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REGULATORY COMMITTEE RESPONSE TO U S EPA REGION IV COMMENTS ON
CORRECTIVE MEASURES STUDY WORK PLAN ZONE I CNC CHARLESTON SC

4/26/2002
CH2MHILL



CH2MHILL

April 26, 2002

Mr. Dann Spariosu
U.S. EPA, Region 4
61 Forsyth Street, SW
4WD-FFB
Atlanta, Georgia 30303

Re: Response to Comments on the Zone I CMS Work Plan

Dear Mr. Scaturo:

Enclosed are four copies CH2M-Jones' response to EPA comments on Response to Comments on the CMS Work Plan for Zone I sites.

The principal author of this document is Kris Garcia. Please contact Ms. Garcia at 770/604-9182, extension 476, or me, at 352-335-5877, extension 2280, if you have any questions or comments.

Sincerely,

CH2M HILL

c: David Scaturo/SCDHEC, w/ att
Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att
Kris Garcia/CH2M HILL w/o att

**Response to EPA Comments on the
Corrective Measures Study Work Plan – Zone I
Charleston Naval Complex
North Charleston, South Carolina
Dated February 2002**

General Comments

The recommendations of the CMS Work Plan appear to be appropriate based upon the data presented. The CMS Work Plan appears to be complete with the exceptions noted in the Specific Comments below.

CH2M-Jones Response: *Thank you, we concur.*

Specific Comments

1. **Section 1, Figure 1-2.** The figure shows the locations of several Areas of Concern (AOC) that are not mentioned in the CMS Work Plan (AOC 711, AOC 715, and AOC 718). Please provide information about these AOC or why they are not included in the report.

CH2M-Jones Response:

AOCs 711, 715, and 718 are oil/water separators (OWSs) that were identified by SCDHEC in late 2001. Due to their recent identification, they have not yet been evaluated under the RFI process, but Confirmatory Sampling and Investigation reports are in progress for each one. The sites were included on the figure to indicate their presence. The text in Section 1.0 of the CMS Work Plan will be revised to reflect the current status of these three AOCs. The AOCs and SWMUs addressed in the Zone I CMS Work Plan (other than the OWSs AOCs) can be evaluated separately and closed out independently of these OWS AOCs.

2. **Section 4, Table 4-4.** The naphthalene concentration at Sample Station I677SB009 is listed as 5.9 milligrams per kilogram (mg/Kg) which exceeds the Soil Screening Level (SSL) of 4 mg/Kg. This constituent is not addressed in the chemicals of concern (COC) discussions for AOC 677. Please address why naphthalene was not considered a COC.

CH2M-Jones Response:

The SSL value for naphthalene reported in Table 4-4 (and Table 4-3) was listed as 4 mg/kg, which is the SSL for a DAF=1. This compound should have been included in the discussion of COPCs presented in Section 4.3.2.1 of the CMS Work Plan. Based on review of the naphthalene data at AOCs 675/676/677 (Tables 4-3 and 4-4), it appears that naphthalene was detected in only one of the nine subsurface soil samples, which is also the single exceedence of the SSL (DAF=1) at I677SB009. Naphthalene was not detected in the surface sample collected from the same location (0.75U mg/kg in sample I677SB00901.)

Naphthalene was detected at 1 ug/L in two groundwater samples collected during the first and third sampling events at shallow monitoring well I675GW002. This well is

located cross-gradient from boring I687SB009 and thus is not likely to have been impacted by this boring (See Figure 4-1 for sampling locations). Naphthalene was not detected in either groundwater sample collected during the second or fourth sampling events.

No other naphthalene detections in groundwater were identified at the site, indicating that naphthalene is not leaching from site soils into groundwater.

The average surface soil concentration of naphthalene is 0.47 mg/kg and its average subsurface soil concentration is 1.1 mg/kg, well below the generic SSL of 4 mg/kg (DAF = 10). Thus the amount of naphthalene in soils at the site does not present a significant leaching hazard. Based on these considerations, naphthalene should not be considered a COC at AOCs 676/676/677. The text in Section 4.3.2.1 of the CMS Work Plan will be revised to include this information.

3. **Section 5.3.1.2, Page 5-4.** There is a typographic error in the endrin RBC that should be corrected prior to finalizing the document.

CH2M-Jones Response:

The text will be corrected accordingly. The correct value for the endrin residential RBC is 2,300 ug/kg (HI = 0.1) or 23,000 (HI = 1).

4. **Section 6.3.2.1, Page 6-6.** The report states that 1,2-dichloroethene was detected in surface and subsurface soil in the same boring at concentrations greater than the SSL. Since 1,2-dichloroethene was not detected in groundwater at a co-located well and the concentrations are only slightly above the SSL, the report concludes that 1,2-dichloroethene is not a COC. However, the nearest soil sample is approximately 50 feet from the detection location. Additional soil sampling may be required to adequately determine that 1,2-dichloroethene is not present at concentrations of concern.

CH2M-Jones Response:

CH2M-Jones proposes to resample surface (0 – 1 ft bls) and subsurface (3 – 5 ft bls) soil at the location adjacent to well I680GW004 and analyze the samples for VOCs to assess current soil conditions. In addition, surface and subsurface soil samples will be collected at three locations approximately 20 feet from I680GW004. One soil sampling location will be upgradient of the well and two will be downgradient. Attachment 1 is a figure that shows the specific proposed sampling locations.

After collection and analysis of these samples, a CMS Work Plan addendum for AOC 680 will be prepared. The results will be evaluated to assess whether VOCs in surface or subsurface soil should be considered COCs. If VOCs are determined to be COCs at the site, a pathway forward for additional activities, which may include more soil or groundwater sampling, will be developed, after consultation with EPA.

5. **Section 7.2, Page 7-4.** On Line 11, BEQs are listed as a COC for subsurface soil. However, on lines 21 and 22 it is indicated that no COCs were identified in subsurface soil. Please correct this discrepancy.

CH2M-Jones Response:

BEQs were identified as COCs for soils in the RFI Report (Ensafe, 1999), not specific to interval. The text in Section 7.2.4.2 will be revised to include BEQs in subsurface soil as a COC at AOC 681.

6. **Section 9.3.3.1, Page 9-6.** The report indicates that when well I687GW002 was re-sampled in 1999, the concentration of arsenic had decreased to 26.7 micrograms per liter (ug/L). However, this result could not be located on the tables provided. Please provide this data, since it is used to conclude that arsenic in groundwater at AOC 687 is not a COC. Please provide a description of the sampling technique, since this can significantly impact inorganic compound results. For example were low flow purging/sampling techniques used in more recent sampling events?

CH2M-Jones Response:

The arsenic data for 1999 were inadvertently omitted from Table 9-10. The table will be revised to include the 1999 arsenic results.

Regarding the low flow purge and sampling techniques, we have enclosed copies of several groundwater sampling forms for the sampling performed dates of 1/16/96, 6/4/96, and 9/10/96 (see Attachment 2). These forms show that the groundwater purge flow rates ranged from about 0.1 to 0.23 gallons per minute. This flow rate is generally within the range considered to be low flow purging. Based on conversations with Ensafe, low flow purge methods were used for all groundwater sampling.

Also, Attachment 3 to this Response to Comments is a figure that plots arsenic versus iron concentrations in groundwater samples from well I687GW002 (except for the 1999 data point, for which iron was not measured). The figure shows a linear regression for the data, with an R-squared value of 0.957, a remarkably good coefficient for groundwater data of this type. The regression shows a significant relationship between arsenic and iron, strongly confirming the probability that the arsenic is present due to natural geochemical processes.

Based on these considerations, we believe that arsenic is not site related and should not be considered a COC for this site.

7. **Section 11, Table 11-8.** The title of this table is "VOCs Detected in Surface Soil"; Table 11-3 is also entitled "VOCs in Surface Soil." It appears that this table should be labeled VOCs Detected in Subsurface Soil. Please correct this discrepancy.

CH2M-Jones Response:

The correct title for Table 11-8 should be "VOCs detected in Subsurface Soil." This correction will be made.

8. **Section 12.3.3.1, Page 12-4.** The report concludes that elevated arsenic concentrations detected in well I012GW002 (128 to 253 ug/L) are from natural background sources based on the presence of arsenic in background grid wells and elevated iron and manganese concentrations in groundwater at well I012GW002. The 1999 data could not be located on the tables provided. Please provide this data, since it is used to conclude that arsenic in groundwater is not a COC. Also, the concentration of arsenic in groundwater at this well is 2 to 4 times the maximum concentration detected in grid wells (66 ug/L). While iron and manganese concentrations are also many times higher than the concentrations detected at other wells, re-sampling of the well using low flow purging/sampling is recommended to confirm the results.

CH2M-Jones Response:

The arsenic data for 1999 were inadvertently omitted from Table 9-10. The table will be revised to include the 1999 arsenic results. Also, Attachment 4 to this Response to Comments is a figure that plots arsenic versus iron concentrations in groundwater samples collected at SMWU 12. The figure shows a linear regression for the data, with an R-squared value of 0.8159, which is a remarkably good coefficient for groundwater data of this type.

There is one outlier in the data set. When the outlier is removed from the regression analysis, the arsenic versus iron concentrations have an even stronger relationship with an R-squared value of 0.9707, which is an exceptionally strong correlation coefficient (See Attachment 5).

These regression analyses show a strongly significant relationship between arsenic and iron, strongly confirming the probability that the arsenic is present due to natural geochemical processes.

Based on these considerations, we believe that arsenic is not site related and should not be considered a COC for this site.

9. ~~**Section 12.3.3.3, Page 12-5.** The report states that dioxins (calculated TEQs) are not a COC because (1) only the highest detected value exceeds the RBC, (2) dioxins resulted in a cancer risk greater than 1×10^{-6} for both residential and industrial receptors, and (3) dioxins were not detected in the most recent sampling event at well 012001. This designation appears to be a typo, since no well with this designation was found on the tables. Dioxins were detected in wells I012GW001 and IGDIGW003 (5.6J to 8.9J picograms per liter — pg/L). These concentrations exceed the RBC. The maximum detected value was recorded at well IGDIGW003, according to Table 12-6. This table also indicates that dioxins were detected at this well in the most recent sampling event (8/21/96) at a concentration of 7.9J pg/L (which exceeds the RBC). If the calculated cancer risk is greater than 1×10^{-6} , then dioxin should be a COC under the residential scenario. Please provide more information regarding dioxins.~~

[Note: Disregard comment 9; I leave it in for your information only. Dioxins >RBC but < 1 ppb need not be considered COCs. However, these facts should be pointed out in the uncertainties section. -ds]

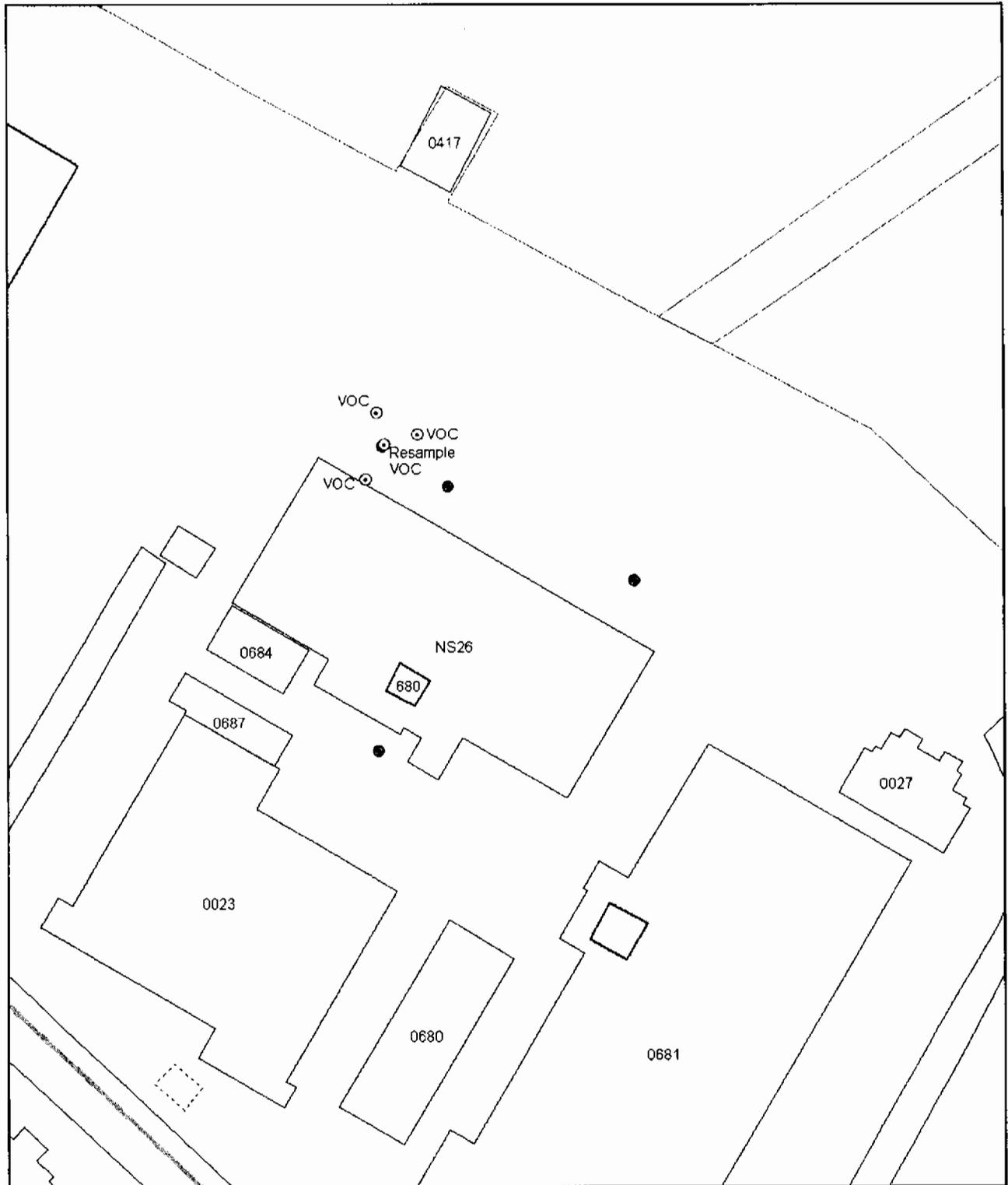
CH2M-Jones Response:

Although this comment was included for informational purposes only, CH2M-Jones feels that some clarification is warranted.

The primary criterion for SCDHEC for determining whether a chemical in groundwater is a COC is whether the concentrations of the chemical are above or below the drinking water MCL. The MCL for dioxin in drinking water is 30 pg/L. None of the dioxin concentrations in groundwater samples at this site, including the nearby grid well, exceeded the MCL. Therefore, dioxin is not considered a COC in groundwater at this site.

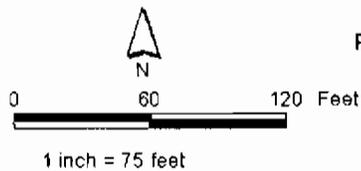
The tables included as Attachment 6 present the grid well concentration ranges for dioxins measured in Zone I, for shallow and deep groundwater (see Table 1 below). As can be noted in Table 1, background concentration ranges are 1.3 pg/L to 5.2 pg/L, with a mean of 3 pg/L for shallow groundwater. Similar values for deep groundwater are 0.9 pg/L to 9.9 pg/L, with a mean of 2.7 pg/L. In most cases, much of the concentrations in these estimated values result simply from summing up the values represented by half the detection limit. The TEF values calculated based on actual detected concentrations (= or j flagged) are much lower than those shown in the attached tables.

The estimated TEQ values in site wells at SWMU 12 ranged (Table 2) between 1.5 pg/L to 4.7 pg/L, with a mean value of 2.1 pg/L. The last round of samples for two of the three wells are non-detects and the one detect is at 2 pg/L. The average background concentration is at 3 pg/L. These values are all well below the MCL.



- ⊙ Proposed Sample Location
- Groundwater Sample
- - - Fence
- ≡ Roads
- ~ Shoreline
- ▭ Buildings

- ⋯ Zone Boundary
- - - AOC Boundary
- - - SWMU Boundary



Attachment 1
Proposed Confirmation Surface Soil and
Subsurface Soil Sampling Locations
AOC 680, Zone I
Charleston Naval Complex

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Attachment 2
(1 of 3)

Final Comprehensive Sampling and Analysis Plan
Naval Base Charleston
August 30, 1994

Figure 6-1
Groundwater Sampling Form

Groundwater Sampling		Sample ID: _____					
PROJECT NAME: <u>NAVAL BASE CHARLESTON</u>		JOB NO: <u>2908-08440</u> DATE: <u>1/16/96</u>					
WELL NO.: <u>NBCI/ 687 GW 002 02</u>		LOCATION: <u>ZONE I</u>					
WEATHER CONDITIONS: <u>Cloudy</u>		AMBIENT TEMP: <u>55°</u>					
REVIEWED BY: _____		PERSONNEL: <u>LESTER/BASHA/WARD</u>					
PURGING DEVICE Type device? <u>PERISTALTIC PUMP/TEFLON TUBING</u> How was the device decontaminated? <u>N/A</u> How was the line decontaminated? <u>5 STEP D-CON</u> Which well was previously purged? <u>NBCI/</u>	SAMPLING DEVICE Type device? _____ S How was the device decontaminated? _____ A How was the line decontaminated? _____ M Which well was previously sampled? _____ E						
INITIAL WELL VOLUME Well diameter (in.) <u>2</u> Stickup (ft.) _____ Depth to bottom of well from TOC (ft.) <u>15.51</u> Depth to water surface from TOC (ft.) <u>5.80</u> Length of water (ft.) <u>9.71</u> Volume of water (ft.) _____ (gal.) <u>1.6</u> Amount of sediment at bottom of well (ft.) _____ 3 Volumes of water (gal.) <u>4.8</u>	PURGING Time started <u>1533</u> Finished <u>1602</u> Volume purged <u>4.8 gal</u> Comments on Well Recovery _____ Depth to water (ft.) <u>5.80</u> Completion <u>N/A 9.11</u> Additional Comments _____ Sample Collected: Start <u>1615</u> Finish <u>1628</u>						
IN-SITU TESTING	Time:	<u>1535</u>	<u>1576</u>	<u>1551</u>	<u>1601</u>		
		1	2	3	4	5	6
Well Volume Purged (gal.)		<u>0</u>	<u>1.6</u>	<u>3.2</u>	<u>4.8</u>		
Turbidity		<u>266</u>	<u>4.88</u>	<u>2.14</u>	<u>1.49</u>		
Odor							
pH (units)		<u>7.25</u>	<u>7.13</u>	<u>7.12</u>	<u>7.15</u>		
Conductivity (umhos)		<u>4570</u>	<u>4070</u>	<u>4090</u>	<u>4140</u>		
Water Temperature (°C)		<u>67</u>	<u>67</u>	<u>68</u>	<u>67</u>		
Depth to water (ft.)		<u>5.80</u>	<u>8.10</u>	<u>8.85</u>	<u>9.11</u>		
NOTES:		1 ft. length of 4" Turbidity chambers: _____ = 0.087 ft ³ or 0.85 gal. clear, turbid, opaque		1 ft. length 2" = 0.022 ft ³ or 0.18 gal. Revision Date: 8/5/92			

Attachment 2
(2 of 3)

Final Comprehensive Sampling and Analysis Plan
Naval Base Charleston
August 30, 1994

FIGURE 6-1

Groundwater Sampling Form

Groundwater Sampling		Sample ID: NBCI 687 GW 00203
PROJECT NAME: NAVAL BASE CHARLESTON (clean)	JOB NO: _____	DATE: 6-4-96
WELL NO: NBCI 687-002	LOCATION: ZONE I	
WEATHER CONDITIONS: <u>Sunny Windy</u>	AMBIENT TEMP: 85°	
REVIEWED BY: <u>[Signature]</u>	PERSONNEL: <u>B. Herrick M. Zetzkoff</u>	

PURGING DEVICE	SAMPLING DEVICE
Type device? <u>Peristaltic Pump</u>	Type device? <u>Peristaltic Pump</u>
How was the device decontaminated? <u>Per CSAP</u>	How was the device decontaminated? <u>Per CSAP</u>
How was the line decontaminated? <u>Per CSAP</u>	How was the line decontaminated? <u>Per CSAP</u>
Which well was previously purged? <u>NBCI 687-001</u>	Which well was previously sampled? <u>NBCI 687-001</u>

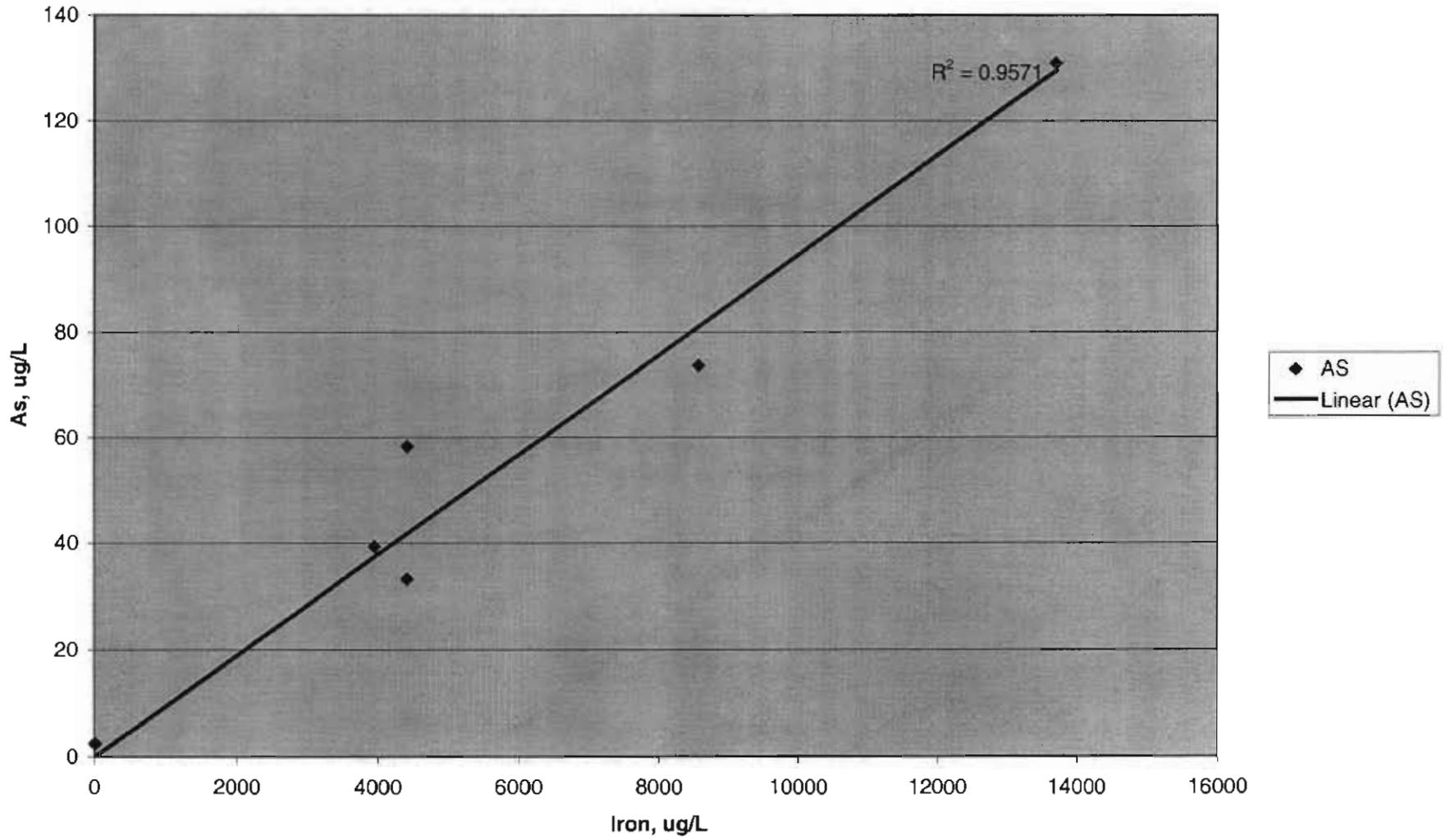
INITIAL WELL VOLUME	PURGING
Well diameter (in.) <u>2</u>	Time started <u>1150</u> Finished <u>1258</u>
Stickup (ft.) <u>3'</u>	Volume purged <u>6.75 gal</u>
Depth to bottom of well from TOC (ft.) <u>15.51</u>	Comments on Well Recovery <u>Pool</u>
Depth to water surface from TOC (ft.) <u>7.67</u>	Depth to water (ft.) <u>11.19</u>
Length of water (ft.) <u>7.84</u>	Completion _____
Volume of water (ft.) _____	Additional Comments _____
(gal.) <u>1.3</u>	Sample Collected: Start <u>1305</u>
Amount of sediment at bottom of well (ft.) <u>None</u>	Finish <u>1312</u>
3 volumes of water (gal.) <u>4</u>	

IN-SITU TESTING	Time: <u>1258</u>	_____	<u>1157</u>	<u>1203</u>	<u>1210</u>	<u>1216</u>	<u>1222</u>	<u>1229</u>	<u>1238</u>	<u>1249</u>
	<u>9</u>	_____	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Well Volume Purged (gal.)	<u>6.75</u>	_____	<u>7</u>	<u>1.5</u>	<u>2.25</u>	<u>3</u>	<u>3.75</u>	<u>4.5</u>	<u>5.25</u>	<u>6</u>
Turbidity	<u>6</u>	_____	<u>3/1</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>8.5</u>	<u>3</u>	<u>8</u>
Odor	<u>None</u>	_____	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>
pH (units)	<u>6.58</u>	_____	<u>6.64</u>	<u>6.58</u>	<u>6.59</u>	<u>6.57</u>	<u>6.61</u>	<u>6.57</u>	<u>6.61</u>	<u>6.59</u>
Conductivity (umho)	<u>3.90</u>	_____	<u>3.84</u>	<u>3.58</u>	<u>3.69</u>	<u>3.67</u>	<u>3.79</u>	<u>6.62</u>	<u>4.02</u>	<u>3.85</u>
Water Temperature (deg. C)	<u>21.5</u>	_____	<u>21.4</u>	<u>21.5</u>	<u>21.3</u>	<u>21.3</u>	<u>21.0</u>	<u>21.4</u>	<u>22.0</u>	<u>22.1</u>
Depth to water (ft.)	<u>11.19</u>	_____	<u>8.64</u>	<u>9.22</u>	<u>9.68</u>	<u>10.1</u>	<u>10.71</u>	<u>11.01</u>	<u>10.99</u>	<u>11.04</u>

NOTES: 1 FT. LENGTH OF 4" Turbidity choices: _____ equals 0.087 R or 0.65 gal. clear, turbid, opaque 1 ft. length 2" equals 0.022ft or 0.16 gal. Revision Date: 8/5/92

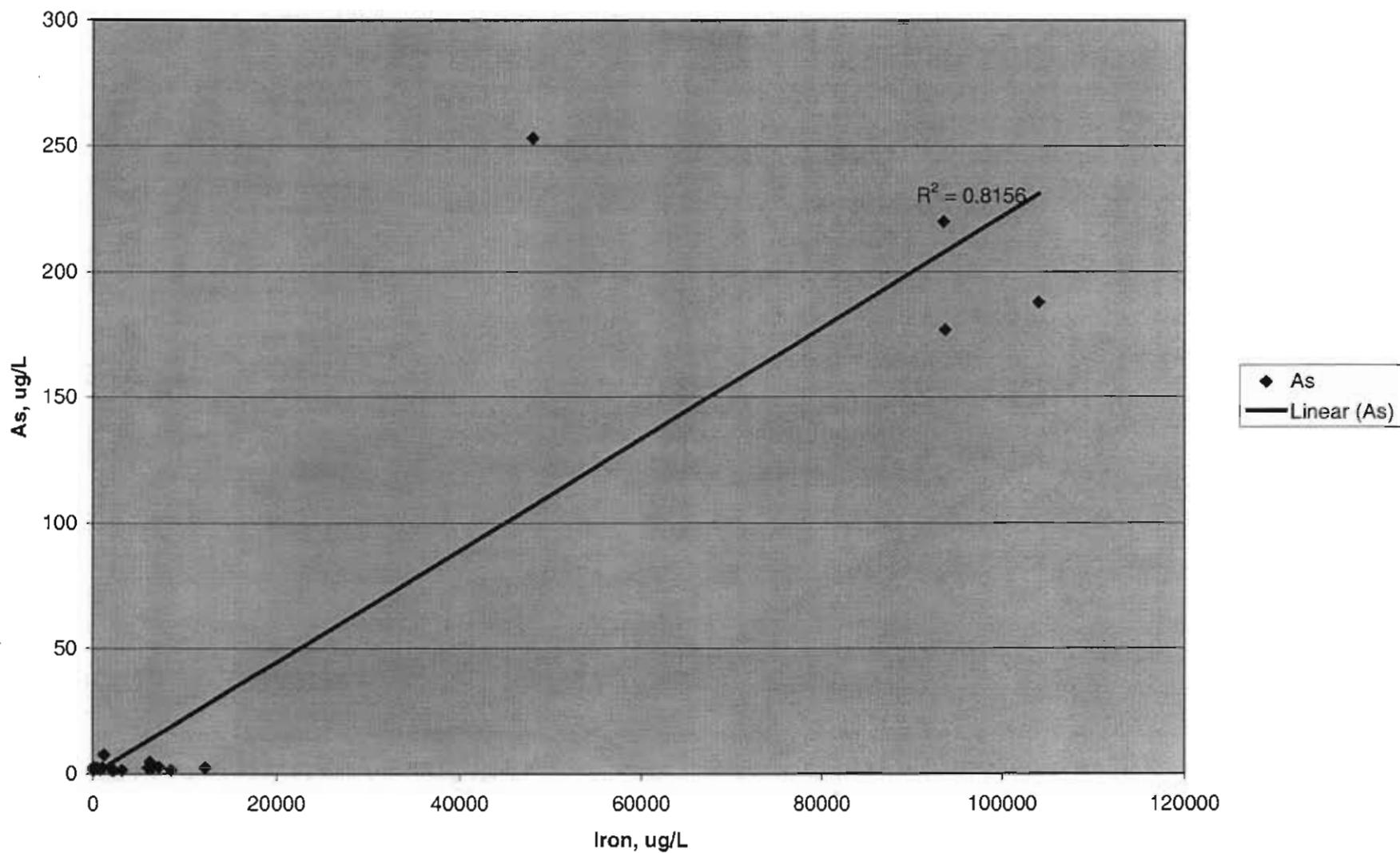
Attachment 3

Arsenic as a function of Iron Concentration (ug/L)
At Well I687GW002

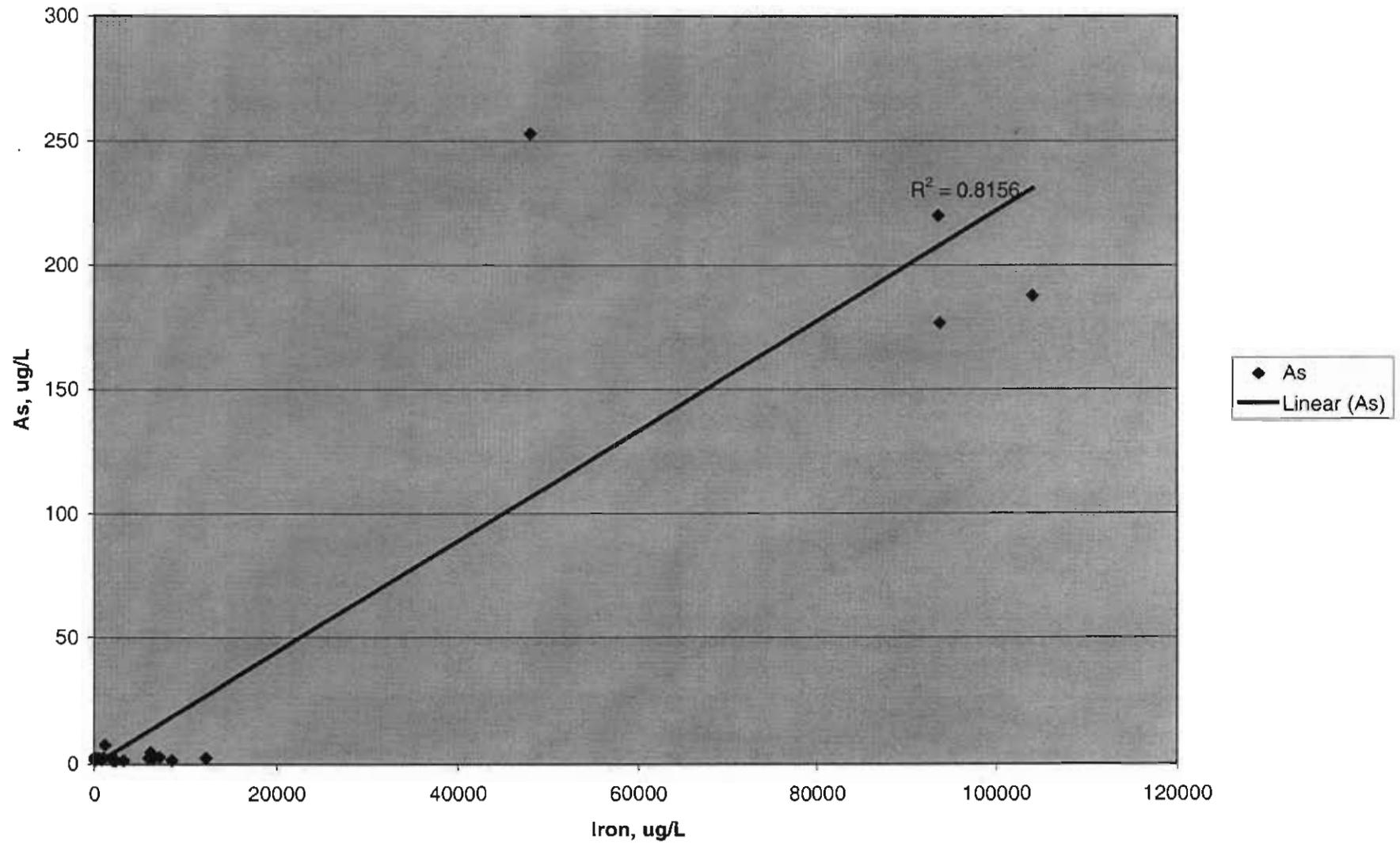


Attachment 4

Arsenic Versus Iron in Groundwater at SWMU 12



Attachment 5
Arsenic Versus Iron in Groundwater at SWMU 12



Attachment 6

Table 1: TEQs in Background Wells in Zone I – Shallow and Deep

STATION ID	SAMPLE ID	SAMPLE DATE	TEQ	QUAL	UNITS	SAMPLE TYPE
IGDIGW002	GDIGW00201a	12-May-95	4.0	=	pg/L	N
IGDIGW002	GDIGW00202	12-Dec-95	1.5	=	pg/L	N
IGDIGW003	GDIGW00301b	12-May-95	3.5	=	pg/L	N
IGDIGW003	GDIGW00302	14-Dec-95	2.0	=	pg/L	N
IGDIGW003	GDIGW00303	20-May-96	3.1	=	pg/L	N
IGDIGW003	GDIGW00304	21-Aug-96	5.2	=	pg/L	N
IGDIGW004	GDIGW00401b	12-May-95	3.0	=	pg/L	N
IGDIGW004	GDIGW00402	13-Dec-95	1.9	=	pg/L	N
IGDIGW004	GDIGW00403	21-May-96	3.2	=	pg/L	N
IGDIGW004	GDIGW00404	22-Aug-96	2.8	=	pg/L	N
IGDIGW008	GDIHW00801a	02-May-95	4.0	=	pg/L	FD
IGDIGW009	GDIHW00901	05-May-95	5.1	=	pg/L	FD
IGDIGW010	GDIGW01002	11-Dec-95	3.7	=	pg/L	N
IGDIGW010	GDIGW01003	31-May-96	2.4	=	pg/L	N
IGDIGW012	GDIHW01201a	15-May-95	3.4	=	pg/L	FD
IGDIGW015	GDIGW01504	23-Aug-96	2.8	=	pg/L	N
IGDIGW015	GDIHW01501a	23-May-95	1.5	=	pg/L	FD
IGDIGW019	GDIGW01901b	15-May-95	1.8	=	pg/L	N
IGDIGW019	GDIGW01904	28-Aug-96	1.3	=	pg/L	N
Mean of background			3.0			
Max of Background			5.2			
Minimum of Background			1.3			
Deep Background Groundwater						
IGDIGW01D	GDIGW01D01	23-May-95	1.6	=	pg/L	N
IGDIGW01D	GDIGW01D03	15-May-96	9.9	=	pg/L	N
IGDIGW02D	GDIGW02D01	23-May-95	1.0	=	pg/L	N
IGDIGW03D	GDIGW03D01a	08-Jun-95	1.5	=	pg/L	N
IGDIGW04D	GDIGW04D01	06-Jun-95	0.9	=	pg/L	N
IGDIGW04D	GDIGW04D02	15-Dec-95	2.1	=	pg/L	N
IGDIGW04D	GDIGW04D03	23-May-96	3.3	=	pg/L	N
IGDIGW06D	GDIHW06D01a	24-May-95	3.0	=	pg/L	FD
IGDIGW12D	GDIHW12D01a	08-Jun-95	2.3	=	pg/L	FD
IGDIGW16D	GDIGW16D03	28-May-96	2.6	=	pg/L	N
IGDIGW19D	GDIGW19D01	01-Jun-95	1.1	=	pg/L	N
Mean of background			2.7			
Max of Background			9.9			
Minimum of Background			0.9			

Attachment 6**Table 2: TEQs in Groundwater at SWMU 12 – Zone I**

STATION ID	SAMPLE ID	SAMPLE DATE	TEQ	QUAL	UNITS	SAMPLE TYPE
I012GW001	012GW00101 c	12-Jun-95	4.7	=	pg/L	N
I012GW001	012GW00104	09-Sep-96	2.7	U	pg/L	N
I012GW002	012GW00204	04-Sep-96	1.5	=	pg/L	N
I012GW003	012GW00304	09-Sep-96	1.8	U	pg/L	N
I012GW003	012HW00301	06-Jun-95	2.0	=	pg/L	FD
Mean of detects + non-detects at ½-value			2.1			
Max of detects			4.7			
Minimum of detects			1.5			