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U.S. Army Soldier and Biological Chemical Command
Edgewood Chemical Biological Center
ATTN: Edgewood Chemical Biological
Forensic Analytical Center
Aberdeen Proving Ground, MD 21010-5424
Phone: (410) 436-8600
Fax: (410) 436-3384

ANALYTICAL TEST REPORT

Report Date: 17 September 2001

Project/Event Title: Analysis of CS, 2-Chlorobenzaldehyde and Malononitrile in Air and Soil for UOS
Project/Event Number: 99P-0074-19

Report Number: 0074-19-091701

QuickSilver Analytics, Inc.
1309 Continental Drive, Suite N
Abingdon, MD 21009

ATTN: Rodney Hudson
(410) 676-4300

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Background

The following samples were collected by URS Operating Services, Inc. for Quicksilver Analytical and received at the Edgewood Chemical and Biological Forensic Analytical Center between August 15 and August 21, 2001.

Table I

Samples received for o-chlorobenzylidene malonitrile (CS), 2-chlorobenzyaldehyde and/or malononitrile analysis.

URS/Quicksilver Sample ID	EC/BFAC Sample ID	Date Received
DT-AR-001T	980103-05901	08/15/2001
DT-AR-002T	980103-05902	08/15/2001
DT-AR-003T	98010305903	08/15/2001
DT-AR-004T	980103-05904	08/15/2001
DT-AR-005T	980103-05905	08/15/2001
DT-AR-006T	980103-05906	08/15/2001
DT-AR-001F	980103-05907	08/15/2001
DT-AR-002F	980103-05908	08/15/2001
DT-AR-003F	980103-05909	08/15/2001
DT-AR-004F	980103-05910	08/15/2001
DT-AR-005F	980103-05911	08/15/2001
DT-AR-006F	980103-05912	08/15/2001
DT-AR-007F	980103-06101	08/16/2001
DT-AR-008F	980103-06102	08/16/2001
DT-AR-009F	980103-06103	08/16/2001
DT-AR-010F	980103-06104	08/16/2001
DT-AR-011F	980103-06105	08/16/2001
DT-AR-012F	980103-06106	08/16/2001
DT-AR-019F	980103-06107	08/16/2001
DT-AR-007T	980103-06108	08/16/2001
DT-AR-008T	980103-06109	08/16/2001
DT-AR-009T	980103-06110	08/16/2001
DT-AR-010T	980103-06111	08/16/2001
DT-AR-011T	980103-06112	08/16/2001
DT-AR-012T	980103-06112	08/16/2001
DT-AR-019T	980103-06114	08/16/2001
DT-AR-013F	980103-06401	08/20/2001
DT-AR-014F	980103-06402	08/20/2001
DT-AR-015F	980103-06403	08/20/2001
DT-AR-016F	980103-06404	08/20/2001
DT-AR-017F	980103-06405	08/20/2001
DT-AR-018F	980103-06406	08/20/2001
DT-AR-026F	980103-06407	08/20/2001
DT-AR-013T	980103-06408	08/17/2001
DT-AR-014T	980103-06409	08/17/2001
DT-AR-015T	980103-06410	08/17/2001

URS/Quicksilver Sample ID	EC/BFAC Sample ID	Date Received
DT-AR-016T	980103-06411	08/17/2001
DT-AR-017T	980103-06412	08/17/2001
DT-AR-018T	980103-06413	08/17/2001
DT-AR-026T	980103-06414	08/17/2001
DT-AR-020F	980103-06501	08/21/2001
DT-AR-021F	980103-06502	08/21/2001
DT-AR-022F	980103-06503	08/21/2001
DT-AR-023F	980103-06504	08/21/2001
DT-AR-024F	980103-06505	08/21/2001
DT-AR-025F	980103-06506	08/21/2001
DT-AR-020T	980103-06507	08/21/2001
DT-AR-021T	980103-06508	08/21/2001
DT-AR-022T	980103-06509	08/21/2001
DT-AR-023T	980103-06510	08/21/2001
DT-AR-024T	980103-06511	08/21/2001
DT-AR-025T	980103-06512	08/21/2001
DT-TS-009	980103-06513	08/21/2001
DT-TS-010	980103-06514	08/21/2001
DT-SO-01	980103-04909	06/15/2001
DT-SO-02	980103-04910	06/15/2001
DT-SO-03	980103-04911	06/15/2001
DT-SO-04	980103-04912	06/15/2001
DT-SO-05	980103-04913	06/15/2001
DT-SO-06	980103-04914	06/15/2001
DT-SO-07	980103-04915	06/15/2001
DT-SO-08	980103-04916	06/15/2001
DT-SO-09	980103-04917	06/15/2001

Action Taken

The glass fiber filters were extracted and analyzed in accordance with Method AM-087 for the presence of CS (o-chlorobenzylidene malonitrile). The glass fiber filters were extracted with two 20 milliliter aliquots of methylene chloride and concentrated to 1.0 mL in a turbovap. The methylene chloride extracts were then transferred to GC vials and analyzed by gas chromatography/mass spectrometry (GC/MS) SCAN Mode.

Tenax tubes were analyzed in accordance with Method AM-097 for the presence of 2-Chlorobenzaldehyde and Malononitrile and Tentatively Identified Compounds (TIC's). See attached data package for TIC results. The tenax tubes were desorbed using an ACEM 900 Dynatherm Thermal Desorber interfaced with a gas chromatograph/mass spectrometry (GC/MS) SCAN Mode.

Soil samples were extracted and analyzed in accordance with Method AM-087 for the presence of CS, 2-chlorobenzylaldehyde and Tentatively Identified Compounds (TIC'S). See attached data package for TIC results. Each soil sample prepared for CS and 2-chlorobenzylaldehyde was extracted with two 20 milliliter aliquots of methylene chloride

and concentrated to 1.0 mL in a turbovap. The methylene chloride extracts were then transferred to GC vial and analyzed by (GC/MS) SCAN mode.

Soil samples were also extracted and analyzed for malononitrile by AM-087. Each soil sample was extracted with two 20 milliliter aliquots of methylene chloride, and the combined extracts diluted to 50.0 milliters. One milliliter of the total extract was transferred to a GC vial for (GC/MS) SCAN Mode analysis.

Results

The purpose of the analysis was to detect the presence of CS, 2-chlorobenzylaldehyde and malononitrile in various matrices and by various GC/MS techniques. Tables II-IV summarize the results of the GC/MS analyses. Quality control results are summarized in Tables V – VII.

Table II

Results of GC/MS analysis of glass fiber air samples for CS

Sample ID	CS, mg/m³	Date Analyzed
Blank (Glass fiber filter)	<0.0037	8/16/2001
Laboratory Control Sample (Glass fiber filter)	0.0830	8/16/2001
DT-AR-001F	<0.0037	8/16/2001
DT-AR-002F	<0.0037	8/16/2001
DT-AR-003F	<0.0037	8/16/2001
DT-AR-004F	<0.0037	8/16/2001
DT-AR-005F	<0.0037	8/16/2001
DT-AR-006F	<0.0037	8/16/2001
DT-AR-007F	<0.0037	8/16/2001
DT-AR-008F	<0.0037	8/16/2001
DT-AR-009F	<0.0037	8/16/2001
DT-AR-010F	<0.0037	8/16/2001
DT-AR-011F	<0.0037	8/16/2001
DT-AR-012F	<0.0037	8/16/2001
DT-AR-019F	<0.0037	8/16/2001
MS (Glass fiber filter)	0.0840	8/16/2001
MSD (Glass fiber filter)	0.0770	8/16/2001
Blank (Glass fiber filter)	<0.0037	8/20/2001
Laboratory Control Sample (Glass fiber filter)	0.0750	8/20/2001
DT-AR-013F	<0.0037	8/20/2001
DT-AR-014F	<0.0037	8/20/2001
DT-AR-015F	<0.0037	8/20/2001
DT-AR-016F	<0.0037	8/20/2001
DT-AR-017F	<0.0037	8/20/2001
DT-AR-018F	<0.0037	8/20/2001
DT-AR-026F	<0.0037	8/20/2001
MS (Glass fiber filter)	0.0860	8/20/2001
MSD (Glass fiber filter)	0.0810	8/20/2001
Blank (Glass fiber filter)	<0.0037	8/21/2001
Laboratory Control Sample (Glass fiber filter)	0.0750	8/21/2001
DT-AR-20F	<0.0037	8/21/2001
DT-AR-21F	<0.0037	8/21/2001
DT-AR-22F	<0.0037	8/21/2001
DT-AR-23F	<0.0037	8/21/2001
DT-AR-24F	<0.0037	8/21/2001
DT-AR-25F	<0.0037	8/21/2001
MS (Glass fiber filter)	0.0560	8/21/2001
MSD (Glass fiber filter)	0.0660	8/21/2001

Table III

Results of GC/MS analysis of Tenax tube samples for 2-Chlorobenzaldehyde/Malononitrile

Sample ID	2-Chlorobenzyaldehyde mg/m³	Malononitrile mg/m³	Date Analyzed
Blank (Tenax tube)	<0.00012	<0.00004	8/21/2001
Laboratory Control Sample (Tenax tube)	0.00068	na	8/22/2001
Laboratory Control Sample (Tenax tube)	na	0.00058	8/22/2001
DT-AR-001T	<0.00013	<0.00005	8/22/2001
DT-AR-002T	<0.00028	<0.00094	8/22/2001
DT-AR-003T	<0.00012	<0.00004	8/22/2001
DT-AR-004T	<0.00024	<0.00008	8/22/2001
DT-AR-005T	<0.00011	<0.00004	8/22/2001
DT-AR-006T	<0.00022	<0.00007	8/22/2001
DT-AR-007T	<0.00016	<0.00005	8/23/2001
DT-AR-008T	<0.00008	<0.00003	8/23/2001
DT-AR-009T	<0.00023	<0.00008	8/23/2001
DT-AR-010T	<0.00010	<0.00003	8/23/2001
DT-AR-011T	<0.00015	<0.00005	8/23/2001
DT-AR-012T	<0.00024	<0.00008	8/23/2001
DT-AR-013T	<0.00013	<0.00004	8/24/2001
DT-AR-014T	<0.00011	<0.00004	8/24/2001
DT-AR-015T	<0.00009	<0.00003	8/24/2001
DT-AR-016T	>0.00011 but <0.00018	<0.00004	8/24/2001
MS (Tenax tube)	0.00073	na	8/22/2001
MSD (Tenax tube)	0.00068	na	8/23/2001
MS (Tenax tube)	na	0.00071	8/23/2001
MSD (Tenax tube)	na	0.00072	8/23/2001
Blank (Tenax tube)	<0.00012	<0.00004	8/23/2001
Blank (Tenax tube)	<0.00012	<0.00004	8/24/2001
Laboratory Control Sample (Tenax tube)	0.00070	na	8/24/2001
Laboratory Control Sample (Tenax tube)	0.00063	na	8/27/2001
Laboratory Control Sample (Tenax tube)	na	0.00059	8/27/2001
DT-AR-017T	<0.00009	<0.00003	8/27/2001
DT-AR-018T	<0.00012	<0.00004	8/27/2001
DT-AR-019T	<0.00014	<0.00005	8/27/2001
DT-AR-020T	<0.00009	<0.00003	8/27/2001
DT-AR-021T*	<0.00010	<0.00003	8/27/2001
DT-AR-022T	<0.00011	<0.00004	8/27/2001
DT-AR-023T	<0.00010	<0.00003	8/27/2001
DT-AR-024T	<0.00010	<0.00003	8/27/2001
DT-AR-025T	<0.00011	<0.00004	8/28/2001
DT-AR-026T	<0.00009	<0.00003	8/28/2001
Laboratory Control Sample (Tenax tube)	0.00061	na	8/28/2001
Laboratory Control Sample (Tenax tube)	na	0.00075	8/28/2001
Laboratory Control Sample (Tenax tube)	0.00071	na	8/29/2001
Laboratory Control Sample (Tenax tube)	na	0.00073	8/29/2001

* Tube was cracked prior to analysis, therefore data may not be valid.

Table IV

Results of GC/MS analysis of soil samples

Sample ID	CS µg/g	2-chlorobenzaldehyde µg/g	Malononitrile µg/g	Date Analyzed
Blank	<0.072	<0.040	<1.764	8/30/2001
Laboratory Control Sample	0.128	0.116		8/30/2001
			11.3	9/05/2001
DT-TS-009	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-TS-010	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-01	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-02	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-03	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-04	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-05	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-06	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-07	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-08	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
DT-SO-09	<0.072	<0.040		8/30/2001
			<1.764	9/05/2001
Matrix Spike	0.127	0.073		8/23/2001
			7.4	9/05/2001
Matrix Spike Duplicate	0.119	0.109		8/23/2001
			7.7	9/05/2001

Table V

QA/QC results for GC/MS analysis, glass fiber filters

Sample ID	CS % Recovery	QA/QC Limits
Blank (Glass fiber filter)	nd	n/a
Laboratory Control Sample (Glass fiber filter)	93	20-150%
Matrix Spike (Glass fiber filter)	84	20-150%
Matrix Spike Dup. (Glass fiber filter)	77	20-150%
MS/MSD %RPD	8.7	0-25%
Blank (Glass fiber filter)	nd	n/a
Laboratory Control Sample (Glass fiber filter)	75	20-150%
Matrix Spike (Glass fiber filter)	66	20-150%
Matrix Spike Dup. (Glass fiber filter)	81	20-150%
MS/MSD %RPD	20	0-25%
Blank (Glass fiber filter)	nd	n/a
Laboratory Control Sample (Glass fiber filter)	75	20-150%
Matrix Spike (Glass fiber filter)	56	20-150%
Matrix Spike Dup. (Glass fiber filter)	66	20-150%
MS/MSD %RPD	17	0-25%

Table VI

QA/QC results for GC/MS analysis, Tenax tube

Sample ID	2-chlorobenzaldehyde % Recovery	Malononitrile % Recovery	QA/QC Limits
Blank (Tenax tube)	nd	nd	n/a
Laboratory Control Sample (Tenax tube)	113	97	75-125%
Blank (Tenax tube)	nd	nd	n/a
Laboratory Control Sample (Tenax tube)	116	121	75-125%
Laboratory Control Sample (Tenax tube)	105	99	75-125%
Laboratory Control Sample (Tenax tube)	101	124	75-125%
Laboratory Control Sample (Tenax tube)	118	122	75-125%
Matrix Spike (Tenax tube)	121	119	20-150%
Matrix Spike Dup. (Tenax tube)	113	120	20-150%
MS/MSD %RPD	6.8	0.84	0-25%

Table VII

QA/QC results for GC/MS analysis, soil

Sample ID	CS %Recovery	2-chlorobenzaldehyde %Recovery	Malononitrile % Recovery	QA/QC Limits
Blank (Soil)	nd	nd	nd	n/a
Laboratory Control Sample (Soil)	51	46	91	20-150%
Matrix Spike (Soil)	51	29	62	20-150%
Matrix Spike Dup. (Soil)	47	43	59	20-150%
MS/MSD %RPD	8.0	38*	4.9	0-25%

*Outside of QA/QC limits, data will be considered acceptable as no quantifiable concentrations of CS or 2-chlorobenzyaldehyde were detected.