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Document No. Battelle-TBD-6000; Appendix G	Revision No. 0	Effective Date: 4/30/2007	Page 2
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## ANACONDA COMPANY

### G.1 Introduction

This document serves as an appendix to Battelle-TBD-6000, Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals. This appendix describes the results of document research specific to this site. Where specific information is lacking, research into similar facilities described in the body of this Site Profile is used.

### G.2 Site Description

The Atomic Weapons Employer Anaconda Company was located in Waterbury Connecticut. The facility was also known as American Brass Co., Fabric Metal Goods Plant and West Tube Mill, and Anamet Inc. It is listed as an Atomic Weapons Employer in 1942 and 1956 through 1959. In 1942, the American Brass Company produced the barriers used in the gaseous diffusion process. In the late 1950s, under contract to Nuclear Metals Inc., the company extruded copper-clad uranium billets into tubes at least two separate times for the Savannah River Site. While the original plans called for work on 500 billets, only around 50 were actually processed. The operations involved plating, heating, extruding, sawing, drilling, deburring, cleaning, testing, crating, and shipping. Work was conducted at the West Tube Mill. AEC Health and Safety Laboratory personnel visited the site in 1956 and 1959, and obtained air quality and surface radiation measurements during the later visit.<sup>1</sup>

#### G.2.1 Site Activities

References indicate 4 billets were received for the pilot run in September 1956, ten extrusions were done in March 1957, and fifty billets were extruded in 1959. Although the extrusion rate for the last campaigns in 1959 was at four billets per hour, an estimate that is favorable to claimants of three eight-hour shifts should be used for 1959, and one shift each in 1957 and 1956. No additional information was found on what work was being done in 1942. Production of barriers used in the gaseous diffusion process would not result in radiation dose to Anaconda employees other than required medical xray dose.

#### G.2.2 Job Categories

Each claim will be evaluated to determine the most appropriate Job Category from the list below.

Plant Floor High	(Involved directly in operations)
Plant Floor Low	(Involved in support of operations)
Supervisor	
Clerk	

### G.3 Occupational Medical Dose

No information regarding occupational medical dose specific to Anaconda was found. Information to be used in dose reconstructions for which no specific information is available is provided in ORAUT-OTIB-0006, the dose reconstruction project technical information bulletin covering diagnostic x-ray procedures.

Document No. Battelle-TBD-6000; Appendix G	Revision No. 0	Effective Date: 4/30/2007	Page 3
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#### **G.4 Occupational Internal Dose**

Air monitoring data are available from the 1956 and 1959 operations reported as averages by the New York Operations Office (Reference ID 14180, page 5). The breathing zone air monitoring results for the machine shop are reported as an average of 5 dpm/M<sup>3</sup>. The maximum for the campaign was 39 dpm/M<sup>3</sup>. It is not known if the 39 dpm/M<sup>3</sup> result was a breathing zone sample, but to be favorable to claimants this maximum value has been used as the process average because when 5 is used with a GSD of 5, the 95<sup>th</sup> percentile is only 19.

These values were used to derive the inhalation values presented in Table G.1. The values in the table are presented as pCi per calendar day inhalation. These values were used to determine an ingestion intake in accordance with this TBD. Those values are presented as a pCi per calendar day ingestion in Table G.2

#### **G.5 Occupational External Dose**

No data was found in the Site Research database related to occupational external dose during AEC work. The work performed at Anaconda involved extruding uranium ingots. Therefore, the external dose values in the TBD for extrusion should be used.

Tables G.3 and G.4 present these values as a mrem per calendar day value to be used for each calendar year listed.

#### **G.6 Residual Contamination**

Operations at Anaconda resulted in little potential for residual contamination. As such, no exposure to residual contamination is assumed for 1958 and after 1959<sup>2</sup>. Also, since there was no radioactive material associated with the operations described for 1942, no residual contamination is assumed prior to 1956.

#### **G.7 References**

1. DOE Office of Health, Safety and Security, EEOICPA web site.  
<http://www.hss.energy.gov/healthsafety/fwsp/advocacy/faclist/findfacility.cfm>
2. Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vender Facilities.  
<http://www.cdc.gov/niosh/ocas/pdfs/tbd/rescon/rcontam1206.pdf> &  
<http://www.cdc.gov/niosh/ocas/pdfs/tbd/rescon/appen-a2.pdf>

**Table G.1 INTERNAL DOSE PATHWAYS - Inhalation of Airborne Radionuclides****Assumptions:**Operational Period Daily Weighted Average Air Concentration: 11 dpm/M<sup>3</sup>Residual Period Daily Weighted Average Air Concentration: 6.93E-04 dpm/M<sup>3</sup>

TBD GSD Default is 5

Conversion Factor: 2.22 dpm/pCi

Breathing Rate: 1.2 m<sup>3</sup>/hour

All intakes and doses assume full-time employment for the given year.

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1956	Operations	8	U234	1.27E-01	5	Measured air sample data
Plant Floor High	1957	Operations	8	U234	1.27E-01	5	Measured air sample data
Plant Floor High	1958	Operations	0	U234	0.00E+00	5	Measured air sample data
Plant Floor High	1959	Operations	24	U234	3.80E-01	5	Measured air sample data
Plant Floor Low	1956	Operations	4	U234	6.34E-02	5	Ratio'ed from Plant Floor High
Plant Floor Low	1957	Operations	4	U234	6.34E-02	5	Ratio'ed from Plant Floor High
Plant Floor Low	1958	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Plant Floor Low	1959	Operations	12	U234	1.90E-01	5	Ratio'ed from Plant Floor High
Supervisor	1956	Operations	2	U234	3.17E-02	5	Ratio'ed from Plant Floor High
Supervisor	1957	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Supervisor	1958	Operations	2	U234	3.17E-02	5	Ratio'ed from Plant Floor High
Supervisor	1959	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1956	Operations	0.2	U234	3.17E-03	5	Ratio'ed from Plant Floor High
Clerical	1957	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1958	Operations	0.2	U234	3.17E-03	5	Ratio'ed from Plant Floor High
Clerical	1959	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High

**Table G.2 INTERNAL DOSE PATHWAYS - Ingestion of Airborne Radionuclides****Assumptions:**Air Concentration to Intake Conversion Factor:  $3.06E-05$  ( $M^3/d$ )/(hr/y) - see 7.1.6 TBD-6000

Deposition velocity: 0.00075 m/s

Resuspension Factor:  $1.00E-06$  1/m

TBD GSD Default is 5

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1956	Operations	8	U234	1.18E-03	5	Measured air sample data
Plant Floor High	1957	Operations	8	U234	1.18E-03	5	Measured air sample data
Plant Floor High	1958	Operations	0	U234	0.00E+00	5	Measured air sample data
Plant Floor High	1959	Operations	24	U234	3.54E-03	5	Measured air sample data
Plant Floor Low	1956	Operations	4	U234	5.90E-04	5	Ratio'ed from Plant Floor High
Plant Floor Low	1957	Operations	4	U234	5.90E-04	5	Ratio'ed from Plant Floor High
Plant Floor Low	1958	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Plant Floor Low	1959	Operations	12	U234	1.77E-03	5	Ratio'ed from Plant Floor High
Supervisor	1956	Operations	2	U234	2.95E-04	5	Ratio'ed from Plant Floor High
Supervisor	1957	Operations	0	U234	2.95E-04	5	Ratio'ed from Plant Floor High
Supervisor	1958	Operations	2	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Supervisor	1959	Operations	0	U234	8.85E-04	5	Ratio'ed from Plant Floor High
Clerical	1956	Operations	0.2	U234	2.95E-05	5	Ratio'ed from Plant Floor High
Clerical	1957	Operations	0	U234	2.95E-05	5	Ratio'ed from Plant Floor High
Clerical	1958	Operations	0.2	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1959	Operations	0	U234	8.85E-05	5	Ratio'ed from Plant Floor High

**Table G.3 EXTERNAL DOSE PATHWAYS - Whole Body****Assumptions:**Submersion Dose Conversion Factor: 2.462E-09 mrem/h/dpm/m<sup>3</sup>

Deposition velocity: 0.0008

Contaminated Surface Dose Conversion Factor: 5.615E-10 mrem/h/dpm/m<sup>2</sup>

All external dose from estimated exposure to uranium rods

Residual period: Assume no handling of U metal - only exposure is from residual contamination on floor and in air

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	External Whole Body (mR/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1956	Operations	8	U234	6.25E-03	5	Generic Metal TBD, Section 6.3
Plant Floor High	1957	Operations	8	U234	6.25E-03	5	Generic Metal TBD, Section 6.3, with Residual assumptions
Plant Floor High	1958	Operations	0	U234	0.00E+00	5	Generic Metal TBD, Section 6.3, with Residual assumptions
Plant Floor High	1959	Operations	24	U234	1.87E-02	5	Generic Metal TBD, Section 6.3, with Residual assumptions
Plant Floor Low	1956	Operations	4	U234	3.12E-03	5	Ratio'ed from Plant Floor High
Plant Floor Low	1957	Operations	4	U234	3.12E-03	5	Ratio'ed from Plant Floor High
Plant Floor Low	1958	Operations	0	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Plant Floor Low	1959	Operations	12	U234	9.37E-03	5	Ratio'ed from Plant Floor High
Supervisor	1956	Operations	2	U234	1.56E-03	5	Ratio'ed from Plant Floor High
Supervisor	1957	Operations	0	U234	1.56E-03	5	Ratio'ed from Plant Floor High
Supervisor	1958	Operations	2	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Supervisor	1959	Operations	0	U234	4.69E-03	5	Ratio'ed from Plant Floor High
Clerical	1956	Operations	0.2	U234	1.56E-04	5	Ratio'ed from Plant Floor High
Clerical	1957	Operations	0	U234	1.56E-04	5	Ratio'ed from Plant Floor High
Clerical	1958	Operations	0.2	U234	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1959	Operations	0	U234	4.69E-04	5	Ratio'ed from Plant Floor High

**Table G.4 EXTERNAL DOSE PATHWAYS - Skin****Assumptions:**

All assumptions from TBD-6000 Section 6.3

Operational Period: Non-penetrating dose to skin 115 mr/hour (hands and forearms) 10.4 mr/hour (other)

Plant Floor High: Assume hands in contact with metal 50% of time. Other skin is 100% of dose rate at 1-ft, 20.8 mrem/h

Plant Floor Low: 50% of Plant Floor High

Supervisor: assume 10% of Plant Floor Low for time in contact with metal

Clerical: assume no handling of U metal.

Residual Period: Non-penetrating dose to skin 3.9E-06 mr/hour

Assume no handling of U metal.

Assume 10x the photon whole body dose rate

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Skin: Hands & Forearms (mR/d)	Skin - Other (mR/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1956	Operations	8	U234	2.52E+00	2.28E-01	5	Generic Metal TBD, Section 6.3
Plant Floor High	1957	Operations	8	U234	2.52E+00	2.28E-01	5	Generic Metal TBD, Section 6.3
Plant Floor High	1958	Operations	0	U234	0.00E+00	0.00E+00	5	Generic Metal TBD, Section 6.3
Plant Floor High	1959	Operations	24	U234	7.56E+00	6.84E-01	5	Generic Metal TBD, Section 6.3
Plant Floor Low	1956	Operations	4	U234	1.26E+00	1.14E-01	5	Ratio'ed from Plant Floor High
Plant Floor Low	1957	Operations	4	U234	1.26E+00	1.14E-01	5	Ratio'ed from Plant Floor High
Plant Floor Low	1958	Operations	0	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Plant Floor Low	1959	Operations	12	U234	3.78E+00	3.42E-01	5	Ratio'ed from Plant Floor High
Supervisor	1956	Operations	2	U234	6.30E-01	5.70E-02	5	Ratio'ed from Plant Floor High
Supervisor	1957	Operations	0	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Supervisor	1958	Operations	2	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Supervisor	1959	Operations	0	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1956	Operations	0.2	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1957	Operations	0	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1958	Operations	0.2	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High
Clerical	1959	Operations	0	U234	0.00E+00	0.00E+00	5	Ratio'ed from Plant Floor High