick, Maryland, just four blocks from Fort Detrick. Among his numerous professional and commercial publications is the "Cutting Edge, A History of Fort Detrick, Maryland" available online at: http://www.detrick.army.mil/cutting_edge/index.cfm

In 1983, he was instrumental in the establishment of the Restoration Advisory Board (RAB) at Detrick and was responsible for maintaining the records of the RAB and the environmental reports and publications provided to the public (e.g. Administrative Record) with one set being maintained at the Frederick Public Library, one at the Detrick Post library and one in his office. The latter of set of material was transferred to the Garrison's Environmental Management Office, which now has members on the RAB including Joe Gortva, Restoration Manager. He believed this series of material of represents a fairly comprehensive series of environmental material from approximately 1980 onward.

In regards to the former Fort Detrick Technical Library, this occurred before his arrival on post but his understanding was that it was disbanded fairly quickly (approximately six months) in 1971 with the bulk of the material going to Dugway Proving Ground's Technical Library with other parts going to Edgewood perhaps. Portions of the material were not retained but he was uncertain as how much or what the reasoning was, such as duplication of material elsewhere.

When he retired, left his Command Historian and other files at the post with the Garrison but could not say what happened to all the records afterwards as he was not there. Based on conversations with his contacts on post, he suspects they ended up damaged beyond repair due to improper storage and may have been subsequently ruined.

He discussed some of his challenges as PAO over nearly 20 years with Fort Detrick and the difficulties in educating the public about what occurred as evidenced by the facts as opposed to stories that have developed from people's fears. He also suggested a number of avenues of research or specific historical material to review for this investigation, which many had already been undertaken.

He provided an inventory of bound volumes of reprints of public science journals store within the USAMRIID Library, presented to former director of Science Dr. Riley D. Housewright. Mr. Covert had someone prepare a chronological list of the articles and authors.

B.1.13 National Academies Press
500 Fifth Street NW
Lockbox 285
Washington, DC 20055
bhttp://www.nap.edu/

The research team downloaded the Executive Summary of Veterans and Agent Orange: Update 2008 by Institute of Medicine (IOM) of the National Academies. The 2008 report is the eighth volume in a series of biennial updates regarding the comprehensive evaluation of scientific and medical information regarding the health effects of exposure to Agent Orange and other herbicides used in Vietnam.

B.1.14 National Archives at Washington DC
8th and Pennsylvania
Washington, DC 20408-0001
http://www.archives.gov/dc-metro/washington/index.html

The research team did not identify any relevant holdings at this repository.

B.1.15 National Archives at College Park, Textual Records
8601 Adelphi Road
College Park, MD 20740-6001
http://www.archives.gov/dc-metro/college-park/index.html

Record Group 16 (Records of the Secretary of Agriculture)

Entry 17 General Correspondence of the Office of the Secretary, 1945
Boxes 1094-1096, 1160-1162, 1594, 1595

Record Group 18 (Records of the Army Air Forces)

Entry 1A Confidential and Secret Decimal Correspondence, 1945-1948
Box 278

Entry 1D Decimal File, 1946-1947
Box 672

Entry 2A Decimal File, 1944-1946
Boxes 2247, 2248

Entry 166 Central Decimal Files, 1917-1938
Boxes 589, 590, 592, 596, 606, 628, 636, 643, 1173, 1177, 1210

Entry 293B Central Decimal Files, 1939-1942

Box 324

Entry 295A Project Files Airfields, 1939-1943
Boxes 1492-1502

Record Group 51 (Office of the Bureau of Budget)

Entry 149A War Projects Unit General Files, 1940-1945
Boxes 9, 38-42, 51, 62, 63, 64, 65

Entry 149B War Projects Unit, Inspections, 1940-1945
Boxes 1-8, 10-75, 76-171, 217-253, 348, 608-616

Record Group 59 (Records of the Department of State)

Entry 1587 M Subject File on Biological Warfare, 1956-1962

Entry 5545 Records Relating to Agent Orange, 1961-1974

Record Group 77 (Records of the Office of the Chief of Engineers)

Entry 33 Real Property, 1952 (77-56A-0417)
Box 118

Entry 106B General Correspondence, 1918-1945
Box 777

Entry 276 Project and Geographic File, 1954
Box 14

Entry 391 Construction Completion Reports, 1917-1943
Box 12

Entry 416 Real Estate Branch, 1917-1944
Box 8

Entry 417 Real Estate Branch, 1917-1944
Boxes 45-47

Entry 433 Project Geographic Files, 1948
Box 24

Entry 435 Project and Geographic File, 1949-1950
Box 19

Entry 436 Project and Geographic Files, 1940-1952
Boxes 20, 42

Entry 437 Military Planning Design Construction, 1953
Box 9

Entry 532 Real Property Title/Hist, 1955 (59G-0814)
Boxes 24, 25

Entry 568 Realty, 1948 (52A-0088)
Boxes 23, 24

Entry 1011 Formerly Security Classified Subject Files, 1941-1945
Boxes 318, 518

Record Group 92 (Records of the Office of the Quartermaster General)

Entry 1974A Construction Completion Reports, 1917-1919
Boxes 146-148

Record Group 107 (Records of the Office of the Secretary of War)

Entry 211 Establishment of Airfields and Air Bases, 1940-1945
Boxes 203-217

Record Group 112 (Records of the Office of the Surgeon General [Army])

Entry 4 Fort Detrick, MD Human Subjects Review Board, Investigational Drug Files, 1968-1979
Boxes 1-4

Entry 5 Fort Detrick, MD, Clinical Investigation Service, Human Use Board, Drug Tests, 1970-1979
Box 1

Entry 6 Fort Detrick, MD Surgeon General Human Subjects Research Review Board, Meeting Minutes, 1984
Boxes 1-2

Entry 31-AH World War II Administrative Records-ZI (Geographic File, 1917-1949)
Boxes 213, 226, 268, 520, 522, 1045-1047, 1074, 1429

Entry 31-AL World War II Administrative Records-SWPA (Geographic File, 1917-1949)
Box 213

Entry 54A World War II Administrative Records, 1940-1949
Box 63

Entry 120 Office of the Surgeon General, Fort Detrick, MD Human Subjects Research Review Board, Minutes, 1982
Boxes 1-2

Entry 178 Inspector General Inspection Files, 1959
Box 40

Entry 192 Research and Development Studies, 1971 (63J-1605)
Box 3

Entry 221 Inspector General Inspection Files, 1962
Box 14

Entry 247 Radiation Protection Committee, 1969 (72N-3502)
Box 34

Entry 260 Inspector General Files, 1970
Box 2

Entry 282 Field Experiment Cases, 1941-1948
Boxes 1-2

Entry 295A Records of the Preventive Medicine Division: Biological Warfare Specialized Files, 1941-1947
Boxes 1-13

Entry 438A Fort Detrick, MD 1973 (79-0015)
Boxes 1-4

Entry 1011 Security Classified Administrative File
Box 33

Entry 1018 Divisions of Surgeon General Office Annual Reports

Entry 1036 U.S. Army Garrison Fort Detrick, MD Program Briefing Files, 1977-1979
Boxes 7-9

Entry 1037 U.S. Army Garrison Fort Detrick, MD General Records, 1971-1974
Box 10

Entry 1038 U.S. Army Medical Research and Development Command, Fort Detrick, MD Comptroller Division Program Development Files, FY1967-1975
Boxes 1-6

Record Group 121 (Records of the Public Building Service)

Entry 6 Real Property, 1975 (121-77-0302)
Box 5

Entry 8, Real Property, 1971 (121-76-309)
Box 3

Record Group 156 (Records of the Office of the Chief of Ordnance)

Entry 1120 Services and Installations Office, Contractor and Real Estate Branch Military Construction, Army Project Files, 1955-1957
Box 1

Record Group 159 (Records of the Office of the Inspector General)

Entry 26D General Correspondence, 1939-1947
Boxes 454

Entry 26E General Correspondence (formerly Confidential), 1939-1947
Box 178

Record Group 160 (Headquarters Army Service Forces)

Entry 27 Installations Branch Correspondence Files Relating to Construction, Utilization and Disposition of Bases, 1942-1946
Boxes 31, 34

Record Group 165 (Records of the War Department General and Special Staffs)

Entry 258 Reports and Correspondence Relating to Construction, Utilization, and Disposal of Army Installations, 1944-1947
Boxes 149-152

Entry 486 Decimal File 1943-May 1946

Boxes 26, 37, 52, 63, 113

Entry 488 Security Classified Correspondence File, 1942-1947
Boxes 180-188

Entry 489 Security Classified General Correspondence of a Special Committee on Secret Weapons, 1943-1944
Boxes 170-177

Entry 490 Agenda, Minutes of Meetings, Reports and Correspondence Relating to Suggestions, Discoveries, and Mechanisms Made by Civilian Inventors, 1940-1945
Boxes 178, 179

Record Group 175 (Records of the Chemical Warfare Service)

Entry 1 Records of the Office of the Chief Chemical Officer, 1946-1954 (67A4900)
Boxes 9-13, 17-24, 27-36, 41-58, 61-71, 76-78, 91, 194-202, 223-232, 236, 290, 300, 308, 311, 312, 315, 321, 362, 365, 395, 401, 402

Entry 2 Index Briefs, 1918-October 1942
Boxes 41, 65, 140

Entry 2A Army Chemical Center Edgewood Arsenal, 1941-1945
Box 91

Entry 4C Station Series, 1942-1945
Box 183

Entry 4E Travel Reports, 1944-1958
Boxes 68-76

Entry 4F Travel Reports, 1944-1945
Boxes 184, 185

Entry 4M Research and Development Case Files, 1921-1945
Boxes 379-382

Entry 5 General Correspondence Station Series, 1955-1959
Boxes 4-10, 12, 29-31, 36-46, 51-59, 62-68

Entry 6 Historian's Background Files, 1922-1967
Boxes 1-14

Entry 22 Biological Department Chemical Corps Fort Detrick
Boxes 1-16

Entry General Correspondence, Miscellaneous Series, 1955-1959
Boxes 88-93

Record Group 181 (Records of the Naval Districts and Shore Establishments)

Entry 81, Naval Unit Fort Detrick, Maryland" Medical Research and Development Project Files, 1973-1975; Acc:#75-0183
Box 1

Record Group 218 (Records of the Joint Chiefs of Staff)

Entry 92 Joint New Weapons Committee, 1942-1945
Boxes 1, 19, 36-39

Entry 93 Joint New Weapons Committee Subject File, 1942-1946
Box 1

Record Group 227 (Records of the Office of Scientific Research and Development)

Entry 96 Division 10 (Absorbents and Aerosols) General Records, 1942-1945
Boxes 1-15

Entry 160 Tropical Deterioration Administrative Committee General Records, 1944-1946
Boxes 1-24

Record Group 310 (Records of the Agricultural Research Service[ARS])

Entry 1038, Crops Research Division, Nematology Section, Research Annual Reports 1925-64
Boxes 1-7

Entry 1039, Crops Research Division, Research Annual Reports 1905-67
Boxes 1-9
310/170/80/30/1

Record Group 319 (Records of the Army Staff)

Entry 47 Assistant Chief of Staff, 1942-1955
Box 8

Entry 47C
Box 1232

Entry 47F Army Intelligence Project Decimal File, 1949-1950
Box 75

Entry 47G Army Intelligence Project Decimal File, 1951-1952
Boxes 189, 192

Entry 47H Project Decimal Files, 1954
Box 30

Entry 68 Top Secret Correspondence, 1956-1962

Entry 82 Publications Files, 1950-1951
Boxes 3243-3244

Entry 254A War Department Liaison Officer--NDRC General File, 1940-1946
Boxes 266-285

Entry 254B War Department Liaison Officer--NDRC Daily File, 1942-1947
Boxes 411-422

Entry 1166 Medical Unit Annual Reports, 1970-1983
Boxes 4, 73

Entry A3700 (microfilm) Annual Historical Summaries of Department of the Army Agencies, 1950-1964
Reels 1-15

Record Group 330 (Records of the Office of the Secretary of Defense)

Entry Herbicide File 1965-1971
Box 1

Entry 341 Records Concerning Organization, Budget, and the Allocation of Research and Development, 1946-1953
Boxes 3, 4, 22, 23, 25, 26, 35, 37, 78, 79, 80, 319, 320, 321, 324, 336, 337, 363, 364, 365, 467

Entry 395
Boxes 1-5

Entry 396
Box 1

Entry 397
Box 1

Entry 1016 Defense Research And Engineering Office, Research and Development Board, Records Relating to Chemical and Biological Warfare, 1946-60
Box 1

Record Group 337 (Records of Headquarters of the Army Ground Forces)

Entry 93A Quartermaster Section Formerly Classified Decimal Files, 1944-1947
Box 6

Record Group 338 (Records of U.S. Army Operational, Tactical and Support Organizations World War II and Thereafter)

Entry 78-AH Unclassified Records of US Army Commands Transferred from NPRC, Chemical Commands, Chemical Core Research and Engineering and Chemical Corps Material Command
Boxes 1-8 FRCs 490/32/35/1

Entry 78-P Unclassified Records of US Army Commands Transferred from NPRC Chemical Corps Research and Development Command, Edgewood Arsenal
Boxes 1-3 FRCs 490/32/33/6

Entry 401-167 Fort Detrick, MD, 1975 (79-0014)
Box 1 FRC 170/46/23/7

Entry 401-172 Fort Detrick, 1968-1972 (74A-0700)
Box 1 FRC 170/46/24/5

Entry 401-238 R&D Committee Fort Detrick, 1965-1976(84-0301)
Boxes 10-12 FRCs 170/46/28/6

Entry 401-296 R&D Committee Fort Detrick, 1965-1979 (84-0302)
Boxes 1-8 FRCs 170/46/35/1

Entry 401-322 BIO Lab Fort Detrick, 1971 (74C-0925)
Boxes 5-6 FRCs 170/47/4/1

Entry 401-402 Fort Detrick, MD, 1975 (79-0013)

Box 1 FRC 170/47/14/4

Entry 401-405 BIO Lab Fort Detrick, 1962-1971 (74A-0925)
Box 1 FRC 170/47/16/4

Entry 402-12 Tubes 8-46 Fort Detrick, 1966 (72E-1057)
Tubes 8-46

Entry 402-55 Fort Detrick, 1970 (71A-0342)
Boxes 1-2

Entry 402-56 Fort Detrick Tech Report, 1970 (71G-0342)
Boxes 49-50

Entry 402-57 Fort Detrick, 1960-1969 (71K-0342)
Boxes 61-66

Entry Fort Detrick Technical Reports, 1969 (71I-0342)
Boxes 56-57

The following boxes were originally reviewed at the WNRC but have been transferred to the National Archives – College Park (Classified Holdings) and were reviewed for purposes of copying previously identified pertinent documents.

Accession 338-78-0267, Biological Laboratories Fort Detrick, Misc. Manuals and Reports, 1954-64

Boxes 3, 6, 7, and 10

Accession 338-78-0268, Biological Laboratories Fort Detrick
Box 1

Accession 338-78-0281, Biological Laboratories Fort Detrick, 1958-1960
Box 1

Accession 338-78-0282, Biological Laboratories Fort Detrick, R&D Case Files, 1956-1960
Boxes 2, 3, and 6

Accession 338-78-0290, Comptroller Fort Detrick, 1946-1958
Box 1

Accession 338-78-0292, HQ Fort Detrick, 1955
Boxes 1 and 2

Accession 338-78-0296, HQ Fort Detrick, 1953-54
Boxes 6, 14 and 15

Record Group 342 (Records of the U.S. Air Force Commands, Activities, and Organizations)

Entry 26 Central Decimal Correspondence Files, 1919-1950
Box 1987

Record Group 389 (Records of the Office of the Provost Marshal General 1941-)

Entry 481 Subject Correspondence Files, 1947-1950
Box 2045

Record Group 407 (Records of the Adjutant General's Office 1917-)

Entry 37H Project Files, 1926-1939
Boxes 2998, 3133

Entry 360B Army AF Classified Decimal Files, 1951-1952
Box 3901

Entry 363A Army AG Decimal File, 1940-1945
Box 4426

Entry 363B Unclassified Project Decimal Files, 1946-1948
Box 1719

Entry 363C Unclassified Project Decimal Files, 1949-1950
Box 1074

Entry 363D Unclassified Project Decimal Files, 1951-1952
Box 1022

Entry Project Decimal File, 1953-1954
Box 382

Entry Unclassified Project Decimal Files and Cross Reference Sheets, 1957-1958
Box 650

Record Group 429 (Records of Organizations in the Executive Office of the President)

Entry 4 Records Relating to Federal Agencies
Boxes 1-2 (Dept of Agriculture land) 130/51/44/2

Entry 7 Records Relating to Legal Authorizations for Property Disposition, March-May 1982
Box 1 (Dept. of Agriculture land) 130/51/44/6

Entry 12 Central Real Property Surveys
Box 34

Record Group 544 (Records of the US Army Materiel Command)

Entry 1 Research and Development Case Files, 1959-1962

Entry 1 Installation Historical Files, Developmental Test Command Centers, 1920-1977
Boxes 1-18

Entry 1 USAMC Historical Office Annual Historical Summaries and Directly Related Unique Background Materials, 1964-1984
Boxes 1-5

Entry 2 USAMC Historical Office Installation Files, 1953-1977
Boxes 1-2 550/5/34/1

Entry 9 US Army Biological Defense Research Laboratory Program Records, 1965-1977
Boxes 3, 4, 16-19

Entry 34
Box 56

Entry 36 USASMC Safety Instruction Files, 1963-1965 (67G-4571)
Box 14

Entry 89 Military Construction Program, 1967 (69A-4331)
Boxes 1-2

Entry 90 Real Estate, 1974 (77-1032)
Boxes 1-4

Entry 91
Boxes 1-5

Entry 295
Box 4

Entry 645 Fort Detrick AG Organizational Planning File, 1964 (68A-3865)
Boxes 1-8

Entry 646 USA BIOLAB Fort Detrick, 1967-1968 (71B-0412)
Box 1

Entry 647 USA BIOLAB Fort Detrick (71C-0412)
Boxes 2-4

Entry 648 Fort Detrick, 1968 (72B-0520)
Box 1

Entry 649 Comptroler Fort Detrick, 1968 (72D-0520)
Boxes 19-22

Entry 650 Fort Detrick, FY68-FY69 (73C-0191)
Boxes 20-21

Entry 651 Fort Detrick, FY64-FY65 (69A-0599)
Box 1

Entry 652 Cost Ledger Fort Detrick (69C-0599)
Box 3

Entry 653 BIOCTR Fort Detrick, 1965-1967 (71C-0152)
Boxes 16-19

Entry 654 Fort Detrick, MD (70B-0624)
Box 1

Entry 655 Fort Detrick, MD, 1966 (70C-0624)
Box 2

Entry 657 Fort Detrick Tech Reports, 1969 (70G-0624)
Boxes 7-8

Entry 658 Fort Detrick, 1964-1966 (70A-0363)
Box 1

Entry 659 Fort Detrick, 1966 (70C-0363)
Boxes 25-26

Entry 660 Biological Center Fort Detrick, FY63-FY68 (71A-0152)
Box 1

Entry 661 Fort Detrick Briefing, 1965-1970 (74B-0515)
Box 3

Entry 663 BIO DEF Labs Fort Detrick, 1968-1971 (73C-3198)
Box 1

Entry 664 Fort Detrick, 1971 (73F-3198)
Box 6

Entry 665 USAMRIID Fort Detrick, 1971 (73G-3198)
Box 17

Entry 666 USAMRIID Fort Detrick (73H-3198)
Box 18

Entry 667 Fort Detrick, 1968 (72A-1014)
Boxes 1-3

Entry 668 Fort Detrick, FY68-FY70 (74A-0515)
Box 2

Entry 857 Security Program Files, 1960 (63A-1742)
Boxes 1-3

Entry 1139 Ordnance Disposal (70A-0987)
Box 1

Entry 1305 Installations History Files, 1956-1971 (73A-2089)
Boxes 1-4

Entry 1313 AMC Safety Instruction Files, 1958-1968 (68A-4175)
Box 1

Record Group 546 (Records of the United States Continental Army Command)

Entry 54 Headquarters US Army Combat Development Command, US Army Combat Systems Group, US Army Chemical, Biological, and Radiological Subject Files, 1967-1972
Box 125

B.1.16 National Archives at College Park, Cartographic and Architectural Branch
8601 Adelphi Road
College Park, MD 20740

The research team reviewed the Military, Forts, Posts and Installations Finding Aid notebooks and located the following items:

Record Group 77 (Records of the Office of the Chief of Engineers)
Entry Fortification – WWII "Military Files"
Folder 6972 Frederick Municipal Airport (Detrick Field), 1941

The research team also looked into potential holding within the following record group with no success:

Record Group 227 (Records of the Office of Scientific Research and Development)
22 items total concerning Divisions 4, 5 and 14 (not applicable to Detrick)

B.1.17 National Archives at College Park, Still Pictures Branch
8601 Adelphi Road
College Park, MD 20740

Record Group 111 (Records of the Army Signal Corps)

Entry 111-SC Signal Corps Photographs of American Military Activity, 1941-1954
No pertinent imagery identified

Entry SC-111A Signal Corps Photographs of American Military Activity, 1941-1954, Albums
Albums 211, 5710-5723, 5937-5940A

Entry 111-SC Signal Corps Photographs of American Military Activity, 1955-1981
Boxes 358, 412

Entry 111-C Contact Prints: Color Photographs of Signal Corps Activities, ca.1944-1981
Boxes 47, 48, 50

Record Group 342 (Records of United States Air Force Commands, Activities and Organizations)

Entry 342FH Air Force Pre-1954 Official Still Photography Collection
Boxes 2207, 2229

B.1.18 National Archives at College Park - Motion Picture, Sound and Video Reference

8601 Adelphi Road
College Park, MD 20740
http://www.archives.gov/research/formats/film-sound-video.html#online

ARC #2123750/local identifier 175.23 "A Look into Fort Detrick 1962"

ARC #30277226/local id 175.75 " Q Fever"

ARC #630396/local id 342 "Half a Loaf – Evaluation of Anticrop Weapon" – not available

B.1.19 National Personnel Records Center Military Personnel Records (NPRC, MPR)

Appraisal and Disposition Section
9700 Page Avenue
St. Louis, MO 63132-5100
http://www.archives.gov/st-louis/index.html

The primary mission of the NPRC, MPR is to store the Official Military Personnel Files (OMPF) from all service branches for veterans for NARA. However, the NPRC, MPR retains a significant amount of Army and Air Force records accessioned after World War II that is slowing being processed for retention elsewhere in the NARA system, primarily at the College Park facility. The material was assigned to basic records groups based on whether it came from the Army or the Air Force:

Record Group 338 (Records of U. S. Army Commands, 1942-)
Record Group 342 (Records of the U.S. Air Force Commands, Organizations and Activities)

Accession 338-56A-3068 Headquarters Fort Detrick Administration 1951-52
Boxes 1, 2, 3, 4, 6, 7, 8

Accession 338-56B-3068 Headquarters Fort Detrick Administration 1951-52
Box 1

Accession 338-56C-3068 Headquarters Fort Detrick Publications 1951-52
Box 1

Accession 338-56E-3068 Fort Detrick Publications 1951-52
Box 1

Accession 338-57A-3186 Fort Detrick Administration 1953
Boxes 1, 2

Accession 338-57A-4072 Fort Detrick Administration 1953
Box 1

Accession 338-57A-5087 Fort Detrick Administration 1953
Box 1

Accession 338-57B-4072 Fort Detrick Administration 1953
Boxes 1, 2, 3

Accession 338-58A-0077 Fort Detrick Administration 1954
Boxes 2, 3, 4, 5, 6, 8, 9

Accession 338-58B-0077 Fort Detrick Administration 1954
Box 1

Accession 338-58C-0077 Fort Detrick Instructions 1953-54
Box 1

Accession 338-58D-0077 Fort Detrick Administration 1954
Box 1

Accession 338-58F-0077 Fort Detrick Publications 1954
Boxes 1-12

Accession 338-58G-0077 Fort Detrick Publications 1954
Box 1

Accession 338-58H-0077 Fort Detrick Administration 1954
Boxes 1, 2

Accession 338-58I-0077 Fort Detrick Instructions 1954
Box 2

Accession 338-58J-0077 Fort Detrick Technical Reports 1954
Boxes 1-6

Accession 338-58K-0077 Fort Detrick Technical Reports 1954
Boxes 1-4

Accession 338-58L-0077 Fort Detrick Research & Development Supervisor 1954
Box 1

Accession 338-59A-3322 Fort Detrick Administration 1955
Boxes 1-7

Accession 338-59B-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59C-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59D-3322 Fort Detrick Unit History 1955
Box 1

Accession 338-59E-3322 Fort Detrick Instructions 1955
Box 1

Accession 338-59F-3322 Fort Detrick Instructions 1955
Box 1

Accession 338-59H-3322 Fort Detrick Administration 1955
Boxes 1, 2

Accession 338-59I-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59J-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59K-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59L-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59M-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59N-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59O-3322 Fort Detrick Administration 1955
Box 1

Accession 338-59P-3322 Fort Detrick Administration 1955

Box 1

Accession 338-59R-3322 Fort Detrick Unit History 1955
Box 1

Accession 338-60A-0147 Fort Detrick Administration 1956
Boxes 1, 3, 4, 5, 6, 7

Accession 338-60B-0147 Fort Detrick Publications 1956
Box 1

Accession 338-60C-0147 Fort Detrick Historical Background 1956
Box 1

Accession 338-60D-0147 Fort Detrick Administration 1956
Boxes 1, 3, 5, 6

Accession 338-60E-0147 Fort Detrick Research & Development PROJ 1956
Boxes 1, 2

Accession 338-60F-0147 Fort Detrick Organizational Planning 1956
Box 1

Accession 338-60G-0147 Fort Detrick Unit History 1956
Box 1

Accession 338-61A-3208 Fort Detrick Administration 1957
Boxes 1-4

Accession 338-61C-3208 Fort Detrick Technical Reports 1957
Box 1

Accession 338-61D-3208 Fort Detrick Administration 1957
Box 1

Accession 338-61E-3208 Fort Detrick Unit History 1957
Box 1

Accession 338-61G-3208 Fort Detrick Administration 1957
Box 1

Accession 338-61H-3208 Fort Detrick Organizational Planning 1957
Box 1

Accession 338-61I-3208 Fort Detrick Administration 1957
Box 1

Accession 338-62A-0061 Fort Detrick Administration 1958
Boxes 1-4

Accession 338-62B-0061 Fort Detrick Administration 1958
Boxes 1-3

Accession 338-62C-0061 Fort Detrick Instructions 1958
Boxes 1-2

Accession 338-62D-0061 Fort Detrick Instructions 1958
Box 1

Accession 338-62E-0061 Fort Detrick Instructions 1958
Box 1

Accession 338-62F-0061 Fort Detrick Publications 1958
Boxes 1-2

Accession 338-63C-4062 Headquarters Fort Detrick Operational Program 1958-59
Box 1

Accession 338-63D-0020 Fort Detrick Instructions 1959
Box 1

Accession 338-63E-0020 Fort Detrick Publications 1959
Box 1

Accession 338-63F-0020 Fort Detrick Security Classified 1959
Box 1

Accession 338-63G-0020 Fort Detrick Technical Reports 1957
Box 1

Accession 338-63H-0020 Fort Detrick Security Classified 1959
Box 1

Accession 338-64A-0066 Fort Detrick Organizational Planning 1962
Boxes 1-2

Accession 338-64A-0108 Fort Detrick Organizational Planning 1960
Box 1

Accession 338-64A-0424 Fort Detrick Organizational Planning 1961
Box 1

Accession 338-64B-0066 Fort Detrick Technical Reports 1960
Boxes 1, 2, 3, 4, 5, (6) 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

Accession 338-64B-0108 Fort Detrick Instructions 1960
Box 1

Accession 338-64B-0424 Fort Detrick Operational Planning 1961
Box 1

Accession 338-64C-0108 Fort Detrick Security Classified 1960
Boxes 1, 2

Accession 338-64C-0424 Fort Detrick Operational Program 1961
Box 1

Accession 338-64D-0424 Fort Detrick Operational Planning 1959-61
Box 1

Accession 338-65A-0454 Fort Detrick Organizational Planning 1962
Box 1

Accession 338-65B-0109 Fort Detrick Instructions 1961
Box 1

Accession 338-65B-0454 Fort Detrick Organizational Planning 1962
Box 1

Accession 338-65C-0109 Fort Detrick Organizational Planning 1961
Box 1

Accession 338-67A-6014 Fort Detrick Organizational Planning 1963
Box 1

Accession 338-67B-0725 Fort Detrick Operational Procedures 1963
Box 1

Accession 338-67B-6014 Fort Detrick Security Classified 1963
Box 1

Accession 338-67C-6014 Fort Detrick Technical Reports 1961
Boxes 1-6

Accession 338-67D-6014 Fort Detrick Security Classified 1963
Box 1

Accession 338-67E-6014 Fort Detrick Technical Reports 1966
Boxes 1-3

Accession 338-68A-0716 Fort Detrick Operational Procedures 1961-64
Box 1

Accession 338-68B-0716 Fort Detrick Program Briefing 1964
Box 1

Accession 338-68C-0716 Fort Detrick Operational Procedures 1964
Box 1

Accession 338-68D-0716 Fort Detrick Instructions 1963-64
Box 1

B.1.20 Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738
Public Document Room (PDR)
http://www.nrc.gov/reading-rm/pdr.html

The NRC has nuclear regulation responsibility. Originally this fell under the Atomic Energy Commission (AEC), which Congress established in the Atomic Energy Act of 1946. With the Atomic Energy Act of 1954, AEC gained the mission of regulating nuclear safety. The Energy Reorganization Act of 1974 created the Nuclear Regulatory Commission (NRC), which began operations on January 19, 1975. At the headquarters Public Document Room (PDR) reference librarians help in locating or obtaining documents in Agency wide Documents Access and Management System (ADAMS), the NRC official recordkeeping system. The web based ADAMS provides ready access to downloadable PDF documents on the Publicly Available Records System (PARS) Library as well as bibliographic citations on the Public Legacy Library relating to documents available in paper or microfiche formats. The research team conducted ADAMS queries of Detrick and the specific license numbers as follows:

- 19-11831-03 U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)

- 08-01738-02, and 08-01738-03 Walter Reed Army Medical Center
- 19-21091-01 SAIC-FREDERICK, INC (at NCI at Detrick)
- 19-01151-1 & 19-01151-02 Dept of the Army

This resulted in locating a number of Detrick related documents which were downloaded for this investigation. Queries of the Public Legacy Library database for the microfiche citations did not reveal any pre 1990 references to Detrick documents. There were a couple hits in the 1990s regarding license 19-01151-02 but were of limited value and they were not reviewed.

B.1.21 U.S. Army and Joint Services Records Research Center (JSRRC)

7701 Telegraph Road
Kingman Building, Suite 2C08
Alexandria, Virginia 22315-3802
https://www.rmda.army.mil/organization/jsrrc.shtml

The JSRRC mission is to research military unit records in support of Veterans' claims for Post Traumatic Stress Disorder and Agent Orange exposure and serves as Secretary of the Army's action agent for direct support of the Department of Veterans Affairs,. It is formerly the U.S. Armed Services Center for Unit Records Research (CURR), and before that Research of Unit Records, Environmental Support Group (ESG). The research team did not identify relevant material at this repository not available at other repositories.

B.1.22 U.S. Army Center of Military History (CMH)

Historical References Branch
103 Third Avenue
Fort McNair
Washington DC 20319-5058
http://www.history.army.mil/

The research team reviewed applicable volumes of the CMH's multi-volume United States Army in World War II history series for The Technical Services including:

- THE CHEMICAL WARFARE SERVICE: ORGANIZING FOR WAR. By Leo P. Brophy and George J. B. Fisher. (1959, 1989; 498 pages, CMH Pub 10-1.) - Includes discussion of the Special Project Division, Biological Warfare Installations and other CWS school which include information on Detrick
- THE CHEMICAL WARFARE SERVICE: FROM LABORATORY TO FIELD. By Leo P. Brophy, Wyndham D. Miles, and Rexmond C. Cochrane. (1959, 1980; 498 pages, CMH Pub 10-2.) - Chapter V covers Biological Warfare overall and Detrick specific information.

B.1.23 U.S. Army Chemical, Biological, Radiological, and Nuclear School Historical Office
Fort Leonard Wood, MD 65472-8926

The research team contacted the chemical school history office and archives and discussed the mission. The historian stated he did not feel the collection would contain any useful information but referred us to the Chemical Command historical office.

B.1.24 U.S. Army Chemical Materials Agency
AMSCM-SSP
5183 Blackhawk Road
APG-EA, MD 21010-5424
http://www.cma.army.mil/home.aspx

The U.S. Army Chemical Materials Agency's Non-Stockpile Chemical Materiel Project (NSCMP) provides centralized management and direction to the U.S. Department of Defense for the disposal of non-stockpile chemical warfare materiel. In 1993 the NSCMP developed a Survey and Analysis Report to identify location, types and quantities of non-stockpile chemical material (NSCM). That report was updated in 1996 and released publicly and the Fort Detrick property was not included among the listed properties.

B.1.25 U.S. Army Corps of Engineers, Baltimore District, Real Estate Branch (CENAB-RE)
City Crest Building
10 South Howard Street, Room 7710
Baltimore, MD 21201

The research team reviewed the five volume of Real Estate Division Permanent Historical File for Fort Detrick, Audit No. 5066.

The real estate office also provided the team a printout of the current REMIS Outgrant Document Record listings for Fort Detrick. In general ONLY active or current outgrant files are retained and earlier ones that have expired or canceled are destroyed (i.e. the agricultural out leases between 1950s through the 1980s were not retained). The examined the files for:

- DACA-31-4-98-1123 Department of Agriculture
- DACA-31-4-03-282 AF Medical Evaluation Support Act

The team also reviewed the Cadastral flat map files for Fort Detrick, getting copies of the three 1985 revised real estate sheets.
Note there are five drawers of Closed Military files (i.e. FUDS).

B.1.26 U. S. Army Corps of Engineers – Baltimore District, HTRW Branch
(CENAB-EN-H)
City Crest Building
10 South Howard Street, Room 11000
Baltimore, MD 21201

The research team discussed and coordinated the scope of the ASR effort and any potential coordination efforts with the HTRW team's work, but did not receive any primary information used in this effort.

B.1.27 U. S. Army Corps of Engineers – Baltimore District - Fort Detrick Integrated Program Office (IPO)
(CENAB-DET)
1557 Porter Street
Fort Detrick, MD 21702

The research team discussed and coordinated the scope of the ASR effort and any potential coordination efforts with the IPO team's work, but did not receive any primary information used in this effort.

B.1.28 U.S. Army Corps of Engineers, St. Louis District
Ordnance and Technical Service Branch
CEMVS-EC-P
1222 Spruce St.
St. Louis, MO 63103-2833

The research team began their research of the subject property by consulting research and back-up files. In 1996, this organization completed an ASR on Fort Ritchie for ordnance, explosives (OE) and chemical warfare material (CWM) following the recommendations of the 1995 Base Realignment and Closure (BRAC) to close Fort Ritchie. Although the installation and the report is similar in name (i.e. ASR), the focus of the 1996 effort was only on OE and CWM and did not include any information relating to herbicide testing there. The 1996 ASR back-up files did provide some general information regarding the installation, including historic aerial photographs and maps.

B.1.29 U.S. Army Dugway Proving Ground (DPG)
Dugway, UT 84022-5000

The research team contacted the Public Affairs Officer, former Program Manager for the DPG Technical Information Center (TIC), regarding Unclassified but Limited Distribution Material at the DPG TIC and available through the CBRNIAC and DTIC information services. The material in question includes a number of the formal technical reports which are unclassified but have restrictions on distribution, including

- Further Dissemination Only As Directed
- U.S. Govt. And Their Contractors
- U.S. Govt. Only; DOD Controlled
- Controlled; DOD Controlled
- U.S. Govt. Agencies Only
- U.S. Govt. Agencies and Their Contractors
- DOD Components Only
- For Official Use Only
- Approved For Public Release
- Unlimited Distribution

Although the Biological Department of the Chemical Corps headquartered at Fort Detrick (and its various other names) were the corporate authors of the documents, DPG Technical Library (i.e. TIC) is noted as the responsible authority for other distribution requests on many of the documents since it provided the documents to CBRNIAC and DTIC. The PAO contacted DPG's FOIA official and lead librarian who offered advice on how to handle the matter but suggesting other offices would likely be more suited to handle the request.

B.1.30 U.S. Army Edgewood Chemical Biological Center (ECBC) Technical Library
5183 Blackhawk Road, Building 3330
APG, MD 21010-5424

The ECBC Technical Library is a separate and distinct collection for the CBRNIAC holdings, based on the old DPG Technical Library. The ECBC Technical Library indexes their holdings with the STILAS online catalog with ~75,000 unique document records. It is separate from the CBRNIAC as well. The numbering system includes "ADE" numbers similar in series to the DTIC numbers.

The CBRNIAC librarians should also have access to the earlier Chemical Biological Archive Information Management System (CBAIMS). The purpose of CBAIMS was to collect, assemble, catalogue , and archive CB defense information from multiple service locations into a central repository and library. Battelle was the lead contractor and this served as the basis of CBRNIAC.

The CBRNIAC librarian believes the holdings of the former Fort Detrick Technical Library went to DPG in the mid-late 1970s but did not know this for certain.

The research team visited this location on 2 and 3 March 2011 and reviewed the following documents from the original distribution to acquire better copies of the photos in the reports:

- 1945-11 SR038 A Pilot Plant for the Production of Plant Pathogens CB-046956.pdf
- 1945-01-01 SR039 The Development of IR as a Biological Warfare Agent CB-046955
- 1946-01-01 SR044V1 Munitions for Biological Warfare Volume 1 CB-022690.pdf
- 1946-01-01 SR044V2 Munitions for Biological Warfare Volume 2 CB-109500.pdf
- 1946-08 SR078 Observations on The Permanent Effects of Aerial Plant Growth Inhibitory Sprays Upon Natural Vegetation CB-048759.pdf
- 1947-09 SR079 Crop Destruction by Chemical Agents AD310658.pdf
- 1947-09 SR079P2 Crop Destruction by Chemical Agents AD0310659.pdf
- 1947-09 SR079P3 Crop Destruction by Chemical Agents AD0310660.pdf
- 1948-02-24 SR092 Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons AD0310664
- 1949-08-01 SR105 Field Plot Experiments with Plant Inhibitors, 1948 Season CB-046362.pdf
- 1952-04-11 IR006 (BLIR) Preliminary Investigation of Rotating Clusters for BW Munitions AD0310638.pdf
- 1952-09-04 IR010 (BLIR) Bomb, Biological, 750 lb., E86 AD0325445.pdf
- 1957-10 IR167 Principles and Practices of BW Decontamination 23, Decontamination of Aircraft Interiors by Means of Detroxide CB-011181.pdf
- 1958-08 Technical Study 011 Anticrop Agents

The research team also copied the following documents not available elsewhere:

- Chemical Corps Research and Development Command Biological Warfare Laboratories, Interim Report 139 Thermal Death Time of Bacillus Anthracis Spores December 1956 (AD159387)
- Chemical Corps Research and Development Command Biological Warfare Laboratories, Interim Report 164 The Evaluation of Field Methods of BW Decontamination of Vehicles and a Study of the Hazards Created During Contamination and Decontamination of Vehicles February 1958 (AD159469)

The research team reviewed these classified documents:

- Technical Report 59 Development of a Process for Filling, Assembling, and Packaging the E412T (U) January 1965 AD357220 (not at Fort Detrick)

- Miscellaneous Publications 38 Water Test in Building 8 (U) ADE473266 (not at Fort Detrick)
-

B.1.31 U..S. Army Engineering and Support Center Huntsville Recovered Chemical Warfare Material Design Center (RCWM DC or CEHNC-OE-CW)
Ordnance and Explosives Directorate
4820 University Square
P. O. Box 1600
Huntsville, AL 35807-4301
http://www.hnd.usace.army.mil/oew/RCWM_DC.aspx

The research team coordinated with the RCWM DC regarding the interviews being conducted regarding Fort Detrick of former personnel and others in the community.

B.1.32 U.S. Army Environmental Command (USAEC)
5179 Hoadley Road
Aberdeen Proving Ground Edgewood Area, MD 21010-5401
IMAE-CDN

The ASR research team worked directly for and coordinated with USAEC but did not receive any additional documentation relating to this project not acquired from another source.

B.1.33 U.S. Army Legal Services Agency
Environmental Law Division
Litigation Branch
901 N. Stuart St.
Arlington, VA 22203-1837

The research team assisted this office of the Judge Advocate General (JAG) regarding Agent Orange testing questions at Fort Ritchie.

B.1.34 U.S. Army Medical Department (AMEDD) Center of History and Heritage
Directorate of Strategic Communication, MEDCOM
Fort Sam Houston, TX

The research team contacted the MEDCOM Center of History and Heritage regarding records pertaining to Fort Detrick and to discuss the current research project. This office does not have records on Fort Detrick testing which are specific to our records project. They have a collection of more general unit activities used for overall history. The Center of History and Heritage is interested in our findings and having our data in electronic format upon completion. They will be able to store classified data if necessary.

B.1.35 U.S. Army Medical Research and Materiel Command (MRMC)

Public Affairs (MCMR-PA)
504 Scott Street
Fort Detrick MD 21702-5012
https://mrmc.detrick.army.mil/

The research team visited this repository to review the contents of five, 5 drawer safes that came from U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) Command's secured room in 2009. The contents of these safes primarily consisted of the pre-1970 Detrick produced documents including numerous technical reports, studies, memorandums, etc. The reviewed material did not contain any material relating to herbicides except as an overview or general documentation regarding Detrick, such as an annual history. This makes sense as USAMRIID did not inherit that mission and would not need to retain that data as part of their reference collection

B.1.36 U.S. Army Public Health Command (Provisional) (USAPHC)

[formerly US Army Center for Health Promotion and Preventive Medicine (USACHPPM)]
5158 Blackhawk Road, Bldg. E-1677
Aberdeen Proving Ground (Edgewood Area), MD 21010-5403

The ASR research team coordinated with USAPHC but did not receive any additional documentation relating to this project not acquired from another source.

B.1.37 U.S. Army Public Health Command (Provisional) - Entomological Sciences Program

E-5158 Blackhawk Road
Aberdeen Proving Ground, MD 21010-5403

The research team met with the Manager Entomological Sciences Program and staffers to discuss the research mission. Burroughs stated that his office supervises the Army's pest management program. This office frequently receives outside requests inquiries regarding types of chemicals or pesticides were sprayed at different installations in the past (for lawsuits, health issues, etc.). In the past this office became the repository for Form 1532. Form 1532s list routine use by month, types, quantities, and locations of pesticides, rodenticides, herbicides, and insecticides used at different army installations. Their collection ranges in time from late 1970s through the 1980s. The guidance changed and currently each installation is supposed to maintain their own records on types of pesticides or insecticides used and record copies are supposed to be filed in the environmental office on each installation. Army Material Command at Rock Island now oversees the monthly Form 1532 for the Army. The research team reviewed the Form 1532 file for Fort Detrick.

B.1.38 U.S. Army Research, Development and Engineering Command (RDEC)
Aberdeen Proving Ground, MD 21005-5201
www.army.mil/RDECOM/
Research and Technology Directorate

The research team requested assistance in review of Limited Distribution of Unclassified Material to release the information to the public from the RDEC FOIA office.

B.1.39 U.S. Army Research, Development and Engineering Command (RDECOM)
Historical Office
Bldg. E-5027, Blackhawk Road
Aberdeen Proving Ground Edgewood Area, MD 21010-5423

This office was formerly the U.S. Army Soldier Biological Chemical Command (SBCCOM) along with various other names. It is the historian's office / repository for the former US Army Chemical Corps / Chemical Center of which Camp /Fort Detrick fell under until the 1970s. They have a large number of number of classified and unclassified records relating to those commands. The research team visited this location the week of 28 February 2011 and they reviewed the contents of the following unclassified cabinets:

Cabinet 04, Drawer 3 – Fort Detrick
Cabinet 80, Drawer 4 – History of the Chemical Corps
Cabinet 122, Drawers 1-2 – Chemical Corps Technical Committee (CCTC)
Cabinet 155, Drawers 1-4 – Biological
Cabinet 155, Drawer 5 – Herbicides
Cabinet 237 & 238, Drawers 1-5 – Environmental

The research team reviewed portions of the office holdings, which contained copies of the material within the repository cabinets but that he had gathered for his ease of use including his notebooks on Agent Orange and Fort Detrick and his file drawer on Biological Warfare.

The research team also reviewed numerous classified documents in their vault. They acquired the following classified material to be sent:

Cabinet 10, Drawer 3

- 6th Annual Report of the Chemical Corps Biological Laboratory, 1 September 1952
- Production of Anti-Crop Agents, 1952
- Brief of the Committee on Biological Warfare, 1952
- Technical Estimates AMCTC Meeting 9-68, 5 September 1968
- Compilation & Assignment of BW Agents, 26 July 1956

Cabinet 8

- Compilation of US Army Biological Warfare Agent Production, Storage, Test, Disposal and Decontamination Operations, 1940-1970, November 1970

B.1.40 U.S. Department of Agriculture National Agricultural (USDA) Agricultural Research Service (ARS)
Foreign Disease - Weed Science Research Unit
1301 Ditto Ave.
Fort Detrick, MD 21702
http://www.ars.usda.gov/main/site_main.htm?modecode=19-20-00-00

The research team contacted this organization and received technical reports including copies of the Defoliation Conferences and newspaper articles and clippings regarding Fort Detrick's past activities. The records were left from other scientists upon their retirement or departure. He stated that there was no technical library currently on Fort Detrick but they have an in-house pdf listing of articles ranging from the 1970s-1980s. Generally, Department of Agriculture scientists at Fort Detrick published articles in professional journals. The National Agriculture Library in Beltsville, MD is the main repository for journal articles written by scientists at Fort Detrick filed under the specific scientist's name.

B.1.41 U.S. Department of Agriculture National Agricultural Library, Special Collections
10301 Baltimore Avenue
Beltsville, MD 20705
http://www.ars.usda.gov/main/site_main.htm?modecode=12-00-00-00
301-504-5876
speccoll@nal.usda.gov

The research team reviewed records at the National Agriculture Library in their Special Collections. After reviewing the finding aids the following records were reviewed.

American Biological Safety Association Records-Manuscript Collection 359
(11 boxes in total). This collection contained meeting minutes, photographs from conferences, and programs from conferences. Only box 9 contained information pertinent to our mission. The complete finding aid can be viewed on the NAL website. Box 9 contained CDs of Fort Detrick safety bulletins from approximately 1953-1960s. The research team copied all the CDs.

The Alvin L. Young Collection on Agent Orange
http://www.nal.usda.gov/speccoll/findaids/agentorange/index.htm

The research team consulted the Alvin L. Young Collection on Agent Orange within their Special Collections holdings. The research team did not locate any additional documentation at this repository relating to the Fort Detrick testing than available from the DoD technical information centers/libraries (i.e. DTIC and CBRNIAC). Most of this collection is on line. The documents that are not posted are either copyright materials or have been restricted access due to its classification or former classification

B.1.42 **U.S. Department of Agriculture National Agricultural (USDA) Natural Resources Conservation Service (NRSC) - Frederick Service Center**
92 Thomas Johnson Dr Ste 240
Frederick, MD 21702-4403

The research team contacted this repository in an attempt to locate the "Soil Survey of Frederick County, Maryland. Advance sheets – Field operations of Soils, 1919" cited in Special Report No. 92 regarding the soil classification noted in the field plot experiments. Reportedly the oldest version of the county survey is from 1957. They would allow copies to be made of it but do not have extra ones to pass out. They also provided the team a link to copy Historical Soil Survey maps posted by the University of Alabama on the internet, which includes the 1919 map available:

http://alabamamaps.ua.edu/historicalmaps/soilsurvey/index.html

B.1.43 Washington National Records Center
4205 Suitland Road
Suitland, MD 20746-8001
http://www.archives.gov/dc-metro/suitland/

A research team from visited the holdings at the WNRC over a number of weeks beginning first in November 2010, and continuing in December 2010, January, March and May 2011, to conduct research on Fort Detrick.

Accession 338-09-0145, U.S. Army Medical Research and Materiel Command MCMR-RPS, 1965-96
Boxes 1-7

Accession 338-63A-1665, Fort Detrick, 1953-56
Boxes 1-4

Accession 338-74B-0925, Biological Laboratories Fort Detrick, 1962-72
Boxes 2-3

Accession 338-74D-0925, Biological Laboratories Fort Detrick BX 7-14, 1971
Boxes 7-14

Accession 338-84-0305, Fort Detrick, 1973-1982
Boxes 8-10;

Accession 338-86-0217, Fort Detrick, 1974-82
Boxes 1-2

Accession 338-71B-0342, Munitions Research & Development Fort Detrick BX 3-47, 1970
Boxes 3-26, 29-34, 36, 46-47

Accession 338-69D-0739, Fort Detrick Research & Development Item Case Files, 1963
Box 3

Accession 338-69E-0739, Fort Detrick Research & Development Item Case Files, 1963-1965
Box 4

Accession 338-70C-0623, Fort Detrick Research & Development Item Case Files, 1964
Boxes 3-6

Accession 338-70D-0624, Fort Detrick Spec & Drawings, 1964
Boxes 3-4

Accession 338-70H-0624, Fort Detrick Research & Development Item Case Files, 1964
Boxes 9-11

Accession 338-71A-0224, US Army Biological Center (Munition Development Research and Development), 1966
Boxes 55-77

Accession 338-71H-0342, Fort Detrick Research & Development Cases, 1970
Boxes 51-55

Accession 338-71J-0342, Fort Detrick Research & Development Cases (Plant Sciences), 1970
Boxes 58-60

Accession 338-72D-1057, Fort Detrick Plans and Programs, 1969-70
Boxes 6-7

Accession 338-72A-2679, Fort Detrick, 1965-1971
Boxes 1

Accession 338-75A-0156, Fort Detrick Miscellaneous Administration, 1960-71
Boxes 1-2

Accession 338-78-0267, Biological Laboratories Fort Detrick (Miscellaneous Manuals & Reports), 1954-1964
Boxes 1-9

Accession 338-78-0276, Biological Laboratories Fort Detrick (Miscellaneous Administration), 1959-1965
Boxes 1-12

Accession 338-78-0278, Biological Laboratories Fort Detrick, 1957
Boxes 1-3

Accession 338-78-0279, Biological Laboratories Fort Detrick (Budget Files), 1959-1962
Box 1

Accession 338-78-0280, Biological Laboratories Fort Detrick (Technical Reports), 1958-1960
Boxes 1-2

Accession 338-78-0281, Biological Laboratories Fort Detrick, 1958-1960
Box 1

Accession 338-78-0282, Biological Laboratories Fort Detrick (Research & Development Case Files), 1956-1960
Boxes 1-8

Accession 338-78-0283, Comptroller Fort Detrick (Budget), 1955-60
Boxes 1-2

Accession 338-78-0284, Fort Detrick (Miscellaneous & Technical Reports), 1958
Boxes 1-3

Accession 338-78-0285, Fort Detrick Research & Development Reports, 1955-1957
Boxes 1-12

Accession 338-78-0288, Biological Laboratories Fort Detrick (Research & Development Administration Files), 1954-56

Boxes 1-16

Accession 338-78-0289, Biological Laboratories Fort Detrick, 1945-1956
Boxes 1-11

Accession 338-78-0290, Comptroller Fort Detrick, 1946-1958
Box 1

Accession 338-78-0291, HQ Fort Detrick, 1955
Boxes 1-3

Accession 338-78-0292, HQ Fort Detrick, 1955
Boxes 1-4

Accession 338-78-0293, HQ Fort Detrick, 1953-55
Boxes 1-8

Accession 338-78-0295, HQ Fort Detrick, 1953-54
Boxes 1-16

Accession 338-78-0296, HQ Fort Detrick, 1953-54
Boxes 1-39

Accession 338-78-0297, HQ Fort Detrick, 1950-1954
Box 1

Accession 338-78-0298, HQ Fort Detrick, 1953
Boxes 1-2

Accession 338-78-0299, HQ Fort Detrick, 1953
Boxes 1-5

Accession 338-78-0386, Biological Laboratories Fort Detrick, 1963-64
Boxes 1-2

Accession 338-78-0398, Comptroller & Projects Cord Detrick, 1959-63
Box 1

Accession 338-78-0554, Fort Detrick, 1961-66
Boxes 1-4

Accession 338-78-0555, Fort Detrick, 1966
Boxes 1-2

Accession 338-78-0825, Biological Laboratories Fort Detrick, 1948-52
Boxes 1

Accession 338-80A-0413, CBW Fort Detrick Laboratory Notebooks, 1943-1971
Boxes 1-46
Accession 338-80B-0413, CBW Fort Detrick, 1943-1971
Boxes 47-192

As discussed in section 1.3.1 of this ASR, this is a 192 box accession of laboratory notebooks, with handwritten notes primarily on investigations and tests conducted from 1943 thru December 1971. Based on an index for the accession, there were originally approximately 6,150 notebooks, however only about three fourths of the notebooks remain in this accession. In some cases, Detrick destroyed the notebooks and in other cases, the investigators withdrew the notebooks and did not return them to the central Detrick repository. Hence these notebooks are not in the collection sent to the record center. Using the index, the ASR research team identified the notebooks associated with the Crops Division (the group conducting herbicide and defoliation investigations), identified 476 notebooks, of those only 306 notebooks remained in the record center accession. The ASR team reviewed these notebooks and copied the portions of the notebooks dealing with outdoor field testing that occurred on Fort Detrick, as well as other locations.

B.2 AERIAL PHOTOGRAPHY REPOSITORIES

The following repositories were consulted for aerial imagery of the property. Note historical imagery that exceeded 1:40,000 scale was not considered for acquisition. The light gray shading indicates historical imagery that was acquired.

B.2.1 U.S. Army Geospatial Center (AGC)

Warfighter Geospatial Support & Production Directorate Hydrologic & Environmental Analysis Branch (CEAGC-TO-H)
7701 Telegraph Road
Alexandria, VA 22315-3864
http://www.tec.army.mil/

The research team contacted the former US Army Corps of Engineers, Engineer Research and Development Center Topographic Engineering Center (ERDC-TEC) Operation Division, Hydrologic and Environmental Analysis Branch (CEERD-TO-H) regarding the Fort Detrick, Maryland Photogeologic Analysis completed in August 2000. The research team sought information regarding the aerial imagery acquisition that occurred for it, in order to locate any contact prints or film diapositives remaining there or where the acquired material was shipped to.

B.2.2 **U.S. Environmental Protection Agency-Office of Research and Development**
Environmental Sciences Division
PO Box 93478
Las Vegas, NV 89193-3478

The research team contacted this office regarding the January 2001 Aerial Photographic Analysis of Fort Detrick (Area B) Site and the aerial imagery acquisition that occurred for it, in order to locate any contact prints or film diapositives remaining there or where the acquired material was shipped to.

B.2.3 **Fort Detrick, US. Army Garrison – Directorate of Information Services (DIS)**
201 Beasley Drive
DIS Engineering and Contracting Division, Room 247-C
Fort Detrick, MD 21702
http://www.detrick.army.mil/dis/

The research team reviewed the contents of the 452 flat files / map drawers in the Engineering Drawing/Blueprint Vault on the 2nd floor of Building 201. The research team took temporary control (i.e. borrowed) the following items from Drawer 236 "Photographs":

Aerial Film Cans
- 1972-11-16 at 1:12,800
- 1982-07-21 at 1:13,750

Aerial Film Prints 9" by 9"
- 1952 (6) AHA-4K-98 thru 100 and 145-147
- 1976-08095 (2) 2-1 thru 2-2
- "Fort Detrick" no date (10), 4-3, 4-13, 5-16, 6-15, 6-20, 6-21, 6-22, 6-27, 6-28 and 7-89. Potentially these are the missing prints to a series provided by Gortva in 10/2010
- Undated "Spot" (2) #2 and #3

Aerial Mylars 30" by 42"
- 1975 March (4) Sheets 3, 4, 5 and ?

Miscellaneous Aerial Obliques "C" size
- (8)

Aerial Film Prints 26" by 26"
- 1958-6-9

Aerial Film Prints Annotated Reproductions
- 1937 Images (3)

AMS Aerial Photo Mosaic
- 1948 map from Sept. Oct. 1947 Imagery

The oversized photos were returned on 11/17/2010 with the 9 by 9 inch prints and cans being retained.

B.2.4 National Archives at College Park, Cartographic & Architectural Branch 8601 Adelphi Road College Park, MD 20740

The research team consulted the aerial photo coverage overlays in Record Group 373 (Records of the U.S. Defense Intelligence Agency) for imagery at a scale of 1:40,000 or better covering the area. They pulled the index sheet for N39 W77.

Date	Scale	Record Group	Can Number	Frames	Total Frames
9/12/1952	1:20,000	373	DN3728	AHA-4K-99, 100, 101, 144, 145, 146	6

The research team also consulted *Aerial Photographs in the National Archives-Special List 25*, dated 1990, for available imagery from:

Record Group 57 (Records of the U.S. Geological Survey)
Record Group 95 (Records of the U.S. Forest Service)
Record Group 114 (Records of the Soil Conservation Service)
Record Group 145 (Records of the Agriculture Stabilization and Conservation Service)

The team located the following imagery in Record Group 145:

Date	Scale	Record Group	Can Number	Frames	Total Frames
9/18/1943	20,000	145	ON 38556	DCO-10-26 thru 28 DCO-11-27 thru 29	6

B.2.5 U.S. Geological Survey - EROS Data Center Sioux Falls, South Dakota 57198

CEMVS-EC-S conducted an initial search of available imagery for Fort Detrick and identified the following imagery that covers the property.

Aerial Photography Single Frame

Acquisition Date	Scale	Entity ID	Image Type	Project	Roll No.	Frame No.	Remarks
04/18/1974	12000	AR1VDNO	BW	VDNO00	1	149- thru 153 123 thru 127	

Note: *Last four digits of the Entity ID are the frame number (replace XXXX with frame number – include leading zeros).*

NAPP

Acquisition	Entity ID	Project	Roll	Frame No.	Film	Project	Remarks

Date			No.		Type	Number	
2/10/1987	NP0NAPP000108XXX	NAPP	108	1	CIR	Frederick	
4/11/1988	NP0NAPP000008XXX	NAPP	8	14 thru 16	CIR	Frederick	
4/6/1998	N10NAPPW10588XXX	NAPPW	10588	43 thru 44	BW	Frederick	
3/26/2000 3/31/2000	N10NAPPW12134XXX N10NAPPW12139XXX	NAPPW	12134 12139	93 & 212	BW	Frederick	

Note: *Last three digits of the Entity ID are the frame number (replace XXX with frame number – include leading zeros).*

NHAP

Acquisition Date	Scale	Entity ID	Project	Roll No.	Frame No.	Film Type	Remarks
4/2/1981	58000	NB1NHAP80033XXX	NHAP80	439	214-215	CIR	

Note: *Last three digits of the Entity ID are the frame number (replace XXX with frame number – include leading zeros).*

B.2.6 U.S. Department of Agriculture - Aerial Photography Field Office 2222 W 2300 S Salt Lake City, Utah 84119-2020

CEMVS-EC-S conducted an initial search of available imagery for Fort Detrick and identified the following imagery that covers the property.

Frederick County, MD

YEAR	RES/SCL	PROG	%COV *	BND/FLM	FMT	QTY *	REMARKS
1958	20000	FSA	100	BW	PI	4	5006
1964	20000	FSA	100	BW	PI	4	5007
1970	50000	FSA	100	BW	PI	4	5008
1979	40000	FSA	100	BW	PI	6	5009
1981	60000	NHAP1	100	CIRP			
1988	1	NDOP	100	BW	MR	1	CCM
1988	40000	NAPP1	100	CIRP	SI	1	16705
1998	40000	NAPP3	100	BW	DI	1	
2005	1	NAIP05	100	NC	MR	72	QQ 10,249GB
2006	1	NAIP06	45	NC	MR	1	CCM 1.344GB
2007	1	NAIP07	100	NC	MR	1	CCM .703GB
2009	1	NAIP09	100	NC	MR	1	CCM .729GB
2011	1	NAIP11	100	NC	GT	122	CCM .704GB

* %COV and QTY represents amounts for entire county and not necessarily the site

APPENDIX C

REFERENCES

C REFERENCES

The following list of references only represents the items cited in preparation of this report and do not illustrate all the documents reviewed or copied for the backup files.

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1945-03-30 Memo, Weekly Progress Report on LN8 Agent, CWS Washington DC.pdf

[5] 1946-05 Technical Progress Report, Sept 1945 - May 1946, C Division, Technical Department, Camp Detrick, MD.pdf
1947-03 MVDIVPR Mar 1947 Project Progress Report CB-108174.pdf

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1948-02-24 SR92 Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons AD0310664
1949-08-01 SR105 Field Plot Experiments with Plant Inhibitors, 1948 Season CB-046362.pdf
1950-04-14 SR130 Field Plot Experiments with Plant Inhibitors 1949 Season AD325737.pdf
1951-12-01 SR153 Field Plot Experiments with Plant Inhibitors 1950 Season ADB817147.pdf
1952-08-25 SR156 Field Plot Experiments with Plant Inhibitors. 1950-1951 Crop Season AD010996.pdf

[10] 1956-09-13 Trespassing on Crops Div Experimental Area.pdf

[11] 1949-03-31 PC Division, Quarterly Technical Summary.pdf

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[14] 1952-01-14 Real Estate Directives - Acquisition of Land.pdf
1952-05-01 FD Military Reservation Real Estate Map Sheet 3 MAD 59 FDDrwr334.TIF
1977-12-02 FD Military Reservation Real Estate Map Sheet 3 MAD 59 FDDrwr334.TIF
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[15] 1954-02 SR200 Field Development of Chemical Anticrop Agents AD049571.pdf

[16] 1951-12-20 SR151 LOW VOLUME ANTICROP AERIAL SPRAY TRIALS, PHASE II AD325744.pd
1953-02-01 SR184 Anticrop Aerial Spray Trials, Phase III CB-174122.pdf
1953-07-01 Development of BW Anticrop Agents Status Report 53-6 310700.pdf
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1959-03 Summary Major Events & Problems 1958-59.pdf
[19] 1956-10-30 Memo, Chemical Defoliants.pdf

[20] 1955-06 Interim Rpt, Defoliation, Target Marking and Implications.pdf
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1956-10 IR140 Defoliation Investigations During 1954 and 1955 AD0310655.pdf

[21] 1956-02-13 Proposed use of T-321 by Crops Division.pdf

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[23] 1957-01-31 Item 3288, Military Requirement & Characteristics for Chemical Defoliants.pdf

[24] 1959-07 TR016 Defoliation and Desiccation CB-120217.pdf

[25] 1957-01-15 R&D Program Directive Ft. Detrick.pdf
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1970-01-27 FD Roads and Grounds Mowing Grass in Area B F-93-1-7820 FDDrwr325.TIF
1970-01-28 FD Roads and Grounds Mowing Grass in Area A and Area C Sheet 2 F-93-1-7819 FDDrwr325.TIF
1971-12-10 FD Grass Mowing Schedule Area B SK 5075 FFDrwr410.TIF
1971-12-10 FD Grass Mowing Schedule Areas A and C 93-1 (Sheet 2) FFDrwr410.TIF
1971-12-10 FD Grass Mowing Schedule Areas A and C SK-5075 (Sheet 1) FFDrwr410.TIF

1994-11-29 FD Grass Mowing Site Plan Detail Site Map Sheet 1 F93-1-8098 FDDrwr289.TIF
1994-11-29 FD Grass Mowing Site Plan Detail Site Map Sheet 2 F93-1-8098 FDDrwr289.TIF
1994-11-29 FD Grass Mowing Site Plan Detail Site Map Sheet 3 F93-1-8098 FDDrwr289.TIF

[233] 1959-03-05 Garden Plots SK_C-4596 FDDrwr446.TIF

[234] 1964_06_30_FD_Aerial_Image_201.tif

[235] 1970_07_06_FD_Aerial_Image_50.tif

[236] 1972_11_16_FD_Aerial_Image_2

[237] 1982_07_21_FD_Aerial_Image_926

[238] 1971-03 USDA Agric Econ Rept 199 Restricting the Use of 245-T Costs to Domestic Use.pdf

[239] 1971-03 USDA Agric Econ Rept 199 Restricting the Use of 245-T Costs to Domestic Use.pdf

[240] 1948-02-24 SR92 Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons AD0310664

[241] 1948-02-24 SR92 Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons AD0310664

[242] 1948-02-24 SR92 Field Plot Experiments with Plant Inhibitors 1946 and 1947 Seasons AD0310664

[243]Density of 2,4,5-T = 1.803 g/ cm^3 (20 C)
http://www.chemicalbook.com/ProductMSDSDetailCB6263140_EN.htm

APPENDIX D

HERBICIDES TESTED

HERBICIDES TESTED TABLES

As part of this ASR on Herbicide Testing at Fort Detrick, the analysis developed a number of tables to assist in analyzing herbicides tested available data. The tables were created using Microsoft Excel and imported into Microsoft Word for inclusion in the ASR as this Appendix D.

Table D-1
Comprehensive List of Herbicides Field Tested at Fort Detrick – Names, Codes, Group (sorted by Code)

Table D-2
List of Herbicides Field Tested at Fort Detrick by Year and Test Series

Table D-3
Frequency of Herbicides Field Tested at Fort Detrick

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
1	132	heavy aromatic naphtha	
2	34520-R	diesel oil	
3	50534-R	hydrocarbons chiefly aromatics; the remainder naphthenes and olefins	
4	#2 fuel oil	2% TBP in #2 fuel oil	
5	2,3,6-trichlorobenzoic acid	2,3,6-trichlorobenzoic acid	
6	2,3-dichlorophenyl-4-chlorophenoxyacetate	2,3-dichlorophenyl-4-chlorophenoxyacetate	
7	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetate	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetate	
8	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetic acid	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetic acid	2,4,5-T related
9	2,4-dichlorophenoxyacetyl thiocyanate	2,4-dichlorophenoxyacetyl thiocyanate	2,4-D related
10	2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate	2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate	2,4,5-T & 2,4-D
11	2,4-Difluorophenoxyacetamide	2,4-Difluorophenoxyacetamide	
12	2-chloro-4-fluorophenoxyacetic acid	2-chloro-4-fluorophenoxyacetic acid	
13	3-cl IPC	Isopropyl n-(3-chlorophenyl) carbamate	
14	3-cl IPC+Esteron 44	herbicide mixture	
15	4-chlorophenoxyacetic acid	4-chlorophenoxyacetic acid	
16	4-Fluoro-2-methylphenoxyacetic acid	4-Fluoro-2-methylphenoxyacetic acid	
17	50533-R	aromatic extracts of straight run distillates	
18	50533-R+50534-R	herbicide mixture	
19	50715-R	synthetic cracked materials; less aromatic	
20	50715-R+50754-R	herbicide mixture	
21	50754-R	aromatic extracts of straight run distillates, higher naphthene	
22	713D	bis (ethylxanthogen) trisulfide	
23	ACP-M-103-A1	mix of polychlorobenzoic acids	
24	ACP-X-177	mix of polychlorobenzoic acids	
25	aminotriazole	aminotriazole	
26	ammonium 2,4-dichlorophenoxyacetate	ammonium 2,4-dichlorophenoxyacetate	
27	ammonium sulfamate	ammonium sulfamate	
28	ammonium thiocyanate	ammonium thiocyanate	
29	amyl 2,4-difluorophenoxyacetate	amyl 2,4-difluorophenoxyacetate	
30	Aresklene 400	Dibutylphenyl-phenol sodium disulfonate	
31	arsenic trioxide	arsenic trioxide	arsenicals
32	beta-chlorophenyl-N-phenylcarbamate	beta-chlorophenyl-N-phenylcarbamate	
33	Beta-hydroxyethyl-2,4-difluorophenoxyacetate	Beta-hydroxyethyl-2,4-difluorophenoxyacetate	
34	bis(ethylxanthogen) trisulfide	bis(ethylxanthogen) trisulfide	
35	Bromacil	5-bromo-3-sec-butyl-6-methyl-	
36	butyl 2,4-difluorophenoxyacetate	butyl 2,4-difluorophenoxyacetate	
37	Butyl-4-fluoro-2-methyl-phenoxyacetate	Butyl-4-fluoro-2-methyl-phenoxyacetate	
38	Butynediol	2-Butyne-l,4-diol	
39	CD-13539	P,P-dibutyl N,N di-isopropyl-phosphinic amide	
40	CD-14580	bis(ethylxanthogen) trisulfide	
41	CD-1626	disodium 3,6-Endoxohexahydrophthalate	
42	CMU	parachlorophenyl dimethyl urea	
43	copper chloride	copper chloride	
44	Diesel oil	Diesel oil	
45	DNOSBP	dinitro ortho secondary butyl phenol	
46	Dow contact	isopropyl 2,4-dichlorophenoxyacetate	
47	Dow contact+LN-8	herbicide mixture	
48	Dow Premerge	2-sec-butyl-4,6-dinitrophenol	
49	Endothal	disodium 3,6-Endoxohexahydrophthalate	
50	ester of 2,4-dichlorophenoxyacetic acid	ester of 2,4-dichlorophenoxyacetic acid	2,4-D
51	Esteron 44	isopropyl 2,4-dichlorophenoxyacetate	2,4-D related
52	ethyl 2,4-dichlorophenoxyacetate	ethyl 2,4-dichlorophenoxyacetate	
53	ethyl 2,4-difluorophenoxyacetate	ethyl 2,4-difluorophenoxyacetate	
54	Folex	Tributyl phosphorotrithioite	
55	herbicide not recorded	herbicide not recorded	
56	IPC	Isopropyl n-phenyl carbamate	
57	isopropyl 2,4-dichlorophenoxyacetic acid	isopropyl 2,4-dichlorophenoxyacetic acid	2,4-D related
58	isopropyl 2,4-difluorophenoxyacetate	isopropyl 2,4-difluorophenoxyacetate	
59	isopropyl 2-methyl 4-chlorophenoxyacetate	isopropyl 2-methyl 4-chlorophenoxyacetate	
60	isopropyl 4-Fluoro-2-methyl-phenoxyacetate	isopropyl 4-Fluoro-2-methyl-phenoxyacetate	
61	KClO3	Potassium chlorate	
62	KOCN	Potassium cyanate	
63	Krilinum	Calcium ++ cation	
64	KSCN	Potassium thiocyanate	
65	LN-10052	3-amino-1,2,4-triazole	

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
66	LN-10524	n-phenyl n', n'-dimethyl urea	
67	LN-10529	Undetermined formulation	
68	LN-10593	2-Chloro-4-fluorophenoxyacetic Acid	
69	LN-10699	2,4,5-Trifluorophenoxyacetic Acid	
70	LN-10720	borosyl ester of 2,4,-D	2,4-D related
71	LN-10728	carosyl ester of 2,4,-D	2,4-D related
72	LN-10778	2,4-Dichloro-5-fluorophenoxyacetic Acid	
73	LN-11	2-chloro-5-nitrobenzoic acid	
74	LN-11333	4-Chloro-2,5-difluorophenoxyacetic Acid	
75	LN-115	Undetermined formulation	
76	LN-117	Undetermined formulation	
77	LN-12007	2,5-Dichloro-4-fluorophenoxyacetic Acid	
78	LN-12160	4-Octyne-3,6-diol, 3,6-dimethyl-	
79	LN-12253	Undetermined formulation	
80	LN-12254	Undetermined formulation	
81	LN-12255	Undetermined formulation	
82	LN-12522	2-Chloro-4,5-difluorophenoxyacetic Acid	
83	LN-12962	Cacodylic acid	arsenicals
84	LN-12962	dimethylarsinic acid	arsenicals
85	LN-12964	Methylarsonic acid	arsenicals
86	LN-12965	Sodium salt of 2,2,3-trichloro-propionic acid	
87	LN-12976	2,3,5,6-tetrachlorobenzoic acid	
88	LN-13	2,3,5-triiodobenzoic acid	
89	LN-13097	butyl ester of benzothiazolyl-2-oxyacetic acid	
90	LN-13104	1,3-Diphenyl-1-butyne-3-ol	
91	LN-13106	2,5-Diphenyl-3-hexyne-2,5-diol	
92	LN-13109	Propargyl chloride	
93	LN-13110	2-Butene-l,4-diol	
94	LN-13112	2,4-Hexadiyne-1,6-diol	
95	LN-13113	o-Chlorophenol sulfonyl fluoride	
96	LN-13115	Endothal anhydride	
97	LN-13116	disodium 3,6-Endoxohexahydrophthalate	
98	LN-13539	P,P-dibutyl N,N di-isopropyl-phosphinic amide	
99	LN-13805	Phenylarsonic acid	arsenicals
100	LN-14	2,4,5-trichlorophenoxyacetic acid	2,4,5-T
101	LN-14+KSCN	herbicide mixture	
102	LN-14+LN-2462	herbicide mixture	2,4,5-T
103	LN-14+LN-33	herbicide mixture	2,4,5-T
104	LN-14+LN-539	herbicide mixture	
105	LN-14213	3,5-Dichloro-2-pyridoxyacetic Acid	
106	LN-14293	Undetermined formulation	
107	LN-143	Butyl 2,4-dichlorophenoxyacetate	2,4-D related
108	LN-143+LN-32+LN-33+LN-379	herbicide mixture	2,4,5-T related
109	LN-143+LN-33	herbicide mixture	2,4-D related
110	LN-143+LN-33+LN-379	herbicide mixture	2,4,5-T related
111	LN-143+LN-379	herbicide mixture	2,4,5-T related and 2,4-D related
112	LN-143+LN-974	herbicide mixture	2,4,5-T related and 2,4-D related
113	LN-144	2-ethylhaxyl 2,4-dichlorophenoxyacetate	2,4-D related
114	LN-14584	Undetermined formulation	
115	LN-14586	Undetermined formulation	
116	LN-14589	Undetermined formulation	
117	LN-14596	3,5-Dibromo-2-pyridoxyacetic Acid	
118	LN-146	Beta-chloroethyl para-chlorophenoxyacetate	
119	LN-14684	Undetermined formulation	
120	LN-147	Beta-bromoethyl ester of LN-2	
121	LN-14710	Undetermined formulation	
122	LN-148	Beta-chloroethyl 2,4-dichlorophenoxyacetate	2,4-D related
123	LN-14850	Undetermined formulation	
124	LN-14917	Undetermined formulation	
125	LN-14918	Methylarsine oxide	arsenicals
126	LN-14968	1-propyl arsonic acid	arsenicals
127	LN-14969	1-butyl arsonic acid	arsenicals
128	LN-153	Beta-hydroxyethyl ester of LN-2	
129	LN-154	2-hydroxyethyl 2,4-dichlorophenoxyacetate	2,4-D related
130	LN-155	Allyl ester of LN-2	
131	LN-155+LN-33	herbicide mixture	
132	LN-155+LN-33+LN-379	herbicide mixture	2,4,5-T related

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
133	LN-155+LN-379	herbicide mixture	2,4,5-T related
134	LN-156	Allyl 2,4-dichlorophenoxyacetate	2,4-D related
135	LN-1578	4-carbamylmethylaminobenzoic acid - - Na salt	
136	LN-1626	disodium 3,6-Endoxohexahydrophthalate	
137	LN-164	Methyl 2,4-dichlorophenoxyacetate	2,4-D related
138	LN-1661	4-Fluorophenoxyacetic Acid	
139	LN-1662	2,4-Difluorophenoxyacetic Acid	
140	LN-167	isopropyl 2,4-D	2,4-D related
141	LN-168	amyl 2,4-dichlorophenoxyacetate	2,4-D related
142	LN-170	n-octyl 2,4-dichlorophenoxyacetate	2,4-D related
143	LN-1700	1,2-dihydro-3,6-pyridazinedione	
144	LN-1700	Maleic hydrazide	
145	LN-1700+LN-2464	herbicide mixture	
146	LN-171	Isobutyl 2,4-dichlorophenoxyacetate	2,4-D related
147	LN-173	Beta-trichloroethyl 2,4-dichlorophenoxyacetate	2,4-D related
148	LN-1787	Alpha-4-chlorophenoxypropionic acid	
149	LN-1800	Ethyleneglycol ½ ester of 4-dichloroacetic acid	
150	LN-1814	secondary butyl 2,4-D	2,4-D related
151	LN-1816	Undetermined formulation	
152	LN-1817	Undetermined formulation	
153	LN-182	Undetermined formulation	
154	LN-182+LN-33	herbicide mixture	
155	LN-182+LN-33+LN-379	herbicide mixture	2,4,5-T related
156	LN-182+LN-379	herbicide mixture	2,4,5-T related
157	LN-183	Ethyl ester of LN-32	
158	LN-183+LN-33	herbicide mixture	
159	LN-183+LN-33+LN-379	herbicide mixture	2,4,5-T related
160	LN-183+LN-379	herbicide mixture	2,4,5-T related
161	LN-184	n-propyl ester of LN-32	
162	LN-184+LN-33	herbicide mixture	
163	LN-184+LN-33+LN-379	herbicide mixture	2,4,5-T related
164	LN-184+LN-379	herbicide mixture	2,4,5-T related
165	LN-1856	a-(2,4,5-Trichlorophenoxy)-propionic acid	2,4,5-T related
166	LN-194	Undetermined formulation	
167	LN-195	2-nitro-4-methylpropyl ester of LN-8	2,4-D related
168	LN-1993	3-alpha-imino-ethyl-5-methyltetronic acid	
169	LN-1999	n-(4-chlorophenyl)-N', N'-dimethyl urea	
170	LN-2	Para-chlorophenoxyacetic acid	
171	LN-2025	Undetermined formulation	
172	LN-2052	propyl 2,4-dichlorophenoxyacetate	2,4-D related
173	LN-2076	2,4-dichlorophenoxyacetylisothiocyanate	2,4-D related
174	LN-2160	thiodiphenylamine	
175	LN-2168	n-propyl 4-chlorophenoxyacetate	
176	LN-2169	Isopropyl 4-chlorophenoxyacetate	
177	LN-2170	n-butyl 4-chlorophenoxyacetate	
178	LN-2172	Methyl 2-methyl-4-chlorophenoxyacetate	
179	LN-2173	Ethyl 2-methyl-4-chlorophenoxyacetate	
180	LN-2174	n-butyl 2-methyl-4-chlorophenoxyacetate	
181	LN-2175	2-chlorophenoxacetyl chloride	
182	LN-2176	Isobutyl 2-methyl-4-chlorophenoxyacetate	
183	LN-2177	n-propyl 2-chlorophenoxyacetate	
184	LN-2179	n-butyl x-chlorophenoxyacetate	
185	LN-2370	Pentachlorophenyl 2-bromo-3,5-dichlorobenzoate	
186	LN-2374	2-bromo-5-chlorobenzoic acid	
187	LN-2375	2,5-dichlorobenzoic acid	
188	LN-2387	2-chloro-5-bromobenzoic acid	
189	LN-2388	2,5-dichloro-3-bromobenzoic acid	
190	LN-2392	2-chloro-5-iodobenzoic acid	
191	LN-2394	2,5-dibromobenzoic acid	
192	LN-2395	2,5-????iobenzoic acid	
193	LN-2399	2-chloro-3-bromo-5-iodobenzoic acid	
194	LN-2404	2-bromo-3-iodo-5-chlorobenzoic acid	
195	LN-2409	2,3-diodo-5-chlorobenzoic acid	
196	LN-2415	2-iodo-3,5-dibromobenzoic acid	
197	LN-2416	2,3-dichloro-5-bromobenzoic acid	
198	LN-2418	2,5-dibromo-3-chlorobenzoic acid	
199	LN-2425	Methyl alpha-napthaleneacetate	
200	LN-2426	2,4,5-Trichlorophenoxyacetic anhydride	2,4,5-T related
201	LN-243	beta-chloroethyl-N-phenylcarbamate	

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
202	LN-2452	2-bromo-3,5-diiodobenzoic acid	
203	LN-2462	Undetermined formulation	
204	LN-2464	Isopropyl n-(3-chlorophenyl) carbamate	
205	LN-2469	ispropyl N-phenylthio-carbamate	
206	LN-2475	allyl N-(3-chlorophenyl)-carbamate	
207	LN-2478	ispropyl N-(2-chlorophenyl)-carbamate	
208	LN-2480	normal-propyl N-(3-chlorophenyl)-carbamate	
209	LN-2588	beta-chloroethyl N-(3-bromophenyl)-carbamate	
210	LN-2594	beta-chloroethyl N-(2,5-dichlorophenyl)-carbamate	
211	LN-2599	beta-chloroethyl N-(2,4-dimethylphenyl)-carbamate	
212	LN-2606	di-(2,(4'-chlorophenoxy)-ethyl)ether	
213	LN-2608	beta-chloroethyl N-(2,4-methylphenyl)-carbamate	
214	LN-2610	normal-propyl N-(3-methylphenyl)-carbamate	
215	LN-2612	beta-chloroethyl N-(3-methylphenyl)-carbamate	
216	LN-2616	ethyl N-(3-bromophenyl)-carbamate	
217	LN-2632	2-(4'-chlorophenoxy)-ethyl N-phenyl-carbamate	
218	LN-2634	2-(4'-chlorophenyl)-carbamate	
219	LN-2671	normal-propyl N-(3-nitrophenyl)-carbamate	
220	LN-2672	beta-chloroethyl N-(3-chlorophenyl)-carbamate	
221	LN-2687	ispropyl N-(2,5-dichlorophenyl)-carbamate	
222	LN-2694	ispropyl N-(3-methylphenyl)-carbamate	
223	LN-2705	ispropyl N-(3-bromophenyl)-carbamate	
224	LN-2743	o-methyl N-(3-bromophenyl) carbamate	
225	LN-2749	o-ethyl N-(3-chlorophenyl) carbamate	
226	LN-2759	2-bromo-5-iodobenzoic acid	
227	LN-2777	isopropyl 2,4,5-Trichlorophenoxyacetate	2,4,5-T related
228	LN-2809	2-(2'-isopropyl-5-methylphenoxy)-ethanol	
229	LN-2893	2,3-dichloro-5-iodobenzoic acid	
230	LN-2979	2,5-dibromaniline	
231	LN-3069	Ethyl 2,4-dibromophenoxyacetate	
232	LN-3078	Methyl 4-bromophenoxyacetate	
233	LN-315	Undetermined formulation	
234	LN-32	2-methyl-4-chlorophenoxyacetic acid	
235	LN-32+LN-2462	herbicide mixture	
236	LN-33	Isopropyl n-phenyl carbamate	
237	LN-372	Acetyl chloride of LN-8	2,4-D related
238	LN-379	Chloride of LN-14	2,4,5-T related
239	LN-380	2,4,5-trichlorophenoxyacetamide	2,4,5-T related
240	LN-385	2,3,5-trichlorobenzoic acid	
241	LN-401	Undetermined formulation	
242	LN-4016	dichloral urea	
243	LN-4056	n-(4-fluorophenyl)-n',n'-dimethyl urea	
244	LN-409	Undetermined formulation	
245	LN-4119	Isopropyl-4-fluorophenoxyacetate	
246	LN-4158	Undetermined formulation	
247	LN-416	Undetermined formulation	
248	LN-4218	Ethyl-4-fluorophenoxyacetate	
249	LN-4219	Propyl-4-fluorophenoxyacetate	
250	LN-4220	Butyl-4-fluorophenoxyacetate	
251	LN-4221	Amyl-4-fluorophenoxyacetate	
252	LN-4222	Beta-hydroxyethyl-4-fluorophenoxyacetate	
253	LN-4223	4-fluorophenoxyacetamide	
254	LN-4227	Ethylene bis-4-fluorophenoxyacetate	
255	LN-4321	n-3,4-dichlorophenyl n',n'-dimethyl urea	
256	LN-4322	n-(4-bromophenyl)-n',n'-dimethyl urea	
257	LN-4324	Beta-chloroethyl-4-fluorophenoxyacetate	
258	LN-4339	Dodecyl-4-fluorophenyl ether	
259	LN-4345	b-hydroxyethyl 2-methyl 4-fluorophenoxyacetate	
260	LN-4357	1,3-Dichloro-2-propyl-4-fluorophenoxyacetate	
261	LN-4359	Undetermined formulation	
262	LN-4372	(1-Carboisopropoxy)-ethyl-4-fluorophenoxyacetate	
263	LN-4373	2-Ethoxyethyl-4-fluorophenoxyacetate	
264	LN-4374	2(2-Hydroxyethoxy) ethyl-4-fluorophenoxyacetate	
265	LN-4384	Undetermined formulation	
266	LN-4397	3-Amino-1,2,4-triazole-f-fluorophenoxyacetate	
267	LN-44	Ethyl ester of LN-8	2,4-D related
268	LN-44+LN-33	herbicide mixture	2,4-D related
269	LN-44+LN-33+LN-379	herbicide mixture	2,4,5-T related and 2,4-D related

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
270	LN-44+LN-33+LN-379	herbicide mixture	2,4,5-T related and 2,4-D related
271	LN-44+LN-379	herbicide mixture	2,4,5-T related and 2,4-D related
272	LN-44+LN-379+LN-835	herbicide mixture	2,4,5-T related and 2,4-D related
273	LN-44+LN-835	herbicide mixture	2,4,5-T related and 2,4-D related
274	LN-4474	butyl 2,4-dichloro-5-fluorophenoxyphenoxyacetate	
275	LN-4497	2-chloroethyl 2,4-dichloro-5-fluorophenoxyacetate	
276	LN-4534	2-chloro-4-fluorophenoxyacetate	
277	LN-4543	unknown	
278	LN-458	2-methyl-4-fluorophenoxyacetic acid	
279	LN-4584	Undetermined formulation	
280	LN-4594	2-hydroxyethyl 2,4-dichloro-5-fluorophenoxyacetate	
281	LN-4595	isopropyl 2,4-dichloro-5-fluorophenoxyacetate	
282	LN-4596	Amyl 2,4-dichloro-5-fluorophenoxyacetate	
283	LN-4599	Propyl 2,4-dichloro-5-fluorophenoxyacetate	
284	LN-4633	Undetermined formulation	
285	LN-4634	Undetermined formulation	
286	LN-4639	B,B,B-trifluoroethyl 2,4-dichloro-5-fluorophenoxyacetate	
287	LN-4641	Tetrahydrofurfuryl 2,4-dichloro-5-fluorophenoxyacetate	
288	LN-4643	Ethylmercaptoethyl 2,4-dichloro-5-fluorophenoxyacetate	
289	LN-4644	Tert-butyl 2,4-dichloro-5-fluorophenoxyacetate	
290	LN-49	Alpha-2,4-dichlorophenoxybutyric acid	
291	LN-5	Ethyl parachlorophenoxyacetate	
292	LN-539	Thiourea	
293	LN-620	N-(dichlorophenoxyacetyl) trea	
294	LN-633	Undetermined formulation	
295	LN-658	Guanidine of LN-8	2,4-D related
296	LN-67	methyl 2-bromo-3-benzoate	
297	LN-687	Undetermined formulation	
298	LN-69	Parabromophenoxyacetic acid ethyl ester	
299	LN-694	Undetermined derivative of LN-14	2,4,5-T related
300	LN-699	Undetermined formulation	
301	LN-719	2-bromo-3,5-dichlorobenzoic acid	
302	LN-724	2,3,5-tribromobenzoic acid	
303	LN-73	2-chloro-3-nitrobenzoic acid	
304	LN-74	Undetermined formulation	
305	LN-761	Anhydride of LN-8	2,4-D related
306	LN-773	Undetermined derivative of LN-14	2,4,5-T related
307	LN-8	2,4-dichlorophenoxyacetic acid	2,4-D
308	LN-8+ammonium sulfamate	herbicide mixture	2,4-D
309	LN-8+ammonium thiocyanate	herbicide mixture	2,4-D
310	LN-8+copper chloride	herbicide mixture	2,4-D
311	LN-8+KSCN	herbicide mixture	
312	LN-8+LN-14	herbicide mixture	2,4,5-T & 2,4-D
313	LN-8+LN-14+LN-33	herbicide mixture	2,4,5-T & 2,4-D
314	LN-8+LN-14+LN-33	herbicide mixture	2,4,5-T & 2,4-D
315	LN-8+LN-14+LN-379	herbicide mixture	2,4,5-T & 2,4-D
316	LN-8+LN-2462	herbicide mixture	2,4-D
317	LN-8+LN-32+LN-379	herbicide mixture	2,4,5-T related & 2,4-D
318	LN-8+LN-33	herbicide mixture	2,4-D
319	LN-8+LN-33+LN-379	herbicide mixture	2,4,5-T related & 2,4-D
320	LN-8+LN-372	herbicide mixture	2,4-D
321	LN-8+LN-379	herbicide mixture	2,4-D & 2,4,5-T related
322	LN-8+LN-539	herbicide mixture	
323	LN-80	Undetermined formulation	
324	LN-810	Undetermined formulation	
325	LN-811	2-(2-methyl-4-chlorophonoxyacetylamine)-naphthalene-6,8-disulfonic acid	
326	LN-9	2-bromo-3-nitrobenzoic acid	
327	LN-90	Gamma-2,4-dichlorophenoxybutyric acid	
328	LN-93	2-bromo-4-chlorophenoxypropionic acid	
329	LN-951	Pentachlorophenyl 2,4,5-Trichlorophenoxyacetate	2,4,5-T related
330	LN-974	Butyl 2,4,5-trichlorophenoxyacetate	2,4,5-T related
331	LN-974+KClO3	herbicide mixture	2,4,5-T related
332	LN-974+KOCN	herbicide mixture	2,4,5-T related

Table D-1 Comprehensive List of Herbicides Field Tested at Fort			
	Herbicide code(or name if no code assigned)	**NAME**	**group descr**
333	LN-974+LN-1700	herbicide mixture	2,4,5-T related
334	LN-974+LN-1999	herbicide mixture	2,4,5-T related
335	LN-974+NaTCA	herbicide mixture	2,4,5-T related
336	Magnesium chlorate	Magnesium chlorate	
337	Maleic hydrazide	Maleic hydrazide	
338	NaTCA	sodium trichloroacetate	
339	o-pentachlorophenyl-N-phenylcarbamate	o-pentachlorophenyl-N-phenylcarbamate	
340	Orange	50% 2,4-dichlorophenoxyacetic acid, 50% 2,4,5-trichlorophenoxyacetic acid	2,4,5-T & 2,4-D
341	pentachlorophenol	2,3,4,5,6-Pentachlorophenol	
342	pentachlorophenyl-2,4-dichlorophenoxyacetate	pentachlorophenyl-2,4-dichlorophenoxyacetate	
343	pentachlorophenyl-2-methyl-4-chlorophenoxyacetate	pentachlorophenyl-2-methyl-4-chlorophenoxyacetate	
344	pentachlorophenyl-4-chlorophenoxyacetate	pentachlorophenyl-4-chlorophenoxyacetate	
345	pentachlorophenyl-N-phenylcarbamate	pentachlorophenyl-N-phenylcarbamate	
346	Phosphoric acid	Phosphoric acid	
347	Picloram	4-amino-3,5,6-trichloropicolinic acid	
348	Polychlorobenzoic acid 103	mix of polychlorobenzoic acids	
349	Polychlorobenzoic acid 177	mix of polychlorobenzoic acids	
350	propyl 2,4-difluorophenoxyacetate	Propyl 2,4-difluorophenoxyacetate	
351	Santomerse 3	3-dodecylbenzenesulfonate	
352	SD1369	P,P-dibutyl-N,N-diisopropyl-phosphinic amide	
353	Shed-a-leaf	sodium chlorate	
354	Shell #10	herbicidal oil	
355	Shell #11	herbicidal oil	
356	Shell #20	herbicidal oil	
357	Sodium chlorate	Shed-a-leaf	
358	sodium chlorate + sodium pentachlorate	herbicide mixture	
359	Tandex	m-(3,3-Dimethylureido)phenyl-tert-butyl-carbamate	
360	TBP	Tributyl phosphate	
361	TBP+oil	herbicide mixture	
362	TCA	trichloroacetic acid	
363	Tributyl phosphate	Tributyl phosphate	
364	triethanolamine 2,4-trichlorophenoxyacetate	triethanolamine 2,4-trichlorophenoxyacetate	
365	Triton 155	DuPont herbicide	
366	VKL	LN-8+TBP	2,4-D
367	Weedone 2,4-D	LN-8 ester	2,4-D
368	White	Picloram and 2,4,dichlorophenoxyacetic acid	2,4-D

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD331, Exp 618, LN agents & potatoes	1945	LN-14
CD331, Exp 618, LN agents & potatoes	1945	LN-182
CD331, Exp 618, LN agents & potatoes	1945	LN-183
CD331, Exp 618, LN agents & potatoes	1945	LN-194
CD331, Exp 618, LN agents & potatoes	1945	LN-195
CD331, Exp 618, LN agents & potatoes	1945	LN-32
CD331, Exp 618, LN agents & potatoes	1945	LN-33
CD331, Exp 618, LN agents & potatoes	1945	LN-379
CD331, Exp 618, LN agents & potatoes	1945	LN-401
CD331, Exp 618, LN agents & potatoes	1945	LN-409
CD331, Exp 618, LN agents & potatoes	1945	LN-416
CD331, Exp 618, LN agents & potatoes	1945	LN-633
CD331, Exp 618, LN agents & potatoes	1945	LN-687
CD331, Exp 618, LN agents & potatoes	1945	LN-694
CD331, Exp 618, LN agents & potatoes	1945	LN-699
CD331, Exp 618, LN agents & potatoes	1945	LN-773
CD331, Exp 618, LN agents & potatoes	1945	LN-8
CD331, Exp 618, LN agents & potatoes	1945	LN-8+LN-14+LN-33
CD331, Exp 618, LN agents & potatoes	1945	LN-8+LN-33+LN-379
CD331, Exp 618, LN agents & potatoes	1945	LN-80
CD331, Exp 618, LN agents & potatoes	1945	LN-810
CD331, Exp 618, LN agents & potatoes	1945	LN-811
CD331, Exp 618, LN agents & potatoes	1945	TBP
CD331, Exp 624, LN agents & millet	1945	LN-14
CD331, Exp 624, LN agents & millet	1945	LN-143
CD331, Exp 624, LN agents & millet	1945	LN-155
CD331, Exp 624, LN agents & millet	1945	LN-2
CD331, Exp 624, LN agents & millet	1945	LN-32
CD331, Exp 624, LN agents & millet	1945	LN-33
CD331, Exp 624, LN agents & millet	1945	LN-372
CD331, Exp 624, LN agents & millet	1945	LN-379
CD331, Exp 624, LN agents & millet	1945	LN-8
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-14+LN-33
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-14+LN-379
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-32+LN-379
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-33+LN-379
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-372
CD331, Exp 624, LN agents & millet	1945	LN-8+LN-379
CD331, Exp 624, LN agents & millet	1945	TBP
CD331, Exp 625, LN agents & sudan grass	1945	LN-14
CD331, Exp 625, LN agents & sudan grass	1945	LN-143
CD331, Exp 625, LN agents & sudan grass	1945	LN-143+LN-32+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-143+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-143+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-143+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-155
CD331, Exp 625, LN agents & sudan grass	1945	LN-155+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-155+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-155+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-182
CD331, Exp 625, LN agents & sudan grass	1945	LN-182+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-182+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-182+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-183
CD331, Exp 625, LN agents & sudan grass	1945	LN-183+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-183+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-183+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-184
CD331, Exp 625, LN agents & sudan grass	1945	LN-184+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-184+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-184+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-2
CD331, Exp 625, LN agents & sudan grass	1945	LN-32
CD331, Exp 625, LN agents & sudan grass	1945	LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-44+LN-33
CD331, Exp 625, LN agents & sudan grass	1945	LN-44+LN-33+LN-379
CD331, Exp 625, LN agents & sudan grass	1945	LN-44+LN-379

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD331, Exp 625, LN agents & sudan grass	1945	LN-8
CD333, Observational Soil Contamination	1945	LN-8
CD333, Observational Soil Contamination	1945	LN-8+LN-14+LN-33
SR 79, Crop Susceptibility, soil contamination	1945	LN-14
SR 79, Crop Susceptibility, soil contamination	1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1945	LN-8+LN-14
SR 79, Crop Susceptibility, soil contamination	1945	LN-8+LN-14+LN-33
SR 79, Crop Susceptibility, soil contamination	1945	LN-8+LN-33
SR 79, Crop Susceptibility, soil contamination	1945	LN-8+LN-33
SR 79, Irish Potatoes spray aqueous & non-aqueous	1945	LN-14
SR 79, persistance in soils, carrier test 2	1945	LN-8
SR 79, Soil contamination Soybean Persistance test	1945	LN-14
SR 79, Soil contamination Soybean Persistance test	1945	LN-8
CD482, Demonstrational Spray Exp	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1946	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1946	LN-32
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-2076
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-44
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1946	LN-974
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1946	ammonium sulfamate
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1946	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1946	TBP
SR 92, Size of Droplet Exp. 1	1946	LN-14
SR 92, Size of Droplet Exp. 1	1946	LN-974
SR 92, Size of Droplet Exp. 2	1946	LN-44
SR 92, Size of Droplet Exp. 2	1946	LN-8
SR 92, SOIL, Inhibitor & Stage of Develop Study Exp. 1	1946	LN-33
SR 92, SOIL, Inhibitor & Stage of Develop Study Exp. 1	1946	LN-8
SR 92, SOIL, Persistance Study Experiment 1	1946	LN-14
SR 92, SOIL, Persistance Study Experiment 1	1946	LN-32
SR 92, SOIL, Persistance Study Experiment 1	1946	LN-33
SR 92, SOIL, Persistance Study Experiment 1	1946	LN-8
SR 92, Stage of Devlop Study Exp. 1	1946	ammonium sulfamate
SR 92, Stage of Devlop Study Exp. 1	1946	LN-33
SR 92, Stage of Devlop Study Exp. 1	1946	LN-8
SR 92, Stage of Devlop Study Exp. 1	1946	TBP
SR 92, Vol-Conc. Spray Exp. 1	1946	LN-14
SR 92, Vol-Conc. Spray Exp. 1	1946	LN-14
SR 92, Vol-Conc. Spray Exp. 1	1946	TBP
SR 92, Vol-Conc. Spray Exp. 2	1946	LN-8
CD595, Broadleaf demonstration area	1947	LN-14
CD595, Broadleaf demonstration area	1947	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	isopropyl 2,4-dichlorophenoxyacetic acid
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	isopropyl 2-methyl 4-chlorophenoxyacetate
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	LN-458
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	LN-8
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	LN-951
SR 92, Compare Aqueous vs Non-Aqueous Exp. 1	1947	LN-974
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1947	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1947	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1947	LN-951
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1947	LN-974
SR 92, Compare Aqueous vs Non-Aqueous Exp. 2	1947	TBP
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1947	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1947	LN-14
SR 92, Compare Aqueous vs Non-Aqueous Exp. 3	1947	LN-974
SR 92, Firebreaks	1947	LN-14
SR 92, Firebreaks	1947	LN-14
SR 92, Firebreaks	1947	LN-14
SR 92, Firebreaks	1947	LN-14+LN-33
SR 92, Firebreaks	1947	LN-33

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 92, Firebreaks	1947	LN-8
SR 92, Observ. Spray Exp. 1	1947	132
SR 92, Observ. Spray Exp. 1	1947	#2 fuel oil
SR 92, Observ. Spray Exp. 1	1947	34520-R
SR 92, Observ. Spray Exp. 1	1947	50533-R
SR 92, Observ. Spray Exp. 1	1947	50533-R+50534-R
SR 92, Observ. Spray Exp. 1	1947	50534-R
SR 92, Observ. Spray Exp. 1	1947	50715-R
SR 92, Observ. Spray Exp. 1	1947	50715-R+50754-R
SR 92, Observ. Spray Exp. 1	1947	50754-R
SR 92, Observ. Spray Exp. 2	1947	132
SR 92, Observ. Spray Exp. 2	1947	34520
SR 92, Observ. Spray Exp. 2	1947	50534
SR 92, Observ. Spray Exp. 2	1947	50754
SR 92, Observ. Spray Exp. 2	1947	LN-14
SR 92, Observ. Spray Exp. 2	1947	LN-2425
SR 92, Observ. Spray Exp. 2	1947	Shell #10
SR 92, Observ. Spray Exp. 2	1947	Shell #11
SR 92, Observ. Spray Exp. 2	1947	Shell #20
SR 92, Observ. Spray Exp. 3	1947	ammonium 2,4-dichlorophenoxyacetate
SR 92, Observ. Spray Exp. 3	1947	LN-14
SR 92, Observ. Spray Exp. 3	1947	LN-14
SR 92, Observ. Spray Exp. 3	1947	LN-458
SR 92, Observ. Spray Exp. 3	1947	LN-8
SR 92, Observ. Spray Exp. 4	1947	2,4-dichlorophenoxyacetyl thiocyanate
SR 92, Observ. Spray Exp. 4	1947	ethyl 2,4-dichlorophenoxyacetate
SR 92, Observ. Spray Exp. 4	1947	LN-14
SR 92, Observ. Spray Exp. 4	1947	LN-32
SR 92, SOIL, Inhibitor & Stage of Develop Study Exp. 1	1947	LN-14
SR 92, SOIL, Inhibitor & Stage of Develop Study Exp. 1	1947	LN-8
SR 92, SOIL, Inhibitor & Stage of Develop Study Exp. 1	1947	LN-951
SR 92, SOIL, Inhibitor Exp. 1	1947	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetic acid
SR 92, SOIL, Inhibitor Exp. 1	1947	2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 1	1947	4-chlorophenoxyacetic acid
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-11
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-2370
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-2375
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-2394
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-243
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-385
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-458
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-719
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-724
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-8
SR 92, SOIL, Inhibitor Exp. 1	1947	LN-9
SR 92, SOIL, Inhibitor Exp. 1	1947	pentachlorophenol
SR 92, SOIL, Inhibitor Exp. 1	1947	pentachlorophenyl-2-methyl-4-chlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 1	1947	pentachlorophenyl-4-chlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 1	1947	pentachlorophenyl-N-phenylcarbamate
SR 92, SOIL, Inhibitor Exp. 2	1947	LN-14
SR 92, SOIL, Inhibitor Exp. 2	1947	LN-33
SR 92, SOIL, Inhibitor Exp. 3	1947	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 3	1947	2,4-dichlorophenyl 2,4,5-Trichlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-11
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-13
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-2370
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-2375
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-2394
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-243
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-385
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-458
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-719
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-724
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-8
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-9
SR 92, SOIL, Inhibitor Exp. 3	1947	LN-951
SR 92, SOIL, Inhibitor Exp. 3	1947	o-pentachlorophenyl-N-phenylcarbamate

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 92, SOIL, Inhibitor Exp. 3	1947	pentachlorophenyl
SR 92, SOIL, Inhibitor Exp. 3	1947	pentachlorophenyl-2-methyl-4-chlorophenoxyacetate
SR 92, SOIL, Inhibitor Exp. 3	1947	pentachlorophenyl-4-chlorophenoxyacetate
SR 92, SOIL, Observational Study Experiment 1	1947	LN-14
SR 92, SOIL, Observational Study Experiment 1	1947	LN-33
SR 92, SOIL, Observational Study Experiment 2	1947	LN-14
SR 92, SOIL, Observational Study Experiment 2	1947	LN-951
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Particle Size	1947	LN-14
SR 92, SOIL, Persistance Study Experiment 1	1947	2,3-dichlorophenyl-4-chlorophenoxyacetate
SR 92, SOIL, Persistance Study Experiment 1	1947	2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetic acid
SR 92, SOIL, Persistance Study Experiment 1	1947	2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate
SR 92, SOIL, Persistance Study Experiment 1	1947	4-chlorophenoxyacetic acid
SR 92, SOIL, Persistance Study Experiment 1	1947	beta-chlorophenyl-N-phenylcarbamate
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-11
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-13
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-14
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-2370
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-32
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-385
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-719
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-724
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-73
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-8
SR 92, SOIL, Persistance Study Experiment 1	1947	LN-9
SR 92, SOIL, Persistance Study Experiment 1	1947	pentachlorophenyl
SR 92, SOIL, Persistance Study Experiment 1	1947	pentachlorophenyl-2,4-dichlorophenoxyacetate
SR 92, SOIL, Persistance Study Experiment 1	1947	pentachlorophenyl-2-methyl-4-chlorophenoxyacetate
SR 92, SOIL, Persistance Study Experiment 1	1947	pentachlorophenyl-4-chlorophenoxyacetate
SR 92, SOIL, Persistance Study Experiment 1	1947	pentachlorophenyl-N-phenylcarbamate
SR 92, SOIL, Persistance Study Experiment 2	1947	LN-33
SR 92, SOIL, Stage of Develop Study Exp. 1	1947	LN-33
SR 92, Stage of Devlop Study Exp. 1	1947	LN-33
SR 92, Stage of Devlop Study Exp. 2	1947	LN-14
SR 92, Stage of Devlop Study Exp. 2	1947	LN-951
SR 92, Stage of Devlop Study Exp. 3	1947	LN-974
SR 92, Vol-Conc. Spray Exp. 1	1947	LN-14
SR 92, Vol-Conc. Spray Exp. 1	1947	LN-14
CD677, Demonstration - Observation on Broadleaves	1948	LN-14
CD677, Demonstration - Observation on Broadleaves	1948	LN-2426
CD677, Demonstration - Observation on Broadleaves	1948	LN-719
CD677, Demonstration - Observation on Broadleaves	1948	LN-8
SR 105, Agent Comp Spray Exp. 1	1948	Esteron 44
SR 105, Agent Comp Spray Exp. 1	1948	LN-14
SR 105, Agent Comp Spray Exp. 1	1948	LN-143
SR 105, Agent Comp Spray Exp. 1	1948	LN-2777
SR 105, Agent Comp Spray Exp. 1	1948	LN-719
SR 105, Agent Comp Spray Exp. 1	1948	LN-8
SR 105, Agent Comp Spray Exp. 2	1948	LN-14
SR 105, Agent Comp Spray Exp. 2	1948	LN-8
SR 105, Agent Comp Spray Exp. 3	1948	LN-14
SR 105, Agent Comp Spray Exp. 3	1948	LN-2777
SR 105, Agent Comp Spray Exp. 3	1948	LN-974
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-243
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2480
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2588
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2594
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2599
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2608
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2610
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2612
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2616
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2632

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2634
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2671
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2672
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2687
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2694
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-2705
SR 105, Agent Comparisons on cereals, Exp. 1	1948	LN-33
SR 105, Agent Comparisons on cereals, Exp. 2	1948	LN-2464
SR 105, Agent Comparisons on cereals, Exp. 2	1948	LN-2469
SR 105, Agent Comparisons on cereals, Exp. 2	1948	LN-2475
SR 105, Agent Comparisons on cereals, Exp. 2	1948	LN-2478
SR 105, Agent Comparisons on cereals, Exp. 2	1948	LN-33
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-11
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-13
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-2370
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-2375
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-2394
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-2399
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-2404
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-33
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-385
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-67
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-719
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-724
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-73
SR 105, Agent Comparisons on cereals, Exp. 3	1948	LN-9
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2370
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2374
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2387
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2388
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2392
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2394
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2416
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2418
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-2452
SR 105, Agent Comparisons on cereals, Exp. 4	1948	LN-33
SR 105, Carrier Spray Exp.	1948	LN-8
SR 105, Coagent Spray Exp.	1948	ammonium sulfamate
SR 105, Coagent Spray Exp.	1948	ammonium thiocyanate
SR 105, Coagent Spray Exp.	1948	copper chloride
SR 105, Coagent Spray Exp.	1948	LN-33
SR 105, Coagent Spray Exp.	1948	LN-8
SR 105, Coagent Spray Exp.	1948	LN-8+ammonium sulfamate
SR 105, Coagent Spray Exp.	1948	LN-8+ammonium thiocyanate
SR 105, Coagent Spray Exp.	1948	LN-8+copper chloride
SR 105, Effects of Carbamate on Cereals, Exp. 1	1948	LN-33
SR 105, Effects of Carbamate on Cereals, Exp. 2	1948	LN-33
SR 105, SOIL AP-Agent Comp -Stage of Development	1948	LN-14
SR 105, SOIL AP-Agent Comp -Stage of Development	1948	LN-2426
SR 105, SOIL AP-Agent Comp -Stage of Development	1948	LN-719
SR 105, SOIL AP-Agent Comparisons	1948	LN-14
SR 105, SOIL AP-Agent Comparisons	1948	LN-2370
SR 105, SOIL AP-Agent Comparisons	1948	LN-2374
SR 105, SOIL AP-Agent Comparisons	1948	LN-2387
SR 105, SOIL AP-Agent Comparisons	1948	LN-2388
SR 105, SOIL AP-Agent Comparisons	1948	LN-2392
SR 105, SOIL AP-Agent Comparisons	1948	LN-2394
SR 105, SOIL AP-Agent Comparisons	1948	LN-2416
SR 105, SOIL AP-Agent Comparisons	1948	LN-719
SR 105, SOIL AP-Comp LN14 EXP 1	1948	LN-14
SR 105, SOIL AP-Comp LN14 EXP 2	1948	LN-14
SR 105, SOIL AP-Persistance Study	1948	LN-14
SR 105, SOIL AP-Persistance Study	1948	LN-2370
SR 105, SOIL AP-Persistance Study	1948	LN-2374
SR 105, SOIL AP-Persistance Study	1948	LN-2375
SR 105, SOIL AP-Persistance Study	1948	LN-2387
SR 105, SOIL AP-Persistance Study	1948	LN-2388
SR 105, SOIL AP-Persistance Study	1948	LN-2392
SR 105, SOIL AP-Persistance Study	1948	LN-2394

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 105, SOIL AP-Persistance Study	1948	LN-2395
SR 105, SOIL AP-Persistance Study	1948	LN-2416
SR 105, SOIL AP-Persistance Study	1948	LN-2418
SR 105, SOIL AP-Persistance Study	1948	LN-2426
SR 105, SOIL AP-Persistance Study	1948	LN-2452
SR 105, SOIL AP-Persistance Study	1948	LN-2759
SR 105, SOIL AP-Persistance Study	1948	LN-385
SR 105, SOIL AP-Persistance Study	1948	LN-719
SR 105, SOIL AP-Persistance Study	1948	LN-8
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	Dow contact
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	Dow contact+LN-8
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-14
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-14
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-14
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-33
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-8
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-8
SR 105, SOIL AP-Veg Control of Unplowed Area	1948	LN-8+LN-33
SR 105, Stage of Dev. Spray Exp. 1	1948	LN-33
SR 105, Stage of Dev. Spray Exp. 2	1948	LN-14
SR 105, Stage of Dev. Spray Exp. 2	1948	LN-2426
SR 105, Vol-Conc. Spray Exp. 1	1948	LN-14
SR 105, Vol-Conc. Spray Exp. 2	1948	LN-14
SR 105, Vol-Conc. Spray Exp. 3	1948	LN-33
SR 105, Vol-Conc. Spray Exp. 3	1948	TBP
SR 130 Firebreak Exp	1948	ammonium sulfamate
SR 130 Firebreak Exp	1948	arsenic trioxide
SR 130 Firebreak Exp	1948	LN-14
SR 130 Firebreak Exp	1948	LN-8
SR 130 Soil Apl Stage of Devel Exp. 2	1948	LN-33
SR 130 Benzoic Acid Exp.	1949	LN-719
SR 130 Droplet Size Test	1949	LN-14
SR 130 Droplet Size Test	1949	LN-974
SR 130 Minimum Number of Droplets Test	1949	LN-974
SR 130 Soil Apl Agent Exp. 1	1949	LN-4016
SR 130 Soil Apl Agent Exp. 1	1949	TCA
SR 130 Soil Apl Agent Exp. 2	1949	LN-2464
SR 130 Soil Apl Agent Exp. 2	1949	LN-2608
SR 130 Soil Apl Agent Exp. 2	1949	LN-2694
SR 130 Soil Apl Agent Exp. 2	1949	LN-2705
SR 130 Soil Apl Agent Exp. 2	1949	LN-2743
SR 130 Soil Apl Agent Exp. 2	1949	LN-2749
SR 130 Soil Apl Agent Exp. 2	1949	LN-33
SR 130 Soil Apl Batch Compar Exp.	1949	LN-33
SR 130 Soil Apl LN-719 Exp.	1949	LN-719
SR 130 Soil Apl Solution Compar Exp.	1949	LN-33
SR 130 Soil Apl Stage of Devel Exp. 1	1949	LN-2464
SR 130 Soil Apl Stage of Devel Exp. 1	1949	LN-2469
SR 130 Soil Apl Stage of Devel Exp. 1	1949	LN-2475
SR 130 Soil Apl Stage of Devel Exp. 1	1949	LN-2478
SR 130 Soil Apl Stage of Devel Exp. 1	1949	LN-33
SR 130 Soil Apl Stage of Devel Exp. 3	1949	LN-33
SR 130 Soil Apl Surface Agents Exp.	1949	LN-33
SR 130, Carrier Spray, Exp. 1	1949	LN-14
SR 130, Carrier Spray, Exp. 1	1949	LN-14
SR 130, Carrier Spray, Exp. 2	1949	LN-8
SR 130, Comp. Spray, Exp. 1	1949	LN-2464
SR 130, Comp. Spray, Exp. 1	1949	LN-33
SR 130, Comp. Spray, Exp. 10	1949	LN-143
SR 130, Comp. Spray, Exp. 10	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 10	1949	LN-974
SR 130, Comp. Spray, Exp. 11	1949	LN-143
SR 130, Comp. Spray, Exp. 11	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 11	1949	LN-974
SR 130, Comp. Spray, Exp. 12	1949	LN-143
SR 130, Comp. Spray, Exp. 12	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 12	1949	LN-974
SR 130, Comp. Spray, Exp. 13	1949	LN-143
SR 130, Comp. Spray, Exp. 13	1949	LN-143+LN-974

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 130, Comp. Spray, Exp. 13	1949	LN-974
SR 130, Comp. Spray, Exp. 14	1949	LN-143
SR 130, Comp. Spray, Exp. 14	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 14	1949	LN-974
SR 130, Comp. Spray, Exp. 2	1949	LN-143
SR 130, Comp. Spray, Exp. 2	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 2	1949	LN-974
SR 130, Comp. Spray, Exp. 3	1949	LN-143
SR 130, Comp. Spray, Exp. 3	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 3	1949	LN-974
SR 130, Comp. Spray, Exp. 4	1949	LN-143
SR 130, Comp. Spray, Exp. 4	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 4	1949	LN-974
SR 130, Comp. Spray, Exp. 5	1949	LN-143
SR 130, Comp. Spray, Exp. 5	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 5	1949	LN-974
SR 130, Comp. Spray, Exp. 6	1949	LN-143
SR 130, Comp. Spray, Exp. 6	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 6	1949	LN-974
SR 130, Comp. Spray, Exp. 7	1949	LN-143
SR 130, Comp. Spray, Exp. 7	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 7	1949	LN-974
SR 130, Comp. Spray, Exp. 8	1949	LN-143
SR 130, Comp. Spray, Exp. 8	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 8	1949	LN-974
SR 130, Comp. Spray, Exp. 9	1949	LN-143
SR 130, Comp. Spray, Exp. 9	1949	LN-143+LN-974
SR 130, Comp. Spray, Exp. 9	1949	LN-974
SR 130, Stage of Development Exp. 1	1949	LN-33
SR 130, Stage of Development Exp. 2	1949	LN-33
SR 130, Vol-Conc. Spray Exp. 1	1949	LN-14
SR 130, Vol-Conc. Spray Exp. 2	1949	LN-14
SR 130, Vol-Conc. Spray Exp. 2	1949	LN-974
SR 130, Vol-Conc. Spray Exp. 3	1949	LN-2462
SR 153, Soil Appl Exp 1	1949	LN-33
SR 153, Soil Appl Exp 3a	1949	LN-33
SR 153, Agent Comparison Spray Exp. 1	1950	LN-143
SR 153, Agent Comparison Spray Exp. 1	1950	LN-974
SR 153, Agent Comparison Spray Exp. 1	1950	LN-974
SR 153, Agent Comparison Spray Exp. 2	1950	LN-143
SR 153, Agent Comparison Spray Exp. 2	1950	LN-974
SR 153, Agent Comparison Spray Exp. 2	1950	LN-974
SR 153, Agent Comparison Spray Exp. 3	1950	LN-143
SR 153, Agent Comparison Spray Exp. 3	1950	LN-974
SR 153, Agent Comparison Spray Exp. 3	1950	LN-974
SR 153, Agent Comparison Spray Exp. 4	1950	LN-143
SR 153, Agent Comparison Spray Exp. 4	1950	LN-2464
SR 153, Agent Comparison Spray Exp. 4	1950	LN-974
SR 153, Agent Comparison Spray Exp. 5	1950	LN-143
SR 153, Agent Comparison Spray Exp. 5	1950	LN-2464
SR 153, Agent Comparison Spray Exp. 5	1950	LN-974
SR 153, Agent Comparison Spray Exp. 6	1950	LN-143
SR 153, Agent Comparison Spray Exp. 6	1950	LN-974
SR 153, Agent Comparison Spray Exp. 7	1950	LN-143
SR 153, Agent Comparison Spray Exp. 7	1950	LN-155
SR 153, Agent Comparison Spray Exp. 7	1950	LN-156
SR 153, Agent Comparison Spray Exp. 7	1950	LN-167
SR 153, Agent Comparison Spray Exp. 7	1950	LN-171
SR 153, Agent Comparison Spray Exp. 7	1950	LN-1814
SR 153, Agent Comparison Spray Exp. 7	1950	LN-2170
SR 153, Agent Comparison Spray Exp. 7	1950	LN-44
SR 153, Agent Comparison Spray Exp. 7	1950	LN-974
SR 153, Agent Rate Comparison	1950	LN-14
SR 153, Droplet Size Spray Exp. 1	1950	LN-2464
SR 153, Droplet Size Spray Exp. 2	1950	LN-974
SR 153, Droplet Size Spray Exp. 3	1950	LN-974
SR 153, Droplet Size Spray Exp. 4	1950	LN-143
SR 153, Droplet Size Spray Exp. 5	1950	LN-974
SR 153, Exp 1 Persistence of Plant Inhibitors in Progeny	1950	LN-14

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 153, Exp 1 Persistence of Plant Inhibitors in Progeny	1950	LN-719
SR 153, Exp 1 Persistence of Plant Inhibitors in Progeny	1950	LN-8
SR 153, Exp 2 Persistence of Plant Inhibitors in Progeny	1950	LN-14
SR 153, Exp 2 Persistence of Plant Inhibitors in Progeny	1950	LN-719
SR 153, Exp 2 Persistence of Plant Inhibitors in Progeny	1950	LN-8
SR 153, Maleic Hydrazide Spray Exp 1	1950	LN-1700
SR 153, Min. Volu Spray Exp. 1	1950	LN-974
SR 153, Min. Volu Spray Exp. 2	1950	LN-974
SR 153, Min. Volu Spray Exp. 4	1950	LN-143
SR 153, Min. Volu Spray Exp. 5	1950	LN-974
SR 153, Minimum Amount of Dust Study	1950	LN-14
SR 153, Point of Apl Spray Exp 1	1950	LN-2464
SR 153, Point of Apl Spray Exp 1	1950	LN-33
SR 153, Soil Appl Exp 2	1950	LN-2464
SR 153, Soil Appl Exp 2	1950	LN-33
SR 153, Soil Appl Exp 3b	1950	Aresklene 400
SR 153, Soil Appl Exp 3b	1950	LN-33
SR 153, Soil Appl Exp 3b	1950	Santomerse 3
SR 153, Soil Appl Exp 4	1950	LN-33
SR 153, Stage of Devel Spray Exp. 1	1950	LN-2464
SR 153, Stage of Devel Spray Exp. 2	1950	LN-2464
SR 153, Stage of Devel Spray Exp. 2	1950	LN-33
SR 153, Stage of Devel Spray Exp. 3	1950	LN-143
SR 153, Stage of Devel Spray Exp. 3	1950	LN-974
SR 153, Vegetative Control	1950	Dow Premerge
SR 153, Vegetative Control	1950	LN-14
SR 153, Vegetative Control	1950	LN-14
SR 153, Vegetative Control	1950	LN-14+LN-2462
SR 153, Vegetative Control	1950	LN-14+LN-33
SR 153, Vegetative Control	1950	LN-1700
SR 153, Vegetative Control	1950	LN-2464
SR 153, Vegetative Control	1950	LN-32
SR 153, Vegetative Control	1950	LN-32+LN-2462
SR 153, Vegetative Control	1950	LN-33
SR 153, Vegetative Control	1950	LN-8
SR 153, Vegetative Control	1950	LN-8+LN-14
SR 153, Vegetative Control	1950	LN-8+LN-2462
SR 153, Vegetative Control	1950	LN-8+LN-33
SR 156 Comparison of LN's on Rye	1950	LN-1700
SR 156 Comparison of LN's on Rye	1950	LN-1700+LN-2464
SR 156 Comparison of LN's on Rye	1950	LN-2464
SR 156 Comparison of LN's on Winter Wheat	1950	LN-1700
SR 156 Comparison of LN's on Winter Wheat	1950	LN-2464
SR 156 Droplet Size on Wheat	1950	LN-2464
SR 156 Droplet Size, Stage of Devel on Wheat	1950	LN-2464
SR 156 Soil Application Study LN-33 on Five Stages	1950	LN-33
SR 156 Soil Application Study LN-33 on Six Stages	1950	LN-33
SR 156 Soil Application Study LN-33, LN-1999	1950	LN-1999
SR 156 Soil Application Study LN-33, LN-1999	1950	LN-33
SR 156 Soil Application Study LN-33, LN-2464	1950	LN-2464
SR 156 Soil Application Study LN-33, LN-2464	1950	LN-33
SR 156 96% LN-974 on Irish Potatoes	1951	LN-974
SR 156 96% LN-974 on Oil Flax	1951	LN-974
SR 156 Compare to LN-143 on Eggplant	1951	LN-143
SR 156 Compare to LN-143 on Eggplant	1951	LN-974
SR 156 Compare to LN-143 on Hemp	1951	LN-143
SR 156 Compare to LN-143 on Hemp	1951	LN-974
SR 156 Compare to LN-143 on Kale	1951	LN-143
SR 156 Compare to LN-143 on Kale	1951	LN-974
SR 156 Compare to LN-143 on Lima Beans	1951	LN-143
SR 156 Compare to LN-143 on Lima Beans	1951	LN-974
SR 156 Compare to LN-143 on Mangels	1951	LN-143
SR 156 Compare to LN-143 on Mangels	1951	LN-974
SR 156 Compare to LN-143 on Peanuts	1951	LN-143
SR 156 Compare to LN-143 on Peanuts	1951	LN-974
SR 156 Compare to LN-143 on Rutabaga (Swede)	1951	LN-143
SR 156 Compare to LN-143 on Rutabaga (Swede)	1951	LN-974
SR 156 Compare to LN-143 on String Beans	1951	LN-143
SR 156 Compare to LN-143 on String Beans	1951	LN-974

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 156 Compare to LN-143 on Sugar Beets	1951	LN-143
SR 156 Compare to LN-143 on Sugar Beets	1951	LN-974
SR 156 Compare to LN-143 on Sunflower	1951	LN-143
SR 156 Compare to LN-143 on Sunflower	1951	LN-974
SR 156 Compare to LN-143 on Sweet Pepper	1951	LN-143
SR 156 Compare to LN-143 on Sweet Pepper	1951	LN-974
SR 156 Compare to LN-143 on Sweet Potatoes	1951	LN-143
SR 156 Compare to LN-143 on Sweet Potatoes	1951	LN-974
SR 156 Compare to LN-143 on Tobacco	1951	LN-143
SR 156 Compare to LN-143 on Tobacco	1951	LN-974
SR 156 Compare to LN-143 on Tomatoes	1951	LN-143
SR 156 Compare to LN-143 on Tomatoes	1951	LN-974
SR 156 Comparions of LN's dose on Soybeans	1951	LN-14
SR 156 Comparions of LN's dose on Soybeans	1951	LN-1856
SR 156 Comparions of LN's dose on Soybeans	1951	LN-1999
SR 156 Comparions of LN's on Beets	1951	LN-143
SR 156 Comparions of LN's on Beets	1951	LN-620
SR 156 Comparions of LN's on Beets	1951	LN-658
SR 156 Comparions of LN's on Beets	1951	LN-761
SR 156 Comparison of LN-974 mixed w/chems	1951	KClO3
SR 156 Comparison of LN-974 mixed w/chems	1951	KOCN
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-1700
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-1999
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974+KClO3
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974+KOCN
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974+LN-1700
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974+LN-1999
SR 156 Comparison of LN-974 mixed w/chems	1951	LN-974+NaTCA
SR 156 Comparison of LN-974 mixed w/chems	1951	NaTCA
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-143
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-144
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-146
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-147
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-148
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-153
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-156
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-1578
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-164
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-170
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-171
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-173
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-1787
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-1800
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2160
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2168
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2169
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2170
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2172
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2173
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2174
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2175
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2176
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2177
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2179
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2409
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2415
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2425
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2606
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2809
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2893
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-2979
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-3069
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-3078
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-44
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-458
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-5
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-620
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-658

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-69
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-761
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-9
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-90
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-93
SR 156 Comparison of LN-974 w/45 compounds	1951	LN-974
SR 156 Comparison of LN's on Irish Potatoes	1951	LN-14
SR 156 Comparison of LN's on Irish Potatoes	1951	LN-1856
SR 156 Comparison of LN's on Irish Potatoes	1951	LN-2426
SR 156 Comparison of LN's on Oats	1951	LN-1993
SR 156 Comparison of LN's on Oats	1951	LN-1999
SR 156 Comparison of LN's on Oats	1951	LN-2464
SR 156 Comparison of LN's on Oats	1951	LN-2464
SR 156 Comparison of LN's on Soybeans	1951	LN-14
SR 156 Comparison of LN's on Soybeans	1951	LN-620
SR 156 Comparison of LN's on Soybeans	1951	LN-658
SR 156 Comparison of LN's on Soybeans	1951	LN-761
SR 156 Comparison of LN's on Winter Wheat	1951	LN-143
SR 156 Comparison of LN's on Winter Wheat	1951	LN-1700
SR 156 Comparison of LN's on Winter Wheat	1951	LN-2464
SR 156 Comparison of LN's on Winter Wheat	1951	LN-974
SR 156 Comparison of LN's on Winter Wheat	1951	LN-2464
SR 156 Comparison of LN's on Winter Wheat	1951	LN-974
SR 156 Droplet Size on Soybeans	1951	LN-974
SR 156 LN 14 (TEA) with additives on Black Valentine Beans	1951	LN-14
SR 156 LN 14 (TEA) with additives on Black Valentine Beans	1951	LN-1999
SR 156 LN 14 (TEA) with additives on Black Valentine Beans	1951	LN-539
SR 156 LN 14 (TEA) with additives on Black Valentine Beans	1951	Phosphoric acid
SR 156 LN-14 w/additives on Sweet Potatoes	1951	KSCN
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-14
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-14+KSCN
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-14+LN-539
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-539
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-8
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-8+KSCN
SR 156 LN-14 w/additives on Sweet Potatoes	1951	LN-8+LN-539
SR 156 Test of LN-143 on Beets	1951	LN-143
SR 156 Test of LN-143 on Cabbage	1951	LN-143
SR 156 Test of LN-143 on Rutabega	1951	LN-143
SR 156 Top Application Dust Study	1951	LN-14
SR 156 Top Application Dust Study	1951	LN-2
SR 156 Top Application Dust Study	1951	LN-974
CD1775, Effect of 3-cl IPC on Quack grass	1952	3-cl IPC
CD1775, Vegetation Control Experiment	1952	3-cl IPC+Esteron 44
CD1775, Vegetation Control Experiment	1952	CMU
CD1775, Winter Wheat - Fall 1952 - Absorption Studies	1952	3-cl IPC
CD1775, Winter Wheat - Fall 1952 - Absorption Studies	1952	CMU
CD1775, Winter Wheat - Fall 1952 - Absorption Studies	1952	IPC
CD1775, Winter Wheat - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	3-cl IPC
CD1775, Winter Wheat - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	CMU
CD1775, Winter Wheat - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	IPC
CD1775, Winter Wheat - Fall 1952 - IPC	1952	IPC
CD1775, Winter Wheat - Fall 1952 - Persistence and Penetration	1952	3-cl IPC
CD1775, Winter Wheat - Fall 1952 - Persistence and Penetration	1952	IPC
CD1775, Winter Wheat and Rye - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	3-cl IPC
CD1775, Winter Wheat and Rye - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	CMU
CD1775, Winter Wheat and Rye - Fall 1952 - Agent Comparison Experiment - Soil Contamination	1952	IPC
SR 256, Eval on small field plots	1952	LN-1661
SR 256, Eval on small field plots	1952	LN-458
CD1775, Agent Comparison	1953	3-cl IPC
CD1775, Agent Comparison	1953	CMU
CD1775, Agent Comparison	1953	IPC
CD1775, Comparison of VKL, Triton 155 with ester formulation of 2,4-D on grasses and broadleaves	1953	Triton 155
CD1775, Comparison of VKL, Triton 155 with ester formulation of 2,4-D on grasses and broadleaves	1953	VKL
CD1775, Comparison of VKL, Triton 155 with ester formulation of 2,4-D on grasses and broadleaves	1953	Weedone 2,4-D

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD1775, Effects of Maleic Hydrazide on Grasses	1953	IPC
CD1775, Effects of Maleic Hydrazide on Grasses	1953	Maleic hydrazide
CD1775, Formulation Comparison	1953	IPC
CD1775, Krilinum experiment on grasses	1953	Krilinum
CD1775, Persistence and Penetration Studies	1953	3-cl IPC
CD1775, Persistence and Penetration Studies	1953	IPC
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1661
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1661
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1661
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1661
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1661
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1700
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-1700
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-2464
CD2081, Ontogeny of cereal crops, effect of inhibitors	1953	LN-2464
SR 201, Agents Released from Spray Tower	1953	LN-143+LN-974
SR 201, Agents Released from Spray Tower	1953	LN-143+LN-974
SR 234, Effectiveness applied as dusts	1953	LN-1661
SR 234, Effectiveness applied as dusts	1953	LN-1661
SR 234, Effectiveness applied as dusts	1953	LN-1661
SR 234, Effectiveness applied as dusts	1953	LN-1661
SR 234, Effectiveness applied as dusts	1953	LN-1661
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Effectiveness applied as dusts	1953	LN-458
SR 234, Eval on small field plots, broad-leaf	1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots, broad-leaf	1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots, broad-leaf	1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots, broad-leaf	1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots, broad-leaf	1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	LN-1661
SR 234, Eval on small field plots, broad-leaf	1953	LN-1661
SR 234, Eval on small field plots, broad-leaf	1953	LN-1661
SR 234, Eval on small field plots, broad-leaf	1953	LN-1661
SR 234, Eval on small field plots, broad-leaf	1953	LN-1662
SR 234, Eval on small field plots, broad-leaf	1953	LN-1662
SR 234, Eval on small field plots, broad-leaf	1953	LN-1662
SR 234, Eval on small field plots, broad-leaf	1953	LN-1662
SR 234, Eval on small field plots, broad-leaf	1953	LN-4119
SR 234, Eval on small field plots, broad-leaf	1953	LN-4119
SR 234, Eval on small field plots, broad-leaf	1953	LN-4119
SR 234, Eval on small field plots, broad-leaf	1953	LN-4119
SR 234, Eval on small field plots, broad-leaf	1953	LN-4219
SR 234, Eval on small field plots, broad-leaf	1953	LN-4219
SR 234, Eval on small field plots, broad-leaf	1953	LN-4220
SR 234, Eval on small field plots, broad-leaf	1953	LN-4220
SR 234, Eval on small field plots, broad-leaf	1953	LN-4221
SR 234, Eval on small field plots, broad-leaf	1953	LN-4221

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 234, Eval on small field plots, broad-leaf	1953	LN-4222
SR 234, Eval on small field plots, broad-leaf	1953	LN-4222
SR 234, Eval on small field plots, broad-leaf	1953	propyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots, broad-leaf	1953	propyl 2,4-difluorophenoxyacetate
SR 256, Eval on small field plots	1953	LN-1661
SR 256, Eval on small field plots	1953	LN-1661
SR 256, Eval on small field plots	1953	LN-1661
SR 256, Eval on small field plots	1953	LN-1661
SR 256, Eval on small field plots	1953	LN-1661
SR 256, Eval on small field plots	1953	LN-1662
SR 256, Eval on small field plots	1953	LN-4119
SR 256, Eval on small field plots	1953	LN-4221
SR 256, Eval on small field plots	1953	LN-4222
SR 256, Eval on small field plots	1953	LN-4324
SR 256, Eval on small field plots	1953	LN-4339
CD1775, Agent Comparison	1954	LN-10524
CD1775, Agent Comparison	1954	LN-10524
CD1775, Agent Comparison	1954	LN-10524
CD1775, Agent Comparison	1954	LN-10593
CD1775, Agent Comparison	1954	LN-10593
CD1775, Agent Comparison	1954	LN-10720
CD1775, Agent Comparison	1954	LN-10728
CD1775, Agent Comparison	1954	LN-10778
CD1775, Agent Comparison	1954	LN-10778
CD1775, Agent Comparison	1954	LN-11333
CD1775, Agent Comparison	1954	LN-11333
CD1775, Agent Comparison	1954	LN-1661
CD1775, Agent Comparison	1954	LN-1661
CD1775, Agent Comparison	1954	LN-1999
CD1775, Agent Comparison	1954	LN-1999
CD1775, Agent Comparison	1954	LN-1999
CD1775, Agent Comparison	1954	LN-4056
CD1775, Agent Comparison	1954	LN-4158
CD1775, Agent Comparison	1954	LN-4321
CD1775, Agent Comparison	1954	LN-4321
CD1775, Agent Comparison	1954	LN-4321
CD1775, Agent Comparison	1954	LN-4322
CD1775, Agent Comparison	1954	LN-4345
CD1775, Agent Comparison	1954	LN-4345
CD1775, Agent Comparison on rice	1954	LN-10593
CD1775, Agent Comparison on rice	1954	LN-10778
CD1775, Agent Comparison on rice	1954	LN-11333
CD1775, Agent Comparison on rice	1954	LN-143
CD1775, Agent Comparison on rice	1954	LN-1662
CD1775, Agent Comparison on rice	1954	LN-458
CD1775, CMU applied to rice water	1954	CMU
IR94, target marking	1954	DNSOP
IR94, target marking	1954	TBP
IR94, target marking	1954	CMU
IR94, target marking	1954	3-amino-1,2,4-triazole
SR 256, Eval on small field plots	1954	LN-10593
SR 256, Eval on small field plots	1954	LN-10593
SR 256, Eval on small field plots	1954	LN-10699
SR 256, Eval on small field plots	1954	LN-10778
SR 256, Eval on small field plots	1954	LN-10778
SR 256, Eval on small field plots	1954	LN-11333
SR 256, Eval on small field plots	1954	LN-11333
SR 256, Eval on small field plots	1954	LN-143
SR 256, Eval on small field plots	1954	LN-1661
SR 256, Eval on small field plots	1954	LN-1661
SR 256, Eval on small field plots	1954	LN-1661
SR 256, Eval on small field plots	1954	LN-1661
SR 256, Eval on small field plots	1954	LN-4119
SR 256, Eval on small field plots	1954	LN-4218
SR 256, Eval on small field plots	1954	LN-4219
SR 256, Eval on small field plots	1954	LN-4220
SR 256, Eval on small field plots	1954	LN-4221
SR 256, Eval on small field plots	1954	LN-4222
SR 256, Eval on small field plots	1954	LN-4223

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 256, Eval on small field plots	1954	LN-4227
SR 256, Eval on small field plots	1954	LN-4324
SR 256, Eval on small field plots	1954	LN-4357
SR 256, Eval on small field plots	1954	LN-4372
SR 256, Eval on small field plots	1954	LN-4373
SR 256, Eval on small field plots	1954	LN-4374
SR 256, Eval on small field plots	1954	LN-4397
SR 256, Eval on small field plots	1954	LN-458
SR 256, Eval on small field plots	1954	LN-974
SR 262, Field Experiments in 1954-55	1954	LN-10052
SR 262, Field Experiments in 1954-55	1954	LN-10052
SR 262, Field Experiments in 1954-55	1954	LN-10052
SR 262, Initial Field Tests in 1953-54	1954	LN-10052
SR 262, Initial Field Tests in 1953-54	1954	LN-10052
SR 262, Initial Field Tests in 1953-54	1954	LN-1661
CD2504, field defoliation	1955	butynediol
CD2504, field defoliation	1955	butynediol
CD2504, field defoliation	1955	butynediol
CD2504, field defoliation	1955	butynediol
CD2504, field defoliation	1955	endothal
CD2504, field defoliation	1955	endothal
CD2504, field defoliation	1955	endothal
CD2504, field defoliation	1955	endothal
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	herbicide not recorded
CD2504, field defoliation	1955	LN-10529
CD2504, field defoliation	1955	LN-115
CD2504, field defoliation	1955	LN-117
CD2504, field defoliation	1955	LN-12253
CD2504, field defoliation	1955	LN-12254
CD2504, field defoliation	1955	LN-12255
CD2504, field defoliation	1955	LN-13
CD2504, field defoliation	1955	LN-13115
CD2504, field defoliation	1955	LN-1626
CD2504, field defoliation	1955	LN-1816
CD2504, field defoliation	1955	LN-1817
CD2504, field defoliation	1955	LN-315
CD2504, field defoliation	1955	LN-380
CD2504, field defoliation	1955	LN-4359
CD2504, field defoliation	1955	LN-4384
CD2504, field defoliation	1955	LN-49
CD2504, field defoliation	1955	LN-74
CD2504, field defoliation	1955	LN-90
CD2504, field defoliation	1955	magnesium chlorate
CD2504, field defoliation	1955	magnesium chlorate
CD2504, field defoliation	1955	magnesium chlorate
CD2504, field defoliation	1955	magnesium chlorate
CD2504, field defoliation	1955	sodium chlorate + sodium pentachlorate
CD2504, field defoliation	1955	sodium chlorate + sodium pentachlorate
CD2504, field defoliation	1955	sodium chlorate + sodium pentachlorate
CD2886, field desiccation test	1956	bis(ethylxanthogen) trisulfide
CD2886, field desiccation test	1956	pentachlorophenol
CD2886, field desiccation test	1956	Shed-a-leaf
CD2886, field desiccation test	1956	TBP
CD2886, field screening test	1956	pentachlorophenol
CD2886, field screening test	1956	SD1369
CD2886, field screening test	1956	TBP
CD3053, field screening	1956	bis(ethylxanthogen) trisulfide
CD3053, field screening	1956	butynediol
CD3053, field screening	1956	diesel oil
CD3053, field screening	1956	diesel oil
CD3053, field screening	1956	endothal
CD3053, field screening	1956	pentachlorophenol
CD3053, field screening	1956	Shed-a-leaf

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD3053, field screening	1956	Shed-a-leaf
CD3053, field screening	1956	TBP
CD3053, field screening	1956	TBP
CD3053, field screening, wet foliage	1956	713D
CD3053, field screening, wet foliage	1956	endothal
CD3053, field screening, wet foliage	1956	pentachlorophenol
CD3053, field screening, wet foliage	1956	Shed-a-leaf
CD3053, field screening, wet foliage	1956	TBP
CD3153, Comparison on Wheat	1956	LN-10052
CD3155, Comparison on Beets	1956	ester of 2,4-dichlorophenoxyacetic acid
CD3155, Comparison on Beets	1956	LN-10593
CD3155, Comparison on Beets	1956	LN-10778
CD3155, Comparison on Beets	1956	LN-10778
CD3155, Comparison on Beets	1956	LN-10778
CD3155, Comparison on Beets	1956	LN-11333
CD3155, Comparison on Beets	1956	LN-12522
CD3155, Comparison on Beets	1956	LN-12962
CD3155, Comparison on Beets	1956	LN-12976
CD3155, Comparison on Beets	1956	LN-14213
CD3155, Comparison on Beets	1956	LN-143
CD3155, Comparison on Beets	1956	LN-143
CD3155, Comparison on Beets	1956	LN-14596
CD3155, Comparison on Beets	1956	LN-154
CD3155, Comparison on Beets	1956	LN-168
CD3155, Comparison on Beets	1956	LN-2052
CD3155, Comparison on Beets	1956	LN-44
CD3155, Comparison on Beets	1956	LN-4474
CD3155, Comparison on Beets	1956	LN-4497
CD3155, Comparison on Beets	1956	LN-4594
CD3155, Comparison on Beets	1956	LN-4596
CD3155, Comparison on Beets	1956	LN-4599
CD3155, Comparison on Beets	1956	LN-8
CD3155, Comparison on Broccoli	1956	LN-10778
CD3155, Comparison on Broccoli	1956	LN-143
CD3155, Comparison on Cabbage	1956	LN-10778
CD3155, Comparison on Cabbage	1956	LN-143
CD3155, Comparison on Flax	1956	LN-10778
CD3155, Comparison on Flax	1956	LN-10778
CD3155, Comparison on Flax	1956	LN-974
CD3155, Comparison on Flax	1956	LN-974
CD3155, Comparison on Green Beans	1956	LN-10778
CD3155, Comparison on Green Beans	1956	LN-974
CD3155, Comparison on Kale	1956	LN-10778
CD3155, Comparison on Kale	1956	LN-143
CD3155, Comparison on Potato	1956	ester of 2,4-dichlorophenoxyacetic acid
CD3155, Comparison on Potato	1956	LN-10778
CD3155, Comparison on Potato	1956	LN-10778
CD3155, Comparison on Potato	1956	LN-12007
CD3155, Comparison on Potato	1956	LN-12007
CD3155, Comparison on Potato	1956	LN-14213
CD3155, Comparison on Potato	1956	LN-4474
CD3155, Comparison on Potato	1956	LN-4497
CD3155, Comparison on Potato	1956	LN-4594
CD3155, Comparison on Potato	1956	LN-4595
CD3155, Comparison on Potato	1956	LN-4596
CD3155, Comparison on Potato	1956	LN-4599
CD3155, Comparison on Potato	1956	LN-974
CD3155, Comparison on Rutabega	1956	LN-10778
CD3155, Comparison on Rutabega	1956	LN-143
CD3155, Comparison on Soybean	1956	ester of 2,4-dichlorophenoxyacetic acid
CD3155, Comparison on Soybean	1956	LN-10593
CD3155, Comparison on Soybean	1956	LN-10778
CD3155, Comparison on Soybean	1956	LN-10778
CD3155, Comparison on Soybean	1956	LN-11333
CD3155, Comparison on Soybean	1956	LN-12007
CD3155, Comparison on Soybean	1956	LN-12522
CD3155, Comparison on Soybean	1956	LN-12962
CD3155, Comparison on Soybean	1956	LN-12976
CD3155, Comparison on Soybean	1956	LN-14213
CD3155, Comparison on Soybean	1956	LN-143

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD3155, Comparison on Soybean	1956	LN-14596
CD3155, Comparison on Soybean	1956	LN-154
CD3155, Comparison on Soybean	1956	LN-168
CD3155, Comparison on Soybean	1956	LN-2025
CD3155, Comparison on Soybean	1956	LN-44
CD3155, Comparison on Soybean	1956	LN-8
CD3155, Comparison on Soybean	1956	LN-974
CD3155, Comparison on Sunflower	1956	LN-10778
CD3155, Comparison on Sunflower	1956	LN-143
CD3155, Comparison on Tobacco	1956	LN-10778
CD3155, Comparison on Tobacco	1956	LN-143
CD3155, Comparison on Tobacco	1956	LN-974
CD3155, Comparison on Tomato	1956	LN-10778
CD3155, Comparison on Tomato	1956	LN-974
TR 006, Comparison on Oats	1956	LN-12962
TR 006, Comparison on Rye	1956	LN-10052
TR 006, Comparison on Rye	1956	LN-12962
TR 006, Comparison on Wheat	1956	LN-10052
TR 006, Comparison on Wheat	1956	LN-12962
TR 015, Comparison Study	1956	LN-10778
TR 015, Comparison Study	1956	LN-10778
TR 015, Comparison Study	1956	LN-10778
TR 015, Comparison Study	1956	LN-10778
TR 015, Comparison Study	1956	LN-10778
TR 015, Comparison Study	1956	LN-143
TR 015, Comparison Study	1956	LN-143
TR 015, Comparison Study	1956	LN-143
TR 015, Comparison Study	1956	LN-143
TR 015, Comparison Study	1956	LN-974
TR 015, Ester Study	1956	LN-10778
TR 015, Ester Study	1956	LN-4596
TR 015, Ester Study	1956	LN-4599
TR 015, Stage Study	1956	LN-10778
CD3153, Comparison on Beets	1957	LN-10778
CD3153, Comparison on Beets	1957	LN-4596
CD3153, Comparison on Beets	1957	LN-4599
CD3153, Comparison on Beets	1957	LN-4634
CD3153, Comparison on Beets	1957	LN-4639
CD3153, Comparison on Beets	1957	LN-4641
CD3153, Comparison on Beets	1957	LN-4643
CD3153, Comparison on Millet	1957	LN-12962
CD3153, Comparison on Oats	1957	LN-12964
CD3153, Comparison on Oats	1957	LN-12976
CD3153, Comparison on Oats	1957	LN-13539
CD3153, Comparison on Oats	1957	LN-14918
CD3153, Comparison on Peanut	1957	LN-10778
CD3153, Comparison on Potato	1957	LN-10778
CD3153, Comparison on Potato	1957	LN-13097
CD3153, Comparison on Potato	1957	LN-14293
CD3153, Comparison on Potato	1957	LN-14584
CD3153, Comparison on Potato	1957	LN-14586
CD3153, Comparison on Potato	1957	LN-14589
CD3153, Comparison on Potato	1957	LN-14684
CD3153, Comparison on Potato	1957	LN-14710
CD3153, Comparison on Potato	1957	LN-14850
CD3153, Comparison on Potato	1957	LN-14917
CD3153, Comparison on Potato	1957	LN-4543
CD3153, Comparison on Potato	1957	LN-4584
CD3153, Comparison on Potato	1957	LN-4599
CD3153, Comparison on Rye	1957	LN-10052
CD3153, Comparison on Rye	1957	LN-12964
CD3153, Comparison on Rye	1957	LN-12976
CD3153, Comparison on Rye	1957	LN-13539
CD3153, Comparison on Rye	1957	LN-13805
CD3153, Comparison on Rye	1957	LN-14918
CD3153, Comparison on Soybean	1957	LN-10778
CD3153, Comparison on Soybean	1957	LN-4474
CD3153, Comparison on Soybean	1957	LN-4497
CD3153, Comparison on Soybean	1957	LN-4594

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
CD3153, Comparison on Soybean	1957	LN-4595
CD3153, Comparison on Soybean	1957	LN-4633
CD3153, Comparison on Soybean	1957	LN-4634
CD3153, Comparison on Sweet Corn	1957	LN-10778
CD3153, Comparison on Sweet Corn	1957	LN-12962
CD3153, Comparison on Wheat	1957	LN-10052
CD3153, Comparison on Wheat	1957	LN-10052
CD3153, Comparison on Wheat	1957	LN-10052
CD3153, Comparison on Wheat	1957	LN-12976
CD3153, Comparison on Wheat	1957	LN-13539
CD3153, Comparison on Wheat	1957	LN-13805
CD3153, Comparison on Wheat	1957	LN-14918
CD3153, Comparison on Wheat	1957	LN-14968
CD3153, Comparison on Wheat	1957	LN-14969
CD3264, bud development	1957	ACP-M-103-A1
CD3264, bud development	1957	ACP-X-177
CD3264, bud development	1957	aminotriazole
CD3264, bud development	1957	VKL
TR 006, Comparison	1957	LN-4534
TR 006, Comparison on Corn	1957	LN-12962
TR 006, Comparison on Sorghum	1957	LN-12962
TR 006, Comparison on Wheat	1957	LN-12962
TR 006, Dosage Rate Study	1957	LN-12962
TR 006, Droplet Size Study	1957	LN-12962
TR 015, Ester Study	1957	LN-10778
TR 015, Ester Study	1957	LN-4596
TR 015, Ester Study	1957	LN-4599
TR 015, Ester Study	1957	LN-4639
TR 015, Ester Study	1957	LN-4641
TR 015, Ester Study	1957	LN-4643
TR 015, Ester Study	1957	LN-4644
TR016, Species Test	1957	Butynediol
TR016, Species Test	1957	Butynediol
TR016, Species Test	1957	Butynediol
TR016, Species Test	1957	Butynediol
TR016, Species Test	1957	CD-13539
TR016, Species Test	1957	CD-13539
TR016, Species Test	1957	CD-13539
TR016, Species Test	1957	CD-13539
TR016, Species Test	1957	CD-14580
TR016, Species Test	1957	CD-14580
TR016, Species Test	1957	CD-14580
TR016, Species Test	1957	CD-14580
TR016, Species Test	1957	CD-1626
TR016, Species Test	1957	CD-1626
TR016, Species Test	1957	CD-1626
TR016, Species Test	1957	CD-1626
TR016, Species Test	1957	Folex
TR016, Species Test	1957	Folex
TR016, Species Test	1957	Folex
TR016, Species Test	1957	Folex
TR016, Species Test	1957	Magnesium chlorate
TR016, Species Test	1957	Magnesium chlorate
TR016, Species Test	1957	Magnesium chlorate
TR016, Species Test	1957	Magnesium chlorate
TR016, Species Test	1957	Sodium chlorate
TR016, Species Test	1957	Sodium chlorate
TR016, Species Test	1957	Sodium chlorate
TR016, Species Test	1957	Sodium chlorate
TR016, Sprays on Entire Trees	1957	Butynediol
TR016, Sprays on Entire Trees	1957	Butynediol
TR016, Sprays on Entire Trees	1957	Butynediol
TR016, Sprays on Entire Trees	1957	Endothal
TR016, Sprays on Entire Trees	1957	Endothal
TR016, Sprays on Entire Trees	1957	Endothal
TR016, Sprays on Entire Trees	1957	Endothal
TR016, Sprays on Entire Trees	1957	Folex
TR016, Sprays on Entire Trees	1957	Folex
TR016, Sprays on Entire Trees	1957	Folex

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
TR016, Veg Ctl Studies, Field Test w/conifers	1957	2,3,6-trichlorobenzoic acid
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Butynediol
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Diesel oil
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Endothal
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Polychlorobenzoic acid 103
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Polychlorobenzoic acid 177
TR016, Veg Ctl Studies, Field Test w/conifers	1957	Tributyl phosphate
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-10778
TR 015, Comparison Study	1958	LN-143
TR 015, Comparison Study	1958	LN-143
TR 015, Comparison Study	1958	LN-143
TR 015, Comparison Study	1958	LN-974
TR 015, Comparison Study	1958	LN-974
TR 015, Comparison Study	1958	LN-974
TR 015, Comparison Study	1958	LN-974
TR 015, Comparison Study	1958	LN-974
TR 015, Comparison Study	1958	LN-974
TR 015, Field Screening	1958	LN-10593
TR 015, Field Screening	1958	LN-10593
TR 015, Field Screening	1958	LN-10778
TR 015, Field Screening	1958	LN-10778
TR 015, Field Screening	1958	LN-11333
TR 015, Field Screening	1958	LN-11333
TR 015, Field Screening	1958	LN-143
TR 015, Field Screening	1958	LN-974
TR 015, Stage Study	1958	LN-10778
TR 015, Stage Study	1958	LN-10778
TR 017, Stage Study	1958	LN-10778
TR 017, Stage Study	1958	LN-10778
TR 017, Stage Study	1958	LN-10778
TR 017, Stage Study	1958	LN-10778
TR 017, Stage Study	1958	LN-12962
TR 017, Stage Study	1958	LN-12962
TR 017, Stage Study	1958	LN-12962
TR 017, Stage Study	1958	LN-12962
TR 017, Stage Study	1958	LN-4534
TR 017, Stage Study	1958	LN-4534
TR 017, Stage Study	1958	LN-4534
TR 017, Stage Study	1958	LN-4534
TM09-24, Field Test on Barley	1960	LN-12962
TM09-24, Field Test on Beets	1960	LN-12962
TM09-24, Field Test on Corn	1960	LN-12962
TM09-24, Field Test on Kaoling	1960	LN-12962
TM09-24, Field Test on Millet	1960	LN-12962
TM09-24, Field Test on Oats	1960	LN-12962
TM09-24, Field Test on Potatoes	1960	LN-12962
TM09-24, Field Test on Rye	1960	LN-12962
TM09-24, Field Test on Snap Beans	1960	LN-12962
TM09-24, Field Test on Soybean	1960	LN-12962
TM09-24, Field Test on Sweet Potatoes	1960	LN-12962
TM09-24, Field Test on Wheat	1960	LN-12962
TM212, herbicides on soil	1962	Bromacil
TM212, herbicides on soil	1962	Orange
TM212, herbicides on soil	1962	Picloram
TM212, herbicides on soil	1962	Tandex
TM212, herbicides on soil	1962	White
SR 79, aqueous and non-aqueous	1944-1945	LN-32
SR 79, aqueous and non-aqueous	1944-1945	LN-32
SR 79, aqueous and non-aqueous	1944-1945	LN-32

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 79, aqueous and non-aqueous	1944-1945	LN-8
SR 79, aqueous and non-aqueous	1944-1945	LN-8
SR 79, aqueous and non-aqueous	1944-1945	LN-8
SR 79, co-agent test	1944-1945	ammonium sulfamate
SR 79, co-agent test	1944-1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1944-1945	LN-33
SR 79, Crop Susceptibility, soil contamination	1944-1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1944-1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1944-1945	LN-8
SR 79, Crop Susceptibility, soil contamination	1944-1945	LN-8+LN-33
SR 79, Crop Susceptibility, soil contamination, observational	1944-1945	LN-8
SR 79, Crop Susceptibility, soil contamination, observational	1944-1945	LN-8+LN-14+LN-33
SR 79, Crop Susceptibility, spray	1944-1945	ammonium sulfamate
SR 79, Crop Susceptibility, spray	1944-1945	LN-14
SR 79, Crop Susceptibility, spray	1944-1945	LN-14
SR 79, Crop Susceptibility, spray	1944-1945	LN-14
SR 79, Crop Susceptibility, spray	1944-1945	LN-32
SR 79, Crop Susceptibility, spray	1944-1945	LN-32
SR 79, Crop Susceptibility, spray	1944-1945	LN-32
SR 79, Crop Susceptibility, spray	1944-1945	LN-33
SR 79, Crop Susceptibility, spray	1944-1945	LN-33
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	LN-8
SR 79, Crop Susceptibility, spray	1944-1945	TBP+oil
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-14
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-32
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-32
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-44
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-44+LN-379
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-44+LN-379+LN-835
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-44+LN-835
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-8
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	LN-8
SR 79, Crop Susceptibility, spray, larger plants	1944-1945	TBP+oil
SR 79, Crop Susceptibility, spray, smaller plants	1944-1945	LN-32
SR 79, Crop Susceptibility, spray, smaller plants	1944-1945	LN-8
SR 79, Crop Susceptibility, spray, stage of development	1944-1945	LN-14
SR 79, Crop Susceptibility, spray, stage of development	1944-1945	LN-32
SR 79, Crop Susceptibility, spray, stage of development	1944-1945	LN-8
SR 79, Crop Susceptibility, spray, stage of development	1944-1945	LN-8
SR 79, Irish Potatoes spray test	1944-1945	LN-14
SR 79, persistance in soils	1944-1945	LN-33
SR 79, persistance in soils	1944-1945	LN-8
SR 79, persistance in soils - obs	1944-1945	LN-32
SR 79, persistance in soils - obs	1944-1945	LN-33
SR 79, persistance in soils - obs	1944-1945	LN-8
SR 79, persistance in soils, carrier test 1	1944-1945	LN-8
SR 79, rice spray test	1944-1945	LN-8
SR 234, Eval on small field plots	1951-1953	2,4-Difluorophenoxyacetamide
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Eval on small field plots	1951-1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	amyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 234, Eval on small field plots	1951-1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	Beta-hydroxyethyl-2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	butyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	Butyl-4-fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	ethyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 4-Fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 4-Fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 4-Fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 4-Fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	isopropyl 4-Fluoro-2-methyl-phenoxyacetate
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143
SR 234, Eval on small field plots	1951-1953	LN-143+LN-974
SR 234, Eval on small field plots	1951-1953	LN-143+LN-974
SR 234, Eval on small field plots	1951-1953	LN-143+LN-974
SR 234, Eval on small field plots	1951-1953	LN-143+LN-974
SR 234, Eval on small field plots	1951-1953	LN-143+LN-974
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1661
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-1662
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4119
SR 234, Eval on small field plots	1951-1953	LN-4219
SR 234, Eval on small field plots	1951-1953	LN-4219

Table D-2 - List of Herbicides Field Tested at Fort Detrick by Year and Test Series		
Test	**Year**	**Herbicide code (or name if no code assigned)**
SR 234, Eval on small field plots	1951-1953	LN-4219
SR 234, Eval on small field plots	1951-1953	LN-4219
SR 234, Eval on small field plots	1951-1953	LN-4220
SR 234, Eval on small field plots	1951-1953	LN-4220
SR 234, Eval on small field plots	1951-1953	LN-4220
SR 234, Eval on small field plots	1951-1953	LN-4220
SR 234, Eval on small field plots	1951-1953	LN-4220
SR 234, Eval on small field plots	1951-1953	LN-4221
SR 234, Eval on small field plots	1951-1953	LN-4221
SR 234, Eval on small field plots	1951-1953	LN-4221
SR 234, Eval on small field plots	1951-1953	LN-4221
SR 234, Eval on small field plots	1951-1953	LN-4221
SR 234, Eval on small field plots	1951-1953	LN-4222
SR 234, Eval on small field plots	1951-1953	LN-4222
SR 234, Eval on small field plots	1951-1953	LN-4223
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	LN-974
SR 234, Eval on small field plots	1951-1953	propyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	propyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	propyl 2,4-difluorophenoxyacetate
SR 234, Eval on small field plots	1951-1953	propyl 2,4-difluorophenoxyacetate
IR140, Field screening trials at Camp Detrick	1954-55	LN-12160
IR140, Field screening trials at Camp Detrick	1954-55	LN-12965
IR140, Field screening trials at Camp Detrick	1954-55	LN-13104
IR140, Field screening trials at Camp Detrick	1954-55	LN-13106
IR140, Field screening trials at Camp Detrick	1954-55	LN-13109
IR140, Field screening trials at Camp Detrick	1954-55	LN-13110
IR140, Field screening trials at Camp Detrick	1954-55	LN-13112
IR140, Field screening trials at Camp Detrick	1954-55	LN-13113
IR140, Field screening trials at Camp Detrick	1954-55	LN-13115
IR140, Field screening trials at Camp Detrick	1954-55	LN-13116
TR016, Veg Ctl Studies, Field Test w/scrub pine	1957?	103A
TR016, Veg Ctl Studies, Field Test w/scrub pine	1957?	2,3,6-trichlorobenzoic acid
TR016, Veg Ctl Studies, Field Test w/scrub pine	1957?	713D
TR016, Veg Ctl Studies, Field Test w/scrub pine	1957?	pentachlorophenol
SR 92, Observ. Spray Exp. 4	1947	triethanolamine 2,4-trichlorophenoxyacetate
SR 92, Observ. Spray Exp. 4	1947	LN-8
SR 234, Effectiveness on rice when applied to irrigation water	unknown	2-chloro-4-fluorophenoxyacetic acid
SR 234, Effectiveness on rice when applied to irrigation water	unknown	2-chloro-4-fluorophenoxyacetic acid
SR 234, Effectiveness on rice when applied to irrigation water	unknown	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Effectiveness on rice when applied to irrigation water	unknown	4-Fluoro-2-methylphenoxyacetic acid
SR 234, Effectiveness on rice when applied to irrigation water	unknown	butyl 2,4-difluorophenoxyacetate
SR 234, Effectiveness on rice when applied to irrigation water	unknown	butyl 2,4-difluorophenoxyacetate
SR 234, Effectiveness on rice when applied to irrigation water	unknown	LN-10778
SR 234, Effectiveness on rice when applied to irrigation water	unknown	LN-10778
SR 234, Effectiveness on rice when applied to irrigation water	unknown	LN-1662
SR 234, Effectiveness on rice when applied to irrigation water	unknown	LN-1662

Table D-3 - Frequency of Herbicides Field Tested at Fort Detrick	
Herbicide code (or name if no code assigned)	**test frequency**
LN-974	84
LN-14	78
LN-143	71
LN-8	68
LN-10778	55
LN-33	49
LN-1661	44
LN-12962	28
LN-2464	22
LN-143+LN-974	20
LN-32	19
LN-1662	16
4-Fluoro-2-methylphenoxyacetic acid	15
LN-458	14
Butynediol	13
LN-4119	13
LN-719	13
Endothal	12
LN-10052	12
TBP	12
isopropyl 2,4-difluorophenoxyacetate	10
Beta-hydroxyethyl-2,4-difluorophenoxyacetate	9
butyl 2,4-difluorophenoxyacetate	9
IPC	9
LN-10593	9
LN-11333	9
LN-4221	9
LN-1700	8
LN-1999	8
LN-4220	8
Magnesium chlorate	8
3-cl IPC	7
amyl 2,4-difluorophenoxyacetate	7
Folex	7
LN-2370	7
LN-4219	7
LN-44	7
ammonium sulfamate	6
Butyl-4-fluoro-2-methyl-phenoxyacetate	6
CMU	6
ethyl 2,4-difluorophenoxyacetate	6
herbicide not recorded	6
LN-2394	6
LN-4222	6
LN-4599	6
LN-951	6
propyl 2,4-difluorophenoxyacetate	6
isopropyl 4-Fluoro-2-methyl-phenoxyacetate	5
LN-12976	5
LN-2426	5
LN-385	5
LN-4534	5
LN-4596	5
LN-8+LN-14+LN-33	5
LN-8+LN-33	5
LN-9	5
pentachlorophenol	5
CD-13539	4
CD-14580	4
CD-1626	4
LN-11	4
LN-13	4
LN-2375	4
LN-724	4
Shed-a-leaf	4
Sodium chlorate	4
2,4-dichlorophenyl 2,4,5-trichlorophenoxyacetate	3
Diesel oil	3
ester of 2,4-dichlorophenoxyacetic acid	3
LN-10524	3
LN-13539	3
LN-14213	3
LN-14918	3
LN-155	3
LN-2	3
LN-2374	3
LN-2387	3
LN-2388	3
LN-2392	3

Table D-3 - Frequency of Herbicides Field Tested at Fort Detrick	
Herbicide code (or name if no code assigned)	**test frequency**
LN-2416	3
LN-243	3
LN-379	3
LN-4321	3
LN-4474	3
LN-4497	3
LN-4594	3
LN-620	3
LN-658	3
LN-761	3
pentachlorophenol	3
pentachlorophenyl-2-methyl-4-chlorophenoxyacetate	3
pentachlorophenyl-4-chlorophenoxyacetate	3
sodium chlorate + sodium pentachlorate	3
132	2
2,3,6-trichlorobenzoic acid	2
2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetic acid	2
2-chloro-4-fluorophenoxyacetic acid	2
4-chlorophenoxyacetic acid	2
713D	2
bis(ethylxanthogen) trisulfide	2
LN-12007	2
LN-12522	2
LN-12964	2
LN-13115	2
LN-13805	2
LN-14+LN-33	2
LN-14596	2
LN-154	2
LN-156	2
LN-168	2
LN-171	2
LN-182	2
LN-183	2
LN-1856	2
LN-2170	2
LN-2418	2
LN-2425	2
LN-2452	2
LN-2469	2
LN-2475	2
LN-2478	2
LN-2608	2
LN-2694	2
LN-2705	2
LN-2777	2
LN-4223	2
LN-4324	2
LN-4345	2
LN-44+LN-379	2
LN-4595	2
LN-4634	2
LN-4639	2
LN-4641	2
LN-4643	2
LN-539	2
LN-73	2
LN-8+LN-14	2
LN-8+LN-33+LN-379	2
LN-90	2
pentachlorophenyl-N-phenylcarbamate	2
TBP+oil	2
VKL	2
34520	1
50534	1
50754	1
#2 fuel oil	1
103A	1
2,3-dichlorophenyl-4-chlorophenoxyacetate	1
2,4,6-trichlorophenyl 2,4,5-Trichlorophenoxyacetate	1
2,4-dichlorophenoxyacetyl thiocyanate	1
2,4-Difluorophenoxyacetamide	1
34520-R	1
3-cl IPC+Esteron 44	1
50533-R	1
50533-R+50534-R	1
50534-R	1
50715-R	1
50715-R+50754-R	1
50754-R	1

Table D-3 - Frequency of Herbicides Field Tested at Fort Detrick	
Herbicide code (or name if no code assigned)	**test frequency**
ACP-M-103-A1	1
ACP-X-177	1
aminotriazole	1
ammonium 2,4-dichlorophenoxyacetate	1
ammonium thiocyanate	1
Aresklene 400	1
arsenic trioxide	1
beta-chlorophenyl-N-phenylcarbamate	1
Bromacil	1
copper chloride	1
Dow contact	1
Dow contact+LN-8	1
Dow Premerge	1
Esteron 44	1
ethyl 2,4-dichlorophenoxyacetate	1
isopropyl 2,4-dichlorophenoxyacetic acid	1
isopropyl 2-methyl 4-chlorophenoxyacetate	1
KClO3	1
KOCN	1
Krilinum	1
KSCN	1
LN-10529	1
LN-10699	1
LN-10720	1
LN-10728	1
LN-115	1
LN-117	1
LN-12160	1
LN-12253	1
LN-12254	1
LN-12255	1
LN-12965	1
LN-13097	1
LN-13104	1
LN-13106	1
LN-13109	1
LN-13110	1
LN-13112	1
LN-13113	1
LN-13116	1
LN-14+KSCN	1
LN-14+LN-2462	1
LN-14+LN-539	1
LN-14293	1
LN-143+LN-32+LN-33+LN-379	1
LN-143+LN-33	1
LN-143+LN-33+LN-379	1
LN-143+LN-379	1
LN-144	1
LN-14584	1
LN-14586	1
LN-14589	1
LN-146	1
LN-14684	1
LN-147	1
LN-14710	1
LN-148	1
LN-14850	1
LN-14917	1
LN-14968	1
LN-14969	1
LN-153	1
LN-155+LN-33	1
LN-155+LN-33+LN-379	1
LN-155+LN-379	1
LN-1578	1
LN-1626	1
LN-164	1
LN-167	1
LN-170	1
LN-1700+LN-2464	1
LN-173	1
LN-1787	1
LN-1800	1
LN-1814	1
LN-1816	1
LN-1817	1
LN-182+LN-33	1
LN-182+LN-33+LN-379	1
LN-182+LN-379	1

Table D-3 - Frequency of Herbicides Field Tested at Fort Detrick	
Herbicide code (or name if no code assigned)	**test frequency**
LN-183+LN-33	1
LN-183+LN-33+LN-379	1
LN-183+LN-379	1
LN-184	1
LN-184+LN-33	1
LN-184+LN-33+LN-379	1
LN-184+LN-379	1
LN-194	1
LN-195	1
LN-1993	1
LN-2025	1
LN-2052	1
LN-2076	1
LN-2160	1
LN-2168	1
LN-2169	1
LN-2172	1
LN-2173	1
LN-2174	1
LN-2175	1
LN-2176	1
LN-2177	1
LN-2179	1
LN-2395	1
LN-2399	1
LN-2404	1
LN-2409	1
LN-2415	1
LN-2462	1
LN-2480	1
LN-2588	1
LN-2594	1
LN-2599	1
LN-2606	1
LN-2610	1
LN-2612	1
LN-2616	1
LN-2632	1
LN-2634	1
LN-2671	1
LN-2672	1
LN-2687	1
LN-2743	1
LN-2749	1
LN-2759	1
LN-2809	1
LN-2893	1
LN-2979	1
LN-3069	1
LN-3078	1
LN-315	1
LN-32+LN-2462	1
LN-372	1
LN-380	1
LN-401	1
LN-4016	1
LN-4056	1
LN-409	1
LN-4158	1
LN-416	1
LN-4218	1
LN-4227	1
LN-4322	1
LN-4339	1
LN-4357	1
LN-4359	1
LN-4372	1
LN-4373	1
LN-4374	1
LN-4384	1
LN-4397	1
LN-44+LN-33	1
LN-44+LN-33+LN-379	1
LN-44+LN-379+LN-835	1
LN-44+LN-835	1
LN-4543	1
LN-4584	1
LN-4633	1
LN-4644	1
LN-49	1

Table D-3 - Frequency of Herbicides Field Tested at Fort Detrick	
Herbicide code (or name if no code assigned)	**test frequency**
LN-5	1
LN-633	1
LN-67	1
LN-687	1
LN-69	1
LN-694	1
LN-699	1
LN-74	1
LN-773	1
LN-8+ammonium sulfamate	1
LN-8+ammonium thiocyanate	1
LN-8+copper chloride	1
LN-8+KSCN	1
LN-8+LN-14+LN-379	1
LN-8+LN-2462	1
LN-8+LN-32+LN-379	1
LN-8+LN-372	1
LN-8+LN-379	1
LN-8+LN-539	1
LN-80	1
LN-810	1
LN-811	1
LN-93	1
LN-974+KClO3	1
LN-974+KOCN	1
LN-974+LN-1700	1
LN-974+LN-1999	1
LN-974+NaTCA	1
Maleic hydrazide	1
NaTCA	1
o-pentachlorophenyl-N-phenylcarbamate	1
Orange	1
pentachlorophenyl-2,4-dichlorophenoxyacetate	1
Phosphoric acid	1
Picloram	1
Polychlorobenzoic acid 103	1
Polychlorobenzoic acid 177	1
Santomerse 3	1
SD1369	1
Shell #10	1
Shell #11	1
Shell #20	1
Tandex	1
TCA	1
Tributyl phosphate	1
triethanolamine 2,4-trichlorophenoxyacetate	1
Triton 155	1
Weedone 2,4-D	1
White	1