Brian Rakvica

From: Brian Rakvica
Sent: Wednesday, December 26, 2007 6:51 AM
To: Keith Bailey (okbailey@flash.net); Susan Crowley (susan.crowley@tronox.com)
Cc: Jim Najima; Shannon Harbour; Brian Rakvica; sahuron@earthlink.net; Mark.Jones@erm.com; pblack@neptuneinc.org
Subject: TRX Parcels A and B
Importance: High

Susan and Keith,

The NFA letter is ready to be issued; however, we don't want you to be surprised as there will be an asbestos-related condition.

Based upon our review of the asbestos tech memo and risk assessment we have a few additional comments as follows:

Chrysotile was apparently dismissed because the risk was considered sufficiently low by TRX. However, the risk assessment was performed for the entire site (both parcels in their entirety) assuming a single population distribution across the site. Given the density of the data collection (every 3 acres or so), this might not be appropriate. There are a few areas that we are concerned about because they were not remediated and it does not seem appropriate to treat the entire site as one decision unit.

One is the area for which sample AR-11 is the only representation. This sample had 13 total chrysotile fibers, 8 of which are long. Based on this 1 sample, the risk in this sub-area, if evaluated separately and based on the 8 long fibers, is 7E-6. This "hole" in the remediation should be dealt with (by remediating).

The other is the area for which sample BJ-01 is the only representation. This sample had 31 total chrysotile fibers, 19 of which are long. Based on this 1 sample, the risk in this subarea, if evaluated separately and based on the 19 long fibers, is 1E-5. This "hole" in the remediation should also be dealt with (by remediating).

The sample from AR-02 also has 5 chrysotile fibers, only 2 of which are long, which also drives a small risk for the RME. This one is perhaps ignorable because it is within a larger area of low concentrations. Also BJ-05 has 6 fibers, 3 of which are long. This one is also perhaps ignorable because it is within a larger area of low concentrations.

It is not clear to the NDEP why this issue was not raised previously, however, we are prepared to issue the NFA letter if TRX agrees to the condition of remediating these two areas.

I am not in the office today, however, I can make myself available for a call, if necessary. Please respond by email with a time that works for a call, if necessary.

Thanks,

Brian

Brian Rakvica

From: Brian Rakvica
Sent: Thursday, December 27, 2007 8:38 AM
To: 'Keith Bailey'; susan.crowley@tronox.com; 'Ranajit Sahu'; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org; Brian Rakvica
Subject: RE: TRX Parcels A and B
Importance: High

Keith and Susan,

NDEP has reviewed the additional documentation submitted by TRX and has determined that it is necessary to remediate (and take confirmatory samples) for the polygons related to the asbestos contamination at locations AR-11 and BJ-01. The polygons are defined on Figure 1 of the "Asbestos Data Review" submitted on 12/17/07.

It is expected that a revised "Asbestos Data Review" can be submitted to document the completion of these activities.

Please advise re: schedule to complete this work.

Thank you,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Wednesday, December 26, 2007 2:37 PM
To: Brian Rakvica; susan.crowley@tronox.com; 'Ranajit Sahu'; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org
Subject: RE: TRX Parcels A and B

Brian,

I just got off the phone with Tronox management. They just learned that the buyer will not move on the Parcel A sale if the NFA includes a conditional asbestos removal. It looks like we will have to wait until Neptune can review the calculations. If Neptune is satisfied, we can then proceed with the NFA. If not, we can discuss the next option.

Thanks very much for your help. Please let us know if you hear from Neptune.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 26, 2007 4:17 PM
To: Keith Bailey; susan.crowley@tronox.com; Ranajit Sahu; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org
Subject: RE: TRX Parcels A and B
Importance: High

Keith,

As noted repeatedly, I need to discuss this with Neptune and I cannot commit to a date or time by when this will occur.

If TRX wants the NFA "today" then you need to commit to remediate these areas and take confirmation samples.

If you can agree to this I can issue the NFA this afternoon.

If you want us to consider the revised calcs we will need to review them and perhaps add more language to the Attachment.

It is hard to justify leaving a known carcinogen, in place, at the surface where it is easily accessed and can potentially migrate downgradient.

This is an issue that can easily and cheaply be addressed by TRX.

Since this is a "new issue" I may need to discuss with management, as well (if TRX strongly opposes remediation).

Please advise.

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
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Subject: FW: TRX Parcels A and B

Brian,

With upper bound risk estimates of 3x10-6 and 4x10-6, the chrysotile risk seems minimal and is in the same range as the 5x10-6 amphibole risk (for zero amphibole fibers). Is this sufficient to proceed with the NFA?

Give me a call at 405.216.9213 if you want to discuss the situation.

Keith

From: Mark Jones [mailto:Mark.Jones@erm.com]
Sent: Wednesday, December 26, 2007 3:22 PM
To: Brian Rakvica; Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour
Subject: RE: TRX Parcels A and B

Brian,

Here are the revised asbestos risk estimates, based on the smaller areal extents, but assuming an exposure time of 250 days at each area.

-Mark J.

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 26, 2007 12:36 PM
To: Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: Mark Jones; wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour; Brian Rakvica
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Importance: High

Keith,

As I noted this AM Paul Black is on vacation so I am not sure when NDEP will complete our review.

It is highly unlikely that the NFA will be issued today.

Also, unless TRX wants another condition added to the letter regarding future use of the site we cannot tinker with the exposure time.

Please resubmit the calculation utilizing the default exposure time of 250 days.

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Wed 12/26/2007 12:31 PM
To: Brian Rakvica; pblack@neptuneinc.org; susan.crowley@tronox.com; 'Ranajit Sahu'
Subject: FW: TRX Parcels A and B

Brian,

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As we discussed this morning by phone, we are hopeful that these revised calculations will allow NDEP to remove the asbestos condition from the NFA. Mark Jones, Ranajit Sahu, Susan Crowley and I can be available for discussions by phone if necessary.

We look forward to receiving the completed NFA today.

We have received your draft NFA comments and are reviewing them now.

Thanks for your efforts.

Keith

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Please visit ERM's web site: http://www.erm.com

Shannon Harbour

From: Keith Bailey [okbailey@flash.net]
Sent: Thursday, December 27, 2007 9:01 AM
To: Brian Rakvica; susan.crowley@tronox.com; 'Ranajit Sahu'; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org
Subject: RE: TRX Parcels A and B

Brian,

We are working on getting trucks and a scraper crew. We will advise as soon as we find them.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Thursday, December 27, 2007 10:38 AM
To: Keith Bailey; susan.crowley@tronox.com; Ranajit Sahu; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org; Brian Rakvica
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Keith

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Brian Rakvica

From: Brian Rakvica

Sent: Thursday, December 27, 2007 9:36 AM

To: 'Ranajit (Ron) Sahu'

Cc: okbailey@flash.net; susan.crowley@tronox.com; Mark Jones; Jim Najima; pblack@neptuneinc.org; Brian Rakvica; Shannon Harbour

Subject: RE: Tronox A and B New Scraping Areas

Ranajit,

This looks fine.

Thanks,

Brian

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thursday, December 27, 2007 9:31 AM
To: Brian Rakvica
Cc: okbailey@flash.net; susan.crowley@tronox.com; Mark Jones
Subject: Tronox A and B New Scraping Areas

Brian:

Per our recent discussion, please see an updated figure showing the polygons around AR-11 and BJ-01 that we believe needs to be remediated in order to address the chrosytile hits. This Figure is a little different from Figure 1 in the Dec 17th Asbestos memo in that (a) it excludes a strip of land just to the east of the AR-11 polygon which was actually already scraped in the last round; and (b) it excludes a polygon around BJ-06 which is a clean sample. The Figure shows the corner points that will be staked in the field in order to assist the field crew. The resamples will be collected from the original AR-11 and BJ-01 locations, after scraping.

Please let me know if you have any questions.

Thanks

Ranajit

Brian Rakvica

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Thursday, December 27, 2007 9:31 AM
To: Brian Rakvica
Cc: okbailey@flash.net; susan.crowley@tronox.com; Mark Jones
Subject: Tronox A and B New Scraping Areas
Attachments: Tronox_Parcels-A-B_Chrysotile-Remediate.pdf

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Please let me know if you have any questions.

Thanks

Ranajit

GPS Point	X	Y
AR11-Pt1	826449.21250	26723523.31174
AR11-Pt2	826500.06437	26723254.13581
AR11-Pt3	826477.68955	26723164.63651
AR11-Pt4	826209.86967	26723156.50021
AR11-Pt5	826238.34672	26723285.32496
AR11-Pt6	826321.06577	26723521.95569

GPS Point	X	Y
BJ01-Pt1	826775.50083	26722682.92156
BJ01-Pt2	826720.42250	26722553.05796
BJ01-Pt3	826670.24865	26722414.06284
BJ01-Pt4	826647.87382	26722420.84309
BJ01-Pt5	826668.10900	26722683.53844

🟩 Remediated Areas*
🟨 Unremedated Area Around AR-11 (1.8 Acres)
🟪 Unremedated Area Around BJ-01 (0.4 Acres)

February 2007 Aerial from AirPhotoUSA.

*These areas have had a minimum of 4" of soil removed for remediation purposes.

BEC / Tronox Parcels A/B Data Review
BMI Common Areas, Henderson, Nevada

FIGURE

CHRYSOTILE ASBESTOS
REMEDIATION AREAS

Basic Environmental
COMPANY

Prepared by: MKJ
Date 12/26/07
JOB No. 0069073
FILE: GIS/BEC/TRONOX/FIGURE_4 MXD

Brian Rakvica

From: Keith Bailey [okbailey@flash.net]
Sent: Wednesday, December 26, 2007 12:32 PM
To: Brian Rakvica; pblack@neptuneinc.org; susan.crowley@tronox.com; 'Ranajit Sahu'
Subject: FW: TRX Parcels A and B
Attachments: Tronox Parcels A-B Asbestos Calculations_AR-11.xls; Tronox Parcels A-B Asbestos Calculations_BJ-01.xls

Brian,

This is the first of two e-mails containing the Tronox reasoning that the chrysotile risk is minimal. The second e-mail will include the pdf figures.

Basically, our concern is that the dust generation from the two small areas is very small relative to the 74 acre parcel and that construction workers will not be working on the two small areas for the full 250 day construction time. Use of these assumptions (74 acres and 250 days) was the only way Mark Jones of ERM could come up with the risks you cited in your e-mail this morning. With adjustments to what we believe are more defensible assumptions, the risk associated with chrysotile at the two locations is very modest. As directed by NDEP we have not included the normal use of dust suppression moisture to further reduce the calculated risk.

As we discussed this morning by phone, we are hopeful that these revised calculations will allow NDEP to remove the asbestos condition from the NFA. Mark Jones, Ranajit Sahu, Susan Crowley and I can be available for discussions by phone if necessary.

We look forward to receiving the completed NFA today.

We have received your draft NFA comments and are reviewing them now.

Thanks for your efforts.

Keith

Keith

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location AR-11)

Scenario	Estimated Airborne Chrysotile Concentrations[1] (s/cm^3)	Estimated Airborne Amphibole Concentrations[1] (s/cm^3)	Adjusted Chrysotile URF[2] (s/cm^3)$^{-1}$	Adjusted Amphibole URF[2] (s/cm^3)$^{-1}$	Estimated Chrysotile[3] Risk	Estimated Amphibole[3] Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	3.8 E-2	0.0 E+0	4.5 E-6	4.9 E-4	2 E-7	0 E+0
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	6.9 E-2	1.4 E-2	4.5 E-6	4.9 E-4	3 E-7	7 E-6
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	1.8 E-2	0.0 E+0	4.5 E-6	4.9 E-4	8 E-8	0 E+0
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.3 E-2	6.8 E-3	4.5 E-6	4.9 E-4	1 E-7	3 E-6
Future Maintenance Worker-Best Estimate	1.7 E-5	0.0 E+0	4.2 E-3	4.6 E-1	7 E-8	0 E+0
Future Maintenance Worker-Upper Bound	3.2 E-5	6.6 E-6	4.2 E-3	4.6 E-1	1 E-7	3 E-6
Current/Future On-Site Trespasser-Best Estimate	1.7 E-5	0.0 E+0	1.1 E-4	1.2 E-2	2 E-9	0 E+0
Current/Future On-Site Trespasser-Upper Bound	3.2 E-5	6.6 E-6	1.1 E-4	1.2 E-2	4 E-9	8 E-8

Notes:

(1) Calculated based on estimated dust estimates and asbestos fiber concentrations (see Attachment A CD).

(2) Calculated uing equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003; see Attachment A CD).

(3) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location BJ-01)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
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Brian,

Mark Jones is revising the asbestos risk calculations back to 250 days, but with the smaller area ratio. The results should be available shortly.

Depending on the results, I have a few options to suggest.

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From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 26, 2007 2:36 PM
To: Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: Mark.Jones@erm.com; wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour; Brian Rakvica
Subject: RE: TRX Parcels A and B
Importance: High

Keith,

As I noted this AM Paul Black is on vacation so I am not sure when NDEP will complete our review.

It is highly unlikely that the NFA will be issued today.

Also, unless TRX wants another condition added to the letter regarding future use of the site we cannot tinker with the exposure time.

Please resubmit the calculation utilizing the default exposure time of 250 days.

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Wed 12/26/2007 12:31 PM
To: Brian Rakvica; pblack@neptuneinc.org; susan.crowley@tronox.com; 'Ranajit Sahu'
Subject: FW: TRX Parcels A and B

Brian,

This is the first of two e-mails containing the Tronox reasoning that the chrysotile risk is minimal. The second e-mail will include the pdf figures.

Basically, our concern is that the dust generation from the two small areas is very small relative to the 74 acre parcel and that construction workers will not be working on the two small areas for the full 250 day construction time. Use of these assumptions (74 acres and 250 days) was the only way Mark Jones of ERM could come up with the risks you cited in your e-mail this morning. With adjustments to what we believe are more defensible assumptions, the risk associated with chrysotile at the two locations is very modest. As directed by NDEP we have not included the normal use of dust suppression moisture to further reduce the calculated risk.

As we discussed this morning by phone, we are hopeful that these revised calculations will allow NDEP to remove the asbestos condition from the NFA. Mark Jones, Ranajit Sahu, Susan Crowley and I can be available for discussions by phone if necessary.

We look forward to receiving the completed NFA today.

We have received your draft NFA comments and are reviewing them now.

Thanks for your efforts.

Keith

Keith

Brian Rakvica

From: Mark Jones [Mark.Jones@erm.com]
Sent: Wednesday, December 26, 2007 1:22 PM
To: Brian Rakvica; Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour
Subject: RE: TRX Parcels A and B
Attachments: Tronox Parcels A-B Asbestos Calculations_BJ-01-250days.xls; Tronox Parcels A-B Asbestos Calculations_AR-11-250days.xls

Brian,

Here are the revised asbestos risk estimates, based on the smaller areal extents, but assuming an exposure time of 250 days at each area.

-Mark J.

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
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As we discussed this morning by phone, we are hopeful that these revised calculations will allow NDEP to remove the asbestos condition from the NFA. Mark Jones, Ranajit Sahu, Susan Crowley and I can be available for discussions by phone if necessary.

We look forward to receiving the completed NFA today.

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Thanks for your efforts.

Keith

Keith

This message contains information which may be confidential, proprietary, privileged, or otherwise protected by law from disclosure or use by a third party. If you have received this message in error, please contact us immediately at (925) 946-0455 and take the steps necessary to delete the message completely from your computer system. Thank you.

Please visit ERM's web site: http://www.erm.com

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location BJ-01)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
<u>LONG FIBERS</u>						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	1.5 E-2	0.0 E+0	1.9 E-4	2.1 E-2	3 E-6	0 E+0
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	2.2 E-2	2.4 E-3	1.9 E-4	2.1 E-2	4 E-6	5 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	1.3 E-2	0.0 E+0	9.7 E-5	1.1 E-2	1 E-6	0 E+0
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	1.8 E-2	2.0 E-3	9.7 E-5	1.1 E-2	2 E-6	2 E-5
Future Maintenance Worker-Best Estimate	4.2 E-5	0.0 E+0	4.2 E-3	4.6 E-1	2 E-7	0 E+0
Future Maintenance Worker-Upper Bound	6.1 E-5	6.6 E-6	4.2 E-3	4.6 E-1	3 E-7	3 E-6
Current/Future On-Site Trespasser-Best Estimate	4.2 E-5	0.0 E+0	1.1 E-4	1.2 E-2	5 E-9	0 E+0
Current/Future On-Site Trespasser-Upper Bound	6.1 E-5	6.6 E-6	1.1 E-4	1.2 E-2	7 E-9	8 E-8

Notes:

(1) Calculated based on estimated dust estimates and asbestos fiber concentrations (see Attachment A CD).

(2) Calculated uing equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003; see Attachment A CD).

(3) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location AR-11)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	8.0 E-3	0.0 E+0	1.9 E-4	2.1 E-2	1 E-6	0 E+0
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	1.4 E-2	3.0 E-3	1.9 E-4	2.1 E-2	3 E-6	6 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	6.7 E-3	0.0 E+0	9.7 E-5	1.1 E-2	7 E-7	0 E+0
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	1.2 E-2	2.5 E-3	9.7 E-5	1.1 E-2	1 E-6	3 E-5
Future Maintenance Worker-Best Estimate	1.7 E-5	0.0 E+0	4.2 E-3	4.6 E-1	7 E-8	0 E+0
Future Maintenance Worker-Upper Bound	3.2 E-5	6.6 E-6	4.2 E-3	4.6 E-1	1 E-7	3 E-6
Current/Future On-Site Trespasser-Best Estimate	1.7 E-5	0.0 E+0	1.1 E-4	1.2 E-2	2 E-9	0 E+0
Current/Future On-Site Trespasser-Upper Bound	3.2 E-5	6.6 E-6	1.1 E-4	1.2 E-2	4 E-9	8 E-8

Notes:

(1) Calculated based on estimated dust estimates and asbestos fiber concentrations (see Attachment A CD).

(2) Calculated uing equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003; see Attachment A CD).

(3) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

BJ-01- 250 days

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - NO DUST MITIGATION (ONE YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 2)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fugitive dust from wind erosion(1)	M_{wind}	g	4.4 E+3
Fraction of vegetative cover(2)	V	--	0.0 E+0
Mean annual wind speed(3)	U_m	m/s	4.00
Equivalent threshold value of wind speed(2)	U_t	m/s	1.1 E+1
Function dependent on U/U_t(2)	F(x)	--	1.9 E-1
Areal Extent of site surface contamination(4)	A_{surf}	m^2	1619
Exposure duration(5)	ED	year	1
Fugitive dust from excavation(6)	M_{excav}	g	409.20
Wet soil bulk density(7)	r_{soil}	Mg/m^3	1.83
Percent moisture in soil(8)	M	%	4.9
Areal extent of site excavation(9)	A_{excav}	m^2	323.8
Depth of site excavation(2)	d_{excav}	m	1.0
Number of times soil is dumped(2)	N_A	--	2.0
Fugitive dust from dozing(10)	M_{doz}	g	182.41
Percent weight of silt in soil(7)	s	%	9.4
Percent moisture in soil(8)	M	%	4.9
Mean vehicle speed(2)	S_{doz}	km/hr	11.4
Sum dozing kilometers traveled(11)	VKT_{doz}	km	1.99
Fugitive dust from grading(12)	M_{grade}	g	869.22
Mean vehicle speed(2)	S_{grade}	km/hr	11.4
Sum dozing kilometers traveled(12)	VKT_{grade}	km	1.99
Fugitive dust from tilling(13)	M_{till}	g	273
Percent weight of silt in soil(7)	s	%	9.4
Areal extent of site tilling(9)	A_{till}	acre	0.1
Number of times soil is tilled(2)	N_A	--	2.0
Total Time Averaged PM_{10} Emission(14)	J'_T	g/m2-sec	5.24E-07
Duration of construction(2)	T	sec	7200000
Subchronic Dispersion Factor for Area Source(15)	Q/C_{sa}	g/m^2-sec per kg/m^3	14.95
Constant A(2)	A	--	2.4538
Constant B(2)	B	--	17.5660
Constant C(2)	C	--	189.0426
Areal Extent of site surface contamination(4)	A_{surf}	acres	0.4
Dispersion correction factor(16)	F_D	--	0.1879
Subchronic PEF for Construction Activities(17)	**PEF_{sc}**	**m^3/kg**	**1.52E+08**

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - NO DUST MITIGATION (ONE YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 2)

Parameter	Abbrev.	Units	Value
	Unpaved Road Traffic		
Length of road segment(18)	L_R	m	40
Width of road segment(2)	W_R	m	6.1
Surface area of road segment(19)	A_R	m^2	245
Percent weight of silt in road surface(20)	s	%	9.4
Mean vehicle weight(2)	W	tons	8
Percent moisture in dry road surface(20)	M	%	3.0
Number of days/year ³ 0.01 inches(3)	p	days	27.0
Sum vehicle kilometers traveled(21)	VKT_{road}	km	156.92
Subchronic Dispersion Factor for road segment(22)	Q/C_{sr}	g/m^2-sec per kg/m^3	24.0
Constant A(2)	A		12.9351
Constant B(2)	B		5.7383
Constant C(2)	C		71.7711
Areal Extent of site surface contamination	A_{surf}	acres	0.4
Subchronic PEF for Unpaved Road Traffic(23)	**PEF_{sc_road}**	**m^3/kg**	**3.9E+06**
Total construction related PEF(24)	PEF_{sc_total}	m^3/kg	3.8 E+6
Total outdoor ambient air dust concentration(25)	C_{const_dust}	kg/m^3	2.6 E-7

(1) From USEPA. (2002a). Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.
- $M_{wind} = 0.036 \prime (1\text{-}V) \prime (U_m/U_{t)}{}^3 \prime F(x) \prime A_{surf} \prime ED \prime 8760hr/yr$.

(2) Assumed value for the site based upon USEPA (2002a).
(3) Based on long-term weather data for the area of interest (WRCC 2006, On-line. http://www.wrcc.dri.edu/).
(4) Site area of 74 acres (Parcels A and B combined).
(5) Construction worker ED.
(6) From USEPA 2002a - $M_{excav} = 0.35 \prime 0.0016 \prime [(U_m/2.2_{)}{}^{1.3}/(M/2)^{1.4}] \prime r_{soil} \prime A_{excav} \prime d_{excav} \prime N_A \prime 10^3 g/kg$.
(7) Based on data from vicinity investigations (from data collected by GES 2006) for VLEACH modeling.
(8) Average of site data.
(9) Assumed value of one fifth of the site based upon USEPA (2002).
(10) From USEPA 2002a - $M_{doz} = 0.75 \prime [(0.45 \prime s^{1.5})/(M)^{1.4}] \prime \sum VKT_{doz}/S_{doz} \prime 10^3 g/kg$.
(11) From USEPA 2002a - $VKT_{doz} = [(A_{surf}{}^{0.5}/2.44m) \prime A_{surf}{}^{0.5} \prime 3]/1{,}000\ m/km$.
(12) From USEPA 2002a - $M_{grade} = 0.60 \prime (0.0056 \prime S^{2.0}) \prime \sum VKT_{grade} \prime 10^3 g/kg$.
(13) From USEPA 2002a - $M_{till} = 1.1 \prime s^{0.6} \prime A_{till} \prime 4{,}047m^2/acre \prime 10^{-4} ha/m^2 \prime 10^3 g/kg \prime N_A$.
(14) From USEPA 2002a - $J'_T = (M_{wind} + M_{excav} + M_{doz} + M_{grade} + M_{till})/(A_{surf} \prime T)$.
(15) From USEPA 2002a - $Q/C_{sa} = A \prime \exp[(\ln(A_{surf}) - B)^2/C]$.
(16) From USEPA 2002a - $F_D = 0.1852 + (5.3537/t_c)+(-9.6318/t_c{}^2),\ t_c = T/(3{,}600sec/hour)$.
(17) From USEPA 2002a - $PEF_{sc} = Q/C_{sa} \prime (1/F_D) \prime (1/J'_T)$.
(18) Assumed value of the square root of the site area, based upon USEPA (2002a).
(19) From USEPA 2002a - $A_R = L_R \prime W_R$
(20) Average of site data (surface soil).
(21) From USEPA 2002a - $VKT_{road} = 30\ vehicles \prime L_R \prime [(52\ wks/yr)/2] \prime (5\ days/week) / (1000\ m/km)$.
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$\{[2.6 \prime (s/12)^{0.8} \prime (W/3)^{0.4}/(M/0.2)^{0.3}] \prime [(365\text{-}p)/365] \prime 281.9 \prime \sum VKT_{road}\}$.
(24) $PEF_{sc\_total} = \{1/[(1/PEF_{sc})+(1/PEF_{sc\_road})]\}$.
(25) $C_{const\_dust} = 1/PEF_{sc\_total}$.

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CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - WITH DUST MITIGATION (1/2-YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 2)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fugitive dust from wind erosion(1)	M_{wind}	g	2.2 E+3
Fraction of vegetative cover(2)	V	--	0.0 E+0
Mean annual wind speed(3)	U_m	m/s	4.00
Equivalent threshold value of wind speed(2)	U_t	m/s	1.1 E+1
Function dependent on U/U_t(2)	F(x)	--	1.9 E-1
Areal Extent of site surface contamination(4)	A_{surf}	m^2	1619
Exposure duration(5)	ED	year	0.5
Fugitive dust from excavation(6)	M_{excav}	g	15.94
Wet soil bulk density(7)	r_{soil}	Mg/m^3	1.83
Percent moisture in soil(8)	M	%	50.0
Areal extent of site excavation(9)	A_{excav}	m^2	323.8
Depth of site excavation(2)	d_{excav}	m	1.0
Number of times soil is dumped(2)	N_A	--	2.0
Fugitive dust from dozing(10)	M_{doz}	g	7.10
Percent weight of silt in soil(7)	s	%	9.4
Percent moisture in soil(8)	M	%	50.0
Mean vehicle speed(2)	S_{doz}	km/hr	11.4
Sum dozing kilometers traveled(11)	VKT_{doz}	km	1.99
Fugitive dust from grading(12)	M_{grade}	g	869.22
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Areal extent of site tilling(9)	A_{till}	acre	0.1
Number of times soil is tilled(2)	N_A	--	2.0
Total Time Averaged PM_{10} Emission(14)	J'_T	g/m2-sec	5.53E-07
Duration of construction(2)	T	sec	3744000
Subchronic Dispersion Factor for Area Source(15)	Q/C_{sa}	g/m^2-sec per kg/m^3	14.95
Constant A(2)	A	--	2.4538
Constant B(2)	B	--	17.5660
Constant C(2)	C	--	189.0426
Areal Extent of site surface contamination(4)	A_{surf}	acres	0.4
Dispersion correction factor(16)	F_D	--	0.1903
Subchronic PEF for Construction Activities(17)	**PEF_{sc}**	**m^3/kg**	**1.42E+08**

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$\{[2.6$ ´ $(s/12)^{0.8}$ ´ $(W/3)^{0.4}/(M/0.2)^{0.3}]$ ´ $[(365\text{-}p)/365]$ ´ 281.9 ´ $\sum VKT_{road}\}$.
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(25) $C_{const\_dust} = 1/PEF_{sc\_total}$.

			Concentration Protocol Structures(2)			Number of Protocol Structures(1)			
	Analytical Sensitivity		Chrysotile		Amphibole	Chrysotile		Amphibole	
Sample	**(10^6 s/gPM$_{10}$)**		**(10^6 s/gPM$_{10}$)**		**(10^6 s/gPM$_{10}$)**	**Total**	**Long**	**Total**	**Long**
TSB-AJ-01	2.998	<	2.998 E+6	<	2.998 E+6	0		0	0
TSB-AJ-01 FD	2.961	<	2.961 E+6	<	2.961 E+6	0		0	0
TSB-AJ-02	2.901	<	2.901 E+6	<	2.901 E+6	2		0	0
TSB-AJ-03-PS	1.797	<	1.797 E+6	<	1.797 E+6	0		0	0
TSB-AR-01	2.991	<	2.991 E+6	<	2.991 E+6	1		0	0
TSB-AR-02	2.976		2.976 E+6	<	2.976 E+6	1		0	0
TSB-AR-03	2.998	<	2.998 E+6	<	2.998 E+6	0		0	0
TSB-AR-04	2.985	<	2.985 E+6	<	2.985 E+6	0		0	0
TSB-AR-05	2.976		8.929 E+6	<	2.976 E+6	4		0	0
TSB-AR-06-PS	2.979	<	2.979 E+6	<	2.979 E+6	0		0	0
TSB-AR-07	2.976	<	2.976 E+6	<	2.976 E+6	1		0	0
TSB-AR-08-PS	2.493	<	2.493 E+6	<	2.493 E+6	0		0	0
TSB-AR-09-PS	2.849	<	2.980 E+6	<	2.980 E+6	0		0	0
TSB-AR-10-PS	2.849	<	2.849 E+6	<	2.849 E+6	0		0	0
TSB-AR-11	2.975		2.380 E+7	<	2.975 E+6	13		0	0
TSB-AR-12-PS	2.991	<	2.991 E+6	<	2.991 E+6	0		0	0
TSB-AR-13-PS	2.993	<	2.993 E+6	<	2.993 E+6	0		0	0
TSB-AR-14-PS	2.921	<	2.921 E+6	<	2.921 E+6	0		0	0
TSB-BJ-01	2.998		6.090 E+7	<	3.205 E+6	31	19	0	0
TSB-BJ-02-PS	2.998	<	2.998 E+6	<	2.998 E+6	0		0	0
TSB-BJ-03	2.963	<	2.963 E+6	<	2.963 E+6	1		0	0
TSB-BJ-04	2.986	<	2.986 E+6	<	2.986 E+6	1		0	0
TSB-BJ-05	2.745		8.236 E+6	<	2.745 E+6	6		0	0
TSB-BJ-06	2.978	<	2.978 E+6	<	2.978 E+6	0		0	0
TSB-BR-01	2.762	<	2.762 E+6	<	2.762 E+6	0		0	0
TSB-BR-02	2.991	<	2.991 E+6	<	2.991 E+6	0		0	0
TSB-BR-03	2.998	<	2.988 E+6	<	2.988 E+6	0		0	0
TSB-BR-04	2.958		5.917 E+6	<	2.958 E+6	4		1	0
TSB-BR-05-PS	2.998	<	2.998 E+6		2.998 E+6	0		0	0
TSB-BR-06	2.987	<	2.987 E+6	<	2.987 E+6	2		0	0
	2.998		**Pooled Analytical Sensitivity**						

$$\textit{Pooled Analytical Sensitivity} = 1/\left[\sum\nolimits_i (1/\textit{analytical sensitivity for trial } i)\right]$$

(1) Fiber dimensions are presented in the respective analytical reports for each sample.

(2) Only long structures present a potential risk and are used for estimating asbestos risks. Total fiber concentrations are presented for informational purposes only.

Mineral Type	**Number of Samples**	**Number of Long Structures**	**Analytical Sensitivity (10^6 s/gPM$_{10}$)**	**Best Estimate Concentrations Long (10^6 s/gPM$_{10}$)**	**Upper Bound Concentrations Long (10^6 s/gPM$_{10}$)**
Chrysotile	30	19	2.9980	57.0	83.6
Amphibole	30	0	2.9980	0	9.0

Estimated Concentration = Analytical Sensitivity x Number of Structures
Upper Bound Concentration = 95% UCL of the Poisson Distribution where the mean equals the number of structures.

Scenario	Estimated Bulk Chrysotile Concentrations (10^6 s/gPM$_{10}$)	Estimated Bulk Amphibole Concentrations (10^6 s/gPM$_{10}$)	Estimated Dust Levels(1) (kg/m^3)	Estimated Dust Levels (μg/cm^3)	Estimated Airborne Chrysotile Concentrations(2) (s/cm^3)	Estimated Airborne Amphibole Concentrations(2) (s/cm^3)
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mitigation)	5.70 E+1	0.00 E+0	2.62 E-7	2.62 E-4	1.49 E-2	0.00 E+0
Construction Worker-Upper Bound (No Dust Mitigation)	8.36 E+1	8.98 E+0	2.62 E-7	2.62 E-4	2.19 E-2	2.36 E-3
Construction Worker-Best Estimate (with Dust Mitigation)	5.70 E+1	0.00 E+0	2.21 E-7	2.21 E-4	1.26 E-2	0.00 E+0
Construction Worker-Upper Bound (with Dust Mitigation)	8.36 E+1	8.98 E+0	2.21 E-7	2.21 E-4	1.85 E-2	1.98 E-3
Future Maintenance Worker-Best Estimate	5.70 E+1	0.00 E+0	7.35 E-10	7.35 E-7	4.19 E-5	0.00 E+0
Future Maintenance Worker-Upper Bound	8.36 E+1	8.98 E+0	7.35 E-10	7.35 E-7	6.15 E-5	6.60 E-6
Current/Future On-Site Trespasser-Best Estimate	5.70 E+1	0.00 E+0	7.35 E-10	7.35 E-7	4.19 E-5	0.00 E+0
Current/Future On-Site Trespasser-Upper Bound	8.36 E+1	8.98 E+0	7.35 E-10	7.35 E-7	6.15 E-5	6.60 E-6

(1) The estimated dust levels are equal to the PEFs used in the chemical risk assessment.

(2) Estimated bulk concentration (10^6 s/g) × Estimated dust levels (ug/cm^3) × g/10^6ug.

Notes:

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Scenario	Time of Exposure$^{(1)}$ (sec)	Lifetime Exposure (sec)	URF Adjustment Factor	Unadjusted Chrysotile URF$^{(2)}$ (s/cm^3)$^{-1}$	Adjusted Chrysotile URF$^{(2)}$ (s/cm^3)$^{-1}$	Unadjusted Amphibole URF$^{(2)}$ (s/cm^3)$^{-1}$	Adjusted Amphibole URF$^{(2)}$ (s/cm^3)$^{-1}$
LONG FIBERS							
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	7.20 E+6	2.21 E+9	3.26 E-3	5.69 E-2	1.86 E-4	6.32 E+0	2.06 E-2
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	7.20 E+6	2.21 E+9	3.26 E-3	5.69 E-2	1.86 E-4	6.32 E+0	2.06 E-2
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	3.74 E+6	2.21 E+9	1.70 E-3	5.69 E-2	9.66 E-5	6.32 E+0	1.07 E-2
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.74 E+6	2.21 E+9	1.70 E-3	5.69 E-2	9.66 E-5	6.32 E+0	1.07 E-2
Future Maintenance Worker-Best Estimate	1.62 E+8	2.21 E+9	7.34 E-2	5.69 E-2	4.18 E-3	6.32 E+0	4.64 E-1
Future Maintenance Worker-Upper Bound	1.62 E+8	2.21 E+9	7.34 E-2	5.69 E-2	4.18 E-3	6.32 E+0	4.64 E-1
Current/Future On-Site Trespasser-Best Estimate	4.32 E+6	2.21 E+9	1.96 E-3	5.69 E-2	1.11 E-4	6.32 E+0	1.24 E-2
Current/Future On-Site Trespasser-Upper Bound	4.32 E+6	2.21 E+9	1.96 E-3	5.69 E-2	1.11 E-4	6.32 E+0	1.24 E-2

Notes:

(1) Calculated using the exposure parameters presented in Closure Plan Tables 9-2 through 9-5. Because the unadjusted URF is based on continuous exposure over a lifetime, it requires adjustment for use in these less than lifetime exposure scenarios.

(2) This value is the URF from the table below times a multiplier of 0.00001/0.00010, and applies only to long asbestos structures (chrysotile and amphibole).

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Using Equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003)

	Expected Chrysotile	Expected Amphibole
Non-Smoking Males (NSM)	2.69E-01	62.9
Non-Smoking Females (NSF)	0.303	72.5
Smoking Males (SM)	1.65	38.3
Smoking Females (SF)	1.57	55.1
Unit Risk Factor (URF)		
URF=0.5((0.786*(NSM+NSF))+((0.214*(SM+SF))	0.569	63.2

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location BJ-01)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	1.5 E-2	0.0 E+0	1.9 E-4	2.1 E-2	3 E-6	0 E+0
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	2.2 E-2	2.4 E-3	1.9 E-4	2.1 E-2	4 E-6	5 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	1.3 E-2	0.0 E+0	9.7 E-5	1.1 E-2	1 E-6	0 E+0
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	1.8 E-2	2.0 E-3	9.7 E-5	1.1 E-2	2 E-6	2 E-5
Future Maintenance Worker-Best Estimate	4.2 E-5	0.0 E+0	4.2 E-3	4.6 E-1	2 E-7	0 E+0
Future Maintenance Worker-Upper Bound	6.1 E-5	6.6 E-6	4.2 E-3	4.6 E-1	3 E-7	3 E-6
Current/Future On-Site Trespasser-Best Estimate	4.2 E-5	0.0 E+0	1.1 E-4	1.2 E-2	5 E-9	0 E+0
Current/Future On-Site Trespasser-Upper Bound	6.1 E-5	6.6 E-6	1.1 E-4	1.2 E-2	7 E-9	8 E-8

Notes:

(1) Calculated based on estimated dust estimates and asbestos fiber concentrations (see Attachment A CD).

(2) Calculated uing equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003; see Attachment A CD).

(3) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

AR-11-250 dys

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - NO DUST MITIGATION (ONE YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 2)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fugitive dust from wind erosion(1)	M_{wind}	g	2.0 E+4
Fraction of vegetative cover(2)	V	--	0.0 E+0
Mean annual wind speed(3)	U_m	m/s	4.00
Equivalent threshold value of wind speed(2)	U_t	m/s	1.1 E+1
Function dependent on U/U_t(2)	F(x)	--	1.9 E-1
Areal Extent of site surface contamination(4)	A_{surf}	m^2	7284
Exposure duration(5)	ED	year	1.0
Fugitive dust from excavation(6)	M_{excav}	g	1841.01
Wet soil bulk density(7)	r_{soil}	Mg/m^3	1.83
Percent moisture in soil(8)	M	%	4.9
Areal extent of site excavation(9)	A_{excav}	m^2	1456.8
Depth of site excavation(2)	d_{excav}	m	1.0
Number of times soil is dumped(2)	N_A	--	2.0
Fugitive dust from dozing(10)	M_{doz}	g	820.69
Percent weight of silt in soil(7)	s	%	9.4
Percent moisture in soil(8)	M	%	4.9
Mean vehicle speed(2)	S_{doz}	km/hr	11.4
Sum dozing kilometers traveled(11)	VKT_{doz}	km	8.96
Fugitive dust from grading(12)	M_{grade}	g	3910.66
Mean vehicle speed(2)	S_{grade}	km/hr	11.4
Sum dozing kilometers traveled(12)	VKT_{grade}	km	8.96
Fugitive dust from tilling(13)	M_{till}	g	1230
Percent weight of silt in soil(7)	s	%	9.4
Areal extent of site tilling(9)	A_{till}	acre	0.4
Number of times soil is tilled(2)	N_A	--	2.0
Total Time Averaged PM_{10} Emission(14)	J'_T	g/m2-sec	5.24E-07
Duration of construction(2)	T	sec	7200000
Subchronic Dispersion Factor for Area Source(15)	Q/C_{sa}	g/m^2-sec per kg/m^3	11.27
Constant A(2)	A	--	2.4538
Constant B(2)	B	--	17.5660
Constant C(2)	C	--	189.0426
Areal Extent of site surface contamination(4)	A_{surf}	acres	1.8
Dispersion correction factor(16)	F_D	--	0.1879
Subchronic PEF for Construction Activities(17)	**PEF_{sc}**	**m^3/kg**	**1.15E+08**

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - NO DUST MITIGATION (ONE YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 2)

Parameter	Abbrev.	Units	Value
	Unpaved Road Traffic		
Length of road segment(18)	L_R	m	85
Width of road segment(2)	W_R	m	6.1
Surface area of road segment(19)	A_R	m^2	520
Percent weight of silt in road surface(20)	s	%	9.4
Mean vehicle weight(2)	W	tons	8
Percent moisture in dry road surface(20)	M	%	3.0
Number of days/year ³ 0.01 inches(3)	p	days	27.0
Sum vehicle kilometers traveled(21)	VKT_{road}	km	332.85
Subchronic Dispersion Factor for road segment(22)	Q/C_{sr}	g/m^2-sec per kg/m^3	18.7
Constant A(2)	A		12.9351
Constant B(2)	B		5.7383
Constant C(2)	C		71.7711
Areal Extent of site surface contamination	A_{surf}	acres	1.8
Subchronic PEF for Unpaved Road Traffic(23)	**PEF_{sc_road}**	**m^3/kg**	**3.1E+06**
Total construction related PEF(24)	PEF_{sc_total}	m^3/kg	3.0 E+6
Total outdoor ambient air dust concentration(25)	C_{const_dust}	kg/m^3	3.4 E-7

(1) From USEPA. (2002a). Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.

- $M_{wind} = 0.036 ´ (1-V) ´ (U_m/U_t)^3 ´ F(x) ´ A_{surf} ´ ED ´ 8760hr/yr$.

(2) Assumed value for the site based upon USEPA (2002a).

(3) Based on long-term weather data for the area of interest (WRCC 2006, On-line. http://www.wrcc.dri.edu/).

(4) Site area of 74 acres (Parcels A and B combined).

(5) Construction worker ED.

(6) From USEPA 2002a - $M_{excav} = 0.35 ´ 0.0016 ´ [(U_m/2.2)^{1.3}/(M/2)^{1.4}] ´ r_{soil} ´ A_{excav} ´ d_{excav} ´ N_A ´ 10^3 g/kg$.

(7) Based on data from vicinity investigations (from data collected by GES 2006) for VLEACH modeling.

(8) Average of site data.

(9) Assumed value of one fifth of the site based upon USEPA (2002).

(10) From USEPA 2002a - $M_{doz} = 0.75 ´ [(0.45 ´ s^{1.5})/(M)^{1.4}] ´ \sum VKT_{doz}/S_{doz} ´ 10^3 g/kg$.

(11) From USEPA 2002a - $VKT_{doz} = [(A_{surf}^{0.5}/2.44m) ´ A_{surf}^{0.5} ´ 3]/1,000\ m/km$.

(12) From USEPA 2002a - $M_{grade} = 0.60 ´ (0.0056 ´ S^{2.0}) ´ \sum VKT_{grade} ´ 10^3 g/kg$.

(13) From USEPA 2002a - $M_{till} = 1.1 ´ s^{0.6} ´ A_{till} ´ 4,047m^2/acre ´ 10^{-4} ha/m^2 ´ 10^3 g/kg ´ N_A$.

(14) From USEPA 2002a - $J'_T = (M_{wind} + M_{excav} + M_{doz} + M_{grade} + M_{till})/(A_{surf} ´ T)$.

(15) From USEPA 2002a - $Q/C_{sa} = A ´ \exp[(\ln(A_{surf}) - B)^2/C]$.

(16) From USEPA 2002a - $F_D = 0.1852 + (5.3537/t_c)+(-9.6318/t_c^2)$, $t_c = T/(3,600sec/hour)$.

(17) From USEPA 2002a - $PEF_{sc} = Q/C_{sa} ´ (1/F_D) ´ (1/J'_T)$.

(18) Assumed value of the square root of the site area, based upon USEPA (2002a).

(19) From USEPA 2002a - $A_R = L_R ´ W_R$

(20) Average of site data (surface soil).

(21) From USEPA 2002a - $VKT_{road} = 30$ vehicles $´ L_R ´ [(52\ wks/yr)/2] ´ (5\ days/week) / (1000\ m/km)$.

(22) From USEPA 2002a - $Q/C_{sr} = A ´ \exp[(\ln(A_{surf}) - B)^2/C]$.

(23) From USEPA 2002a - $PEF_{sc\_road} = Q/C_{sr} ´ (1/F_D) ´ T ´ A_R /$
$\{[2.6 ´ (s/12)^{0.8} ´ (W/3)^{0.4}/(M/0.2)^{0.3}] ´ [(365-p)/365] ´ 281.9 ´ \sum VKT_{road}\}$.

(24) $PEF_{sc\_total} = \{1/[(1/PEF_{sc})+(1/PEF_{sc\_road})]\}$.

(25) $C_{const\_dust} = 1/PEF_{sc\_total}$.

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - WITH DUST MITIGATION (1/2-YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 2)

Parameter	Abbrev.	Units	Value
Wind Erosion and Construction Activities			
Fugitive dust from wind erosion(1)	M_{wind}	g	9.8 E+3
Fraction of vegetative cover(2)	V	--	0.0 E+0
Mean annual wind speed(3)	U_m	m/s	4.00
Equivalent threshold value of wind speed(2)	U_t	m/s	1.1 E+1
Function dependent on U/U_t(2)	F(x)	--	1.9 E-1
Areal Extent of site surface contamination(4)	A_{surf}	m^2	7284
Exposure duration(5)	ED	year	0.50
Fugitive dust from excavation(6)	M_{excav}	g	71.69
Wet soil bulk density(7)	r_{soil}	Mg/m^3	1.83
Percent moisture in soil(8)	M	%	50.0
Areal extent of site excavation(9)	A_{excav}	m^2	1456.8
Depth of site excavation(2)	d_{excav}	m	1.0
Number of times soil is dumped(2)	N_A	--	2.0
Fugitive dust from dozing(10)	M_{doz}	g	31.96
Percent weight of silt in soil(7)	s	%	9.4
Percent moisture in soil(8)	M	%	50.0
Mean vehicle speed(2)	S_{doz}	km/hr	11.4
Sum dozing kilometers traveled(11)	VKT_{doz}	km	8.96
Fugitive dust from grading(12)	M_{grade}	g	3910.66
Mean vehicle speed(2)	S_{grade}	km/hr	11.4
Sum dozing kilometers traveled(12)	VKT_{grade}	km	8.96
Fugitive dust from tilling(13)	M_{till}	g	1230
Percent weight of silt in soil(7)	s	%	9.4
Areal extent of site tilling(9)	A_{till}	acre	0.4
Number of times soil is tilled(2)	N_A	--	2.0
Total Time Averaged PM_{10} Emission(14)	J'_T	g/m2-sec	5.53E-07
Duration of construction(2)	T	sec	3744000
Subchronic Dispersion Factor for Area Source(15)	Q/C_{sa}	g/m^2-sec per kg/m^3	11.27
Constant A(2)	A	--	2.4538
Constant B(2)	B	--	17.5660
Constant C(2)	C	--	189.0426
Areal Extent of site surface contamination(4)	A_{surf}	acres	1.8
Dispersion correction factor(16)	F_D	--	0.1903
Subchronic PEF for Construction Activities(17)	**PEF_{sc}**	**m^3/kg**	**1.07E+08**

TABLE
CONSTRUCTION ACTIVITIES FUGITIVE DUST MODEL PARAMETERS - WITH DUST MITIGATION (1/2-YEAR EXPOSURE)
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 2)

Parameter	Abbrev.	Units	Value
	Unpaved Road Traffic		
Length of road segment(18)	L_R	m	85
Width of road segment(2)	W_R	m	6.1
Surface area of road segment(19)	A_R	m^2	520
Percent weight of silt in road surface(20)	s	%	9.4
Mean vehicle weight(2)	W	tons	8
Percent moisture in dry road surface(20)	M	%	50.0
Number of days/year ³ 0.01 inches(3)	p	days	27.0
Sum vehicle kilometers traveled(21)	VKT_{road}	km	332.85
Subchronic Dispersion Factor for road segment(22)	Q/C_{sr}	g/m^2-sec per kg/m^3	18.7
Constant A(2)	A		12.9351
Constant B(2)	B		5.7383
Constant C(2)	C		71.7711
Areal Extent of site surface contamination	A_{surf}	acres	1.8
Subchronic PEF for Unpaved Road Traffic(23)	**PEF_{sc_road}**	**m^3/kg**	**3.65E+06**
Total construction related PEF(24)	PEF_{sc_total}	m^3/kg	3.5 E+6
Total outdoor ambient air dust concentration(25)	C_{const_dust}	kg/m^3	2.8 E-7

(1) From USEPA. (2002a). Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, DC. OSWER 9355.4-24. December.
- M_{wind} = 0.036 ´ (1-V) ´ $(U_m/U_t)^3$ ´ F(x) ´ A_{surf} ´ ED ´ 8760hr/yr.

(2) Assumed value for the site based upon USEPA (2002a).
(3) Based on long-term weather data for the area of interest (WRCC 2006, On-line. http://www.wrcc.dri.edu/).
(4) Site area of 74 acres (Parcels A and B combined).
(5) Construction worker ED.
(6) From USEPA 2002a - M_{excav} = 0.35 ´ 0.0016 ´ $[(U_m/2.2_)^{1.3}/(M/2)^{1.4}]$ ´ r_{soil} ´ A_{excav} ´ d_{excav} ´ N_A ´ 10^3g/kg.
(7) Based on data from 2006 Borrow Area investigation (for VLEACH modeling).
(8) Average of site data.
(9) Assumed value of one fifth of the site based upon USEPA (2002).
(10) From USEPA 2002a - M_{doz} = 0.75 ´ $[(0.45$ ´ $s^{1.5})/(M)^{1.4}]$ ´ $\sum VKT_{doz}/S_{doz}$ ´ 10^3g/kg.
(11) From USEPA 2002a - VKT_{doz} = $[(A_{surf}{}^{0.5}/2.44m)$ ´ $A_{surf}{}^{0.5}$ ´ 3]/1,000 m/km.
(12) From USEPA 2002a - M_{grade} = 0.60 ´ (0.0056 ´ $S^{2.0}$) ´ $\sum VKT_{grade}$ ´ 10^3g/kg.
(13) From USEPA 2002a - M_{till} = 1.1 ´ $s^{0.6}$ ´ A_{till} ´ 4,047m^2/acre ´ 10^{-4}ha/m^2 ´ 10^3g/kg ´ N_A.
(14) From USEPA 2002a - $J'_T = (M_{wind} + M_{excav} + M_{doz} + M_{grade} + M_{till})/(A_{surf}$ ´ T).
(15) From USEPA 2002a - Q/C_{sa} = A ´ $\exp[(\ln(A_{surf}) - B)^2/C]$.
(16) From USEPA 2002a - $F_D = 0.1852 + (5.3537/t_c)+(-9.6318/t_c{}^2)$, t_c = T/(3,600sec/hour).
(17) From USEPA 2002a - $PEF_{sc} = Q/C_{sa}$ ´ $(1/F_D)$ ´ $(1/J'_T)$.
(18) Assumed value of the square root of the site area, based upon USEPA (2002a).
(19) From USEPA 2002a - $A_R = L_R$ ´ W_R
(20) Average of site data (surface soil).
(21) From USEPA 2002a - VKT_{road} = 30 vehicles ´ L_R ´ [(52 wks/yr)/2] ´ (5 days/week) / (1000 m/km).
(22) From USEPA 2002a - Q/C_{sr} = A ´ $\exp[(\ln(A_{surf}) - B)^2/C]$.
(23) From USEPA 2002a - $PEF_{sc\_road} = Q/C_{sr}$ ´ $(1/F_D)$ ´ T ´ A_R /
{[2.6 ´ $(s/12)^{0.8}$ ´ $(W/3)^{0.4}/(M/0.2)^{0.3}$] ´ [(365-p)/365] ´ 281.9 ´ $\sum VKT_{road}$}.
(24) $PEF_{sc\_total} = \{1/[(1/PEF_{sc})+(1/PEF_{sc\_road})]\}$.
(25) $C_{const\_dust} = 1/PEF_{sc\_total}$.

		Concentration		Number of			
	Analytical	Protocol Structures(2)		Protocol Structures(1)			
	Sensitivity	Chrysotile	Amphibole	Chrysotile		Amphibole	
Sample	(10^6 s/gPM$_{10}$)	(10^6 s/gPM$_{10}$)	(10^6 s/gPM$_{10}$)	Total	Long	Total	Long
TSB-AJ-01	2.998	< 2.998 E+6	< 2.998 E+6	0		0	0
TSB-AJ-01 FD	2.961	< 2.961 E+6	< 2.961 E+6	0		0	0
TSB-AJ-02	2.901	< 2.901 E+6	< 2.901 E+6	2		0	0
TSB-AJ-03-PS	1.797	< 1.797 E+6	< 1.797 E+6	0		0	0
TSB-AR-01	2.991	< 2.991 E+6	< 2.991 E+6	1		0	0
TSB-AR-02	2.976	2.976 E+6	< 2.976 E+6	1		0	0
TSB-AR-03	2.998	< 2.998 E+6	< 2.998 E+6	0		0	0
TSB-AR-04	2.985	< 2.985 E+6	< 2.985 E+6	0		0	0
TSB-AR-05	2.976	8.929 E+6	< 2.976 E+6	4		0	0
TSB-AR-06-PS	2.979	< 2.979 E+6	< 2.979 E+6	0		0	0
TSB-AR-07	2.976	< 2.976 E+6	< 2.976 E+6	1		0	0
TSB-AR-08-PS	2.493	< 2.493 E+6	< 2.493 E+6	0		0	0
TSB-AR-09-PS	2.849	< 2.980 E+6	< 2.980 E+6	0		0	0
TSB-AR-10-PS	2.849	< 2.849 E+6	< 2.849 E+6	0		0	0
TSB-AR-11	2.975	2.380 E+7	< 2.975 E+6	13	8	0	0
TSB-AR-12-PS	2.991	< 2.991 E+6	< 2.991 E+6	0		0	0
TSB-AR-13-PS	2.993	< 2.993 E+6	< 2.993 E+6	0		0	0
TSB-AR-14-PS	2.921	< 2.921 E+6	< 2.921 E+6	0		0	0
TSB-BJ-01	2.975	6.090 E+7	< 3.205 E+6	31		0	0
TSB-BJ-02-PS	2.998	< 2.998 E+6	< 2.998 E+6	0		0	0
TSB-BJ-03	2.963	< 2.963 E+6	< 2.963 E+6	1		0	0
TSB-BJ-04	2.986	< 2.986 E+6	< 2.986 E+6	1		0	0
TSB-BJ-05	2.745	8.236 E+6	< 2.745 E+6	6		0	0
TSB-BJ-06	2.978	< 2.978 E+6	< 2.978 E+6	0		0	0
TSB-BR-01	2.762	< 2.762 E+6	< 2.762 E+6	0		0	0
TSB-BR-02	2.991	< 2.991 E+6	< 2.991 E+6	0		0	0
TSB-BR-03	2.998	< 2.988 E+6	< 2.988 E+6	0		0	0
TSB-BR-04	2.958	5.917 E+6	< 2.958 E+6	4		1	0
TSB-BR-05-PS	2.998	< 2.998 E+6	2.998 E+6	0		0	0
TSB-BR-06	2.987	< 2.987 E+6	< 2.987 E+6	2		0	0

2.975 **Pooled Analytical Sensitivity**

$$Pooled\ \ Analytical\ \ Sensitivi\ ty = 1/\left[\sum_i (1/analyti\ \ cal\ \ sensitivi\ \ ty\ \ for\ \ trial\ \ i)\right]$$

(1)Fiber dimensions are presented in the respective analytical reports for each sample.

(2)Only long structures present a potential risk and are used for estimating asbestos risks. Total fiber concentrations are presented for informational purposes only.

Mineral Type	Number of Samples	Number of Long Structures	Analytical Sensitivity (10^6 s/gPM$_{10}$)	Best Estimate Concentrations Long (10^6 s/gPM$_{10}$)	Upper Bound Concentrations Long (10^6 s/gPM$_{10}$)
Chrysotile	30	8	2.9746	23.8	42.9
Amphibole	30	0	2.9746	0	8.9

Estimated Concentration = Analytical Sensitivity x Number of Structures
Upper Bound Concentration = 95% UCL of the Poisson Distribution where the mean equals the number of structures.

Scenario	Estimated Bulk Chrysotile Concentrations (10^6 s/gPM$_{10}$)	Estimated Bulk Amphibole Concentrations (10^6 s/gPM$_{10}$)	Estimated Dust Levels[(1)] (kg/m^3)	Estimated Dust Levels (µg/cm^3)	Estimated Airborne Chrysotile Concentrations[(2)] (s/cm^3)	Estimated Airborne Amphibole Concentrations[(2)] (s/cm^3)
<u>LONG FIBERS</u>						
Construction Worker-Best Estimate (No Dust Mitigation)	2.38 E+1	0.00 E+0	3.36 E-7	3.36 E-4	8.00 E-3	0.00 E+0
Construction Worker-Upper Bound (No Dust Mitigation)	4.29 E+1	8.91 E+0	3.36 E-7	3.36 E-4	1.44 E-2	3.00 E-3
Construction Worker-Best Estimate (with Dust Mitigation)	2.38 E+1	0.00 E+0	2.83 E-7	2.83 E-4	6.74 E-3	0.00 E+0
Construction Worker-Upper Bound (with Dust Mitigation)	4.29 E+1	8.91 E+0	2.83 E-7	2.83 E-4	1.22 E-2	2.53 E-3
Future Maintenance Worker-Best Estimate	2.38 E+1	0.00 E+0	7.35 E-10	7.35 E-7	1.75 E-5	0.00 E+0
Future Maintenance Worker-Upper Bound	4.29 E+1	8.91 E+0	7.35 E-10	7.35 E-7	3.16 E-5	6.55 E-6
Current/Future On-Site Trespasser-Best Estimate	2.38 E+1	0.00 E+0	7.35 E-10	7.35 E-7	1.75 E-5	0.00 E+0
Current/Future On-Site Trespasser-Upper Bound	4.29 E+1	8.91 E+0	7.35 E-10	7.35 E-7	3.16 E-5	6.55 E-6

(1) The estimated dust levels are equal to the PEFs used in the chemical risk assessment.

(2) Estimated bulk concentration (10^6 s/g) × Estimated dust levels (ug/cm^3) × g/10^6ug.

Notes:

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Scenario	Time of Exposure[1] (sec)	Lifetime Exposure (sec)	URF Adjustment Factor	Unadjusted Chrysotile URF[2] $(s/cm^3)^{-1}$	Adjusted Chrysotile URF[2] $(s/cm^3)^{-1}$	Unadjusted Amphibole URF[2] $(s/cm^3)^{-1}$	Adjusted Amphibole URF[2] $(s/cm^3)^{-1}$
LONG FIBERS							
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	7.20 E+6	2.21 E+9	3.26 E-3	5.69 E-2	1.86 E-4	6.32 E+0	2.06 E-2
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	7.20 E+6	2.21 E+9	3.26 E-3	5.69 E-2	1.86 E-4	6.32 E+0	2.06 E-2
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	3.74 E+6	2.21 E+9	1.70 E-3	5.69 E-2	9.66 E-5	6.32 E+0	1.07 E-2
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.74 E+6	2.21 E+9	1.70 E-3	5.69 E-2	9.66 E-5	6.32 E+0	1.07 E-2
Future Maintenance Worker-Best Estimate	1.62 E+8	2.21 E+9	7.34 E-2	5.69 E-2	4.18 E-3	6.32 E+0	4.64 E-1
Future Maintenance Worker-Upper Bound	1.62 E+8	2.21 E+9	7.34 E-2	5.69 E-2	4.18 E-3	6.32 E+0	4.64 E-1
Current/Future On-Site Trespasser-Best Estimate	4.32 E+6	2.21 E+9	1.96 E-3	5.69 E-2	1.11 E-4	6.32 E+0	1.24 E-2
Current/Future On-Site Trespasser-Upper Bound	4.32 E+6	2.21 E+9	1.96 E-3	5.69 E-2	1.11 E-4	6.32 E+0	1.24 E-2

Notes:

(1) Calculated using the exposure parameters presented in Closure Plan Tables 9-2 through 9-5. Because the unadjusted URF is based on continuous exposure over a lifetime, it requires adjustment for use in these less than lifetime exposure scenarios.

(2) This value is the URF from the table below times a multiplier of 0.00001/0.00010, and applies only to long asbestos structures (chrysotile and amphibole).

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Using Equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003)

	Expected Chrysotile	Expected Amphibole
Non-Smoking Males (NSM)	2.69E-01	62.9
Non-Smoking Females (NSF)	0.303	72.5
Smoking Males (SM)	1.65	38.3
Smoking Females (SF)	1.57	55.1
Unit Risk Factor (URF)		
URF=0.5((0.786*(NSM+NSF))+((0.214*(SM+SF))	0.569	63.2

TABLE 4
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers-Sample Location AR-11)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	8.0 E-3	0.0 E+0	1.9 E-4	2.1 E-2	1 E-6	0 E+0
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	1.4 E-2	3.0 E-3	1.9 E-4	2.1 E-2	3 E-6	6 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	6.7 E-3	0.0 E+0	9.7 E-5	1.1 E-2	7 E-7	0 E+0
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	1.2 E-2	2.5 E-3	9.7 E-5	1.1 E-2	1 E-6	3 E-5
Future Maintenance Worker-Best Estimate	1.7 E-5	0.0 E+0	4.2 E-3	4.6 E-1	7 E-8	0 E+0
Future Maintenance Worker-Upper Bound	3.2 E-5	6.6 E-6	4.2 E-3	4.6 E-1	1 E-7	3 E-6
Current/Future On-Site Trespasser-Best Estimate	1.7 E-5	0.0 E+0	1.1 E-4	1.2 E-2	2 E-9	0 E+0
Current/Future On-Site Trespasser-Upper Bound	3.2 E-5	6.6 E-6	1.1 E-4	1.2 E-2	4 E-9	8 E-8

Notes:

(1) Calculated based on estimated dust estimates and asbestos fiber concentrations (see Attachment A CD).

(2) Calculated using equation information from Table 8-2 of 2003 Methodology (Berman and Crump 2003; see Attachment A CD).

(3) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Brian Rakvica

From: Keith Bailey [okbailey@flash.net]
Sent: Wednesday, December 26, 2007 2:37 PM
To: Brian Rakvica; susan.crowley@tronox.com; 'Ranajit Sahu'; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org
Subject: RE: TRX Parcels A and B

Brian,

I just got off the phone with Tronox management. They just learned that the buyer will not move on the Parcel A sale if the NFA includes a conditional asbestos removal. It looks like we will have to wait until Neptune can review the calculations. If Neptune is satisfied, we can then proceed with the NFA. If not, we can discuss the next option.

Thanks very much for your help. Please let us know if you hear from Neptune.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 26, 2007 4:17 PM
To: Keith Bailey; susan.crowley@tronox.com; Ranajit Sahu; Mark.Jones@erm.com
Cc: Jim Najima; Shannon Harbour; wjfrey@ag.state.nv.us; pblack@neptuneinc.org
Subject: RE: TRX Parcels A and B
Importance: High

Keith,

As noted repeatedly, I need to discuss this with Neptune and I cannot commit to a date or time by when this will occur.

If TRX wants the NFA "today" then you need to commit to remediate these areas and take confirmation samples.

If you can agree to this I can issue the NFA this afternoon.

If you want us to consider the revised calcs we will need to review them and perhaps add more language to the Attachment.

It is hard to justify leaving a known carcinogen, in place, at the surface where it is easily accessed and can potentially migrate downgradient.

This is an issue that can easily and cheaply be addressed by TRX.

Since this is a "new issue" I may need to discuss with management, as well (if TRX strongly opposes remediation).

Please advise.

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Wed 12/26/2007 1:38 PM
To: Brian Rakvica; susan.crowley@tronox.com; 'Ranajit Sahu'; Mark.Jones@erm.com
Subject: FW: TRX Parcels A and B

Brian,

With upper bound risk estimates of 3x10-6 and 4x10-6, the chrysotile risk seems minimal and is in the same range as the 5x10-6 amphibole risk (for zero amphibole fibers). Is this sufficient to proceed with the NFA?

Give me a call at 405.216.9213 if you want to discuss the situation.

Keith

From: Mark Jones [mailto:Mark.Jones@erm.com]
Sent: Wednesday, December 26, 2007 3:22 PM
To: Brian Rakvica; Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour
Subject: RE: TRX Parcels A and B

Brian,

Here are the revised asbestos risk estimates, based on the smaller areal extents, but assuming an exposure time of 250 days at each area.

-Mark J.

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 26, 2007 12:36 PM
To: Keith Bailey; pblack@neptuneinc.org; susan.crowley@tronox.com; Ranajit Sahu
Cc: Mark Jones; wjfrey@ag.state.nv.us; Jim Najima; Shannon Harbour; Brian Rakvica
Subject: RE: TRX Parcels A and B
Importance: High

Keith,

As I noted this AM Paul Black is on vacation so I am not sure when NDEP will complete our review.

It is highly unlikely that the NFA will be issued today.

Also, unless TRX wants another condition added to the letter regarding future use of the site we cannot tinker with the exposure time.

Please resubmit the calculation utilizing the default exposure time of 250 days.

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Wed 12/26/2007 12:31 PM
To: Brian Rakvica; pblack@neptuneinc.org; susan.crowley@tronox.com; 'Ranajit Sahu'
Subject: FW: TRX Parcels A and B

Brian,

This is the first of two e-mails containing the Tronox reasoning that the chrysotile risk is minimal. The second e-mail will include the pdf figures.

Basically, our concern is that the dust generation from the two small areas is very small relative to the 74 acre parcel and that construction workers will not be working on the two small areas for the full 250 day construction time. Use of these assumptions (74 acres and 250 days) was the only way Mark Jones of ERM could come up with the risks you cited in your e-mail this morning. With adjustments to what we believe are more defensible assumptions, the risk associated with chrysotile at the two locations is very modest. As directed by NDEP we have not included the normal use of dust suppression moisture to further reduce the calculated risk.

As we discussed this morning by phone, we are hopeful that these revised calculations will allow NDEP to remove the asbestos condition from the NFA. Mark Jones, Ranajit Sahu, Susan Crowley and I can be available for discussions by phone if necessary.

We look forward to receiving the completed NFA today.

We have received your draft NFA comments and are reviewing them now.

Thanks for your efforts.

Keith

Keith

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Please visit ERM's web site: http://www.erm.com

call w/ TRX

re: Panels A/B

12/26/07
10AM

via : phone

NDEP - Brian ✓
TRX - Keith✓, Susan
BRC -
ERM -

① NDEP email 12/26/07
re: chrysotile remand @ 2 locations

② AR-11 → 8 long fibers } possible hot spot
BJ-01 → 19 long fibers

③ A location = ~~[illegible]~~ 1.8 acres } o
B locn = 0.6 acres

④ TRX thinks the NDEP risk calcs are in error.
and is working on submitting something.

we have Neptune check

Ron → when you pick hot spot area

dust generation rate → based on area, partially

o→ also scaled time duration → ✱ more significant

Shannon Harbour

From: Brian Rakvica
Sent: Friday, December 21, 2007 5:27 AM
To: Mark Jones; Ranajit (Ron) Sahu; okbailey@flash.net; susan.crowley@tronox.com
Cc: Shannon Harbour; Jim Najima; pblack@neptuneinc.org
Subject: RE: TRX parcels a anb asbo

thanks

From: Mark Jones [mailto:Mark.Jones@erm.com]
Sent: Thu 12/20/2007 9:15 PM
To: Ranajit (Ron) Sahu; Brian Rakvica; okbailey@flash.net; susan.crowley@tronox.com
Cc: Brian Rakvica; Shannon Harbour; Jim Najima; pblack@neptuneinc.org
Subject: RE: TRX parcels a anb asbo

Brian,

As Ranajit noted, the focus of the remediation for asbestos was on amphibole, not chrysotile because the risks associated amphibole are much higher than with chrysotile. While just a few fibers of amphibole (and no fibers when looking at the upper-bound risks based on the Poisson distribution) will contribute to a risk greater than 1x10-6, the risks associated with the chrysotile fibers, even with some fibers remaining, are still less than 1x10-6. The risks associated with the residual chrysotile fibers at the site, presented in the December 6 tech memo, are 6x10-7 (best estimate) and 8x10-7 (upper-bound); for construction workers (other worker receptors risks are all less than 1x10-7). I've attached the asbestos risk table from the tech memo. These risk levels are similar to those for other chemicals with low residual levels detected at the site (for example, TCDD TEFs). Because the cancer risk posed by asbestos is a specific form of cancer (mesothelioma), we generally don't sum these with other chemicals, but even if they were, they would only add a minimal amount to the total cancer risk estimate (and the upper-bound risk is still well below that for amphibole, even though no amphibole fibers were detected following remediation).

-Mark J.

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thursday, December 20, 2007 8:27 PM
To: Brian Rakvica; okbailey@flash.net; susan.crowley@tronox.com
Cc: Brian Rakvica; Shannon Harbour; Jim Najima; pblack@neptuneinc.org; Mark Jones
Subject: Re: TRX parcels a anb asbo

Brian:

The main reason was that the risks due to these are very small. We showed that via the risk assessments that were submitted. Please let me know if there are any issues in the risk calculations.

Thanks

Ranajit

> ----- Original Message -----
> **From:** Brian Rakvica
> **To:** okbailey@flash.net ; sahuron@earthlink.net ; susan.crowley@tronox.com
> **Cc:** Brian Rakvica ; Shannon Harbour ; Jim Najima ; pblack@neptuneinc.org ; Mark.Jones@erm.com
> **Sent:** Thursday, December 20, 2007 7:08 PM

Subject: TRX parcels a anb asbo

Ranajit,

the memo indicates several areas with (long protocol) chrysotile fibers that were not removed and the text provides no justification for leaving these in place

for example:

TSB-AR-02 - I FIBER

TSB-AR-05 - 3 FIBERS

TSB-AR-11 - 8 FIBERS

TSB-BJ-01 - 19 FIBERS

TSB-BJ-05 - 3 FIBERS

TSB-BR-04 - 2 FIBERS

please explain why these were not removed and why this was not discussed previously.

thanks,

Brian

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.516 / Virus Database: 269.17.5/1191 - Release Date: 12/20/2007 2:14 PM

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Please visit ERM's web site: http://www.erm.com

Shannon Harbour

From: Brian Rakvica
Sent: Friday, December 21, 2007 6:18 AM
To: Keith Bailey; susan.crowley@tronox.com
Cc: Shannon Harbour; 'Ranajit Sahu'
Subject: RE: TRX Parcels A and B

that is our intention

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Fri 12/21/2007 6:14 AM
To: Brian Rakvica; susan.crowley@tronox.com
Cc: Shannon Harbour; 'Ranajit Sahu'
Subject: RE: TRX Parcels A and B

Brian,

The issues you are mentioning are directly related to the Parcel A/B NFAD and as such, should be an attachment to the NFAD. It would be helpful in the attachment to provide the reasoning of why each issue does not require action at this time.

Thanks for the help.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Friday, December 21, 2007 8:04 AM
To: Keith Bailey; susan.crowley@tronox.com
Cc: Shannon Harbour; Ranajit Sahu; Brian Rakvica
Subject: RE: TRX Parcels A and B

Keith,

it is my hope to have an NFAD by Monday

my only concern with putting the info under separate cover is that the future owners need to hunt for another piece of paper to fully understand the conditions at the site...that is why we would prefer to wrap it under one cover

there are already so many oddities about this NFAD process that I would hate to provide any more obfuscation

for example, the risk assessment evaluates uranium but none of the daughters...this is bizarre, but we understand why it was done

there are other examples...e.g.: we have probable leaching concerns for beta-BHC, cadmium and antimony (ND exceedances), however, we are not going to require anything for this issue

thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Fri 12/21/2007 5:45 AM
To: Brian Rakvica; susan.crowley@tronox.com
Cc: Shannon Harbour; 'Ranajit Sahu'
Subject: RE: TRX Parcels A and B

Brian,

Lets provide the information under separate cover if it does not alter the NFAD for Parcels A and B. By "trying to wrap up by Monday", does that mean we could receive the NFAD by the end of the day Monday? It would be a nice Christmas present.

Susan and I are available to discuss any comments you may have. If needed, give me a call at (405) 216-9213. I can conference Susan into the call.

Thanks for working on our issue while you are out. Did the operation go well?

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Thursday, December 20, 2007 6:19 PM
To: okbailey@flash.net; susan.crowley@tronox.com
Cc: Shannon Harbour; Brian Rakvica
Subject: TRX Parcels A and B
Importance: High

Susan and Keith,

Regarding the NFA, we will have some comments for use in future risk evaluations and to note for the record.

How shall we provide these so as not to cause problems for the transaction? Typically, we would just make these an attachment but we could easily provide under separate cover as well.

Please advise ASAP as we are trying to wrap up by Monday.

I am not in at all and Shannon is on vacation so email is best.

Thanks,

Brian

Brian Rakvica

From: Mark Jones [Mark.Jones@erm.com]
Sent: Thursday, December 20, 2007 9:15 PM
To: Ranajit (Ron) Sahu; Brian Rakvica; okbailey@flash.net; susan.crowley@tronox.com
Cc: Brian Rakvica; Shannon Harbour; Jim Najima; pblack@neptuneinc.org
Subject: RE: TRX parcels a anb asbo

Brian,

As Ranajit noted, the focus of the remediation for asbestos was on amphibole, not chrysotile because the risks associated amphibole are much higher than with chrysotile. While just a few fibers of amphibole (and no fibers when looking at the upper-bound risks based on the Poisson distribution) will contribute to a risk greater than 1x10-6, the risks associated with the chrysotile fibers, even with some fibers remaining, are still less than 1x10-6. The risks associated with the residual chrysotile fibers at the site, presented in the December 6 tech memo, are 6x10-7 (best estimate) and 8x10-7 (upper-bound); for construction workers (other worker receptors risks are all less than 1x10-7). I've attached the asbestos risk table from the tech memo. These risk levels are similar to those for other chemicals with low residual levels detected at the site (for example, TCDD TEFs). Because the cancer risk posed by asbestos is a specific form of cancer (mesothelioma), we generally don't sum these with other chemicals, but even if they were, they would only add a minimal amount to the total cancer risk estimate (and the upper-bound risk is still well below that for amphibole, even though no amphibole fibers were detected following remediation).

-Mark J.

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thursday, December 20, 2007 8:27 PM
To: Brian Rakvica; okbailey@flash.net; susan.crowley@tronox.com
Cc: Brian Rakvica; Shannon Harbour; Jim Najima; pblack@neptuneinc.org; Mark Jones
Subject: Re: TRX parcels a anb asbo

Brian:

The main reason was that the risks due to these are very small. We showed that via the risk assessments that were submitted. Please let me know if there are any issues in the risk calculations.

Thanks

Ranajit

> ----- Original Message -----
> **From:** Brian Rakvica
> **To:** okbailey@flash.net ; sahuron@earthlink.net ; susan.crowley@tronox.com
> **Cc:** Brian Rakvica ; Shannon Harbour ; Jim Najima ; pblack@neptuneinc.org ; Mark.Jones@erm.com
> **Sent:** Thursday, December 20, 2007 7:08 PM
> **Subject:** TRX parcels a anb asbo
>
> Ranajit,
>
> the memo indicates several areas with (long protocol) chrysotile fibers that were not removed and the text provides no justification for leaving these in place
>
> for example:

TSB-AR-02 - I FIBER

TSB-AR-05 - 3 FIBERS

TSB-AR-11 - 8 FIBERS

TSB-BJ-01 - 19 FIBERS

TSB-BJ-05 - 3 FIBERS

TSB-BR-04 - 2 FIBERS

please explain why these were not removed and why this was not discussed previously.

thanks,

Brian

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.516 / Virus Database: 269.17.5/1191 - Release Date: 12/20/2007 2:14 PM

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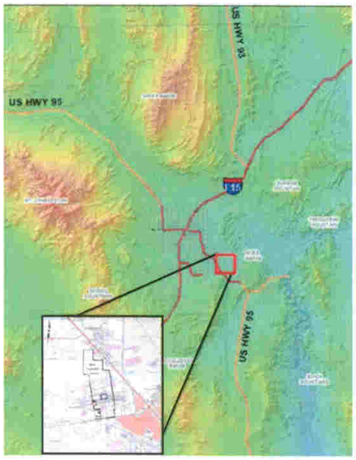
received 12/19/07

Tronox LLC Henderson Facility
Fact Sheet

The Tronox LLC (Tronox), formerly Kerr-McGee Chemical LLC, Henderson facility is located within the Black Mountain Industrial (BMI) complex. The facility is approximately 450 acres in size and is located 13 miles southeast of Las Vegas in an unincorporated section of Clark County, Nevada. It is completely surrounded by the incorporated area comprising the City of Henderson (COH).



Site Location

Site History

The BMI complex has been the site of industrial operations since 1942 and was originally sited and operated by the U.S. government as a magnesium production plant in support of the World War II effort. Following the war, a portion of the complex was leased by Western Electrochemical Company (WECCO). By August 1952, WECCO had purchased several portions of the complex, including six of the large unit buildings, and produced manganese dioxide, sodium chlorate and various perchlorates. In addition, in the early 1950s, pursuant to a contract with the U.S. Navy, WECCO constructed and operated a plant to produce ammonium perchlorate on land purchased by the Navy. In 1956, WECCO merged with American Potash and Chemical Company (AP&CC) and continued to operate the processes, with the Navy's continued involvement in the ammonium perchlorate process. In 1962, AP&CC purchased the ammonium perchlorate plant from the Navy, but continued to supply the Navy, and its contractors, material from the operating process. AP&CC merged with Kerr-McGee Corporation (Kerr-McGee) in 1967. This merger included boron production processes in California, which were moved to Henderson and began operation in the early 1970s. These included elemental boron, boron trichloride and boron tribromide. In 1994, the boron tribromide process was shut down and dismantled. In 1997, the sodium chlorate process was shut down and in 1998, production of commercial ammonium perchlorate ended as well. The ammonium perchlorate production equipment was used to reclaim perchlorate from on-site materials until early 2002, when the equipment was permanently shut down. In 2005, Kerr-McGee Chemical LLC's name was changed to Tronox LLC. Processes currently operated by Tronox at the Henderson facility are for production of manganese dioxide, boron trichloride and elemental boron.

Air Photo of Tronox LLC Site

Site Investigation and Remediation

A groundwater investigation was initiated by Tronox in July 1981 to comply with the federal Resource Conservation and Recovery Act (RCRA) standards for monitoring the existing on-site impoundments. In December 1983, the Nevada Division of Environmental Protection (NDEP) requested that Tronox investigate the extent of chromium impact in the groundwater beneath the facility.

A Consent Order between Tronox and NDEP, prepared in September 1986, stipulated additional groundwater characterization and the implementation of remedial activities to address chromium in the groundwater. As a result of the 1986 Consent Order, monitor wells, groundwater interceptor wells, a groundwater treatment system for chromium reduction and two treated-groundwater injection trenches were installed and the treatment of groundwater began in mid-1987. This treatment is on-going today.

In April 1991, Tronox was one of six companies entering into a Consent Agreement with the NDEP to conduct environmental studies to assess site-specific environmental conditions, which are the result of past and present industrial operations and waste disposal practices. The six companies that entered into the Consent Agreement included those past or present entities that conducted business within the BMI complex. The Consent Agreement specified that, among other things, the companies identify, document or address soil, surface water, groundwater or air impacts and document measures that have been taken to address environmental impacts from their respective sites.

In April 1993, in compliance with the 1991 Consent Agreement, Tronox submitted the Phase I Environmental Conditions Assessment (ECA) to NDEP. The purpose of the report was to identify and document site-specific environmental impacts resulting from past or present industrial activities. The Phase I ECA included an assessment of the geologic and hydrologic setting, as well as historical manufacturing activities. In 1994, the NDEP issued a letter of understanding (LOU) that identified 69 data gap areas which needed additional information, either in the form of additional document research or field sampling of site conditions.

During the mid to late 1990s, Tronox collected additional data to fill the LOU identified data gaps. This was done by investigating past operator records as well as through field sampling. Results of this work are described in the Phase II Written Response to the LOU, the Phase II ECA and the Supplemental Phase II ECA, the later two of which were reports describing the results of field sampling of groundwater and soils. Through this effort, potential environmental impacts associated with the 69 LOU areas were evaluated.

In 1997, perchlorate was discovered in the Las Vegas Wash vicinity and this aspect of the ECA was placed on a remedial fast-track. Impact characterization and treatment methodology evaluation was on-going in the late 1990s with installation of a water collection system and temporary ion exchange (IX) process for perchlorate removal. This remedial process began operation in November 1999. Tronox and NDEP entered into a 1999 Consent Agreement, which defined remedial requirements and looked forward to a more permanent treatment process that would replace the temporary IX. After considerable research and process development, a permanent treatment technology was developed. Tronox and NDEP entered into an October 2001 Administrative Order on Consent (AOC) defining the more permanent remedial requirements, which were installed and are operating today. To date, perchlorate remediation efforts have included the design, installation and operation of groundwater extraction as well as surface water collection systems, along with development, design, installation and operation of a permanent treatment process. These activities include:

1) The on-site groundwater barrier wall together with an upgradient collection well field,
2) The Athens Road groundwater collection well field,
3) The seep area collection well field as well as a sump for collection of water in the area where groundwater surfaced, and
4) A treatment process that removes chromium and perchlorate from the collected groundwater then discharges the water in accordance with the limits set forth in the existing National Pollutant Discharge Elimination System (NPDES) permit.

Biological Treatment Plant for Groundwater

The groundwater remediation systems will continue to operate under the direction of NDEP.

In 2004, a list of site-related chemicals was developed based upon investigations associated with operations at the site. This list included raw materials, process chemicals, intermediates, as well as products of all current and previous manufacturers at the site. In 2005, a Conceptual Site Model (CSM) was prepared for the site which consolidated information gathered about environmental impact, both known and potential. Concentrations of the site-related chemicals in both soil and groundwater upgradient of the Tronox site were investigated in 2006. On-site investigation of the site-related chemicals in soil and groundwater continued in 2006 and 2007 with the Phase A Site Investigation. The purpose of the Phase A work was first, to gather extensive data from 27 locations on the site; and second, to determine which of the site-related chemicals were adequately characterized for a future risk assessment and which would require additional characterization. A proposal for a subsequent Phase B Site Investigation to complete characterization of the site was submitted to NDEP as part of the Phase A report.

Future Activities

While much has been learned about site-related chemicals, Tronox, under the supervision of NDEP, will continue to define the nature and extent of impacts to soil and groundwater from its operations. The proposed Phase B Site Investigation, designed to fill data gaps identified in the CSM and the Phase A studies, will be followed by a site-wide human health risk assessment. The risk assessment, planned for the second half 2008, will establish site-specific risk-based action levels and identify additional remedial requirements if any.

December 13, 2007

Shannon Harbour

From: Crowley, Susan [Susan.Crowley@tronox.com]
Sent: Wednesday, December 19, 2007 4:43 PM
To: Shannon Harbour
Cc: Brian Rakvica; Keith Bailey; Ho, Brian; Bilodeau, Sally; Gerry, Dave
Subject: LOU 20 Summary Table 12-17-07.doc
Attachments: LOU 20 Summary Table 12-17-07.doc

Shannon,
Attached please find a review of the LOU 20 area - formatted as discussed in our last meeting re the Tronox ECA site investigation. I have attached the description as well as the map and table (both reference in the document). We're open to format. Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

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If you are not the intended recipient of this e-mail message, any use, distribution or copying of the message is prohibited.
Please let me know immediately by return e-mail if you have received this message by mistake, then delete the e-mail message.
Thank you.

Summary of Available Data for LOU 20 in EA08

Tronox Facility – Henderson, Nevada

Name of LOU:	**Pond C-1 and Associated Piping**
Site Investigation Area:	- Size: Approximately 175 ft by 275 ft; 1.5 acres - Location: north end of EA08.
Description:	- C-1 Pond period of operation: October 1974 through October 1994. - Pond received liquid waste products from Unit 4, Unit 5, and Steam Plant. - Pond floor covered with 60 mil PVC liner and sidewalls lined with butyl rubber. Lining was removed about 1996. - Minor excavation of soils occurred during the liner removal. - Process waste streams - metal wastes and various sulfates & phosphates discharged into the C-1 Pond. - No wastes from production processes that contained fuels, solvents, PCBs, pesticides, were placed into pond. - <u>Associated piping system:</u> above-ground plastic piping aligned along 9th Street from Units 4 & 5 to pond, and above-ground piping running from steam plant across 9th Street to pond. - Pipe system handled low pressure flow with no vents or sample points. - Pipeline outfalls were in the southeast and southwest corners of Pond C-1. - Process waste flow was diverted to LOU 21 (Pond Mn-1) if Pond C-1 neared maximum capacity.
Known or Potential Chemical Classes:	- Metals - Sulfates - Phosphates - Paraffin

Process Waste Stream	Known or Potential Chemicals Associated with LOU 20
Steam Plant boiler blow-down	metal wastes
boiler plant wash-down	phosphates sulfates
manganese dioxide cathode wash	manganese dioxide Anolyte
boron neutralization solutions	boron boron trichloride
hot process water softener solutions - from steam production and boron & manganese dioxide production processes.	calcium sulfates phosphates

Known or Potential Release Mechanisms:

- Surface releases (Kleinfelder 1993 report: "possible releases from around the edges of the pond could have occurred."), it was also noted that salt concentrations in groundwater beneath this area increased in the early 1990s;
- leaching to subsurface – potentially to groundwater (no known releases documented).

Results of Historical Sampling:

- One historical boring (BDB05) was drilled approximately 150 feet west of the pond (CSM – ENSR, 2005). However, this boring was located to evaluate the Beta-Ditch (LOU 5) and not the C-1 pond (LOU 20). This boring is considered too far from LOU 20 to be applicable.
- Soil samples were collected following the liner removal to confirm the pond solids were all removed from the area. The location of these results is currently being researched and will be transmitted when found.
- Upgradient, cross-gradient, and downgradient monitoring wells (M35, M19, and M39, respectively) are routinely tested for Cr^{+6}, Mn, and perchlorate as part of groundwater monitoring program.

Did Historical Samples Address Potential Release?

No

Summary of Phase A SAI:

Soil: None specifically conducted for this LOU. Closest boring (SA17) is 60 ft to the north (downgradient) within the Beta Ditch (LOU 5) and was not specifically designed to evaluate LOU 20, although potential subsurface releases from the C-1 Pond (if any) might be noticeable in SA17 soil results.

Groundwater: None specifically conducted for this LOU. M39 is the closest well sampled, 250 feet to the north (downgradient).

Are Phase A Sample Locations in "Worst Case" Areas?

No

Is Phase B Investigation Recommended?

Yes

Proposed Phase B Soil Investigation/Rationale:

- Boring SA62 located in Pond C-1 at low point of Pond Floor to evaluate for potential subsurface impacts from possible liner leaks.
- Boring SA71 located adjacent to the north and downgradient of Pond C-1 to evaluate for impacts from potential over-topping of pond.
- Boring SA61 located near southeast corner of the Pond C-1 near pipeline discharge point to evaluate potential

impacts from overspills and surface releases.

- SA140 located near the southwest corner of Pond C-1 pipeline discharge point to evaluate for potential impacts from overspills and surface releases.
- SA107 is located near the associated pipeline to C-1 Pond to evaluate for potential pipeline leaks.
- Note: Drill rig access is limited in the area between LOU 20 and LOU 21. Therefore no borings are proposed in this area.

Proposed Chemical Classes for Phase B Investigation for soils:

LOU Specific Analytes:
- Metals (Phase A list);
- Wet Chemistry

Site-wide Analytes:
- Perchlorate
- Ammonia

Proposed Phase B Groundwater Investigation/Rationale:

- Well M35 is located upgradient to Pond C-1.
- Well M39 is located downgradient to Pond C-1.
- Well M19 is located cross-gradient and only 50 feet from Pond C-1.
- Wells M31A, M34, and M52 are located close to the alignment of associated piping that runs from the Unit 4/Unit 5 process area to the C-1 Pond.
- Well M02A is located near the alignment of associated piping that runs from the Steam Plant to the C-1 Pond.

Proposed Phase B Constituents List for Groundwater:

LOU Specific:
- Metals (Phase A list)
- Wet Chemistry

Site-wide Analyses:
- Perchlorate
- Ammonia
- VOCs
- Radionuclides
- Organochlorine Pesticides

Goal of Closure

- Unrestricted Closure, for commercial/industrial future use

LOU MAP

Soil and Groundwater Characterization Data

Basic Environmental
COMPANY

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2007 DEC 18 P 4:12

Transmittal

To: Shannon Harbour

Date: 12/18/07

From: Ron Sahu
Director of Environmental Services

Company: NDEP
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

VIA:
☐ Pick up
☐ Courier
☐ Overnight Courier
☑ Hand Delivered
☐ US Mail

The following items are for your:

☐ Return
☑ Records
☐ Review & Comments
☐ Review & Approval
☐ Signature
☐ Information

We are transmitting the following:

Tronox Parcels A-B Rad Approach Memo to NDEP 12.18.07
1 hard copy & 1 electronic copy

Comments:

Please call Ron Sahu if you have any questions 626-382-0001.

Received by: ______________________

cc: Brian Rakvica, NDEP, BCA, Las Vegas
Jim Najima, NDEP Carson City

RECYCLED PAPER

Basic Environmental
COMPANY

Transmittal

To: Shannon Harbour

Date: 12/18/07

From: Ron Sahu
Director of Environmental Services

Company: NDEP
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

VIA:
☐ Pick up
☐ Courier
☐ Overnight Courier
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☐ US Mail

The following items are for your:

☐ Return
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☐ Review & Comments
☐ Review & Approval
☐ Signature
☐ Information

We are transmitting the following:

Tronox Parcels A & B Asbestos Memo 12.17.07
1 hard copy & 1 electronic copy

Comments:

Please call Ron Sahu if you have any questions 626-382-0001.

Received by: ______________________________

cc: Brian Rakvica, NDEP, BCA, Las Vegas
Jim Najima, NDEP Carson City

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ENVIRONMENTAL PROTECTION
LAS VEGAS OFFICE
2007 DEC 18 A 11:06

875 West Warm Springs, Henderson, Nevada 89011 • Phone 702.567.0400 • Fax 702.567.0475

Brian Rakvica TRY

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Tuesday, December 18, 2007 10:21 AM
To: Brian Rakvica; susan.crowley@tronox.com; okbailey@flash.net; Paul Black; David Gratson; Shannon Harbour
Cc: Mark.Jones@erm.com
Subject: Re: BRC Radionuclides

Brian:

In response to your question below, here is the sequence of steps relating to the analysis (excerpted from an e-mail from the lab):

1. *Soil samples are prepared first by 5013 which is a drying and grinding process.*

2. *If total* dissolutions *are* *not* *needed (i.e., like for Uranium done at Richland) the samples are leeched according to SOP 5013.*

3. *If total* dissolution is done (like for Thoriums done at Richland):

- the samples are prepped according to SOP 5013, as above
- SOP 5032 is then implemented and the soil sample is dissolved using a combination of HCL, HF and concentrated Nitric. This process which can take several hours totally dissolves the soil sample in a tephlon beaker through basically a six step process. The sample is them transferred to a glass beaker were the sample taken to total dryness in preparation for 5086. [According to the lab, they follow SOP 5032 steps 11.1.1.1 thru 11.1.3., 11.2 thru 11.2.13.1 as written.]

Thanks

Ranajit

> ----- Original Message -----
> **From:** Brian Rakvica
> **To:** Ranajit (Ron) Sahu ; susan.crowley@tronox.com ; okbailey@flash.net ; Paul Black ; David Gratson ; Shannon Harbour
> **Cc:** Brian Rakvica
> **Sent:** Sunday, December 16, 2007 8:05 AM
> **Subject:** RE: BRC Radionuclides
>
> Ranajit,
>
> Re: SOP 5086...
>
> This SOP is applicable to waters, urine, and "soil digestates." This means the sample must be in a liquid form to start. So it is unclear what steps were performed to prepare the soil digestates. What SOP or digestion steps were used to prepare these. We need to have the complete preparation documented somewhere.
>
> thanks,
>
> Brian

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Fri 12/14/2007 7:14 PM
To: Brian Rakvica; susan.crowley@tronox.com; okbailey@flash.net; Paul Black; David Gratson; Shannon Harbour
Subject: Fw: BRC Radionuclides

Hi all:

Per our call earlier today, please see e-mail below and SOPs attached re. Test America prep methods for all of our projects, including Tronox A/B.

Thanks

Ranajit

----- Original Message -----
From: Jordan, Erika
To: Maria Barajas ; Ranajit Sahu
Cc: Mark Jones ; Miller, Ken ; Carnes, Jodie ; Wild, Elaine ; Everett, Jerry ; Cahill, Martha ; Antonson, Lisa
Sent: Friday, December 14, 2007 3:54 PM
Subject: RE: BRC Radionuclides

The methods of digestion used for all of the projects we've processed for you are as follows:

Uranium	Nitric Leach	RICH-RC-5013/5086
Thorium	Total Dissolution	RICH-RC-5013/5032
Gamma (Ra226/228)	No Chemical Digestions (Dry/Homogenize/In-grow 10 days)	RICH-RC-5013

I've attached the SOP's involved.

Thank you and have a good weekend!

Erika

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.503 / Virus Database: 269.17.4/1187 - Release Date: 12/16/2007 11:36 AM

Brian Rakvica TRX

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Monday, December 17, 2007 4:05 PM
To: Todd Croft; Brian Rakvica
Cc: susan.crowley@tronox.com; ekrish@frontiernet.net
Subject: Damaged Tronox Wells on BRC Property

Todd:

Based on our conversation a fews days before Thanksgiving, BRC has reviewed the situation regarding the damaged wells on BRC property belonging to Tronox. BRC also met with Tronox (Susan Crowley) and Ed Krish. Based on these findings and meetings, I am summarizing the following actions:

1. Our assessment shows that the followinng Tronox wells on BRC property were or may have been damaged by BRC contractors engaged in Tamarisk removal. PC-58, 68, 79, 80, 82, and 83. While PC-95 was also damaged, BRC believes that it is not responsible. Tronox will be repairing or reinstalling PC-95 separately.

2. Based on discussions with Ed, he indicated that PC-68 is not required in the future, so it will be abandoned.

3. PC-58 may need to be replaced. While BRC will attempt to rehab this well, if that is not possible, a new replacement well will be installed approximately 5 feet NW of the present location of this well. We will match the original well construction.

4. For the remaining wells, i.e., PC-79, 80, 82, and 83, BRC will bail silt and redo surface completions (replace well vaults and top portion of casing).

Please let me know if you have any comments. BRC would like to complete this work in the next two weeks.

5. Separately, BRC has requested Tronox to provide BRC a complete list of all of its wells on BRC property such that this list can form the basis of a formal access agreement between BRC and Tronox regarding all future well access and sampling. This access agreement will:

(a) require that all of the Tronox wells have adequate well-head propection (such as with yellow Bollards); and
(b) depending on BRC's future development needs the surface completions of these wells and/or their locations may need to be reassessed.

6. It is BRC's understanding that Tronox wants to install 3 additional wells on BRC property. BRC and Tronox have agreed that these new wells will be installed after the access agreement above is completed.

7. BRC will also initiate a similar access agreement with Ampac for their wells on BRC property.

Please be assured that BRC has revised its procedures regarding field work, in order to avoid any similar incidents in the future.

Please call me (626 382 0001) or e-mail me if you have any questions.

Regards

Ron

Shannon Harbour

From: Brian Rakvica
Sent: Monday, December 17, 2007 5:44 PM
To: Shannon Harbour
Subject: FW: Damaged Tronox Wells on BRC Property

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Mon 12/17/2007 4:05 PM
To: Todd Croft; Brian Rakvica
Cc: susan.crowley@tronox.com; ekrish@frontiernet.net
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Regards

Ron

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 17, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to: *Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox, Parcel "H" Site, Henderson, Nevada, Revision 1*
Dated December 12, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified Sampling and Analysis Plan and finds that the document is acceptable. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

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NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 17, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to: *Phase A Source Area Investigation Results, Appendix G - Data Validation Summary Report (DVSR), Tronox Facility, Henderson, Nevada*
Dated September 27, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified DVSR and finds that the document is acceptable. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
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Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Shannon Harbour

From: Brian Rakvica
Sent: Monday, December 17, 2007 9:20 AM
To: Brian Rakvica; 'Keith Bailey'; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Cc: Shannon Harbour
Subject: TRX Digestion Methods

All,

I reviewed Appendix H from the Phase A report...

Uranium (as a metal) is elevated versus background

Uranium (as a rad) is low – and the reason was confirmed by STL

Radium 226 – is elevated versus background (although a low bias has been noted by NDEP)

Th-230 (Radium-226's parent) – is generally very low, below background - - this seems to suggest an analytical problem

Radium-228 – is lower than background or consistent with background (although a low bias has been noted by NDEP)

Th-232 (Ra-228's parent) – is much lower than background – this seems to suggest an analytical problem

Th-228 – is much lower than background

These lines of evidence seem to suggest one of a few things:

1. Thorium was perhaps not digested with HF.
2. Rads are out of secular equilibrium
3. Some other analytical problem?

Please advise.

Thanks,

Brian

From: Brian Rakvica
Sent: Sunday, December 16, 2007 4:24 PM
To: Keith Bailey; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Cc: Shannon Harbour; Brian Rakvica
Subject: RE: Digestion Methods
Importance: High

Keith,

Sorry, I thought you were responding to the original email...and I was assuming STL's response to Ranajit would encompass the Parcels A/B data.

We will have to look at the stats for Phase A and see what the repercussions are for these findings.

For example, if Thorium is very low in Phase A (but accurate) and uranium is biased low (and inaccurate)...this would imply a failure to demonstrate secular equilibrium OR some other analytical problem.

Thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Sun 12/16/2007 2:02 PM
To: Brian Rakvica; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Subject: RE: Digestion Methods

Brian,

The STL response was to Robert Kennedy of ENSR and is specific to the Tronox Phase A data (though it may also apply to the Parcel A/B data). Note the gamma spec work for radium. We will have more info on the Parcel A/B work shortly.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Sunday, December 16, 2007 3:48 PM
To: Keith Bailey; Paul Black; David Gratson; Crowley, Susan; Gerry, Dave; Ranajit Sahu; Kennedy, Robert
Subject: RE: Digestion Methods
Importance: High

Keith,

The response from STL was specfcially to BRC regarding BRC data sets including the Parcels A and B work.

Phase A work was conducted by STL-Richland for TRX and it is <u>necessary</u> to verify for this specific data set excatly what was done.

Thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Sun 12/16/2007 11:22 AM
To: Brian Rakvica; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Subject: FW: Digestion Methods

Brian and Paul,

Attached is the latest from STL Richland on the Phase A analyses. Where we had been previously told that both U and Th analyses were performed on a single digestion, Richland now indicates that they did used mixed acids (including HF) on the Th series nuclides and only nitric acid on the U series nuclides. This answers the questions related to the Tronox Phase A work.

Keith

-----Original Message-----
From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Sunday, December 16, 2007 9:19 AM
To: okbailey@flash.net
Subject: FW: Digestion Methods

Keith,

This email from Erika does confirm the isotopic Th digestion for Phase A soils performed by STL-Richland did employ HF, and the digestion for isotopic U analysis did not use HF.
The crossover to the HF step is early enough in the process for Th that it can be considered "total dissolution", whereas the isotopic U was only an "acid leach". Please pass this confirming information on to Paul Black.

-Robert

-----Original Message-----
From: Jordan, Erika [mailto:Erika.Jordan@testamericainc.com]
Sent: Friday, December 14, 2007 7:33 PM
To: Kennedy, Robert
Subject: Digestion Methods

Robert,

Sorry its taken so long. I can't get 5 minutes to myself today to get anything done.

The methods of digestion used for all of the projects we've processed for you are as follows:
Uranium Nitric Leach
RICH-RC-5013/5086
- After step 11.7.15, process by 5086.

Thorium Total Dissolution
RICH-RC-5013/5032
- Follow method 5013 thru step 11.6.7 and then proceed to 5032.

Gamma (Ra226/228) No Chemical Digestions RICH-RC-5013
- Stop after completed with 11.6.7 (Dry/Homogenize only, place in geometry - then in-grow 10 days & count)

I've attached the SOP's involved.

I will touch base with you early next week once I have a better feel for how long it will take to re-calculate the Gamma data and report it.

Thank you and have a great weekend!

ERIKA JORDAN
Manager, Project Management

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STL

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Email: www.stl-inc.com

UNCONTROLLED COPY

Richland-Operation Specific Standard Operating Procedure

TITLE: Complete Dissolution by Mixed Acids in a Teflon Beaker

(SUPERSEDES: RICHRC5032, Revision 2)

Prepared by: Tanya G Wood

Reviewed by: ______________________
Technical Specialist

Approved by: ______________________
Quality Assurance Manager

Approved by: ______________________
Environmental Health and Safety Coordinator

Approved by: ______________________
Laboratory Director

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RICH-RC-5032

Revision 3

1. SCOPE AND APPLICATION

1.1. This procedure is for the complete dissolution by mixed acids of 1 to 2 grams of mineral-matrix samples. The procedure may be used with soil, sediment, air filters and vegetation.

1.2. This procedure is effective for many mineral-matrix samples of 2 grams or less. Ores, ashes, and high-organic content samples may require the repetition of one or more steps. The procedure may be able to handle larger samples with corresponding increases of reagent volumes. However, the time required will be longer, and the procedure has not been validated with samples over 2 grams.

1.3. No analyte is measured in this SOP; hence it is unnecessary to specify an achievable minimum detectable concentration.

2. SUMMARY OF METHOD

2.1. The sample is dried and/or ground as appropriate per RICHRC5013 or RICHRC5016. A weighed aliquot is reacted in a Teflon beaker with hydrogen peroxide and nitric acid, hydrochloric acid, hydrofluoric acid, and perchloric acid or boric acid, either singly or in designated combinations. The sample is heated to dryness between each addition of reagent(s). The final dry salts are dissolved in a diluted acid that is appropriate for the separation procedure to be followed. When required by the customer, the dissolved sample is centrifuged, the supernate decanted, and any residue is dried and weighed.

3. DEFINITIONS

3.1. LCS – Laboratory Control Sample

4. INTERFERENCES

4.1. Only a few elements are volatile under the conditions of this method. These include the halogens, mercury and possibly, depending on the sample, technetium, tin, and some metalloid elements. The closed-container digestion procedure RICHRC5019 should be used if volatilization of the analyte is a concern.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

- All work must be stopped in the event of a known or potential compromise to the health and safety of an associate. The situation must be reported immediately to a laboratory supervisor.

- Eye protection that satisfies ANSI Z87.1, laboratory coat, and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded; other gloves will be cleaned immediately.

- Exposure to chemicals must be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples should be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation.

- 16M HNO_3 and 30% H_2O_2 when mixed together will liberate large quantities of oxygen. If these are mixed together and the container is sealed, pressure may build up causing a pressure explosion. Always add nitric acid before adding 30% H2O2 to avoid possible vigorous reactions. Use extreme caution when wet-ashing samples.

- WARNING: Perchloric acid may cause fire or explosion when hot and in contact with oxidizable or combustible material. Do not contact perchloric acid with alcohols at any temperature. Use of perchloric acid requires a hood equipped appropriately with fan and running water to prevent production of explosive compounds.

- Do not use hand to stop centrifuge from spinning.

- Remove samples from muffle furnace using Zeetex gloves and tongs.

- <u>WARNING:</u> Hydrofluoric acid (HF) is one of the strongest and most corrosive acids known. Do not assume that dilute solutions do not require special precautions! Always double check your personal protective equipment before each use of HF. A pinhole in a glove or leaky container can cause an accident. HF burns penetrate deeply into skin and muscle tissue and can't be treated by simply flushing the area with water. HF causes delayed burns over several hours so the immediate care is essential to prevent further harm.

FIRST AID MEASURES

1. Flush area with water for at least 15 minutes.
2. Remove contaminated clothing immediately.
3. After washing exposed skin, use gloves to rub a generous amount of calcium gluconate gel into burn area.
4. For areas too large to apply gel, use an Epsom salts solution in a concentration of ½ to 1 cup of Epsom salts in one quart of iced water. Immerse the limb into a bucket of solution or soak the solution into gauze and apply to the wound. This dressing should be replaced or re-soaked every two minutes.
5. If area affected is greater than 2 inches by 2 inches, give 6 tablets of calcium gluconate orally.
6. If area affected is greater than 4 inches by 4 inches, assume significant inhalation injury and treat accordingly.

5.1.1 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrofluoric Acid	Poison Corrosive Dehydrator	3 ppm-TWA	Severely corrosive to the respiratory tract. Corrosive to the skin and eyes. Permanent eye damage may occur. Skin contact causes serious skin burns, which may not be immediately apparent or painful. Symptoms may be delayed 8 hours or longer. THE FLUORIDE ION READILY PENETRATES THE SKIN CAUSING DESTRUCTION OF DEEP TISSUE LAYERS AND BONE DAMAGE.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Octanol	Flammable		Liquid may be irritating to skin and eyes. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet. Vapors may flow along surfaces to distant ignition sources and flash back.
Perchloric Acid	Corrosive Oxidizer Poison	None	Unstable at ordinary temperature and pressure and can undergo explosive decomposition, especially at elevated temperatures or if allowed to dehydrate. Inhalation of vapors or mists will cause irritation with coughing, choking, and inflammation of the nose, throat, and upper respiratory tract. Highly corrosive to tissue. Can cause severe burns with discoloration and pain. Permanent visual damage may occur.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance - capable of reading to 0.01 g.

6.2. Beakers - TFE Teflon, 100 to 250 mL; glass, 100 to 250 mL.

6.3. Beaker covers - TFE Teflon, sized to fit the beakers used.

6.4. Centrifuge.

6.5. Centrifuge tubes - approximately 50 mL, conical bottom, plastic or glass. Must withstand dry heat at 110°C. Disposable tubes are acceptable.

6.6. Drying oven or heat lamp.

6.7. Filter paper and filtration apparatus - for suspended sediment, as specified by the contract or by supervisor.

6.8. Hot plate(s), adjustable heat.

6.9. Mortar and pestle - preferably 10 cm ID, diamonite.

6.10. Perchloric acid fume hood.

6.11. Pipets - transfer, polyethylene, disposable, about 2 mL.

6.12. Planchets - stainless steel, 3.8-cm (1.5-inch) diameter. Before use, flame to a red heat or bake overnight at approximately 475°C.

6.13. Razor blade - single edged, for suspended sediment.

6.14. Sieve - No. 120 mesh, with pan, cover, and brush.

6.15. Tongs.

6.16. Vials with caps - approximately 20-mL, plastic; liquid-scintillation vials are suitable.

6.17. Vortex mixer.

6.18. Weighing paper- approximately 10 by 10 cm (4 by 4 inches).

6.19. Zeetex mats - to place between beakers and hot plate.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Reagent water is obtained from the Nano-pure system.

Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. Boric Acid (H_3BO_4) – powdered, reagent grade.

7.3. 12M Hydrochloric acid (12M HCl) - Concentrated. **WARNING**: Corrosive.

7.4. Hydrofluoric acid (48% HF) - Concentrated. Do not put HF into glass containers. **CAUTION**: Corrosive.

NOTE: Hydrofluoric acid (HF) can cause deep-seated burns. Incidents involving HF spills on the skin must receive prompt medical attention. Always dispense HF from its original drip free non glass shipping bottle or a special HF container.

7.5. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.6. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.7. 8M Nitric acid (8M HNO_3) - Add 500 mL 16M HNO_3 to approximately 400 mL reagent water. Dilute to 1L with reagent water and mix well. **WARNING**: Corrosive and Oxidizer.

7.8. 4M Nitric acid (4M HNO_3) - Add 250 mL of 16M HNO_3 to approximately 700 mL of reagent water. Dilute to 1L with reagent water and mix well.

7.9. 2M Nitric acid (2M HNO_3) - Add 125 mL of 16M HNO_3 to 800 mL of reagent water. Dilute to 1 L with reagent water and mix well.

7.10. Octanol ($CH_3(CH_2)5CHOHCH_3$) - **WARNING**: Flammable.

7.11. 12M Perchloric acid (12M $HClO_4$) - Concentrated (70%), **WARNING**: Corrosive and Oxidizer.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers using no preservatives. Storage of the sample prior to analysis should not exceed six months.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for sample and QC data acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

NOTE: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

NOTE: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. Sample preparation

11.1.1. Sample Preparation for Bottom Sediment, Sludge, and Soil

11.1.1.1. Follow procedure RICHRC5013 through the final blending for initial preparation of the sample.

11.1.1.2. **NOTE**: Perform this step only if directed to do so by supervision. Otherwise continue with the acid dissolution section below.

Transfer a 3- to 5-gram aliquot of the blended sample to a mortar and pestle. Grind until all of this aliquot passes through a clean, number 120-mesh sieve. Remove the aliquot from the sieve pan to a piece of weighing paper. Transfer the ground sample into a small plastic vial, labeled with the sample identification number.

11.1.1.3. Use this prepared aliquot in the acid dissolution section

11.1.2. Sample Preparation for Suspended Sediment

11.1.2.1. Filter the water sample through the kind of filter specified by the contract or by supervision. Collect and save the dissolved fraction (filtrate) for any requested analyses; otherwise discard in accordance with contractual requirements or an appropriate waste container.

11.1.2.2. Dry the filter in an oven set at no more than 105°C.

11.1.2.3. Scrape the solid material off the filter with a single edged razor blade onto a piece of weighing paper. Minimize the amount of filter fibers scraped off with the razor blade. Transfer the material to a small plastic vial labeled with the sample identification number. This material is used in the acid dissolution section.

11.1.3. Sample Preparation of Vegetation:

11.1.3.1. Weigh a clean labeled beaker and record the weight.

11.1.3.2. Prepare the sample according to RICHRC5016 steps 11.1.5 to 11.1.9.2.

11.1.3.3. Remove the beaker from the muffle oven and allow to cool to room temperature. Weigh the beaker and record the weight.

11.1.3.4. If the ashed material is 2 grams or less, proceed to the acid dissolution step. If the ashed material is greater than 2 grams, consult supervision for the appropriate amount of acid to add at the acid dissolution step.

11.1.4. Sample Preparation of Air Filter:

11.1.4.1. Weigh a clean labeled beaker and record the weight. Add the filter(s) to the appropriate beaker.

11.1.4.2. Muffle the filters in a muffle oven set at 500°C for at least 8 hours. If the filters do not appear to be completely ashed, consult supervision.

11.1.4.3. Remove the beaker from the muffle oven and allow to cool to room temperature. Weigh the beaker and record the weight.

11.1.4.4. If the ashed material is 2 grams or less, proceed to the acid dissolution step. If the ashed material is greater than 2 grams, consult supervision for the appropriate amount of acid to add at the acid dissolution step.

11.2. Acid Dissolution

11.2.1. Weigh no more than a 2.0 g aliquot of sample on an analytical balance. Enter the weight on the analytical worksheet.

NOTE: Consult supervision if larger aliquots are required.

NOTE: Consult supervision to determine if the sample should be muffled.

11.2.2. Transfer the weighed aliquot to a labeled TFE Teflon beaker.

11.2.3. Transfer the appropriate yield monitors to the Teflon beaker. Rinse each vial three times with small quantities of 8M HNO_3. Remove the vial labels and place them on the corresponding analytical worksheet.

11.2.4. Prepare the appropriate QC samples as directed by the client specific QAS or supervision. Add appropriate spikes, yield monitors, and/or QC matrix to the QC beakers by transferring pre-weighed quantities of the solutions/matrix provided in vials/containers. Rinse the vial and/or container three times with small quantities of 8M HNO_3 to ensure quantitative transfer. Remove the vial labels and place them on the analytical worksheet. From this step on, the LCS and the blank samples are treated as actual samples.

11.2.5. **CAUTION**: Dry Teflon can melt on a hot plate. Remove Teflon promptly upon completion of liquid evaporation.

Place the beakers on a Zeetex mat-covered hot plate or under a heat lamp. Evaporate the samples to near dryness.

11.2.6. **NOTE**: Use the stated amounts of reagents per gram of sample or fraction thereof. For example, double the stated quantities for a 1.4-g sample.

Keep the beaker uncovered except where the SOP states otherwise. Keep a Zeetex mat between the beaker and the hot plate. Do not heat the samples too rapidly. Allow enough time for the acids to be effective.

11.2.7. Add 5 mL of concentrated HNO_3 per gram of sample or fraction thereof. Heat slowly on a hot plate. If the sample foams heavily, add a drop of 2-octanol. Heat the sample to just dryness; DO NOT BAKE.

11.2.8. Add 5 mL of concentrated HNO_3 and 1.5 mL of 30% H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Heat on the hot plate to incipient dryness; DO NOT BAKE.

NOTE: You may need to tap the beaker to make condensate on the wall slide to the bottom for evaporation.

11.2.9. **WARNING:** Hydrofluoric acid (HF) is particularly hazardous because it numbs the skin upon contact, thereby preventing prompt detection of the contact and subsequent severe burn. If you contact or suspect the possibility of contact with HF, flood the skin area with water and immediately call for help. Use of appropriate gloves is especially important with this acid. Always store and dispense HF from its original, dripless shipping bottle or from a special HF container.

Add approximately 5 mL of concentrated HNO_3, about 3 mL of HF, and approximately 1.5 mL of H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Evaporate to just dryness; DO NOT BAKE.

11.2.10. Add approximately 5 mL of concentrated HNO_3 and approximately 6 mL of HF per gram of sample. Evaporate to just dryness; DO NOT BAKE.

11.2.11. If isotopic uranium, thorium or polonium-210 have been requested, proceed to step 11.2.12. All other analysis proceed to step 11.2.13.

11.2.12. Samples requiring total uranium, isotopic uranium, thorium and/or polonium-210:

11.2.12.1. Add approximately 8 mL of concentrated HNO_3, approximately 3 mL of HF, and about 3 mL of H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Evaporate to just dryness; DO NOT BAKE.

11.2.12.2. **NOTE**: If there is unoxidized (black) carbon on the beaker wall, cover the beaker with a Teflon beaker cover after adding the acids, and heat until the carbon is gone. Then remove the cover and heat the sample to dryness.

Add 10 mL of 8M HNO_3 to the beaker. Cover with a Teflon beaker cover. Heat for about 20 minutes. Uncover and carefully check the sample for solids. If many solids remain, cover the beaker and heat for approximately 20 minutes. If no solids or only a few solids remain, continue with step 11.2.12.7.

11.2.12.3. Add approximately 10 mL of 8M HNO_3 and evaporate to just dryness.

11.2.12.4. Add approximately 1 mL of concentrated hydrochloric acid. Heat covered for another 30 minutes.

11.2.12.5. Uncover and heat for about 20 minutes.

11.2.12.6. Add 15 mL of 4M HNO_3. Cover and heat for about 30 minutes.

11.2.12.7. If percent dissolution is required proceed to step 11.2.14.

11.2.12.8. Samples requiring total uranium, wet ash three times in the Teflon beaker and proceed to RICH-RC-5015.

11.2.13. For uranium isotopic and/or thorium, quantitatively transfer the sample from the Teflon beaker to a glass beaker (usually 250 mL) using concentrated HNO_3, making sure any remaining residue is transferred with the last rinse. Rinse twice with about 5 mL of reagent water and combine all rinses in the glass beaker. Wet ash if necessary, using concentrated HNO_3 and 30% hydrogen peroxide.

11.2.13.1. If the sample requests uranium isotopic and/or thorium isotopic analysis, proceed to RICH-RC-5086 or continue with this SOP, depending on client requirements,

11.2.13.2. Wet ash with concentrated HCl or HNO_3 (HCl for RICH-RC-5084 & RICH-RC-5079 and HNO_3 for RICH-RC-5087) and evaporate to dryness. Wet ash with HCl or HNO_3 a second time and evaporate to dryness. Record the appropriate information on the analytical work sheet. Continue with the appropriate analytical procedure.

<u>NOTE:</u> The perchloric acid step is not used for uranium isotopic or thorium samples.

11.2.14. All other requested analysis:

11.2.14.1. <u>NOTE</u>: A perchloric acid hood is required with fan and running water at this stage, make sure all necessary precautions are followed.

Place the beaker on a hot plate and slowly take the sample to dryness. Two options are available for eliminating the HF acid from the sample. Consult supervision.

One is to add approximately 20 mL 16M HNO_3 and approximately 1 g boric acid to the dried sample, then evaporate slowly on low heat.

The second is to wet ash in a perchloric acid hood using at least of 2-3 mL of concentrated $HClO_4$ (perchloric acid) and 20-30 mL of concentrated HNO_3 to remove any insoluble fluorides. Evaporate to complete dryness.

11.2.14.2. **<u>NOTE</u>**: If there is unoxidized (black) carbon on the beaker wall, cover the beaker with a Teflon beaker cover after adding the acids, and heat until the carbon is gone. Then remove the cover and evaporate the sample to dryness.

Add approximately 5 mL of concentrated HNO_3 and approximately 3 mL of $HClO_4$ per gram of sample. Evaporate to dryness and continue heating until dense white fumes from the $HClO_4$ cease. One gram of boric acid may be substituted for the perchloric acid. If boric acid is used, this step must be repeated.

11.2.15. If excessive solids remain in the sample, continue with step 11.2.15.1. If no solids or only a few solids remain, quantitatively transfer the sample from the Teflon beaker to a glass beaker (usually 250 mL) using concentrated HNO_3, making sure any remaining residue is transferred with the last rinse. Rinse twice with about 5 mL of reagent water and combine all rinses in the glass beaker. Wet ash three times using concentrated HNO_3 and 30% hydrogen peroxide.

11.2.16. Add 10 mL of 8M HNO_3 to the beaker. Cover with a Teflon beaker cover. Heat for about 20 minutes. Uncover and carefully look at the sample. If many solids remain, cover the beaker and heat for another 20 minutes.

If no solids or only a few solids remain, wet ash three times using concentrated HNO_3 and 30% hydrogen peroxide and proceed to appropriate procedure or step 11.2.16. If solids still remain, proceed to next step.

11.2.16.1. **NOTE**: Do not heat hydrochloric acid in a stainless steel hood.

If more than a few solids remain, move the beaker from the perchloric acid hood to a non-stainless steel hood and add 1 mL of concentrated hydrochloric acid. Heat covered for another 30 minutes.

11.2.16.2. Uncover and heat for about 20 minutes.

11.2.16.3. Add 15 mL of 4M HNO_3. Cover and heat for about 30 minutes. If percent dissolution is required proceed to step 11.2.14. If percent dissolution has not been requested, continue with the appropriate analytical procedure.

11.2.17. Continue at step 11.2.16 if percent dissolution is required or the sample is to be analyzed by inductively coupled plasma - mass spectrometry.

11.2.18. If determination of percent dissolved is required, weigh a dry, clean labeled 50-mL conical-bottom centrifuge tube to the nearest 0.001 g. For all samples, uncover and transfer to the 50-mL tube. Rinse the beaker using 4M HNO_3, and add the acid to the tube. Centrifuge for several minutes. Pour the supernate into a labeled glass beaker for analysis.

11.2.18.1. Wash the centrifuged solid residue with 10 mL of 2M HNO_3. Mix by vortexing well. Centrifuge for several minutes, and then add the supernate to the same glass beaker.

11.2.18.2. Repeat the previous step.

11.2.18.3. Reserve the supernate and proceed to the next step when the determination of percent dissolved is required. When percent dissolved is not required, take the supernate and continue with the appropriate radiochemical procedure.

11.2.18.4. Dry the residue in the tube in the drying oven at no more than 105°C; or transfer the residue to a preweighed planchet, using a plastic transfer pipet and minimum of reagent water. Dry the planchet under a heat lamp. Cool, weigh the tube or planchet to the nearest 0.001 g, and enter the weight on the SPR.

11.2.18.5. Calculate the percent of sample dissolution using the equations given in the Calculations section and enter the result on the SPR.

11.2.18.6. Continue with the appropriate radiochemical procedure with the supernate after supervision has reviewed the "percent of sample digested" value. Discard the residue to an appropriate waste container.

12. DATA ANALYSIS AND CALCULATIONS

12.1. Computations are performed with a hand calculator. Enter data and results on a Sample Preparation Record. (An example form is shown at the end of the procedure.) The percent of undissolved sample is calculated as:

$$\%\text{ undissolved} = \frac{(\text{residue} + \text{container wt.}) - \text{container wt.}}{\text{starting dry sample weight}} \times 100$$

12.2. The percent dissolved is 100% minus the percent undissolved.

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. WASTE MANAGEMENT AND POLLUTION PREVENTION

All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

14.1. Waste Streams Produced by the Method

- Aqueous acidic waste pH< 2. Waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.

- Aqueous Basic waste with a pH >2. Waste is collected in an appropriate container and transferred into a Neutral waste container color coded with Green tape and a Green Cap
- Flammable waste. Waste is collected in an appropriate container and placed in a Flammable waste container. Container is red with a self closing metal lid

Radioactive Waste
Dry Radioactive waste shall be placed in a RAD Trash container. This waste stream can be distinguished by its yellow trash bags, and radioactive material stickers on the trash container.

All mixed waste shall be placed in the appropriate radioactive waste stream. The RAD waste stream color codes are the same as the non-radioactive waste streams but there are radioactive material stickers on the SAP container and spill tray.

Broken glassware shall be deposited in the appropriate broken glassware container. All Category I broken glassware is deposited in a White Broken Glass container. All Category II and/or III broken glassware is deposited in Magenta with White Radioactive Material box.

15. REFERENCES

15.1. Z. Sulcek, P. Povondra, and Dolezal, J. 1977, "Decomposition Procedures in Inorganic Analyses", CRC Critical Review in Analytical Chemistry, No. 6, CRC Press, Boca Raton, Florida, pp. 255-323.

15.2. STL Quality Management Plan, latest revision.

15.3. STL Richland Laboratory Quality Manual, latest revision.

15.4. STL Richland Quality Assurance Summary, latest revision.

15.5. Associated SOPs

15.5.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

15.5.2. RICHRC5013 - Preparation of Soil Samples.

15.5.3. RICHRC5016 - Preparation of Environmental Matrices.

15.5.4. RICHRC5086 – Urine and Water Sample Preparation by Calcium Phosphate Precipitation

16. MISCELLANEOUS

16.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs review on raw instrument data.

Technical Data Reviewer: Performs final data review.

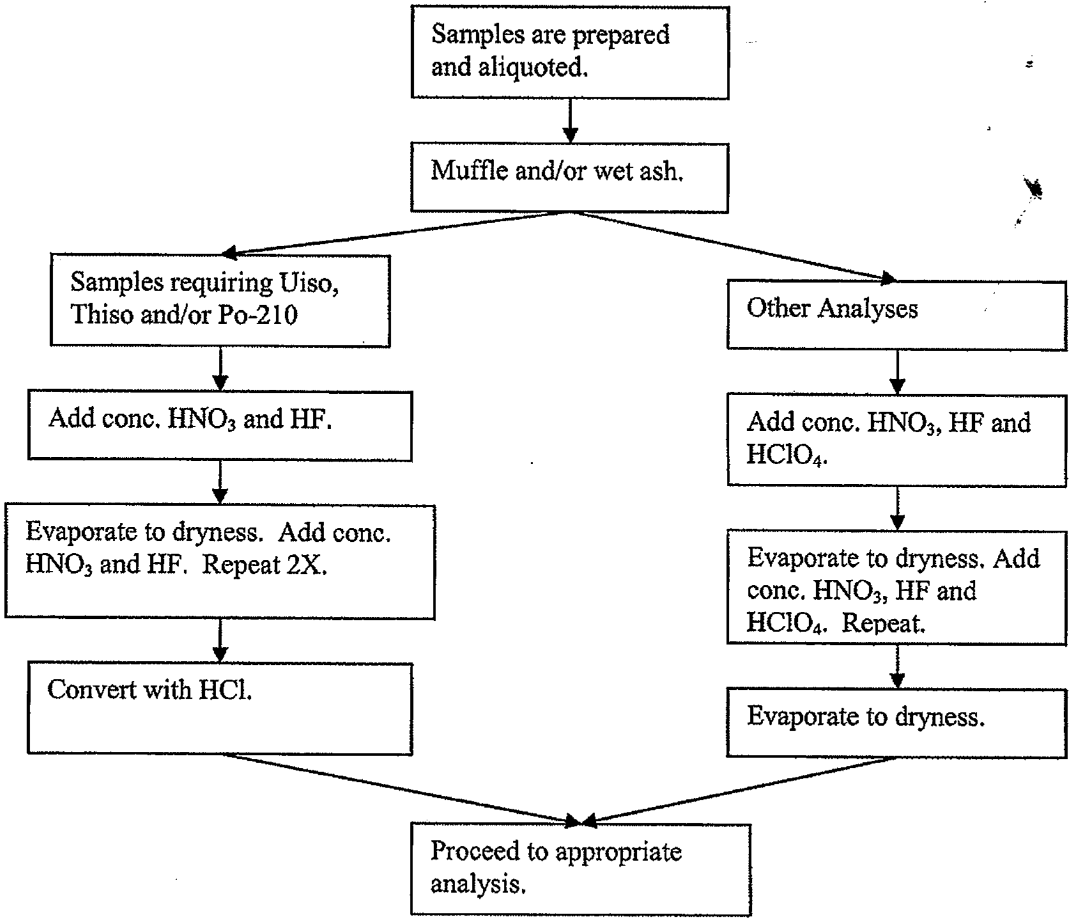
Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the Quality Assurance policies.

16.2. Records Management/Documentation

16.2.1. All records generated by this analysis will be filed and kept in accordance with STL QA policies for records management and maintenance.

16.3. Procedural Flow Chart



STL

SOP No.: RICH-RC-5013
Revision No.: 7
Effective Date: 6/4/07
Page 1 of 17

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Richland-Operation Specific Standard Operating Procedure

TITLE: Preparation of Soil Samples

(SUPERSEDES: RICHRC5013 Revision 6)

Prepared by: Tanya G Wood

Reviewed by: ______________________
Technical Specialist

Approved by: ______________________
Quality Assurance Manager

Approved by: ______________________
Environmental Health and Safety Coordinator

Approved by: ______________________
Laboratory Director

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RICH-RC-5013

Revision 7

1. SCOPE AND APPLICATION

1.1. This procedure describes the steps taken to prepare a soil, sediment or related matrix sample for radiochemical analysis. The goal is to provide a homogeneous starting material, free of extraneous matter from which portions representative of the entire sample may be taken for analysis. Samples are then acid digested or dissolved to bring any radionuclides from environmental contamination into solution.

1.2. Refer to Policy P-R-01 for method detection limit information.

2. SUMMARY OF METHOD

2.1. The objectives of this procedure are twofold. The first is to detail a procedure by which a homogeneous solid sample is produced, from which representative aliquots are taken for digesting or dissolution.

2.2. The entire sample is dried and milled, and an aliquot is sieved to remove extraneous material.

2.3. The second objective is to detail the procedure for the removal of radionuclides of interest by digesting an aliquot of the sample. The alkaline earth metals are separated from the digestate, leaving the other elements and actinide metals in solution. Large amounts of organic matter may first be removed by dry ashing at a high temperature. The soil is digested with nitric acid and hydrogen peroxide, while constantly stirring on a hot plate. This digestion method, while not ensuring complete dissolution of the sample, does solubilize the environmental contamination adsorbed onto surfaces of the matrix. The radionuclides in the digestate are then converted to chloride salts.

2.4. The chloride salts are dissolved in concentrated nitric acid. The alkaline earth elements (Ca, Sr, etc.) are separated by precipitation with fuming nitric acid for radiostrontium analysis. The supernate may be evaporated and taken for actinide element analysis.

3. DEFINITIONS

3.1. Homogenized – A substance having uniform composition.

4. INTERFERENCES

4.1. None.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

- Close safety gate on ball mill before starting. Gate should remain closed until rollers have stopped.
- If an employee is required to work in the room with the ball mill in operation for more than two hours during the day, ANSI approved hearing protection must be used. A sign is posted on the door of this room to indicate the hearing protection requirement.
- When pulverizing samples, wait until pulverizer has stopped before removing sample. Caution: The pulverizer dish is heavy. Use proper lifting techniques when moving the dish.
- If an employee is required to work in the room with the pulverizer in operation for more than five hours during the day, ANSI approved hearing protection must be used. A sign is posted on the door of this room to indicate the hearing protection requirement.
- Remove samples from muffle furnace using Zeetex gloves and tongs.
- 16M HNO_3 and 30% H_2O_2, when mixed together, will liberate large quantities of oxygen. If these are mixed together and the container is sealed, pressure may build up causing a pressure explosion. Use extreme caution when wet-ashing samples.
- This method utilizes 90% Nitric (fuming) acid. Use extreme caution when handling this reagent. Rubber or heavy plastic gloves should be used.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.

Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance - top loading, 2 kg capacity minimum, readable to 0.1 g.

6.2. Beakers - Pyrex glass and Teflon, sizes appropriate for sample.

6.3. Brush - soft bristle, for sieves and sieve pans.

6.4. Centrifuge.

6.5. Centrifuge tubes - 90 mL, polypropylene, with optional caps.

6.6. Containers - plastic jar or metal can approximately 4 L or other volume appropriate for the sample size, wide mouth, with appropriate lid.

6.7. Drying pan or container.

6.8. Filter - glass fiber, 1.2 micrometer pore size.

6.9. Flasks - Side-arm, size appropriate for filtrate.

6.10. Funnels - Buchner, various sizes; powder, large, separatory, size appropriate for sample, or disposable.

6.11. Furnace - muffle, capable of maintaining 500°C.

6.12. Gloves - Zeetex.

6.13. Grinding cylinders - 1¼ inch diameter by 1¼ inch height or metal grinding balls. One grinding ball is equivalent to 2 grinding cylinders.

6.14. Heat lamp.

6.15. Hot plates - stirring, magnetic.

6.16. Ice bath.

6.17. Ball Mill - mechanical rotation device for containers.

6.18. Oven - drying, forced-air, capable of maintaining 105°C.

6.19. Pen - felt tip, permanent black ink.

6.20. Pipet - transfer, glass, disposable, with rubber bulb.

6.21. Pulverizer - concentric ring.

6.22. Pump - mechanical vacuum, or aspirator.

6.23. Shaker - wrist action (if separatory funnel is used).

6.24. Sieves – various sizes, U.S. Standard, stainless steel or brass, 8" diameter, 2" height above cloth.

6.25. Sieve pans and lid to fit sieves.

6.26. Stir bars - Teflon-coated magnetic.

6.27. Stirring rods - glass and Teflon, length appropriate for beaker or tube.

6.28. Tape - plastic.

6.29. Tech Pen/ Pencil.

6.30. Timer (may be part of the shaker).

6.31. Tongs.

6.32. Tubing - vacuum, ¼" inside diameter.

6.33. Vacuum manifold for filtration.

6.34. Vortex.

6.35. Watch glass - Pyrex, appropriate size and Teflon, appropriate size.

6.36. Zeetex.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Reagent water is obtained from the Nano-pure system. Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. 12M Hydrochloric acid (12M HCl) - concentrated. **WARNING**: Corrosive.

7.3. 8M Hydrochloric acid (8M HCl)- Add 670 mL of concentrated HCl to approximately 200 mL of reagent water. Dilute to 1 L with reagent water and mix well. **CAUTION**: Corrosive.

7.4. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.5. 90% Nitric acid (90% HNO_3) - Fuming. **WARNING**: Corrosive and Oxidizer.

7.6. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.7. 8M Nitric acid (8M HNO_3) - Add 500 mL 16M HNO_3 to approximately 400 mL reagent water. Dilute to 1L with reagent water and mix well. **WARNING**: Corrosive and Oxidizer.

7.8. 2M Nitric acid (2M HNO_3) - Add 125 mL of 16M HNO_3 to 800 mL of reagent water. Dilute to 1 L with reagent water and mix well.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers using no preservatives. Storage of the sample prior to analysis should not exceed six months.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for sample and QC data acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

NOTE: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

NOTE: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. Label an appropriate number of containers with the Lab ID number. Tare the containers and record the tare weight in the Soil Preparation Logbook. Transfer the corresponding sample into the appropriate container. Weigh each container and record the weight in the Soil Preparation logbook.

11.2. **NOTE**: If tritium and/or carbon-14 analyses are required, the tritium and/or carbon-14 aliquot must beremoved prior to drying the sample.

Dry the sample by placing it into an oven set at approximately 105°C, for at least 8 hours or until dry.

NOTE: Consult supervision for analyte and client specific drying temperature and time.

CAUTION: Do not dry the aliquot to be used for **Tc-99** analysis above 95°C.

11.3. After drying, cool and weigh the sample and container. Record the dried weight in the Soil Preparation logbook. If percent moisture is requested, enter the appropriate information on the Percent Moisture Form and calculate (see Figure 1).

NOTE: Consult supervision prior to proceeding regarding specific client contractual requirements for sieving and/or ball milling. Record client specific information on the analytical work sheet and/or the Soil Preparation logbook.

11.4. Ball Milling

NOTE: If an employee is required to work in the room with the ball mill in operation for more than two hours during the day, ANSI approved hearing protection must be used. A sign shall be posted on the door of this room to indicate the hearing protection requirement.

NOTE: Samples may have been dried in the ball mill container. Prior to the addition of the grinding cylinders, ensure that the sample is not a solid mass. If a solid mass is present, break up the sample and transfer to a clean container prior to adding the grinding cylinders.

11.4.1. Add the following to a container of appropriate size: one grinding cylinder per 100g or fraction of sample weight, plus one additional cylinder. (For example, use a total of 12 cylinders or 6 balls for a 1030-g sample.)

NOTE: One metal grinding ball is equivalent to 2 grinding cylinders. If metal grinding balls are used, do not use more than 12 balls in a large can or the integrity of the can may be compromised.

11.4.2. Record the Lab ID number on the lid and the bottom of the container.

11.4.3. Add the sample to the container.

11.4.4. Close the container tightly and seal with appropriate material (clips, rings, tape).

11.4.5. Place the container on its side on a set of ball mill rollers. Start the mill. Roll the sample for at least 1 hour.

NOTE: Consult supervision for client-specific time requirements.

11.4.6. Stop the mill and remove the container.

11.4.7. If the sample requires pulverizing, continue to section 11.5. If pulverizing is not required, proceed to Sieving, section 11.6.

11.5. Pulverizing

NOTE: If an employee is required to work in the room with the pulverizer in operation for more than five hours during the day, ANSI approved hearing protection must be used. A sign shall be posted on the door of this room to indicate the hearing protection requirement.

11.5.1. If the sample has been ball milled, remove the cylinders and brush off any excess sample into the container.

11.5.2. Place the sample in the pulverizing bowl located inside the pulverizer. The bowl will have three rings which are used to pulverize the sample. Pulverize for the appropriate time.

NOTE: If the entire sample does not fit in the pulverizer at one time, recombine all pulverized fractions into the original milling container and roll for an additional 60 minutes before sieving.

11.6. Sieving

11.6.1. **NOTE:** If the aliquot or initial sample mass is appreciably over 1.0 kg, it is advisable to sieve the sample in more than one portion.

NOTE: Consult supervision for client-specific sieve size requirements. Record the client specific information on the analytical worksheet and/or in the Sample Preparation logbook.

Set a clean, dry No. 10 mesh (2 mm) and/or a No. 120 mesh (125 μm) stainless steel or brass sieve, or the particular sieves specified by the client, on top of a clean receiving pan. Label with the Lab ID number.

11.6.2. Open the pulverizer and remove the bowl from the pulverizer. Transfer an appropriate aliquot of the homogenized sample onto a clean No. 10 mesh and/or a 120-mesh sieve. Tap or shake the pulverizing bowl over the sieve to remove any adhering sample.

11.6.2.1. If the sample has not been pulverized, open the container and remove the cylinders and brush off any excess sample into the container. Transfer an appropriate aliquot of the homogenized sample or the entire sample onto the sieve.

11.6.3. Place the lid on the sieve. Clamp the receiving pan, sieve, and lid assembly. Shake the sieve assembly for about one minute.

11.6.4. Open the assembly and transfer the sample in the receiving pan to an appropriately labeled sample container.

11.6.5. Return the residue retained on the No. 10 mesh sieve to the original sample container.

11.6.6. If additional pulverizing is required upon completion of sieving, repeat section 11.5 and continue at section 11.6.7.

11.6.7. Transfer weighed aliquots of the sample into clean, labeled beakers (the weights vary depending on analysis). If applicable, transfer weighed aliquots of matrix material to the blank and LCS sample beakers.

NOTE: The sample may be transferred to a plastic jar for later aliquoting.

Record all aliquot weights in a laboratory logbook or on the analytical work sheet. Also record in the logbook or on the analytical work sheet, the procedure number, including any revision used. Proceed to step 11.7 for acid digestion or to the appropriate procedure for dissolution.

11.7. Soil and Sediment Acid Digestion

11.7.1. Add the specified yield monitors for the analyses requested to all beakers. Rinse the vials three times with about 5 mL of 8M HNO_3, (use 2M HNO_3 when transferring strontium carrier and spikes) and add the rinses to the beaker to assure quantitative transfer of the yield monitor solutions. Record the vial labels on the corresponding analytical work sheet.

11.7.2. Add spikes from the vials to the appropriate beakers. Transfer the vial contents as described in the previous step. Record the vial labels on the corresponding analytical work sheet.

11.7.3. Evaporate the samples to dryness if muffling is required.

<u>CAUTION</u>: Do not muffle if **Lead-210** analysis has been requested instead proceed to step 11.7.5 (The melting point of lead is 327^0 C.). Do not muffle the aliquot to be used for **Tc-99** analysis.

<u>NOTE:</u> Ensure the muffle furnace is set no higher than 500°C. When the muffle is greater than 500°C the glass beaker will melt.

11.7.4. **<u>NOTE</u>**: If samples do not appear to contain significant organic matter, muffling may not be required. Consult supervision.

When muffling is required (see supervision for instructions), use a TECH PEN or HI-TEMP PENCIL to label the sample beaker with the Lab ID number. Place the beaker with the sample in an unheated muffle furnace. Set the temperature of the furnace to approximately 500°C and turn on the furnace. Muffle the sample at this temperature for at least 6 hours.

11.7.5. Remove the beaker from the muffle furnace using Zeetex gloves and tongs, and let the beaker <u>cool</u> on a Zeetex pad.

11.7.6. Add about 200 mL of 8M HNO_3 to appropriately labeled blank, LCS, and cooled sample beakers (the volume of 8M HNO_3 required may be less depending on the sample size and the analysis requested).

11.7.7. Add a large magnetic stir bar to each labeled beaker and place the beaker on a magnetic stirring hot plate in a fume hood. Place a watch glass on the beaker.

11.7.8. Adjust the temperature so that the solution just boils. Allow the sample to reflux for about 45 minutes with constant stirring. Wash down the sides of the beaker periodically with small amounts of 8M HNO_3.

11.7.9. After heating, remove the sample from the hot plate and allow the soil to settle. Decant most of the solution into a clean, labeled beaker.

11.7.10. Add about 200 mL of 2M HNO_3 to the residue, and rinse the beaker walls with 2M HNO_3 (the volume of 2M HNO_3 required may be less depending on the sample size or analysis requested). Replace the watch glass on the beaker. Reflux for about 45 minutes with constant stirring and heating. Remove the sample from the hot plate and allow the soil to settle.

11.7.11. <u>**NOTE:**</u> Make sure vacuum is applied to the Buchner funnel prior to decanting the samples.

Transfer the solution from step 11.7.9 into a Buchner filter funnel fitted with a moistened glass fiber filter. Collect the sample digestate under vacuum in a side-arm flask. Rinse the beaker with a small amount of 2M HNO_3 and add the rinsate to the funnel/filter.

<u>**NOTE**</u>: A disposable filter may be used.

<u>**NOTE**</u>: Samples may be centrifuged instead of filtered. If the sample is centrifuged, rinse the beaker with small amounts of reagent water, adding the rinses to the centrifuge tube. Centrifuge for approximately 10 minutes. Decant the supernate to a clean labeled beaker. Rinse the sample residue with a small amount of 2M HNO_3. Centrifuge for approximately 10 minutes and decant to the appropriate beaker.

11.7.12. Decant the 2M HNO_3 solution containing the soil residue from step 11.7.10 through the same Buchner funnel and filter paper with vacuum on. Rinse the beaker with 2M HNO_3 and add to the funnel. Continue to apply vacuum until the soil residue is free of visible liquid and liquid ceases to drip from the funnel. Rinse the filtered residue with up to 25 mL reagent water.

11.7.13. Transfer the filtered digestate from the side-arm flask back into the beaker from step 11.7.9. Rinse the flask with small volumes of 2M HNO_3 and add the rinsate to the beaker.

11.7.14. Place the beakers on a hot plate and evaporate to **just dryness**. <u>**DO NOT BAKE**</u>. When salts start appearing, cover the sample with a watch glass and lower the temperature setting of the hot plate to minimize losses due to spattering. Wet ash the samples with small amounts of concentrated HNO_3 and 30% H_2O_2. Evaporate to just dryness.

11.7.15. Strontium only requests may proceed to the appropriate strontium procedure. The strontium sequential analysis continues at Section 11.8. Proceed to the appropriate analytical procedure for isotopic analyses.

<u>**NOTE:**</u> For uranium isotopic analysis only: samples may be processed by RICH-RC-5086 or add approximately 5 mL 12M HCl to the sample and evaporate to dryness. Repeat twice.

<u>**NOTE:**</u> For thorium isotopic analysis only: Samples which will be processed by RICH-RC-5087 are to be wet ashed three times and evaporated to dryness.

Samples which will be processed by RICH-RC-5084 are to be converted three times with approximately 5 mL 12M HCl and evaporated to dryness.

11.8. Fuming Nitric Acid Separation

11.8.1. **WARNING:** Fuming nitric acid is used in the next several steps. It is hazardous, especially when brought in contact with organic materials including skin. Exercise extreme care. Rubber or heavy plastic gloves should be used. Immediately rinse any area contacted with fuming nitric acid.

Suspend, and if possible dissolve, the sample residue in a minimum amount of concentrated HNO_3 while stirring. Heat briefly if needed. If necessary, use a stir rod to loosen all solids sticking to the beaker and break up all large pieces.

11.8.2. Transfer the sample to a labeled 90-mL plastic centrifuge tube, rinsing the beaker and rod (if used) with a minimum amount of concentrated HNO_3. Larger samples may require two or more centrifuge tubes. Vortex the remaining solids to ensure that any large pieces are broken up. Add at least 50 mL of fuming nitric acid to each tube.

NOTE: It is recommended that the centrifuge tubes be capped. Capping the tubes before centrifuging can minimize the fumes..

11.8.3. Cool in an ice bath for 20-30 minutes. Remove from the ice bath and wipe the outside of the tube dry. Centrifuge until the supernate is clear (at least 10 minutes). Save the supernate for plutonium and/or other actinide analyses, if requested, and transfer to a labeled beaker.

11.8.4. If the precipitate is less than 20 mL per tube, proceed to 11.8.6. To precipitates greater than 20 mL per tube, vortex to break up the precipitate and add about 20-30 mL of fuming nitric acid. Thoroughly mix the precipitate with the acid. Centrifuge, and decant the supernate into the beaker with the supernate from step 11.8.3. The final precipitate from this step or step 11.8.3 will be used for strontium analysis, if requested.

11.8.5. Evaporate the supernate to dryness when plutonium or other actinides are requested. The warm hot plate may be covered with Zeetex to prevent spattering.

11.8.6. Proceed to the appropriate analytical procedure with each fraction and analytical worksheet(s).

12. DATA ANALYSIS AND CALCULATIONS

NOTE: Consult the client specific QAS or supervision to determine the appropriate calculation to be used.

12.1. Percent Moisture (Wet Sample Weight):

$$\text{Percent Moisture} = \left(\frac{M_i - M_d}{M_i - M_p}\right)100$$

where:

M_i = the combined weight of the initial sample and the pan weight in grams.

M_d = the combined weight of the dried sample and the pan weight in grams.

M_p = the pan weight in grams.

12.2. Percent Moisture (Dry Sample Weight):

$$\text{Percent Moisture} = \left(\frac{M_i - M_d}{M_d - M_p}\right)100$$

where:

M_i = the combined weight of the initial sample and the pan weight in grams.

M_d = the combined weight of the dried sample and the pan weight in grams.

M_p = the pan weight in grams.

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. POLLUTION PREVENTION

14.1. Standards and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of expired standards and reagents to be disposed.

15. WASTE MANAGEMENT

All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

15.1 The following waste stream is produced when this method is carried out.

- Aqueous acidic waste pH<2. The waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.

16. REFERENCES

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16.7. American Society of Testing and Materials. "Standard Method for Soil Sample Preparation for the Determination of Radionuclides", C 999-83, in Annual Book of ASTM Standards, v. 12.01 ASTM, Philadelphia.

16.8. American Society of Testing and Materials. "Determination of Water (Moisture) Content of Soil and Rock", D2216-92, in Annual Book of ASTM Standards, v. 12.01 ASTM, Philadelphia.

16.9. STL Quality Management Plan, latest revision.

16.10. STL Richland Laboratory Quality Manual, latest revision.

16.11. STL Richland Quality Assurance Summary, latest revision.

16.12. Associated SOPs

16.12.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

17. MISCELLANEOUS

17.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs review on raw instrument data.

Technical Data Reviewer: Performs final data review.

Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the Quality Assurance policies.

17.2. Records Management/Documentation

17.2.1. All records generated by this analysis will be filed and kept in accordance with STL QA policies for records management and maintenance.

17.3. Procedural Flow Chart

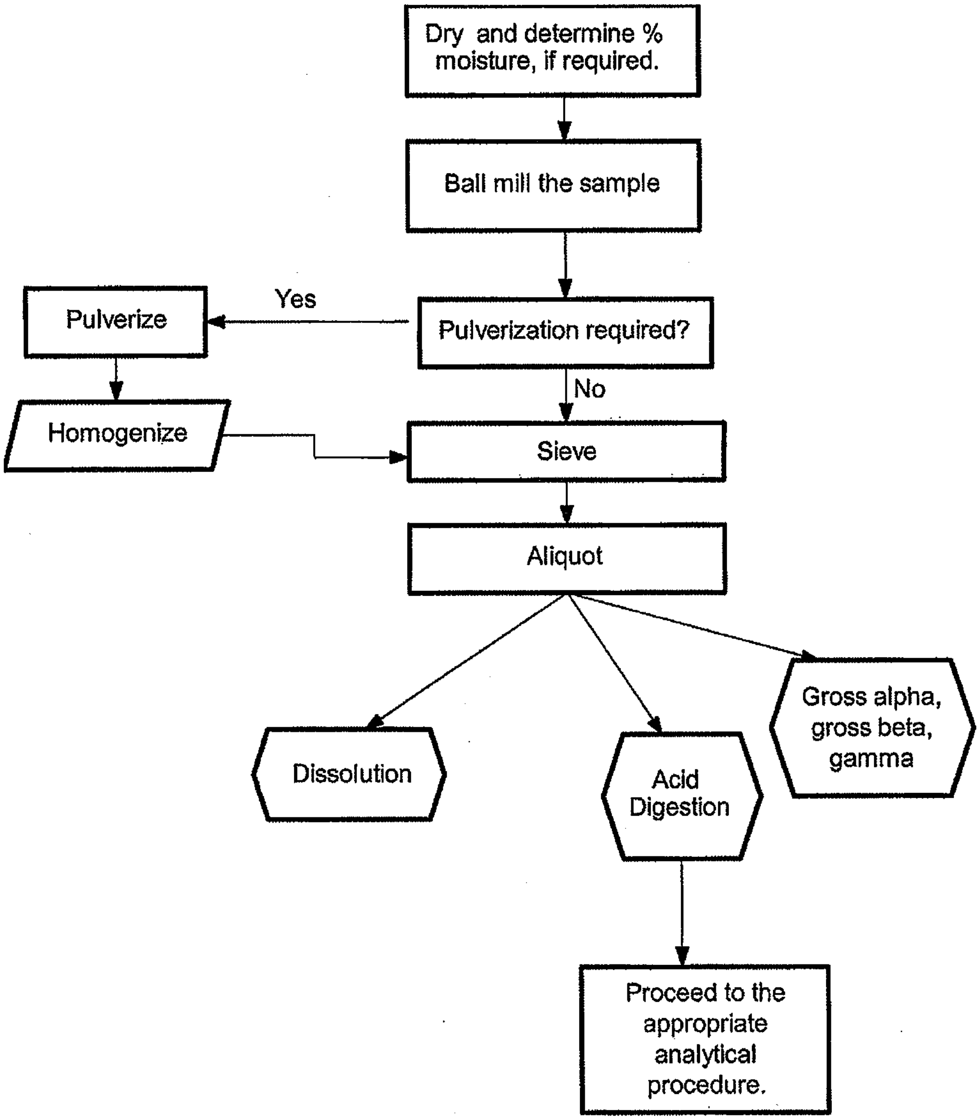
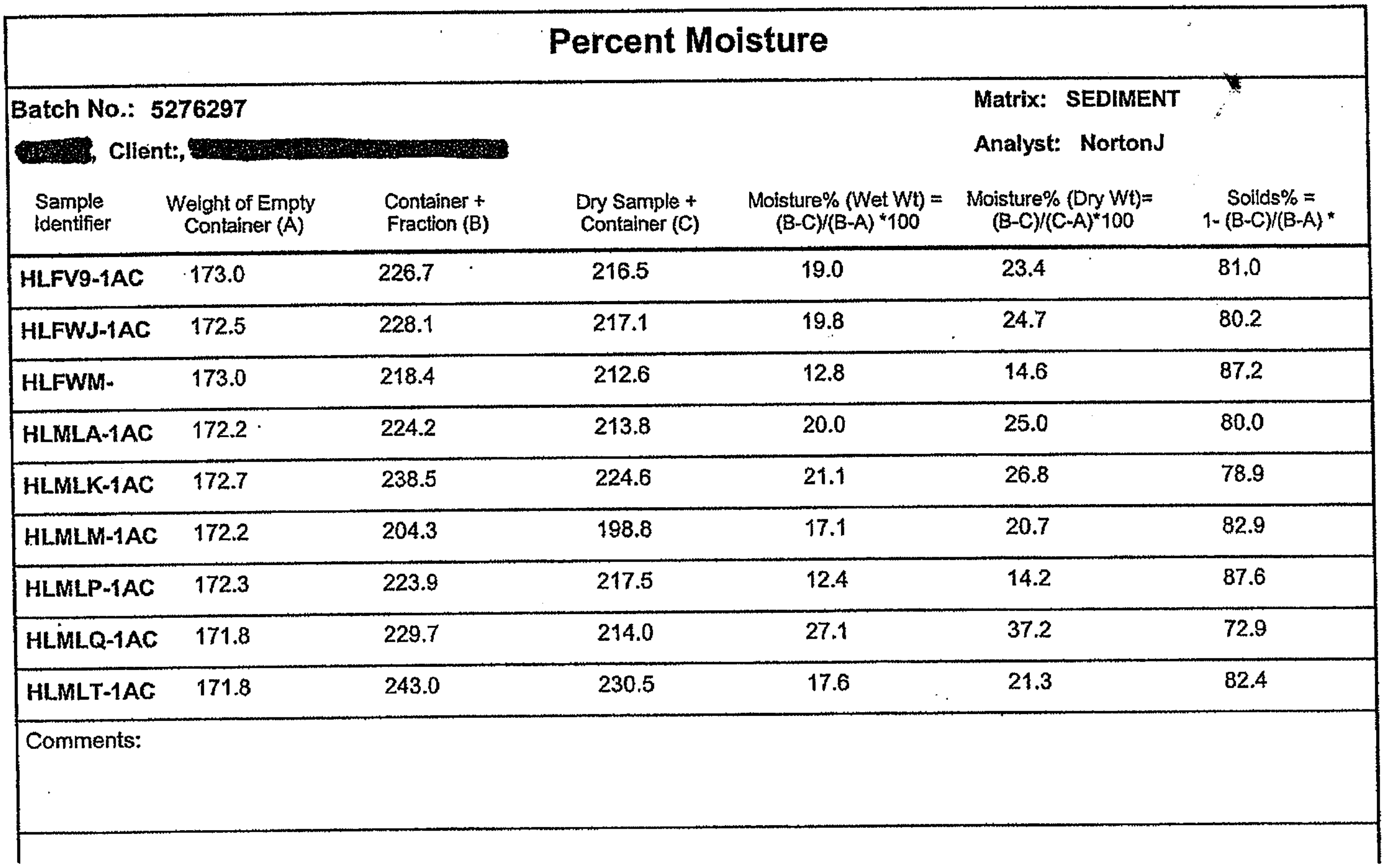


Figure 1: Percent Moisture Determination



Percent Moisture

Batch No.: 5276297
Matrix: SEDIMENT

[redacted], Client:, [redacted]
Analyst: NortonJ

Sample Identifier	Weight of Empty Container (A)	Container + Fraction (B)	Dry Sample + Container (C)	Moisture% (Wet Wt) = (B-C)/(B-A) *100	Moisture% (Dry Wt)= (B-C)/(C-A)*100	Solids% = 1- (B-C)/(B-A) *
HLFV9-1AC	173.0	226.7	216.5	19.0	23.4	81.0
HLFWJ-1AC	172.5	228.1	217.1	19.8	24.7	80.2
HLFWM-	173.0	218.4	212.6	12.8	14.6	87.2
HLMLA-1AC	172.2	224.2	213.8	20.0	25.0	80.0
HLMLK-1AC	172.7	238.5	224.6	21.1	26.8	78.9
HLMLM-1AC	172.2	204.3	198.8	17.1	20.7	82.9
HLMLP-1AC	172.3	223.9	217.5	12.4	14.2	87.6
HLMLQ-1AC	171.8	229.7	214.0	27.1	37.2	72.9
HLMLT-1AC	171.8	243.0	230.5	17.6	21.3	82.4

Comments:

FMC-Idaho Client Specific Instruction

1. Soil and Rock samples submitted for analysis will be dried, ground, pulverized and sieved as described in steps 11.1 through 11.6.6 of this procedure. If the sample must be split for analysis at another facility, proceed to step 2.

2. Samples will be split using Alternate Shoveling. The technician takes a series of scoops selected randomly from the entire sample, depositing the alternate scoops in two piles containing an equal number of scoops. NOTE: The minimum number of scoops should be nine for each pile. Small scoop sizes should be used to achieve lower grouping and segregation error. Repeat if necessary until enough sample is divided for additional analysis.

3. Proceed to step 11.6.7 for in house analysis.

STL

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SOP No.: RICH-RC-5086
Revision No.: 3
Effective Date: 6/4/07
Page 1 of 12

Richland-Operation Specific Standard Operating Procedure

TITLE: Urine and Water Sample Preparation by Calcium Phosphate Precipitation

(SUPERSEDES: RICH-RC-5086 Rev. 2)

Prepared by: John Norton

Reviewed by: J. Dobecki
Technical Specialist

Approved by: Jodie
Quality Assurance Manager

Approved by:
Environmental ~~Health and~~ Safety Coordinator

Approved by:
Laboratory Director

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RICH-RC-5086

Revision 3

1. SCOPE AND APPLICATION

1.1. This procedure describes a method for the preparation of water, soil digestates and urine samples for strontium and various actinides.

1.2. Refer to Policy P-R-01 for method detection limit information.

2. SUMMARY OF METHOD

2.1. A calcium phosphate precipitation concentrates and removes actinides and strontium from water and urine samples. The individual separations are performed by the appropriate SOP(s).

3. DEFINITIONS

3.1. Precipitation – The process of producing a separable solid phase within a liquid medium.

4. INTERFERENCES

4.1. Very high levels of phosphate in the sample may cause an interference. Adjusting the amount of phosphate added to coprecipitate may be necessary in these cases.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

Phenolphthalein solution is known to be flammable.

Octanol is known to be flammable.

Do not use hand to stop centrifuge from spinning.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Ammonium Hydroxide	Corrosive Poison	50 ppm-TWA	Vapors and mists cause irritation to the respiratory tract. Causes irritation and burns to the skin and eyes.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance, Top Loading.

6.2. Beakers, various sizes.

6.3. Bottles, plastic, squirt for reagent use.

6.4. Centrifuge.

6.5. Centrifuge tubes or bottles (250 mL), plastic with holders.

6.6. Cover, plastic film.

6.7. Filter holder for 47mm filter and filter flasks.

6.8. Fitter – 0.45 µm – pore or equivalent, 47mm diameter recommended.

6.9. Funnels, glass or plastic.

6.10. Hot plate.

6.11. Magnetic stir plate, large Teflon stir bars and stir bar retriever.

6.12. pH paper – 0-14 range.

6.13. Pipettors, adjustable volume, capable of measuring 0.2 through 20 mL, non-critical, with disposable plastic tips.

6.14. Pipets, transfer, disposable, plastic.

6.15. Stirring rod, glass.

6.16. Vacuum pump with collection apparatus, for filtration and aspiration.

6.17. Vortex mixer.

6.18. Watch glasses, various sizes.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. Ammoniated Reagent Water – Adjust the pH of approximately 500 mL of reagent water to 8-9 by the addition of concentrated NH_4OH and checking with pH strips. If the pH is overshot, adjust back with 0.1M HCl.

7.3. 3.2M Ammonium phosphate, dibasic (3.2M $(NH_4)_2HPO_4$) - Dissolve 104 grams of $(NH_4)_2HPO_4$ in approximately 200 mL of reagent water, heating gently to dissolve. Dilute to 250 mL with reagent water and mix well.

7.4. 14.7M Ammonium hydroxide, concentrated (14.7M NH_4OH). **CAUTION**: Corrosive.

7.5. 1.25M Calcium nitrate (1.25M $Ca(NO_3)_2$) - Dissolve 73.8 grams of $Ca(NO_3)_2{\bullet}4H_2O$ in approximately 100 mL of reagent water. Dilute to 250 mL with reagent water and mix well. **CAUTION**: Oxidizing agent.

7.6. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.7. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.8. 2M Nitric acid (2M HNO_3) - Add 127 mL of concentrated HNO_3 to approximately 800 mL of reagent water. Dilute to 1 liter with reagent water and mix well. **CAUTION**: Corrosive and oxidizing agent.

7.9. Octanol ($CH_3(CH_2)_7OH$) - or equivalent. **WARNING**: Flammable.

7.10. Phenolphthalein solution, 0.5% - Dissolve 1 g Phenolphthalein in 100 mL of 95% isopropyl alcohol or in 100 mL of anhydrous, denatured ethanol. Dilute with approximately 100 mL of reagent water and mix well. **CAUTION**: Flammable.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers. Storage of the sample prior to analysis should not exceed six months.

8.2 It is recommended that water samples be preserved at the time of collection by adding enough 1M HNO_3 to the sample to bring it to pH 2.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for QC acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

NOTE: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

NOTE: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. **Sample Preparation:**

11.1.1. Water and Soil Digestate Sample Preparation

11.1.2. **NOTE**: If Carbon-14, Iodine-129, Iodine-131, or Tritium analyses have been requested and the aliquots are to be taken from the same sample container, mix sample and remove those aliquot(s) prior to acidification of the sample. Document on the analytical work sheet that aliquots were removed prior to acidification.

Using a wide range pH paper, measure the pH of the sample and record the pH on the analytical work sheet. If the pH is 2 or less, proceed to 11.1.2.2.

11.1.2.1. **NOTE**: Some clients do not want samples analyzed if preservation is incorrect. If the pH is above 2, consult the client specific QAS or supervision to determine if the sample analysis may proceed after acidification.

To acidify the sample, add acid to the sample using approximately 1 mL of concentrated HNO_3 to each liter of sample. Mix the sample and recheck the pH. Continue to add acid in 1 mL increments until the sample pH is below 2. Hold the sample in the original container for a minimum of 16 hours before continuing with this procedure.

11.1.2.2. **CAUTION**: Do not perform this step if the client has requested analysis of an unfiltered sample.

If the sample is not prefiltered, filter using vacuum filtration.

11.1.2.3. Mix the sample. According to the Quality Assurance Summary for the client, measure the appropriate amount of sample to be analyzed into a beaker. Record weight.

11.1.2.4. Add appropriate tracers and/or spikes as designated in the client-specific Quality Assurance Summary. If multiple beakers were used, dilute QC vial with 2M HNO_3 and disperse evenly among beakers. Rinse the vials three times with approximately 5 mL of 2M HNO_3, transferring the rinses quantitatively to the appropriate beaker. Remove the vial labels and place on the analytical work sheet.

11.1.2.5. Proceed to the calcium phosphate precipitation.

11.2. Urine Sample Preparation

11.2.1. Weigh the urine sample by taring a labeled beaker on a top-loading balance. Remove the beaker from the balance, add all the urine from the plastic collection bottles and re-weigh the beaker. Record the total sample volume (1g = 1 mL) on the analytical work sheet(s). Verify the sample volume meets contractual requirements.

<u>NOTE</u>: For large sample volumes (approximately >1500 mL), a second beaker is required.

<u>NOTE:</u> Samples of insufficient volume are not discarded without consulting supervision and/or checking contract volume requirements.

11.2.2. Transfer appropriate amounts of blank/synthetic urine into both the LCS and the matrix blank beaker. Add an appropriate volume of reagent water to the reagent blank beaker. From here on, the LCSs, the blanks, and the actual samples are treated alike with the exception that reagent blanks for Uranium isotopic, Radium-226 and Thorium isotopic are not put in the muffle oven.

<u>NOTE</u>: Synthetic or raw urine may be used for matrix LCSs. Consult the client specific QAS or supervision for further information.

11.2.3. Tritium, Carbon-14, Sulfur-35 or Phosphorus-32 and/or gamma analysis for Iodine-129 or iodine-131, if requested, must be performed on unacidifed samples. Mix sample and remove the appropriate size aliquots before proceeding to the acidification step (step 11.2.4). If any of these analytes are requested, proceed to the analytical procedure for the analyte of interest.

11.2.4. <u>NOTE</u>: Add about 3-4 drops of Octanol to the sample prior to acidification to reduce the possibility of sample loss due to a vigorous reaction.

Rinse each plastic collection bottle with concentrated HNO_3, unless already acidified, and add the rinses to the beaker using a total volume of acid approximately equivalent to 10% of the sample volume.

11.2.5. Rinse each plastic collection bottle with reagent water and add the rinses to the flask/beaker. Replace each container lid, secure tightly and discard to regular trash. Record total acidified weight.

11.2.6. Aliquot the sample for each analysis requested. Consult the client specific Quality Assurance Summary (QAS) or your supervisor for the appropriate sample size.

11.2.7. For each analysis, add the appropriate carrier and/or yield monitors to each beaker. To the LCS beaker only, add the appropriate spike. Rinse the vials 3 times with 2M or 8M HNO_3. Remove the labels from the QC vials and place them on the analytical work sheet.

NOTE: If multiple beakers were used, dilute QC vial with 2M HNO_3 and disperse evenly among beakers. Rinse three times.

NOTE: If a sequential analysis is identified as Pu239/Uiso and Pu238 is not requested, the Uiso tracer is added at this time. When both Pu238 and 239 are requested, the Uiso tracer shall be added after the Pu extraction. For all other sequential analysis, consult supervision prior to addition of yield monitors and/or carriers.

11.2.8. Add 30% hydrogen peroxide at approximately 5% of the sample volume.

11.2.9. Urine samples that require Uiso must first initially be prepared by RICH-RB-5002. The organics in urine interfere with the precipitation of uranium. The final muffled urine salts are redissolved in approximately 100-200 mL of 2M HNO_3 (No conversion to the chloride form is required). The resulting solution is ready for the calcium phosphate precipitation.

11.3. Calcium phosphate precipitation:

11.3.1. If multiple beakers were used for one sample, treat each beaker as an individual sample. Add 0.5 mL of 1.25M calcium nitrate ($Ca(NO_3)_2$) to each acidified sample beaker.

11.3.2. Place each beaker on a hot plate, cover with a watch glass and allow the sample to heat to near boiling. For urine, continue heating for at least two hours, adding 30% hydrogen peroxide until sample clears, in order to digest the sample.

11.3.3. Remove the watch glass and remove from the hot plate.

11.3.4. Add 2-3 ml of phenolphthalein indicator and 2.0 mL of 3.2M ammonium phosphate, dibasic ($(NH_4)_4 HPO_4$).

11.3.5. Place the sample on hot plate and slowly add enough concentrated NH_4OH from a squirt bottle or dropwise to reach the phenolphthalein end point (which is a permanent pink color) and form $Ca_3(PO_4)_2$ precipitate. Verify a pH of >10 with pH paper. Stir the solution with a stirring rod. Cover with a watch glass. Allow the sample to heat for another 20-30 minutes.

11.3.6. If the sample volume is too large to centrifuge the entire sample in one centrifuge tube, remove the stirring rod from each beaker, allow the precipitate to settle until solution can be decanted (30 minutes minimum) and proceed to step 11.3.8.

11.3.7. If the volume is small enough to centrifuge, remove the stirring rod and proceed to step 11.3.9.

11.3.8. Aspirate or decant off the supernatant liquid and discard to an appropriate waste container.

11.3.9. Transfer the precipitate to a centrifuge tube. Rinse the beaker with small amounts of ammoniated reagent water and add the rinses to the tube. Centrifuge the precipitate for at least 5 minutes at medium-high speed.

11.3.10. Decant the supernatant liquid and discard to an appropriate waste container.

11.3.11. If more than one beaker was used, combine the sample at this point.

11.3.12. Wash the precipitate with an amount of ammoniated reagent water approximately twice the volume of the precipitate. Mix well on a vortex mixer. Centrifuge, decant and discard the supernate as before.

11.3.13. Repeat the precipitation wash once.

11.3.14. Dissolve the precipitate in approximately 5 mL 16M HNO_3 and transfer the solution to a beaker (250 mL beaker is typical). Rinse the tube 2-3 times with 2-3 mL 16M HNO_3 and transfer the rinses to the beaker. Evaporate the solution to dryness. Wet ash with 16M HNO_3 and hydrogen peroxide. Some samples may require several wet ashings to achieve a white precipitate.

12. DATA ANALYSIS AND CALCULATIONS

12.1. N/A

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. POLLUTION PREVENTION

14.1. Standards and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of expired standards and reagents to be disposed.

15. WASTE MANAGEMENT

15.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

15.2 Waste Streams Produced by the Method

- Aqueous acidic waste pH <2. Waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.
- Aqueous Basic waste with a pH>2. Waste is collected in an appropriate container and transferred into a Neutral waste container color coded with Green tape and a Green Cap.
- Flammable Waste with a pH<2. Waste is collected in an appropriate container and placed in a Flammable waste container. Container is red with a self closing metal lid.

16. REFERENCES

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16.4. Nelson, D., November 1992, "Improved Methods for the Analysis of Radioactive Elements in Bioassay and Environmental Samples," **38th Annual Conference on Bioassay, Analytical and Environmental Radiochemistry**, Santa Fe, NM.

16.5. STL Quality Management Program, latest revision.

16.6. STL Richland Laboratory Quality Manual, latest revision.

16.7. STL Richland Quality Assurance Summary, latest revision.

16.8. Associated SOPs

16.8.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

17. MISCELLANEOUS

17.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs calculation and first level of data review.

Technical Data Reviewer: Performs final data review. Schedules analysts.

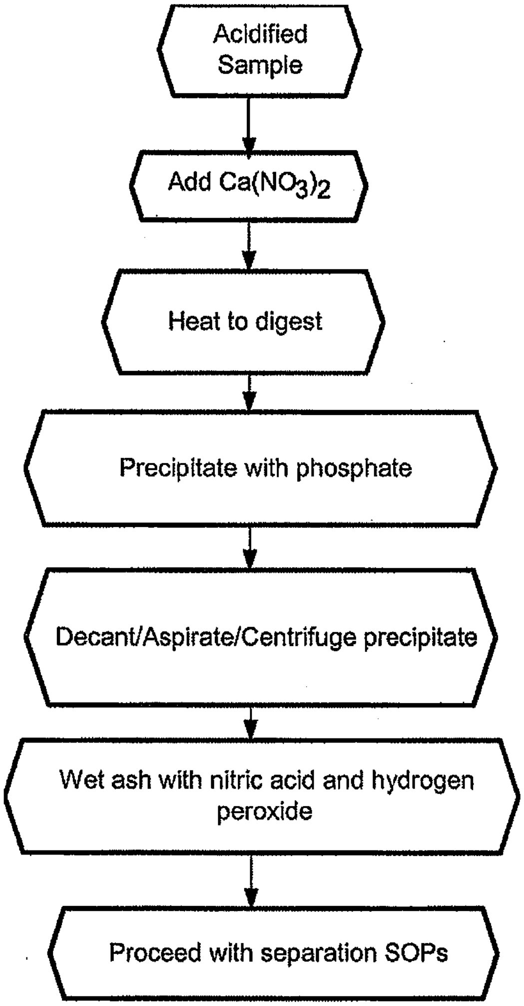
Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the facilities Quality Assurance procedures.

17.2. Records Management/Documentation

17.2.1. All records generated by this analysis will be filed and kept in accordance with STL policies and SOPs for records management and maintenance.

17.3. Procedural Flow Chart



Brian Rakvica

From: Brian Rakvica
Sent: Sunday, December 16, 2007 4:24 PM
To: Keith Bailey; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Cc: Shannon Harbour; Brian Rakvica
Subject: RE: Digestion Methods
Importance: High

Keith,

Sorry, I thought you were responding to the original email...and I was assuming STL's response to Ranajit would encompass the Parcels A/B data.

We will have to look at the stats for Phase A and see what the repercussions are for these findings.

For example, if Thorium is very low in Phase A (but accurate) and uranium is biased low (and inaccurate)...this would imply a failure to demonstrate secular equilibrium OR some other analytical problem.

Thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Sun 12/16/2007 2:02 PM
To: Brian Rakvica; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Subject: RE: Digestion Methods

Brian,

The STL response was to Robert Kennedy of ENSR and is specific to the Tronox Phase A data (though it may also apply to the Parcel A/B data). Note the gamma spec work for radium. We will have more info on the Parcel A/B work shortly.

Keith

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Sunday, December 16, 2007 3:48 PM
To: Keith Bailey; Paul Black; David Gratson; Crowley, Susan; Gerry, Dave; Ranajit Sahu; Kennedy, Robert
Subject: RE: Digestion Methods
Importance: High

Keith,

The response from STL was specifcially to BRC regarding BRC data sets including the Parcels A and B work.

Phase A work was conducted by STL-Richland for TRX and it is necessary to verify for this specific data set excatly what was done.

Thanks,

Brian

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Sun 12/16/2007 11:22 AM
To: Brian Rakvica; 'Paul Black'; 'David Gratson'; 'Crowley, Susan'; 'Gerry, Dave'; 'Ranajit Sahu'; 'Kennedy, Robert'
Subject: FW: Digestion Methods

Brian and Paul,

Attached is the latest from STL Richland on the Phase A analyses. Where we had been previously told that both U and Th analyses were performed on a single digestion, Richland now indicates that they did used mixed acids (including HF) on the Th series nuclides and only nitric acid on the U series nuclides. This answers the questions related to the Tronox Phase A work.

Keith

-----Original Message-----
From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Sunday, December 16, 2007 9:19 AM
To: okbailey@flash.net
Subject: FW: Digestion Methods

Keith,

This email from Erika does confirm the isotopic Th digestion for Phase A soils performed by STL-Richland did employ HF, and the digestion for isotopic U analysis did not use HF.
The crossover to the HF step is early enough in the process for Th that it can be considered "total dissolution", whereas the isotopic U was only an "acid leach". Please pass this confirming information on to Paul Black.

-Robert

-----Original Message-----
From: Jordan, Erika [mailto:Erika.Jordan@testamericainc.com]
Sent: Friday, December 14, 2007 7:33 PM
To: Kennedy, Robert
Subject: Digestion Methods

Robert,

Sorry its taken so long. I can't get 5 minutes to myself today to get anything done.

The methods of digestion used for all of the projects we've processed for you are as follows:

Uranium	Nitric Leach
RICH-RC-5013/5086 - After step 11.7.15, process by 5086.	
Thorium	Total Dissolution

RICH-RC-5013/5032
- Follow method 5013 thru step 11.6.7 and then proceed to 5032.

Gamma (Ra226/228) No Chemical Digestions RICH-RC-5013
- Stop after completed with 11.6.7 (Dry/Homogenize only, place in geometry - then in-grow 10 days & count)

I've attached the SOP's involved.

I will touch base with you early next week once I have a better feel for how long it will take to re-calculate the Gamma data and report it.

Thank you and have a great weekend!

ERIKA JORDAN
Manager, Project Management

TestAmerica Richland
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Brian Rakvica

From: Brian Rakvica
Sent: Sunday, December 16, 2007 8:05 AM
To: Ranajit (Ron) Sahu; susan.crowley@tronox.com; okbailey@flash.net; Paul Black; David Gratson; Shannon Harbour
Cc: Brian Rakvica
Subject: RE: BRC Radionuclides
Importance: High

Ranajit,

Re: SOP 5086...

This SOP is applicable to waters, urine, and "soil digestates." This means the sample must be in a liquid form to start. So it is unclear what steps were performed to prepare the soil digestates. What SOP or digestion steps were used to prepare these. We need to have the complete preparation documented somewhere.

thanks,

Brian

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Fri 12/14/2007 7:14 PM
To: Brian Rakvica; susan.crowley@tronox.com; okbailey@flash.net; Paul Black; David Gratson; Shannon Harbour
Subject: Fw: BRC Radionuclides

Hi all:

Per our call earlier today, please see e-mail below and SOPs attached re. Test America prep methods for all of our projects, including Tronox A/B.

Thanks

Ranajit

----- Original Message -----
From: Jordan, Erika
To: Maria Barajas ; Ranajit Sahu
Cc: Mark Jones ; Miller, Ken ; Carnes, Jodie ; Wild, Elaine ; Everett, Jerry ; Cahill, Martha ; Antonson, Lisa
Sent: Friday, December 14, 2007 3:54 PM
Subject: RE: BRC Radionuclides

The methods of digestion used for all of the projects we've processed for you are as follows:

Uranium	Nitric Leach	RICH-RC-
5013/5086		
Thorium	Total Dissolution	RICH-RC-

5013/5032
Gamma (Ra226/228) No Chemical Digestions RICH-RC-5013
(Dry/Homogenize/In-grow 10 days)

I've attached the SOP's involved.

Thank you and have a good weekend!

Erika

Brian Rakvica

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Friday, December 14, 2007 7:14 PM
To: Brian Rakvica; susan.crowley@tronox.com; okbailey@flash.net; Paul Black; David Gratson; Shannon Harbour
Subject: Fw: BRC Radionuclides
Attachments: RICH-RC-5032 Rev.3.pdf; RICH-RC-5013 Rev.7.pdf; RICH-RC-5086 Rev.3.pdf

Hi all:

Per our call earlier today, please see e-mail below and SOPs attached re. Test America prep methods for all of our projects, including Tronox A/B.

Thanks

Ranajit

----- Original Message -----
From: Jordan, Erika
To: Maria Barajas ; Ranajit Sahu
Cc: Mark Jones ; Miller, Ken ; Carnes, Jodie ; Wild, Elaine ; Everett, Jerry ; Cahill, Martha ; Antonson, Lisa
Sent: Friday, December 14, 2007 3:54 PM
Subject: RE: BRC Radionuclides

The methods of digestion used for all of the projects we've processed for you are as follows:

Uranium	Nitric Leach	RICH-RC-5013/5086
Thorium	Total Dissolution	RICH-RC-5013/5032
Gamma (Ra226/228)	No Chemical Digestions (Dry/Homogenize/In-grow 10 days)	RICH-RC-5013

I've attached the SOP's involved.

Thank you and have a good weekend!

Erika

STL

STL Richland
2800 George Washington Way
Richland, WA 99354
Tel: 509-375-3131
Fax: 509-375-5590
Email: www.stl-inc.com

UNCONTROLLED COPY

Richland-Operation Specific Standard Operating Procedure

TITLE: Complete Dissolution by Mixed Acids in a Teflon Beaker

(SUPERSEDES: RICHRC5032, Revision 2)

Prepared by: Tanya G Wood

Reviewed by: ______ Technical Specialist

Approved by: ______ Quality Assurance Manager

Approved by: ______ Environmental Health and Safety Coordinator

Approved by: ______ Laboratory Director

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RICH-RC-5032

Revision 3

1. SCOPE AND APPLICATION

1.1. This procedure is for the complete dissolution by mixed acids of 1 to 2 grams of mineral-matrix samples. The procedure may be used with soil, sediment, air filters and vegetation.

1.2. This procedure is effective for many mineral-matrix samples of 2 grams or less. Ores, ashes, and high-organic content samples may require the repetition of one or more steps. The procedure may be able to handle larger samples with corresponding increases of reagent volumes. However, the time required will be longer, and the procedure has not been validated with samples over 2 grams.

1.3. No analyte is measured in this SOP; hence it is unnecessary to specify an achievable minimum detectable concentration.

2. SUMMARY OF METHOD

2.1. The sample is dried and/or ground as appropriate per RICHRC5013 or RICHRC5016. A weighed aliquot is reacted in a Teflon beaker with hydrogen peroxide and nitric acid, hydrochloric acid, hydrofluoric acid, and perchloric acid or boric acid, either singly or in designated combinations. The sample is heated to dryness between each addition of reagent(s). The final dry salts are dissolved in a diluted acid that is appropriate for the separation procedure to be followed. When required by the customer, the dissolved sample is centrifuged, the supernate decanted, and any residue is dried and weighed.

3. DEFINITIONS

3.1. LCS – Laboratory Control Sample

4. INTERFERENCES

4.1. Only a few elements are volatile under the conditions of this method. These include the halogens, mercury and possibly, depending on the sample, technetium, tin, and some metalloid elements. The closed-container digestion procedure RICHRC5019 should be used if volatilization of the analyte is a concern.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

- All work must be stopped in the event of a known or potential compromise to the health and safety of an associate. The situation must be reported immediately to a laboratory supervisor.

- Eye protection that satisfies ANSI Z87.1, laboratory coat, and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded; other gloves will be cleaned immediately.

- Exposure to chemicals must be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples should be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation.

- 16M HNO_3 and 30% H_2O_2 when mixed together will liberate large quantities of oxygen. If these are mixed together and the container is sealed, pressure may build up causing a pressure explosion. Always add nitric acid before adding 30% H2O2 to avoid possible vigorous reactions. Use extreme caution when wet-ashing samples.

- WARNING: Perchloric acid may cause fire or explosion when hot and in contact with oxidizable or combustible material. Do not contact perchloric acid with alcohols at any temperature. Use of perchloric acid requires a hood equipped appropriately with fan and running water to prevent production of explosive compounds.

- Do not use hand to stop centrifuge from spinning.

- Remove samples from muffle furnace using Zeetex gloves and tongs.

- WARNING: Hydrofluoric acid (HF) is one of the strongest and most corrosive acids known. Do not assume that dilute solutions do not require special precautions! Always double check your personal protective equipment before each use of HF. A pinhole in a glove or leaky container can cause an accident. HF burns penetrate deeply into skin and muscle tissue and can't be treated by simply flushing the area with water. HF causes delayed burns over several hours so the immediate care is essential to prevent further harm.

FIRST AID MEASURES

1. Flush area with water for at least 15 minutes.
2. Remove contaminated clothing immediately.
3. After washing exposed skin, use gloves to rub a generous amount of calcium gluconate gel into burn area.
4. For areas too large to apply gel, use an Epsom salts solution in a concentration of ½ to 1 cup of Epsom salts in one quart of iced water. Immerse the limb into a bucket of solution or soak the solution into gauze and apply to the wound. This dressing should be replaced or re-soaked every two minutes.
5. If area affected is greater than 2 inches by 2 inches, give 6 tablets of calcium gluconate orally.
6. If area affected is greater than 4 inches by 4 inches, assume significant inhalation injury and treat accordingly.

5.1.1 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrofluoric Acid	Poison Corrosive Dehydrator	3 ppm-TWA	Severely corrosive to the respiratory tract. Corrosive to the skin and eyes. Permanent eye damage may occur. Skin contact causes serious skin burns, which may not be immediately apparent or painful. Symptoms may be delayed 8 hours or longer. THE FLUORIDE ION READILY PENETRATES THE SKIN CAUSING DESTRUCTION OF DEEP TISSUE LAYERS AND BONE DAMAGE.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Octanol	Flammable		Liquid may be irritating to skin and eyes. Store in a cool, dry, well-ventilated, flammable liquid storage area or cabinet. Vapors may flow along surfaces to distant ignition sources and flash back.
Perchloric Acid	Corrosive Oxidizer Poison	None	Unstable at ordinary temperature and pressure and can undergo explosive decomposition, especially at elevated temperatures or if allowed to dehydrate. Inhalation of vapors or mists will cause irritation with coughing, choking, and inflammation of the nose, throat, and upper respiratory tract. Highly corrosive to tissue. Can cause severe burns with discoloration and pain. Permanent visual damage may occur.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance - capable of reading to 0.01 g.

6.2. Beakers - TFE Teflon, 100 to 250 mL; glass, 100 to 250 mL.

6.3. Beaker covers - TFE Teflon, sized to fit the beakers used.

6.4. Centrifuge.

6.5. Centrifuge tubes - approximately 50 mL, conical bottom, plastic or glass. Must withstand dry heat at 110°C. Disposable tubes are acceptable.

6.6. Drying oven or heat lamp.

6.7. Filter paper and filtration apparatus - for suspended sediment, as specified by the contract or by supervisor.

6.8. Hot plate(s), adjustable heat.

6.9. Mortar and pestle - preferably 10 cm ID, diamonite.

6.10. Perchloric acid fume hood.

6.11. Pipets - transfer, polyethylene, disposable, about 2 mL.

6.12. Planchets - stainless steel, 3.8-cm (1.5-inch) diameter. Before use, flame to a red heat or bake overnight at approximately 475°C.

6.13. Razor blade - single edged, for suspended sediment.

6.14. Sieve - No. 120 mesh, with pan, cover, and brush.

6.15. Tongs.

6.16. Vials with caps - approximately 20-mL, plastic; liquid-scintillation vials are suitable.

6.17. Vortex mixer.

6.18. Weighing paper- approximately 10 by 10 cm (4 by 4 inches).

6.19. Zeetex mats - to place between beakers and hot plate.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Reagent water is obtained from the Nano-pure system.

Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. Boric Acid (H_3BO_4) – powdered, reagent grade.

7.3. 12M Hydrochloric acid (12M HCl) - Concentrated. **WARNING**: Corrosive.

7.4. Hydrofluoric acid (48% HF) - Concentrated. Do not put HF into glass containers. **CAUTION**: Corrosive.

NOTE: Hydrofluoric acid (HF) can cause deep-seated burns. Incidents involving HF spills on the skin must receive prompt medical attention. Always dispense HF from its original drip free non glass shipping bottle or a special HF container.

7.5. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.6. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.7. 8M Nitric acid (8M HNO_3) - Add 500 mL 16M HNO_3 to approximately 400 mL reagent water. Dilute to 1L with reagent water and mix well. **WARNING**: Corrosive and Oxidizer.

7.8. 4M Nitric acid (4M HNO_3) - Add 250 mL of 16M HNO_3 to approximately 700 mL of reagent water. Dilute to 1L with reagent water and mix well.

7.9. 2M Nitric acid (2M HNO_3) - Add 125 mL of 16M HNO_3 to 800 mL of reagent water. Dilute to 1 L with reagent water and mix well.

7.10. Octanol ($CH_3(CH_2)5CHOHCH_3$) - **WARNING**: Flammable.

7.11. 12M Perchloric acid (12M $HClO_4$) - Concentrated (70%), **WARNING**: Corrosive and Oxidizer.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers using no preservatives. Storage of the sample prior to analysis should not exceed six months.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for sample and QC data acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

<u>NOTE</u>: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

<u>NOTE</u>: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. Sample preparation

11.1.1. Sample Preparation for Bottom Sediment, Sludge, and Soil

11.1.1.1. Follow procedure RICHRC5013 through the final blending for initial preparation of the sample.

11.1.1.2. <u>NOTE</u>: Perform this step only if directed to do so by supervision. Otherwise continue with the acid dissolution section below.

Transfer a 3- to 5-gram aliquot of the blended sample to a mortar and pestle. Grind until all of this aliquot passes through a clean, number 120-mesh sieve. Remove the aliquot from the sieve pan to a piece of weighing paper. Transfer the ground sample into a small plastic vial, labeled with the sample identification number.

11.1.1.3. Use this prepared aliquot in the acid dissolution section

11.1.2. Sample Preparation for Suspended Sediment

11.1.2.1. Filter the water sample through the kind of filter specified by the contract or by supervision. Collect and save the dissolved fraction (filtrate) for any requested analyses; otherwise discard in accordance with contractual requirements or an appropriate waste container.

11.1.2.2. Dry the filter in an oven set at no more than 105°C.

11.1.2.3. Scrape the solid material off the filter with a single edged razor blade onto a piece of weighing paper. Minimize the amount of filter fibers scraped off with the razor blade. Transfer the material to a small plastic vial labeled with the sample identification number. This material is used in the acid dissolution section.

11.1.3. Sample Preparation of Vegetation:

11.1.3.1. Weigh a clean labeled beaker and record the weight.

11.1.3.2. Prepare the sample according to RICHRC5016 steps 11.1.5 to 11.1.9.2.

11.1.3.3. Remove the beaker from the muffle oven and allow to cool to room temperature. Weigh the beaker and record the weight.

11.1.3.4. If the ashed material is 2 grams or less, proceed to the acid dissolution step. If the ashed material is greater than 2 grams, consult supervision for the appropriate amount of acid to add at the acid dissolution step.

11.1.4. Sample Preparation of Air Filter:

11.1.4.1. Weigh a clean labeled beaker and record the weight. Add the filter(s) to the appropriate beaker.

11.1.4.2. Muffle the filters in a muffle oven set at 500°C for at least 8 hours. If the filters do not appear to be completely ashed, consult supervision.

11.1.4.3. Remove the beaker from the muffle oven and allow to cool to room temperature. Weigh the beaker and record the weight.

11.1.4.4. If the ashed material is 2 grams or less, proceed to the acid dissolution step. If the ashed material is greater than 2 grams, consult supervision for the appropriate amount of acid to add at the acid dissolution step.

11.2. Acid Dissolution

11.2.1. Weigh no more than a 2.0 g aliquot of sample on an analytical balance. Enter the weight on the analytical worksheet.

NOTE: Consult supervision if larger aliquots are required.

NOTE: Consult supervision to determine if the sample should be muffled.

11.2.2. Transfer the weighed aliquot to a labeled TFE Teflon beaker.

11.2.3. Transfer the appropriate yield monitors to the Teflon beaker. Rinse each vial three times with small quantities of 8M HNO_3. Remove the vial labels and place them on the corresponding analytical worksheet.

11.2.4. Prepare the appropriate QC samples as directed by the client specific QAS or supervision. Add appropriate spikes, yield monitors, and/or QC matrix to the QC beakers by transferring pre-weighed quantities of the solutions/matrix provided in vials/containers. Rinse the vial and/or container three times with small quantities of 8M HNO_3 to ensure quantitative transfer. Remove the vial labels and place them on the analytical worksheet. From this step on, the LCS and the blank samples are treated as actual samples.

11.2.5. **CAUTION**: Dry Teflon can melt on a hot plate. Remove Teflon promptly upon completion of liquid evaporation.

Place the beakers on a Zeetex mat-covered hot plate or under a heat lamp. Evaporate the samples to near dryness.

11.2.6. **NOTE**: Use the stated amounts of reagents per gram of sample or fraction thereof. For example, double the stated quantities for a 1.4-g sample.

Keep the beaker uncovered except where the SOP states otherwise. Keep a Zeetex mat between the beaker and the hot plate. Do not heat the samples too rapidly. Allow enough time for the acids to be effective.

11.2.7. Add 5 mL of concentrated HNO_3 per gram of sample or fraction thereof. Heat slowly on a hot plate. If the sample foams heavily, add a drop of 2-octanol. Heat the sample to just dryness; DO NOT BAKE.

11.2.8. Add 5 mL of concentrated HNO_3 and 1.5 mL of 30% H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Heat on the hot plate to incipient dryness; DO NOT BAKE.

NOTE: You may need to tap the beaker to make condensate on the wall slide to the bottom for evaporation.

11.2.9. **WARNING:** Hydrofluoric acid (HF) is particularly hazardous because it numbs the skin upon contact, thereby preventing prompt detection of the contact and subsequent severe burn. If you contact or suspect the possibility of contact with HF, flood the skin area with water and immediately call for help. Use of appropriate gloves is especially important with this acid. Always store and dispense HF from its original, dripless shipping bottle or from a special HF container.

Add approximately 5 mL of concentrated HNO_3, about 3 mL of HF, and approximately 1.5 mL of H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Evaporate to just dryness; DO NOT BAKE.

11.2.10.Add approximately 5 mL of concentrated HNO_3 and approximately 6 mL of HF per gram of sample. Evaporate to just dryness; DO NOT BAKE.

11.2.11. If isotopic uranium, thorium or polonium-210 have been requested, proceed to step 11.2.12. All other analysis proceed to step 11.2.13.

11.2.12. Samples requiring total uranium, isotopic uranium, thorium and/or polonium-210:

11.2.12.1. Add approximately 8 mL of concentrated HNO_3, approximately 3 mL of HF, and about 3 mL of H_2O_2 per gram of sample. Add the H_2O_2 dropwise. Evaporate to just dryness; DO NOT BAKE.

11.2.12.2. **NOTE**: If there is unoxidized (black) carbon on the beaker wall, cover the beaker with a Teflon beaker cover after adding the acids, and heat until the carbon is gone. Then remove the cover and heat the sample to dryness.

Add 10 mL of 8M HNO_3 to the beaker. Cover with a Teflon beaker cover. Heat for about 20 minutes. Uncover and carefully check the sample for solids. If many solids remain, cover the beaker and heat for approximately 20 minutes. If no solids or only a few solids remain, continue with step 11.2.12.7.

11.2.12.3. Add approximately 10 mL of 8M HNO_3 and evaporate to just dryness.

11.2.12.4. Add approximately 1 mL of concentrated hydrochloric acid. Heat covered for another 30 minutes.

11.2.12.5. Uncover and heat for about 20 minutes.

11.2.12.6. Add 15 mL of 4M HNO_3. Cover and heat for about 30 minutes.

11.2.12.7. If percent dissolution is required proceed to step 11.2.14.

11.2.12.8. Samples requiring total uranium, wet ash three times in the Teflon beaker and proceed to RICH-RC-5015.

11.2.13. For uranium isotopic and/or thorium, quantitatively transfer the sample from the Teflon beaker to a glass beaker (usually 250 mL) using concentrated HNO_3, making sure any remaining residue is transferred with the last rinse. Rinse twice with about 5 mL of reagent water and combine all rinses in the glass beaker. Wet ash if necessary, using concentrated HNO_3 and 30% hydrogen peroxide.

11.2.13.1. If the sample requests uranium isotopic and/or thorium isotopic analysis, proceed to RICH-RC-5086 or continue with this SOP, depending on client requirements.

11.2.13.2. Wet ash with concentrated HCl or HNO_3 (HCl for RICH-RC-5084 & RICH-RC-5079 and HNO_3 for RICH-RC-5087) and evaporate to dryness. Wet ash with HCl or HNO_3 a second time and evaporate to dryness. Record the appropriate information on the analytical work sheet. Continue with the appropriate analytical procedure.

NOTE: The perchloric acid step is not used for uranium isotopic or thorium samples.

11.2.14. All other requested analysis:

11.2.14.1. NOTE: A perchloric acid hood is required with fan and running water at this stage, make sure all necessary precautions are followed.

Place the beaker on a hot plate and slowly take the sample to dryness. Two options are available for eliminating the HF acid from the sample. Consult supervision.

One is to add approximately 20 mL 16M HNO_3 and approximately 1 g boric acid to the dried sample, then evaporate slowly on low heat.

The second is to wet ash in a perchloric acid hood using at least of 2-3 mL of concentrated $HClO_4$ (perchloric acid) and 20-30 mL of concentrated HNO_3 to remove any insoluble fluorides. Evaporate to complete dryness.

11.2.14.2. **NOTE**: If there is unoxidized (black) carbon on the beaker wall, cover the beaker with a Teflon beaker cover after adding the acids, and heat until the carbon is gone. Then remove the cover and evaporate the sample to dryness.

Add approximately 5 mL of concentrated HNO_3 and approximately 3 mL of $HClO_4$ per gram of sample. Evaporate to dryness and continue heating until dense white fumes from the $HClO_4$ cease. One gram of boric acid may be substituted for the perchloric acid. If boric acid is used, this step must be repeated.

11.2.15. If excessive solids remain in the sample, continue with step 11.2.15.1. If no solids or only a few solids remain, quantitatively transfer the sample from the Teflon beaker to a glass beaker (usually 250 mL) using concentrated HNO_3, making sure any remaining residue is transferred with the last rinse. Rinse twice with about 5 mL of reagent water and combine all rinses in the glass beaker. Wet ash three times using concentrated HNO_3 and 30% hydrogen peroxide.

11.2.16. Add 10 mL of 8M HNO_3 to the beaker. Cover with a Teflon beaker cover. Heat for about 20 minutes. Uncover and carefully look at the sample. If many solids remain, cover the beaker and heat for another 20 minutes.

If no solids or only a few solids remain, wet ash three times using concentrated HNO_3 and 30% hydrogen peroxide and proceed to appropriate procedure or step 11.2.16. If solids still remain, proceed to next step.

11.2.16.1. **<u>NOTE</u>**: Do not heat hydrochloric acid in a stainless steel hood.

If more than a few solids remain, move the beaker from the perchloric acid hood to a non-stainless steel hood and add 1 mL of concentrated hydrochloric acid. Heat covered for another 30 minutes.

11.2.16.2. Uncover and heat for about 20 minutes.

11.2.16.3. Add 15 mL of 4M HNO_3. Cover and heat for about 30 minutes. If percent dissolution is required proceed to step 11.2.14. If percent dissolution has not been requested, continue with the appropriate analytical procedure.

11.2.17. Continue at step 11.2.16 if percent dissolution is required or the sample is to be analyzed by inductively coupled plasma - mass spectrometry.

11.2.18. If determination of percent dissolved is required, weigh a dry, clean labeled 50-mL conical-bottom centrifuge tube to the nearest 0.001 g. For all samples, uncover and transfer to the 50-mL tube. Rinse the beaker using 4M HNO_3, and add the acid to the tube. Centrifuge for several minutes. Pour the supernate into a labeled glass beaker for analysis.

11.2.18.1. Wash the centrifuged solid residue with 10 mL of 2M HNO_3. Mix by vortexing well. Centrifuge for several minutes, and then add the supernate to the same glass beaker.

11.2.18.2. Repeat the previous step.

11.2.18.3. Reserve the supernate and proceed to the next step when the determination of percent dissolved is required. When percent dissolved is not required, take the supernate and continue with the appropriate radiochemical procedure.

11.2.18.4. Dry the residue in the tube in the drying oven at no more than 105°C; or transfer the residue to a preweighed planchet, using a plastic transfer pipet and minimum of reagent water. Dry the planchet under a heat lamp. Cool, weigh the tube or planchet to the nearest 0.001 g, and enter the weight on the SPR.

11.2.18.5. Calculate the percent of sample dissolution using the equations given in the Calculations section and enter the result on the SPR.

11.2.18.6. Continue with the appropriate radiochemical procedure with the supernate after supervision has reviewed the "percent of sample digested" value. Discard the residue to an appropriate waste container.

12. DATA ANALYSIS AND CALCULATIONS

12.1. Computations are performed with a hand calculator. Enter data and results on a Sample Preparation Record. (An example form is shown at the end of the procedure.) The percent of undissolved sample is calculated as:

$$\% \text{ undissolved} = \frac{(\text{residue} + \text{container wt.}) - \text{container wt.}}{\text{starting dry sample weight}} \times 100$$

12.2. The percent dissolved is 100% minus the percent undissolved.

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. WASTE MANAGEMENT AND POLLUTION PREVENTION

All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

14.1. Waste Streams Produced by the Method

- Aqueous acidic waste pH< 2. Waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.

- Aqueous Basic waste with a pH >2. Waste is collected in an appropriate container and transferred into a Neutral waste container color coded with Green tape and a Green Cap
- Flammable waste. Waste is collected in an appropriate container and placed in a Flammable waste container. Container is red with a self closing metal lid

Radioactive Waste
Dry Radioactive waste shall be placed in a RAD Trash container. This waste stream can be distinguished by its yellow trash bags, and radioactive material stickers on the trash container.

All mixed waste shall be placed in the appropriate radioactive waste stream. The RAD waste stream color codes are the same as the non-radioactive waste streams but there are radioactive material stickers on the SAP container and spill tray.

Broken glassware shall be deposited in the appropriate broken glassware container. All Category I broken glassware is deposited in a White Broken Glass container. All Category II and/or III broken glassware is deposited in Magenta with White Radioactive Material box.

15. REFERENCES

15.1. Z. Sulcek, P. Povondra, and Dolezal, J. 1977, "Decomposition Procedures in Inorganic Analyses", CRC Critical Review in Analytical Chemistry, No. 6, CRC Press, Boca Raton, Florida, pp. 255-323.

15.2. STL Quality Management Plan, latest revision.

15.3. STL Richland Laboratory Quality Manual, latest revision.

15.4. STL Richland Quality Assurance Summary, latest revision.

15.5. Associated SOPs

15.5.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

15.5.2. RICHRC5013 - Preparation of Soil Samples.

15.5.3. RICHRC5016 - Preparation of Environmental Matrices.

15.5.4. RICHRC5086 – Urine and Water Sample Preparation by Calcium Phosphate Precipitation

16. MISCELLANEOUS

16.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs review on raw instrument data.

Technical Data Reviewer: Performs final data review.

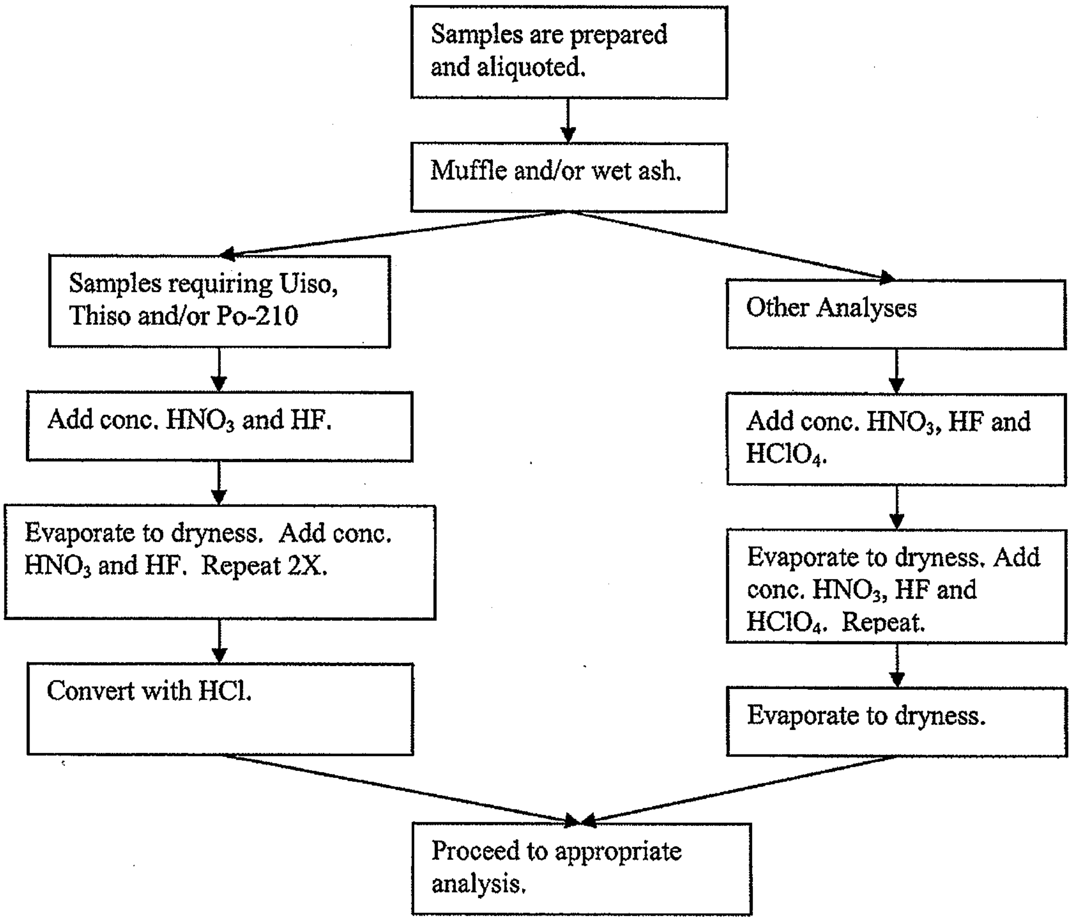
Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the Quality Assurance policies.

16.2. Records Management/Documentation

16.2.1. All records generated by this analysis will be filed and kept in accordance with STL QA policies for records management and maintenance.

16.3. Procedural Flow Chart



STL

SOP No.: RICH-RC-5013
Revision No.: 7
Effective Date: 6|4|07
Page 1 of 17

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Richland-Operation Specific Standard Operating Procedure

TITLE: Preparation of Soil Samples

(SUPERSEDES: RICHRC5013 Revision 6)

Prepared by: Tanya G Wood

Reviewed by: ______________________
Technical Specialist

Approved by: ______________________
Quality Assurance Manager

Approved by: ______________________
Environmental Health and Safety Coordinator

Approved by: ______________________
Laboratory Director

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RICH-RC-5013

Revision 7

1. SCOPE AND APPLICATION

1.1. This procedure describes the steps taken to prepare a soil, sediment or related matrix sample for radiochemical analysis. The goal is to provide a homogeneous starting material, free of extraneous matter from which portions representative of the entire sample may be taken for analysis. Samples are then acid digested or dissolved to bring any radionuclides from environmental contamination into solution.

1.2. Refer to Policy P-R-01 for method detection limit information.

2. SUMMARY OF METHOD

2.1. The objectives of this procedure are twofold. The first is to detail a procedure by which a homogeneous solid sample is produced, from which representative aliquots are taken for digesting or dissolution.

2.2. The entire sample is dried and milled, and an aliquot is sieved to remove extraneous material.

2.3. The second objective is to detail the procedure for the removal of radionuclides of interest by digesting an aliquot of the sample. The alkaline earth metals are separated from the digestate, leaving the other elements and actinide metals in solution. Large amounts of organic matter may first be removed by dry ashing at a high temperature. The soil is digested with nitric acid and hydrogen peroxide, while constantly stirring on a hot plate. This digestion method, while not ensuring complete dissolution of the sample, does solubilize the environmental contamination adsorbed onto surfaces of the matrix. The radionuclides in the digestate are then converted to chloride salts.

2.4. The chloride salts are dissolved in concentrated nitric acid. The alkaline earth elements (Ca, Sr, etc.) are separated by precipitation with fuming nitric acid for radiostrontium analysis. The supernate may be evaporated and taken for actinide element analysis.

3. DEFINITIONS

3.1. Homogenized – A substance having uniform composition.

4. INTERFERENCES

4.1. None.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

- Close safety gate on ball mill before starting. Gate should remain closed until rollers have stopped.

- If an employee is required to work in the room with the ball mill in operation for more than two hours during the day, ANSI approved hearing protection must be used. A sign is posted on the door of this room to indicate the hearing protection requirement.

- When pulverizing samples, wait until pulverizer has stopped before removing sample. Caution: The pulverizer dish is heavy. Use proper lifting techniques when moving the dish.

- If an employee is required to work in the room with the pulverizer in operation for more than five hours during the day, ANSI approved hearing protection must be used. A sign is posted on the door of this room to indicate the hearing protection requirement.

- Remove samples from muffle furnace using Zeetex gloves and tongs.

- 16M HNO_3 and 30% H_2O_2, when mixed together, will liberate large quantities of oxygen. If these are mixed together and the container is sealed, pressure may build up causing a pressure explosion. Use extreme caution when wet-ashing samples.

- This method utilizes 90% Nitric (fuming) acid. Use extreme caution when handling this reagent. Rubber or heavy plastic gloves should be used.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.

Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance - top loading, 2 kg capacity minimum, readable to 0.1 g.

6.2. Beakers - Pyrex glass and Teflon, sizes appropriate for sample.

6.3. Brush - soft bristle, for sieves and sieve pans.

6.4. Centrifuge.

6.5. Centrifuge tubes - 90 mL, polypropylene, with optional caps.

6.6. Containers - plastic jar or metal can approximately 4 L or other volume appropriate for the sample size, wide mouth, with appropriate lid.

6.7. Drying pan or container.

6.8. Filter - glass fiber, 1.2 micrometer pore size.

6.9. Flasks - Side-arm, size appropriate for filtrate.

6.10. Funnels - Buchner, various sizes; powder, large, separatory, size appropriate for sample, or disposable.

6.11. Furnace - muffle, capable of maintaining 500°C.

6.12. Gloves - Zeetex.

6.13. Grinding cylinders - 1¼ inch diameter by 1¼ inch height or metal grinding balls. One grinding ball is equivalent to 2 grinding cylinders.

6.14. Heat lamp.

6.15. Hot plates - stirring, magnetic.

6.16. Ice bath.

6.17. Ball Mill - mechanical rotation device for containers.

6.18. Oven - drying, forced-air, capable of maintaining 105°C.

6.19. Pen - felt tip, permanent black ink.

6.20. Pipet - transfer, glass, disposable, with rubber bulb.

6.21. Pulverizer - concentric ring.

6.22. Pump - mechanical vacuum, or aspirator.

6.23. Shaker - wrist action (if separatory funnel is used).

6.24. Sieves – various sizes, U.S. Standard, stainless steel or brass, 8" diameter, 2" height above cloth.

6.25. Sieve pans and lid to fit sieves.

6.26. Stir bars - Teflon-coated magnetic.

6.27. Stirring rods - glass and Teflon, length appropriate for beaker or tube.

6.28. Tape - plastic.

6.29. Tech Pen/ Pencil.

6.30. Timer (may be part of the shaker).

6.31. Tongs.

6.32. Tubing - vacuum, ¼" inside diameter.

6.33. Vacuum manifold for filtration.

6.34. Vortex.

6.35. Watch glass - Pyrex, appropriate size and Teflon, appropriate size.

6.36. Zeetex.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Reagent water is obtained from the Nano-pure system. Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. 12M Hydrochloric acid (12M HCl) - concentrated. **WARNING**: Corrosive.

7.3. 8M Hydrochloric acid (8M HCl)- Add 670 mL of concentrated HCl to approximately 200 mL of reagent water. Dilute to 1 L with reagent water and mix well. **CAUTION**: Corrosive.

7.4. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.5. 90% Nitric acid (90% HNO_3) - Fuming. **WARNING**: Corrosive and Oxidizer.

7.6. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.7. 8M Nitric acid (8M HNO_3) - Add 500 mL 16M HNO_3 to approximately 400 mL reagent water. Dilute to 1L with reagent water and mix well. **WARNING**: Corrosive and Oxidizer.

7.8. 2M Nitric acid (2M HNO_3) - Add 125 mL of 16M HNO_3 to 800 mL of reagent water. Dilute to 1 L with reagent water and mix well.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers using no preservatives. Storage of the sample prior to analysis should not exceed six months.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for sample and QC data acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

NOTE: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

NOTE: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. Label an appropriate number of containers with the Lab ID number. Tare the containers and record the tare weight in the Soil Preparation Logbook. Transfer the corresponding sample into the appropriate container. Weigh each container and record the weight in the Soil Preparation logbook.

11.2. **NOTE**: If tritium and/or carbon-14 analyses are required, the tritium and/or carbon-14 aliquot must beremoved prior to drying the sample.

Dry the sample by placing it into an oven set at approximately 105°C, for at least 8 hours or until dry.

NOTE: Consult supervision for analyte and client specific drying temperature and time.

CAUTION: Do not dry the aliquot to be used for **Tc-99** analysis above 95°C.

11.3. After drying, cool and weigh the sample and container. Record the dried weight in the Soil Preparation logbook. If percent moisture is requested, enter the appropriate information on the Percent Moisture Form and calculate (see Figure 1).

NOTE: Consult supervision prior to proceeding regarding specific client contractual requirements for sieving and/or ball milling. Record client specific information on the analytical work sheet and/or the Soil Preparation logbook.

11.4. Ball Milling

NOTE: If an employee is required to work in the room with the ball mill in operation for more than two hours during the day, ANSI approved hearing protection must be used. A sign shall be posted on the door of this room to indicate the hearing protection requirement.

NOTE: Samples may have been dried in the ball mill container. Prior to the addition of the grinding cylinders, ensure that the sample is not a solid mass. If a solid mass is present, break up the sample and transfer to a clean container prior to adding the grinding cylinders.

11.4.1. Add the following to a container of appropriate size: one grinding cylinder per 100g or fraction of sample weight, plus one additional cylinder. (For example, use a total of 12 cylinders or 6 balls for a 1030-g sample.)

NOTE: One metal grinding ball is equivalent to 2 grinding cylinders. If metal grinding balls are used, do not use more than 12 balls in a large can or the integrity of the can may be compromised.

11.4.2. Record the Lab ID number on the lid and the bottom of the container.

11.4.3. Add the sample to the container.

11.4.4. Close the container tightly and seal with appropriate material (clips, rings, tape).

11.4.5. Place the container on its side on a set of ball mill rollers. Start the mill. Roll the sample for at least 1 hour.

NOTE: Consult supervision for client-specific time requirements.

11.4.6. Stop the mill and remove the container.

11.4.7. If the sample requires pulverizing, continue to section 11.5. If pulverizing is not required, proceed to Sieving, section 11.6.

11.5. Pulverizing

NOTE: If an employee is required to work in the room with the pulverizer in operation for more than five hours during the day, ANSI approved hearing protection must be used. A sign shall be posted on the door of this room to indicate the hearing protection requirement.

11.5.1. If the sample has been ball milled, remove the cylinders and brush off any excess sample into the container.

11.5.2. Place the sample in the pulverizing bowl located inside the pulverizer. The bowl will have three rings which are used to pulverize the sample. Pulverize for the appropriate time.

NOTE: If the entire sample does not fit in the pulverizer at one time, recombine all pulverized fractions into the original milling container and roll for an additional 60 minutes before sieving.

11.6. Sieving

11.6.1. **NOTE:** If the aliquot or initial sample mass is appreciably over 1.0 kg, it is advisable to sieve the sample in more than one portion.

NOTE: Consult supervision for client-specific sieve size requirements. Record the client specific information on the analytical worksheet and/or in the Sample Preparation logbook.

Set a clean, dry No. 10 mesh (2 mm) and/or a No. 120 mesh (125 µm) stainless steel or brass sieve, or the particular sieves specified by the client, on top of a clean receiving pan. Label with the Lab ID number.

11.6.2. Open the pulverizer and remove the bowl from the pulverizer. Transfer an appropriate aliquot of the homogenized sample onto a clean No. 10 mesh and/or a 120-mesh sieve. Tap or shake the pulverizing bowl over the sieve to remove any adhering sample.

11.6.2.1. If the sample has not been pulverized, open the container and remove the cylinders and brush off any excess sample into the container. Transfer an appropriate aliquot of the homogenized sample or the entire sample onto the sieve.

11.6.3. Place the lid on the sieve. Clamp the receiving pan, sieve, and lid assembly. Shake the sieve assembly for about one minute.

11.6.4. Open the assembly and transfer the sample in the receiving pan to an appropriately labeled sample container.

11.6.5. Return the residue retained on the No. 10 mesh sieve to the original sample container.

11.6.6. If additional pulverizing is required upon completion of sieving, repeat section 11.5 and continue at section 11.6.7.

11.6.7. Transfer weighed aliquots of the sample into clean, labeled beakers (the weights vary depending on analysis). If applicable, transfer weighed aliquots of matrix material to the blank and LCS sample beakers.

NOTE: The sample may be transferred to a plastic jar for later aliquoting.

Record all aliquot weights in a laboratory logbook or on the analytical work sheet. Also record in the logbook or on the analytical work sheet, the procedure number, including any revision used. Proceed to step 11.7 for acid digestion or to the appropriate procedure for dissolution.

11.7. Soil and Sediment Acid Digestion

11.7.1. Add the specified yield monitors for the analyses requested to all beakers. Rinse the vials three times with about 5 mL of 8M HNO_3, (use 2M HNO_3 when transferring strontium carrier and spikes) and add the rinses to the beaker to assure quantitative transfer of the yield monitor solutions. Record the vial labels on the corresponding analytical work sheet.

11.7.2. Add spikes from the vials to the appropriate beakers. Transfer the vial contents as described in the previous step. Record the vial labels on the corresponding analytical work sheet.

11.7.3. Evaporate the samples to dryness if muffling is required.

CAUTION: Do not muffle if **Lead-210** analysis has been requested instead proceed to step 11.7.5 (The melting point of lead is 327^0 C.). Do not muffle the aliquot to be used for **Tc-99** analysis.

NOTE: Ensure the muffle furnace is set no higher than 500°C. When the muffle is greater than 500°C the glass beaker will melt.

11.7.4. **NOTE**: If samples do not appear to contain significant organic matter, muffling may not be required. Consult supervision.

When muffling is required (see supervision for instructions), use a TECH PEN or HI-TEMP PENCIL to label the sample beaker with the Lab ID number. Place the beaker with the sample in an unheated muffle furnace. Set the temperature of the furnace to approximately 500°C and turn on the furnace. Muffle the sample at this temperature for at least 6 hours.

11.7.5. Remove the beaker from the muffle furnace using Zeetex gloves and tongs, and let the beaker cool on a Zeetex pad.

11.7.6. Add about 200 mL of 8M HNO_3 to appropriately labeled blank, LCS, and cooled sample beakers (the volume of 8M HNO_3 required may be less depending on the sample size and the analysis requested).

11.7.7. Add a large magnetic stir bar to each labeled beaker and place the beaker on a magnetic stirring hot plate in a fume hood. Place a watch glass on the beaker.

11.7.8. Adjust the temperature so that the solution just boils. Allow the sample to reflux for about 45 minutes with constant stirring. Wash down the sides of the beaker periodically with small amounts of 8M HNO_3.

11.7.9. After heating, remove the sample from the hot plate and allow the soil to settle. Decant most of the solution into a clean, labeled beaker.

11.7.10. Add about 200 mL of 2M HNO_3 to the residue, and rinse the beaker walls with 2M HNO_3 (the volume of 2M HNO_3 required may be less depending on the sample size or analysis requested). Replace the watch glass on the beaker. Reflux for about 45 minutes with constant stirring and heating. Remove the sample from the hot plate and allow the soil to settle.

11.7.11. **NOTE:** Make sure vacuum is applied to the Buchner funnel prior to decanting the samples.

Transfer the solution from step 11.7.9 into a Buchner filter funnel fitted with a moistened glass fiber filter. Collect the sample digestate under vacuum in a side-arm flask. Rinse the beaker with a small amount of 2M HNO_3 and add the rinsate to the funnel/filter.

NOTE: A disposable filter may be used.

NOTE: Samples may be centrifuged instead of filtered. If the sample is centrifuged, rinse the beaker with small amounts of reagent water, adding the rinses to the centrifuge tube. Centrifuge for approximately 10 minutes. Decant the supernate to a clean labeled beaker. Rinse the sample residue with a small amount of 2M HNO_3. Centrifuge for approximately 10 minutes and decant to the appropriate beaker.

11.7.12. Decant the 2M HNO_3 solution containing the soil residue from step 11.7.10 through the same Buchner funnel and filter paper with vacuum on. Rinse the beaker with 2M HNO_3 and add to the funnel. Continue to apply vacuum until the soil residue is free of visible liquid and liquid ceases to drip from the funnel. Rinse the filtered residue with up to 25 mL reagent water.

11.7.13. Transfer the filtered digestate from the side-arm flask back into the beaker from step 11.7.9. Rinse the flask with small volumes of 2M HNO_3 and add the rinsate to the beaker.

11.7.14. Place the beakers on a hot plate and evaporate to **just dryness**. **DO NOT BAKE**. When salts start appearing, cover the sample with a watch glass and lower the temperature setting of the hot plate to minimize losses due to spattering. Wet ash the samples with small amounts of concentrated HNO_3 and 30% H_2O_2. Evaporate to just dryness.

11.7.15. Strontium only requests may proceed to the appropriate strontium procedure. The strontium sequential analysis continues at Section 11.8. Proceed to the appropriate analytical procedure for isotopic analyses.

NOTE: For uranium isotopic analysis only: samples may be processed by RICH-RC-5086 or add approximately 5 mL 12M HCl to the sample and evaporate to dryness. Repeat twice.

NOTE: For thorium isotopic analysis only: Samples which will be processed by RICH-RC-5087 are to be wet ashed three times and evaporated to dryness.

Samples which will be processed by RICH-RC-5084 are to be converted three times with approximately 5 mL 12M HCl and evaporated to dryness.

11.8. Fuming Nitric Acid Separation

11.8.1. **WARNING:** Fuming nitric acid is used in the next several steps. It is hazardous, especially when brought in contact with organic materials including skin. Exercise extreme care. Rubber or heavy plastic gloves should be used. Immediately rinse any area contacted with fuming nitric acid.

Suspend, and if possible dissolve, the sample residue in a minimum amount of concentrated HNO_3 while stirring. Heat briefly if needed. If necessary, use a stir rod to loosen all solids sticking to the beaker and break up all large pieces.

11.8.2. Transfer the sample to a labeled 90-mL plastic centrifuge tube, rinsing the beaker and rod (if used) with a minimum amount of concentrated HNO_3. Larger samples may require two or more centrifuge tubes. Vortex the remaining solids to ensure that any large pieces are broken up. Add at least 50 mL of fuming nitric acid to each tube.

NOTE: It is recommended that the centrifuge tubes be capped. Capping the tubes before centrifuging can minimize the fumes.

11.8.3. Cool in an ice bath for 20-30 minutes. Remove from the ice bath and wipe the outside of the tube dry. Centrifuge until the supernate is clear (at least 10 minutes). Save the supernate for plutonium and/or other actinide analyses, if requested, and transfer to a labeled beaker.

11.8.4. If the precipitate is less than 20 mL per tube, proceed to 11.8.6. To precipitates greater than 20 mL per tube, vortex to break up the precipitate and add about 20-30 mL of fuming nitric acid. Thoroughly mix the precipitate with the acid. Centrifuge, and decant the supernate into the beaker with the supernate from step 11.8.3. The final precipitate from this step or step 11.8.3 will be used for strontium analysis, if requested.

11.8.5. Evaporate the supernate to dryness when plutonium or other actinides are requested. The warm hot plate may be covered with Zeetex to prevent spattering.

11.8.6. Proceed to the appropriate analytical procedure with each fraction and analytical worksheet(s).

12. DATA ANALYSIS AND CALCULATIONS

NOTE: Consult the client specific QAS or supervision to determine the appropriate calculation to be used.

12.1. Percent Moisture (Wet Sample Weight):

$$\text{Percent Moisture} = \left(\frac{M_i - M_d}{M_i - M_p}\right)100$$

where:

M_i = the combined weight of the initial sample and the pan weight in grams.

M_d = the combined weight of the dried sample and the pan weight in grams.

M_p = the pan weight in grams.

12.2. Percent Moisture (Dry Sample Weight):

$$\text{Percent Moisture} = \left(\frac{M_i - M_d}{M_d - M_p}\right)100$$

where:

M_i = the combined weight of the initial sample and the pan weight in grams.

M_d = the combined weight of the dried sample and the pan weight in grams.

M_p = the pan weight in grams.

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. POLLUTION PREVENTION

14.1. Standards and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of expired standards and reagents to be disposed.

15. WASTE MANAGEMENT

All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

15.1 The following waste stream is produced when this method is carried out.

- Aqueous acidic waste pH<2. The waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.

16. REFERENCES

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16.7. American Society of Testing and Materials. "Standard Method for Soil Sample Preparation for the Determination of Radionuclides", C 999-83, in Annual Book of ASTM Standards, v. 12.01 ASTM, Philadelphia.

16.8. American Society of Testing and Materials. "Determination of Water (Moisture) Content of Soil and Rock", D2216-92, in Annual Book of ASTM Standards, v. 12.01 ASTM, Philadelphia.

16.9. STL Quality Management Plan, latest revision.

16.10. STL Richland Laboratory Quality Manual, latest revision.

16.11. STL Richland Quality Assurance Summary, latest revision.

16.12. Associated SOPs

16.12.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

17. MISCELLANEOUS

17.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs review on raw instrument data.

Technical Data Reviewer: Performs final data review.

Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the Quality Assurance policies.

17.2. Records Management/Documentation

17.2.1. All records generated by this analysis will be filed and kept in accordance with STL QA policies for records management and maintenance.

17.3. Procedural Flow Chart

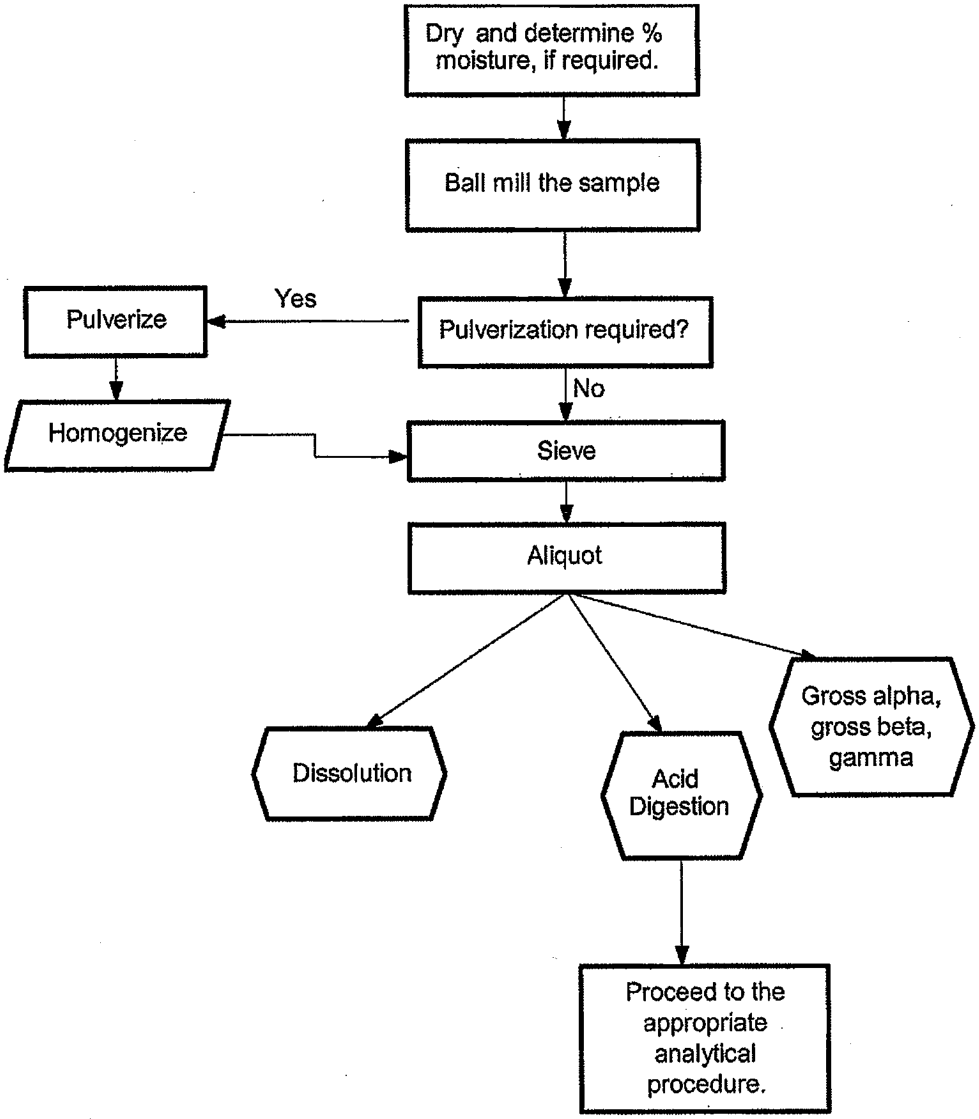

Figure 1: Percent Moisture Determination

Percent Moisture

Batch No.: 5276297

Matrix: SEDIMENT

[redacted], Client:, [redacted]

Analyst: NortonJ

Sample Identifier	Weight of Empty Container (A)	Container + Fraction (B)	Dry Sample + Container (C)	Moisture% (Wet Wt) = (B-C)/(B-A) *100	Moisture% (Dry Wt)= (B-C)/(C-A)*100	Solids% = 1- (B-C)/(B-A) *
HLFV9-1AC	173.0	226.7	216.5	19.0	23.4	81.0
HLFWJ-1AC	172.5	228.1	217.1	19.8	24.7	80.2
HLFWM-	173.0	218.4	212.6	12.8	14.6	87.2
HLMLA-1AC	172.2	224.2	213.8	20.0	25.0	80.0
HLMLK-1AC	172.7	238.5	224.6	21.1	26.8	78.9
HLMLM-1AC	172.2	204.3	198.8	17.1	20.7	82.9
HLMLP-1AC	172.3	223.9	217.5	12.4	14.2	87.6
HLMLQ-1AC	171.8	229.7	214.0	27.1	37.2	72.9
HLMLT-1AC	171.8	243.0	230.5	17.6	21.3	82.4

Comments:

FMC-Idaho Client Specific Instruction

1. Soil and Rock samples submitted for analysis will be dried, ground, pulverized and sieved as described in steps 11.1 through 11.6.6 of this procedure. If the sample must be split for analysis at another facility, proceed to step 2.

2. Samples will be split using Alternate Shoveling. The technician takes a series of scoops selected randomly from the entire sample, depositing the alternate scoops in two piles containing an equal number of scoops. NOTE: The minimum number of scoops should be nine for each pile. Small scoop sizes should be used to achieve lower grouping and segregation error. Repeat if necessary until enough sample is divided for additional analysis.

3. Proceed to step 11.6.7 for in house analysis.

STL

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SOP No.: RICH-RC-5086
Revision No.: 3
Effective Date: 6/4/07
Page 1 of 12

Richland-Operation Specific Standard Operating Procedure

TITLE: Urine and Water Sample Preparation by Calcium Phosphate Precipitation

(SUPERSEDES: RICH-RC-5086 Rev. 2)

Prepared by: John Norton

Reviewed by: J. Dobecki
Technical Specialist

Approved by: Jodie C
Quality Assurance Manager

Approved by:
Environmental ~~Health and~~ Safety Coordinator

Approved by:
Laboratory Director

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RICH-RC-5086

Revision 3

1. SCOPE AND APPLICATION

1.1. This procedure describes a method for the preparation of water, soil digestates and urine samples for strontium and various actinides.

1.2. Refer to Policy P-R-01 for method detection limit information.

2. SUMMARY OF METHOD

2.1. A calcium phosphate precipitation concentrates and removes actinides and strontium from water and urine samples. The individual separations are performed by the appropriate SOP(s).

3. DEFINITIONS

3.1. Precipitation – The process of producing a separable solid phase within a liquid medium.

4. INTERFERENCES

4.1. Very high levels of phosphate in the sample may cause an interference. Adjusting the amount of phosphate added to coprecipitate may be necessary in these cases.

5. SAFETY

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.1 Specific Safety Concerns or Requirements

Phenolphthalein solution is known to be flammable.

Octanol is known to be flammable.

Do not use hand to stop centrifuge from spinning.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	**Hazards**	**Exposure Limit (2)**	**Signs and symptoms of exposure**
Ammonium Hydroxide	Corrosive Poison	50 ppm-TWA	Vapors and mists cause irritation to the respiratory tract. Causes irritation and burns to the skin and eyes.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

6.1. Balance, Top Loading.

6.2. Beakers, various sizes.

6.3. Bottles, plastic, squirt for reagent use.

6.4. Centrifuge.

6.5. Centrifuge tubes or bottles (250 mL), plastic with holders.

6.6. Cover, plastic film.

6.7. Filter holder for 47mm filter and filter flasks.

6.8. Fitter – 0.45 µm – pore or equivalent, 47mm diameter recommended.

6.9. Funnels, glass or plastic.

6.10. Hot plate.

6.11. Magnetic stir plate, large Teflon stir bars and stir bar retriever.

6.12. pH paper – 0-14 range.

6.13. Pipettors, adjustable volume, capable of measuring 0.2 through 20 mL, non-critical, with disposable plastic tips.

6.14. Pipets, transfer, disposable, plastic.

6.15. Stirring rod, glass.

6.16. Vacuum pump with collection apparatus, for filtration and aspiration.

6.17. Vortex mixer.

6.18. Watch glasses, various sizes.

7. REAGENTS AND STANDARDS

7.1. Reagents are prepared from analytical reagent grade chemicals unless otherwise specified below. Reagent water, which must have an electrical resistivity of 1 megohm-cm or greater when obtained, is used throughout. Label all reagents as outlined in procedure RICHQA5002.

NOTE: Consult the Material Safety Data Sheets for the properties of these reagents and how to work with them.

7.2. Ammoniated Reagent Water – Adjust the pH of approximately 500 mL of reagent water to 8-9 by the addition of concentrated NH_4OH and checking with pH strips. If the pH is overshot, adjust back with 0.1M HCl.

7.3. 3.2M Ammonium phosphate, dibasic (3.2M $(NH_4)_2HPO_4$) - Dissolve 104 grams of $(NH_4)_2HPO_4$ in approximately 200 mL of reagent water, heating gently to dissolve. Dilute to 250 mL with reagent water and mix well.

7.4. 14.7M Ammonium hydroxide, concentrated (14.7M NH_4OH). **CAUTION**: Corrosive.

7.5. 1.25M Calcium nitrate (1.25M $Ca(NO_3)_2$) - Dissolve 73.8 grams of $Ca(NO_3)_2{\bullet}4H_2O$ in approximately 100 mL of reagent water. Dilute to 250 mL with reagent water and mix well. **CAUTION**: Oxidizing agent.

7.6. 30% Hydrogen peroxide (30% H_2O_2). **WARNING**: Corrosive and Oxidizer.

7.7. 16M Nitric acid (16M HNO_3) - Concentrated. **WARNING**: Corrosive and Oxidizer.

7.8. 2M Nitric acid (2M HNO_3) - Add 127 mL of concentrated HNO_3 to approximately 800 mL of reagent water. Dilute to 1 liter with reagent water and mix well. **CAUTION**: Corrosive and oxidizing agent.

7.9. Octanol ($CH_3(CH_2)_7OH$) - or equivalent. **WARNING**: Flammable.

7.10. Phenolphthalein solution, 0.5% - Dissolve 1 g Phenolphthalein in 100 mL of 95% isopropyl alcohol or in 100 mL of anhydrous, denatured ethanol. Dilute with approximately 100 mL of reagent water and mix well. **CAUTION**: Flammable.

8. SAMPLE COLLECTION, PRESERVATIVES, SHIPMENT AND STORAGE

8.1. The sample may be collected in glass or plastic containers. Storage of the sample prior to analysis should not exceed six months.

8.2 It is recommended that water samples be preserved at the time of collection by adding enough 1M HNO_3 to the sample to bring it to pH 2.

9. QUALITY CONTROL

9.1. All quality control data shall be maintained and available for easy reference.

9.2. Yield monitors (carriers and tracers) and QC spikes are prepared with a pre-set mass and/or activity and distributed appropriately in coded vials for use during sample analysis. Consult the latest version of the client specific Quality Assurance Summary (QAS) for the appropriate yield monitors, spikes, carriers, and/or tracers to use.

9.3. Consult the Quality Assurance Summary for client specific information regarding QC frequency.

9.4. Refer to SOP RICH-RC-0002 for QC acceptance criteria and corrective action.

10. CALIBRATION

10.1. None.

11. PROCEDURE

NOTE: If any parameter is found to be out of limits, consult supervision. Also, a nonconformance will be issued to the Quality Assurance Group.

NOTE: One time procedural variations are allowed if deemed necessary by the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variation in procedure shall require approval by supervision and immediate notification of the Quality Assurance Group. If contractually required, the client shall be notified prior to any procedure changes. A Nonconformance Memo shall be completed and forwarded to the Quality Assurance Group within one day of the supervisor's approval. The Nonconformance Memo will be filed in the project file.

11.1. **Sample Preparation:**

11.1.1. Water and Soil Digestate Sample Preparation

11.1.2. <u>NOTE</u>: If Carbon-14, Iodine-129, Iodine-131, or Tritium analyses have been requested and the aliquots are to be taken from the same sample container, mix sample and remove those aliquot(s) prior to acidification of the sample. Document on the analytical work sheet that aliquots were removed prior to acidification.

Using a wide range pH paper, measure the pH of the sample and record the pH on the analytical work sheet. If the pH is 2 or less, proceed to 11.1.2.2.

11.1.2.1. <u>NOTE</u>: Some clients do not want samples analyzed if preservation is incorrect. If the pH is above 2, consult the client specific QAS or supervision to determine if the sample analysis may proceed after acidification.

To acidify the sample, add acid to the sample using approximately 1 mL of concentrated HNO_3 to each liter of sample. Mix the sample and recheck the pH. Continue to add acid in 1 mL increments until the sample pH is below 2. Hold the sample in the original container for a minimum of 16 hours before continuing with this procedure.

11.1.2.2. <u>CAUTION</u>: Do not perform this step if the client has requested analysis of an unfiltered sample.

If the sample is not prefiltered, filter using vacuum filtration.

11.1.2.3. Mix the sample. According to the Quality Assurance Summary for the client, measure the appropriate amount of sample to be analyzed into a beaker. Record weight.

11.1.2.4. Add appropriate tracers and/or spikes as designated in the client-specific Quality Assurance Summary. If multiple beakers were used, dilute QC vial with 2M HNO_3 and disperse evenly among beakers. Rinse the vials three times with approximately 5 mL of 2M HNO_3, transferring the rinses quantitatively to the appropriate beaker. Remove the vial labels and place on the analytical work sheet.

11.1.2.5. Proceed to the calcium phosphate precipitation.

11.2. Urine Sample Preparation

11.2.1. Weigh the urine sample by taring a labeled beaker on a top-loading balance. Remove the beaker from the balance, add all the urine from the plastic collection bottles and re-weigh the beaker. Record the total sample volume (1g = 1 mL) on the analytical work sheet(s). Verify the sample volume meets contractual requirements.

NOTE: For large sample volumes (approximately >1500 mL), a second beaker is required.

NOTE: Samples of insufficient volume are not discarded without consulting supervision and/or checking contract volume requirements.

11.2.2. Transfer appropriate amounts of blank/synthetic urine into both the LCS and the matrix blank beaker. Add an appropriate volume of reagent water to the reagent blank beaker. From here on, the LCSs, the blanks, and the actual samples are treated alike with the exception that reagent blanks for Uranium isotopic, Radium-226 and Thorium isotopic are not put in the muffle oven.

NOTE: Synthetic or raw urine may be used for matrix LCSs. Consult the client specific QAS or supervision for further information.

11.2.3. Tritium, Carbon-14, Sulfur-35 or Phosphorus-32 and/or gamma analysis for Iodine-129 or iodine-131, if requested, must be performed on unacidifed samples. Mix sample and remove the appropriate size aliquots before proceeding to the acidification step (step 11.2.4). If any of these analytes are requested, proceed to the analytical procedure for the analyte of interest.

11.2.4. NOTE: Add about 3-4 drops of Octanol to the sample prior to acidification to reduce the possibility of sample loss due to a vigorous reaction.

Rinse each plastic collection bottle with concentrated HNO_3, unless already acidified, and add the rinses to the beaker using a total volume of acid approximately equivalent to 10% of the sample volume.

11.2.5. Rinse each plastic collection bottle with reagent water and add the rinses to the flask/beaker. Replace each container lid, secure tightly and discard to regular trash. Record total acidified weight.

11.2.6. Aliquot the sample for each analysis requested. Consult the client specific Quality Assurance Summary (QAS) or your supervisor for the appropriate sample size.

11.2.7. For each analysis, add the appropriate carrier and/or yield monitors to each beaker. To the LCS beaker only, add the appropriate spike. Rinse the vials 3 times with 2M or 8M HNO_3. Remove the labels from the QC vials and place them on the analytical work sheet.

<u>NOTE</u>: If multiple beakers were used, dilute QC vial with 2M HNO_3 and disperse evenly among beakers. Rinse three times.

<u>NOTE</u>: If a sequential analysis is identified as Pu239/Uiso and Pu238 is not requested, the Uiso tracer is added at this time. When both Pu238 and 239 are requested, the Uiso tracer shall be added after the Pu extraction. For all other sequential analysis, consult supervision prior to addition of yield monitors and/or carriers.

11.2.8. Add 30% hydrogen peroxide at approximately 5% of the sample volume.

11.2.9. Urine samples that require Uiso must first initially be prepared by RICH-RB-5002. The organics in urine interfere with the precipitation of uranium. The final muffled urine salts are redissolved in approximately 100-200 mL of 2M HNO_3 (No conversion to the chloride form is required). The resulting solution is ready for the calcium phosphate precipitation.

11.3. Calcium phosphate precipitation:

11.3.1. If multiple beakers were used for one sample, treat each beaker as an individual sample. Add 0.5 mL of 1.25M calcium nitrate ($Ca(NO_3)_2$) to each acidified sample beaker.

11.3.2. Place each beaker on a hot plate, cover with a watch glass and allow the sample to heat to near boiling. For urine, continue heating for at least two hours, adding 30% hydrogen peroxide until sample clears, in order to digest the sample.

11.3.3. Remove the watch glass and remove from the hot plate.

11.3.4. Add 2-3 ml of phenolphthalein indicator and 2.0 mL of 3.2M ammonium phosphate, dibasic ($(NH_4)_4$ HPO_4).

11.3.5. Place the sample on hot plate and slowly add enough concentrated NH_4OH from a squirt bottle or dropwise to reach the phenolphthalein end point (which is a permanent pink color) and form $Ca_3(PO_4)_2$ precipitate. Verify a pH of >10 with pH paper. Stir the solution with a stirring rod. Cover with a watch glass. Allow the sample to heat for another 20-30 minutes.

11.3.6. If the sample volume is too large to centrifuge the entire sample in one centrifuge tube, remove the stirring rod from each beaker, allow the precipitate to settle until solution can be decanted (30 minutes minimum) and proceed to step 11.3.8.

11.3.7. If the volume is small enough to centrifuge, remove the stirring rod and proceed to step 11.3.9.

11.3.8. Aspirate or decant off the supernatant liquid and discard to an appropriate waste container.

11.3.9. Transfer the precipitate to a centrifuge tube. Rinse the beaker with small amounts of ammoniated reagent water and add the rinses to the tube. Centrifuge the precipitate for at least 5 minutes at medium-high speed.

11.3.10. Decant the supernatant liquid and discard to an appropriate waste container.

11.3.11. If more than one beaker was used, combine the sample at this point.

11.3.12. Wash the precipitate with an amount of ammoniated reagent water approximately twice the volume of the precipitate. Mix well on a vortex mixer. Centrifuge, decant and discard the supernate as before.

11.3.13. Repeat the precipitation wash once.

11.3.14. Dissolve the precipitate in approximately 5 mL 16M HNO_3 and transfer the solution to a beaker (250 mL beaker is typical). Rinse the tube 2-3 times with 2-3 mL 16M HNO_3 and transfer the rinses to the beaker. Evaporate the solution to dryness. Wet ash with 16M HNO_3 and hydrogen peroxide. Some samples may require several wet ashings to achieve a white precipitate.

12. DATA ANALYSIS AND CALCULATIONS

12.1. N/A

13. METHOD PERFORMANCE

13.1. The supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use.

13.2. Method Demonstration of Capability documentation is maintained in the quality files.

14. POLLUTION PREVENTION

14.1. Standards and reagents should be prepared in volumes consistent with laboratory use to minimize the volume of expired standards and reagents to be disposed.

15. WASTE MANAGEMENT

15.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment.

15.2 Waste Streams Produced by the Method

- Aqueous acidic waste pH <2. Waste is collected in an appropriate container and transferred into an Acid Waste container color coded with Yellow tape and a Yellow cap.
- Aqueous Basic waste with a pH>2. Waste is collected in an appropriate container and transferred into a Neutral waste container color coded with Green tape and a Green Cap.
- Flammable Waste with a pH<2. Waste is collected in an appropriate container and placed in a Flammable waste container. Container is red with a self closing metal lid.

16. REFERENCES

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16.5. STL Quality Management Program, latest revision.

16.6. STL Richland Laboratory Quality Manual, latest revision.

16.7. STL Richland Quality Assurance Summary, latest revision.

16.8. Associated SOPs

16.8.1. RICHQA5002 – Reagent and Non-Radioactive Standard Labeling.

17. MISCELLANEOUS

17.1. Responsibilities

Analyst: Implements SOP as written.

Counting Room: Performs calculation and first level of data review.

Technical Data Reviewer: Performs final data review. Schedules analysts.

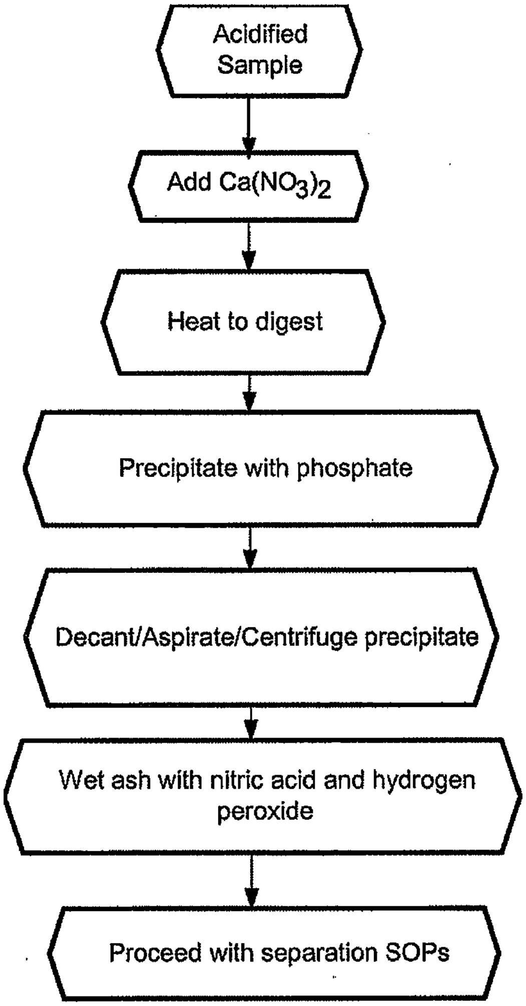
Project Manager: Confirms final review and prepares data for reporting to client.

QA Manager: Performs product quality assessments as defined in the facilities Quality Assurance procedures.

17.2. Records Management/Documentation

17.2.1. All records generated by this analysis will be filed and kept in accordance with STL policies and SOPs for records management and maintenance.

17.3. Procedural Flow Chart



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NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 13, 2007

Steve Burke
Nevada Pick-A-Part
110 West Rolly
Henderson, NV 89011

Subject: **Request For Release/Spill Information**

Facility: Nevada Pick-A-Part, 110 W. Rolly, Henderson, NV, Facility ID: H-000539

Dear Mr. Burke:

The Nevada Division of Environmental Protection (NDEP) received notification on December 12, 2007 of a Release/Spill (Release) of contaminants at the above described property. During an inspection by the Southern Nevada Health District, greater than 3 cumulative cubic yards of visibly impacted soil from the release of automotive fluids from various vehicles and automotive parts in several locations were observed. Because this Release appears to have resulted in contamination that exceeds limits established by Nevada Administrative Code (NAC) 445A.347, you are required to provide an evaluation of the release per 445A.2269 and 445A.227.

Accordingly, you are required to provide one of the following reports within 45 days from the date of this letter and no later than January 29, 2008.

(A) For Releases that have only impacted soil (not groundwater or surface water), have been excavated such that all residual soil concentrations of contaminants are less than state action levels listed in NAC 445A.2272, and meet other criteria listed in Attachment A, provide a report that contains all the information listed in Attachment A; or

(B) For all other Releases that do not meet the criteria listed in Attachment A, a report that contains all the information listed in Attachment B.

Should you have trouble meeting this deadline, please contact the undersigned to discuss the need for additional time, as the NDEP is interested in resolving incidents such as this as efficiently and amicably as possible.

This information will be used to ensure that sound decisions are collectively made regarding the Release. Please understand that the release of contaminants can be harmful to human health and the environment and that you may be required per NAC to perform cleanup activities related to the Release.

Every effort should be made to determine the source and location of the Release. Additionally, every effort should be made to: isolate, contain, and remove the source of the Release, repair or replace equipment, and revise operating, maintenance and inspection procedures necessary to prevent recurrence of this Release.

Community health and safety concerns require that you undertake rapid recovery and remediation efforts. Every effort should be made to assess the site and conduct cleanup as quickly as possible. Assessment and cleanup may be conducted concurrently. Quick response minimizes contaminant migration and helps reduce cleanup costs.

NAC 459.9719 requires that consulting services involving response, assessment, or cleanup of a hazardous substance release that are conducted for a fee must be performed under the direction and responsible control of a Nevada Certified Environmental Manager. Information on the NDEP Certification Program can be obtained by contacting Certification Program staff at 775-687-9368 or at the Certification Program website at http://ndep.nv.gov/bca/certhome.htm.

Please note that the NDEP acknowledges that while this parcel is considered a part of the TRX facility (H-000539) but that the operator (Nevada Pick-A-Part) will be conducting the remediation of the impacted soils associated with the operations of the salvage yard.

For any questions or further assistance, please contact the undersigned at (702) 486-2850 ext 240 or sharbour@ndep.nv.gov.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Special Projects Branch
Bureau of Corrective Actions, NDEP

Attachments (2)
Attachment A – Information Requirements for Soil Releases Excavated to Below Soil Action Levels
Attachment B – Information Requirements for all other Releases

cc w/out attachments
Greg Lovato, Bureau of Corrective Actions, NDEP, Carson City, NV
Todd Croft, Bureau of Corrective Actions, NDEP, Las Vegas, NV
Brian Rakvica, Bureau of Corrective Actions, NDEP, Las Vegas, NV
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Dennis Campbell, Southern Nevada Health District, PO Box 3902, Las Vegas, NV 89127
Susan Crowley, Tronox LLC, PO Box 55, Henderson, Nevada 89009
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

ATTACHMENT A
Information Requirements for Soil Releases Excavated to Below Soil Action Levels

Release circumstances and initial abatement actions must meet the following criteria for the information requirements in this Attachment to be applicable:

- Location and type of container from which the Release occurred must be known
- Neither groundwater or surface water have been impacted by the Release
- All soil with concentrations of hazardous substances or petroleum substances that exceed soil action levels listed in NAC 445A.2272 has been removed
- Confirmation sampling has been performed that verifies the removal of all soil with concentrations of hazardous substances or petroleum substances that exceed soil action levels in 445A.2272
- Removal of soil with concentrations of hazardous substances or petroleum substances that exceed soil action levels in NAC 445A.2272 has not been prevented by permanent structures or impediments, including, but not limited to sidewalks, utilities, building or road foundations, trees

If the Release meets the criteria listed above, you are required to provide the information listed below.

For all Releases that do not meet the criteria listed above, you are required to provide the information listed in Attachment B.

1. Description of the Release of Hazardous or Regulated Substances
   (a) Type of material released, including any available documentation (e.g. Material Safety Data Sheets or test results)
   (b) Estimated quantity of material released and the estimation technique utilized
   (c) Date and time of Release or of the release discovery
   (d) Cause of Release
   (e) A description of measures taken to correct and prevent recurrence of this incident
   (f) Potential for a hazard related to fire, vapor or explosion
   (g) A description of any damage known to the operator to have been caused by the release
   (h) Description of soil action levels from NAC 445A.2272 applicable to the hazardous substances and/or petroleum substances released and how these soil action levels were established.

2. Description of Site Conditions
   (a) Spill Location Information:
      i. Latitude/Longitude in decmical degrees (NAD 83)
      ii. Estimated accuracy in feet
      iii. Location determination method used
   (b) Names and correspondence address information for all property owners

ATTACHMENT A

and facility owners and operators at the site of the Release

(c) Scaled drawing(s) depicting:
  i. Property, current land use and structures
  ii. Locations and description of underground utilities within 10 feet of Release boundaries
  iii. Release surface area boundaries

3. Sample Results
   (a) All available testing results (such as laboratory or field soil and/or groundwater sample analysis) including chain of custody sheets, description of sample collection and preservation methods, analytical test methods used, laboratory result sheets with analytical detection limits, and "confirmation" sample results
   (b) Scaled drawing depicting Release surface area boundaries, excavation boundaries, and location and depth of each soil/water sample.

4. Description of investigation or cleanup activities completed, underway, and/or proposed
   (a) Names and contact information for contractors and consultants employed and scope of duties and responsibilities
   (b) A description of completed abatement, containment, and/or remediation activities conducted to date and disposition of any liquid wastes or contaminated soil (include bills of lading, disposal certificates or manifest documentation), including location of soil removal activities and quantity of soil removed and source of material used for backfill
   (c) Extent of Contamination (i.e. lateral and vertical dimensions and volume of impacted soil).
   (d) Description of sample collection and preservation procedures, analytical test methods, and sample location and depth for all samples collected to date and proposed
   (e) Description of proposed additional characterization and/or remediation activities
   (f) Scaled drawing depicting (can be included on Drawing(s) associated with 2.(c) above):
      i. Surface area boundaries of Release incident
      ii. Locations of initial abatement activities
      iii. Surface area boundaries and depths of soil removal.

ATTACHMENT B
Information Requirements for all other Releases

For all Releases that do not meet the criteria listed in Attachment A, you are required to provide the following information.

1. Description of the Release of Hazardous or Regulated Substances
   - (a) Type of material released, including any available documentation (e.g. Material Safety Data Sheets or test results)
   - (b) Estimated quantity of material released and the estimation technique utilized
   - (c) Date and time of Release or of the release discovery
   - (d) Cause of Release
   - (e) A description of measures taken to correct and prevent recurrence of this incident
   - (f) Potential for a hazard related to fire, vapor or explosion
   - (g) A description of any damage known to the operator to have been caused by the release

2. Description of Site Conditions and Surrounding Areas
   - (a) Township, Range and Section
   - (b) Spill Location information:
     - i. Latitude/Longitude in decimal degrees (NAD 83)
     - ii. Estimated accuracy in feet
     - iii. Location determination method used
   - (c) Depth to groundwater and how estimated
   - (d) Soil classification (e.g. ASTM D 2487-00 Standard Practice for Classification of Soil for Engineering Purposes) of impacted, underlying, and surrounding soils
   - (e) Annual precipitation
   - (f) Description and identification and location of any threatened, endangered, or sensitive plant or animal species in the area which may have been or has the potential to be impacted by the Release, if warranted. The Nevada Natural Heritage Program can be contacted at 775-684-2900 to determine locations of recorded threatened, endangered, or sensitive species
   - (g) Names and correspondence address information for all property owners and facility owners and operators at the site of the Release
   - (h) Names and correspondence address information for all adjacent property owners and location of their property in relation to Release location
   - (i) Scaled drawing(s) depicting:
     - i. Property, adjacent properties, and current land uses
     - ii. Locations and description of underground utilities
     - iii. Drainage features and structures
     - iv. Roadways and right-of-ways
     - v. Release surface area boundaries
     - vi. Locations of structures or other impediments to subsurface

investigation or cleanup

vii. Municipal, domestic, and irrigation supply wells within 1 mile of Release location.

3. Sample Results
   - (a) All available testing results (such as laboratory or field soil and/or groundwater sample analysis) including chain of custody sheets, description of sample collection and preservation methods, analytical test methods used, laboratory result sheets with analytical detection limits, and "confirmation" sample results
   - (b) Scaled drawing depicting Release surface area boundaries, excavation boundaries, and location and depth of each soil/water sample.

4. For non-residential properties, if the specific release source (location and/or container) and timing of the release cannot be identified, then you must evaluate past chemical use on the property by submitting a Phase 1 Environmental Site Assessment conducted by a Certified Environmental Manager, or by other method(s) approved by the Division, conducted in accordance with accepted industry standards.

5. Description of investigation or cleanup activities completed, underway, and/or proposed
   - (a) Names and contact information for contractors and consultants employed and scope of duties and responsibilities
   - (b) A description of completed abatement, containment, and/or remediation activities conducted to date and disposition of any liquid wastes or contaminated soil (include bills of lading, disposal certificates or manifest documentation) including location of soil removal activities and quantity of soil removed and source of material used for backfill
   - (c) Extent of Contamination (i.e. lateral and vertical dimensions and volume of impacted soil). If the full extent is not yet defined, then provide details and a schedule for future characterization activities.
   - (d) Description of sample collection and preservation procedures, analytical test methods, and sample location and depth for all samples collected to date and proposed
   - (e) Description of proposed additional characterization and/or remediation activities
   - (f) Scaled drawing depicting (can be included on Drawing(s) associated with 2.(i) above):
     - iv. Surface area boundaries of Release incident
     - v. Locations of abatement and remediation activities
     - vi. Future/proposed sampling locations.

NDEP # 071212-01

Report Date: 12/12/2007 Report Time: 1630

Incident Date: 12/12/2007 Incident Time: 1615

Complaint/Spill Report Form

State of Nevada

Telephone: (888) 331-6337

Fax: (775) 687-8335

Nevada Division of Environmental Protection

Do You Want to Remain Anonymous? ☐

Reporting Person/Agency Nevada Pick-a-Part/ Steve Burke

Address: 110 W. Rolly Phone: 702-528-3125

City: Henderson State: NV Zip: 89011

Discharger/Owner/Operator of Facility: Nevada Pick-A-Part

Address: 110 W. Rolly

City: Henderson State: NV Zip: 89011

Contact Person: Steve Burke Phone: 702-528-3125

Location of Complaint/Spill: various locations at Rolly address, site of car dismantling and parts sales operation.

City: Henderson State: NV County: Clark

Township: ____ Range: ____ Section: ____ Q,Q2: ____ Mile Marker: ____

Type of Material Discovered: oil, TPH

Concentration (%, ppm, ppb): ____

Quantity Found: >3cy Media Affected: soil

Cause of Complaint/Spill: historic leaking of car crankcases, etc. in various locations on site.

Remedial Action Taken: See Shannon Harbour for details; she should be case officer also.

Oversight/Enforcement: BCA LV (Remediation) Todd Croft & James Dotchin, via e-mail

cc: ____

cc: ____

Comments: This is another case of many deminimis areas of contaminated soil that cumulatively add up to >3cy.

Shannon Parcel I

Report Taken By: Jeryl Gardner

Shannon Harbour

From: Shannon Harbour
Sent: Wednesday, December 12, 2007 3:31 PM
To: 'Crowley, Susan'
Cc: Keith Bailey; Brian Rakvica; Bilodeau, Sally; ekrish@frontiernet.net
Subject: RE: Update on Several Deliverables

Susan,

The submittal deadlines listed below are acceptable to the NDEP.

Sincerely,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Wednesday, December 12, 2007 3:03 PM
To: Shannon Harbour
Cc: Keith Bailey; Brian Rakvica; Bilodeau, Sally; ekrish@frontiernet.net
Subject: RE: Update on Several Deliverables

Shannon,
Please excuse the delay in getting back to you re the items listed below. I've talked with those responsible for various pieces of the tasks and propose the following delivery dates for your approval:

Update of the February 2007 Fact Sheet – Tronox delivers to NDEP 12-19-07

Completion of the well rehabilitation – Begin by 12-17-07 and complete by 1-31-08

Groundwater Monitoring SAP – Tronox delivers to NDEP 3-31-08

Please let me know if these delivery dates are acceptable? Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

From: Shannon Harbour [mailto:sharbour@ndep.nv.gov]
Sent: Wednesday, December 12, 2007 12:01 PM
To: Shannon Harbour; Crowley, Susan
Cc: Keith Bailey; Brian Rakvica
Subject: RE: Update on Several Deliverables

Susan,

I have not received a reply to the email below. Please respond by COB today with an update and revised schedule for submittal.

Sincerely,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
NDEP BCA-Las Vegas Office

From: Shannon Harbour
Sent: Friday, December 07, 2007 11:15 AM
To: 'Crowley, Susan'
Cc: Keith Bailey; Brian Rakvica
Subject: Update on Several Deliverables

Susan,

It has come to my attention that several TRX deliverables are late:

- Factsheet update (due 11/2/07)
- Well Rehab schedule (due 11/5/07)
- Site-wide SAP for groundwater monitoring (due 11/16/07)

Please report on the status of these documents and provide an updated submittal date.

Sincerely,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

Tronox Confidentiality Notice!
If you are not the intended recipient of this e-mail message, any use, distribution or copying of the message is prohibited.
Please let me know immediately by return e-mail if you have received this message by mistake,

then delete the e-mail message.
Thank you.

Shannon Harbour

From: Mark Jones [Mark.Jones@erm.com]
Sent: Wednesday, December 12, 2007 2:50 PM
To: Brian Rakvica; Keith Bailey; Crowley, Susan; Ranajit Sahu
Cc: Paul Black; terilcopeland@aol.com; Shannon Harbour; David Gratson; Kennedy, Robert
Subject: RE: TRX Parcels A and B
Attachments: Tronox Parcels A-B DataSummary-Industrial_Rev1.xls; Tronox Parcels A-B DataSummary-Industrial_Rev1.pdf

Brian,

Attached is the revised summary table that includes comparisons to the SSLs (using both DAF of 1 and 20).

Ranajit mentioned providing errata pages for the tech memo based on the most recent asbestos post-scrape results. The tech memo was written with the assumption that this final sample would be clean. So there are no changes/errata that need to be made regarding this issue. The exception to this is the post-scrape asbestos EDD that was included on the CD. This was provided with 'pending' listed for results for the final post-scrape sample. Therefore, this is the only change and only affects the CD. However, errata pages, or a re-submittal may be needed based on the revised summary table (and the outcome of the uranium issue).

We are currently working on the uranium issue and will provide information on this soon.

Mark Jones
ERM
Sacramento, CA
916-924-9378

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Wednesday, December 12, 2007 8:22 AM
To: Brian Rakvica; Keith Bailey; Crowley, Susan; Ranajit Sahu; Mark Jones
Cc: Paul Black; terilcopeland@aol.com; Shannon Harbour; David Gratson; Kennedy, Robert
Subject: RE: TRX Parcels A and B

By the way, the SSL comparison should use the DAF of 1 as well as DAF 20.

From: Brian Rakvica
Sent: Wednesday, December 12, 2007 8:16 AM
To: 'Keith Bailey'; 'Crowley, Susan'; 'Ranajit Sahu'; 'Mark.Jones@erm.com'
Cc: Paul Black; 'terilcopeland@aol.com'; Shannon Harbour; Brian Rakvica; 'David Gratson'; 'Kennedy, Robert'
Subject: TRX Parcels A and B
Importance: High

All,

The risk evaluation submitted for Parcels A and B shows that uranium (as a metal) exceeds background.

This presents a slight problem in that (it is my understanding) the radionuclide data was completed by STL-Richland which means that the radionuclide data is biased low.

This means that the risk calculations for the radionuclide data are also biased low.

This makes it difficult for us to concur with the evaluation.

In addition, we could not locate any of the comparisons of Site data to the SSLs. They are referenced in the text as being on Table 1, however, we did not see these comparisons on Table 1. Currently, we are doing this manually, however, an e-version would expedite this.

We need a proposal from TRX regarding how this can be resolved.

Thanks,

Brian

Brian A. Rakvica, P.E.
Supervisor, Special Projects Branch
Bureau of Corrective Actions
Nevada Division of Environmental Protection
2030 East Flamingo Road, Suite 230
Las Vegas, Nevada 89119
tel: 702-486-2850 x 247
e: brakvica@ndep.nv.gov
fax: 702-486-5733 (please note the new fax number)

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TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
Dioxins/Furans	TCDD TEF	pg/g	32	32	100%	0.73	472	TSB-BJ-05-0	--	--
Asbestos[i]	Chrysotile	Structures	30	6	20%	0	19	TSB-BJ-01	--	--
	Amphibole	Structures	30	0	0%	--	--	--	--	--
General Chemistry	Bromide	mg/kg	64	28	44%	0.69	7.8	TSB-AJ-02-10	2.5	3.1
	Bromine	mg/kg	64	28	44%	1.4	15.7	TSB-AJ-02-10	5.1	6.3
	Chlorate	mg/kg	64	17	27%	1.4	17	TSB-BR-02-10	5.1	6.3
	Chloride	mg/kg	64	62	97%	3.3	2,210	TSB-AR-06-0-DUP	2	206
	Chlorine	mg/kg	64	62	97%	6.6	4,410	TSB-AR-06-0-DUP	4.1	411
	Chlorite	ug/kg	3	0	0%	--	--	--	220	250
	Fluoride	mg/kg	64	41	64%	0.39	4.3	TSB-BJ-04-10	1	1.3
	Nitrate (as N)	mg/kg	64	64	100%	0.33	229	TSB-AR-06-0-DUP	0.2	10.4
	Nitrite (as N)	mg/kg	64	1	2%	0.45	0.45	TSB-AJ-03-0	0.2	0.25
	Orthophosphate as P	mg/kg	64	2	3%	2	2	TSB-AR-11-0	5.1	6.3
	Perchlorate	ug/kg	64	63	98%	53.4	41,600	TSB-BJ-03-10	40.6	2480
	Sulfate	mg/kg	64	64	100%	9.1	8,870	TSB-AR-12-10	5.1	265
Glycols/Alcohols	Ethanol	ug/kg	64	0	0%	--	--	--	250	310
Metals	Aluminum	mg/kg	64	64	100%	6,780	9,750	TSB-BJ-01-0	10.1	12.5
	Antimony	mg/kg	64	54	84%	0.11	0.42	TSB-BR-02-0	1	1.3
	Arsenic	mg/kg	64	64	100%	2.3	5.8	TSB-BR-04-10	2	2.5
	Barium	mg/kg	64	64	100%	148	269	TSB-BJ-01-10	4.1	5
	Beryllium	mg/kg	64	64	100%	0.41	0.65	TSB-BJ-01-10	0.2	0.25
	Boron	mg/kg	64	0	0%	--	--	TSB-BR-06-10	20.3	25
	Cadmium	mg/kg	64	52	81%	0.069	0.59	TSB-BJ-02-0	0.1	0.13
	Calcium	mg/kg	64	64	100%	15,600	75,300	TSB-AR-13-10	101	125
	Chromium (Total)	mg/kg	64	64	100%	7.3	17	TSB-BR-04-10	2	2.5
	Chromium (VI)	mg/kg	61	25	41%	0.18	0.58	TSB-BJ-04-0	1	1.3
	Cobalt	mg/kg	64	64	100%	4.6	7.5	TSB-BR-02-0	0.41	0.5
	Copper	mg/kg	64	64	100%	11.3	31	TSB-BR-02-0	2	2.5
	Iron	mg/kg	64	64	100%	10,100	17,200	TSB-BJ-02-0	10.1	12.5
	Lead	mg/kg	64	64	100%	6.5	136	TSB-BR-03-0	0.61	0.75
	Lithium	mg/kg	64	56	88%	10.9	22.6	TSB-AR-13-10	10.1	26.4
	Magnesium	mg/kg	64	64	100%	6,690	13,600	TSB-BR-05-10	101	125
	Manganese	mg/kg	64	64	100%	218	668	TSB-BR-02-0	0.41	0.5
	Mercury	ug/kg	64	40	63%	7.3	17.5	TSB-BJ-04-0	33.8	41.7
	Molybdenum	mg/kg	64	31	48%	0.48	1.4	TSB-AR-04-10	1	1.3
	Nickel	mg/kg	64	64	100%	11.2	23.7	TSB-AJ-02-0	1	1.3
	Niobium	mg/kg	64	2	3%	1.6	2	TSB-AR-08-0	5.1	6.3
	Palladium	mg/kg	64	64	100%	0.3	1.2	TSB-AR-13-10	0.2	0.25
	Phosphorus (as P)	mg/kg	64	64	100%	527	1,510	TSB-BR-02-0	101	125
	Platinum	mg/kg	64	0	0%	--	--	--	0.2	0.25
	Potassium	mg/kg	64	64	100%	2,040	4,800	TSB-AR-06-0-DUP	20.3	25

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect^a	Max. Detect^a	Location of Max. Detect	Min. Non-Detect Limit^b	Max. Non-Detect Limit^b
Metals	Selenium	mg/kg	64	0	0%	--	--	--	1	1.3
	Silicon	mg/kg	64	64	100%	128	1,320	TSB-AR-02-0	50.7	62.6
	Silver	mg/kg	64	64	100%	0.081	0.82	TSB-BR-03-0	0.41	0.5
	Sodium	mg/kg	64	64	100%	244	1,720	TSB-AR-06-0	40.6	50.1
	Strontium	mg/kg	64	64	100%	120	487	TSB-AR-13-10	1	1.3
	Sulfur	mg/kg	64	26	41%	443	5,980	TSB-AR-12-10	1010	2550
	Thallium	mg/kg	64	0	0%	--	--	TSB-BR-06-10	0.41	0.5
	Tin	mg/kg	64	56	88%	0.4	1.5	TSB-BR-02-0	0.41	0.5
	Titanium	mg/kg	64	64	100%	504	982	TSB-BJ-02-0	1	1.3
	Tungsten	mg/kg	64	0	0%	--	--	TSB-BR-06-10	1	1.3
	Uranium	mg/kg	64	64	100%	0.69	3.1	TSB-AR-13-10	0.2	0.25
	Vanadium	mg/kg	64	64	100%	24.2	53.4	TSB-BJ-02-0	2	2.5
	Zinc	mg/kg	64	64	100%	25.9	211	TSB-BJ-01-0	4.1	5
	Zirconium	mg/kg	64	64	100%	4.9	27.3	TSB-BJ-02-10	20.3	25
Organochlorine Pesticides	2,4-DDD	ug/kg	64	4	6%	2	17	TSB-BR-01-0	1.7	19
	2,4-DDE	ug/kg	64	11	17%	2.1	150	TSB-BR-01-0	1.7	19
	4,4-DDD	ug/kg	64	2	3%	7.5	18	TSB-BJ-05-0	1.7	19
	4,4-DDE	ug/kg	64	19	30%	1.8	310	TSB-BR-01-0	1.7	19
	4,4-DDT	ug/kg	64	10	16%	2.3	99	TSB-BR-01-0	1.7	19
	Aldrin	ug/kg	64	0	0%	--	--	--	1.7	19
	alpha-BHC	ug/kg	64	0	0%	--	--	--	1.7	19
	alpha-Chlordane	ug/kg	64	0	0%	--	--	--	1.7	19
	beta-BHC	ug/kg	64	31	48%	1.7	190	TSB-BR-01-0	1.7	19
	Chlordane	ug/kg	64	0	0%	--	--	--	17	190
	delta-BHC	ug/kg	64	0	0%	--	--	--	1.7	19
	Dieldrin	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan I	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan II	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan sulfate	ug/kg	64	0	0%	--	--	--	1.7	19
	Endrin	ug/kg	64	1	2%	7	7	TSB-BR-01-0	1.7	19
	Endrin aldehyde	ug/kg	64	2	3%	2.7	3.6	TSB-AR-12-0	1.7	19
	Endrin ketone	ug/kg	64	0	0%	--	--	--	1.7	19
	gamma-Chlordane	ug/kg	64	0	0%	--	--	--	1.7	19
	Heptachlor	ug/kg	64	0	0%	--	--	--	1.7	19
	Heptachlor epoxide	ug/kg	64	0	0%	--	--	--	1.7	19
	Lindane	ug/kg	64	0	0%	--	--	--	1.7	19
	Methoxychlor	ug/kg	64	0	0%	--	--	--	3.3	37
	Toxaphene	ug/kg	64	0	0%	--	--	--	68	760
Petroleum Hydrocarbons	TPH (as Gasoline)	mg/kg	64	0	0%	--	--	--	0.1	0.13
	TPH (as Diesel)	mg/kg	64	0	0%	--	--	--	25	31
	Oil/Grease	mg/kg	64	0	0%	--	--	--	203	250

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 3 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
Radionuclides	Radium-226	pCi/g	64	64	100%	0.837	1.48	TSB-AJ-01-10	0.0487	0.0944
	Radium-228	pCi/g	64	64	100%	1.4	2.13	TSB-BR-06-0	0.0978	0.18
	Thorium-228	pci/g	64	63	98%	0.973	2.17	TSB-BR-06-0	0.1	0.1
	Thorium-230	pci/g	64	64	100%	0.308	2.03	TSB-AR-3-10	0.1	0.1
	Thorium-232	pci/g	64	63	98%	1.1	2.36	TSB-BR-04-0	0.1	0.1
	Uranium-233/234	pci/g	64	64	100%	0.225	2.31	TSB-AR-02-10	0.6	0.6
	Uranium-235/236	pci/g	64	28	44%	0.0141	0.0509	TSB-AR-02-10	0.6	0.6
	Uranium-238	pci/g	64	64	100%	0.125	1.26	TSB-AR-02-10	0.6	0.6
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	64	0	0%	--	--	--	330	410
	1,2-Diphenylhydrazine	ug/kg	64	0	0%	--	--	--	330	410
	1,4-Dioxane	ug/kg	64	0	0%	--	--	--	330	410
	1-Nonanal	ug/kg	64	0	0%	--	--	--	10	13
	2,2'-/4,4'-Dichlorobenzil	ug/kg	64	0	0%	--	--	--	330	2800
	2,4,5-Trichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4,6-Trichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dimethylphenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dinitrophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	2,4-Dinitrotoluene	ug/kg	64	0	0%	--	--	--	330	410
	2,6-Dinitrotoluene	ug/kg	64	0	0%	--	--	--	330	410
	2-Chloronaphthalene	ug/kg	64	0	0%	--	--	--	330	410
	2-Chlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2-Methylnaphthalene	ug/kg	64	0	0%	--	--	--	330	410
	2-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	2-Nitrophenol	ug/kg	64	0	0%	--	--	--	330	410
	3,3'-Dichlorobenzidine	ug/kg	64	0	0%	--	--	--	1600	2000
	3-Methylphenol & 4-Methylphenol	ug/kg	64	0	0%	--	--	--	670	830
	3-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	4-Bromophenyl phenyl ether	ug/kg	64	0	0%	--	--	--	330	410
	4-Chloro-3-Methylphenol	ug/kg	64	0	0%	--	--	--	330	410
	4-Chlorophenyl phenyl ether	ug/kg	64	0	0%	--	--	--	330	410
	4-Nitrophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	Acenaphthene	ug/kg	64	10	16%	65	1,000	TSB-AJ-01-10	51	63
	Acenaphthylene	ug/kg	64	0	0%	--	--	--	100	130
	Acetophenone	ug/kg	64	0	0%	--	--	--	330	410
	Aniline	ug/kg	64	0	0%	--	--	--	330	410
	Anthracene	ug/kg	64	0	0%	--	--	--	30	38
	Azobenzene	ug/kg	64	0	0%	--	--	--	330	410
	Benzenethiol	ug/kg	64	0	0%	--	--	--	330	410
	Benzo(a)anthracene	ug/kg	64	1	2%	55	55	TSB-AR-01-0-DUP	15	19
	Benzo(a)pyrene	ug/kg	64	1	2%	19	19	TSB-BJ-03-0	15	19

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
SVOCs	Benzo(b)fluoranthene	ug/kg	64	1	2%	21	21	TSB-BJ-03-0	15	19
	Benzo(g,h,i)perylene	ug/kg	64	0	0%	--	--	--	30	38
	Benzo(k)fluoranthene	ug/kg	64	0	0%	--	--	--	15	19
	Benzoic acid	ug/kg	64	0	0%	--	--	--	1600	2000
	Benzyl alcohol	ug/kg	64	0	0%	--	--	--	330	410
	Benzyl butyl phthalate	ug/kg	64	4	6%	42	420	TSB-BJ-04-0	330	410
	bis(2-Chloroethoxy) methane	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Chloroethyl) ether	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Chloroisopropyl) ether	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Ethylhexyl) phthalate	ug/kg	64	2	3%	37	140	TSB-BR-03-0	330	410
	bis(p-Chlorophenyl) disulfide	ug/kg	64	0	0%	--	--	--	330	410
	bis(p-Chlorophenyl) sulfone	ug/kg	64	0	0%	--	--	--	330	410
	Carbazole	ug/kg	64	0	0%	--	--	--	330	410
	Chrysene	ug/kg	64	2	3%	18	24	TSB-BJ-03-0	15	19
	Dibenzo(a,h)anthracene	ug/kg	64	0	0%	--	--	--	30	38
	Dibenzofuran	ug/kg	64	0	0%	--	--	--	330	410
	Dibutyl phthalate	ug/kg	64	1	2%	50	50	TSB-BR-03-0	330	410
	Diethyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Dimethyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Di-n-octyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Diphenyl sulfone	ug/kg	64	0	0%	--	--	--	330	410
	Fluoranthene	ug/kg	64	0	0%	--	--	--	330	410
	Fluorene	ug/kg	64	0	0%	--	--	--	330	410
	Hexachlorobenzene	ug/kg	64	1	2%	49	49	TSB-BR-01-0	330	410
	Hexachlorocyclopentadiene	ug/kg	64	0	0%	--	--	--	1600	2000
	Hydroxymethyl phthalimide	ug/kg	64	0	0%	--	--	--	330	410
	Indeno(1,2,3-cd)pyrene	ug/kg	64	0	0%	--	--	--	15	19
	Isophorone	ug/kg	64	0	0%	--	--	--	330	410
	Naphthalene	ug/kg	64	0	0%	--	--	--	330	410
	Nitrobenzene	ug/kg	64	0	0%	--	--	--	330	410
	N-nitrosodi-n-propylamine	ug/kg	64	0	0%	--	--	--	330	410
	N-nitrosodiphenylamine	ug/kg	64	0	0%	--	--	--	330	410
	o-Cresol	ug/kg	64	0	0%	--	--	--	330	410
	Octachlorostyrene	ug/kg	64	1	2%	41	41	TSB-BR-01-0	330	410
	p-Chloroaniline	ug/kg	64	0	0%	--	--	--	330	410
	p-Chlorothiophenol	ug/kg	64	0	0%	--	--	--	330	410
	Pentachlorobenzene	ug/kg	64	0	0%	--	--	--	330	410
	Pentachlorophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	Phenanthrene	ug/kg	64	0	0%	--	--	--	30	38
	Phenol	ug/kg	64	0	0%	--	--	--	330	410
	Phenyl Disulfide	ug/kg	64	0	0%	--	--	--	330	410

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 5 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
SVOCs	Phenyl Sulfide	ug/kg	64	0	0%	--	--	--	330	410
	Phthalic acid	ug/kg	64	0	0%	--	--	--	1600	2000
	p-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	Pyrene	ug/kg	64	0	0%	--	--	--	30	38
	Pyridine	ug/kg	64	0	0%	--	--	--	670	830
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,1-Trichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,2,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,2-Trichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloropropene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,3-Trichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,3-Trichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,4-Trichlorobenzene	ug/kg	64	1	2%	0.9	0.9	TSB-AJ-01-10	5	6.3
	1,2,4-Trimethylbenzene	ug/kg	64	34	53%	0.23	0.57	TSB-AR-13-10	5	6.3
	1,2-Dibromo-3-chloropropane	ug/kg	64	0	0%	--	--	--	10	13
	1,2-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2-Dichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	10	13
	1,2-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3,5- Trichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3,5-Trimethylbenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,4-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2,3-Trimethylbutane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2-Dimethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,3-Dimethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,4-Dimethylpentane	ug/kg	64	0	0%	--	--	--	20	25
	2-Chlorotoluene	ug/kg	64	0	0%	--	--	--	5	6.3
	2-Nitropropane	ug/kg	64	0	0%	--	--	--	10	13
	2-Phenylbutane	ug/kg	64	0	0%	--	--	--	5	6.3
	3,3-dimethylpentane	ug/kg	64	0	0%	--	--	--	10	13
	3-ethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3
	3-Methylhexane	ug/kg	64	0	0%	--	--	--	5	6.3
	4-Chlorothioanisole	ug/kg	64	0	0%	--	--	--	330	410
	4-Chlorotoluene	ug/kg	64	0	0%	--	--	--	5	6.3
	Acetone	ug/kg	64	9	14%	6.5	16	TSB-BJ-01-10	20	25
	Acetonitrile	ug/kg	64	0	0%	--	--	--	50	63

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 6 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
VOCs	Benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromodichloromethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromomethane	ug/kg	64	0	0%	--	--	--	10	13
	Carbon disulfide	ug/kg	64	0	0%	--	--	--	5	6.3
	Carbon tetrachloride	ug/kg	64	0	0%	--	--	--	5	6.3
	Freon 11	ug/kg	64	0	0%	--	--	--	5	6.3
	Freon 12	ug/kg	64	0	0%	--	--	--	10	13
	Freon 113	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorobromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorodibromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Chloroethane	ug/kg	64	0	0%	--	--	--	10	13
	Chloroform	ug/kg	64	0	0%	--	--	--	5	6.3
	Chloromethane	ug/kg	64	0	0%	--	--	--	10	13
	cis-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	cis-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Cymene	ug/kg	64	0	0%	--	--	--	5	6.3
	Dibromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Dichloromethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Ethylbenzene	ug/kg	64	3	5%	0.2	0.24	TSB-AR-07-10	5	6.3
	Hexachloro-1,3-butadiene	ug/kg	64	0	0%	--	--	--	330	410
	Hexachloroethane	ug/kg	64	0	0%	--	--	--	330	410
	Hexane, 2-methyl-	ug/kg	64	0	0%	--	--	--	5	6.3
	Isopropylbenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	m,p-Xylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl disulfide	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl ethyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	Methyl iodide	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl isobutyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	Methyl n-butyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	MTBE (Methyl tert-butyl ether)	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Butyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Heptane	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Propyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	o-Xylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Styrene (monomer)	ug/kg	64	0	0%	--	--	--	5	6.3
	tert-Butyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Tetrachloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Toluene	ug/kg	64	11	17%	0.24	0.65	TSB-BR-06-10	5	6.3
	trans-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 7 of 21)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
VOCs	trans-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Tribromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Trichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Vinyl acetate	ug/kg	64	0	0%	--	--	--	5	6.3
	Vinyl chloride	ug/kg	64	0	0%	--	--	--	5	6.3
	Xylenes (total)	ug/kg	64	0	0%	--	--	--	10	13

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.
b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.
c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs. Several chemicals have both cancer and non-cancer toxicity criteria. For these chemicals USEPA calculates PRGs for both cancer and non-cancer endpoints; however only the lower value is published in its PRG table. The other value is included in a separate spreadsheet table. This other value is shown on this table as the 'Secondary Industrial PRG' and is included in the screening-level risk assessment calculations.
d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).
e - Based on results of statistical comparison tests performed between shallow background and site datasets (see Table 2).
f - Non-cancer hazard indices were calculated by dividing the maximum detected value by its PRG (or secondary PRG). The total non-cancer hazard index is the sum of all chemical-specific hazard indices.
g - Theoretical upper-bound incremental lifetime cancer risks were calculated by were calculated by dividing the maximum detected value by its PRG (or secondary PRG) times 1E-6. The total incremental lifetime cancer risk is the sum of all chemical-specific cancer risks.
h - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).
i - Asbestos results shown are for long protocol structures (>10um).
j - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 8 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	SSL (DAF = 1)[c]	Count of Detects > SSL (1)	SSL (DAF = 20)[c]	Count of Detects > SSL (20)
Dioxins/Furans	TCDD TEF[h]	pg/g	472	1,000	ca	–	0	–	–	–	–
Asbestos[i]	Chrysotile	Structures	19	–	–	–	–	–	–	–	–
	Amphibole	Structures	–	–	–	–	–	–	–	–	–
General Chemistry	Bromide	mg/kg	7.8	–	–	–	–	–	–	–	–
	Bromine	mg/kg	15.7	–	–	–	–	–	–	–	–
	Chlorate	mg/kg	17	–	–	–	–	–	–	–	–
	Chloride	mg/kg	2,210	–	–	–	–	–	–	–	–
	Chlorine	mg/kg	4,410	–	–	–	–	–	–	–	–
	Chlorite	ug/kg	–	–	–	–	–	–	–	–	–
	Fluoride	mg/kg	4.3	36,900	nc	–	0	–	–	–	–
	Nitrate (as N)	mg/kg	229	–	–	–	–	–	–	–	–
	Nitrite (as N)	mg/kg	0.45	–	–	–	–	–	–	–	–
	Orthophosphate as P	mg/kg	2	–	–	–	–	–	–	–	–
	Perchlorate	ug/kg	41,600	>100,000	–	–	0	–	–	–	–
	Sulfate	mg/kg	8,870	–	–	–	–	–	–	–	–
Glycols/Alcohols	Ethanol	ug/kg	–	–	–	–	–	–	–	–	–
Metals	Aluminum	mg/kg	9,750	>100,000	nc	–	0	–	–	–	–
	Antimony	mg/kg	0.42	409	nc	–	0	0.3	3	5	0
	Arsenic	mg/kg	5.8	1.6	ca	260	64	1	64	29	0
	Barium	mg/kg	269	66,600	nc	–	0	82	64	1600	0
	Beryllium	mg/kg	0.65	1940	ca	–	0	3	0	63	0
	Boron	mg/kg	–	>100,000	nc	–	0	–	–	–	–
	Cadmium	mg/kg	0.59	451	nc	3,000	0	0.4	4	8	0
	Calcium	mg/kg	75,300	–	–	–	–	–	–	–	–
	Chromium (Total)	mg/kg	17	448	nc	–	0	–	–	–	–
	Chromium (VI)	mg/kg	0.58	64	ca	2,500	0	2	0	38	0
	Cobalt	mg/kg	7.5	1,920	ca	–	0	–	–	–	–
	Copper	mg/kg	31	40,900	nc	–	0	–	–	–	–
	Iron	mg/kg	17,200	>100,000	nc	–	0	–	–	–	–
	Lead	mg/kg	136	800	nc	–	0	–	–	–	–
	Lithium	mg/kg	22.6	20,400	nc	–	0	–	–	–	–
	Magnesium	mg/kg	13,600	–	–	–	–	–	–	–	–
	Manganese	mg/kg	668	19,500	nc	–	0	–	–	–	–
	Mercury	ug/kg	17.5	–	–	–	–	–	–	–	–
	Molybdenum	mg/kg	1.4	5,110	nc	–	0	–	–	–	–
	Nickel	mg/kg	23.7	20,400	nc	–	0	7	64	130	0
	Niobium	mg/kg	2	–	–	–	–	–	–	–	–
	Palladium	mg/kg	1.2	–	–	–	–	–	–	–	–
	Phosphorus (as P)	mg/kg	1,510	–	nc	–	–	–	–	–	–
	Platinum	mg/kg	–	–	–	–	–	–	–	–	–
	Potassium	mg/kg	4,800	–	–	–	–	–	–	–	–

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 9 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	SSL (DAF = 1)[c]	Count of Detects > SSL (1)	SSL (DAF = 20)[c]	Count of Detects > SSL (20)
Metals	Selenium	mg/kg	–	5,110	nc	–	0	0.3	0	5	0
	Silicon	mg/kg	1,320	–	–	–	–	–	–	–	–
	Silver	mg/kg	0.82	5,110	nc	–	0	2	0	34	0
	Sodium	mg/kg	1,720	–	–	–	–	–	–	–	–
	Strontium	mg/kg	487	>100,000	nc	–	0	–	–	–	–
	Sulfur	mg/kg	5,980	–	–	–	–	–	–	–	–
	Thallium	mg/kg	–	68	nc	–	0	–	–	–	–
	Tin	mg/kg	1.5	>100,000	nc	–	0	–	–	–	–
	Titanium	mg/kg	982	>100,000	nc	–	0	–	–	–	–
	Tungsten	mg/kg	–	–	–	–	–	–	–	–	–
	Uranium	mg/kg	3.1	204	nc	–	0	–	–	–	–
	Vanadium	mg/kg	53.4	1,020	nc	–	0	300	0	6000	0
	Zinc	mg/kg	211	>100,000	nc	–	0	620	0	12000	0
	Zirconium	mg/kg	27.3	–	–	–	–	–	–	–	–
Organochlorine Pesticides	2,4-DDD	ug/kg	17	–	–	–	–	–	–	–	–
	2,4-DDE	ug/kg	150	–	–	–	–	–	–	–	–
	4,4-DDD	ug/kg	18	9,950	ca	–	0	0.8	0	16	0
	4,4-DDE	ug/kg	310	7,020	ca	–	0	3	0	54	0
	4,4-DDT	ug/kg	99	7,020	ca	>100,000	0	2	0	32	0
	Aldrin	ug/kg	–	101	ca	19,000	0	0.02	0	0.5	0
	alpha-BHC	ug/kg	–	359	ca	>100,000	0	0.00003	0	0.0005	0
	alpha-Chlordane	ug/kg	–	–	–	–	–	0.5	0	10	0
	beta-BHC	ug/kg	190	1,260	ca	>100,000	0	0.0001	31	0.003	26
	Chlordane	ug/kg	–	–	–	–	–	0.5	0	10	0
	delta-BHC	ug/kg	–	–	–	–	–	–	–	–	–
	Dieldrin	ug/kg	–	108	ca	31,000	0	0.0002	0	0.004	0
	Endosulfan I	ug/kg	–	–	–	–	–	0.9	0	18	0
	Endosulfan II	ug/kg	–	–	–	–	–	0.9	0	18	0
	Endosulfan sulfate	ug/kg	–	–	–	–	–	–	–	–	–
	Endrin	ug/kg	7	>100,000	nc	–	0	0.05	0	1	0
	Endrin aldehyde	ug/kg	3.6	–	–	–	–	–	–	–	–
	Endrin ketone	ug/kg	–	–	–	–	–	–	–	–	–
	gamma-Chlordane	ug/kg	–	–	–	–	–	0.5	0	10	0
	Heptachlor	ug/kg	–	383	ca	>100,000	0	1	0	23	0
	Heptachlor epoxide	ug/kg	–	189	ca	8,000	0	0.03	0	0.7	0
	Lindane	ug/kg	–	1,740	ca	>100,000	0	0.0005	0	0.009	0
	Methoxychlor	ug/kg	–	>100,000	nc	–	0	8	0	160	0
	Toxaphene	ug/kg	–	1,570	ca	–	0	2	0	31	0
Petroleum Hydrocarbons	TPH (as Gasoline)	mg/kg	–	–	–	–	–	–	–	–	–
	TPH (as Diesel)	mg/kg	–	–	–	–	–	–	–	–	–
	Oil/Grease	mg/kg	–	–	–	–	–	–	–	–	–

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 10 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect^{a}	Industrial PRG^{c}	PRG Basis	Secondary Industrial PRG^{c}	Count of Detects > PRG	SSL (DAF = 1)^{c}	Count of Detects > SSL (1)	SSL (DAF = 20)^{c}	Count of Detects > SSL (20)
Radionuclides	Radium-226	pCi/g	1.48	0.026	ca	--	64	--	--	--	--
	Radium-228	pCi/g	2.13	0.15	ca	--	64	--	--	--	--
	Thorium-228	pci/g	2.17	0.26	ca	--	63	--	--	--	--
	Thorium-230	pci/g	2.03	20	ca	--	0	--	--	--	--
	Thorium-232	pci/g	2.36	19	ca	--	0	--	--	--	--
	Uranium-233/234	pci/g	2.31	32	ca	--	0	--	--	--	--
	Uranium-235/236	pci/g	0.0509	0.40	ca	--	0	--	--	--	--
	Uranium-238	pci/g	1.26	1.8	ca	--	0	--	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	1,2-Diphenylhydrazine	ug/kg	--	2,150	ca	--	0	--	--	--	--
	1,4-Dioxane	ug/kg	--	>100,000	ca	--	0	--	--	--	--
	1-Nonanal	ug/kg	--	--	--	--	--	--	--	--	--
	2,2'-/4,4'-Dichlorobenzil	ug/kg	--	--	--	--	--	14	0	270	0
	2,4,5-Trichlorophenol	ug/kg	--	>100,000	nc	--	0	0.008	0	0.2	0
	2,4,6-Trichlorophenol	ug/kg	--	61,600	nc	>100,000	0	0.05	0	1	0
	2,4-Dichlorophenol	ug/kg	--	>100,000	nc	--	0	0.4	0	9	0
	2,4-Dimethylphenol	ug/kg	--	>100,000	nc	--	0	0.01	0	0.3	0
	2,4-Dinitrophenol	ug/kg	--	>100,000	nc	--	0	4E-05	0	0.0008	0
	2,4-Dinitrotoluene	ug/kg	--	>100,000	nc	--	0	0.00003	0	0.0007	0
	2,6-Dinitrotoluene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	2-Chloronaphthalene	ug/kg	--	>100,000	nc	--	0	0.2	0	4	0
	2-Chlorophenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	2-Methylnaphthalene	ug/kg	--	--	--	--	--	--	--	--	--
	2-Nitroaniline	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	2-Nitrophenol	ug/kg	--	--	--	--	--	0.0003	0	0.007	0
	3,3'-Dichlorobenzidine	ug/kg	--	3,830	ca	--	0	--	--	--	--
	3-Methylphenol & 4-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--
	3-Nitroaniline	ug/kg	--	82,100	ca	>100,000	0	--	--	--	--
	4-Bromophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chloro-3-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--
	4-Nitrophenol	ug/kg	--	--	--	--	--	29	0	570	0
	Acenaphthene	ug/kg	1,000	>100,000	nc	--	0	--	--	--	--
	Acenaphthylene	ug/kg	--	--	--	--	--	--	--	--	--
	Acetophenone	ug/kg	--	--	--	--	--	--	--	--	--
	Aniline	ug/kg	--	>100,000	ca	>100,000	0	590	0	12000	0
	Anthracene	ug/kg	--	>100,000	ca	--	0	--	--	--	--
	Azobenzene	ug/kg	--	15,700	ca	--	0	--	--	--	--
	Benzenethiol	ug/kg	--	--	--	--	--	0.08	0	2	0
	Benzo(a)anthracene	ug/kg	55	2,110	ca	--	0	0.4	0	8	0
	Benzo(a)pyrene	ug/kg	19	211	ca	--	0	0.2	0	5	0

TABLE 1
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TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 11 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect^{a}	Industrial PRG^{c}	PRG Basis	Secondary Industrial PRG^{c}	Count of Detects > PRG	SSL (DAF = 1)^{c}	Count of Detects > SSL (1)	SSL (DAF = 20)^{c}	Count of Detects > SSL (20)
SVOCs	Benzo(b)fluoranthene	ug/kg	21	2,110	ca	--	0	--	--	--	--
	Benzo(g,h,i)perylene	ug/kg	--	--	--	--	--	2	0	49	0
	Benzo(k)fluoranthene	ug/kg	--	21,100	ca	--	0	20	0	400	0
	Benzoic acid	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Benzyl alcohol	ug/kg	--	>100,000	nc	--	0	810	0	930	0
	Benzyl butyl phthalate	ug/kg	420	>100,000	nc	--	0	--	--	--	--
	bis(2-Chloroethoxy) methane	ug/kg	--	--	--	--	--	0.00002	0	0.0004	0
	bis(2-Chloroethyl) ether	ug/kg	--	575	ca	--	0	--	--	--	--
	bis(2-Chloroisopropyl) ether	ug/kg	--	7,350	ca	>100,000	0	--	--	--	--
	bis(2-Ethylhexyl) phthalate	ug/kg	140	>100,000	ca	>100,000	0	--	--	--	--
	bis(p-Chlorophenyl) disulfide	ug/kg	--	--	--	--	--	--	--	--	--
	bis(p-Chlorophenyl) sulfone	ug/kg	--	>100,000	nc	--	0	0	0	0.6	0
	Carbazole	ug/kg	--	86,200	ca	--	0	8	0	160	0
	Chrysene	ug/kg	24	>100,000	ca	--	0	0.08	0	2	0
	Dibenzo(a,h)anthracene	ug/kg	--	211	ca	--	0	--	--	--	--
	Dibenzofuran	ug/kg	--	>100,000	nc	--	0	270	0	2300	0
	Dibutyl phthalate	ug/kg	50	>100,000	nc	--	0	--	--	--	--
	Diethyl phthalate	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Dimethyl phthalate	ug/kg	--	>100,000	nc	--	0	10000	0	10000	0
	Di-n-octyl phthalate	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Diphenyl sulfone	ug/kg	--	>100,000	nc	--	0	210	0	4300	0
	Fluoranthene	ug/kg	--	>100,000	nc	--	0	28	0	560	0
	Fluorene	ug/kg	--	>100,000	nc	--	0	0.1	0	2	0
	Hexachlorobenzene	ug/kg	49	1,080	ca	>100,000	0	20	0	400	0
	Hexachlorocyclopentadiene	ug/kg	--	>100,000	nc	--	0	0.02	0	0.5	0
	Hydroxymethyl phthalimide	ug/kg	--	--	--	--	--	0.7	0	14	0
	Indeno(1,2,3-cd)pyrene	ug/kg	--	2,110	ca	--	0	0.03	0	0.5	0
	Isophorone	ug/kg	--	>100,000	ca	>100,000	0	4	0	84	0
	Naphthalene	ug/kg	--	>100,000	nc	--	0	0.007	0	0.1	0
	Nitrobenzene	ug/kg	--	>100,000	nc	--	0	0.000002	0	0.00005	0
	N-nitrosodi-n-propylamine	ug/kg	--	246	ca	--	0	0.06	0	1	0
	N-nitrosodiphenylamine	ug/kg	--	>100,000	ca	>100,000	0	0.8	0	15	0
	o-Cresol	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Octachlorostyrene	ug/kg	41	--	--	--	--	0.03	0	0.7	0
	p-Chloroaniline	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	p-Chlorothiophenol	ug/kg	--	--	--	--	--	--	--	--	--
	Pentachlorobenzene	ug/kg	--	>100,000	nc	--	0	0.001	0	0.03	0
	Pentachlorophenol	ug/kg	--	9,000	ca	>100,000	0	--	--	--	--
	Phenanthrene	ug/kg	--	--	--	--	--	5	0	100	0
	Phenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Phenyl Disulfide	ug/kg	--	--	--	--	--	--	--	--	--

TABLE 1
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TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 12 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	SSL (DAF = 1)[c]	Count of Detects > SSL (1)	SSL (DAF = 20)[c]	Count of Detects > SSL (20)
SVOCs	Phenyl Sulfide	ug/kg	--	--	--	--	--	--	--	--	--
	Phthalic acid	ug/kg	--	--	--	--	--	--	--	--	--
	p-Nitroaniline	ug/kg	--	82,100	ca	>100,000	0	210	0	4200	0
	Pyrene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Pyridine	ug/kg	--	>100,000	nc	--	0	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	--	7,280	ca	>100,000	0	0.1	0	2	0
	1,1,1-Trichloroethane	ug/kg	--	>100,000	nc	--	0	0.0002	0	0.003	0
	1,1,2,2-Tetrachloroethane	ug/kg	--	929	ca	>100,000	0	0.0009	0	0.02	0
	1,1,2-Trichloroethane	ug/kg	--	1,610	ca	>100,000	0	1	0	23	0
	1,1-Dichloroethane	ug/kg	--	>100,000	nc	--	0	0.003	0	0.06	0
	1,1-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	1,1-Dichloropropene	ug/kg	--	--	--	--	--	--	--	--	--
	1,2,3-Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--
	1,2,3-Trichloropropane	ug/kg	--	76	ca	79,000	0	0.3	0	5	0
	1,2,4-Trichlorobenzene	ug/kg	0.9	>100,000	nc	--	0	--	--	--	--
	1,2,4-Trimethylbenzene	ug/kg	0.57	>100,000	nc	--	0	--	--	--	--
	1,2-Dibromo-3-chloropropane	ug/kg	--	2,020	ca	11,000	0	0.9	0	17	0
	1,2-Dichlorobenzene	ug/kg	--	>100,000	nc	--	0	0.001	0	0.02	0
	1,2-Dichloroethane	ug/kg	--	603	ca	28,000	0	--	--	--	--
	1,2-Dichloroethylene	ug/kg	--	--	--	--	--	0.001	0	0.03	0
	1,2-Dichloropropane	ug/kg	--	742	ca	21,000	0	--	--	--	--
	1,3,5- Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--
	1,3,5-Trimethylbenzene	ug/kg	--	69,700	nc	--	0	--	--	--	--
	1,3-Dichlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	1,3-Dichloropropane	ug/kg	--	>100,000	nc	--	0	0.1	0	2	0
	1,4-Dichlorobenzene	ug/kg	--	7,870	ca	>100,000	0	--	--	--	--
	2,2,3-Trimethylbutane	ug/kg	--	--	--	--	--	--	--	--	--
	2,2-Dichloropropane	ug/kg	--	--	--	--	--	--	--	--	--
	2,2-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2,3-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2,4-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2-Chlorotoluene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	2-Nitropropane	ug/kg	--	--	--	--	--	--	--	--	--
	2-Phenylbutane	ug/kg	--	--	--	--	--	--	--	--	--
	3,3-dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	3-ethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	3-Methylhexane	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorothioanisole	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorotoluene	ug/kg	--	--	--	--	--	0.8	0	16	0
	Acetone	ug/kg	16	>100,000	nc	--	0	--	--	--	--
	Acetonitrile	ug/kg	--	>100,000	nc	--	0	0.002	0	0.03	0

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CLARK COUNTY, NEVADA
(Page 13 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	SSL (DAF = 1)[c]	Count of Detects > SSL (1)	SSL (DAF = 20)[c]	Count of Detects > SSL (20)
VOCs	Benzene	ug/kg	--	1,410	ca	>100,000	0	--	--	--	--
	Bromobenzene	ug/kg	--	92,200	nc	--	0	0.03	0	0.6	0
	Bromodichloromethane	ug/kg	--	1,830	ca	>100,000	0	0.01	0	0.2	0
	Bromomethane	ug/kg	--	13,100	nc	--	0	2	0	32	0
	Carbon disulfide	ug/kg	--	>100,000	nc	--	0	0.003	0	0.07	0
	Carbon tetrachloride	ug/kg	--	549	ca	7,300	0	--	--	--	--
	Freon 11	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Freon 12	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Freon 113	ug/kg	--	>100,000	nc	--	0	0.07	0	1	0
	Chlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Chlorobromomethane	ug/kg	--	--	--	--	--	0.02	0	0.4	0
	Chlorodibromomethane	ug/kg	--	2,550	ca	>100,000	0	--	--	--	--
	Chloroethane	ug/kg	--	6,490	ca	>100,000	0	0.03	0	0.6	0
	Chloroform	ug/kg	--	470	ca	>100,000	0	--	--	--	--
	Chloromethane	ug/kg	--	>100,000	nc	--	0	0.02	0	0.4	0
	cis-1,2-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	0.0002	0	0.004	0
	cis-1,3-Dichloropropylene	ug/kg	--	--	--	--	--	--	--	--	--
	Cymene	ug/kg	--	--	--	--	--	--	--	--	--
	Dibromomethane	ug/kg	--	>100,000	nc	--	0	0.001	0	0.02	0
	Dichloromethane	ug/kg	--	20,500	ca	>100,000	0	0.7	0	13	0
	Ethylbenzene	ug/kg	0.24	>100,000	nc	--	0	--	--	--	--
	Hexachloro-1,3-butadiene	ug/kg	--	22,100	ca	>100,000	0	0.1	0	2	0
	Hexachloroethane	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--
	Hexane, 2-methyl-	ug/kg	--	--	--	--	--	--	--	--	--
	Isopropylbenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	m,p-Xylene	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl disulfide	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl ethyl ketone	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Methyl iodide	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl isobutyl ketone	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	Methyl n-butyl ketone	ug/kg	--	--	--	--	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	ug/kg	--	70,000	ca	>100,000	0	--	--	--	--
	n-Butyl benzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	n-Heptane	ug/kg	--	--	--	--	--	--	--	--	--
	n-Propyl benzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	o-Xylene	ug/kg	--	--	--	--	--	0.2	0	4	0
	Styrene (monomer)	ug/kg	--	>100,000	nc	--	0	--	--	--	--
	tert-Butyl benzene	ug/kg	--	>100,000	nc	--	0	0.003	0	0.06	0
	Tetrachloroethylene	ug/kg	--	1,310	ca	>100,000	0	0.6	0	12	0
	Toluene	ug/kg	0.65	>100,000	nc	--	0	0.03	0	0.7	0
	trans-1,2-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	0.0002	0	0.004	0

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 14 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	SSL (DAF = 1)[c]	Count of Detects > SSL (1)	SSL (DAF = 20)[c]	Count of Detects > SSL (20)
VOCs	trans-1,3-Dichloropropylene	ug/kg	–	–	–	–	–	0.04	0	0.8	0
	Tribromomethane	ug/kg	–	>100,000	ca	>100,000	0	0.003	0	0.1	0
	Trichloroethylene	ug/kg	–	115	ca	>100,000	0	8	0	170	0
	Vinyl acetate	ug/kg	–	>100,000	nc	–	0	0.0007	0	0.01	0
	Vinyl chloride	ug/kg	–	746	ca	>100,000	0	10	0	210	0
	Xylenes (total)	ug/kg	–	>100,000	nc	–	0	–	–	–	–

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.

b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.

c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs. Several chemicals have both cancer and non-cancer toxicity criteria. For these chemicals USEPA calculates PRGs for both cancer and non-cancer endpoints; however only the lower value is published in its PRG table. The other value is included in a separate spreadsheet table. This other value is shown on this table as the 'Secondary Industrial PRG' and is included in the screening-level risk assessment calculations.

d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).

e - Based on results of statistical comparison tests performed between shallow background and site datasets (see Table 2).

f - Non-cancer hazard indices were calculated by dividing the maximum detected value by its PRG (or secondary PRG). The total non-cancer hazard index is the sum of all chemical-specific hazard indices.

g - Theoretical upper-bound incremental lifetime cancer risks were calculated by were calculated by dividing the maximum detected value by its PRG (or secondary PRG) times 1E-6. The total incremental lifetime cancer risk is the sum of all chemical-specific cancer risks.

h - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).

i - Asbestos results shown are for long protocol structures (>10um).

j - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 15 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
Dioxins/Furans	TCDD TEF[h]	pg/g	472	--	--	--	1,000	ca	--	--	5 E-7
Asbestos[i]	Chrysotile	Structures	19	--	--	--	--	--	--	--	See Table 4
	Amphibole	Structures	--	--	--	--	--	--	--	--	
General Chemistry	Bromide	mg/kg	7.8	--	--	--	--	--	--	--	--
	Bromine	mg/kg	15.7	--	--	--	--	--	--	--	--
	Chlorate	mg/kg	17	--	--	--	--	--	--	--	--
	Chloride	mg/kg	2,210	1,110	9	--	--	--	--	--	--
	Chlorine	mg/kg	4,410	--	--	--	--	--	--	--	--
	Chlorite	ug/kg	--	--	--	--	--	--	--	--	--
	Fluoride	mg/kg	4.3	2.5	3	--	36,900	nc	--	0.00012	--
	Nitrate (as N)	mg/kg	229	102	1	--	--	--	--	--	--
	Nitrite (as N)	mg/kg	0.45	0.21	1	--	--	--	--	--	--
	Orthophosphate as P	mg/kg	2	--	--	--	--	--	--	--	--
	Perchlorate	ug/kg	41,600	--	--	--	>100,000	--	--	--	--
	Sulfate	mg/kg	8,870	4,130	1	--	--	--	--	--	--
Glycols/Alcohols	Ethanol	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Aluminum	mg/kg	9,750	15,300	0	No	>100,000	nc	--	--	--
	Antimony	mg/kg	0.42	0.5	0	No	409	nc	--	--	--
	Arsenic	mg/kg	5.8	7.2	0	No	1.6	ca	260	--	--
	Barium	mg/kg	269	836	0	No	66,600	nc	--	--	--
	Beryllium	mg/kg	0.65	0.89	0	No	1940	ca	--	--	--
	Boron	mg/kg	--	11.6	0	No	>100,000	nc	--	--	--
	Cadmium	mg/kg	0.59	0.13	22	Yes	451	nc	3,000	0.0013	2 E-10
	Calcium	mg/kg	75,300	82,800	0	No	--	--	--	--	--
	Chromium (Total)	mg/kg	17	16.7	1	Yes	448	nc	--	0.038	--
	Chromium (VI)	mg/kg	0.58	0.32	4	Yes	64	ca	2,500	0.00052	2 E-8
	Cobalt	mg/kg	7.5	16.3	0	No	1,920	ca	--	--	--
	Copper	mg/kg	31	30.5	1	No	40,900	nc	--	--	--
	Iron	mg/kg	17,200	19,700	0	No	>100,000	nc	--	--	--
	Lead	mg/kg	136	35.1	2	Yes	800	nc	--	0.17	--
	Lithium	mg/kg	22.6	26.5	0	No	20,400	nc	--	--	--
	Magnesium	mg/kg	13,600	17,500	0	No	--	--	--	--	--
	Manganese	mg/kg	668	1,090	0	No	19,500	nc	--	--	--
	Mercury	ug/kg	17.5	110	0	No	--	--	--	--	--
	Molybdenum	mg/kg	1.4	2.0	0	Yes	5,110	nc	--	0.00027	--
	Nickel	mg/kg	23.7	30	0	No	20,400	nc	--	--	--
	Niobium	mg/kg	2	2.8	0	Yes	--	--	--	--	--
	Palladium	mg/kg	1.2	1.5	0	No	--	--	--	--	--
	Phosphorus (as P)	mg/kg	1,510	2,010	0	No	--	nc	--	--	--
	Platinum	mg/kg	--	0.099	0	No	--	--	--	--	--
	Potassium	mg/kg	4,800	3,890	5	Yes	--	--	--	--	--

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 16 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
Metals	Selenium	mg/kg	--	0.60	0	No	5,110	nc	--	--	--
	Silicon	mg/kg	1,320	4,150	0	No	--	--	--	--	--
	Silver	mg/kg	0.82	0.26	1	No	5,110	nc	--	--	--
	Sodium	mg/kg	1,720	1,320	5	Yes	--	--	--	--	--
	Strontium	mg/kg	487	808	0	No	>100,000	nc	--	--	--
	Sulfur	mg/kg	5,980	--	--	--	--	--	--	--	--
	Thallium	mg/kg	--	1.8	0	No	68	nc	--	--	--
	Tin	mg/kg	1.5	0.80	4	Yes	>100,000	nc	--	0.000015	--
	Titanium	mg/kg	982	1,010	0	Yes	>100,000	nc	--	0.0098	--
	Tungsten	mg/kg	--	2.5	0	No	--	--	--	--	--
	Uranium	mg/kg	3.1	2.7	3	Yes	204	nc	--	0.015	--
	Vanadium	mg/kg	53.4	59.1	0	No	1,020	nc	--	--	--
	Zinc	mg/kg	211	121	2	No	>100,000	nc	--	--	--
	Zirconium	mg/kg	27.3	179	0	No	--	--	--	--	--
Organochlorine Pesticides	2,4-DDD	ug/kg	17	--	--	--	--	--	--	--	--
	2,4-DDE	ug/kg	150	--	--	--	--	--	--	--	--
	4,4-DDD	ug/kg	18	--	--	--	9,950	ca	--	--	2 E-9
	4,4-DDE	ug/kg	310	--	--	--	7,020	ca	--	--	4 E-8
	4,4-DDT	ug/kg	99	--	--	--	7,020	ca	>100,000	0.00099	1 E-8
	Aldrin	ug/kg	--	--	--	--	101	ca	19,000	--	--
	alpha-BHC	ug/kg	--	--	--	--	359	ca	>100,000	--	--
	alpha-Chlordane	ug/kg	--	--	--	--	--	--	--	--	--
	beta-BHC	ug/kg	190	--	--	--	1,260	ca	>100,000	0.0019	2 E-7
	Chlordane	ug/kg	--	--	--	--	--	--	--	--	--
	delta-BHC	ug/kg	--	--	--	--	--	--	--	--	--
	Dieldrin	ug/kg	--	--	--	--	108	ca	31,000	--	--
	Endosulfan I	ug/kg	--	--	--	--	--	--	--	--	--
	Endosulfan II	ug/kg	--	--	--	--	--	--	--	--	--
	Endosulfan sulfate	ug/kg	--	--	--	--	--	--	--	--	--
	Endrin	ug/kg	7	--	--	--	>100,000	nc	--	0.00019	--
	Endrin aldehyde	ug/kg	3.6	--	--	--	--	--	--	--	--
	Endrin ketone	ug/kg	--	--	--	--	--	--	--	--	--
	gamma-Chlordane	ug/kg	--	--	--	--	--	--	--	--	--
	Heptachlor	ug/kg	--	--	--	--	383	ca	>100,000	--	--
	Heptachlor epoxide	ug/kg	--	--	--	--	189	ca	8,000	--	--
	Lindane	ug/kg	--	--	--	--	1,740	ca	>100,000	--	--
	Methoxychlor	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Toxaphene	ug/kg	--	--	--	--	1,570	ca	--	--	--
Petroleum Hydrocarbons	TPH (as Gasoline)	mg/kg	--	--	--	--	--	--	--	--	--
	TPH (as Diesel)	mg/kg	--	--	--	--	--	--	--	--	--
	Oil/Grease	mg/kg	--	--	--	--	--	--	--	--	--

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 17 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
Radionuclides	Radium-226	pCi/g	1.48	2.36	0	No	0.026	ca	--	--	--
	Radium-228	pCi/g	2.13	2.94	0	No	0.15	ca	--	--	--
	Thorium-228	pci/g	2.17	2.28	0	No	0.26	ca	--	--	--
	Thorium-230	pci/g	2.03	3.01	0	No	20	ca	--	--	--
	Thorium-232	pci/g	2.36	2.23	1	No	19	ca	--	--	--
	Uranium-233/234	pci/g	2.31	2.84	0	No	32	ca	--	--	--
	Uranium-235/236	pci/g	0.0509	0.21	0	No	0.40	ca	--	--	--
	Uranium-238	pci/g	1.26	2.37	0	No	1.8	ca	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,2-Diphenylhydrazine	ug/kg	--	--	--	--	2,150	ca	--	--	--
	1,4-Dioxane	ug/kg	--	--	--	--	>100,000	ca	--	--	--
	1-Nonanal	ug/kg	--	--	--	--	--	--	--	--	--
	2,2'-/4,4'-Dichlorobenzil	ug/kg	--	--	--	--	--	--	--	--	--
	2,4,5-Trichlorophenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2,4,6-Trichlorophenol	ug/kg	--	--	--	--	61,600	nc	>100,000	--	--
	2,4-Dichlorophenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2,4-Dimethylphenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2,4-Dinitrophenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2,4-Dinitrotoluene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2,6-Dinitrotoluene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2-Chloronaphthalene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2-Chlorophenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2-Methylnaphthalene	ug/kg	--	--	--	--	--	--	--	--	--
	2-Nitroaniline	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2-Nitrophenol	ug/kg	--	--	--	--	--	--	--	--	--
	3,3'-Dichlorobenzidine	ug/kg	--	--	--	--	3,830	ca	--	--	--
	3-Methylphenol & 4-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--
	3-Nitroaniline	ug/kg	--	--	--	--	82,100	ca	>100,000	--	--
	4-Bromophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chloro-3-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--
	4-Nitrophenol	ug/kg	--	--	--	--	--	--	--	--	--
	Acenaphthene	ug/kg	1,000	--	--	--	>100,000	nc	--	0.01	--
	Acenaphthylene	ug/kg	--	--	--	--	--	--	--	--	--
	Acetophenone	ug/kg	--	--	--	--	--	--	--	--	--
	Aniline	ug/kg	--	--	--	--	>100,000	ca	>100,000	--	--
	Anthracene	ug/kg	--	--	--	--	>100,000	ca	--	--	--
	Azobenzene	ug/kg	--	--	--	--	15,700	ca	--	--	--
	Benzenethiol	ug/kg	--	--	--	--	--	--	--	--	--
	Benzo(a)anthracene	ug/kg	55	--	--	--	2,110	ca	--	--	3 E-8
	Benzo(a)pyrene	ug/kg	19	--	--	--	211	ca	--	--	9 E-8

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 18 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect^a	Max. Bkgrd^d	Count of Detects > Bkgrd	Above Bkgrd?^{e}	Industrial PRG^c	PRG Basis	Secondary Industrial PRG^c	Non-Cancer Hazard Index^f	Incremental Lifetime Cancer Risk^g
SVOCs	Benzo(b)fluoranthene	ug/kg	21	--	--	--	2,110	ca	--	--	1 E-8
	Benzo(g,h,i)perylene	ug/kg	--	--	--	--	--	--	--	--	--
	Benzo(k)fluoranthene	ug/kg	--	--	--	--	21,100	ca	--	--	--
	Benzoic acid	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Benzyl alcohol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Benzyl butyl phthalate	ug/kg	420	--	--	--	>100,000	nc	--	0.0042	--
	bis(2-Chloroethoxy) methane	ug/kg	--	--	--	--	--	--	--	--	--
	bis(2-Chloroethyl) ether	ug/kg	--	--	--	--	575	ca	--	--	--
	bis(2-Chloroisopropyl) ether	ug/kg	--	--	--	--	7,350	ca	>100,000	--	--
	bis(2-Ethylhexyl) phthalate	ug/kg	140	--	--	--	>100,000	ca	>100,000	0.0041	4 E-9
	bis(p-Chlorophenyl) disulfide	ug/kg	--	--	--	--	--	--	--	--	--
	bis(p-Chlorophenyl) sulfone	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Carbazole	ug/kg	--	--	--	--	86,200	ca	--	--	--
	Chrysene	ug/kg	24	--	--	--	>100,000	ca	--	--	2 E-10
	Dibenzo(a,h)anthracene	ug/kg	--	--	--	--	211	ca	--	--	--
	Dibenzofuran	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Dibutyl phthalate	ug/kg	50	--	--	--	>100,000	nc	--	0.0041	--
	Diethyl phthalate	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Dimethyl phthalate	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Di-n-octyl phthalate	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Diphenyl sulfone	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Fluoranthene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Fluorene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Hexachlorobenzene	ug/kg	49	--	--	--	1,080	ca	>100,000	0.0041	4 E-7
	Hexachlorocyclopentadiene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Hydroxymethyl phthalimide	ug/kg	--	--	--	--	--	--	--	--	--
	Indeno(1,2,3-cd)pyrene	ug/kg	--	--	--	--	2,110	ca	--	--	--
	Isophorone	ug/kg	--	--	--	--	>100,000	ca	>100,000	--	--
	Naphthalene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Nitrobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	N-nitrosodi-n-propylamine	ug/kg	--	--	--	--	246	ca	--	--	--
	N-nitrosodiphenylamine	ug/kg	--	--	--	--	>100,000	ca	>100,000	--	--
	o-Cresol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Octachlorostyrene	ug/kg	41	--	--	--	--	--	--	--	--
	p-Chloroaniline	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	p-Chlorothiophenol	ug/kg	--	--	--	--	--	--	--	--	--
	Pentachlorobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Pentachlorophenol	ug/kg	--	--	--	--	9,000	ca	>100,000	--	--
	Phenanthrene	ug/kg	--	--	--	--	--	--	--	--	--
	Phenol	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Phenyl Disulfide	ug/kg	--	--	--	--	--	--	--	--	--

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 19 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect^a	Max. Bkgrd^d	Count of Detects > Bkgrd	Above Bkgrd?^{e}	Industrial PRG^c	PRG Basis	Secondary Industrial PRG^c	Non-Cancer Hazard Index^f	Incremental Lifetime Cancer Risk^g
SVOCs	Phenyl Sulfide	ug/kg	--	--	--	--	--	--	--	--	--
	Phthalic acid	ug/kg	--	--	--	--	--	--	--	--	--
	p-Nitroaniline	ug/kg	--	--	--	--	82,100	ca	>100,000	--	--
	Pyrene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Pyridine	ug/kg	--	--	--	--	>100,000	nc	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	--	--	--	--	7,280	ca	>100,000	--	--
	1,1,1-Trichloroethane	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,1,2,2-Tetrachloroethane	ug/kg	--	--	--	--	929	ca	>100,000	--	--
	1,1,2-Trichloroethane	ug/kg	--	--	--	--	1,610	ca	>100,000	--	--
	1,1-Dichloroethane	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,1-Dichloroethylene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,1-Dichloropropene	ug/kg	--	--	--	--	--	--	--	--	--
	1,2,3-Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--
	1,2,3-Trichloropropane	ug/kg	--	--	--	--	76	ca	79,000	--	--
	1,2,4-Trichlorobenzene	ug/kg	0.9	--	--	--	>100,000	nc	--	0.000063	--
	1,2,4-Trimethylbenzene	ug/kg	0.57	--	--	--	>100,000	nc	--	0.000063	--
	1,2-Dibromo-3-chloropropane	ug/kg	--	--	--	--	2,020	ca	11,000	--	--
	1,2-Dichlorobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,2-Dichloroethane	ug/kg	--	--	--	--	603	ca	28,000	--	--
	1,2-Dichloroethylene	ug/kg	--	--	--	--	--	--	--	--	--
	1,2-Dichloropropane	ug/kg	--	--	--	--	742	ca	21,000	--	--
	1,3,5- Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--
	1,3,5-Trimethylbenzene	ug/kg	--	--	--	--	69,700	nc	--	--	--
	1,3-Dichlorobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,3-Dichloropropane	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	1,4-Dichlorobenzene	ug/kg	--	--	--	--	7,870	ca	>100,000	--	--
	2,2,3-Trimethylbutane	ug/kg	--	--	--	--	--	--	--	--	--
	2,2-Dichloropropane	ug/kg	--	--	--	--	--	--	--	--	--
	2,2-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2,3-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2,4-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	2-Chlorotoluene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	2-Nitropropane	ug/kg	--	--	--	--	--	--	--	--	--
	2-Phenylbutane	ug/kg	--	--	--	--	--	--	--	--	--
	3,3-dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	3-ethylpentane	ug/kg	--	--	--	--	--	--	--	--	--
	3-Methylhexane	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorothioanisole	ug/kg	--	--	--	--	--	--	--	--	--
	4-Chlorotoluene	ug/kg	--	--	--	--	--	--	--	--	--
	Acetone	ug/kg	16	--	--	--	>100,000	nc	--	0.00025	--
	Acetonitrile	ug/kg	--	--	--	--	>100,000	nc	--	--	--

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 20 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
VOCs	Benzene	ug/kg	--	--	--	--	1,410	ca	>100,000	--	--
	Bromobenzene	ug/kg	--	--	--	--	92,200	nc	--	--	--
	Bromodichloromethane	ug/kg	--	--	--	--	1,830	ca	>100,000	--	--
	Bromomethane	ug/kg	--	--	--	--	13,100	nc	--	--	--
	Carbon disulfide	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Carbon tetrachloride	ug/kg	--	--	--	--	549	ca	7,300	--	--
	Freon 11	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Freon 12	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Freon 113	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Chlorobenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Chlorobromomethane	ug/kg	--	--	--	--	--	--	--	--	--
	Chlorodibromomethane	ug/kg	--	--	--	--	2,550	ca	>100,000	--	--
	Chloroethane	ug/kg	--	--	--	--	6,490	ca	>100,000	--	--
	Chloroform	ug/kg	--	--	--	--	470	ca	>100,000	--	--
	Chloromethane	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	cis-1,2-Dichloroethylene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	cis-1,3-Dichloropropylene	ug/kg	--	--	--	--	--	--	--	--	--
	Cymene	ug/kg	--	--	--	--	--	--	--	--	--
	Dibromomethane	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Dichloromethane	ug/kg	--	--	--	--	20,500	ca	>100,000	--	--
	Ethylbenzene	ug/kg	0.24	--	--	--	>100,000	nc	--	0.000063	--
	Hexachloro-1,3-butadiene	ug/kg	--	--	--	--	22,100	ca	>100,000	--	--
	Hexachloroethane	ug/kg	--	--	--	--	>100,000	ca	>100,000	--	--
	Hexane, 2-methyl-	ug/kg	--	--	--	--	--	--	--	--	--
	Isopropylbenzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	m,p-Xylene	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl disulfide	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl ethyl ketone	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Methyl iodide	ug/kg	--	--	--	--	--	--	--	--	--
	Methyl isobutyl ketone	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Methyl n-butyl ketone	ug/kg	--	--	--	--	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	ug/kg	--	--	--	--	70,000	ca	>100,000	--	--
	n-Butyl benzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	n-Heptane	ug/kg	--	--	--	--	--	--	--	--	--
	n-Propyl benzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	o-Xylene	ug/kg	--	--	--	--	--	--	--	--	--
	Styrene (monomer)	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	tert-Butyl benzene	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Tetrachloroethylene	ug/kg	--	--	--	--	1,310	ca	>100,000	--	--
	Toluene	ug/kg	0.65	--	--	--	>100,000	nc	--	0.000063	--
	trans-1,2-Dichloroethylene	ug/kg	--	--	--	--	>100,000	nc	--	--	--

TABLE 1
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 21 of 21)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
VOCs	trans-1,3-Dichloropropylene	ug/kg	--	--	--	--	--	--	--	--	--
	Tribromomethane	ug/kg	--	--	--	--	>100,000	ca	>100,000	--	--
	Trichloroethylene	ug/kg	--	--	--	--	115	ca	>100,000	--	--
	Vinyl acetate	ug/kg	--	--	--	--	>100,000	nc	--	--	--
	Vinyl chloride	ug/kg	--	--	--	--	746	ca	>100,000	--	--
	Xylenes (total)	ug/kg	--	--	--	--	>100,000	nc	--	--	--
						Total Non-Cancer Hazard Index:				0.27	
						Total Incremental Lifetime Cancer Risk:					1 E-6

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.
b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.
c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs. Several chemicals have both cancer and non-cancer toxicity criteria. For these chemicals USEPA calculates PRGs for both cancer and non-cancer endpoints; however only the lower value is published in its PRG table. The other value is included in a separate spreadsheet table. This other value is shown on this table as the 'Secondary Industrial PRG' and is included in the screening-level risk assessment calculations.
d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).
e - Based on results of statistical comparison tests performed between shallow background and site datasets (see Table 2).
f - Non-cancer hazard indices were calculated by dividing the maximum detected value by its PRG (or secondary PRG). The total non-cancer hazard index is the sum of all chemical-specific hazard indices.
g - Theoretical upper-bound incremental lifetime cancer risks were calculated by were calculated by dividing the maximum detected value by its PRG (or secondary PRG) times 1E-6. The total incremental lifetime cancer risk is the sum of all chemical-specific cancer risks.
h - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).
i - Asbestos results shown are for long protocol structures (>10um).
j - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 11, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Response to Nevada Division of Environmental Protection (NDEP) Comments to the Revised Work Plan to Evaluate Effective Groundwater Capture at Tronox LLC, Henderson, Nevada
Dated November 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's response to comments identified above and finds that the document is acceptable with the following exceptions noted for the administrative record: (Please note that nothing further is required by the NDEP for this Deliverable.)

- General comment, the NDEP recognizes that the new wells PC-134 and PC-135 are located within the highest concentration area. The NDEP believes that providing monitor wells at this one location on the western lobe of the paleochannel will provide the minimum amount of data to demonstrate inward flow. Please note that after collecting and analyzing the data from this location, TRX may find it necessary to install an alluvial well to the west of PC-134 to provide more data for gradient mapping and groundwater elevation contouring for the western lobe of the paleochannel and/or to the east of PC-136 for the eastern lobe of the paleochannel.
- TRX Response to NDEP comment #3, please note that the NDEP's comment requested information on the type of hydraulic testing that TRX was proposing and was not specific to vertical hydraulic conductivity.
- TRX response to NDEP comment #8.c, the NDEP does acknowledge their June 26, 2007 comment that "overlapping cones of depression can be a line of evidence" for demonstrating groundwater capture. However, the June 26, 2007 comment also stated that "The capture zone and cone of depression will only be the same if background hydraulic gradient is zero." Also, the NDEP did not state that overlapping cones equate to capture in the June 26, 2007 comments. Given the current data set at Athens Rd Well Field; the drawdown data indicate capture while more importantly the groundwater elevation maps do not have closed contours indicating inward flow from down gradient. Please note that TRX has drawn the contour map

for the eastern lobe of the channel to show a closed contour but the elevation data on the map do not support that interpretation.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110
Paul Hackenberry, Hackenberry Associates, LLC, 550 W. Plumb Lane B425, Reno, Nevada 89509
Brian Giroux, McGinley and Associates, 425 Maestro Drive, Suite 202, Reno, NV 89511

Shannon Harbour

From: Brian Rakvica
Sent: Monday, December 10, 2007 10:19 AM
To: Shannon Harbour
Subject: FW: Tronox Capture Evaluation Work Plan Implementation

---

From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Monday, December 10, 2007 10:19 AM
To: Wilkinson, Craig
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; Brian Rakvica; Alford, Michael; Reed, Tom
Subject: RE: Tronox Capture Evaluation Work Plan Implementation

Craig,
This is good news. When do you think we might get a copy for review? I'm pressing only because we are poised for the work. Please let me know? Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

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From: Wilkinson, Craig [mailto:Craig.Wilkinson@TIMET.com]
Sent: Monday, December 10, 2007 9:02 AM
To: Crowley, Susan
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; brakvica@ndep.nv.gov; Alford, Michael; Reed, Tom
Subject: RE: Tronox Capture Evaluation Work Plan Implementation

Received approval to move forward with the two wells. I plan to take the current Tronox/TIMET Access Agreement modify it to include locations, security, etc. and forward to you for review.

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Craig Wilkinson
Email: Craig.Wilkinson@TIMET.com

-----Original Message-----
From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Sunday, December 09, 2007 7:22 PM
To: Wilkinson, Craig
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; brakvica@ndep.nv.gov; Alford, Michael; Reed, Tom
Subject: RE: Tronox Capture Evaluation Work Plan Implementation

Craig,
Is there any update on the site access agreement for Tronox to drill several borings/wells on the western boundary of Timet's property? Would it help if we provided a draft document? Please let me know? Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

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From: Wilkinson, Craig [mailto:Craig.Wilkinson@TIMET.com]
Sent: Wednesday, November 28, 2007 7:31 AM
To: Crowley, Susan
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; brakvica@ndep.nv.gov; Alford, Michael; Reed, Tom
Subject: RE: Tronox Capture Evaluation Work Plan Implementation

I have forward your request to Dallas and will follow-up later this week.

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Craig Wilkinson
Email: Craig.Wilkinson@TIMET.com

> -----Original Message-----
> **From:** Crowley, Susan [mailto:Susan.Crowley@tronox.com]
> **Sent:** Tuesday, November 20, 2007 11:56 AM
> **To:** Wilkinson, Craig
> **Cc:** Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; brakvica@ndep.nv.gov; Alford, Michael; Reed, Tom
> **Subject:** Tronox Capture Evaluation Work Plan Implementation

Craig,
From recent transmittals to you (from both Tronox and NDEP) you've seen that Tronox is embarking on an evaluation of it's several groundwater capture zones. The evaluation of the on-site capture wells' performance includes a review of the eastern end of our on-site well field, which extends us onto Timet property. The Work Plan includes installation of two groundwater wells on Timet's side of the property fence line. I've included a rough sketch for your convenience - so that you don't need to track down the information in our Work Plan.

I expect Tronox will need an access agreement with Timet for entry to drill these groundwater wells - do you already have language you've used with others in the complex? Please let me know. Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

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AREA "A"

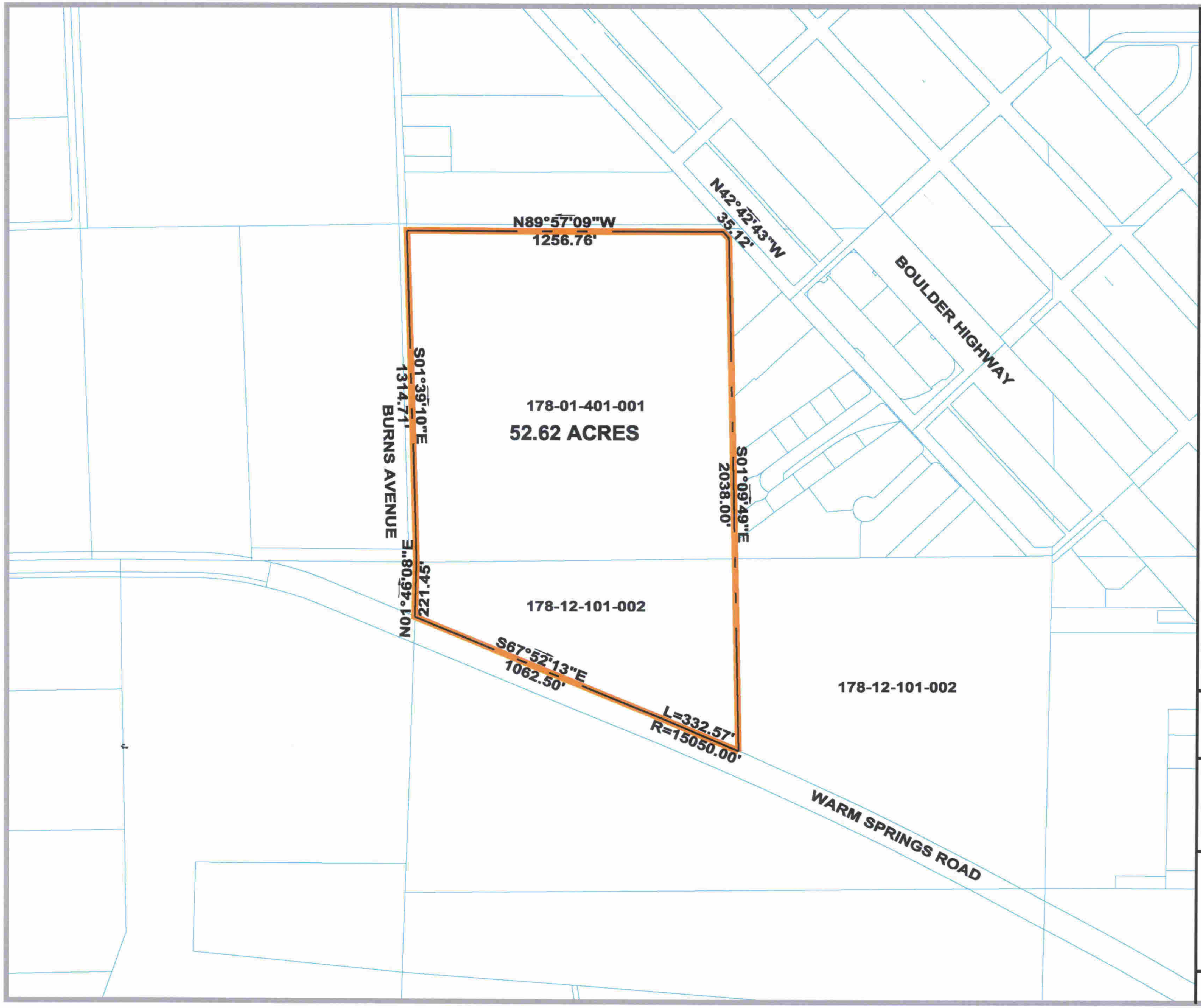
A PORTION OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 1 AND A PORTION OF THE NORTH HALF (N 1/2) OF SECTION 12 OF TOWNSHIP 22 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, DESCRIBED AS FOLLOWS.

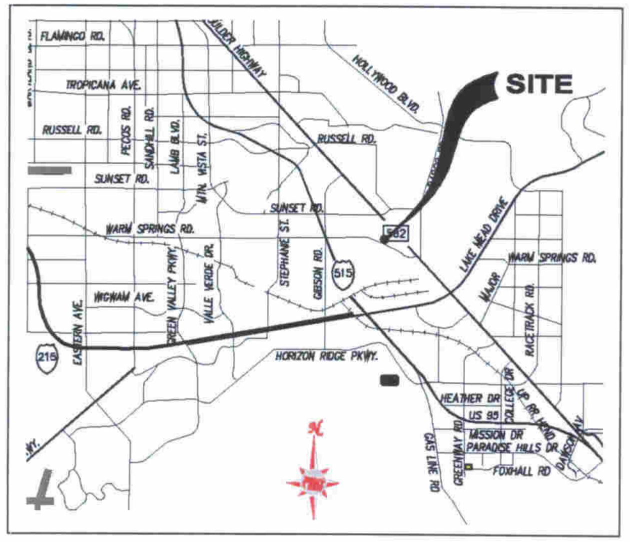
BEGINNING AT THE SOUTHWEST CORNER OF SAID SECTION 1; THENCE NORTH 01°39'10" WEST, ALONG THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SAID SECTION 1, A DISTANCE OF 1314.71 FEET TO THE NORTH LINE OF SAID SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4); THENCE SOUTH 89°57'09" EAST, DEPARTING SAID WEST LINE AND ALONG SAID NORTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4), 1256.76 FEET; THENCE SOUTH 42°42'43" EAST, DEPARTING SAID NORTH LINE, 35.12 FEET TO THE EAST LINE OF SAID SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4); THENCE SOUTH 01°09'49" EAST, 2038.00 FEET TO THE NORTHERLY RIGHT-OF-WAY OF WARM SPRINGS ROAD, SAME BEING THE BEGINNING OF A NON-TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 15050.00 FEET, A RADIAL LINE TO SAID BEGINNING BEARS NORTH 23°23'45" EAST; THENCE ALONG SAID NORTHERLY RIGHT-OF-WAY AND ALONG SAID CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 01°15'58", AN ARC LENGTH OF 332.57 FEET; THENCE NORTH 67°52'13" WEST, 1062.50 FEET TO THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SAID SECTION 12; THENCE NORTH 01°46'08" EAST, DEPARTING SAID RIGHT-OF-WAY AND ALONG SAID WEST LINE, 221.45 FEET TO **THE POINT OF BEGINNING.**

CONTAINING 2,292,314 SQUARE FEET (52.62 ACRES) MORE OR LESS, AS DETERMINED BY COMPUTER METHODS.

BASIS OF BEARINGS:
NORTH 89°00'41" EAST - BEING THE NORTH
LINE OF THE NORTHWEST QUARTER
(NW 1/4) OF SECTION 11, TOWNSHIP 22
SOUTH, RANGE 62 EAST, M.D.M., CLARK
COUNTY, NEVADA AS SHOWN BY A MAP
ON FILE IN THE OFFICE OF THE CLARK
COUNTY RECORDER IN BOOK 82, PAGE 71
OF PLATS, OFFICIAL RECORDS.

C:\Documents and Settings\10575\Desktop\511651-NORTHGATE-52.62.doc
Last saved by th11699
12/6/2007





VICINITY MAP

N.T.S.

LEGEND

▬ PROPERTY LINE

— ASSESSORS PARCEL LINES

SCALE: 1"=400'

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LANDWELL
TRONOX FIGURE "A"

APN: 178-01-401-001 & A PORTION OF 178-12-101-002

GROSS ACREAGE: 52.62 AC

SHEET 1 OF 1 DATE: 05/31/07 PROJECT NUMBER 511729.53 0100

H:\Projects\1729\Exhibits\Misc Landwell Exhibits\Marketing Exhibits\Landwell-Tronox-Figure A xbt.dwg Layout: 11x17 May 31, 2007 - 4:55pm

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LEGAL DESCRIPTION
FOR TRONOX AREA "B"

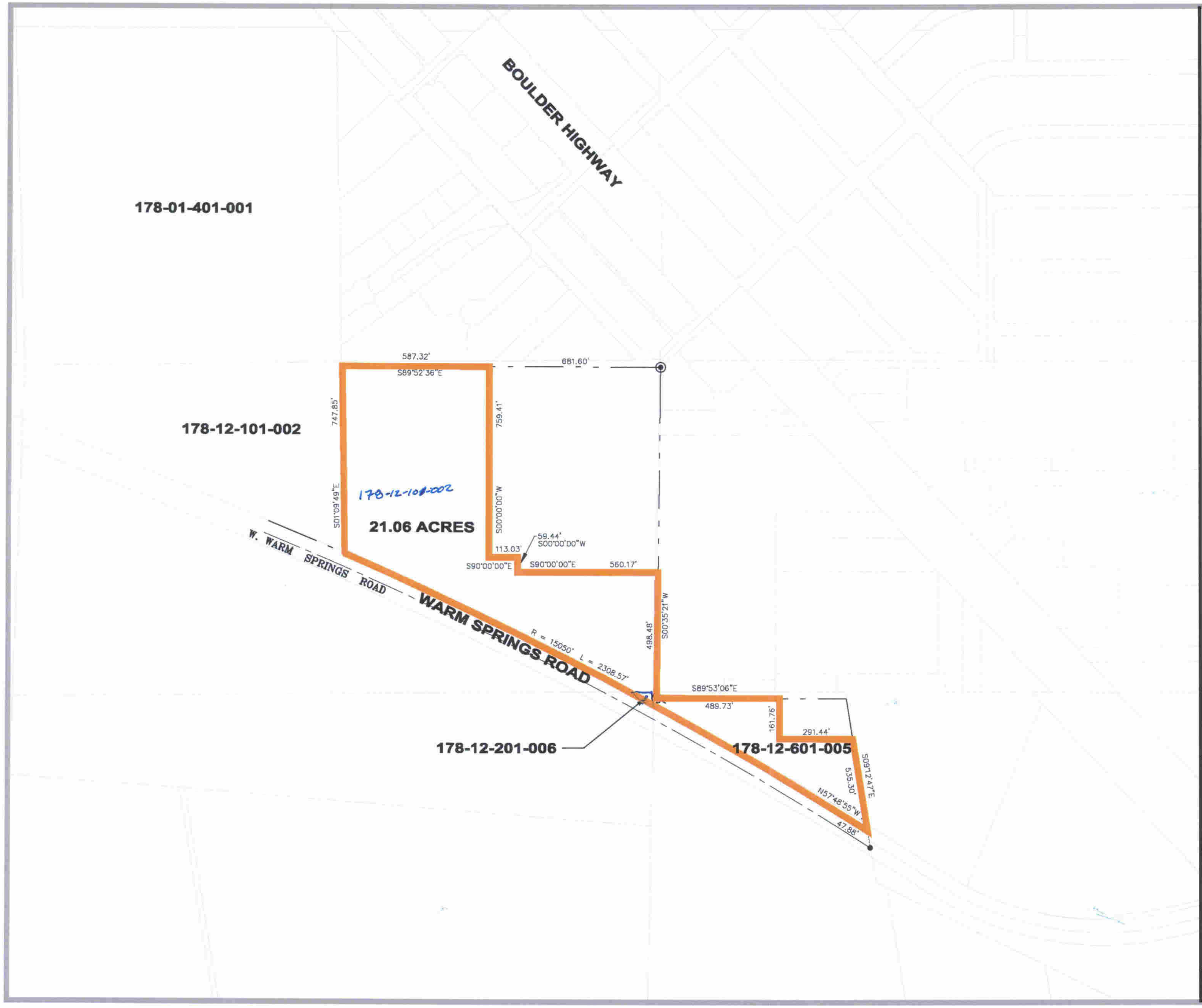
A PORTION OF SECTION 12, TOWNSHIP 22 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

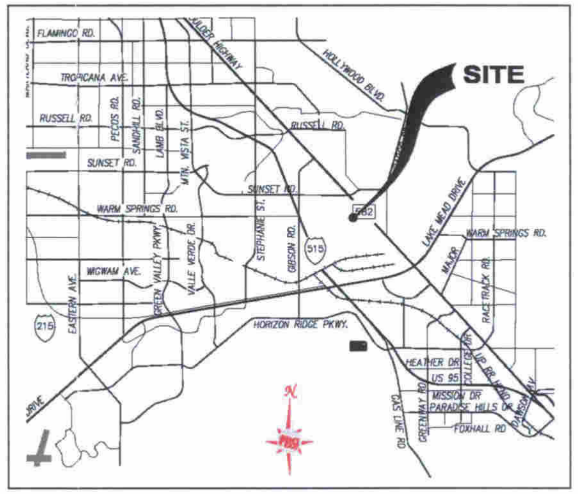
COMMENCING AT THE NORTHEAST CORNER OF THE NORTHWEST QUARTER (NW 1/4) OF SAID SECTION 12; THENCE NORTH 89°52'36" WEST, ALONG THE NORTH LINE THEREOF, 681.60 FEET TO **THE POINT OF BEGINNING**; THENCE SOUTH 00°00'00" WEST, DEPARTING SAID NORTH LINE, 759.41 FEET; THENCE SOUTH 90°00'00" EAST, 113.03 FEET; THENCE SOUTH 00°00'00" WEST, 59.44 FEET; THENCE SOUTH 90°00'00" EAST, 560.17 FEET TO THE EAST LINE OF SAID NORTHWEST QUARTER (NW 1/4); THENCE SOUTH 00°35'21" WEST, ALONG SAID EAST LINE, 498.48 FEET; THENCE SOUTH 89°53'06" EAST, DEPARTING SAID EAST LINE, 489.73 FEET; THENCE SOUTH 00°00'00" WEST, 161.76 FEET; THENCE SOUTH 89°53'06" EAST, 291.44 FEET; THENCE SOUTH 09°12'47" EAST, 371.37 FEET TO THE NORTHERLY RIGHT-OF-WAY OF WARM SPRINGS ROAD; THENCE NORTH 57°48'55" WEST, ALONG SAID RIGHT-OF-WAY, 47.88 FEET, TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHWESTERLY HAVING A RADIUS OF 15050.00 FEET;, THENCE, ALONG SAID CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 8°47'20", AN ARC LENGTH OF 2308.57 FEET; THENCE NORTH 01°09'49" WEST, DEPARTING SAID RIGHT-OF-WAY, 747.85 FEET; THENCE SOUTH 89°52'36" EAST, 587.32 FEET TO THE **POINT OF BEGINNING**.

CONTAINING 917,428 SQUARE FEET (21.06 ACRES), MORE OR LESS, AS DETERMINED BY COMPUTER METHODS.

BASIS OF BEARINGS:
NORTH 88`58'43" EAST - BEING THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 11, TOWNSHIP 22 SOUTH, RANGE 62 EAST, M.D.M., CITY OF HENDERSON, CLARK COUNTY, NEVADA AS SHOWN ON THE MAP IN BOOK 97 OF PLATS, PAGE 99, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

C:\Documents and Settings\10575\Local Settings\Temporary Internet Files\OLK11\511729-TRONOX AREA B.doc
Last saved by th11699
12/6/2007





VICINITY MAP

N.T.S.

LEGEND

🟧	PROPERTY LINE
—	ASSESSORS PARCEL LINES

N

SCALE: 1"=400'

THE LANDWELL COMPANY

PBS&J
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Telephone: 702/263-7275
Fax: 702/263-7200

ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

LANDWELL
TRONOX FIGURE "B"

APN: 178-12-101-002, 178-12-201-006,
& A PORTION OF 178-12-601-005
GROSS ACREAGE: 21.06± AC

SHEET 1 OF 1 DATE: 12/06/07 **PROJECT NUMBER 511729**

H:\Projects\1729\Exhibits\Misc Landwell Exhibits\Marketing Exhibits\Landwell-Tronox-Figure B xbt.dwg Layout: 11x17 Dec 06, 2007 – 5:10pm

Basic Remediation
COMPANY

Transmittal

To: Brian Rakvica

Date: 12/7/07

From: Ron Sahu
Director of Environmental Services

Company: NDEP
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

VIA:
☐ Pick up
☐ Courier
☐ Overnight Courier
☑ Hand Delivered
☐ US Mail

The following items are for your:

☐ Return
☑ Records
☐ Review & Comments
☐ Review & Approval
☐ Signature
☐ Information

We are transmitting the following:

2 hard copy sets of Tronox A, B maps and Legals

Comments:

Please call Ron Sahu if you have any questions 626-382-0001.

Received by: ____________________

RECEIVED
ENVIRONMENTAL PROTECTION
LAS VEGAS OFFICE
2007 DEC -7 A 10: 33

Shannon Harbour

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Friday, December 07, 2007 7:25 AM
To: Brian Rakvica
Cc: Shannon Harbour
Subject: Re: TRX Parcels A & B

Brian:

No, their only comment was that they "dont see this type very often" or words to that effect.

Ranajit

> ----- Original Message -----
> **From:** Brian Rakvica
> **To:** Ranajit (Ron) Sahu
> **Cc:** Shannon Harbour
> **Sent:** Friday, December 07, 2007 7:11 AM
> **Subject:** RE: TRX Parcels A & B
>
> Ron,
>
> Any more word from the lab re: the origin of the "strange" amphibole?
>
> Thanks,
>
> Brian
>
> ---
>
> **From:** Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
> **Sent:** Thursday, December 06, 2007 6:33 PM
> **To:** Brian Rakvica; Shannon Harbour; Crowley, Susan
> **Cc:** Keith Bailey
> **Subject:** Re: TRX Parcels A & B
>
> Brian:
>
> We FedExed it to Shannon/you today - hardcopy and CD etc. Hopefully, you should be getting it tomorrow AM. The electronic .pdf file is attached (minus the database).
>
> Thanks
>
> Ranajit
>
>> ----- Original Message -----
>> **From:** Brian Rakvica
>> **To:** Ranajit (Ron) Sahu ; Shannon Harbour ; Crowley, Susan
>> **Cc:** Keith Bailey
>> **Sent:** Thursday, December 06, 2007 6:09 PM
>> **Subject:** RE: TRX Parcels A & B
>>
>> What is the status of the final report?
>>
>> ---

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thu 12/6/2007 5:29 PM
To: Shannon Harbour; Crowley, Susan
Cc: Keith Bailey; Brian Rakvica
Subject: Re: TRX Parcels A & B

Shannon:

In response to your e-mail, please find attached the maps and legal descriptions for Tronox Parcels A and B that can be used in the issuance of the NFAs. The parcel boundaries will eventually be changed, based on these legal descriptions.

Please let me know if you need us to provide the attached in hardcopy.

Thanks

Ranajit

> ----- Original Message -----
> **From:** Shannon Harbour
> **To:** Crowley, Susan
> **Cc:** Keith Bailey ; Brian Rakvica ; Ranajit (Ron) Sahu
> **Sent:** Tuesday, December 04, 2007 1:09 PM
> **Subject:** TRX Parcels A & B
>
> Susan,
>
> When will the Clark County parcel boundaries be changed to reflect the Parcel A & B boundaries as stated by TRX in their May 29, 2007 response to NDEP's comments on the Phase I for Various TRX Parcels (please see the excerpt shown below)? This issue needs to be addressed prior to the issuance of an NFA for Parcels A & B. Other options can be discussed, such as TRX providing documentation of the Parcel A & B property boundaries that NDEP can reference.
>
> Sincerely,
> Shannon

Parcel [1]	*Description*	*Figure*	*Size (acres)*	*Workplan NFAD Request*	*Associated APNs [2]*
A	*"DiNapoli" 53 acres*	*Fig A*	*53*	*Yes*	
B	*Rest of area north of Warm Springs (no Pick-A-Part; no Bobby Ellis)*	*Fig B*	*??*	*Yes*	
C	*Proposed Pick-A-Part Lease in area south of Warm Springs (Gate 7)*	*Fig C*		*Yes*	
D	*Portion of area south of Warm*	*Fig D*		*Yes*	

	Springs (Gate 7) for Sale				
E	*SMP GWTS well Parcel in Gate 7*	*Fig E*		*Not at this time.*	
F	*Tronox Parcel 4F*	*Fig F (will also show adjoining TIMET NFA parcel)*		*Yes*	
G	*Tronox 4G – Silver State Steel Sale*	*Fig G*	*4*	*Yes*	
H	*Area north of Lake Mead*	*Fig H*		*Yes*	
I	*Current Pick-A-Part Location*	*Fig I*		*Not at this time.*	
J	*Current Bobby Ellis Location*	*Fig J*		*Not at this time.*	

Note [1]: The parcel noted as owned by BMI or USA north of Lake Mead in the Phase 1 Report is not included since only Tronox-owned parcels are the focus of the workplans to be submitted to the NDEP at this time.
Note [2]" The figures will show the APNs associated with a particular parcel, for the sake of completeness.

1. General comment, the Figures do not always show the entire parcel. If only a portion of the parcel is being considered for the Phase I, then the entire parcel should be shown with the area of interest demarked. For example, Figure 3 shows only portions of APN 178-12-401-009 and 178-13-101-002.

   Response: Please see the General Response above. APNs will become obsolete in the future since the parcels as defined above will be recorded with the County based on the boundaries shown.

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

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Version: 7.5.503 / Virus Database: 269.16.14/1172 - Release Date: 12/5/2007 8:41 AM

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Version: 7.5.503 / Virus Database: 269.16.15/1174 - Release Date: 12/6/2007 10:11 AM

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.503 / Virus Database: 269.16.15/1174 - Release Date: 12/6/2007 10:11 AM

Shannon Harbour

From: Brian Rakvica
Sent: Friday, December 07, 2007 8:26 AM
To: 'Crowley, Susan'; Shannon Harbour
Cc: Keith Bailey; Ranajit (Ron) Sahu
Subject: RE: TRX Parcels A & B

All,

FYI, a big difference being that TRECO has negligible VOCs.

Thanks,

Brian

From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Friday, December 07, 2007 8:10 AM
To: Shannon Harbour
Cc: Keith Bailey; Brian Rakvica; Ranajit (Ron) Sahu
Subject: RE: TRX Parcels A & B

Shannon,
See Ron's note below. Does this give you what you need for the meets and bounds re Parcel A and Parcel B?

A quick update on these parcels .... The earthwork is in progress and on track to be completed by our target – December 19th. We are reviewing the draft NFA language you forwarded. Ron indicates the language is consistent with past NFA's for the Timet parcels, except for the condition re the vapor intrusion. We're now ruminating on what this means to us and the buyer and will provide any comment as soon as we can. In the meantime, if there is anything you need, don't hesitate to ask. Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

If you are not the intended recipient of this e-mail message, any use, distribution or copying of the message is prohibited. Please let me know immediately by return e-mail if you have received this message by mistake, then delete the e-mail message. Thank you.

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thursday, December 06, 2007 5:29 PM
To: Shannon Harbour; Crowley, Susan
Cc: Keith Bailey; Brian Rakvica
Subject: Re: TRX Parcels A & B

Shannon:

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Please let me know if you need us to provide the attached in hardcopy.

Thanks

Ranajit

> ----- Original Message -----
> **From:** Shannon Harbour
> **To:** Crowley, Susan
> **Cc:** Keith Bailey ; Brian Rakvica ; Ranajit (Ron) Sahu
> **Sent:** Tuesday, December 04, 2007 1:09 PM
> **Subject:** TRX Parcels A & B
>
> Susan,
>
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>
> Sincerely,
> Shannon

Parcel [1]	*Description*	*Figure*	*Size (acres)*	*Workplan NFAD Request*	*Associated APNs [2]*
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C	*Proposed Pick-A-Part Lease in area south of Warm Springs (Gate 7)*	*Fig C*		*Yes*	
D	*Portion of area south of Warm Springs (Gate 7) for Sale*	*Fig D*		*Yes*	
E	*SMP GWTS well Parcel in Gate 7*	*Fig E*		*Not at this time.*	
F	*Tronox Parcel 4F*	*Fig F (will*		*Yes*	

		also show adjoining TIMET NFA parcel)			
G	*Tronox 4G – Silver State Steel Sale*	*Fig G*	*4*	*Yes*	
H	*Area north of Lake Mead*	*Fig H*		*Yes*	
I	*Current Pick-A-Part Location*	*Fig I*		*Not at this time.*	
J	*Current Bobby Ellis Location*	*Fig J*		*Not at this time.*	

Note [1]: The parcel noted as owned by BMI or USA north of Lake Mead in the Phase 1 Report is not included since only Tronox-owned parcels are the focus of the workplans to be submitted to the NDEP at this time.
Note [2]" The figures will show the APNs associated with a particular parcel, for the sake of completeness.

1. General comment, the Figures do not always show the entire parcel. If only a portion of the parcel is being considered for the Phase I, then the entire parcel should be shown with the area of interest demarked. For example, Figure 3 shows only portions of APN 178-12-401-009 and 178-13-101-002.

    Response: Please see the General Response above. APNs will become obsolete in the future since the parcels as defined above will be recorded with the County based on the boundaries shown.

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

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Version: 7.5.503 / Virus Database: 269.16.14/1172 - Release Date: 12/5/2007 8:41 AM

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Thank you.

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protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 6, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Data Validation Summary Report, Parcels A/B Investigation, August – September 2007, BMI Industrial Complex, Clark County, Nevada
Dated November 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified Data Validation Summary Report and finds that the document is acceptable. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Environmental
Resources
Management

2525 Natomas Park Drive
Suite 350
Sacramento, CA 95833
(916) 924-9378
(916) 920-9378 (fax)

ERM

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December 6, 2007

Ms. Shannon Harbour, P.E.
Nevada Division of Environmental Protection
Bureau of Corrective Actions
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

Subject: **Technical Memorandum – Data Review for 2007 Tronox Parcels A/B Investigation, BMI Industrial Complex, Clark County, Nevada**

Dear Shannon:

On behalf of Ranajit Sahu please find enclosed the Data Review Technical Memorandum for the 2007 Tronox Parcels A/B Investigation, BMI Industrial Complex, Clark County, Nevada. It should be noted that this data review is being submitted prior to receipt of results for the final post-scrape asbestos sample. This technical memorandum assumes that this final result will not have any detectable amphibole asbestos fibers. If you have any questions or comments, please contact me at 916-924-9378 or Ranajit Sahu at 626-382-0001.

Sincerely,

Mark K. Jones
Project Manager

Enclosures: Technical Memorandum – Data Review for 2007 Tronox Parcels A/B Investigation, BMI Industrial Complex, Clark County, Nevada

cc: Ranajit Sahu, BEC, 875 West Warm Springs Road, Henderson, NV 89011
Brian Rakvica, NDEP, BCA, Las Vegas, NV 89119
Jim Najima, NDEP, BCA, Carson City, NV 89701

Shannon Harbour

From: Brian Rakvica
Sent: Friday, November 30, 2007 7:44 AM
To: Shannon Harbour
Subject: FW: Tronox Capture Evaluation Work Plan Implementation

FYI

From: Brian Rakvica
Sent: Wednesday, November 28, 2007 7:33 AM
To: Jim Najima; 'wjfrey@ag.state.nv.us'
Subject: FW: Tronox Capture Evaluation Work Plan Implementation

FYI

From: Wilkinson, Craig [mailto:Craig.Wilkinson@TIMET.com]
Sent: Wednesday, November 28, 2007 7:31 AM
To: Crowley, Susan
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; Brian Rakvica; Alford, Michael; Reed, Tom
Subject: RE: Tronox Capture Evaluation Work Plan Implementation

I have forward your request to Dallas and will follow-up later this week.

This information contained in this message may be confidential and is for the intended addressee only. Any unauthorized use, distribution of the information, or copying of this message is prohibited. If you are not the intended addressee, please notify the sender and delete this message.

Craig Wilkinson
Email: Craig.Wilkinson@TIMET.com

> -----Original Message-----
> **From:** Crowley, Susan [mailto:Susan.Crowley@tronox.com]
> **Sent:** Tuesday, November 20, 2007 11:56 AM
> **To:** Wilkinson, Craig
> **Cc:** Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; brakvica@ndep.nv.gov; Alford, Michael; Reed, Tom
> **Subject:** Tronox Capture Evaluation Work Plan Implementation
>
> Craig,
> From recent transmittals to you (from both Tronox and NDEP) you've seen that Tronox is embarking on an evaluation of it's several groundwater capture zones. The evaluation of the on-site capture wells' performance includes a review of the eastern end of our on-site well field, which extends us onto Timet property. The Work Plan includes installation of two groundwater wells on Timet's side of the property fence line. I've included a rough sketch for your convenience - so that you don't need to track down the information in our Work Plan.
>
> I expect Tronox will need an access agreement with Timet for entry to drill these groundwater wells - do you already have language you've used with others in the complex? Please let me know. Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 30, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase A Source Area Investigation Results, Tronox Facility, Henderson, Nevada
Dated September 27, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-indentified Phase A Report, which included a Phase B Sampling and Analysis Plan (SAP) as an appendix. Based on discussions between the NDEP and TRX, the NDEP acknowledges the submittal of the Phase A Report and understands that TRX will submit a revised, stand-alone, Phase B SAP to address NDEP's comments made during these discussions. It is the understanding of the NDEP that the Phase A report will not be revised and resubmitted and it is agreed that nothing further is required for this Deliverable.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

FINAL

Meeting Minutes

Project: Tronox (TRX)
Location: Greystone Conference Room, Las Vegas, NV
Time and Date: 9:15 AM, Thursday, November 29, 2007
In Attendance: NDEP – Brian Rakvica, Shannon Harbour
Teri Copeland (for NDEP)
Hackenberry Assoc. – Paul Hackenberry (for NDEP)
Neptune – Paul Black (For NDEP)
Tronox –Susan Crowley
Env. Answers (for TRX) – Keith Bailey
ENSR (for TRX) – Dave Gerry, Lisa Bradley, Brian Ho, Carmen Schnell

CC: Jim Najima

1. The meeting was held to discuss a variety of topics including the Phase A Report and Phase B Work Plan. The purpose of the meeting was to review Evaluation Area (EA) 08 and EA09 in detail as they pertain to the Phase B Work Plan.
2. TRX provided a draft LOU table for LOU20 and an aerial map of EA08 illustrating the locations of borings, wells, soil gas sampling, and LOUs for discussion purposes.
3. NDEP provided a sample of a source area worksheet for discussion purposes, which included a local map of the area being described, data for this area, descriptions and pertinent information for the area, data usability information, and risk assessment information.
4. NDEP requested specifics on the various manufacturing processes that are or have been used at TRX. TRX will provide general chemistry groups associated with the various manufacturing process associated with each LOU.
5. TRX will revise the LOU table and map for draft submittal to the NDEP for comment on content and format. **ACTION ITEM.**
6. NDEP stated that if TRX samples the area of the "worst case scenario" for an LOU, then no more samples would need to be collected for that LOU. NDEP also stated that the defining a sample location as the "worst case scenario" would have to be well documented and/or discussed.
7. NDEP stated that if a source area was relocated or had more that one contiguous area, a sample collected in each area would be preferred over a sample collected from between the two areas.
8. TRX stated that EA08 and EA09 are the two EAs that currently have active production.
9. NDEP stated that WAPA has conducted characterization of their site located in part to the south of the unit buildings. WAPA discovered TCE in groundwater to the south of SG44. TRX stated that TCE has been present in the groundwater to the north of this location on their property. NDEP indicated that the WAPA report was available on the State ftp site.
10. At NDEP's request, TRX described the electrolytic process for manganese dioxide (MnO2) production. TRX stated that there is no organics formation in this process. The only organic material used is paraffin wax to prevent evaporation during operations.
11. General LOU Table format,
    a. TRX will consider using bullets in the description column.

   b. TRX will consider using more LOU-specific language in description. For example, LOU 20 could have additional statements like "pond contents and liner removed" and "some soil removal occurred during liner removal".
   c. TRX may list un-validated historical data as indicator data for an LOU.
   d. TRX will consider adding pertinent dates in description (dates of operation, closure, etc.)
   e. TRX will consider changing the heading on the column for Chemicals Identified to Chemicals Potentially Released
   f. TRX will place text pertaining to possible releases in the Physical Characteristics Affecting Release column.
   g. TRX will add a column for the Goal of Closure for an LOU such as "current use" or "unrestricted commercial/industrial use".

12. TRX will consider adding notation on the EA maps indicating the approximate location of piping associated with LOUs as appropriate.
13. EA08
    a. LOU20
       i. TRX will add text indicating that the piping for the steam plant has been removed.
       ii. TRX will add text describing that the pond contents, liner, and some soils were removed during decommissioning.
       iii. TRX stated that the conveyance piping originating from the steam plant was located from the west to the south of the LOU and the piping originating from Unit Buildings 4 and 5 was located in 6th street. Both waste streams were discharged from the SEC of the pond.
       iv. SA71 located to characterize possible spillover events from LOU20.
       v. SA62 is located in the topographical low of LOU20.
       vi. SA61 located in area where conveyance piping emptied into LOU20 and is also representative of down gradient conditions from LOU21.
       vii. TRX will consider sampling on the SWC of LOU20.
    b. LOU21
       i. TRX stated that the aboveground conveyance piping originated from Units 4 and 5 and was located under 11th street and discharged from the SEC of the pond.
       ii. TRX stated that this LOU is an active, lined pond (clay and synthetic liners) and had the same waste streams as LOU20.
       iii. TRX stated that there is no evidence of a release or overflow from this pond. TRX stated that the NPDES permit requires two feet of freeboard on the pond and a SWPP permit regulates overflow.
    c. Manganese (Mn) tailings storage area
       i. Mn tailings sample reported by TRX in the Phase A report was a composite sample of 3 sampling depths from 9 borings (i.e. 27 discrete samples).
       ii. TRX stated that the Mn ore used by the facility has always come from one source because of process sensitivity to different impurities.
       iii. TRX stated that current tailings are being transported to US Ecology for disposal.
       iv. LOU24
          1) LOU24 is the Mn tailings pile. TRX will expand this LOU on future maps to include the current boundaries of the Mn tailings pile.
          2) TRX stated that the Mn tailings pile is covered with a layer of soil.

    3) TRX indicated that the approximate volume of tailings is 213,000 cubic yards. TRX will base any decision to move the Mn tailings based on risk indicators.
    4) TRX stated that the arsenic (As) concentrations were relatively high at 90 ppm in the tailings as well as Mn concentrations. TRX also stated that 4-5 other constituents were elevated above comparison levels but were less than the industrial PRGs.
    5) TRX is considering using the tailings concentrations as a worst case scenario for soil under this LOU. NDEP agreed with this approach but that soil samples collected from under the tailings could be used as a line of evidence for leachability soil comparisons.
    6) TRX agreed to move SA108 north to be closer to groundwater well CLD4R. NDEP stated that this boring could be used for characterization of the piping for LOU21.

v. LOU 46
    1) TRX stated that this LOU is actually located to the south and east of the currently illustrated location and is currently covered by Mn tailings. The concrete pad for this LOU was discovered during recent characterization activities (volume estimate) by TRX and is approximately 1,300 ft by 30 ft.
    2) TRX expects that overflow from this LOU would be to the west. The overflow would leave the LOU and flow to a depression to the west, which empties into the Beta Ditch. TRX proposes to move SA107 to this depression.
    3) TRX proposed to move SA52 to the west end (worst case scenario) of the actual location of LOU46. NDEP and TRX agreed that any surface sample collected from SA52 may be impacted by leaching of the Mn ore. NDEP suggested that if SA52 was located near the west end of LOU46 but not under the ore tailings, characterization of both LOU46 and the aerial deposition of the Mn tailings may be realized.
    4) NDEP stated that TRX could acknowledge that other samples located downwind could additionally characterize “drift” from the Mn tailings piles.

vi. LOU47 (Active Area)
    1) TRX stated that this LOU (Mn Ore Piles) is located in several areas of the Mn leach plant area based on the operational process. TRX proposed to illustrate this by placing a block around the leach plant area that would indicate that the Mn ore piles are within that area.
    2) TRX stated that the southeast LOU47 area indicated on current maps is the current location of analyte tanks.
    3) After discussions, the NDEP and TRX agreed to move SA37 to the south of the leach plant to be located down gradient to address the topographic difference between the leach plant and Unit Building 6. TRX will look into the feasibility of moving this boring to the west so that it is located within the possible former US Vanadium footprint.
    4) TRX agreed to move SA38 to the east so that it is located within the possible former US Vanadium footprint.

vii. LOU34 (Active Area)

        1) TRX stated that this LOU is currently the location of three natural gas roasters.
        2) TRX indicated that a boring could not be advanced in this LOU because of utilities and the roasters.
        3) TRX stated that this area was currently paved.
    viii. LOU43 & LOU61 (Unit 5 Building only) and LOU44
        1) TRX stated that there are tanks located on the east and west sides of Unit 5 that prohibit boring advancement.
        2) TRX stated that they will
            a) Locate SA34 as close to Unit 5 as possible.
            b) Move SA33 to the south on the other side of the road because of utility clearance issues.
            c) Use SA35 to additionally investigate the uranium discrepancy in this area.
            d) Relocate borings SA132 and SA139 because of utility clearance issues; otherwise, TRX may search for patched concrete and collect surface soil samples from under the slab then wait for the decommissioning of the building to investigate further. Currently, there are no plans for decommissioning of this building.

14. EA09
    a. TRX stated that the purple outline on current maps illustrate the boundaries of the boron operations.
    b. LOU43 & LOU61 (Unit 4 Building only), TRX stated that Unit 4 is no longer active; therefore, a boring will be advanced through the basement. TRX believes that this could be a major source of perchlorate, chlorate, and possibly hexavalent chromium. SA43 will be moved within the footprint of Unit 4. TRX stated that all cells located in Unit 4 were the same so boring location shouldn't be an issue.
    c. LOU11
        i. TRX may have to move SA124 because of utility clearance issues.
        ii. TRX stated that borings associated with this LOU are not proposed to be analyzed for OCPs, TPH, PAHs, or asbestos. This was a typo on Table 1-1.
        iii. TRX will move SA30 because it is currently located on a concrete pad that is underlain with a liner that TRX does not want breached.
    d. LOU12
        i. TRX will move SA126 to the north (in street) because of utility clearance issues.
        ii. TRX stated that the boron production facility was constructed after the LOU designations.
    e. LOU28
        i. TRX stated that the concrete pad and approximately 4 ft of soil were removed for the installation of the current ASTs.
        ii. TRX stated that SA04 will be located as close to LOU28 as possible because of ASTs.
    f. LOU4, sample is located in the middle of the LOU4.
    g. LOU27, TRX indicated that LOU27 is located inside Unit 2 and was a staging area for drummed PCB wastes. TRX stated that since the wastes were containerized they are proposing SA24 to be located outside of Unit 2.

  - h. LOU26 (2 areas), TRX indicated that LOU26 was a staging area for drummed PPE used in the chlorate and perchlorate operations. This LOU was paved during use but has since deteriorated. TRX has proposed borings (SA121 and SA122) in both areas.
  - i. LOU41, TRX indicated that this LOU was assigned for equipment staining and illustrated historic sample locations. TRX has proposed one boring (SA103) for this area.
  - j. LOU65 (two of five areas located in EA09), TRX stated that one of these two areas was on office and the other was remediated along with LOU41.
  - k. LOU42, TRX stated that this was a scrap metal operation and that they are proposing one boring (SA111).
  - l. LOU36, TRX indicated that this may be a potential VOC source area. TRX is proposing one deep boring (SA133) in this area.

15. TRX stated that soil gas samples were placed around buildings and to bracket VOC detections.
16. TRX stated that they are investigating deeper groundwater issues with the implementation of the Groundwater Capture Evaluation Work Plan. TRX will address the issue of possible groundwater migration of contaminants into deeper zones after the completion of the the Groundwater Capture Evaluation Work Plan.
17. TRX stated that the airborne dust pathway will be addressed in the Risk Assessment.
18. NDEP cautioned TRX that the "cleaner" parcel areas (Parcels A through I) seem to be getting sampled at a higher density than the other portions of the facility, which may be a perception issue later.
19. TRX stated that they will not determine exposure areas for risk assessment until after reviewing the Phase B results.
20. TRX will move forward with the submittal of a Revised Phase B Work Plan. TRX will submit draft tables, etc. for review for each EA as completed. **ACTION ITEM.**
21. NDEP will respond to the Phase A Report by acknowledging that a Revised Phase B Work Plan will be submitted and that the Phase A data will be included in the Phase B Report. **ACTION ITEM.**

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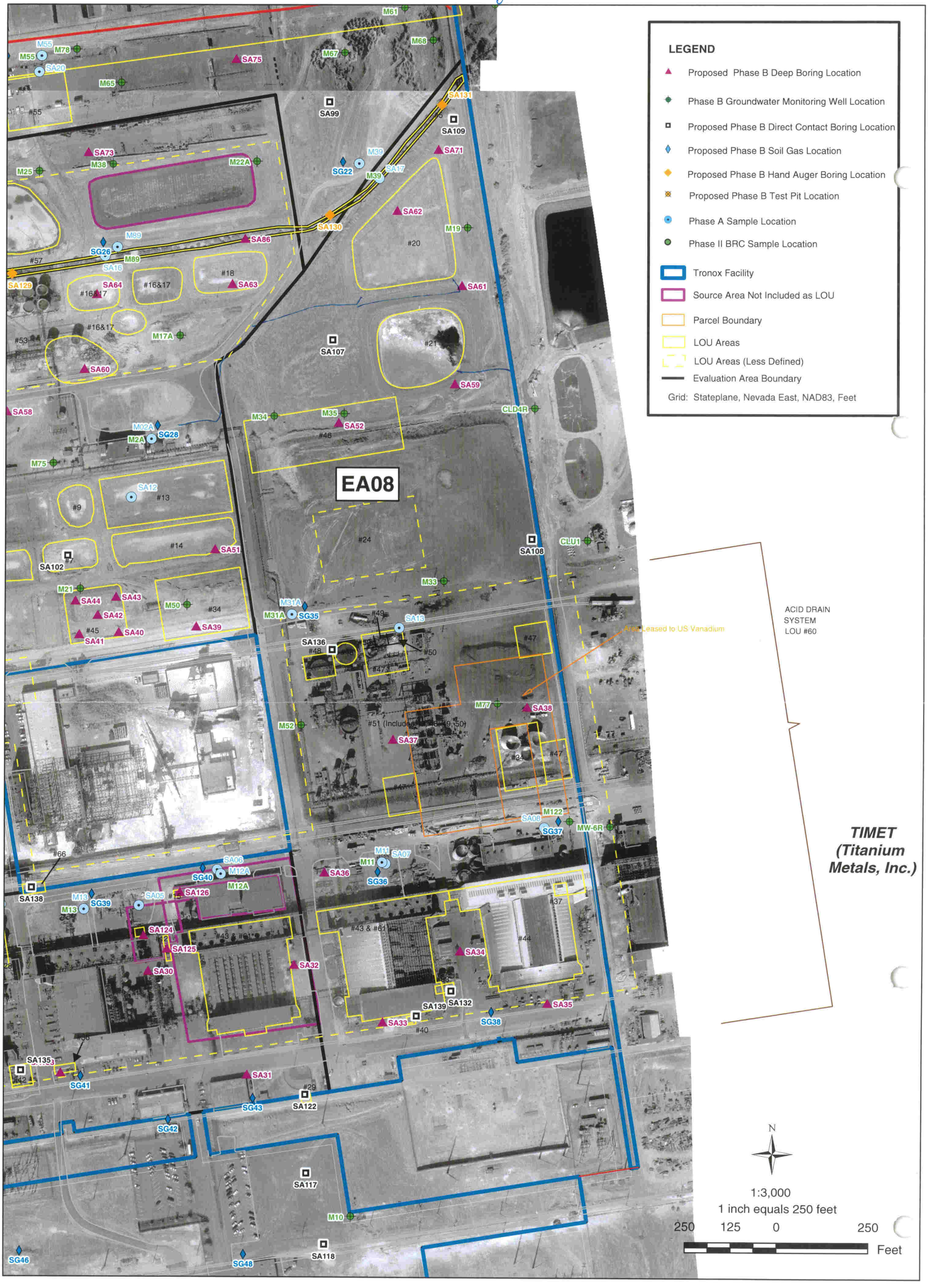

SHEET NUMBER:	FIGURE NUMBER:
X	X

EXPLORATION LOCATIONS EA-08

PHASE B SOURCE AREA INVESTIGATION
TRONOX FACILITY
HENDERSON, NEVADA

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	11/27/2007	04020-023-430

ENSR | AECOM

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TM				
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GAH				
APPROVED BY:				
DG				

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model											Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group											Phase A Wells Sampled	Phase B Well Proposed for Sampling													
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
1	Trade Effluent Settling Ponds	Acid waste neutralized with caustic liquor, hydrochloric acid, sodium hydroxide. The area of the former TE ponds is now occupied by the closed hazardous waste landfill, surface impoundments WC-East and WC-West addressed as separate LOUs. Chemicals mentioned included Silvex. Previously tested for RCRA metals.		X	X			X[2]				No historical groundwater data identified in association with the LOU.	M7B M98 M100 M5A	H28A (u) MC97 (d) M7B (d) M98 M23 (d) M99 M100 M101 M48 (d) M102 M88 (u) M84 (u) M83 (u) M5A (u)	X	X	X	X	X		X						OCHs assessed in Phase A.
2	Open Area Due South of "Trade Effluent Disposal Ponds"	Identified in LOU as "poorly defined historic disposal area."		X	X			X				No historical groundwater data identified in association with the LOU.	M5A	M5A M127 M126 (u)	X	X	X	X	X		X						
3	Air Pollution Emissions Associated with Industrial Processes	Particulates.		X			X				X		--	--													Not applicable. This LOU applies to air quality only.
4	Hardesty Chemical Company Site (prior to J. B. Kelley Operations)	Muriatic acid, synthetic hydrochloric acid, monochlorobenzene, peradichlorobenzene, orthodichlorobenzene, DDT, and soda arsenite solution, two underground storage tanks for kerosene and benzene.		X	X	X	X	X				Arsenic, Di-n-butylphthalate, chloroform, and acetone detected below Phase A comparison levels. Total chromium and perchlorate exceeded Phase A comparison levels.	M92 (d) M97 (d)	M92 (d) M97 (d)	X	X	X	X	X	X	X						
5	On-Site Portion of Beta Ditch, Including "Small Diversion Ditch" Northwest of Pond C-1	VOCs, SVOCs, pesticides/ polychlorinated biphenyls (PCBs), metals, cyanide, chlorate, pH, asbestos and radionuclides.	X	X	X	X	X	X	X	X		No historical groundwater data identified in association with the LOU.	GWSA14 GWSA15 (u) M89 (d) M39 (d)	H38 (d) TR3 (d) TR4 (d) M125 (d) M111R (u) M110 (d) M89 (d) M17A (u) M19 (u) M22A (d) M39 (d) M68 (d) CLD2R (d)	X	X	X	X	X	X	X	X					
6	Unnamed Drainage Ditch Segment (BMI Landfill)	Wastewater and stormwater.		X		X	X	X				No historical groundwater data identified in association with the LOU.	--	--													Not on Tronox property. No Phase B assessment recommended.
7	Old P-2 Pond and Associated Conveyance Facilities	Old P-2 Pond received chlorate process liquids which contained hexavalent chromium, sodium chloride, sodium chlorate, and sodium perchlorate. The latter compound was from the caustic scrubber solution generated at the AP plant.	X	X	X							Historical data show that total chromium in groundwater exceeds the Phase A comparison level.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d) M2A (d)	X	X	X	X	X								
8	Old P-3 Pond and Associated Conveyance Facilities	Ammonium perchlorate and chromium.	X	X	X							No historical groundwater data identified in association with the LOU; however, total chromium was detected at levels that exceeded the Phase A comparison level for soil.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d)	X	X	X	X	X								
9	New P-2 Pond and Associated Piping	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d) M2A (d)	X	X	X	X	X								
10	On-Site Hazardous Waste Landfill (Closed)	Hazardous Waste.	X	X	X	X	X	X	X	X		Historical data show that perchlorate in groundwater exceeded the Phase A comparison level.	M5A (u) M7B (d)	M5A (u) M7B (d) H28A (d) MC32 (d)	X	X	X	X	X	X	X	X					
11	Sodium Chlorate Filter Cake Holding Area	Filter Cake Drying Pad was used to dry particulate material removed from the sodium chlorate process; chromium, chlorate and TDS.	X	X	X							No historical groundwater data identified in association with the LOU.	M13 (d) M12A (d)	M13 (d) M12A (d) M21 (d) M50 (d)	X	X	X	X	X								May convert SA126 to a monitoring well.

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model											Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group											Phase A Wells Sampled	Phase B Well Proposed for Sampling													
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
12	Hazardous Waste Storage Area	Container for waste from the sodium chlorate process.	X	X	X							No historical groundwater data identified in association with the LOU.	M13 (d) M12A (d)	M13 (d) M12A (d) M21 (d) M50 (d)	X	X	X	X	X								May convert SA126 to a monitoring well.
13	Pond S-1	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, sodium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond S-1.	X	X	X							No historical groundwater data identified in association with the LOU.	M2A (d) M31A (u)	M2A (d) M75 (d) M34 (d) M31A (u) M50 (u) M21 (u)	X	X	X	X	X								
14	Pond P-1 and Associated Conveyance Piping	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond P-1. Liquors, residual salt solutions, and rinsates from decommissioning and closure of Pond S-1 and from the decommissioning of potassium perchlorate manufacturing process.	X	X	X							No historical groundwater data identified in association with the LOU.	M2A (d) M31A (u)	M2A (d) M75 (d) M34 (d) M31A (u) M50 (u) M21 (u)	X	X	X	X	X								
15	Platinum Drying Unit	Platinum, sodium perchlorate byproducts, chromium.	X	X								No historical groundwater data identified in association with the LOU.	M12A (d)	M12A (d) M21 (d) M50 (d)	X	X	X	X									May convert SA126 to a monitoring well.
16 & 17	Ponds AP-1, AP-2, and AP-3 and Associated Transfer Lines	Nitrate, nitrite, ammonium perchlorate, and chromium.	X	X	X							Historical data shows that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	M89 (d) M2A (u) GWSA15 (u)	M89 (d) M22A (d) M38 (d) M25 (d) M17A (u) M34 (u) M2A (u) M75 (u) M2A (u)	X	X	X	X	X								
18	Pond AP-4	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	--	M34 (u) M35 (u) M2A (u) M17A (u) M22A (d) M39 (d)	X	X	X	X	X								
19	Pond AP-5	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	GWSA15 (u) M55 (d)	M111R (u) M89 (u) M38 (d) M25 (d) M55 (d)	X	X	X	X	X								
20	Pond C-1 and Associated Piping	Used to evaporate non-hazardous process water, primarily from steam production, but at times also from the boron and manganese dioxide processes.		X	X							Historical data show that total chromium, perchlorate, and manganese in groundwater exceed the Phase A comparison level.	M39 (d) M31A (u)	M31A (u) M33 (u) M35 (u) M19 M39 (d) M68 (d) CLD2R (d)	X	X	X	X	X								
21	Pond Mn-1 and Associated Piping	The manganese pond received non-hazardous process water wastes, including filter wash water and cathode wash water. The pond contents contain manganese as well as high TDS.		X	X							Historical data show that total chromium, perchlorate, and manganese in groundwater exceed the Phase A comparison level.	M39 (d) M31A (u)	M31A (u) M33 (u) CLD4R (u) M35 (u) M19 (d) M39 (d)	X	X	X	X	X								
22	Pond WC-1 (WC-West) and Associated Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X							No historical groundwater data identified in association with the LOU.	M100 (d)	M79 (u) M83 (u) M84 (u) M100 (d) M99 (d) M101 (d)	X	X	X	X	X								
23	Pond WC-2 (WC-East) and Associate Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X							No historical groundwater data identified in association with the LOU.	M100 (d)	M79 (u) M83 (u) M84 (u) M100 (d) M101 (d) M99 (d) M102 (d)	X	X	X	X	X								

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Potential Contaminant Group																								
		Description of Chemicals Identified	Perchlorate	Metals	Wet Chemistry^1	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan		Phase A Wells Sampled	Phase B Well Proposed for Sampling	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry^1	VOCs	OCPs	Radionuclides					
1	Trade Effluent Settling Ponds	Acid waste neutralized with caustic liquor, hydrochloric acid, sodium hydroxide. The area of the former TE ponds is now occupied by the closed hazardous waste landfill, surface impoundments WC-East and WC-West addressed as separate LOUs. Chemicals mentioned included Silvex. Previously tested for RCRA metals.		X	X			X^2				No historical groundwater data identified in association with the LOU.	M7B M98 M100 M5A	H28A (u) MC97 (d) M7B (d) M98 M23 (d) M99 M100 M101 M48 (d) M102 M88 (u) M84 (u) M83 (u) M5A (u)	X	X	X	X	X		X						OCHs assessed in Phase A.
2	Open Area Due South of "Trade Effluent Disposal Ponds"	Identified in LOU as "poorly defined historic disposal area."		X	X			X				No historical groundwater data identified in association with the LOU.	M5A	M5A M127 M126 (u)	X	X	X	X	X		X						
3	Air Pollution Emissions Associated with Industrial Processes	Particulates.		X			X				X		--	--													Not applicable. This LOU applies to air quality only.
4	Hardesty Chemical Company Site (prior to J. B. Kelley Operations)	Muriatic acid, synthetic hydrochloric acid, monochlorobenzene, peradichlorobenzene, orthodichlorobenzene, DDT, and soda arsenite solution, two underground storage tanks for kerosene and benzene.		X	X	X	X	X				Arsenic, Di-n-butylphthalate, chloroform, and acetone detected below Phase A comparison levels. Total chromium and perchlorate exceeded Phase A comparison levels.	M92 (d) M97 (d)	M92 (d) M97 (d)	X	X	X	X	X	X	X						
5	On-Site Portion of Beta Ditch, Including "Small Diversion Ditch" Northwest of Pond C-1	VOCs, SVOCs, pesticides/ polychlorinated biphenyls (PCBs), metals, cyanide, chlorate, pH, asbestos and radionuclides.	X	X	X	X	X	X	X	X		No historical groundwater data identified in association with the LOU.	GWSA14 GWSA15 (u) M89 (d) M39 (d)	H38 (d) TR3 (d) TR4 (d) M125 (d) M111R (u) M110 (d) M89 (d) M17A (u) M19 (u) M22A (d) M39 (d) M68 (d) CLD2R (d)	X	X	X	X	X	X	X	X					
6	Unnamed Drainage Ditch Segment (BMI Landfill)	Wastewater and stormwater.		X		X	X	X				No historical groundwater data identified in association with the LOU.	--	--													Not on Tronox property. No Phase B assessment recommended.
7	Old P-2 Pond and Associated Conveyance Facilities	Old P-2 Pond received chlorate process liquids which contained hexavalent chromium, sodium chloride, sodium chlorate, and sodium perchlorate. The latter compound was from the caustic scrubber solution generated at the AP plant.	X	X	X							Historical data show that total chromium in groundwater exceeds the Phase A comparison level.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d) M2A (d)	X	X	X	X	X								
8	Old P-3 Pond and Associated Conveyance Facilities	Ammonium perchlorate and chromium.	X	X	X							No historical groundwater data identified in association with the LOU; however, total chromium was detected at levels that exceeded the Phase A comparison level for soil.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d)	X	X	X	X	X								
9	New P-2 Pond and Associated Piping	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	M2A (d) M76 (d)	M50 (u) M21 (u) M76 (d) M75 (d) M2A (d)	X	X	X	X	X								
10	On-Site Hazardous Waste Landfill (Closed)	Hazardous Waste.	X	X	X	X	X	X	X	X		Historical data show that perchlorate in groundwater exceeded the Phase A comparison level.	M5A (u) M7B (d)	M5A (u) M7B (d) H28A (d) MC32 (d)	X	X	X	X	X	X	X	X					
11	Sodium Chlorate Filter Cake Holding Area	Filter Cake Drying Pad was used to dry particulate material removed from the sodium chlorate process; chromium, chlorate and TDS.	X	X	X							No historical groundwater data identified in association with the LOU.	M13 (d) M12A (d)	M13 (d) M12A (d) M21 (d) M50 (d)	X	X	X	X	X								May convert SA126 to a monitoring well.

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group										Phase A Wells Sampled	Phase B Well Proposed for Sampling													
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
12	Hazardous Waste Storage Area	Container for waste from the sodium chlorate process.	X	X	X							No historical groundwater data identified in association with the LOU.	M13 (d) M12A (d)	M13 (d) M12A (d) M21 (d) M50 (d)	X	X	X	X	X								May convert SA126 to a monitoring well.
13	Pond S-1	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, sodium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond S-1.	X	X	X							No historical groundwater data identified in association with the LOU.	M2A (d) M31A (u)	M2A (d) M75 (d) M34 (d) M31A (u) M50 (u) M21 (u)	X	X	X	X	X								
14	Pond P-1 and Associated Conveyance Piping	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond P-1. Liquors, residual salt solutions, and rinsates from decommissioning and closure of Pond S-1 and from the decommissioning of potassium perchlorate manufacturing process.	X	X	X							No historical groundwater data identified in association with the LOU.	M2A (d) M31A (u)	M2A (d) M75 (d) M34 (d) M31A (u) M50 (u) M21 (u)	X	X	X	X	X								
15	Platinum Drying Unit	Platinum, sodium perchlorate byproducts, chromium.	X	X								No historical groundwater data identified in association with the LOU.	M12A (d)	M12A (d) M21 (d) M50 (d)	X	X	X	X									May convert SA126 to a monitoring well.
16 & 17	Ponds AP-1, AP-2, and AP-3 and Associated Transfer Lines	Nitrate, nitrite, ammonium perchlorate, and chromium.	X	X	X							Historical data shows that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	M89 (d) M2A (u) GWSA15 (u)	M89 (d) M22A (d) M38 (d) M25 (d) M17A (u) M34 (u) M2A (u) M75 (u) M2A (u)	X	X	X	X	X								
18	Pond AP-4	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	--	M34 (u) M35 (u) M2A (u) M17A (u) M22A (d) M39 (d)	X	X	X	X	X								
19	Pond AP-5	Ammonium perchlorate and chromium.	X	X	X							Historical data show that total chromium and perchlorate in groundwater exceed the Phase A comparison level.	GWSA15 (u) M55 (d)	M111R (u) M89 (u) M38 (d) M25 (d) M55 (d)	X	X	X	X	X								
20	Pond C-1 and Associated Piping	Used to evaporate non-hazardous process water, primarily from steam production, but at times also from the boron and manganese dioxide processes.		X	X							Historical data show that total chromium, perchlorate, and manganese in groundwater exceed the Phase A comparison level.	M39 (d) M31A (u)	M31A (u) M33 (u) M35 (u) M19 M39 (d) M68 (d) CLD2R (d)	X	X	X	X	X								
21	Pond Mn-1 and Associated Piping	The manganese pond received non-hazardous process water wastes, including filter wash water and cathode wash water. The pond contents contain manganese as well as high TDS.		X	X							Historical data show that total chromium, perchlorate, and manganese in groundwater exceed the Phase A comparison level.	M39 (d) M31A (u)	M31A (u) M33 (u) CLD4R (u) M35 (u) M19 (d) M39 (d)	X	X	X	X	X								
22	Pond WC-1 (WC-West) and Associated Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X							No historical groundwater data identified in association with the LOU.	M100 (d)	M79 (u) M83 (u) M84 (u) M100 (d) M99 (d) M101 (d)	X	X	X	X	X								
23	Pond WC-2 (WC-East) and Associate Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X							No historical groundwater data identified in association with the LOU.	M100 (d)	M79 (u) M83 (u) M84 (u) M100 (d) M101 (d) M99 (d) M102 (d)	X	X	X	X	X								

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model											Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group											Phase A Wells Sampled	Phase B Well Proposed for Sampling												
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
24	Leach Beds, Associated Conveyance Facilities, and Mn Tailings Area	Tailings from the beneficiation of manganese dioxide ores were transported as a slurry to unlined surface impoundments/leach beds to the west of the current tailings area; demolition debris was also put into the tailings piles.		X								Historical data show that manganese in groundwater exceeds the Phase A comparison level.	M31A (u)	M31A (u) M33 (u) M34 (d) M35 (d) CLD4R (d) M19 (d)	X	X	X	X									
25	Process Hardware Storage Area	Used to store process hardware, scrap metal parts and equipment from decommissioning of the former sodium chlorate and perchlorate processes, equipment was rinsed prior to placement.	X	X	X							No historical groundwater data identified in association with the LOU.	M92 (d)	M92 (d) M97 (d)	X	X	X	X	X								Not expected to be a groundwater source because equipment was cleaned prior to placement.
26	Trash Storage Area	Two asphalt areas were used to store trash from the sodium chlorate and sodium perchlorate process. Common trash was placed in 55 gallon drums then shipped to Beatty, Nevada as a precautionary measure.	X	X	X							No historical groundwater data identified in association with the LOU.	M92 (d) M97 (d)	M92 (d) M97 (d)	X	X	X	X	X								
27	PCB Storage Area	An eight inch thick concrete and 6-mil plastic lined area received PCB waste.				X	X			X		Historical data show that VOCs, SVOCs, arsenic, and chromium in groundwater were below the Phase A comparison level. Perchlorate in groundwater was below the Phase A comparison level.	M97 (d)	M92 (d) M97 (d)	X	X			X	X							Plastic lined pad, not expected to be a groundwater source.
28	Hazardous Waste Storage Area	Hazardous and non hazardous waste was stored in drums in this area including used oil and flammable maintenance parts washing wastes. The concrete pad and 4 feet of soil were removed. TPH was discovered in the soil and removed in 1994.	X	X		X	X			X		No historical groundwater data identified in association with the LOU.	M97 (d) M13 (d)	M97 (d) M13 (d)	X	X	X	X	X	X							
29	Solid Waste Dumpsters	Open metal dumpsters were placed on concrete surfaces separated by gravel covered soil. The dumpsters contained common trash, recyclable steel and other recyclable metals. Scrap metal was washed before being placed in this area.	X	X	X	X	X			X		No historical groundwater data identified in association with the LOU.	M11 (d) M12A (d)	M11 (d) M12A (d) M10 (u)	X	X	X	X	X	X							Trash and washed metal scrap not expected to be a groundwater source.
30	AP Area-Pad 35	Used for the accumulation of trash potentially contaminated with perchlorate and other industrial wastes, such as cooling tower sludge, and iron oxide sludge.	X	X	X	X	X			X		No historical groundwater data identified in association with the LOU.	IAR (u) M55 (d)	IAR (u) M14A (u) M110 (u) M64 (d)	X	X	X	X	X	X							
31	Drum Recycling Area	Drums from the ammonium perchlorate production were emptied and rinsed prior to delivery to this area.	X	X								No historical groundwater data identified in association with the LOU.	IAR (u) M55 (d)	IAR (u) M110 (u) M25 M64 (d) M55 (d) M78 (d)	X	X	X	X									
32	Ground Water Remediation Unit	This LOU includes the treatment system, the extraction wells and the recharge trenches. The treatment system reduces chromium and other heavy metals from impacted groundwater. The recharge trenches became plugged and discharged treated water to the shallow soils.	X	X								Historical groundwater data for the Groundwater Remediation Unit are documented in the quarterly and annual chromium and perchlorate groundwater monitoring reports submitted to NDEP.	M55 (u) IAR (u) M100 (d)	M55 (u) M57A (u) M64 (u) M65 (u) M67 (u) M68 (u) M69 M78 M79 M83 M84 M88 (d) M99 (d) M100 (d) M101 (d) M102 (d) IB (u) IL (u) IR (u)	X	X	X	X									
33	Sodium Perchlorate Platinum By-Product Filter, Unit 5	A sodium perchlorate platinum recovery filter press with a sump that collected and contained process liquids and wash down water.	X	X								No historical groundwater data identified in association with the LOU.	M11 (d) M29 (d)	M11 (d) M122 (d) M10 (u)	X	X	X	X									May convert SA34 to a monitoring well.

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Potential Contaminant Group																								
		Description of Chemicals Identified	Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan		Phase A Wells Sampled	Phase B Well Proposed for Sampling	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
34	Former Manganese Tailings Area	Tailings from the beneficiation of manganese dioxide ores were transported as a slurry to unlined surface impoundments/leach beds to the west of the current tailings area, demolition debris was also put into the tailings piles.		X								Historical data show that manganese in groundwater exceed the Phase A comparison level.	M12A (u) M2A (d)	M12A (u) M52 (u) M50 M2A (d) M34 (d) M35 (d) M77 (d) M122 (u)	X	X	X	X	X								
35	Truck Emptying/Dumping Site	"Unknown" waste materials disposed in this area. Analytical results detected metals and TPH. One soil sample contained 2.4 ug/kg of 1,1,-trichloroethane (estimated value below PQL). Area consists of three basins, southern, central, and northern. The latter two are interconnected.		X		X	X					No historical groundwater data identified in association with the LOU.	GWSA09	M123 M128 (d) TR06 (u)			X	X		X							
36	Former Satellite Accumulation Point, Unit 3, Maintenance Shop	Accumulation point includes a parts washer and storage of lead acid batteries and waste from the parts washer. Solvent-based and caustic detergent was used for washing. Waste stored included drums of oil and grease, solvents (mainly 1,1,1-trichloroethane), sludge, caustic detergent and metal parts.		X	X	X	X			X		No historical groundwater data identified in association with the LOU.	M13 (d) M12A (d)	M13 (d) M12A (d)			X	X	X	X							May convert SA126 to a monitoring well.
37	Former Satellite Accumulation Point, Unit 6, Maintenance Shop	Area included a parts washer and a drum for temporary storage of parts washer waste. Solvent-based washer and caustic detergent was used for washing. Waste stored in this area included drums of oil and grease, solvents (mainly 1,1,1-trichloroethane), sludge, caustic detergent and metal parts.		X	X	X	X			X		No historical groundwater data identified in association with the LOU.	GWSA08 (d)	M122 (d) MW6R (d) M10 (u)			X	X	X	X							
38	Former Satellite Accumulation Point, AP-Laboratory	Hazardous chemicals (flammable liquids) used in the on-site laboratory were stored in this area.	X	X		X						No historical groundwater data identified in association with the LOU.	GWSA09 (u) GWSA14 (d)	M123 (u)	X	X	X	X		X							May convert SA66 to a monitoring well.
39	Satellite Accumulation Point-AP Maintenance Shop	TPH in the range of motor oil and diesel were detected.	X	X			X					No historical groundwater data identified in association with the LOU.	GWSA15 (d)	M109 (u) M128 (u) M111R (d)	X	X	X	X									
40	PCB Transformer Spill	Approximately 1.75 lbs of PCB-containing fluid was released.								X		No historical groundwater data identified in association with the LOU.	M11 (d) GWSA08 (d)	M11 (d) M10 (u)	X	X	X	X	X								
41	Unit 1 Tenant Stains	TPH in the range of motor oil and diesel was detected.		X			X					Historical data show that VOCs and TPH were not detected in groundwater.	M92 (d) M93 (d)	M92 (d) M93 (d)			X	X									
42	Unit 2 Salt Redler	Sodium chlorate spillage to the ground occurred during transfer from storage in Unit 2 to the conveyor feed hopper.		X	X							No historical groundwater data identified in association with the LOU.	M13 (d) M97 (d)	M13 (d) M97 (d)			X	X	X								
43	Unit 4 and 5 Basements	Soil beneath units may be impacted with concentrations of sodium perchlorate, sodium chlorate, or sodium dichromate (hexavalent chromium) from electrolytic processes.	X	X	X							No historical groundwater data identified in association with the LOU; however, chromium and perchlorate are known to be present in groundwater beneath the site.	M12A (d) M11 (d)	M12A (d) M11 (d) M52 (d) M77 (d) M10 (u)	X	X	X	X	X								
44	Unit 6 Basement	High-purity, battery-battery-grade manganese dioxide has been produced in electrolytic cells in Unit 6. Process spillage and wash water was identified as a source of soil and groundwater impact.	X	X	X							Historical data show that total chromium, hex chromium, perchlorate, and manganese in groundwater exceed the Phase A comparison level.	M11 (d) GWSA08 (d)	M11 (d) MW6R (d) M77 (d) M10 (u) M122 (d)	X	X	X	X	X								
45	Diesel Storage Tank	Diesel range TPH. AST in unlined bermed area.		X		X	X					Historical upgradient and downgradient groundwater data show that TPH was not detected, with the exception of a groundwater grab sample collected in the middle of the LOU with a concentration of 13 mg/L.	M76 (d) M2A (d) M13 (u) M12A (u)	M75 (d) M76 (d) M2A (d) M13 (u) M12A (u) M21 (d)			X	X		X							
46	Former Old Main Cooling Tower and Recirculation Lines	Several recirculation water upsets, which resulted in discharge of high-conductivity water to the Beta ditch, were reported. Chromium was added as a treatment chemical in the cooling tower.		X	X							No historical groundwater data identified in association with the LOU.	M31A (u)	M31A (u) M33 (u) M34 M35 M19 (d)			X	X	X								

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group										Phase A Wells Sampled	Phase B Well Proposed for Sampling	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan																
47	Leach Plant Area Manganese Ore Piles	Manganese ore was stored at sever areas at this site. The dust is composed of 55 percent by weight of manganese dioxide.		X								No historical groundwater data identified in association with the LOU.	M11 (u) M29(u) M31A (d)	M11 (u) M122 (u) M52 M77 M31A (d) M33 (d) M34 (d) M35 (d) CLU1 (d) CLD4R (d)			X	X									LOUs 47 through 50 are considered part of the entire Leach Plant area as shown in LOU 51. Historic operations in LOUs 47 through 50 have occurred throughout the LOU 51 area.
48	Leach Plant Analyte Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X							Historical data show that manganese in groundwater exceeded the Phase A comparison level.	M11 (u) M31A (d)	M11 (u) M52 (u) M31A (d) M33 (d) M34 (d) M35 (d)			X	X	X								
49	Leach Plant Area Sulfuric Acid Storage Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X							Historical data show that manganese in groundwater exceeded the Phase A comparison level.	M11 (u) M31A (d)	M11 (u) M52 (u) M31A (d) M33 (d) M34 (d) M35 (d)			X	X	X								
50	Leach Plant Area Leach Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X							Historical data show that manganese in groundwater exceeded the Phase A comparison level.	M11 (u) M31A (d)	M11 (u) M52 (u) M31A (d) M33 (d) M34 (d) M35 (d)			X	X	X								
51	Leach Plant Area Transfer Lines	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X							Historical data show that manganese in groundwater exceeded the Phase A comparison level.	M11 M29 M31A (d) M12A (u)	M11 M122 M52 M77 CLU1 (d) CLD4R (d) M31A (d) M33 (d) M35 (d) M12A (u) M10 (u)			X	X	X								LOU 51 consists of the Mn Leach Plant and includes current and previous operations of LOU 47, 48, 49, and 50.
52	AP Plant Area Screening Building, Dryer Building and Associated Sump	The sump collected wash-down water. Soil exhibiting white stains was collected and recycled for perchlorate recovery.	X	X								No historical groundwater data identified in association with the LOU.	M76 (u)	M76 (u) M128 (u) M111R (d)	X	X	X	X									
53	AP Plant Area Tank Farm	Contained a number of vertical open-top and closed-top tanks used for process solution storage.	X	X	X							No historical groundwater data identified in association with the LOU.	M2A (u) M76 (u)	M2A (u) M75 (u) M76 (u) M89 (d)	X	X	X	X	X								
54	Septic Tank for AP Plant Area Change House/ Laboratory	Wastewater effluent from the change house showers, restrooms, and laboratory sinks discharged to a septic system with an associated leach	X	X								No historical groundwater data identified in association with the LOU.	GWSA09 (u) GWSA14 (d)	M123 (u) M125 (d)	X	X	X	X									
55	Area Affected by July 1990 Fire	Ammonium perchlorate impacted soil around the fire area.	X	X								No historical groundwater data identified in association with the LOU.	IAR (u) M89 (u) M55 (d)	IAR (u) M25 (u) M55 (d) M78 (d) M64	X	X	X	X									
56	AP Plant Area Old Building D-1- Washdown	Wash-down water contained dissolved ammonium perchlorate.	X	X								No historical groundwater data identified in association with the LOU.	IAR (u)	IAR (u) IB (d) IL (d) IR (d) M110 (u) M14A (u) M64 (d)	X	X	X	X									

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model												Phase A Source Area Investigation	Proposed Phase B Source Area Investigation												Comments
		Description of Chemicals Identified	Potential Contaminant Group									Evaluation of Historical Investigations															
			Perchlorate	Metals	Wet Chemistry¹	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan		Phase A Wells Sampled	Phase B Well Proposed for Sampling	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry¹	VOCs	OCPs	Radionuclides					
57	AP Plant Transfer Lines to Sodium Chlorate Process, AP Plant SI's and Transfer Lines	Ammonium perchlorate was transferred from the AP process to the sodium chlorate ponds.	X	X	X							No historical groundwater data identified in association with the LOU.	M76 (u) M2A (u) GWSA15 M89 IAR M55 (d)	M128 (u) M76 (u) M75 (u) M2A (u) M34 (u) M17A M110 M111R M89 M22A M38 (d) M25 (d) IAR IB (u) IL (u) IR (u) M64 (d) M65 (d)	X	X	X	X	X							
58	AP Plant Area New Building D-1 Washdown	Material handling, mixing, blending, and washdown.	X	X	X							No historical groundwater data identified in association with the LOU.	IAR (u)	IB (d) IL (d) IR (d) IAR (u) M14A (u)	X	X	X	X	X							
59	Storm Sewer System	Between 1941 and 1976, storm sewer system conveyed storm water and process effluent. After 1976, process solutions were controlled in vessels or in lined surface impoundments.	X	X	X	X				X		Storm sewer system serves the site between Avenues L and F and Streets 4 and 11.	GWSA08 M11 M12A M13 M92 M97 GWSA10 GWSA09 M31A	M10 TR08 M13 M92 M93 M97 M21 M50 M31A M33 CLU1 M77 M52 M122 MW6R M11 M12A M13	X	X	X	X	X	X						
60	Acid Drain System	System used to collect acid effluent from throughout the BMI complex. Acid drains in the non-operating portions of the facility (Units 1 and 2) have been filled with concrete debris and soil.		X	X	X	X					The acid drain system serves the six Unit buildings plus the industrial area to the north	M11 M12A M13 M29 M92 M97 M31A GWSA10 M2A	M10 TR08 M13 M92 M97 M21 M34 M35 CLU1 CLD4R M77 M52 M122 MW6R M11 M12A M17A M2A M75 M76 M128 M123			X	X	X	X							SVOCs
61	Old Sodium Chlorate Plant Decommissioning	The process liquids contained primarily sodium chlorate with sodium dichromate as a process chemical additive contained in Units 4 & 5.	X	X	X							No historical groundwater data identified in association with the LOU.	M12A (d) M11 (d)	M12A (d) M11 (d) M10 (u) M52 (d) M77 (d)	X	X	X	X	X							

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Potential Contaminant Group																								
		Description of Chemicals Identified	Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan		Phase A Wells Sampled	Phase B Well Proposed for Sampling	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
62	State Industries, Inc. Site, Including Impoundments and Catch Basin	Used acid drain system to convey various process wastes to the Beta Ditch. Monthly discharges of process waste averaged ~35,000-gallons and included spent sulfuric acid, borax, soda ash and phosphate chemicals. Liquid waste containing spent cyanide was periodically discharged. Two surface impoundments, "western" and "eastern" received spent pickling process wastes which included spent sulphuric acid, borax soda ash (anhydrous sodium carbonate) and phosphates (chemical combinations), and TURCO II H.T.C. soap. Low levels of lead and molybdenum were found. VOCs were also detected.		X	X	X	X	X				No historical groundwater data identified in association with the LOU.	GWSA02 M120 (u)	M121 (u) M118 (u) M10 (d) TR10			X	X	X	X	X						May convert SA28 to a monitoring well.
63	J. B. Kelley, Inc. Trucking Site	Trucking activities included the washing of truck exteriors and interiors, vehicle fueling (from 10,000-gallon fiberglass UST), and minor repair work including oil changes. Toluene, TCA, acetone, and total chromium were identified at the site. TPH was not detected.		X	X	X	X	X		X		Historical data show that VOCs and TPH were not detected in groundwater.	M92 (u) GWSA10 (d)	M92 (u) M93 (u) M124 (d)			X	X	X	X	X						May convert SA137 to a monitoring well.
64	Koch Materials Company Site	Area used as an asphalt emulsion batch plant. Soil samples were analyzed for VOCs, SVOCs, metals, and confirmatory TPH analysis.		X		X	X			X		No historical groundwater data identified in association with the LOU.	M92 (u) GWSA10 M76 (d)	M93 (u) TR6 (u) M124 M128 (d) M76 (d)			X	X		X							
65	Nevada Precast Concrete Products, Green Ventures International, Buckles Construction Company and Ebony Construction Sites	TPH in the range of motor oil, diesel range was detected. TPH in the gasoline range was not detected above the PQL of 29 mg/kg. TPH heavier than diesel was detected at 100 mg/kg.		X		X	X					Historical downgradient data show that BTEX and TPH were not detected in groundwater.	M92 (d)	M92 (d) TR8 (u)			X	X		X							LOU 65 includes five separate areas, three of which were office use only (LOU 65a, 65b, and 65 c). LOU 65d area contained a garage used for equipment storage and will be evaluated by BRC Phase II Parcel G borings. LOU 65e has been identified as a potential source area for TPH; however, it was remediated in association with LOU 41 and further assessment is not recommended. In addition, LOU 65a was sampled as part of the Parcel F Phase II by BRC. Proposed Phase B analysis is for LOU 65d only.
66	Above-Ground Diesel Storage Tank Leased by Flintkote Co.	Diesel tank located near the southwest corner of the Chemstar property.		X			X					No historical groundwater data identified in association with the LOU.	M97 (d)	M10 (u) M97 (d) M21 (d) M50 (d)			X	X									
67	Delbert Madsen and Estate of Delbert Madsen Site	Property was used as a storage and salvage yard. Material and trash was removed and disposed of at the Silver State Landfill in Apex, Nevada.		X		X	X			X		No historical groundwater data identified in association with the LOU.	PC40	H48 (u) H49A (u) MC66 (u) PC40 PC34 (d)			X	X		X							
68	Southern Nevada Auto Parts Site (Pick A Part)	The leased property was and is used to store wrecked, impounded and repossessed vehicles. Stained soil was present in some areas.		X		X	X			X		No historical groundwater data identified in association with the LOU.	M95 M98 (u) M100 (u)	M95 M44 M94 M96 PC33 (d) PC37 (u) M23 (u) M98 (u) M99 (u) PC64 (d) M100 (u)			X	X		X							
69	Dillon Potter Site	The area was used for livestock management and to store approximately 25 vehicles.		X	X							No historical groundwater data identified in association with the LOU.	M100 (u) M48	M48 M100 (u) M101 (u) M102 (u) PC54 (d)			X	X	X								

Table 1-1A
Historic and Proposed Groundwater Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model										Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group										Phase A Wells Sampled	Phase B Well Proposed for Sampling													
			Perchlorate	Metals	Wet Chemistry [1]	VOCs	SVOCs	Pesticides	Radionuclides	PCBs	Dioxin/furan				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	OCPs	Radionuclides					
NA	U. S. Vanadium	Production of tungsten.		X								No historical groundwater data identified in association with the LOU.	GWSA08 M11 (u)	M11 (u) M122 (u) MW6R (u) M77 CLU1 (d) M33 (d) CLD4R (d)			X	X	X								Metals include tungsten.

Notes:
X & OO = Analysis shown applies to all Phase B borings in the LOU.
LOU = Site identified in Letter of Understanding dated August 15, 1994.
PCBs = Polychlorinated biphenyls.
PQL = practical quantitation limit.
SVOCs = Semi-volatile organic compounds.
TDS = Total dissolved solids.
TPH = Total petroleum hydrocarbons.
VOCs = Volatile organic compounds.
PAHs = Polycyclic aromatic hydrocarbons.
1 = Includes general wet chemistry parameters listed on Table 3-2 of the Upgradient Report.
2 = This area will also be tested for herbicides because Silvex is a herbicide.
(d) = Well is located downgradient of LOU.
(u) = Well is located upgradient of LOU.
* = New boring proposed after Phase B Work Plan was submitted to NDEP.
-- = No borings.
OO = Proposed analysis was not included as part of the Phase B Sampling plan submitted to NDEP in September 2007.
NA = Not applicable.

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model													Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group													Phase A Borings Drilled rest EA05	Phase B Boring Proposed													
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	
1	Trade Effluent Settling Ponds	Acid waste neutralized with caustic liquor, hydrochloric acid, sodium hydroxide. The area of the former TE ponds is now occupied by the closed hazardous waste landfill, surface impoundments WC-East and WC-West addressed as separate LOUs. Chemicals mentioned included Silvex. Previously tested for RCRA metals.		X	X			X^2							Soil samples analyzed in 1997 show that arsenic, barium, lead, and chromium exceeded the Phase A comparison level (95th percentile of background).	SA21 EA04 SA22 EA05 SA23	SA76 - LOU32 SA77 SA78 EA04 SA79 SA80 SA81 EA03 SA97 (s) LOU32 SA98 (s)	X	X	OO	X	OO				OO			SA97 ↑ why only SA97 for asbo	OCHs addressed in Phase A. SA98 is a stepout boring to the south. ~~Two~~ 3 shallow test pits will be located east of the hazardous wast landfill.
2	Open Area Due South of "Trade Effluent Disposal Ponds"	Identified in LOU as "poorly defined historic disposal area."		X	X			X								SA18	SA68 SA78 SA95 (s)	X		OO	X	X				OO			X	SA68 is a stepout boring to the south. SA78 is a close stepout boring to the north.
3	Air Pollution Emissions Associated with Industrial Processes	Particulates.		X			X						X		Numerous surface and near surface soil samples have been collected site-wide and analyzed for various SRCs.	SA01 through SA27	Surface & near surface soil samples from Phase B borings	OO	OO	OO	OO	OO	OO		OO	OO	OO	OO		Surface and near surface soil samples will be collected from all proposed borings.
4	Hardesty Chemical Company Site (prior to J. B. Kelley Operations)	Muriatic acid, synthetic hydrochloric acid, monochlorobenzene, peradichlorobenzene, orthodichlorobenzene, DDT, and soda arsenite solution, two underground storage tanks for kerosene and benzene.		X	X	X	X	X	X							SA04	SA29 SA84	X	X	X		X	OO			X	OO			SA29 is a stepout boring to the south.
5	On-Site Portion of Beta Ditch, Including "Small Diversion Ditch" Northwest of Pond C-1	VOCs, SVOCs, pesticides/ polychlorinated biphenyls (PCBs), metals, cyanide, chlorate, pH, asbestos and radionuclides.	X	X	X	X	X	X	X	X	X			X	Historical soil samples show that chlorobenzene, Beta-BHC, arsenic, lead, and chromium exceeded the Phase A comparison level.	SA14 SA16 SA17	SA63 SA64 SA66 SA69 SA70 SA71 SA86 SA128* (s) SA129* (s) SA130* (s) SA131* (s)	OO		OO	OO	OO	OO		X	OO	OO		SA86	SA66 is a step out boring to the southwest. SA63. SA64, SA69, SA70, and SA71 are stepouts on either side of ditch.
6	Unnamed Drainage Ditch Segment (BMI Landfill)	Wastewater and stormwater.		X		X	X	X	X						Not located on Tronox property. No further evaluation proposed.	--	--													No Phase B assessment recommended.
7	Old P-2 Pond and Associated Conveyance Facilities	Old P-2 Pond received chlorate process liquids which contained hexavalent chromium, sodium chloride, sodium chlorate, and sodium perchlorate. The latter compound was from the caustic scrubber solution generated at the AP plant. lined - single	X	X	X										Five soil borings were drilled in the pond and exceeded the Phase A comparison level (95th percentile of background).	~~SA11~~ LOU8	SA102 (s)	X		OO	X	OO	X			X			X	Historic assessment indicates that this LOU is a chromium source; therefore no Phase A assessment was conducted. Phase B assessment will include wet chemistry that has not been evaluated previously. SA45 & SA53 are stepouts to ~~the southwest and northwest,~~ respectively. Waste streams similar to LOU 8 and LOU 9 per Kleinfelder (1993).
8	Old P-3 Pond and Associated Conveyance Facilities	Ammonium perchlorate and chromium. lined - single	X	X	X										During the Phase II ECA, total chromium was detected in pond above the Phase A comparison level (95th percentile of background).	SA11	LOU7 ~~SA102 (s)~~	X		OO	X	OO	X			X			X	No Phase B assessment recommended based on information in Kleinfelder (1999) report indicating that this pond is similar to Old P-3 pond. Waste streams similar to LOU 7 and LOU 9 per Kleinfelder (1993).
9	New P-2 Pond and Associated Piping	Ammonium perchlorate and chromium. lined - double	X	X	X										No historical assessment data.	~~SA11~~ LOU8 not for extent	~~SA102 (s)~~ LOU7 not for extent	X		OO	X	OO	X			X			X	Pond in LOU is lined. New P-2 and the adjacent Old P-2 and P-3 ponds received the same waste stream. Old P-2 and P-3 have been characterized; therefore, by extrapolation, New P-2 pond has also been characterized. Waste streams similar to LOU 7 and LOU 8 per Kleinfelder (1993).

EA03-SEC
EA04 - almost entire EA
EA05 - majority of LOU

EA06

EA06

EA04
1 Phase A boring SA78
3 TP

EA03
Phase 1 - 1 boring
Phase 2 - 26 borings

* Ditch (NW Ditch) not identified as LOU - outlined in yellow on map, but not on tables.
- located in EA01 - small section - SEC (SA25)
EA02 - small section - SWC (SA24)
EA03 - all along N boundary (1 Phase 2 boring)

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

	LOU Number	Name of LOU	Conceptual Site Model												Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Description of Chemicals Identified	Potential Contaminant Group													Phase A Borings Drilled	Phase B Boring Proposed	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry^1	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	
				Perchlorate	Metals	Wet Chemistry^1	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos																
EA04	10	On-Site Hazardous Waste Landfill (Closed)	Hazardous Waste.	X	X	X	X	X	X	X	X	X				The landfill was closed and capped in 1985 in accordance with RCRA interim status requirements. This landfill was closed consistent with the approved closure and post closure plans. A letter dated January 17, 1986 the NDEP approved the landfill closure. - what were RCRA interim status req. in 1985?	to far ~~10~~ 5 ~~SA18~~ not in EA SA21	SA78 2 too far N&E for this LOU	OO	OO	OO	OO	OO				OO	OO	OO	OO	No additional assessment is proposed due to the approval of the closure and the RCRA cap which should not be penetrated; however, two shallow test pits will be located east of the hazardous waste landfill. Phase A borings SA18 and SA21 located north and south of LOU. ← test pits not near this LOU
EA09	11	Sodium Chlorate Filter Cake Holding Area	Filter Cake Drying Pad was used to dry particulate material removed from the sodium chlorate process; chromium, chlorate and TDS.	X	X	X										When pad structure was demolished "discolored soil was removed and disposed of with the concrete." Material removed was disposed of as hazardous waste due to total chromium content of the upper surface; however, there is no record of confirmation samples for this area.	SA05	SA30 SA124* (s) SA125* (s) SA126*	OO		OO	OO	OO				~~OO~~ misprint	~~OO~~	~~OO~~	~~OO~~	SA125 is a stepout to the southeast and SA126 is a stepout to the northeast. SA30 is a stepout to the south.
EA09	12	Hazardous Waste Storage Area	Container for waste from the sodium chlorate process.	X	X	X										No historical assessment data.	SA05	SA30 SA124* (s) SA125* (s) SA126*	OO		OO	OO	OO								SA124 is a stepout to the northwest, SA30 is a stepout to the south, and SA126 is a step out to the northeast.
EA06	13	Pond S-1	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, sodium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond S-1. lined - single	X	X	X										S-1 pond was single-lined surface impoundment used by the sodium chlorate process. During closure of the ponds, approximately two feet of soil from beneath the floor of each pond was removed and soils sampled and analyzed to confirm adequate soil removal. Soil samples were analyzed by Extraction Procedure Toxicity methods and revealed concentrations of total soluble chromium between <0.02 mg/L and 0.11 mg/L.	SA12 ✓	--													No Phase B assessment recommended.
EA06	14	Pond P-1 and ~~Associated Conveyance Piping~~	Liquids from the sodium chlorate, sodium perchlorate, potassium perchlorate, and boron manufacturing processes. Cooling tower and reboiler wastes from the boron trichloride process were also discharged to Pond P-1. Liquors, residual salt solutions, and rinsates from decommissioning and closure of Pond S-1 and from the decommissioning of potassium perchlorate manufacturing process.	X	X	X										P-1 pond was single-lined surface impoundment used by the sodium chlorate process. During closure of the ponds, approximately two feet of soil from beneath the floor of each pond was removed and soils sampled and analyzed to confirm adequate soil removal. Soil samples were analyzed by Extraction Procedure Toxicity methods and revealed concentrations of total soluble chromium between <0.02 mg/L and 0.11 mg/L.	not extent ~~SA12~~	SA51	X		OO	OO	OO	X						X	
	15	Platinum Drying Unit	Platinum, sodium perchlorate byproducts, chromium.	X	X											In 1993, the pad concrete was sampled for metals by TCLP, but not perchlorate. The area was demolished and the concrete was transported to a hazardous waste TSDF. Soil under the pad was sampled for total chromium.	SA06	SA124* (s) SA125* (s) SA126*	OO		OO	OO		OO							SA126 is located within LOU 15 in an area more recently identified as a potential source area for chloroform. SA124 and 125 are stepouts to the west southwest.
EA06	16 & 17	Ponds AP-1, AP-2, and AP-3 and Associated Transfer Lines	Nitrate, nitrite, ammonium perchlorate, and chromium. Pond is lined.	X	X	X										No historical assessment data.	--	SA64 - if point is to have this be last round of sampling - all 3 should be sampled	X	X	X	X	X	X		X	X			x	SA64 is located in AP-1. AP-1, AP-2, and AP-3 ponds received the same waste stream; therefore SA64 will be used to assess the three ponds.
EA06	18	Pond AP-4	Ammonium perchlorate and chromium. Pond is lined.	X	X	X										No historical assessment data.	--	SA63	X	X	OO	OO	OO								This pond is currently lined; therefore, no borings are proposed within the pond.
EA06	19	Pond AP-5	Ammonium perchlorate and chromium. Pond is double lined.	X	X	X										No historical assessment data.	--	~~SA72~~ (d) LOU31	X	X	OO	OO	OO								AP-5 is an active facility that is double lined and a boring cannot be drilled through the LOU; therefore proposed Phase B boring is located downgradient to AP-5 berm.

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

	LOU Number	Name of LOU	Conceptual Site Model														Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Description of Chemicals Identified	Potential Contaminant Group																												
				Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos		Phase A Borings Drilled	Phase B Boring Proposed	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	
EA08	20	Pond C-1 and Associated Piping	Used to evaporate non-hazardous process water, primarily from steam production, but at times also from the boron and manganese dioxide processes.		X	X										No historical assessment data.	--	SA61 SA62 SA71	X	X	X	OO	X								SA62 is located within the LOU. Pond liner has been removed.
EA08	21	Pond Mn-1 and Associated Piping	The manganese pond received non-hazardous process water wastes, including filter wash water and cathode wash water. The pond contents contain manganese as well as high TDS.		X	X										No historical assessment data.	--	SA59 SA61	X	X	X	OO	X								Pond is active and lined; therefore, no borings will be drilled within the LOU.
EA05	22	Pond WC-1 (WC-West) and Associated Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X										A small spill occurred between the two ponds (WC-1 & WC-2). The spilled material was identified as sodium hypochlorite and other water treatment chemicals.	SA23 d.gradient	f-up SA 77 SA81 EA08 SA127* (s) ↑between	X	X	OO	X	X							X	SA77 and SA81 are located upgradient and downgradient, respectively, of the pond. SA127 is located between WC 1 and WC-2. Ponds are currently active and double or triple lined.
EA 05	23	Pond WC-2 (WC-East) and Associate Piping	Process water. Sodium hypochlorite and other water treatment chemicals, were placed in WC-East pond (WC-2).	X	X	X										A small spill occurred between the two ponds. The spilled material was identified as sodium hypochlorite and other water treatment chemicals.	--	dgrad SA80 SA127 (s)*	X	OO	OO	OO	OO							X	SA80 is located downgradient of the pond. SA127 is located between WC-1 and WC-2. This pond is currently active and triple lined.
EA08	24	Leach Beds, Associated Conveyance Facilities, and Mn Tailings Area	Tailings from the beneficiation of manganese dioxide ores were transported as a slurry to unlined surface impoundments/leach beds to the west of the current tailings area; demolition debris was also put into the tailings piles.		X											The tailings were analyzed by EP toxicity in 1979 and by TCLP in 1990 and 1993, and were determined to be non-hazardous.	Mn Tailings Sample Mn Ore Sample	--													LOU 24 is beneath the manganese tailings pile and not reasonably accessible for drilling; however, a manganese tailing sample was collected as part of the Phase A investigation.
	25	Process Hardware Storage Area	Used to store process hardware, scrap metal parts and equipment from decommissioning of the former sodium chlorate and perchlorate processes, equipment was rinsed prior to placement.	X	X	X										No historical assessment data.	--	SA29 SA111 (s)	X	OO	X	OO	OO								SA29 is a stepout boring to the northeast.
	26	Trash Storage Area	Two asphalt areas were used to store trash from the sodium chlorate and sodium perchlorate process. Common trash was placed in 55 gallon drums then shipped to Beatty, Nevada as a precautionary measure.	X	X	X										No historical assessment data.	SA03	SA110 (s) SA120* (s) SA121* (s)	OO	OO	OO	OO	OO								LOU 26 consists of two separate areas north of Unit 1 & 2. SA110 is a stepout boring to the south.
	27	PCB Storage Area	An eight inch thick concrete and 6-mil plastic lined area received PCB waste.				X	X		X		X				The USEPA conducted an inspection of the PCB storage area in 1989 and stated that no problems were noted.	--	--													Based on EPA evaluation of historic data, no further evaluation is recommended.
EA09	28	Hazardous Waste Storage Area	Hazardous and non hazardous waste was stored in drums in this area including used oil and flammable maintenance parts washing wastes. The concrete pad and 4 feet of soil were removed. TPH was discovered in the soil and removed in 1994.	X	X		X	X		X		X				TPH was discovered in the soil and removed in 1994.	SA04	--													LOU is an active operating unit, therefore, SA04 was drilled downgradient of the LOU to avoid drilling through the containment facility.
	29	Solid Waste Dumpsters	Open metal dumpsters were placed on concrete surfaces separated by gravel covered soil. The dumpsters contained common trash, recyclable steel and other recyclable metals. Scrap metal was washed before being placed in this area.	X	X	X	X	X		X		X			X	No historical assessment data.	--	SA122* (s)	OO	OO	OO	OO	OO	OO				OO		OO	
EA06	30	AP Area-Pad 35	Used for the accumulation of trash potentially contaminated with perchlorate and other industrial wastes, such as cooling tower sludge, and iron oxide sludge.	X	X	X	X	X		X		X				No historical assessment data.	SA19	SA123* (s)	OO	OO	OO	OO	OO	OO				OO		X	
EA06	31	Drum Recycling Area	Drums from the ammonium perchlorate production were emptied and rinsed prior to delivery to this area.	X	X											Soils adjacent to the drum crushing area were transported to the AP-4 pond for recovery of the residual perchlorate.	SA19	SA72	X	X	X	OO								X	
EA05	32	Ground Water Remediation Unit	This LOU includes the treatment system, the extraction wells and the recharge trenches. The treatment system reduces chromium and other heavy metals from impacted groundwater. The recharge trenches became plugged and discharged treated water to the shallow soils.	X	X											No historical assessment data.	SA20	fup SA75 SA76 SA96 (s) SA98 (s) X grad ~~SA20~~ SA97 ?	X	OO	X	OO	OO				OO			SA96	Ammonia, wet chem, and OCPs are being analyzed because SA76 is also being used to evaluate LOU 1. SA75 & SA98 are stepout borings to the south and east, respectively.
	33	Sodium Perchlorate Platinum By-Product Filter, Unit 5	A sodium perchlorate platinum recovery filter press with a sump that collected and contained process liquids and wash down water.	X	X											No historical assessment data.	--	SA132* (s)	OO	OO	OO	OO									In addition to SA132, proposed Phase B boring SA34 is located downgradient of LOU.
EA06 EA08	34	Former Manganese Tailings Area	Tailings from the beneficiation of manganese dioxide ores were transported as a slurry to unlined surface impoundments/leach beds to the west of the current tailings area, demolition debris was also put into the tailings piles.		X											The tailings were analyzed by EP toxicity in 1979 and by TCLP in 1990 and 1993, and were determined to be non-hazardous.	--	SA39 SA51 (d)	X	X	X	X	X	X						X	SA39 also used to evaluate general VOC and perchlorate source areas. SA51 is a stepout to the north.

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

	LOU Number	Name of LOU	Conceptual Site Model												Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
			Description of Chemicals Identified	Potential Contaminant Group													Phase A Borings Drilled	Phase B Boring Proposed	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	
				Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos																
EA07	35	Truck Emptying/Dumping Site	"Unknown" waste materials disposed in this area. Analytical results detected metals and TPH. One soil sample contained 2.4 ug/kg of 1,1,-trichloroethane (estimated value below PQL). Area consists of three basins, southern, central, and northern. The latter two are interconnected.		X		X	X		X						Historical soil samples collected in the southern basin show that arsenic, total chromium, barium, chloroform, and lead exceed the Phase A comparison levels.	SA09	SA48 SA49 SA56	X	X	X	X	X	X			X	OO		SA48	SA48 and SA49 are located in the southern and central basins and SA56 is adjacent to the northern basin for investigation of potential off-site contaminants.
	36	Former Satellite Accumulation Point, Unit 3, Maintenance Shop	Accumulation point includes a parts washer and storage of lead acid batteries and waste from the parts washer. Solvent-based and caustic detergent was used for washing. Waste stored included drums of oil and grease, solvents (mainly 1,1,1-trichloroethane), sludge, caustic detergent and metal parts.		X	X	X	X		X		X				No historical assessment data.	--	SA133*			OO	OO	OO	OO				OO			
	37	Former Satellite Accumulation Point, Unit 6, Maintenance Shop	Area included a parts washer and a drum for temporary storage of parts washer waste. Solvent-based washer and caustic detergent was used for washing. Waste stored in this area included drums of oil and grease, solvents (mainly 1,1,1-trichloroethane), sludge, caustic detergent and metal parts.		X	X	X	X		X		X				No historical assessment data.	SA08	SA08 (d)	OO	OO	OO	OO	OO					OO			Currently an active operation with foundations up to 20 feet deep.
EA06	38	Former Satellite Accumulation Point, AP-Laboratory	Hazardous chemicals (flammable liquids) used in the on-site laboratory were stored in this area.	X	X		X									No historical assessment data.	--	~~SA85~~ SA134* (s)	OO	OO	OO	OO		OO						X	SA85 is a stepout boring to the northwest.
EA06	39	Satellite Accumulation Point-AP Maintenance Shop	TPH in the range of motor oil and diesel were detected.	X	X			X		X						Area was remediated and confirmation samples were non-detect.	--	~~SA101 (s)~~	X			X		X			X	OO			Analysis will also include TPH-ORO.
	40	PCB Transformer Spill	Approximately 1.75 lbs of PCB-containing fluid was released.							X		X				Concrete where spill occurred was removed and a small amount of soil beneath the concrete was removed.	--	SA33 SA139*	X	X	X	X	X					OO		x	Due to the presence of utilities in this area, SA33 will be hand augured as close as possible to the LOU. SA33 will also evaluate several other source areas. SA139 will be a shallow soil sample in the area of the spill and will only be tested for PCBs.
	41	Unit 1 Tenant Stains	TPH in the range of motor oil and diesel was detected.		X			X		X						Soil samples were collected and remediation of affected soils was conducted. Confirmation soil sample was below the NDEP action level for TPH.	SA03														Phase B assessment not recommended.
	42	Unit 2 Salt Redler	Sodium chlorate spillage to the ground occurred during transfer from storage in Unit 2 to the conveyor feed hopper.		X	X										Spilled salt was swept up and returned to Unit 2.	--	SA29 (d) SA133* SA135* (s)			OO	OO	OO								SA133 is a stepout to the east. SA29 is a stepout to the northwest and SA133 to the northeast.
	43	Unit 4 and 5 Basements	Soil beneath units may be impacted with concentrations of sodium perchlorate, sodium chlorate, or sodium dichromate (hexavalent chromium) from electrolytic processes.	X	X	X										No historical assessment data.	SA06 SA07	SA06 SA07 SA31 SA32 SA33 SA34 SA36 SA126*	X	X	X	X	X	X						SA32	Phase A borings SA06 & SA07 are located just north of the Unit 4 & 5 buildings. SA34 is crossgradient of Unit 6.
	44	Unit 6 Basement	High-purity, battery-battery-grade manganese dioxide has been produced in electrolytic cells in Unit 6. Process spillage and wash water was identified as a source of soil and groundwater impact.	X	X	X										Remediation measures were undertaken in 1986. The basement was cleaned, the concrete floor was removed, and the subsurface soil was re-contoured. The basement was lined with a 100-mil HDPE liner. Well M29 is located in the basement of Unit 6; however, this well is considered inaccessible for safety reasons and will not be sampled in the future.	SA08	SA34 SA35	X	X	OO	OO	X							X	SA08 is downgradient of Unit 6 to evaluate Unit 6. SA35 is upgradient of Unit 6. SA34 is crossgradient of Unit 6.
EA06	45	Diesel Storage Tank	Diesel range TPH. AST in unlined bermed area.		X		X	X		X						Samples were collected for TPH analysis from seven soil borings. Soil samples from three boreholes contained TPH-diesel at concentrations greater than 100 mg/kg (800 mg/kg to 16,000 mg/kg).	--	SA40 SA41 SA42 SA43 SA44 SA45	X	OO	OO	OO	X	X	Z			X	X		SA45 is a stepout boring to the west.
	46	Former Old Main Cooling Tower and Recirculation Lines	Several recirculation water upsets, which resulted in discharge of high-conductivity water to the Beta ditch, were reported. Chromium was added as a treatment chemical in the cooling tower.		X	X										No historical assessment data.	--	SA52 SA107 (s)	X	X	X	X	X								SA107 is proposed to evaluate the flow of the water discharged from the cooling tower to the Beta-ditch.

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

			Conceptual Site Model														Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													
				Potential Contaminant Group																											
	LOU Number	Name of LOU	Description of Chemicals Identified	Perchlorate	Metals	Wet Chemistry¹	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos	Evaluation of Historical Investigations	Phase A Borings Drilled	Phase B Boring Proposed	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry¹	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	Comments
EA08	47	Leach Plant Area Manganese Ore Piles	Manganese ore was stored at sever areas at this site. The dust is composed of 55 percent by weight of manganese dioxide.		X											No historical assessment data.	SA13 One Mn-ore sample	SA37 SA38	X	X	X	X	X								SA37 & SA38 are located in areas in the manganese leach plant area that contain multiple manganese ore piles. One manganese ore sample was collected and analyzed as part of the Phase A source area investigation.
EA08	48	Leach Plant Analyte Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X										No historical assessment data.	SA13	SA136* (s)			OO	OO	OO								LOUs 48, 49, and 50 are intermingled and have been evaluated by SA13.
EA08	49	Leach Plant Area Sulfuric Acid Storage Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X										No historical assessment data.	SA13	SA136* (s)			OO	OO	OO								
EA08	50	Leach Plant Area Leach Tanks	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X										No historical assessment data.	SA13	SA136* (s)			OO	OO	OO								
EA08	51	Leach Plant Area Transfer Lines	A variety of process equipment is used to beneficiate the manganese dioxide ore and produce high-quality, battery-grade manganese dioxide. A manganese sulfate solution and sulfuric acid were contained in tanks.		X	X										No historical assessment data.	SA07 SA08 SA13	SA36 SA37 SA38 SA136* (s)		OO	OO	OO	OO							SA37	
EA06	52	AP Plant Area Screening Building, Dryer Building and Associated Sump	The sump collected wash-down water. Soil exhibiting white stains was collected and recycled for perchlorate recovery.	X	X											No historical assessment data.	SA15 too far	SA65	X	X	OO	OO	X								
EA06	53	AP Plant Area Tank Farm	Contained a number of vertical open-top and closed-top tanks used for process solution storage.	X	X	X										No historical assessment data.	SA15 too far	~~SA58~~ SA60 ~~SA64 (u)~~	X	X	OO	OO	OO							X	Area currently being demolished. SA58 is a stepout boring to the southwest. SA64 is a stepout to the north.
EA07	54	AP Plant Area Change House/ Laboratory Septic Tank	Wastewater effluent from the change house showers, restrooms, and laboratory sinks discharged to a septic system with an associated leach field. Hazardous solutions were collected and shipped to an appropriate disposal facility.	X	X											Two soil borings were located in this LOU. Acetone was detected in one boring at an estimated value of 9.8 ug/kg.	SA14	SA57 SA67 SA85	X	X	X	X	X	X			X			X	SA85 will also be used to evaluate other LOUs and potential off-site sources to the west. SA57 & SA67 are stepout borings to the southwest and northwest, respectively.
EA05	55	Area Affected by July 1990 Fire	Ammonium perchlorate impacted soil around the fire area.	X	X									X		No historical assessment data.	SA20 ~~[illegible]~~ not in LOU														No Phase B assessment recommended.
EA06	56	AP Plant Area Old Building D-1- Washdown	Wash-down water contained dissolved ammonium perchlorate.	X	X											No historical assessment data.	SA19	~~SA123*~~ (s)	OO	OO	OO	OO	OO	OO				OO		X	SA123 (s) will also be used to evaluate LOU 30.
EA06	57	AP Plant Transfer Lines to Sodium Chlorate Process, AP Plant SI's and Transfer Lines	Ammonium perchlorate was transferred from the AP process to the sodium chlorate ponds.	X	X	X										No historical assessment data.	SA15 SA16	~~SA58~~ ~~SA60~~ SA63 ~~SA64~~ ~~SA65~~ ~~SA69~~ SA70 SA73 SA72 ~~SA75~~ SA86 ? ~~SA99~~ SA123* (s)	X	X	X	X	X	X		X	X			SA70 SA73 ~~SA64~~ SA86	Several of the listed borings will also evaluate other surrounding LOUs. SA69 & SA75 are stepout borings to the west and north, respectively. SA99 & SA58 are stepout borings to the northeast and south, respectively.
EA05	58	AP Plant Area New Building D-1 Washdown	Material handling, mixing, blending, and washdown.	X	X	X										No historical assessment data.	SA19	SA74	X	X	OO	OO	OO								

t up grad.

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

LOU Number	Name of LOU	Conceptual Site Model													Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments
		Description of Chemicals Identified	Potential Contaminant Group													Phase A Borings Drilled	Phase B Boring Proposed	Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry[1]	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos	
			Perchlorate	Metals	Wet Chemistry[1]	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos																
59	Storm Sewer System	Between 1941 and 1976, storm sewer system conveyed storm water and process effluent. After 1976, process solutions were controlled in vessels or in lined surface impoundments.	X	X	X	X					X				No historical assessment data.	SA04 SA05 SA07 SA08 SA10 SA13	SA30 SA31 SA32 SA33 SA34 SA35 SA36 SA39 SA40 SA41 SA104 SA108 SA109 SA115 SA118 SA120* (s) SA121* (s) SA133* SA135* (s) SA136* (s)	X		X	X	X	X						SA30 SA31 SA32 SA33 SA35 SA37 SA104 SA108	This LOU encompasses most of the industrial plant area.
60	Acid Drain System	System used to collect acid effluent from throughout the BMI complex. Acid drains in the non-operating portions of the facility (Units 1 and 2) have been filled with concrete debris and soil.		X	X	X	X		X							SA03 SA04 SA05 SA06 SA07 SA08 SA10 SA13	SA29 SA30 SA32 SA33 SA34 SA35 SA36 SA38 SA39 SA40 SA41 SA45 SA46 SA47 SA51 SA108 SA110 SA111 SA120* (s) SA121* (s) SA124* (s) SA125* (s) SA126* SA132* (s) SA133* SA138* (s)			X	X	X	X				X			The acid drain system served the six Unit buildings and the industrial area to the north.
61	Old Sodium Chlorate Plant Decommissioning	The process liquids contained primarily sodium chlorate with sodium dichromate as a process chemical additive contained in Units 4 & 5.	X	X	X										No historical assessment data.	SA05 SA06 SA07	SA30 SA31 SA32 SA33 SA34 SA36 SA125* (s) SA126* SA132* (s)	X	X	X	X	X	X						SA30 SA31 SA32 SA33	Several borings listed also evaluate other surrounding LOUs.
62	State Industries, Inc. Site, Including Impoundments and Catch Basin	Used acid drain system to convey various process wastes to the Beta Ditch. Monthly discharges of process waste averaged ~35,000-gallons and included spent sulfuric acid, borax, soda ash and phosphate chemicals. Liquid waste containing spent cyanide was periodically discharged. Two surface impoundments, "western" and "eastern" received spent pickling process wastes which included spent sulphuric acid, borax soda ash (anhydrous sodium carbonate) and phosphates (chemical combinations), and TURCO II H.T.C. soap. Low levels of lead and molybdenum were found. VOCs were also detected.		X	X	X	X	X	X						Low levels of lead and molybdenum were found. VOCs were also detected.	SA02	SA28	X	X	X	X	X	X			OO	OO		X	
63	J. B. Kelley, Inc. Trucking Site	Trucking activities included the washing of truck exteriors and interiors, vehicle fueling (from 10,000-gallon fiberglass UST), and minor repair work including oil changes. Toluene, TCA, acetone, and total chromium were identified at the site. TPH was not detected.		X	X	X	X	X	X		X	X			TPH was not detected in historic soil sample.	--	SA137*	X		X	X		OO			X			X	

Table 1-1
Historic and Proposed Soil Evaluation of LOUs
Phase B Source Area Investigation, Tronox Facility
Henderson, Nevada

	LOU Number	Name of LOU	Conceptual Site Model													Evaluation of Historical Investigations	Phase A Source Area Investigation	Proposed Phase B Source Area Investigation													Comments	
			Description of Chemicals Identified	Potential Contaminant Group													Phase A Borings Drilled	Phase B Boring Proposed														
				Perchlorate	Metals	Wet Chemistry^1	VOCs	SVOCs	Pesticides	TPH	Radionuclides	PCBs	Ethylene Glycol	Dioxin/furan	Asbestos				Perchlorate	Ammonia	Metals	Hex Cr	Wet Chemistry^1	VOCs	BTEX	Hexachlorobenzene	OCPs	TPH-DRO	PAHs	Asbestos		
	64	Koch Materials Company Site	Area used as an asphalt emulsion batch plant. Soil samples were analyzed for VOCs, SVOCs, metals, and confirmatory TPH analysis.		X		X	X		X		X				TCLP data show that chromium, manganese, and lead were detected. Hexacholorbenze was also detected.	SA10	SA46 SA47 SA50 SA54 SA55	X	X	X	X	X	X		X		X	X		TPH-ORO will also be evaluated as part of the Phase B assessment. SA50, SA54, & SA55 are stepout borings to the east, northeast, and north, respectively.	
EA07 EA09	65	Nevada Precast Concrete Products, Green Ventures International, Buckles Construction Company and Ebony Construction Sites A B C D E	TPH in the range of motor oil, diesel range was detected. TPH in the gasoline range was not detected above the PQL of 29 mg/kg. TPH heavier than diesel was detected at 100 mg/kg.		X		X	X		X						Visibly stained soil in the northern corner of Unit 1 was sampled and removed. Confirmation samples showed TPH at a concentration below the NDEP action level.	SA03	--													LOU 65 includes five separate areas, three of which were office use only (LOU 65a, 65b, and 65 c). LOU 65d area contained a garage used for equipment storage and will be evaluated by BRC Phase II Parcel G borings. LOU 65e has been identified as a potential source area for TPH; however, it was remediated in association with LOU 41 and further assessment is not recommended. In addition, LOU 65a was sampled as part of the Parcel F Phase II by BRC.	
	66	Above-Ground Diesel Storage Tank Leased by Flintkote Co.	Diesel tank located near the southwest corner of the Chemstar property.		X			X		X						No historical assessment data.	--	SA138* (s)										X			One shallow boring will be drilled in easement between fence and the railroad spur.	
EA01	67	Delbert Madsen and Estate of Delbert Madsen Site	Property was used as a storage and salvage yard. Material and trash was removed and disposed of at the Silver State Landfill in Apex, Nevada.		X		X	X		X		X	X			No historical assessment data.	SA27	--													No Phase B borings have been proposed since three soil samples have been collected by BRC as part of the Parcel A Phase II.	Phase 2 - 36 borings
EA02	68	Southern Nevada Auto Parts Site (Pick A Part)	The leased property was and is used to store wrecked, impounded and repossessed vehicles. Stained soil was present in some areas.		X		X	X		X		X	X			No historical assessment data.	SA26	--													No Phase B borings have been proposed since the lessee must return the land to its original condition, after which, there will be additional parcel samples collected by BRC.	Phase 2 6 borings outside current fence line
EA02	69	Dillon Potter Site	The area was used for livestock management and to store approximately 25 vehicles.		X	X				X						No historical assessment data.	SA24														Soil sampling for Parcel B is being conducted by BRC; therefore, no Phase B borings have been proposed.	- no Phase 2 borings located on LOU
	NA	U. S. Vanadium	Production of tungsten.		X											No historical assessment data.	SA08	SA37 SA38	X	X	X	X	X							SA37		

Notes:
X & OO = Analysis shown applies to all Phase B borings in the LOU.
LOU = Site identified in Letter of Understanding dated August 15, 1994.
PCBs = Polychlorinated biphenyls.
PQL = practical quantitation limit.
SVOCs = Semi-volatile organic compounds.
TDS = Total dissolved solids.
TPH = Total petroleum hydrocarbons.
VOCs = Volatile organic compounds.
PAHs = Polycyclic aromatic hydrocarbons.
1 = Includes general wet chemistry parameters listed on Table 3-2 of the Upgradient Report.
2 = This area will also be tested for herbicides because Silvex is a herbicide.
(s) = Shallow (0-10 ft) boring for area wide direct contact coverage for risk assessment purposes only.
* = New boring proposed after Phase B Work Plan was submitted to NDEP.
-- = No borings.
OO = Proposed analysis was not included as part of the Phase B Sampling plan submitted to NDEP in September 2007.
NA = Not applicable.
Some of the soil boring identifications are not used because soil assessments being conducted by BRC replace previously proposed Phase B borings. Boring IDs that are not used in this table are: SA82, SA83, SA87, SA88, SA89, SA90, SA91, SA92, SA93, SA94, SA104, SA105, SA106, SA112, and SA113.

DRAFT

Table EA08 – Discussion of LOU 20
Tronox Facility - Henderson, Nevada

steam plant near M02A
-piping from here & Units 4&5

Soil & sediment removed at same time

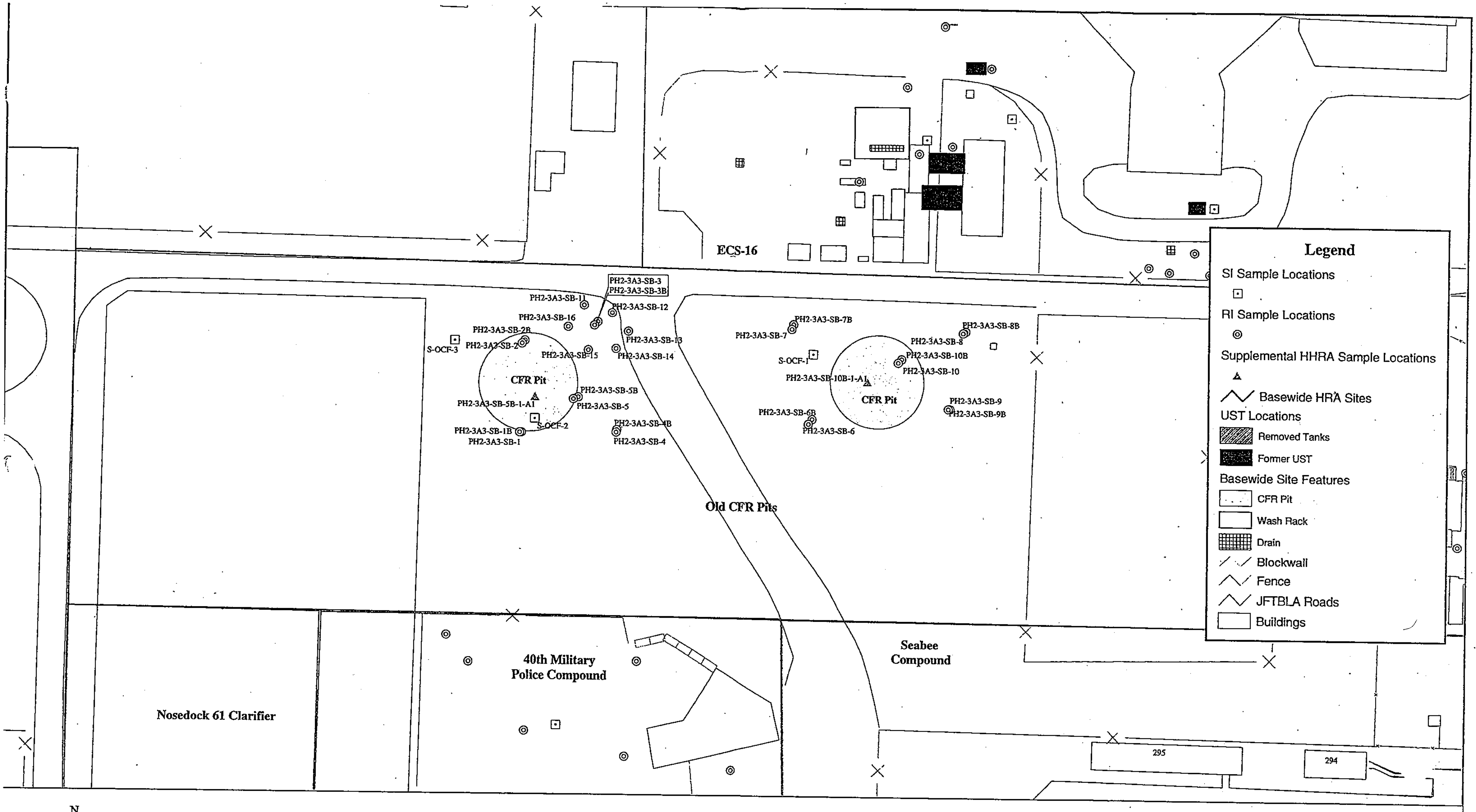
Potentially Released

LOU Number	Name of LOU	Size and Location	Description	Chemicals ~~Identified~~	Physical Characteristics Affecting Release	Results of Historical Sampling	Did Historical Sample(s) Address Potential Release?
20	Pond C-1 and Associated Piping	Approximate Size: 175 ft by 275 ft Located in the northern end of EA08.	The pond is currently inactive. Pond was lined and the liner has been removed. Previously used for evaporation of steam plant boiler blowdown, manganese dioxide ~~cathode wash~~, boron neutralization solutions, and hot water softener solutions, primarily from steam production, but at times also from the boron and manganese dioxide processes. No documented releases; however, "possible releases from around the edges of the pond could have occurred" (Kleinfelder, 1993). Salt concentrations in groundwater beneath this area increased in the early 1990s. Materials introduced in the southeast and the southwest corners. move to Physical Char. affecting Release Associated piping- above ground plastic piping, low pressure flow, no vents, or sample points, ran from Units 4 & 5 and steam plant to pond, along 9th street.	Metals - boron, manganese, possibly chromium from Cr based corrosion inhibitors from steam plant - no evidence of use General Chemistry what is in each stream?	No known releases, however, the potential migration pathways are to immediately surrounding surface soils from surface spills, to subsurface soils if there were leaks in the liner, and potentially to shallow groundwater.	Per the CSM, one historical boring (BDB05) was drilled approximately 150 feet west of the pond. However, this boring was located to evaluate the Beta-Ditch (LOU 5) and not the C-1 pond (LOU 20). This boring is considered too far from LOU 20 to be applicable.	No

steam plant piping gone

Are these data adequate for characterization?

Summary of Phase A Source Area Investigation	Are Phase A Sample Locations in the "Worst Case" Areas?	Comparison of Phase A Maximum Concentration to CL	If Phase A Maximum Exceeds CL, Compare UCL to CL	Receptor/Exposure Area Considerations	Can LOU be combined with other adjacent LOUs into single exposure area?	Is Phase B Investigation Recommended?	Proposed Phase B Soil Investigation/Rationale	Proposed Phase B Constituents List	Proposed Phase B Groundwater Investigation/Rationale
None specifically conducted for this LOU.	NA	NA	NA	NA	Can consider combining with LOU 21 with (Pond Mn-1). Both LOUs have/had similar waste streams and similar operating conditions.	Yes	Boring SA62 located in low spot of interior of LOU. Boring SA71 located adjacent to and downgradient. Boring SA61 located adjacent to and upgradient. to address possible spills Note: Access is limited between LOU 20 and LOU 21.	LOU Specific: Metals Wet Chemistry Site-wide Analyses: ClO_4, NH_4, Cr^{+6}	Wells M31A, M33, and M35 are located nearby and upgradient. Wells M39, M68, and CLD2R are located nearby and downgradient. Well M19 is located adjacent to and to the east. Well CLD4R is up- and cross- gradient.



Map Location: Old CFR Train Pit
hra_site_7.mxd,
06/05/03

Clayton
GROUP SERVICES
1565 MacArthur Boulevard
Costa Mesa, California 92626
Phone# 714.431.4100
Fax# 714.825.0685

Soil Sample Locations
HRA Site 7
Old CFR Training Pits

Joint Forces Training Base
Los Alamitos, California

Site:
7

TA USABILITY WORKSHEET - SOL

Site Investigation Area: **HRA Site 7 - Old CFR Training Pits**

Historical Activities: Two former pits were located south of Bldg 272 and Saratoga Ave (60-foot diameter with berm). For fire training (fill with water, introduce JP-4 fuel, ignite, extinguish and let percolate into ground). Sometimes pit drained fuel without ignition.

Known or Potential Chemicals: Fuels (no gasoline), solvents, fuel combustion products

Potential Chemical Classes: Petroleum hydrocarbons (including VOC and SVOC constituents), fuel combustion-related SVOCs.

Known or Pot. Release Mechanisms: Surface releases; leaching to subsurface (no specific information)

Site Data:

SI Data (1995):

Sample ID	**Sample Depth (ft)**	**VOCs** EPA Method 8240	**SVOCs** EPA Method 8270	**Metals**	**Other**
S-OCF-1	1			None	TPH (8015) all depths; EPA Method 8080 @ 1'; DLs OK; all ND
S-OCF-1-5B	5	DL OK; all ND	DL OK; all ND		
	8				
S-OCF-2	1				
	5				
S-OCF-2-7B	7	DL OK; all ND	DL OK; all ND		
S-OCF-3-1B	1*	DL OK; all ND	DL OK; all ND		
	5				
	10				

* max TPHd = 290 mg/kg

TA USABILITY WORKSHEET - SOI

RI Phase IIA (1999):

Sample ID	Sample Depth (ft)	VOCs	SVOCs	Metals	Other
PH2-3A3-SB-01	0	None	Trace hits (PAHs); DLs slightly elevated but usable.	None	None
PH2-3A3-SB-02	0				
PH2-3A3-SB-03	0				
PH2-3A3-SB-04	0				
PH2-3A3-SB-05	0				
PH2-3A3-SB-06	0				
PH2-3A3-SB-07	0				
PH2-3A3-SB-08	0				
PH2-3A3-SB-09	0				
PH2-3A3-SB-10	0				
PH2-3A3-SB-1B	1,3		None	None	Dioxins
PH2-3A3-SB-2B	1,3				
PH2-3A3-SB-3B	1,3				
PH2-3A3-SB-4B	1,3				
PH2-3A3-SB-5B	1,3				
PH2-3A3-SB-6B	1,3				
PH2-3A3-SB-7B	1,3				
PH2-3A3-SB-8B	1,3				
PH2-3A3-SB-9B	1,3				
PH2-3A3-SB-10B	1,3				
PH2-3A3-SB-11B	1,3				
PH2-3A3-SB-12B	1,3				
PH2-3A3-SB-13B	1,3				
PH2-3A3-SB-14B	1,3				
PH2-3A3-SB-15B	1,3				
PH2-3A3-SB-16B	1				

RI Phase IIB: none

HRA Supplemental Sampling (2002)

Sample ID	Sample Depth (ft)	VOCs	SVOCs	Metals	Other
PH2-3A3-SB-5B-1-1A	1	None	None	CAM	None
PH2-3A3-SB-10B-1-1A					

Data Presentation: All sample locations on figure.

Sample Adequacy: No data gaps. All data usable.

TIER 1 WORKSHEET - SOIL

Site Investigation Area: **HRA Site 7 - Old CFR Training Pits**

Historical Activities: Two former pits were located south of Bldg 272 and Saratoga Ave (60-foot diameter with berm). For fire training (fill with water, introduce JP-4 fuel, ignite, extinguish and let percolate into ground). Sometimes pit drained with fuel without ignition.

Known or Potential Chemicals: Fuels (no gasoline), solvents, fuel combustion products

Potential Chemical Classes: Petroleum hydrocarbons (including VOC and SVOC constituents), fuel combustion-related SVOCs.

Known or Pot. Release Mechanisms: Surface releases; leaching to subsurface (no specific information)

Tier 1 Screen Summary

COPCs: Metals

Chemical	Max (mg/kg)	Res PRG (mg/kg)	PRG Screen	LSSL (mg/kg)	LSSL Screen
Antimony	2.02	31	P	5	P
Arsenic	1.32	0.39 (Indus: 1.6)	E (P)	29	P
Barium	609	5,400	P	1,600	P
Beryllium	<0.05	150	P	63	P
Cadmium	0.340	37	P	8	P
Chromium	25.2	210	P	~~38~~ NA	P
Cobalt	10	900	P	none	
Copper	25.9	3,100	P	none	P
Lead	66.5	400	P	400	
Mercury	<0.1	23	P	none	P
Molybdenum	1.15	390	P	none	
Nickel	22.1	1,600	P	130	P
Selenium	<0.2	390	P	5	P
Silver	20.3	390	P	34	P
Thallium	<0.2	5.2 (Indus: 67)	P	0.7	P
Vanadium	32.5	550	P	6,000	P
Zinc	317	2,300	P	12,000	P

COPCs: PAHs

Carcinogenic PAHs:

E = exceeds; P = passes

Sample ID	BaP Eq (mg/kg)	PRG (mg/kg)		LSSL (mg/kg)
		Res	Indus	
		0.062	0.290	8
PH2-3A3-SB-03-0'	0.65	E	E	P

TIER 1 WORKSHEET - SOIL

Noncarcinogenic PAHs

	Max (mg/kg)	Res PRG (mg/kg)	PRG Screen	LSSL (mg/kg)	LSSL Screen
Acenaphthene	<0.550	3,700	P	570	P
Acenaphthylene	<0.550	56*	P	~~na~~ 84*	P
Anthracene	<0.550	22,000	P	12,000	P
Benzo(g,h,i)perylene	<0.550	56*	P	~~na~~ 84*	P
Fluoranthene	0.130	2,300	P	4,300	P
Fluorene	<0.550	2,700	P	560	P
Naphthalene	<0.550	56	P	84	P
Phenanthrene	0.064	56*	P	~~na~~ 84*	P
Pyrene	0.160	2,300	P	4,200	P

*Naphthalene as surrogate

COPCs: Dioxins

Chemical	Max (mg/kg)	Res PRG (mg/kg)	PRG Screen	LSSL (mg/kg)	LSSL Screen
TCDD TEQ	0.00000116	0.0000039 (0.000016 ind)	P	none	

NA
none

1.16 ppt!

Tier 1 fails arsenic and benzo[a]pyrene eq. (health). Go to Tier 2.

Benzo(a)Pyrene Equivalent Concentrations - Site 7 - Old CFR Training Pits

		PH2-3A3-SB-03-0'	
Carcinogenic PAH	**PEF[1]**	**Sample Concentration (mg/kg)**	**B(a)P Eq (mg/kg)**
Benz(a)anthracene	0.1	*0.275*	0.0275
Benzo(a)pyrene	1	*0.275*	0.275
Benzo(b)fluoranthene	0.1	0.130	0.013
Benzo(k)fluoranthene	0.1	0.275	0.0275
Dibenz(a,h)anthracene	1	*0.275*	*0.2750*
Chrysene	0.01	0.087	0.00087
Indeno(1,2,3-cd)pyrene	0.1	*0.275*	*0.0275*
TOTAL:			0.646
			mg/kg
Res PRG	**0.062**		**exceed**
Indus PRG	**0.290**		**exceed**

[1] CalEPA Potency Equivalent Factors (PEFs) (CalEPA/OEHHA, 1993, 2002).

B(a)P Eq = benzo(a)pyrene equivalents

Values presented in *italics* represent one-half the detection limit for those compounds listed on the laboratory datasheet as 'non-detect'.

TCDD TEQ Calculation - Old CFR Pits

	Sample PH2-3A3-SB-2B-1						Sample PH2-3A3-SB-1B-1					
Congener	Conc.	Detected?	Conc. Adj	TEF*	TEQ	%Contrib	Conc.	Detected?	Conc. Adj	TEF*	TEQ	%Contrib
2378TCDD	0.000303	Yes	0.000303	1	3.03E-04	26.21%	0.000172	No	0.000086	1	8.60E-05	7.44%
12378PeCDD	0.001	No	0.0005	1	5.00E-04	43.25%	0.000178	No	0.000089	1	8.90E-05	7.70%
123478HxCDD	0.000226	Yes	0.000226	0.1	2.26E-05	1.95%	0.00023	Yes	0.00023	0.1	2.30E-05	1.99%
123678HxCDD	0.000375	Yes	0.000375	0.1	3.75E-05	3.24%	0.000663	Yes	0.000663	0.1	6.63E-05	5.73%
123789HxCDD	0.000286	Yes	0.000286	0.1	2.86E-05	2.47%	0.000447	Yes	0.000447	0.1	4.47E-05	3.87%
1234678HpCDD	0.00429	Yes	0.00429	0.01	4.29E-05	3.71%	0.0221	Yes	0.0221	0.01	2.21E-04	19.12%
OCDD	0.0276	Yes	0.0276	0.0001	2.76E-06	0.24%	0.191	Yes	0.191	0.0001	1.91E-05	1.65%
2378TCDF	0.000337	Yes	0.000337	0.1	3.37E-05	2.91%	0.000145	No	0.0000725	0.1	7.25E-06	0.63%
12378PeCDF	0.00016	Yes	0.00016	0.05	8.00E-06	0.69%	0.000215	No	0.0001075	0.05	5.38E-06	0.46%
23478PeCDF	0.000204	Yes	0.000204	0.5	1.02E-04	8.82%	0.000198	No	0.000099	0.5	4.95E-05	4.28%
123478HxCDF	0.000221	Yes	0.000221	0.1	2.21E-05	1.91%	0.0000886	No	0.0000443	0.1	4.43E-06	0.38%
123678HxCDF	0.000179	No	0.0000895	0.1	8.95E-06	0.77%	0.0000887	No	0.00004435	0.1	4.44E-06	0.38%
234678HxCDF	0.000243	Yes	0.000243	0.1	2.43E-05	2.10%	0.00011	No	0.000055	0.1	5.50E-06	0.48%
123789HxCDF	0.000143	Yes	0.000143	0.1	1.43E-05	1.24%	0.000165	No	0.0000825	0.1	8.25E-06	0.71%
1234678HpCDF	0.000495	Yes	0.000495	0.01	4.95E-06	0.43%	0.00104	Yes	0.00104	0.01	1.04E-05	0.90%
1234789HpCDF	0.0000774	No	0.0000387	0.01	3.87E-07	0.03%	0.000126	No	0.000063	0.01	6.30E-07	0.05%
OCDF	0.000622	Yes	0.000622	0.0001	6.22E-08	0.01%	0.00109	Yes	0.00109	0.0001	1.09E-07	0.01%
			TCDD TEQ (ug/kg) =>		1.16E-03	100.00%			TCDD TEQ (ug/kg) =>		6.45E-04	55.79%
			TCDD TEQ (ppt) =>		1.16E+00				TCDD TEQ (ppt) =>		6.45E-01	
			TCDD TEQ (mg/kg) =>		1.16E-06				TCDD TEQ (mg/kg) =>		6.45E-07	

Italics indicate one-half the reporting limit.
*1997 WHO values (Van de Berg et al., 1998)

Tier 2
HRA Site 7 - Old CFR Pits
Incremental Cancer Risk
Adult Worker

DERMAL

		Adult										
	C_s^*	ABS	SA	AF	CF	EF	ED	BW	AT	LADD	SFo	Cancer Risk
Chemical	(mg/kg)	(u)	(cm²)	(mg/cm²)	(kg/mg)	(u)	(yrs)	(kg)	(yrs)	(mg/kg-d)	(mg/kg-d)$^{-1}$	(u)
Arsenic	1.32	0.03	3300	0.2	1E-06	0.685	25	70	70	9.13E-08	1.5	1.4E-07
Beryllium	*0.025*	0.01	3300	0.2	1E-06	0.685	25	70	70	5.77E-10	0	0.0E+00
Cadmium	0.34	0.001	3300	0.2	1E-06	0.685	25	70	70	7.84E-10	0.38	3.0E-10
Nickel	22.1	0.01	3300	0.2	1E-06	0.685	25	70	70	5.10E-07	0	0.0E+00
B[a]P Eq	0.646	0.13	3300	0.2	1E-06	0.685	25	70	70	1.94E-07	12	2.3E-06
TCDD TEQ	0.00000116	0.03	3300	0.2	1E-06	0.685	25	70	70	8.03E-14	130,000	1.0E-08
												2.5E-06

INGESTION

		Adult									
	C_s^*	IR	BF	CF	EF	ED	BW	AT	LADD	SFo	Cancer Risk
Chemical	(mg/kg)	(mg/d)	(u)	(kg/mg)	(u)	(yrs)	(kg)	(yrs)	(mg/kg-d)	(mg/kg-d)$^{-1}$	(u)
Arsenic	1.32	100	0.25	1E-06	0.685	25	70	70	1.15E-07	1.5	1.7E-07
Beryllium	*0.025*	100	1	1E-06	0.685	25	70	70	8.74E-09	0	0.0E+00
Cadmium	0.34	100	1	1E-06	0.685	25	70	70	1.19E-07	0.38	4.5E-08
Nickel	22.1	100	1	1E-06	0.685	25	70	70	7.72E-06	0	0.0E+00
B[a]P Eq	0.646	100	0.29	1E-06	0.685	25	70	70	6.55E-08	12	7.9E-07
TCDD TEQ	0.00000116	100	0.43	1E-06	0.685	25	70	70	1.74E-13	130,000	2.3E-08
											1.0E-06

INHALATION OF PARTICULATES

				Adult							
	C_s^*	PEF	IR	EF	ED	ABS	BW	AT	LADD	SFi	Cancer Risk
Chemical	(mg/kg)	(m³/kg)	(m³/d)	(u)	(yrs)	(u)	(kg)	(yrs)	(mg/kg-d)	(mg/kg-d)$^{-1}$	(u)
Arsenic	1.32	1.32E+09	20	0.685	25	1	70	70	6.99E-11	12	8.4E-10
Beryllium	*0.025*	1.32E+09	20	0.685	25	1	70	70	1.32E-12	8.4	1.1E-11
Cadmium	0.34	1.32E+09	20	0.685	25	1	70	70	1.80E-11	15	2.7E-10
Nickel	22.1	1.32E+09	20	0.685	25	1	70	70	1.17E-09	0.91	1.1E-09
B[a]P Eq	0.646	1.32E+09	20	0.685	25	1	70	70	3.42E-11	3.9	1.3E-10
TCDD TEQ	0.00000116	1.32E+09	20	0.685	25	1	70	70	6.14E-17	130,000	8.0E-12
											2.3E-09

Summary	Dermal Exposure	Soil Ingestion	Part. Inhal	TOTAL RISK
Worker	2.5E-06	1.0E-06	2.3E-09	4E-06

Arsenic RISK	BaP RISK
3E-07	3E-06

Note: BaP Eq concentration is 98% due to NDs.

*EPCs based on maximum detected.

Tier 2
HRA Site 7 - Old CFR Pits
Hazard Index
Adult Worker

DERMAL

Chemical	Cs* (mg/kg)	Abs (u)	SA (cm2)	AF (mg/cm2)	CF (kg/mg)	EF (u)	ED (yrs)	BW (kg)	AT (yrs)	ADD (mg/kg-d)	RfD (mg/kg-d)	HQ (u)
Antimony	2.02	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.30E-07	4.0E-04	3.26E-04
Arsenic	1.32	0.03	3,300	0.2	1.00E-06	0.685	25	70	25	2.56E-07	3.0E-04	8.52E-04
Barium	609	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	3.93E-05	7.0E-02	5.62E-04
Beryllium	*0.025*	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.61E-09	2.0E-03	8.07E-07
Cadmium	0.34	0.001	3,300	0.2	1.00E-06	0.685	25	70	25	2.20E-09	5.0E-04	4.39E-06
Chromium	25.2	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.63E-06	1.5E+00	1.08E-06
Cobalt	10	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	6.46E-07	2.0E-02	3.23E-05
Copper	26	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.67E-06	4.0E-02	4.18E-05
Mercury	*0.05*	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	3.23E-09	3.0E-04	1.08E-05
Molybdenum	1	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	7.43E-08	5.0E-03	1.49E-05
Nickel	22.1	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.43E-06	2.0E-02	7.14E-05
Selenium	*0.1*	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	6.46E-09	5.0E-03	1.29E-06
Silver	20.3	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	1.31E-06	5.0E-03	2.62E-04
Thallium	*0.1*	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	6.46E-09	6.6E-05	9.78E-05
Vanadium	33	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	2.10E-06	7.0E-03	3.00E-04
Zinc	317	0.01	3,300	0.2	1.00E-06	0.685	25	70	25	2.05E-05	3.0E-01	6.82E-05
												2.65E-03

INGESTION

Chemical	Cs* (mg/kg)	IR (mg/d)	BF (u)	CF (kg/mg)	EF (u)	ED (yrs)	BW (kg)	AT (yrs)	ADD (mg/kg-d)	RfD (mg/kg-d)	HQ (u)
Antimony	2.02	100	1	1E-06	0.685	25	70	25	1.98E-06	4.0E-04	4.94E-03
Arsenic	1.32	100	0.25	1E-06	0.685	25	70	25	3.23E-07	3.0E-04	1.08E-03
Barium	609	100	1	1E-06	0.685	25	70	25	5.96E-04	7.0E-02	8.51E-03
Beryllium	*0.025*	100	1	1E-06	0.685	25	70	25	2.45E-08	2.0E-03	1.22E-05
Cadmium	0.34	100	1	1E-06	0.685	25	70	25	3.33E-07	5.0E-04	6.65E-04
Chromium	25.2	100	1	1E-06	0.685	25	70	25	2.47E-05	1.5E+00	1.64E-05
Cobalt	10	100	1	1E-06	0.685	25	70	25	9.78E-06	2.0E-02	4.89E-04
Copper	26	100	1	1E-06	0.685	25	70	25	2.53E-05	4.0E-02	6.34E-04
Mercury	*0.05*	100	1	1E-06	0.685	25	70	25	4.89E-08	3.0E-04	1.63E-04
Molybdenum	1	100	1	1E-06	0.685	25	70	25	1.13E-06	5.0E-03	2.25E-04
Nickel	22.1	100	1	1E-06	0.685	25	70	25	2.16E-05	2.0E-02	1.08E-03
Selenium	*0.1*	100	1	1E-06	0.685	25	70	25	9.78E-08	5.0E-03	1.96E-05
Silver	20.3	100	1	1E-06	0.685	25	70	25	1.99E-05	5.0E-03	3.97E-03
Thallium	*0.1*	100	1	1E-06	0.685	25	70	25	9.78E-08	6.6E-05	1.48E-03
Vanadium	33	100	1	1E-06	0.685	25	70	25	3.18E-05	7.0E-03	4.54E-03
Zinc	317	100	1	1E-06	0.685	25	70	25	3.10E-04	3.0E-01	1.03E-03
											2.89E-02

INHALATION OF PARTICULATES

Chemical	Cs* (mg/kg)	PEF (m³/kg)	IR (m³/d)	EF (u)	ED (yrs)	ABS (u)	BW (kg)	AT (yrs)	ADD (mg/kg-d)	RfD (mg/kg-d)	HQ (u)
Antimony	2.02	1.32E+09	20	0.685	25	1	70	25	2.99E-10	4.0E-04	7.49E-07
Arsenic	1.32	1.32E+09	20	0.685	25	1	70	25	1.96E-10	3.0E-04	6.52E-07
Barium	609	1.32E+09	20	0.685	25	1	70	25	9.03E-08	1.4E-04	6.45E-04
Beryllium	*0.025*	1.32E+09	20	0.685	25	1	70	25	3.71E-12	5.7E-06	6.50E-07
Cadmium	0.34	1.32E+09	20	0.685	25	1	70	25	5.04E-11	5.0E-04	1.01E-07
Chromium	25.2	1.32E+09	20	0.685	25	1	70	25	3.74E-09	1.5E+00	2.49E-09
Cobalt	10	1.32E+09	20	0.685	25	1	70	25	1.48E-09	5.7E-06	2.60E-04
Copper	26	1.32E+09	20	0.685	25	1	70	25	3.84E-09	4.0E-02	9.60E-08
Mercury	*0.05*	1.32E+09	20	0.685	25	1	70	25	7.41E-12	3.0E-04	2.47E-08
Molybdenum	1	1.32E+09	20	0.685	25	1	70	25	1.70E-10	5.0E-03	3.41E-08
Nickel	22.1	1.32E+09	20	0.685	25	1	70	25	3.28E-09	2.0E-02	1.64E-07
Selenium	*0.1*	1.32E+09	20	0.685	25	1	70	25	1.48E-11	5.0E-03	2.97E-09
Silver	20.3	1.32E+09	20	0.685	25	1	70	25	3.01E-09	5.0E-03	6.02E-07
Thallium	*0.1*	1.32E+09	20	0.685	25	1	70	25	1.48E-11	6.6E-05	2.25E-07
Vanadium	33	1.32E+09	20	0.685	25	1	70	25	4.82E-09	7.0E-03	6.88E-07
Zinc	317	1.32E+09	20	0.685	25	1	70	25	4.70E-08	3.0E-01	1.57E-07
											9.09E-04

Summary	Dermal Exposure	Soil Ingestion	Part. Inhal.	TOTAL HI
Worker	2.6E-03	2.9E-02	9.1E-04	3.2E-02

*EPCs based on maximum detected.

Soil Characterization Data

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI	HRA Supplemental Sampling	HRA Supplemental Sampling
Sample ID	S-OCF-1-1B	S-OCF-2-1B	S-OCF-3-1B	PH2-3A3-SB-10B-1-A1	PH2-3A3-SB-5B-1-A1
Sample Depth	1	1	1	1	1
Sample Date	2/2/1995	2/2/1995	2/3/1995	12/10/2002	12/10/2002
Metals					
Antimony				2020	1890
Arsenic				< 100	1320
Barium				609000	126000
Beryllium				< 50	< 50
Cadmium				< 50	340 J
Chromium				25200	19100
Cobalt				9830	10000
Copper				25900	25300
Lead				66500	15900
Mercury				< 100	< 100
Molybdenum				940	1150
Nickel				22100	19300
Selenium				< 200	< 200
Silver				20300	< 400
Thallium				< 200	< 200
Vanadium				30900	32500
Zinc				317000	146000

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI	HRA Supplemental Sampling	HRA Supplemental Sampling
Sample ID	S-OCF-1-1B	S-OCF-2-1B	S-OCF-3-1B	PH2-3A3-SB-10B-1-A1	PH2-3A3-SB-5B-1-A1
Sample Depth	1	1	1	1	1
Sample Date	2/2/1995	2/2/1995	2/3/1995	12/10/2002	12/10/2002
Pesticides					
4,4'-DDD	< 3	< 3	< 3		
4,4'-DDE	< 3	< 3	< 3		
4,4'-DDT	< 3	< 3	< 3		
Aldrin	< 3	< 3	< 3		
alpha-BHC	< 3	< 3	< 3		
Aroclor 1016	< 100	< 100	< 100		
Aroclor 1221	< 100	< 100	< 100		
Aroclor 1232	< 80	< 80	< 80		
Aroclor 1242	< 80	< 80	< 80		
Aroclor 1248	< 80	< 80	< 80		
Aroclor 1254	< 80	< 80	< 80		
Aroclor 1260	< 80	< 80	< 80		
beta-BHC	< 3	< 3	< 3		
Chlordane	< 20	< 20	< 20		
delta-BHC	< 3	< 3	< 3		
Dieldrin	< 3	< 3	< 3		
Endosulfan I	< 3	< 3	< 3		
Endosulfan II	< 3	< 3	< 3		
Endosulfan sulfate	< 3	< 3	< 3		
Endrin	< 3	< 3	< 3		
Endrin aldehyde	< 3	< 3	< 3		
gamma-BHC (Lindane)	< 3	< 3	< 3		
Heptachlor	< 3	< 3	< 3		
Heptachlor epoxide	< 3	< 3	< 3		
Methoxychlor	< 20	< 20	< 20		
Toxaphene	< 200	< 200	< 200		

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI	SI	SI	SI	SI	SI	SI
Sample ID	S-OCF-1-1A	S-OCF-1-5A	S-OCF-1-8A	S-OCF-2-1A	S-OCF-2-5A	S-OCF-2-7A	S-OCF-3-1A	S-OCF-3-5A	S-OCF-3-10A
Sample Depth	1	5	8	1	5	7	1	5	10
Sample Date	2/2/1995	2/2/1995	2/2/1995	2/2/1995	2/2/1995	2/3/1995	2/3/1995	2/3/1995	2/3/1995
TPH									
TPH-diesel	6000	1000	2000	21000	5000	4000	290000	1000	< 1000
TPH-gasoline	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300
TRPH	< 10000	13000	11000	11000	< 10000	< 10000	28000	15000	< 10000

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI
Sample ID	S-OCF-1-5B	S-OCF-2-7B	S-OCF-3-1B
Sample Depth	5	7	1
Sample Date	2/2/1995	2/3/1995	2/3/1995
VOCs			
1,1,1-Trichloroethane	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5
1,2-Dichlorobenzene	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5
1,2-Dichloroethene (total)	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5
1,3-Dichlorobenzene	< 5	< 5	< 5
1,4-Dichlorobenzene	< 5	< 5	< 5
2-Butanone	< 20	< 20	< 20
2-Hexanone	< 20	< 20	< 20
4-Methyl-2-pentanone	< 20	< 20	< 20
Acetone	< 20	< 20	< 20
Benzene	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5
Carbon disulfide	< 5	< 5	< 5
Carbon tetrachloride	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5
Chloroform	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5
cis-1,2-Dichloroethene	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5
Freon 113	< 5	< 5	< 5
m/p-Xylenes	< 5	< 5	< 5
Methylene chloride	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5
Styrene	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5
Toluene	< 5	< 5	< 5

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI
Sample ID	S-OCF-1-5B	S-OCF-2-7B	S-OCF-3-1B
Sample Depth	5	7	1
Sample Date	2/2/1995	2/3/1995	2/3/1995
VOCs (cont.)			
trans-1,2-Dichloroethene	< 5	< 5	< 5
trans-1,3-Dichloropropene	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5
Vinyl acetate	< 10	< 10	< 10
Vinyl chloride	< 5	< 5	< 5
Xylenes (total)	< 5	< 5	< 5

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA
Sample ID	S-OCF-1-5B	S-OCF-2-7B	S-OCF-3-1B	PH2-3A3-SB-01-0'	PH2-3A3-SB-02-0'	PH2-3A3-SB-03-0'	PH2-3A3-SB-04-0'	PH2-3A3-SB-05-0'	PH2-3A3-SB-06-0'	PH2-3A3-SB-07-0'	PH2-3A3-SB-08-0'	PH2-3A3-SB-09-0'	PH2-3A3-SB-10-0'
Sample Depth	5	7	1	0	0	0	0	0	0	0	0	0	0
Sample Date	2/2/1995	2/3/1995	2/3/1995	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/6/1999	5/6/1999	5/6/1999	5/6/1999
SVOCs													
1,2,4-Trichlorobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
1,2-Dichlorobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
1,3-Dichlorobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
1,4-Dichlorobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,4,5-Trichlorophenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,4,6-Trichlorophenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,4-Dichlorophenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,4-Dimethylphenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,4-Dinitrophenol	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
2,4-Dinitrotoluene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2,6-Dinitrotoluene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2-Chloronaphthalene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2-Chlorophenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2-Methyl naphthalene	< 200	< 200	< 200										
2-Methyl-4,6-dinitrophenol	< 1000	< 1000	< 1000										
2-Methylnaphthalene				< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2-Methylphenol (o-Cresol)	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
2-Nitroaniline	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
2-Nitrophenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
3,3'-Dichlorobenzidine	< 5000	< 5000	< 5000	< 1100	< 1300	< 1100	< 1100	< 1200	< 1100	< 1100	< 1100	< 1100	< 1100
3/4-Methylphenol (m/p-cresol)	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
3-Nitroaniline	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
4,6-Dinitro-2-methylphenol				< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
4-Bromophenyl phenyl ether	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
4-Chloro-3-methylphenol	< 200	< 200	< 200	< 1100	< 1300	< 1100	< 1100	< 1200	< 1100	< 1100	< 1100	< 1100	< 1100
4-Chloroaniline	< 1000	< 1000	< 1000	< 1100	< 1300	< 1100	< 1100	< 1200	< 1100	< 1100	< 1100	< 1100	< 1100
4-Chlorophenyl phenyl ether	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
4-Nitroaniline	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
4-Nitrophenol	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
Acenaphthene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Acenaphthylene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Anthracene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Benz(a)anthracene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Benzidine	< 5000	< 5000	< 5000										
Benzo(a)pyrene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Benzo(b)fluoranthene	< 200	< 200	< 200	< 570	< 670	130 J	< 560	< 590	< 560	< 550	130 J	< 540	< 550

HRA Table 07 - Old CFR Training Pits

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	SI	SI	SI	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA	RI - OU2 Phase IIA
Sample ID	S-OCF-1-5B	S-OCF-2-7B	S-OCF-3-1B	PH2-3A3-SB-01-0'	PH2-3A3-SB-02-0'	PH2-3A3-SB-03-0'	PH2-3A3-SB-04-0'	PH2-3A3-SB-05-0'	PH2-3A3-SB-06-0'	PH2-3A3-SB-07-0'	PH2-3A3-SB-08-0'	PH2-3A3-SB-09-0'	PH2-3A3-SB-10-0'
Sample Depth	5	7	1	0	0	0	0	0	0	0	0	0	0
Sample Date	2/2/1995	2/3/1995	2/3/1995	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/5/1999	5/6/1999	5/6/1999	5/6/1999	5/6/1999
SVOCs (cont.)													
Benzo(g,h,i)perylene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Benzo(k)fluoranthene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Benzoic acid	< 800	< 800	< 800										
Benzyl alcohol	< 400	< 400	< 400										
Benzyl butyl phthalate	< 200	< 200	< 200										
Bis(2-chloroethoxy)methane	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Bis(2-chloroethyl) ether	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Bis(2-chloroisopropyl) ether	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Bis(2-ethylhexyl) phthalate	< 2000	< 2000	< 2000	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Butyl benzyl phthalate				< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Chrysene	< 200	< 200	< 200	< 570	< 670	87 J	< 560	< 590	< 560	< 550	79 J	< 540	< 550
Dibenz(a,h)anthracene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Dibenzofuran	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Diethyl phthalate	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Dimethyl phthalate	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
di-n-Butyl phthalate	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Di-n-octyl phthalate	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Fluoranthene	< 200	< 200	< 200	< 570	< 670	130 J	< 560	< 590	< 560	< 550	130 J	< 540	< 550
Fluorene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Hexachlorobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Hexachlorobutadiene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Hexachlorocyclopentadiene	< 2000	< 2000	< 2000	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Hexachloroethane	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Indeno(1,2,3-cd)pyrene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Isophorone	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Naphthalene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Nitrobenzene	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
N-Nitroso-di-n-propylamine				< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
N-Nitrosodi-n-propylamine	< 200	< 200	< 200										
N-Nitrosodiphenylamine	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Pentachlorophenol	< 1000	< 1000	< 1000	< 2900	< 3400	< 2700	< 2800	< 2900	< 2800	< 2800	< 2800	< 2700	< 2800
Phenanthrene	< 200	< 200	< 200	< 570	< 670	64 J	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Phenol	< 200	< 200	< 200	< 570	< 670	< 550	< 560	< 590	< 560	< 550	< 550	< 540	< 550
Pyrene	< 200	< 200	< 200	< 570	< 670	160 J	< 560	< 590	< 560	< 550	140 J	< 540	< 550

HRA Site 07 - Old CFR Training Pits (all units in ug/Kg)

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB
Sample ID	PH2-3A3-SB-1B-1	PH2-3A3-SB-1B-3	PH2-3A3-SB-2B-1	PH2-3A3-SB-2B-3	PH2-3A3-SB-3B-1	PH2-3A3-SB-3B-3	PH2-3A3-SB-4B-1	PH2-3A3-SB-4B-3	PH2-3A3-SB-5B-1	PH2-3A3-SB-5B-3
Sample Depth	1	3	1	3	1	3	1	3	1	3
Sample Date	8/2/2001	8/2/2001	8/2/2001	8/2/2001	8/2/2001	8/2/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001
Dioxins										
1,2,3,4,6,7,8-HpCDD	0.0221	0.00136 A	0.00429	0.00104 A	0.00455	0.000419 A	0.0186	0.00363	0.0062	0.00124 A
1,2,3,4,6,7,8-HpCDF	0.00104 A,B	0.000195 A,B	0.000495 A,B	0.000147 A,B	< 0.000311 B	0.000168 A,B	0.000928 A,B	0.000518 A,B	0.000264 A,B	0.00021 A,B
1,2,3,4,7,8,9-HpCDF	< 0.000126	< 0.000138	< 0.0000774	< 0.0000777	< 0.00016	< 0.0000872	< 0.000106	< 0.0000762	< 0.000107	< 0.00011
1,2,3,4,7,8-HxCDD	0.00023 A	< 0.000308	0.000226 A	< 0.000194	0.000151 A	< 0.000267	0.000213 A	< 0.000199	< 0.000201	< 0.000223
1,2,3,4,7,8-HxCDF	< 0.0000886	0.000123 A,B	0.000221 A,B	0.0000825 A,B	0.000158 A,B	0.0000891 A,B	< 0.000137	0.0001 A,B	< 0.0000656	< 0.0000626
1,2,3,6,7,8-HxCDD	0.000663 A	< 0.000348	0.000375 A	< 0.000226	0.000278 A	< 0.000303	0.000549 A	< 0.000226	0.000379 A	< 0.000241
1,2,3,6,7,8-HxCDF	< 0.0000887	< 0.0000747	< 0.000179	< 0.0000506	< 0.000109	< 0.0000671	< 0.0000848	< 0.0000636	< 0.0000723	< 0.0000616
1,2,3,7,8,9-HxCDD	0.000447 A	< 0.000298	0.000286 A	< 0.000191	0.000248 A	< 0.000259	0.000404 A	< 0.000193	0.000241 A	< 0.00021
1,2,3,7,8,9-HxCDF	< 0.000165	< 0.000141	0.000143 A	< 0.0000795	0.0000837 A	< 0.000056	< 0.0000556	< 0.000101	< 0.000116	< 0.000106
1,2,3,7,8-PeCDD	< 0.000178	< 0.000153	< 0.001	< 0.00007	< 0.000153	< 0.00014	< 0.000209	< 0.000152	< 0.000171	< 0.0000907
1,2,3,7,8-PeCDF	< 0.000215	< 0.000117	0.00016 A	< 0.0000977	< 0.000166	< 0.000161	< 0.000108	< 0.00011	< 0.00015	< 0.000124
2,3,4,6,7,8-HxCDF	< 0.00011	< 0.0000859	0.000243 A	< 0.0000591	0.0000796 A	< 0.0000636	< 0.000135	< 0.0000694	< 0.0000799	< 0.0000713
2,3,4,7,8-PeCDF	< 0.000198	< 0.0001	0.000204 A	< 0.0000838	0.000131 A	< 0.000147	< 0.0000981	< 0.0000976	< 0.000125	< 0.000117
2,3,7,8-TCDD	< 0.000172	< 0.000136	0.000303 A	< 0.0001	< 0.0000871	< 0.000108	< 0.000151	< 0.000139	< 0.000134	< 0.0000869
2,3,7,8-TCDF	< 0.000145	< 0.000126	0.000337 A	< 0.0000729	< 0.000148	< 0.000226	< 0.000212	< 0.000133	< 0.000154	< 0.000167
OCDD	0.191	0.00942	0.0276	0.0106	0.0336	0.00873	0.177	0.0509	0.0142	0.00792
OCDF	0.00109 A	0.000343 A	0.000622 A	0.000253 A	0.000538 A	0.000343 A	0.000949 A	0.000577 A	0.000355 A	0.000268 A
Total HpCDD	0.0433	0.00251	0.00763	0.00214	0.00866	0.00115	0.0353	0.00863	0.00948	0.00236
Total HpCDF	0.00277 B	0.000195 B	0.000495 B	0.000147 B	< 0.000505 B	0.000168 B	0.00263 B	0.00126 B	0.000264 B	0.00021 B
Total HxCDD	0.00544	< 0.00021	0.00272	< 0.000203	0.00176	< 0.000275	0.00472	0.000676	0.002	0.000267
Total HxCDF	0.00143 B	0.000123 B	0.00112 B	0.0000825 B	0.000656 B	0.000196 B	0.00166 B	0.000375 B	< 0.00034 B	0.000141 B
Total PeCDD	< 0.000178	< 0.000153	0.000548	< 0.00007	< 0.000153	< 0.00014	< 0.000209	< 0.000245	< 0.000171	< 0.0000907
Total PeCDF	0.000281	< 0.000108	0.00196	< 0.0000904	0.000273	< 0.000154	0.000726	0.000117	0.000157	< 0.00012
Total TCDD	0.00147	0.000416	0.00286	0.000147	< 0.0000871	< 0.000108	< 0.000151	0.000432	< 0.000134	0.000187
Total TCDF	0.000266	0.000488	0.00562	0.000278	< 0.000148	0.000866	0.000381	< 0.000133	0.000236	0.000217

HRA Site 07 - Old CFR Training Pits (all units in ug/Kg)

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB
Sample ID	PH2-3A3-SB-6B-1	PH2-3A3-SB-6B-3	PH2-3A3-SB-7B-1	PH2-3A3-SB-7B-3	PH2-3A3-SB-8B-1	PH2-3A3-SB-8B-3	PH2-3A3-SB-9B-1	PH2-3A3-SB-9B-3	PH2-3A3-SB-10B-1	PH2-3A3-SB-10B-3	PH2-3A3-SB-11-1	PH2-3A3-SB-11-3
Sample Depth	1	3	1	3	1	3	1	3	1	3	1	3
Sample Date	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/7/2001	8/3/2001	8/3/2001
Dioxins												
1,2,3,4,6,7,8-HpCDD	0.00119 A	< 0.000448	< 0.000557	< 0.000763	0.00447	0.00103 A	0.00148 A	< 0.000258	< 0.00215 A	< 0.000381	0.00877	0.000313 A
1,2,3,4,6,7,8-HpCDF	< 0.000133	< 0.000197	< 0.000189	< 0.000202	0.000591 A	< 0.000277	< 0.000113	< 0.0000677	< 0.000259	< 0.000194	0.000606 A,B	0.000181 A
1,2,3,4,7,8,9-HpCDF	< 0.00023	< 0.000324	< 0.000302	< 0.000336	< 0.000493	< 0.00045	< 0.000179	< 0.000107	< 0.000418	< 0.000297	< 0.000134	< 0.000105
1,2,3,4,7,8-HxCDD	< 0.000229	< 0.00031	< 0.000158	< 0.000415	< 0.000257	< 0.000397	< 0.000198	< 0.000255	< 0.000505	< 0.000201	0.000139 A	< 0.000215
1,2,3,4,7,8-HxCDF	< 0.000122	< 0.00012	< 0.000117	< 0.0000827	< 0.000115	< 0.0000533	< 0.000231	< 0.000059	< 0.000177	< 0.000136	0.00012 A,B	0.000151 A,B
1,2,3,6,7,8-HxCDD	< 0.000272	< 0.000323	< 0.000178	< 0.000448	< 0.000284	< 0.000443	< 0.00021	< 0.000279	< 0.000557	< 0.00022	0.000341 A	< 0.000249
1,2,3,6,7,8-HxCDF	< 0.000122	< 0.00012	< 0.000114	< 0.0000872	< 0.000117	< 0.0000509	< 0.000226	< 0.000057	< 0.000166	< 0.000139	0.0000908 A	0.000102 A
1,2,3,7,8,9-HxCDD	< 0.00023	< 0.00029	< 0.000154	< 0.000395	< 0.000248	< 0.000385	< 0.000187	< 0.000245	< 0.000487	< 0.000193	< 0.000265	< 0.000211
1,2,3,7,8,9-HxCDF	< 0.000205	< 0.000206	< 0.000193	< 0.000148	< 0.000203	< 0.0000919	< 0.00037	< 0.000101	< 0.000295	< 0.000233	< 0.0000486	0.0000693 A
1,2,3,7,8-PeCDD	< 0.000176	< 0.000359	< 0.000235	< 0.00036	< 0.000212	< 0.000246	< 0.000547	< 0.0000563	< 0.000718	< 0.000273	< 0.000152	< 0.000156
1,2,3,7,8-PeCDF	< 0.000192	< 0.000409	< 0.000377	< 0.000321	< 0.000353	< 0.000385	< 0.000141	< 0.000206	< 0.000369	< 0.000426	< 0.000132	< 0.000188
2,3,4,6,7,8-HxCDF	< 0.000129	< 0.000133	< 0.000127	< 0.0000951	< 0.000129	< 0.0000588	< 0.000238	< 0.0000641	< 0.000196	< 0.000149	0.000114 A	0.000121 A
2,3,4,7,8-PeCDF	< 0.00017	< 0.000378	< 0.000332	< 0.000281	< 0.000314	< 0.000342	< 0.000121	< 0.000181	< 0.000312	< 0.000351	< 0.00011	< 0.000166
2,3,7,8-TCDD	< 0.000302	< 0.000162	< 0.000123	< 0.000163	< 0.000126	< 0.000175	< 0.000142	< 0.0000553	< 0.000255	< 0.00019	< 0.0000849	< 0.000183
2,3,7,8-TCDF	< 0.000135	< 0.000201	< 0.000278	< 0.000195	< 0.000421	< 0.000125	< 0.000282	< 0.000148	< 0.000489	< 0.000279	0.000134 A	< 0.000172
OCDD	0.00509	< 0.00115	0.00276 A	< 0.000835	0.0446	0.00999	0.0156	0.00171 A	0.0255	0.0033 A	0.0752	0.00254 A
OCDF	< 0.000692	< 0.00117	< 0.000918	< 0.000597	0.00134 A	< 0.000815	< 0.000608	< 0.000397	< 0.00204	< 0.000589	0.000596 A	0.0003 A
Total HpCDD	0.00119	< 0.000448	< 0.000557	< 0.000763	0.00972	0.00239	0.00148	< 0.000258	0.0029	< 0.000381	0.0163	0.000629
Total HpCDF	< 0.000175	< 0.00025	< 0.000237	< 0.000258	0.00167	< 0.000349	< 0.000141	< 0.0000847	< 0.000327	< 0.000238	0.00146 B	0.000181
Total HxCDD	< 0.000243	< 0.000307	< 0.000163	< 0.000418	0.000337	< 0.000407	< 0.000198	< 0.000259	< 0.000515	< 0.000204	0.00219	< 0.000224
Total HxCDF	< 0.000141	< 0.00014	< 0.000134	< 0.0001	0.000752	< 0.0000618	< 0.00026	< 0.0000681	< 0.000202	< 0.00016	0.00123 B	0.000531 B
Total PeCDD	< 0.000176	< 0.000359	< 0.000235	< 0.00036	< 0.000212	< 0.000246	< 0.000547	< 0.0000563	< 0.000718	< 0.000273	< 0.000152	< 0.000156
Total PeCDF	< 0.000181	< 0.000393	< 0.000353	< 0.0003	< 0.000333	< 0.000363	< 0.000131	< 0.000192	< 0.000339	< 0.000386	0.000633	< 0.000177
Total TCDD	< 0.000302	< 0.000162	< 0.000123	< 0.000163	< 0.000126	< 0.000175	< 0.000142	< 0.0000553	< 0.000255	< 0.00019	< 0.0000849	< 0.000183
Total TCDF	< 0.000135	< 0.000201	< 0.000278	< 0.000195	< 0.000421	< 0.000125	< 0.000282	< 0.000148	< 0.000489	< 0.000279	0.00109	0.000735

HRA Site 07 - Old CFR Training Pits (all units in ug/Kg)

	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits	Old CFR Training Pits
Sampling Program	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB	RI - OU2 Phase IIB
Sample ID	PH2-3A3-SB-12-1	PH2-3A3-SB-12-3	PH2-3A3-SB 13-1	PH2-3A3-SB 13-3	PH2-3A3-SB-14-1	PH2-3A3-SB 14-3	PH2-3A3-SB-15-1	PH2-3A3-SB-15-3	PH2-3A3-SB 16-1
Sample Depth	1	3	1	3	1	3	1	3	1
Sample Date	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001	8/3/2001
Dioxins									
1,2,3,4,6,7,8-HpCDD	0.131	0.0207	< 0.000392	0.000182 A	0.0652	0.00512	0.0016 A	0.000392 A	0.000909 A
1,2,3,4,6,7,8-HpCDF	0.00421	0.000985 A	0.000111 A	0.000105 A	0.00192 A	0.000261 A	0.000199 A	< 0.000113	< 0.000172
1,2,3,4,7,8,9-HpCDF	0.000512 A	< 0.000123	< 0.0000903	< 0.0000634	0.000248 A	< 0.000099	< 0.000084	< 0.0000614	< 0.000135
1,2,3,4,7,8-HxCDD	0.00179 A	< 0.00034	< 0.000242	< 0.000114	0.00113 A	< 0.000169	< 0.000166	< 0.000181	< 0.000214
1,2,3,4,7,8-HxCDF	0.000518 A,B	0.000213 A,B	< 0.0000815	< 0.0000615	0.000317 A,B	< 0.0000907	0.000105 A,B	0000732 A,	< 0.000144
1,2,3,6,7,8-HxCDD	0.00465	0.000917 A	< 0.00028	< 0.000136	0.00241 A	0.000221 A	< 0.000179	< 0.000199	< 0.00024
1,2,3,6,7,8-HxCDF	0.000398 A	< 0.000104	< 0.0000787	< 0.0000387	0.000162 A	< 0.0000581	< 0.0000474	< 0.000048	< 0.0000919
1,2,3,7,8,9-HxCDD	0.00407	0.000877 A	< 0.000237	< 0.000114	0.00224 A	0.000202 A	< 0.000156	< 0.000173	< 0.000206
1,2,3,7,8,9-HxCDF	< 0.0000723	< 0.000182	< 0.000135	< 0.0000613	< 0.0000591	< 0.000104	< 0.0000804	< 0.0000846	< 0.0000841
1,2,3,7,8-PeCDD	0.0012 A	0.000275 A	< 0.000192	< 0.0000723	0.00062 A	< 0.000213	< 0.000121	< 0.0000821	< 0.000138
1,2,3,7,8-PeCDF	0.00011 A	< 0.000157	< 0.000154	< 0.0000964	< 0.000147	< 0.000124	< 0.000113	< 0.00011	< 0.000122
2,3,4,6,7,8-HxCDF	0.000531 A	< 0.000126	< 0.0000914	< 0.0000454	0.000216 A	< 0.00007	< 0.0000567	< 0.0000558	0.000105 A
2,3,4,7,8-PeCDF	0.000202 A	< 0.00014	< 0.000132	< 0.0000842	< 0.000131	< 0.000109	< 0.000103	< 0.0000945	< 0.00012 A
2,3,7,8-TCDD	0.000293 A	< 0.00016	< 0.0000913	< 0.000085	< 0.000135 A	< 0.0000883	< 0.0000852	< 0.0000553	< 0.0000778
2,3,7,8-TCDF	< 0.00024	< 0.000333	0.000169 A	0.000122 A	0.000182 A	0.000169 A	0.000149 A	0.000131 A	0.000188 A
OCDD	0.838	0.158	0.00305 A	0.00134 A	0.361	0.0335	0.0109	0.00414 A	0.00673
OCDF	0.00286 A	0.000727 A	< 0.00019	0.000218 A	0.00161 A	0.000287 A	< 0.000253	0.00018 A	0.000384 A
Total HpCDD	0.248	0.0426	0.000299	0.000182	0.118	0.00942	0.00307	0.000765	0.000909
Total HpCDF	0.0113	0.00233	0.000111	0.000105	0.00486	0.000494	0.000363	< 0.000113	< 0.000172
Total HxCDD	0.0342	0.00638	< 0.000252	< 0.000121	0.0194	0.00135	0.000165	< 0.000189	< 0.000219
Total HxCDF	0.00925 B	0.0016 B	< 0.0000942	0.0000637 B	0.00366 B	0.000378 B	0.000162 B	0.000143 B	0.000204 B
Total PeCDD	0.00337	0.000275	< 0.000192	< 0.0000723	0.00175	< 0.000213	< 0.000121	< 0.0000821	< 0.000138
Total PeCDF	0.00386	0.000334	< 0.000143	< 0.00009	0.000992	0.000154	0.000142	0.0000864	0.000109
Total TCDD	0.000293	< 0.00016	< 0.0000913	< 0.000085	0.000122	0.000187	< 0.0000852	0.00014	< 0.000181
Total TCDF	0.000925	< 0.000333	0.000559	0.000336	0.000718	0.000559	0.000327	0.000756	0.000567

Shannon Harbour

From: Shannon Harbour
Sent: Wednesday, November 28, 2007 11:11 AM
To: 'Irani, Amy'
Subject: RE: Nevada Pic-a-Part

Hi Amy,

I am having a meeting with Tronox tomorrow on another issue but will discuss the below-referenced pic-a-part with TRX at that time. The pic-a-part parcel is already considered a part of the TRX facility but is currently leased to the pic-a-part yard. I will request a schedule from TRX for the vacancy of this parcel by the pic-a-part. It is my current understanding that the pic-a-part will be responsible for the environmental impacts caused by their operation. Please note that TRX will also have to characterize the parcel in order to move toward getting a No Further Action determination from NDEP. I am planning on including in the remediation and confirmation sampling conducted by the pic-a-part into the other regulatory oversight that I provide for the rest of the TRX facility.

If you have any further questions or would like to be included on any correspondence associated with this pic-a-part, please let me know.

Sincerely,

Shannon

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

From: Irani, Amy [mailto:Irani@snhdmail.org]
Sent: Wednesday, November 28, 2007 10:56 AM
To: Shannon Harbour
Subject: Nevada Pic-a-Part

Good Morning Shannon-

I was wondering if you could give me an update as to whether NDEP has added the Nevada pic-a-part to the on-going case you have with the Tronox property @ 110 W. Rolly in Henderson. We would like to add the information to our case file and Ms. Ghamssari indicated to me that during your last meeting on site (11/19/07) that you had indicated adding this area to the entire site case.

Thank you for your help with this Shannon.

Sincerely,

Amy Irani, REHS
Environmental Health Supervisor
Solid Waste and Compliance Section
Southern Nevada Health District
Office (702) 759-0600
Fax (702) 386-8540

Environmental
Resources
Management

2525 Natomas Park Drive
Suite 350
Sacramento, CA 95833
(916) 924-9378
(916) 920-9378 (fax)

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November 28, 2007

Ms. Shannon Harbour, P.E.
Nevada Division of Environmental Protection
Bureau of Corrective Actions
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

Subject: Data Validation Summary Report for the Tronox Parcels A/B Investigation – August-September 2007, BMI Industrial Complex, Clark County, Nevada

Dear Shannon:

On behalf of Ranajit Sahu please find below response to NDEP comments dated November 26, 2007 on the *Data Validation Summary Report* for the Tronox Parcels A/B Investigation – August-September 2007, BMI Industrial Complex, Clark County, Nevada.

Comment #1. Laboratory Report F7I110258_DP. On Acrobat page 55 of the report, Test America indicated the method 8015b TPH gasoline (volatile TPH) samples were received in 1 liter glass containers. These samples should have been collected in volatile VOA vials. This issue should be investigated for all TPH GRO analyses under this report and these samples should be qualified/rejected accordingly.

Response: *Due to an error found on the Tronox Parcel A/B bottle requirements guide, the field crew collected the rinsates samples for this project using 1-L glass ambers, instead of 40-ml HCl preserved VOA vials. While the laboratory received the incorrect bottles for TPH as gasoline for the rinsate samples, they also received three 40-ml HCl preserved VOA vials for volatiles testing by Method 8260B. Although, the TA-St. Louis laboratory report does not document the actions taken at the lab concerning the containers used for the TPH as gasoline analysis, the laboratory did confirm that the analyst compensated for the incorrect bottles by using at least one 40-ml HCl preserved VOA vial from each of the rinsate samples. The volatiles analyst at TA-St. Louis stated this is what is normally done when clients send in the wrong bottle containers. Due to the purge and trap testing procedure, they have no other option but to analyze the samples using VOA vials. The semi-volatiles analysts also confirmed that even if they had received any 1-L ambers for TPH as gasoline, they would not have been able to perform this testing in their department. Based on the laboratory's confirmation, all samples requesting TPH as gasoline were analyzed using the correct container, therefore, all results are acceptable.*

Comment #2. In addition, as discussed with TRX previously, the nomenclature of Dataset 47 should be deleted from the revised report.

Response: *Attached are a revised title sheet, report cover, report spine label, and report CD that omit refererence to this report as Dataset 47. Please replace the existing items with the attached.*

If you have any questions or comments, please contact me at 916-924-9378 or Ranajit Sahu at 626-382-0001.

Sincerely,

Mark K. Jones
Project Manager

Enclosures: Data Validation Summary Report for the Tronox Parcels A/B Investigation – August-September 2007, BMI Industrial Complex, Clark County, Nevada

cc: Ranajit Sahu, BEC, 875 West Warm Springs Road, Henderson, NV 89011
Brian Rakvica, NDEP, BCA, Las Vegas, NV 89119
Jim Najima, NDEP, BCA, Carson City, NV 89701
David Gratson, Neptune and Company, Inc., 1505 15th St., Suite B, Los Alamos, NM 87544

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 26, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Tronox Response to NDEP Comments Dated September 19, 2007 on the Data Validation Summary Report (DVSR) in the Annual Performance Report dated August 28, 2007 for Tronox LLC, Henderson, Nevada
Dated November 9, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's response to comments identified above and finds that the document is acceptable. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

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Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 26, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Tronox Parcels A/B Investigation August-September 2007 (Dataset 47)
Dated November 2007 (received November 5, 2007)

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's document identified above and provides comments below:

Laboratory Report F7I110258_DP. On Acrobat page 55 of the report, Test America indicated the method 8015b TPH gasoline (volatile TPH) samples were received in 1 liter glass containers. These samples should have been collected in volatile VOA vials. This issue should be investigated for all TPH GRO analyses under this report and these samples should be qualified/rejected accordingly.

In addition, as discussed with TRX previously, the nomenclature of Dataset 47 should be deleted from the revised report.

Please contact the undersigned with any questions at brakvicar@ndep.nv.gov or (702) 486-2850 x 247.

Sincerely,

Brian Rakvica, P.E.
Supervisor
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

BAR:s

CC: Jim Najima, NDEP, BCA, Carson City
Shannon Harbour, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
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Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
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Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

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Jim Gibbons, Governor
Allen Biaggi, Director
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November 26, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Tronox Response to NDEP Comments Dated September 19, 2007 on the Data Validation Summary Report (DVSR) in the Annual Performance Report dated August 28, 2007 for Tronox LLC, Henderson, Nevada
Dated November 9, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's response to comments identified above and finds that the document is acceptable. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
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Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Meeting Minutes

Project: Tronox (TRX)
Location: Conference Call
Time and Date: 9:00 AM, Monday, November 26, 2007
In Attendance:

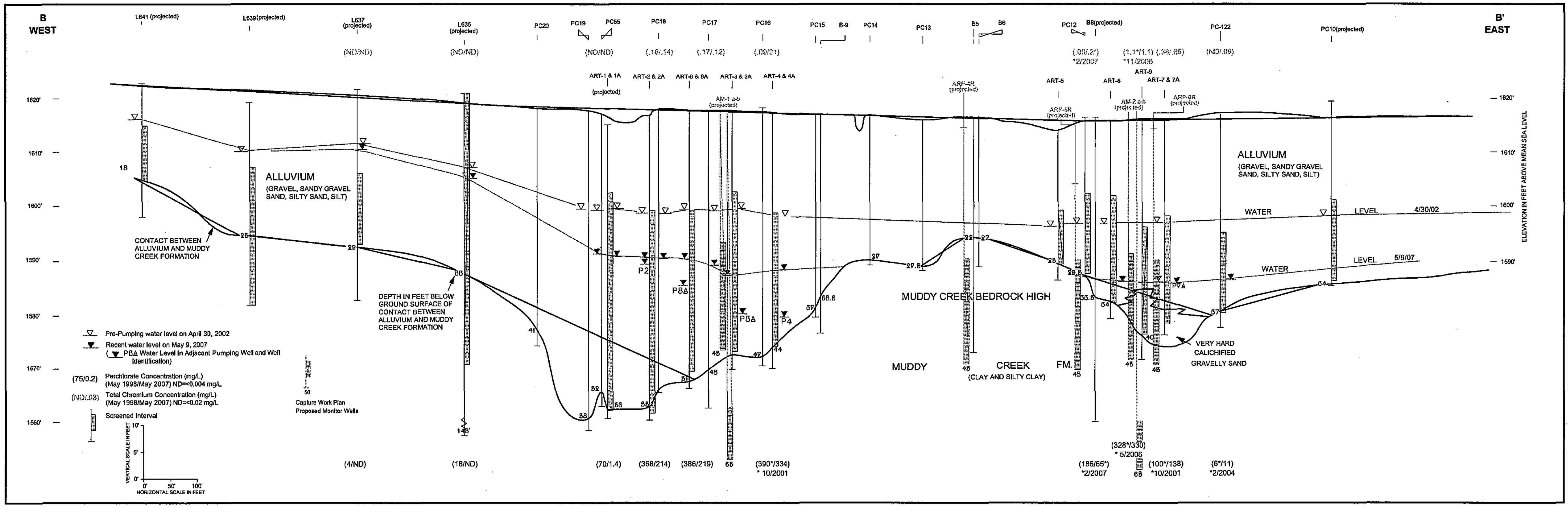
NDEP:	Brian Rakvica, Shannon Harbour
Neptune:	Paul Black (consultant to NDEP)
Copeland:	Teri Copeland (consultant to NDEP)
Environmental Answers:	Keith Bailey (consultant to TRX)
ENSR:	Lisa Bradley (consultant to TRX)

1. The purpose of this conference call was to discuss the Phase B work plan in relation to risk based decision making.
2. TRX stated that the Phase A borings were to represent several source areas. That the TRX facility is large and can be complicated but TRX believes that the data have been largely consistent with the conceptual model, that the site issues are mainly associated with groundwater, and that constituents in soil in Phase A are generally below conservative comparison levels with some exceptions. NDEP does not agree.
3. TRX stated that few constituents were noted above the comparison levels.
4. TRX stated that their approach has focused on constituent comparison levels and EAs based on parcels for sale or that have similar use planned.
5. NDEP's approach has focused on the adequacy of characterization of each source area for risk based decisions.
6. TRX will submit 2 tables by FedEx tomorrow. The tables are organized by LOU and combine elements of the CSM and Phase A/B for groundwater and soil, respectively. A map illustrating the proposed sampling will be submitted at this time also. **ACTION ITEM [Completed.]**
7. NDEP explained that an Exposure Area is defined by the receptor characteristics and the homogeneity of concentrations. That large Exposure Areas (really Decision Units consisting of many Exposure Areas) should have the same receptor scenarios throughout and consist of contiguous Exposure Area with same concentration distribution. NDEP stated that TRX has not filled in data for all source areas so that each source area has some analysis results (historical and/or current).
8. TRX has approached from similar land use not concentration distributions. TRX stated that the EAs are areas of random access by a receptor. NDEP stated that some EAs are so large that random access throughout the EA by a receptor is unlikely. Similar concentrations are then needed instead to be able to think of the EA as a single Exposure Area (Decision Unit). NDEP also noted that potentially some EAs could be combined under the same considerations. TRX stated that current use is important in the risk assessment as an example of potential future industrial use and can be used for informed decision making.
9. NDEP stated that if TRX wants to receive No Further Action with unrestricted industrial and/or commercial use then current conditions do not dictate what future

use may be. For example, a building currently on the property may be demolished in the future.

10. TRX questioned comment 65 in NDEP's Draft comments. Comment 65 mentions a default of 0.5 acre for an exposure area. If TRX wants to use a higher number, rationale should be provided to the NDEP. EA is not the same as an exposure area. For example, EA08 may have 3 (or more) exposure areas based on current use and source areas. NDEP stated that the distribution of concentrations of the driver chemicals should be homogeneous over a large exposure area. Tronox disagrees but will work with NDEP to define exposure areas once the Phase B data are available. Exposure areas for higher concentration distributions should be minimized as the data allows. NDEP noted that exposure frequency may be much lower for a smaller area.
11. NDEP pointed out the post-remediation risk assessment may be different than pre-remediation risk assessment and that the pre-remediation dataset could be used for decision making.
12. TRX does not believe that the exposure areas need to be smaller than the EAs if the concentrations are below the comparison levels. NDEP stated that if the source areas have not been adequately characterized, TRX may not have the highest concentrations for comparison, which could lead to missing a potential risk.
13. TRX stated that the original intent of the Phase B Work Plan was to include both judgmental and random sampling because the receptors are not limited to the source areas.
14. NDEP stated that TRX should first look at the concentration distributions and future land use for the delineation of the exposure areas. TRX disagreed. NDEP stated that if TRX wants to have unrestricted industrial and/or commercial land use, TRX would need to use concentration distributions within each EA; otherwise, the NDEP may have to place restrictions on development in the NFA if an exposure area does not pass the risk assessment and there are no other feasible options.
15. NDEP stated that it is not appropriate to average elevated concentrations into a single large exposure area.
16. NDEP will send TRX references for default building size. **ACTION ITEM. [Completed.]**
17. NDEP stated that TRX should use professional judgment when determining if step-out sampling is necessary. NDEP suggested considering defensibility and providing logical arguments and rationale for any decisions not to conduct step-out sampling if the data are above a comparison level. Additionally, NDEP stated that TRX may discuss NDEP's stance if a particular problem has been identified prior to submittal.
18. NDEP stated that NDEP's Draft comments provided to TRX for the November 9, 2007 conference call were provided after only 30 days of review at TRX's request. NDEP did not have time to review the other documents referenced by the Phase A/B document. TRX could have added the information that was cited in these references to facilitate NDEP's review, which may have eliminated some of NDEP's Draft comments.
19. NDEP stated that the most efficient organization of the Phase A/B document would be based on source areas.

20. TRX stated that PEF modeling would be used for the on-site dust pathway. NDEP stated that Cr-VI could be a driver for this pathway and that TRX had historically provided data for Mn that was five orders of magnitude higher than the PRG.
21. TRX questioned NDEP's request in the Draft comments for additional dioxins/furans sampling in the Phase B Work Plan. NDEP stated that there were elevated concentrations reported in an area with no known source area. NDEP believes the conservative approach would be to sample in this area to check for a possible source and possible higher concentrations. TRX does not agree that the reported concentrations were "elevated" since they are under the 1 ppb comparison level. NDEP stated that TRX may respond to this comment with data and rationale if they want to refute the comment.



DESIGNED BY: E. Krish
DRAWN BY: M. Scop
CHECKED BY: E. Krish
APPROVED BY: D. Gerry

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ENSR CORPORATION
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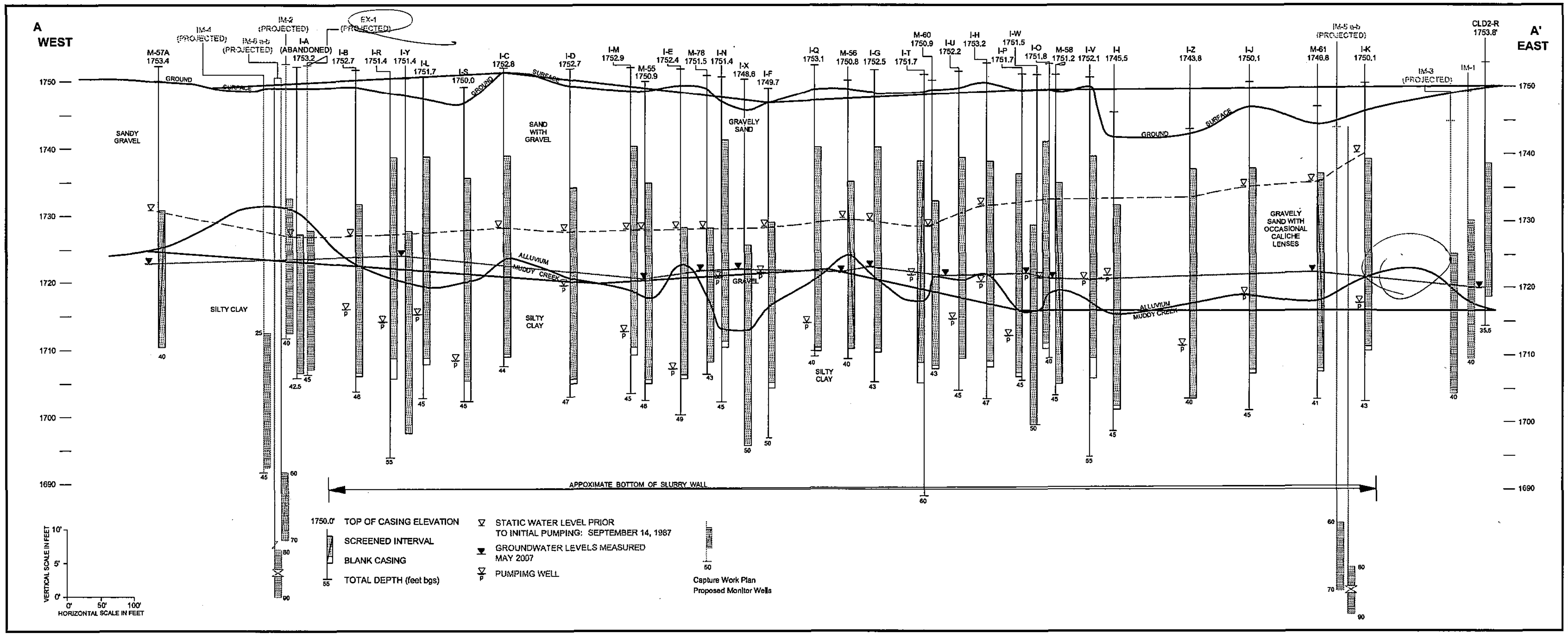
WEST - EAST HYDROGEOLOGIC CROSS SECTION B-B' ATHENS ROAD WELL FIELD MAY 2007

Annual Performance Report
Tronox Facility, Henderson, Nevada

SCALE:	DATE:	PROJECT NUMBER:
as noted	8/8/2007	04020-023-110

FIGURE NUMBER: 3

SHEET NUMBER: X



DESIGNED BY: E. Krish
DRAWN BY: T. Burke
CHECKED BY: E. Krish
APPROVED BY: D. Gerry

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ENSR CORPORATION
1220 AVENIDA ACASO
CAMARILLO, CALIFORNIA 93012
PHONE: (805) 388-3775
FAX: (805) 388-3577
WEB: HTTP://WWW.ENSR.AECOM.COM

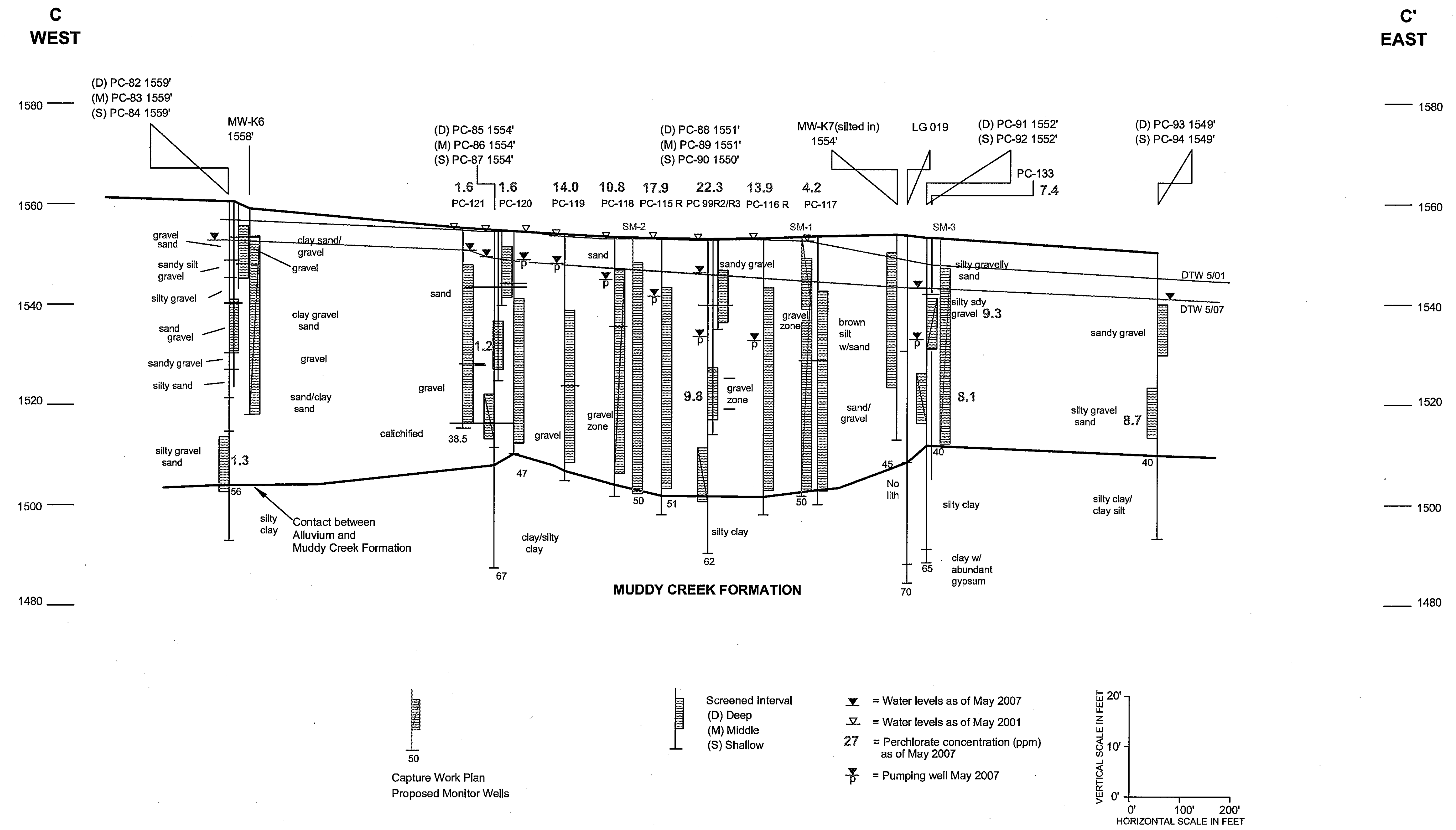
WEST - EAST HYDROGEOLOGIC CROSS SECTION A-A' INTERCEPTOR WELL FIELD MAY 2007

Annual Performance Report
Tronox Facility, Henderson, Nevada

SCALE:	DATE:	PROJECT NUMBER:
as noted	7/19/2007	04020-023-110

FIGURE NUMBER:
2

SHEET NUMBER:
X



FILENAME:

DESIGNED BY: E. Krish
DRAWN BY: M. Scop
CHECKED BY: E. Krish
APPROVED BY: D. Gerry

ENSR | AECOM

ENSR CORPORATION
1220 AVENIDA ACASO
CAMARILLO, CALIFORNIA 93012
PHONE: (805) 388-3775
FAX: (805) 388-3577
WEB: HTTP://WWW.ENSR.AECOM.COM

WEST - EAST HYDROGEOLOGIC CROSS SECTION C-C' SEEP WELL FIELD MAY 2007

Annual Performance Report
Tronox Facility, Henderson, Nevada

SCALE:	DATE:	PROJECT NUMBER:
as noted	8/8/2007	04020-023-110

FIGURE NUMBER:
4

SHEET NUMBER:
X

Shannon Harbour

From: Brian Rakvica
Sent: Wednesday, November 21, 2007 9:51 AM
To: 'Ranajit (Ron) Sahu'; Ed Krish; lnations@landwellco.com
Cc: 'Crowley, Susan'; Todd Croft; Shannon Harbour
Subject: RE: Salt Cedar removal in the Seep well field vicinity; TRX MWs Damaged

All,

Please cc the NDEP case officer – Shannon Harbour on all of this correspondence.

Thanks,

Brian

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Wednesday, November 21, 2007 6:19 AM
To: Ed Krish; lnations@landwellco.com
Cc: 'Crowley, Susan'; Brian Rakvica; Todd Croft
Subject: Re: Salt Cedar removal in the Seep well field vicinity; TRX MWs Damaged

Ed:

That sounds good. We have asked Meadow Valley, our contractor doing the work - and they have told us, thus far, that they have not damaged anything. However, we will look at these coordinates in the interim.

Ron

> ----- Original Message -----
> **From:** Ed Krish
> **To:** 'Ranajit Sahu' ; lnations@landwellco.com
> **Cc:** 'Crowley, Susan' ; 'Brian Rakvica' ; 'Todd Croft'
> **Sent:** Wednesday, November 21, 2007 5:56 AM
> **Subject:** Salt Cedar removal in the Seep well field vicinity; TRX MWs Damaged
>
> All,
>
> It's worse than I originally thought it was.
>
> The attached file contains the well IDs of the seven destroyed or damaged wells and their coordinates.
>
> Ron/Linda/Susan - When I'm back in town next week let's take a trip out there to inspect the damage.
>
> Thanks, Ed
>
> ---
>
> **From:** Todd Croft [mailto:tcroft@ndep.nv.gov]
> **Sent:** Tuesday, November 20, 2007 2:48 PM
> **To:** Ed Krish; Ranajit Sahu
> **Cc:** Crowley, Susan; Brian Rakvica
> **Subject:** RE: Salt Cedar removal in the Seep well field vicinity; TRX Maws Damaged
>
> Ron & Ed:
>
> Please connect on this issue. Brian & Todd are not aware of the specific MW's damaged or their locations. Ed or

Susan should be able to provide these details.

THX BYE

Todd J. Croft, Supervisor
Remediation Branch
Bureau of Corrective Action
NDEP-LV
e: tcroft@ndep.nv.gov
p:(702) 486-2850 x 230

From: Ed Krish [mailto:ekrish@frontiernet.net]
Sent: Tuesday, November 20, 2007 7:25 AM
To: Todd Croft
Cc: 'Crowley, Susan'; Brian Rakvica
Subject: RE: Salt Cedar removal in the Seep well field vicinity

Thanks Todd. I'll give her a call today.

From: Todd Croft [mailto:tcroft@ndep.nv.gov]
Sent: Monday, November 19, 2007 6:08 PM
To: Ed Krish
Cc: Crowley, Susan; Brian Rakvica
Subject: FW: Salt Cedar removal in the Seep well field vicinity

Ed:

Please see e-mail fwd below for contact at Landwell Re: vegetation removal near the Seep Area Well Field.

Todd J. Croft, Supervisor
Remediation Branch
Bureau of Corrective Action
NDEP-LV
e: tcroft@ndep.nv.gov
p:(702) 486-2850 x 230

From: Peggy.Roefer@snwa.com [mailto:Peggy.Roefer@snwa.com]
Sent: Monday, November 19, 2007 1:48 PM
To: Todd Croft
Subject: Fw: Salt Cedar removal in the Seep well field vicinity

FYI

Peggy Roefer
Regional Water Quality Program Manager
Southern Nevada Water Authority
PO Box 99954
Las Vegas, NV 89193-9954
702-856-5041

----- Forwarded by Peggy Roefer/LVVWD on 11/19/2007 01:47 PM -----

Seth Shanahan/LVVWD

11/19/2007 10:23 AM

To Peggy Roefer/LVVWD@LVVWD
cc Nick.Rice@snwa.com
Subject Re: Fw: Salt Cedar removal in the Seep well field vicinity

Peggy,
The clearing project is being conducted by Landwell. Judy Nations is the one who gave me a heads up on the project. She can be reached at lnations@landwellco.com or 567-0400.
Cheers,
Seth
Peggy Roefer/LVVWD

Peggy Roefer/LVVWD
11/19/2007
09:01 AM

To Seth Shanahan/LVVWD@LVVWD
cc
Subject Fw: Salt Cedar removal in the Seep well field vicinity

Seth - Do you know anything about who is removing salt cedar in the vicinity of the Tronox Seep Area Well Field?

Peggy Roefer
Regional Water Quality Program Manager
Southern Nevada Water Authority
PO Box 99954
Las Vegas, NV 89193-9954
702-856-5041
----- Forwarded by Peggy Roefer/LVVWD on 11/19/2007 08:59 AM -----

"Todd Croft" <tcroft@ndep.nv.gov>
11/19/2007 08:35 AM

To <Peggy.Roefer@snwa.com>
cc
Subject FW: Salt Cedar removal in the Seep well field vicinity

Peggy:

Do you have any idea on who is currently removing large amounts of salt cedar in the vicinity of the Tronox Seep Area Well Field? Please see below (to bottom of page).

THX BYE

Todd J. Croft, Supervisor
Remediation Branch
Bureau of Corrective Action
NDEP-LV
e: tcroft@ndep.nv.gov
p:(702) 486-2850 x 230

From: Brian Rakvica
Sent: Monday, November 19, 2007 8:33 AM
To: Todd Croft
Subject: RE: Salt Cedar removal in the Seep well field vicinity

Maybe SNWA or County parks?

From: Todd Croft

Sent: Monday, November 19, 2007 8:23 AM
To: Brian Rakvica
Subject: FW: Salt Cedar removal in the Seep well field vicinity

BAR:

Please see below for TRX concern Re: damaged Seep Area wells.

THX BYE

Todd J. Croft, Supervisor
Remediation Branch
Bureau of Corrective Action
NDEP-LV
e: tcroft@ndep.nv.gov
p:(702) 486-2850 x 230

From: Ed Krish [mailto:ekrish@frontiernet.net]
Sent: Friday, November 16, 2007 9:26 AM
To: Todd Croft
Subject: Salt Cedar removal in the Seep well field vicinity

Todd,

Please verify that Ron Sahu is the person I should contact regarding the damage to two of our monitor wells in the Seep WF area. Is the contractor doing this work for BRC/BMI?

Thanks, Ed

No virus found in this incoming message.
Checked by AVG Free Edition.
Version: 7.5.503 / Virus Database: 269.16.1/1141 - Release Date: 11/20/2007 11:34 AM

DAMAGED OR DESTROYED TRONOX MONITOR WELLS

Hole	X-coord	Y-coord	Latitude	Longitude	TD	REMARKS
PC58	831123.843	26732118.259	36ø04'56.34829"N	114ø59'28.37159"W	36.0	Surface completion destroyed, dirt in well
PC68	829616.959	26732906.820	36ø05'04.23700"N	114ø59'46.67219"W	55.0	Surface completion destroyed
PC79	829815.280	26733246.690	36ø05'07.58627"N	114ø59'44.23093"W	73.0	Surface completion destroyed, dirt in well
PC80	829823.750	26733250.460	36ø05'07.62305"N	114ø59'44.12746"W	32.0	Well destroyed
PC82	830317.050	26733194.850	36ø05'07.04358"N	114ø59'38.12138"W	67.0	Surface completion destroyed
PC83	830325.650	26733201.290	36ø05'07.10675"N	114ø59'38.01613"W	37.0	Surface completion destroyed, dirt in well
PC95	831227.210	26733449.910	36ø05'09.51129"N	114ø59'27.01344"W	50.0	Well destroyed; In-Situ pressure transducer and cable destroyed

Brian Rakvica

From: Brian Rakvica
Sent: Wednesday, November 21, 2007 4:07 PM
To: sahuron@earthlink.net; Susan Crowley (susan.crowley@tronox.com); Keith Bailey (okbailey@flash.net)
Cc: Mark.Jones@erm.com; pblack@neptuneinc.org; paul.duffy@neptuneinc.org; terilcopeland@aol.com; Shannon Harbour; Brian Rakvica
Subject: TRX Parcels A and B
Importance: High

Susan, Keith and Ranajit,

Based upon our review of the calculations for the chemical risk assessment, we noted the following:

1) All of the statistical analyses (t-test, quantile test) were performed correctly.

2) There is again an issue of uranium where it fails as a metal and none of the isotopes fail. As we have noted previously, there is probably not much that can be done at this point until the issues with background are resolved. <u>No response is necessary for this item.</u>
3) There is a minor issue of not comparing to the right sets of background in some cases. Arsenic is showing up as less than background but that appears to be related to not using the appropriate background subset of dataset (e.g. it differs as a function of depth and geology). This appears to not materially affect the outcome of the risk assessment, however, it is worth noting for future reference. In general, it is requested that TRX identify the correct subset of background data for a given comparison. <u>It is requested that TRX consider re-running these analyses for the final submittal.</u> If there are any questions it is suggested that they be discussed with the NDEP and Neptune.
4) As noted previously, in general TRX uses the maximum detect, but in some cases the maximum non-detect is greater than the maximum detect and when this is the case the maximum non-detect should be used. <u>It is requested that this modification be made for the final submittal.</u>

Please do not hesitate to contact us with any questions. Please advise when the final submittal can be expected.

Thanks,

Brian

Brian Rakvica

From: Crowley, Susan [Susan.Crowley@tronox.com]
Sent: Tuesday, November 20, 2007 11:56 AM
To: Wilkinson, Craig
Cc: Stater, Rick; ekrish@frontiernet.net; Keith Bailey; Hurst, Elizabeth; Brian Rakvica; Alford, Michael; Reed, Tom
Subject: Tronox Capture Evaluation Work Plan Implementation
Attachments: 20071120112331769.pdf

Craig,
From recent transmittals to you (from both Tronox and NDEP) you've seen that Tronox is embarking on an evaluation of it's several groundwater capture zones. The evaluation of the on-site capture wells' performance includes a review of the eastern end of our on-site well field, which extends us onto Timet property. The Work Plan includes installation of two groundwater wells on Timet's side of the property fence line. I've included a rough sketch for your convenience - so that you don't need to track down the information in our Work Plan.

I expect Tronox will need an access agreement with Timet for entry to drill these groundwater wells - do you already have language you've used with others in the complex? Please let me know. Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

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Please let me know immediately by return e-mail if you have received this message by mistake, then delete the e-mail message.
Thank you.

● PROPOSED WELL LOCATION


#69
SA-24
SA-23
M100
M101
M102
#22
#23
NORTH LOOP ROAD
M87
M88
M85
M86
M84
M83
M81A
M18
CLD1R
CLD3R
GROUNDWATER BARRIER WALL
M74
M80
SOUTH LOOP ROAD
M73
M72
M58
CLD2R
#32
M70
M55
M78
M15
M71
M56
M60
IZ
M59
IJ
M61
IK
IN
IF
IQ
IG
IT
IU
IH
IO
IP
IV
II
M67
M68
S
IC
ID
IM
IE
M66
M65
#55
WEST ROAD
M64
SA-20
DRYER ROAD
30
S-IM
#5
PROPOSED WELL LOCATIONS
BETA DITCH
M39
M36
M38
M22A
#31
M25
SA-17
M37
#19
M19
#20
M110
M89
SA-16
#57
#18
#16&17
#16&17
#16&17
#21
M17A
#53
SA-15
C-1
CLD4R
M34
M35
ROAD
M2A
#46
M75
M76
SA-12
#13
#9
A-11
#14
#8
#7
M21
M50
#34
#45
0
300'
600'
900'
1 INCH = 300 FEET
N
M77
MW6R

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 20, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to: *Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox, Parcel "H" Site, Henderson, Nevada*;
Dated November 8, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified report and provides comments below:

1. General comment, please provide an explanation for the reporting of groundwater concentration data collected in March 2006 instead of more recently collected data. (i.e. M120 was sampled in May 2007.) Please provide a revised table which presents all available data for these locations.
2. Scope of Work, Task 1, Page 4: please add judgmental samples in the vicinity of wells M120 and M121 to address the elevated concentrations of various chemicals in these wells. The NDEP believes that the source of these chemicals has not yet been identified.

A revised Sampling and Analysis Plan should be submitted based on these comments. Please advise the NDEP regarding the schedule for this resubmittal. TRX should additionally provide an annotated response-to-comments letter as part of the Revised Phase 2 submittal. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 20, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to: *Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcel "H" Site and Errata Pages for Phase 2 Sampling and Analysis Plans to Conduct Soil Characterization, Tronox Parcels "C", "D" and "F" Sites, Henderson Nevada* (Dated November 8, 2007)

Dear Ms. Crowley,

The NDEP has received TRX's above-identified letter with attachments. The Parcel "H" Sampling and Analysis Plan (SAP) is currently in review. The NDEP has reviewed the errata pages for inclusion in the SAPs for Parcels "C" & "D" and Parcel "F" and finds that these pages are acceptable and have been added to the corresponding reports.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

FINAL

Meeting Minutes

Project:	Tronox
Location:	Conference Call
Time and Date:	1:30 PM, Friday, November 16, 2007
Meeting Number:	---
In Attendance:	

NDEP:	Brian Rakvica, Shannon Harbour
Nepture:	Paul Black (consultant to NDEP)
Tronox:	Susan Crowley
Environmental Answers:	Keith Bailey (consultant to Tronox)
BEC:	Ranajit Sahu
ERM:	Mark Jones (consultant to BEC)
CC:	Jim Najima

1. The purpose of this conference call was to discuss the results of the Phase 2 Sampling Analysis Plan (SAP) for asbestos at Parcels A & B located on the Tronox site.
2. BEC submitted risk calculations for asbestos and maps illustrating asbestos concentrations on Parcels A & B for NDEP's review and discussion.
3. BEC reported the concentrations for two of the three samples awaiting analysis:
    a. TSB-AR-01 & TSB-AR-04: zero fibers
    b. TSB-AR-05: still awaiting analysis
4. In the supplied spreadsheets, BEC provided risk values for one fiber remaining on-site and two other scenarios. NDEP requested the risk values for zero fibers remaining on-site. BEC reported an upper bound value of 6E-6 and best estimate value of zero.
5. NDEP stated that the issuance of a conditional NFA would be possible depending on TRX's proposed remedial solution.
6. NDEP stated that any detections of asbestos would have to be remediated and confirmation samples would need to be collected to demonstrate the completeness of the remediation.
7. NDEP stated that watering the site to maintain a minimum moisture content was not an acceptable method of remediation.
8. NDEP stated that an NFA letter with the inclusion of a remediation condition would be drafted. Parcels A & B would have to be remediated with no detections of asbestos in the confirmation samples before the NFA would be valid. Confirmation samples would be collected in the same general location as the Phase 2 samples. BEC has GIS coordinates for these sample locations. In the near term, TRX will excavate six inches of soil in a 50 ft by 50 ft area and collect a sample for each area with a confirmed impact from asbestos. The samples will be sent for analysis and TRX will continue to remediate the rest of the impacted area concurrently.
9. NDEP is currently reviewing the risk reports (chemical data) submitted for Parcels A and B and still needs to confirm the background comparison.

10. NDEP requested that non-detects be accounted for in the statistical evaluation. For example, for some compounds the maximum non-detect exceeds the maximum detected value. In these cases it is suggested that the maximum detection limit be used for the screening level risk assessment calculation. This adds a layer of conservativeness to the assessment and should not adversely affect the final outcome.
11. NDEP also noted that some "p" values are presented as 1.0 and noted that while this is not impossible it is very strange. NDEP will review the data and determine if this is correct.

Shannon Harbour

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]

Sent: Friday, November 16, 2007 1:53 PM

To: Brian Rakvica; Shannon Harbour; Crowley, Susan; Keith Bailey

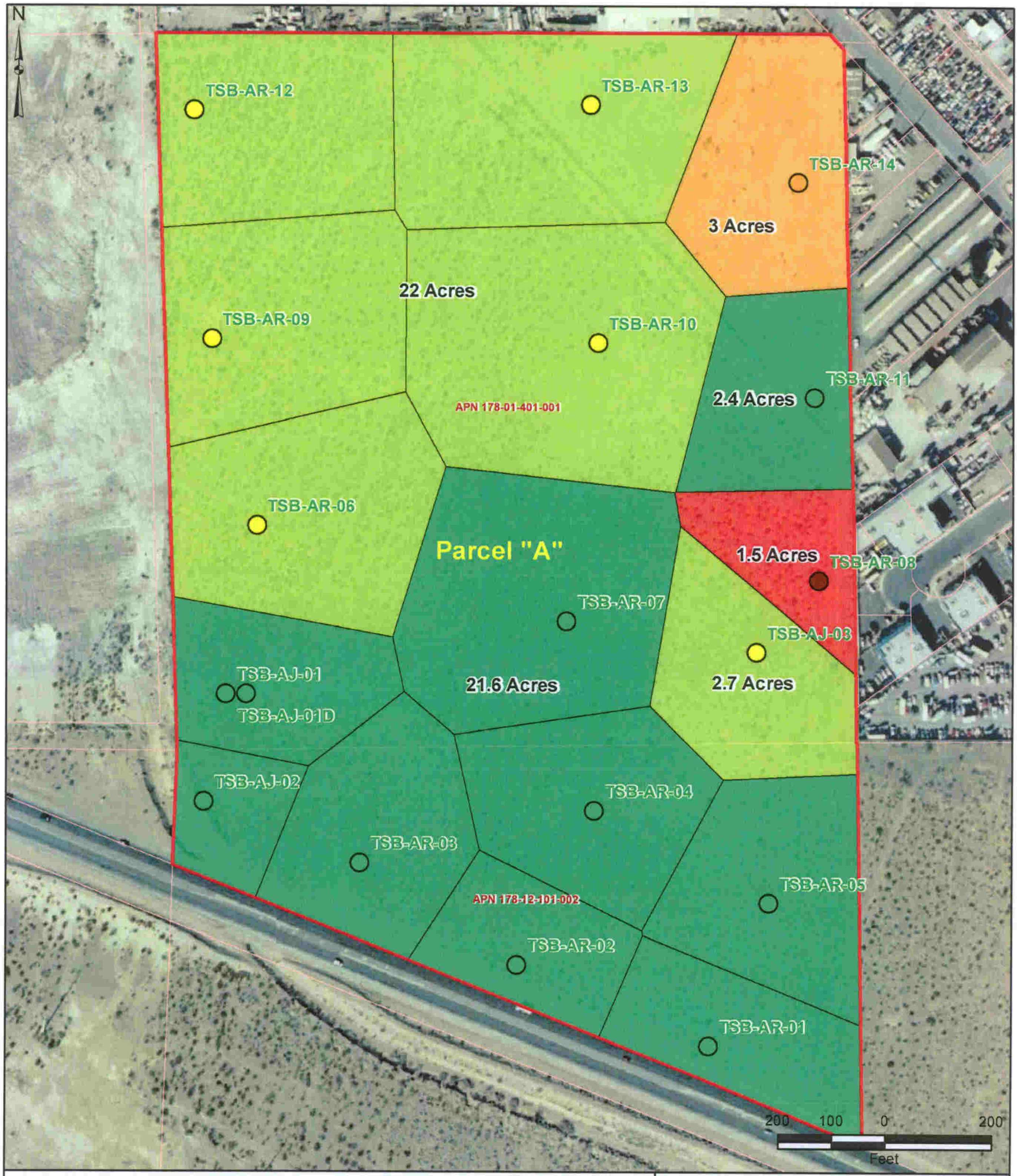
Subject: Re: TRX Parcels A and B asbo

Attachments: Tronox_Parcel-A_Amphibole Voronoi Figure.pdf; Tronox_Parcel-B_Amphibole Voronoi Figure.pdf

Please see polygon diagram.

- Ron

> ----- Original Message -----
> **From:** Brian Rakvica
> **To:** Shannon Harbour ; Ranajit (Ron) Sahu ; Crowley, Susan ; Keith Bailey
> **Sent:** Thursday, November 15, 2007 2:43 PM
> **Subject:** TRX Parcels A and B asbo
>
> When: Friday, November 16, 2007 1:00 PM-2:00 PM (GMT-08:00) Pacific Time (US & Canada).
> Where: phone
>
> *~*~*~*~*~*~*~*~*~*
>
> lets use the NDEP call in number
>
> 1-866-302-8881
>
> pin = 7859920347
>
> ---
>
> No virus found in this incoming message.
> Checked by AVG Free Edition.
> Version: 7.5.503 / Virus Database: 269.15.33/1132 - Release Date: 11/15/2007 9:34 AM



Asbestos Sample Location

- ● 0 Long Amphibole Fibers
- ● 1 Long Amphibole Fiber
- ● 2 Long Amphibole Fibers
- ● 4 Long Amphibole Fibers
- ○ Not Analyzed Yet

February 2007 Aerial from AirPhotoUSA.

BEC / Tronox Sampling and Analysis Plan
BMI Common Areas, Henderson, Nevada

FIGURE

AMPHIBOLE ASBESTOS
RESULTS - PARCEL "A"

Basic Environmental
COMPANY

Prepared by:	Date	
MKJ	11/16/07	JOB No. 0069073 FILE: GIS/BEC/TRONOX/FIGURE_MXD

Asbestos Sample Location

● 0 Long Amphibole Fibers

● 1 Long Amphibole Fiber

February 2007 Aerial from AirPhotoUSA.

BEC / Tronox Sampling and Analysis Plan
BMI Common Areas, Henderson, Nevada

FIGURE

AMPHIBOLE ASBESTOS
RESULTS - PARCEL "B"

Basic Environmental
COMPANY

Prepared by:	Date	
MKJ	11/16/07	JOB No. 0069073 FILE: GIS/BEC/TRONOX/FIGURE_.MXD

Brian Rakvica

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Friday, November 16, 2007 12:22 PM
To: Brian Rakvica; Shannon Harbour; susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox PARCELS A AND B SAMPLING EVENT - Asbestos Risks
Attachments: Tronox_Parcels-AB_Asbestos Risks_BroadRemediation.pdf; Tronox_Parcels-AB_Asbestos Risks_SelectRemediation.pdf; Tronox_Parcels-AB_Asbestos Risks_Baseline.pdf

Shannon/Brian:

Attached are some risk calculations, for varying scenarios, that may be helpful for our call at 1:00 PM.

Thanks

Ron

TABLE 3
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Broad Remediation Risk Estimates (Based on Single Amphibole Fiber Site-Wide)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	5.6 E-3	9.2 E-5	1.9 E-4	2.1 E-2	1 E-6	2 E-6
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	7.0 E-3	4.4 E-4	1.9 E-4	2.1 E-2	1 E-6	9 E-6
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	2.5 E-3	4.1 E-5	9.7 E-5	1.1 E-2	2 E-7	4 E-7
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.1 E-3	2.0 E-4	9.7 E-5	1.1 E-2	3 E-7	2 E-6
Future Maintenance Worker-Best Estimate	4.5 E-6	7.3 E-8	4.2 E-3	4.6 E-1	2 E-8	3 E-8
Future Maintenance Worker-Upper Bound	5.5 E-6	3.5 E-7	4.2 E-3	4.6 E-1	2 E-8	2 E-7
Current/Future On-Site Trespasser-Best Estimate	4.5 E-6	7.3 E-8	1.1 E-4	1.2 E-2	5 E-10	9 E-10
Current/Future On-Site Trespasser-Upper Bound	5.5 E-6	3.5 E-7	1.1 E-4	1.2 E-2	6 E-10	4 E-9

Notes:

(1) From Table 3.

(2) From Table 4.

(2) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

TABLE 3
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Selective Remediation Risk Estimates (Based on Measured Asbestos Fibers minus 2 Locations with 2 and 4 Amphibole Fibers -> 0 Fibers)

Scenario	Estimated Airborne Chrysotile Concentrations(1) (s/cm^3)	Estimated Airborne Amphibole Concentrations(1) (s/cm^3)	Adjusted Chrysotile URF(2) (s/cm^3)$^{-1}$	Adjusted Amphibole URF(2) (s/cm^3)$^{-1}$	Estimated Chrysotile(3) Risk	Estimated Amphibole(3) Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	5.6 E-3	7.4 E-4	1.9 E-4	2.1 E-2	1 E-6	2 E-5
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	7.0 E-3	1.3 E-3	1.9 E-4	2.1 E-2	1 E-6	3 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	2.5 E-3	3.3 E-4	9.7 E-5	1.1 E-2	2 E-7	4 E-6
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.1 E-3	5.9 E-4	9.7 E-5	1.1 E-2	3 E-7	6 E-6
Future Maintenance Worker-Best Estimate	4.5 E-6	5.9 E-7	4.2 E-3	4.6 E-1	2 E-8	3 E-7
Future Maintenance Worker-Upper Bound	5.5 E-6	1.1 E-6	4.2 E-3	4.6 E-1	2 E-8	5 E-7
Current/Future On-Site Trespasser-Best Estimate	4.5 E-6	5.9 E-7	1.1 E-4	1.2 E-2	5 E-10	7 E-9
Current/Future On-Site Trespasser-Upper Bound	5.5 E-6	1.1 E-6	1.1 E-4	1.2 E-2	6 E-10	1 E-8

Notes:

(1) From Table 3.

(2) From Table 4.

(2) Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

TABLE 3
ASBESTOS SCREENING-LEVEL RISK ASSESSMENT RESULTS
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 1)

Baseline Risk Estimates (Based on Measured Asbestos Fibers)

Scenario	Estimated Airborne Chrysotile Concentrations[1] (s/cm^3)	Estimated Airborne Amphibole Concentrations[1] (s/cm^3)	Adjusted Chrysotile URF[2] $(s/cm^3)^{-1}$	Adjusted Amphibole URF[2] $(s/cm^3)^{-1}$	Estimated Chrysotile[3] Risk	Estimated Amphibole[3] Risk
LONG FIBERS						
Construction Worker-Best Estimate (No Dust Mit./1 Yr Exp.)	5.6 E-3	1.3 E-3	1.9 E-4	2.1 E-2	1 E-6	3 E-5
Construction Worker-Upper Bound (No Dust Mit./1 Yr Exp.)	7.0 E-3	2.0 E-3	1.9 E-4	2.1 E-2	1 E-6	4 E-5
Construction Worker-Best Estimate (with Dust Mit./0.5 Yr Exp.)	2.5 E-3	5.8 E-4	9.7 E-5	1.1 E-2	2 E-7	6 E-6
Construction Worker-Upper Bound (with Dust Mit./0.5 Yr Exp.)	3.1 E-3	9.0 E-4	9.7 E-5	1.1 E-2	3 E-7	1 E-5
Future Maintenance Worker-Best Estimate	4.5 E-6	1.0 E-6	4.2 E-3	4.6 E-1	2 E-8	5 E-7
Future Maintenance Worker-Upper Bound	5.5 E-6	1.6 E-6	4.2 E-3	4.6 E-1	2 E-8	7 E-7
Current/Future On-Site Trespasser-Best Estimate	4.5 E-6	1.0 E-6	1.1 E-4	1.2 E-2	5 E-10	1 E-8
Current/Future On-Site Trespasser-Upper Bound	5.5 E-6	1.6 E-6	1.1 E-4	1.2 E-2	6 E-10	2 E-8

Notes:

[1] From Table 3.

[2] From Table 4.

[2] Estimated airborne concentrations × URF.

Best Estimate - Based on the pooled analytical sensitivity multiplied by the number of asbestos fibers found.

Upper Bound - Based on the 95% UCL of the Poisson distribution.

Shannon Harbour

From: Mark Jones [Mark.Jones@erm.com]
Sent: Thursday, November 15, 2007 5:11 PM
To: Brian Rakvica
Cc: Shannon Harbour; pblack@neptuneinc.org; paul.duffy@neptuneinc.org; Ranajit (Ron) Sahu
Subject: RE: Tronox A/B Non-Asbestos Results and Analyses
Attachments: Tronox Parcels A-B_FieldData_wBackground.zip

Brian,

Attached is the non-asbestos dataset for the Tronox Parcels A/B. This spreadsheet also includes the background dataset.

On [illegible] P drive

Mark Jones
ERM
Sacramento, CA
916-924-9378

----- Original Message -----
From: Brian Rakvica
To: Ranajit (Ron) Sahu
Cc: Shannon Harbour ; Paul Black ; paul.duffy@neptuneinc.org
Sent: Thursday, November 15, 2007 3:27 PM
Subject: RE: Tronox A/B Non-Asbestos Results and Analyses

Ranajit,

It would be helpful for Neptune if they had the actual data.

Can you transmit that to them?

Please advise.

Thanks,

Brian

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Thursday, November 15, 2007 1:01 PM
To: Shannon Harbour; Brian Rakvica
Cc: susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox A/B Non-Asbestos Results and Analyses

Shannon/Brian:

Attached are the Excel (i.e., "Live") versions of the data analyses for Tronox Parcels A and B, excluding the asbestos results. This contains the background comparison summary as well as the data summary/risk comparisons. Given the criticality of this project, we would be grateful if you could review these as we proceed to deal with the asbestos issues, in parallel.

Thanks

Ranajit

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Please visit ERM's web site: http://www.erm.com

Shannon Harbour

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Thursday, November 15, 2007 1:01 PM
To: Shannon Harbour; Brian Rakvica
Cc: susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox A/B Non-Asbestos Results and Analyses
Attachments: Tronox_ParcelsA-B_DataSummary-Industrial.xls; Tronox_ParcelsA-B_BackgroundComparison.xls

Shannon/Brian:

Attached are the Excel (i.e., "Live") versions of the data analyses for Tronox Parcels A and B, excluding the asbestos results. This contains the background comparison summary as well as the data summary/risk comparisons. Given the criticality of this project, we would be grateful if you could review these as we proceed to deal with the asbestos issues, in parallel.

Thanks

Ranajit

TABLE 1
BACKGROUND COMPARISON SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 4)

Chemical	Background								Site							
	No. of Detects	Total Samples	Percent Detects	Minimum Detect	Maximum Detect	Median	Mean	Standard Deviation	No. of Detects	Total Samples	Percent Detects	Minimum Detect	Maximum Detect	Median	Mean	Standard Deviation
Metals																
Aluminum	120	120	100%	3740	15300	8420	8899	2653	64	64	100%	6780	9750	8555	8430	689
Antimony	49	120	41%	0.12	0.50	0.16	0.24	0.13	54	64	84%	0.11	0.42	0.17	0.23	0.15
Arsenic	120	120	100%	2.1	7.2	3.9	4.1	1.1	64	64	100%	2.3	5.8	3.0	3.2	0.85
Barium	120	120	100%	73	836	190	223	126	64	64	100%	148	269	199	200	27
Beryllium	120	120	100%	0.16	0.89	0.54	0.56	0.16	64	64	100%	0.41	0.65	0.51	0.51	0.048
Boron	34	104	33%	5.2	12	2.1	3.6	2.6	0	64	0%	NA	NA	10	11	0.45
Cadmium	16	120	13%	0.052	0.16	0.065	0.070	0.017	52	64	81%	0.069	0.59	0.11	0.14	0.11
Calcium	104	104	100%	8160	82800	23650	28130	14860	64	64	100%	15600	75300	26450	29370	10570
Chromium (Total)	120	120	100%	2.6	17	8.8	8.9	2.9	64	64	100%	7.3	17	11	11	2.0
Chromium (VI)	0	104	0%	NA	NA	0.13	0.13	0	25	61	41%	0.18	0.58	0.50	0.42	0.14
Cobalt	120	120	100%	3.7	16	8.3	8.2	2.5	64	64	100%	4.6	7.5	6.1	6.1	0.70
Copper	120	120	100%	7.8	31	17	17	4.2	64	64	100%	11	31	14	15	3.1
Iron	120	120	100%	5410	19700	13050	12810	3263	64	64	100%	10100	17200	13050	13090	1337
Lead	120	120	100%	3.0	35	7.8	9.4	5.1	64	64	100%	6.5	136	9.9	15	20
Lithium	104	104	100%	7.5	27	13	14	4.3	56	64	88%	11	23	14	14	3.7
Magnesium	120	120	100%	4580	17500	9425	9505	3046	64	64	100%	6690	13600	8420	8693	1235
Manganese	120	120	100%	151	1090	419	425	135	64	64	100%	218	668	338	361	93
Molybdenum	120	120	100%	0.17	2.0	0.48	0.55	0.28	31	64	48%	0.48	1.4	0.55	0.63	0.20
Nickel	120	120	100%	7.8	30	15	15	4.2	64	64	100%	11	24	14	14	2.1
Niobium	0	104	0%	NA	NA	0.65	0.71	0.23	2	64	3%	1.6	2.0	2.6	2.6	0.19
Palladium	104	104	100%	0.14	1.5	0.40	0.46	0.24	64	64	100%	0.30	1.2	0.42	0.47	0.16
Platinum	5	104	5%	0.045	0.099	0.022	0.024	0.011	0	64	0%	NA	NA	0.11	0.11	0.0048
Potassium	104	104	100%	625	3890	1535	1730	733	64	64	100%	2040	4800	2855	2956	592
Selenium	52	120	43%	0.10	0.60	0.079	0.18	0.13	0	64	0%	NA	NA	0.50	0.53	0.032
Silicon	104	104	100%	335	4150	720	981	780	64	64	100%	128	1320	513	509	268
Silver	16	120	13%	0.019	0.083	0.13	0.12	0.028	64	64	100%	0.081	0.82	0.11	0.12	0.090

TABLE 1
BACKGROUND COMPARISON SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 4)

	Background								Site							
Chemical	**No. of Detects**	**Total Samples**	**Percent Detects**	**Minimum Detect**	**Maximum Detect**	**Median**	**Mean**	**Standard Deviation**	**No. of Detects**	**Total Samples**	**Percent Detects**	**Minimum Detect**	**Maximum Detect**	**Median**	**Mean**	**Standard Deviation**
Sodium	104	104	100%	111	1320	452	486	286	64	64	100%	244	1720	698	737	348
Strontium	104	104	100%	69	808	186	223	132	64	64	100%	120	487	178	199	69
Thallium	42	120	35%	0.10	1.8	0.27	0.50	0.48	0	64	0%	NA	NA	0.21	0.21	0.0090
Tin	103	104	99%	0.20	0.80	0.49	0.48	0.13	56	64	88%	0.40	1.5	0.52	0.54	0.23
Titanium	120	120	100%	200	1010	504	510	171	64	64	100%	504	982	648	653	93
Tungsten	0	104	0%	NA	NA	0.53	0.59	0.21	0	64	0%	NA	NA	0.50	0.53	0.032
Uranium	103	103	100%	0.43	2.7	0.94	1.0	0.31	64	64	100%	0.69	3.1	1.0	1.2	0.51
Vanadium	120	120	100%	15	59	36	35	11	64	64	100%	24	53	32	33	4.6
Zinc	120	120	100%	15	121	37	37	13	64	64	100%	26	211	32	39	27
Zirconium	104	104	100%	60	179	125	126	27	64	64	100%	4.9	27	23	23	3.0
Radionuclides																
Radium-226	96	104	92%	0.49	2.4	1.1	1.1	0.39	64	64	100%	0.84	1.5	1.0	1.0	0.13
Radium-228	68	84	81%	1.2	2.9	1.9	1.8	0.59	64	64	100%	1.4	2.1	1.8	1.8	0.16
Thorium-228	120	120	100%	1.1	2.3	1.7	1.7	0.28	63	64	98%	0.97	2.2	1.6	1.6	0.33
Thorium-230	120	120	100%	0.66	3.0	1.2	1.2	0.38	64	64	100%	0.31	2.0	1.2	1.2	0.30
Thorium-232	120	120	100%	1.1	2.2	1.6	1.6	0.27	63	64	98%	1.1	2.4	1.4	1.5	0.30
Uranium-233/234	61	120	51%	0.53	2.8	0.58	0.89	0.59	64	64	100%	0.23	2.3	0.47	0.59	0.40
Uranium-235/236	54	120	45%	0.037	0.21	0.041	0.053	0.043	28	64	44%	0.014	0.051	0.0074	0.013	0.012
Uranium-238	120	120	100%	0.45	2.4	1.0	1.1	0.37	64	64	100%	0.13	1.3	0.33	0.38	0.22

Note: Summary and background comparison statistics were performed using one-half the detection limit for metals and using GISdT® (Neptune and Company 2007).

BOLD with Highlight indicates Site concentrations are greater than background.

WRS = Wilcoxon Rank Sum Test with the Gehan Modification

mg/kg - milligrams per kilogram

pCi/g - picoCuries per gram

TABLE 1
BACKGROUND COMPARISON SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 3 of 4)

Chemical	*t*-Test *p*	Quantile Test *p*	Slippage Test *p*	WRS Test *p*	Greater than Background?	Units	Basis
Metals							
Aluminum	9.7 E-1	1.0 E+0	1.0 E+0	5.3 E-1	NO	mg/kg	Multiple Tests
Antimony	6.4 E-1	NA	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Arsenic	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Barium	9.7 E-1	9.8 E-1	1.0 E+0	1.4 E-1	NO	mg/kg	Multiple Tests
Beryllium	1.0 E+0	1.0 E+0	1.0 E+0	9.2 E-1	NO	mg/kg	Multiple Tests
Boron	3.0 E-50	NA	1.0 E+0	0.0 E+0	NO	mg/kg	Non-Detect in Site Data
Cadmium	3.6 E-6	2.4 E-8	1.6 E-5	1.0 E+0	YES	mg/kg	Multiple Tests
Calcium	2.7 E-1	7.1 E-1	1.0 E+0	2.6 E-2	NO	mg/kg	Multiple Tests
Chromium (Total)	7.2 E-9	2.6 E-2	3.5 E-1	5.5 E-8	YES	mg/kg	WRS and *t*-Test
Chromium (VI)	3.4 E-24	NA	NA	1.5 E-10	YES	mg/kg	WRS and *t*-Test
Cobalt	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Copper	1.0 E+0	1.0 E+0	3.5 E-1	1.0 E+0	NO	mg/kg	Multiple Tests
Iron	2.1 E-1	1.0 E+0	1.0 E+0	3.6 E-1	NO	mg/kg	Multiple Tests
Lead	1.8 E-2	2.6 E-2	1.2 E-1	1.0 E-5	YES	mg/kg	WRS and *t*-Test
Lithium	4.0 E-1	NA	1.0 E+0	3.2 E-3	NO	mg/kg	Multiple Tests
Magnesium	9.9 E-1	1.0 E+0	1.0 E+0	9.8 E-1	NO	mg/kg	Multiple Tests
Manganese	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Molybdenum	9.2 E-3	NA	1.0 E+0	0.0 E+0	YES	mg/kg	WRS and *t*-Test
Nickel	9.7 E-1	1.0 E+0	1.0 E+0	9.2 E-1	NO	mg/kg	Multiple Tests
Niobium	2.3 E-106	NA	NA	0.0 E+0	YES	mg/kg	Non-Detect in Background
Palladium	3.7 E-1	6.1 E-1	1.0 E+0	6.8 E-2	NO	mg/kg	Multiple Tests
Platinum	9.9 E-113	NA	1.0 E+0	0.0 E+0	NO	mg/kg	Non-Detect in Site Data
Potassium	7.5 E-24	7.0 E-9	7.3 E-3	0.0 E+0	YES	mg/kg	Multiple Tests
Selenium	7.8 E-61	NA	1.0 E+0	0.0 E+0	NO	mg/kg	Non-Detect in Site Data
Silicon	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Silver	4.5 E-1	3.5 E-1	5.7 E-15	1.0 E+0	NO	mg/kg	Multiple Tests

TABLE 1
BACKGROUND COMPARISON SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA

Chemical	*t*-Test *p*	Quantile Test *p*	Slippage Test *p*	WRS Test *p*	Greater than Background?	Units	Basis
Sodium	1.9 E-6	9.0 E-3	7.3 E-3	2.6 E-6	YES	mg/kg	Multiple Tests
Strontium	9.4 E-1	7.1 E-1	1.0 E+0	5.1 E-1	NO	mg/kg	Multiple Tests
Thallium	1.0 E+0	NA	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Tin	2.0 E-2	1.8 E-1	2.0 E-2	2.6 E-3	YES	mg/kg	Multiple Tests
Titanium	2.9 E-12	1.1 E-2	1.0 E+0	1.6 E-10	YES	mg/kg	Multiple Tests
Tungsten	1.0 E+0	NA	NA	4.9 E-1	NO	mg/kg	Multiple Tests
Uranium	2.9 E-3	2.0 E-2	5.5 E-2	5.8 E-3	YES	mg/kg	Multiple Tests
Vanadium	9.9 E-1	1.0 E+0	1.0 E+0	9.8 E-1	NO	mg/kg	Multiple Tests
Zinc	3.3 E-1	1.0 E+0	1.2 E-1	9.7 E-1	NO	mg/kg	Multiple Tests
Zirconium	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	mg/kg	Multiple Tests
Radionuclides							
Radium-226	8.5 E-1	1.0 E+0	1.0 E+0	8.8 E-1	NO	pCi/g	Multiple Tests
Radium-228	4.3 E-1	1.0 E+0	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple Tests
Thorium-228	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple Tests
Thorium-230	7.7 E-1	6.6 E-1	1.0 E+0	5.2 E-1	NO	pCi/g	Multiple Tests
Thorium-232	1.0 E+0	1.0 E+0	3.5 E-1	1.0 E+0	NO	pCi/g	Multiple Tests
Uranium-233/234	1.0 E+0	NA	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple Tests
Uranium-235/236	1.0 E+0	NA	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple Tests
Uranium-238	1.0 E+0	1.0 E+0	1.0 E+0	1.0 E+0	NO	pCi/g	Multiple Tests

Note: Summary and background comparison statistics were performed using one-half the detection limit for metals and using GISdT® (Neptune and Company 2007).
BOLD with Highlight indicates Site concentrations are greater than background.
WRS = Wilcoxon Rank Sum Test with the Gehan Modification
mg/kg - milligrams per kilogram
pCi/g - picoCuries per gram

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 1 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
Dioxins/Furans	TCDD TEF	pg/g	32	32	100%	0.73	472	TSB-BJ-05-0	–	–
Asbestos[i]	Chrysotile	Structures	31	12	39%	1	19	TSB-BJ-01	–	–
	Amphibole	Structures	31	10	32%	1	4	TSB-AR-08	–	–
General Chemistry	Bromide	mg/kg	64	28	44%	0.69	7.8	TSB-AJ-02-10	2.5	3.1
	Bromine	mg/kg	64	28	44%	1.4	15.7	TSB-AJ-02-10	5.1	6.3
	Chlorate	mg/kg	64	17	27%	1.4	17	TSB-BR-02-10	5.1	6.3
	Chloride	mg/kg	64	62	97%	3.3	2,210	TSB-AR-06-0-DUP	2	206
	Chlorine	mg/kg	64	62	97%	6.6	4,410	TSB-AR-06-0-DUP	4.1	411
	Chlorite	ug/kg	3	0	0%	–	–	–	220	250
	Fluoride	mg/kg	64	41	64%	0.39	4.3	TSB-BJ-04-10	1	1.3
	Nitrate (as N)	mg/kg	64	64	100%	0.33	229	TSB-AR-06-0-DUP	0.2	10.4
	Nitrite (as N)	mg/kg	64	1	2%	0.45	0.45	TSB-AJ-03-0	0.2	0.25
	Orthophosphate as P	mg/kg	64	2	3%	2	2	TSB-AR-11-0	5.1	6.3
	Perchlorate	ug/kg	64	63	98%	53.4	41,600	TSB-BJ-03-10	40.6	2480
	Sulfate	mg/kg	64	64	100%	9.1	8,870	TSB-AR-12-10	5.1	265
Glycols/Alcohols	Ethanol	ug/kg	64	0	0%	–	–	–	250	310
Metals	Aluminum	mg/kg	64	64	100%	6,780	9,750	TSB-BJ-01-0	10.1	12.5
	Antimony	mg/kg	64	54	84%	0.11	0.42	TSB-BR-02-0	1	1.3
	Arsenic	mg/kg	64	64	100%	2.3	5.8	TSB-BR-04-10	2	2.5
	Barium	mg/kg	64	64	100%	148	269	TSB-BJ-01-10	4.1	5
	Beryllium	mg/kg	64	64	100%	0.41	0.65	TSB-BJ-01-10	0.2	0.25
	Boron	mg/kg	64	0	0%	–	–	TSB-BR-06-10	20.3	25
	Cadmium	mg/kg	64	52	81%	0.069	0.59	TSB-BJ-02-0	0.1	0.13
	Calcium	mg/kg	64	64	100%	15,600	75,300	TSB-AR-13-10	101	125
	Chromium (Total)	mg/kg	64	64	100%	7.3	17	TSB-BR-04-10	2	2.5
	Chromium (VI)	mg/kg	61	25	41%	0.18	0.58	TSB-BJ-04-0	1	1.3
	Cobalt	mg/kg	64	64	100%	4.6	7.5	TSB-BR-02-0	0.41	0.5
	Copper	mg/kg	64	64	100%	11.3	31	TSB-BR-02-0	2	2.5
	Iron	mg/kg	64	64	100%	10,100	17,200	TSB-BJ-02-0	10.1	12.5
	Lead	mg/kg	64	64	100%	6.5	136	TSB-BR-03-0	0.61	0.75
	Lithium	mg/kg	64	56	88%	10.9	22.6	TSB-AR-13-10	10.1	26.4
	Magnesium	mg/kg	64	64	100%	6,690	13,600	TSB-BR-05-10	101	125
	Manganese	mg/kg	64	64	100%	218	668	TSB-BR-02-0	0.41	0.5
	Mercury	ug/kg	64	40	63%	7.3	17.5	TSB-BJ-04-0	33.8	41.7
	Molybdenum	mg/kg	64	31	48%	0.48	1.4	TSB-AR-04-10	1	1.3
	Nickel	mg/kg	64	64	100%	11.2	23.7	TSB-AJ-02-0	1	1.3
	Niobium	mg/kg	64	2	3%	1.6	2	TSB-AR-08-0	5.1	6.3
	Palladium	mg/kg	64	64	100%	0.3	1.2	TSB-AR-13-10	0.2	0.25
	Phosphorus (as P)	mg/kg	64	64	100%	527	1,510	TSB-BR-02-0	101	125
	Platinum	mg/kg	64	0	0%	–	–	–	0.2	0.25

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 2 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
	Potassium	mg/kg	64	64	100%	2,040	4,800	TSB-AR-06-0-DUP	20.3	25
Metals	Selenium	mg/kg	64	0	0%	--	--	--	1	1.3
	Silicon	mg/kg	64	64	100%	128	1,320	TSB-AR-02-0	50.7	62.6
	Silver	mg/kg	64	64	100%	0.081	0.82	TSB-BR-03-0	0.41	0.5
	Sodium	mg/kg	64	64	100%	244	1,720	TSB-AR-06-0	40.6	50.1
	Strontium	mg/kg	64	64	100%	120	487	TSB-AR-13-10	1	1.3
	Sulfur	mg/kg	64	26	41%	443	5,980	TSB-AR-12-10	1010	2550
	Thallium	mg/kg	64	0	0%	--	--	TSB-BR-06-10	0.41	0.5
	Tin	mg/kg	64	56	88%	0.4	1.5	TSB-BR-02-0	0.41	0.5
	Titanium	mg/kg	64	64	100%	504	982	TSB-BJ-02-0	1	1.3
	Tungsten	mg/kg	64	0	0%	--	--	TSB-BR-06-10	1	1.3
	Uranium	mg/kg	64	64	100%	0.69	3.1	TSB-AR-13-10	0.2	0.25
	Vanadium	mg/kg	64	64	100%	24.2	53.4	TSB-BJ-02-0	2	2.5
	Zinc	mg/kg	64	64	100%	25.9	211	TSB-BJ-01-0	4.1	5
	Zirconium	mg/kg	64	64	100%	4.9	27.3	TSB-BJ-02-10	20.3	25
Organochlorine Pesticides	2,4-DDD	ug/kg	64	4	6%	2	17	TSB-BR-01-0	1.7	19
	2,4-DDE	ug/kg	64	11	17%	2.1	150	TSB-BR-01-0	1.7	19
	4,4-DDD	ug/kg	64	2	3%	7.5	18	TSB-BJ-05-0	1.7	19
	4,4-DDE	ug/kg	64	19	30%	1.8	310	TSB-BR-01-0	1.7	19
	4,4-DDT	ug/kg	64	10	16%	2.3	99	TSB-BR-01-0	1.7	19
	Aldrin	ug/kg	64	0	0%	--	--	--	1.7	19
	alpha-BHC	ug/kg	64	0	0%	--	--	--	1.7	19
	alpha-Chlordane	ug/kg	64	0	0%	--	--	--	1.7	19
	beta-BHC	ug/kg	64	31	48%	1.7	190	TSB-BR-01-0	1.7	19
	Chlordane	ug/kg	64	0	0%	--	--	--	17	190
	delta-BHC	ug/kg	64	0	0%	--	--	--	1.7	19
	Dieldrin	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan I	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan II	ug/kg	64	0	0%	--	--	--	1.7	19
	Endosulfan sulfate	ug/kg	64	0	0%	--	--	--	1.7	19
	Endrin	ug/kg	64	1	2%	7	7	TSB-BR-01-0	1.7	19
	Endrin aldehyde	ug/kg	64	2	3%	2.7	3.6	TSB-AR-12-0	1.7	19
	Endrin ketone	ug/kg	64	0	0%	--	--	--	1.7	19
	gamma-Chlordane	ug/kg	64	0	0%	--	--	--	1.7	19
	Heptachlor	ug/kg	64	0	0%	--	--	--	1.7	19
	Heptachlor epoxide	ug/kg	64	0	0%	--	--	--	1.7	19
	Lindane	ug/kg	64	0	0%	--	--	--	1.7	19
	Methoxychlor	ug/kg	64	0	0%	--	--	--	3.3	37
	Toxaphene	ug/kg	64	0	0%	--	--	--	68	760
Petroleum	TPH (as Gasoline)	mg/kg	64	0	0%	--	--	--	0.1	0.13

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 3 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect^a	Max. Detect^a	Location of Max. Detect	Min. Non-Detect Limit^b	Max. Non-Detect Limit^b
Hydrocarbons	TPH (as Diesel)	mg/kg	64	0	0%	--	--	--	25	31
	Oil/Grease	mg/kg	64	0	0%	--	--	--	203	250
Radionuclides	Radium-226	pCi/g	64	64	100%	0.837	1.48	TSB-AJ-01-10	0.0487	0.0944
	Radium-228	pCi/g	64	64	100%	1.4	2.13	TSB-BR-06-0	0.0978	0.18
	Thorium-228	pci/g	64	63	98%	0.973	2.17	TSB-BR-06-0	0.1	0.1
	Thorium-230	pci/g	64	64	100%	0.308	2.03	TSB-AR-3-10	0.1	0.1
	Thorium-232	pci/g	64	63	98%	1.1	2.36	TSB-BR-04-0	0.1	0.1
	Uranium-233/234	pci/g	64	64	100%	0.225	2.31	TSB-AR-02-10	0.6	0.6
	Uranium-235/236	pci/g	64	28	44%	0.0141	0.0509	TSB-AR-02-10	0.6	0.6
	Uranium-238	pci/g	64	64	100%	0.125	1.26	TSB-AR-02-10	0.6	0.6
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	64	0	0%	--	--	--	330	410
	1,2-Diphenylhydrazine	ug/kg	64	0	0%	--	--	--	330	410
	1,4-Dioxane	ug/kg	64	0	0%	--	--	--	330	410
	1-Nonanal	ug/kg	64	0	0%	--	--	--	10	13
	2,2'-/4,4'-Dichlorobenzil	ug/kg	64	0	0%	--	--	--	330	2800
	2,4,5-Trichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4,6-Trichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dichlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dimethylphenol	ug/kg	64	0	0%	--	--	--	330	410
	2,4-Dinitrophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	2,4-Dinitrotoluene	ug/kg	64	0	0%	--	--	--	330	410
	2,6-Dinitrotoluene	ug/kg	64	0	0%	--	--	--	330	410
	2-Chloronaphthalene	ug/kg	64	0	0%	--	--	--	330	410
	2-Chlorophenol	ug/kg	64	0	0%	--	--	--	330	410
	2-Methylnaphthalene	ug/kg	64	0	0%	--	--	--	330	410
	2-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	2-Nitrophenol	ug/kg	64	0	0%	--	--	--	330	410
	3,3'-Dichlorobenzidine	ug/kg	64	0	0%	--	--	--	1600	2000
	3-Methylphenol & 4-Methylphenol	ug/kg	64	0	0%	--	--	--	670	830
	3-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	4-Bromophenyl phenyl ether	ug/kg	64	0	0%	--	--	--	330	410
	4-Chloro-3-Methylphenol	ug/kg	64	0	0%	--	--	--	330	410
	4-Chlorophenyl phenyl ether	ug/kg	64	0	0%	--	--	--	330	410
	4-Nitrophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	Acenaphthene	ug/kg	64	10	16%	65	1,000	TSB-AJ-01-10	51	63
	Acenaphthylene	ug/kg	64	0	0%	--	--	--	100	130
	Acetophenone	ug/kg	64	0	0%	--	--	--	330	410
	Aniline	ug/kg	64	0	0%	--	--	--	330	410
	Anthracene	ug/kg	64	0	0%	--	--	--	30	38
	Azobenzene	ug/kg	64	0	0%	--	--	--	330	410

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA

(Page 4 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect^a	Max. Detect^a	Location of Max. Detect	Min. Non-Detect Limit^b	Max. Non-Detect Limit^b
	Benzenethiol	ug/kg	64	0	0%	--	--	--	330	410
	Benzo(a)anthracene	ug/kg	64	1	2%	55	55	TSB-AR-01-0-DUP	15	19
	Benzo(a)pyrene	ug/kg	64	1	2%	19	19	TSB-BJ-03-0	15	19
SVOCs	Benzo(b)fluoranthene	ug/kg	64	1	2%	21	21	TSB-BJ-03-0	15	19
	Benzo(g,h,i)perylene	ug/kg	64	0	0%	--	--	--	30	38
	Benzo(k)fluoranthene	ug/kg	64	0	0%	--	--	--	15	19
	Benzoic acid	ug/kg	64	0	0%	--	--	--	1600	2000
	Benzyl alcohol	ug/kg	64	0	0%	--	--	--	330	410
	Benzyl butyl phthalate	ug/kg	64	4	6%	42	420	TSB-BJ-04-0	330	410
	bis(2-Chloroethoxy) methane	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Chloroethyl) ether	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Chloroisopropyl) ether	ug/kg	64	0	0%	--	--	--	330	410
	bis(2-Ethylhexyl) phthalate	ug/kg	64	2	3%	37	140	TSB-BR-03-0	330	410
	bis(p-Chlorophenyl) disulfide	ug/kg	64	0	0%	--	--	--	330	410
	bis(p-Chlorophenyl) sulfone	ug/kg	64	0	0%	--	--	--	330	410
	Carbazole	ug/kg	64	0	0%	--	--	--	330	410
	Chrysene	ug/kg	64	2	3%	18	24	TSB-BJ-03-0	15	19
	Dibenzo(a,h)anthracene	ug/kg	64	0	0%	--	--	--	30	38
	Dibenzofuran	ug/kg	64	0	0%	--	--	--	330	410
	Dibutyl phthalate	ug/kg	64	1	2%	50	50	TSB-BR-03-0	330	410
	Diethyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Dimethyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Di-n-octyl phthalate	ug/kg	64	0	0%	--	--	--	330	410
	Diphenyl sulfone	ug/kg	64	0	0%	--	--	--	330	410
	Fluoranthene	ug/kg	64	0	0%	--	--	--	330	410
	Fluorene	ug/kg	64	0	0%	--	--	--	330	410
	Hexachlorobenzene	ug/kg	64	1	2%	49	49	TSB-BR-01-0	330	410
	Hexachlorocyclopentadiene	ug/kg	64	0	0%	--	--	--	1600	2000
	Hydroxymethyl phthalimide	ug/kg	64	0	0%	--	--	--	330	410
	Indeno(1,2,3-cd)pyrene	ug/kg	64	0	0%	--	--	--	15	19
	Isophorone	ug/kg	64	0	0%	--	--	--	330	410
	Naphthalene	ug/kg	64	0	0%	--	--	--	330	410
	Nitrobenzene	ug/kg	64	0	0%	--	--	--	330	410
	N-nitrosodi-n-propylamine	ug/kg	64	0	0%	--	--	--	330	410
	N-nitrosodiphenylamine	ug/kg	64	0	0%	--	--	--	330	410
	o-Cresol	ug/kg	64	0	0%	--	--	--	330	410
	Octachlorostyrene	ug/kg	64	1	2%	41	41	TSB-BR-01-0	330	410
	p-Chloroaniline	ug/kg	64	0	0%	--	--	--	330	410
	p-Chlorothiophenol	ug/kg	64	0	0%	--	--	--	330	410
	Pentachlorobenzene	ug/kg	64	0	0%	--	--	--	330	410

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 5 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
SVOCs	Pentachlorophenol	ug/kg	64	0	0%	--	--	--	1600	2000
	Phenanthrene	ug/kg	64	0	0%	--	--	--	30	38
	Phenol	ug/kg	64	0	0%	--	--	--	330	410
	Phenyl Disulfide	ug/kg	64	0	0%	--	--	--	330	410
	Phenyl Sulfide	ug/kg	64	0	0%	--	--	--	330	410
	Phthalic acid	ug/kg	64	0	0%	--	--	--	1600	2000
	p-Nitroaniline	ug/kg	64	0	0%	--	--	--	1600	2000
	Pyrene	ug/kg	64	0	0%	--	--	--	30	38
	Pyridine	ug/kg	64	0	0%	--	--	--	670	830
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,1-Trichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,2,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1,2-Trichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,1-Dichloropropene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,3-Trichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,3-Trichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2,4-Trichlorobenzene	ug/kg	64	1	2%	0.9	0.9	TSB-AJ-01-10	5	6.3
	1,2,4-Trimethylbenzene	ug/kg	64	34	53%	0.23	0.57	TSB-AR-13-10	5	6.3
	1,2-Dibromo-3-chloropropane	ug/kg	64	0	0%	--	--	--	10	13
	1,2-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2-Dichloroethane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	10	13
	1,2-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3,5- Trichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3,5-Trimethylbenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	1,3-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	1,4-Dichlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2,3-Trimethylbutane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2-Dichloropropane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,2-Dimethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,3-Dimethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3
	2,4-Dimethylpentane	ug/kg	64	0	0%	--	--	--	20	25
	2-Chlorotoluene	ug/kg	64	0	0%	--	--	--	5	6.3
	2-Nitropropane	ug/kg	64	0	0%	--	--	--	10	13
	2-Phenylbutane	ug/kg	64	0	0%	--	--	--	5	6.3
	3,3-dimethylpentane	ug/kg	64	0	0%	--	--	--	10	13
	3-ethylpentane	ug/kg	64	0	0%	--	--	--	5	6.3

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 6 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
	3-Methylhexane	ug/kg	64	0	0%	--	--	--	5	6.3
	4-Chlorothioanisole	ug/kg	64	0	0%	--	--	--	330	410
	4-Chlorotoluene	ug/kg	64	0	0%	--	--	--	5	6.3
	Acetone	ug/kg	64	9	14%	6.5	16	TSB-BJ-01-10	20	25
	Acetonitrile	ug/kg	64	0	0%	--	--	--	50	63
VOCs	Benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromodichloromethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Bromomethane	ug/kg	64	0	0%	--	--	--	10	13
	Carbon disulfide	ug/kg	64	0	0%	--	--	--	5	6.3
	Carbon tetrachloride	ug/kg	64	0	0%	--	--	--	5	6.3
	Freon 11	ug/kg	64	0	0%	--	--	--	5	6.3
	Freon 12	ug/kg	64	0	0%	--	--	--	10	13
	Freon 113	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorobenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorobromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Chlorodibromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Chloroethane	ug/kg	64	0	0%	--	--	--	10	13
	Chloroform	ug/kg	64	0	0%	--	--	--	5	6.3
	Chloromethane	ug/kg	64	0	0%	--	--	--	10	13
	cis-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	cis-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Cymene	ug/kg	64	0	0%	--	--	--	5	6.3
	Dibromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Dichloromethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Ethylbenzene	ug/kg	64	3	5%	0.2	0.24	TSB-AR-07-10	5	6.3
	Hexachloro-1,3-butadiene	ug/kg	64	0	0%	--	--	--	330	410
	Hexachloroethane	ug/kg	64	0	0%	--	--	--	330	410
	Hexane, 2-methyl-	ug/kg	64	0	0%	--	--	--	5	6.3
	Isopropylbenzene	ug/kg	64	0	0%	--	--	--	5	6.3
	m,p-Xylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl disulfide	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl ethyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	Methyl iodide	ug/kg	64	0	0%	--	--	--	5	6.3
	Methyl isobutyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	Methyl n-butyl ketone	ug/kg	64	0	0%	--	--	--	20	25
	MTBE (Methyl tert-butyl ether)	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Butyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Heptane	ug/kg	64	0	0%	--	--	--	5	6.3
	n-Propyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 7 of 14)

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Location of Max. Detect	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]
VOCs	o-Xylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Styrene (monomer)	ug/kg	64	0	0%	--	--	--	5	6.3
	tert-Butyl benzene	ug/kg	64	0	0%	--	--	--	5	6.3
	Tetrachloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Toluene	ug/kg	64	11	17%	0.24	0.65	TSB-BR-06-10	5	6.3
	trans-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	trans-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Tribromomethane	ug/kg	64	0	0%	--	--	--	5	6.3
	Trichloroethylene	ug/kg	64	0	0%	--	--	--	5	6.3
	Vinyl acetate	ug/kg	64	0	0%	--	--	--	5	6.3
	Vinyl chloride	ug/kg	64	0	0%	--	--	--	5	6.3
	Xylenes (total)	ug/kg	64	0	0%	--	--	--	10	13

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.
b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.
c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs. Several chemicals have both cancer and non-cancer toxicity criteria. For these chemicals USEPA calculates PRGs for both cancer and non-cancer endpoints; however only the lower value is published in its PRG table. The other value is included in a separate spreadsheet table. This other value is shown on this table as the 'Secondary Industrial PRG' and is included in the screening-level risk assessment calculations.
d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).
e - Based on results of statistical comparison tests performed between shallow background and site datasets.
f - Non-cancer hazard indices were calculated by dividing the maximum detected value by its PRG (or secondary PRG). The total non-cancer hazard index is the sum of all chemical-specific hazard indices.
g - Theoretical upper-bound incremental lifetime cancer risks were calculated by were calculated by dividing the maximum detected value by its PRG (or secondary PRG) times 1E-6. The total incremental lifetime cancer risk is the sum of all chemical-specific cancer risks.
h - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).
i - Asbestos results shown are for long protocol structures (>10um).
j - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 8 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
Dioxins/Furans	TCDD TEF[h]	pg/g	472	1,000	ca	–	0	–	–	–	–	5 E-7
Asbestos[i]	Chrysotile	Structures	19	–	–	–	–	–	–	–	–	See separate table
	Amphibole	Structures	4	–	–	–	–	–	–	–	–	
General Chemistry	Bromide	mg/kg	7.8	–	–	–	–	–	–	–	–	–
	Bromine	mg/kg	15.7	–	–	–	–	–	–	–	–	–
	Chlorate	mg/kg	17	–	–	–	–	–	–	–	–	–
	Chloride	mg/kg	2,210	–	–	–	–	1,110	9	–	–	–
	Chlorine	mg/kg	4,410	–	–	–	–	–	–	–	–	–
	Chlorite	ug/kg	–	–	–	–	–	–	–	–	–	–
	Fluoride	mg/kg	4.3	36,900	nc	–	0	2.5	3	–	0.00012	–
	Nitrate (as N)	mg/kg	229	–	–	–	–	102	1	–	–	–
	Nitrite (as N)	mg/kg	0.45	–	–	–	–	0.21	1	–	–	–
	Orthophosphate as P	mg/kg	2	–	–	–	–	–	–	–	–	–
	Perchlorate	ug/kg	41,600	>100,000	–	–	0	–	–	–	–	–
	Sulfate	mg/kg	8,870	–	–	–	–	4,130	1	–	–	–
Glycols/Alcohols	Ethanol	ug/kg	–	–	–	–	–	–	–	–	–	–
Metals	Aluminum	mg/kg	9,750	>100,000	nc	–	0	15,300	0	No	–	–
	Antimony	mg/kg	0.42	409	nc	–	0	0.5	0	No	–	–
	Arsenic	mg/kg	5.8	1.6	ca	260	64	7.2	0	No	–	–
	Barium	mg/kg	269	66,600	nc	–	0	836	0	No	–	–
	Beryllium	mg/kg	0.65	1940	ca	–	0	0.89	0	No	–	–
	Boron	mg/kg	–	>100,000	nc	–	0	11.6	0	No	–	–
	Cadmium	mg/kg	0.59	451	nc	3,000	0	0.13	22	Yes	0.0013	2 E-10
	Calcium	mg/kg	75,300	–	–	–	–	82,800	0	No	–	–
	Chromium (Total)	mg/kg	17	448	nc	–	0	16.7	1	Yes	0.038	–
	Chromium (VI)	mg/kg	0.58	64	ca	2,500	0	0.32	4	Yes	0.00023	9 E-9
	Cobalt	mg/kg	7.5	1,920	ca	–	0	16.3	0	No	–	–
	Copper	mg/kg	31	40,900	nc	–	0	30.5	1	No	–	–
	Iron	mg/kg	17,200	>100,000	nc	–	0	19,700	0	No	–	–
	Lead	mg/kg	136	800	nc	–	0	35.1	2	Yes	0.17	–
	Lithium	mg/kg	22.6	20,400	nc	–	0	26.5	0	No	–	–
	Magnesium	mg/kg	13,600	–	–	–	–	17,500	0	No	–	–
	Manganese	mg/kg	668	19,500	nc	–	0	1,090	0	No	–	–
	Mercury	ug/kg	17.5	–	–	–	–	110	0	No	–	–
	Molybdenum	mg/kg	1.4	5,110	nc	–	0	2.0	0	Yes	0.00027	–
	Nickel	mg/kg	23.7	20,400	nc	–	0	30	0	No	–	–
	Niobium	mg/kg	2	–	–	–	–	2.8	0	Yes	–	–
	Palladium	mg/kg	1.2	–	–	–	–	1.5	0	No	–	–
	Phosphorus (as P)	mg/kg	1,510	–	nc	–	–	2,010	0	No	–	–
	Platinum	mg/kg	–	–	–	–	–	0.099	0	No	–	–

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 9 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
	Potassium	mg/kg	4,800	--	--	--	--	3,890	5	Yes	--	--
Metals	Selenium	mg/kg	--	5,110	nc	--	0	0.60	0	No	--	--
	Silicon	mg/kg	1,320	--	--	--	--	4,150	0	No	--	--
	Silver	mg/kg	0.82	5,110	nc	--	0	0.26	1	No	--	--
	Sodium	mg/kg	1,720	--	--	--	--	1,320	5	Yes	--	--
	Strontium	mg/kg	487	>100,000	nc	--	0	808	0	No	--	--
	Sulfur	mg/kg	5,980	--	--	--	--	--	--	--	--	--
	Thallium	mg/kg	--	68	nc	--	0	1.8	0	No	--	--
	Tin	mg/kg	1.5	>100,000	nc	--	0	0.80	4	Yes	0.000015	--
	Titanium	mg/kg	982	>100,000	nc	--	0	1,010	0	Yes	0.0098	--
	Tungsten	mg/kg	--	--	--	--	--	2.5	0	No	--	--
	Uranium	mg/kg	3.1	204	nc	--	0	2.7	3	Yes	0.015	--
	Vanadium	mg/kg	53.4	1,020	nc	--	0	59.1	0	No	--	--
	Zinc	mg/kg	211	>100,000	nc	--	0	121	2	No	--	--
	Zirconium	mg/kg	27.3	--	--	--	--	179	0	No	--	--
Organochlorine Pesticides	2,4-DDD	ug/kg	17	--	--	--	--	--	--	--	--	--
	2,4-DDE	ug/kg	150	--	--	--	--	--	--	--	--	--
	4,4-DDD	ug/kg	18	9,950	ca	--	0	--	--	--	--	2 E-9
	4,4-DDE	ug/kg	310	7,020	ca	--	0	--	--	--	--	4 E-8
	4,4-DDT	ug/kg	99	7,020	ca	>100,000	0	--	--	--	0.00099	1 E-8
	Aldrin	ug/kg	--	101	ca	19,000	0	--	--	--	--	--
	alpha-BHC	ug/kg	--	359	ca	>100,000	0	--	--	--	--	--
	alpha-Chlordane	ug/kg	--	--	--	--	--	--	--	--	--	--
	beta-BHC	ug/kg	190	1,260	ca	>100,000	0	--	--	--	0.0019	2 E-7
	Chlordane	ug/kg	--	--	--	--	--	--	--	--	--	--
	delta-BHC	ug/kg	--	--	--	--	--	--	--	--	--	--
	Dieldrin	ug/kg	--	108	ca	31,000	0	--	--	--	--	--
	Endosulfan I	ug/kg	--	--	--	--	--	--	--	--	--	--
	Endosulfan II	ug/kg	--	--	--	--	--	--	--	--	--	--
	Endosulfan sulfate	ug/kg	--	--	--	--	--	--	--	--	--	--
	Endrin	ug/kg	7	>100,000	nc	--	0	--	--	--	0.00007	--
	Endrin aldehyde	ug/kg	3.6	--	--	--	--	--	--	--	--	--
	Endrin ketone	ug/kg	--	--	--	--	--	--	--	--	--	--
	gamma-Chlordane	ug/kg	--	--	--	--	--	--	--	--	--	--
	Heptachlor	ug/kg	--	383	ca	>100,000	0	--	--	--	--	--
	Heptachlor epoxide	ug/kg	--	189	ca	8,000	0	--	--	--	--	--
	Lindane	ug/kg	--	1,740	ca	>100,000	0	--	--	--	--	--
	Methoxychlor	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Toxaphene	ug/kg	--	1,570	ca	--	0	--	--	--	--	--
Petroleum	TPH (as Gasoline)	mg/kg	--	--	--	--	--	--	--	--	--	--

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 10 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
Hydrocarbons	TPH (as Diesel)	mg/kg	--	--	--	--	--	--	--	--	--	--
	Oil/Grease	mg/kg	--	--	--	--	--	--	--	--	--	--
Radionuclides	Radium-226	pCi/g	1.48	0.026	ca	--	64	2.36	0	No	--	--
	Radium-228	pCi/g	2.13	0.15	ca	--	64	2.94	0	No	--	--
	Thorium-228	pci/g	2.17	0.26	ca	--	63	2.28	0	No	--	--
	Thorium-230	pci/g	2.03	20	ca	--	0	3.01	0	No	--	--
	Thorium-232	pci/g	2.36	19	ca	--	0	2.23	1	No	--	--
	Uranium-233/234	pci/g	2.31	32	ca	--	0	2.84	0	No	--	--
	Uranium-235/236	pci/g	0.0509	0.40	ca	--	0	0.21	0	No	--	--
	Uranium-238	pci/g	1.26	1.8	ca	--	0	2.37	0	No	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,2-Diphenylhydrazine	ug/kg	--	2,150	ca	--	0	--	--	--	--	--
	1,4-Dioxane	ug/kg	--	>100,000	ca	--	0	--	--	--	--	--
	1-Nonanal	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,2'-/4,4'-Dichlorobenzil	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,4,5-Trichlorophenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2,4,6-Trichlorophenol	ug/kg	--	61,600	nc	>100,000	0	--	--	--	--	--
	2,4-Dichlorophenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2,4-Dimethylphenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2,4-Dinitrophenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2,4-Dinitrotoluene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2,6-Dinitrotoluene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2-Chloronaphthalene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2-Chlorophenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2-Methylnaphthalene	ug/kg	--	--	--	--	--	--	--	--	--	--
	2-Nitroaniline	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2-Nitrophenol	ug/kg	--	--	--	--	--	--	--	--	--	--
	3,3'-Dichlorobenzidine	ug/kg	--	3,830	ca	--	0	--	--	--	--	--
	3-Methylphenol & 4-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--	--
	3-Nitroaniline	ug/kg	--	82,100	ca	>100,000	0	--	--	--	--	--
	4-Bromophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--	--
	4-Chloro-3-Methylphenol	ug/kg	--	--	--	--	--	--	--	--	--	--
	4-Chlorophenyl phenyl ether	ug/kg	--	--	--	--	--	--	--	--	--	--
	4-Nitrophenol	ug/kg	--	--	--	--	--	--	--	--	--	--
	Acenaphthene	ug/kg	1,000	>100,000	nc	--	0	--	--	--	0.01	--
	Acenaphthylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Acetophenone	ug/kg	--	--	--	--	--	--	--	--	--	--
	Aniline	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--	--
	Anthracene	ug/kg	--	>100,000	ca	--	0	--	--	--	--	--
	Azobenzene	ug/kg	--	15,700	ca	--	0	--	--	--	--	--

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CLARK COUNTY, NEVADA
(Page 11 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
	Benzenethiol	ug/kg	--	--	--	--	--	--	--	--	--	--
	Benzo(a)anthracene	ug/kg	55	2,110	ca	--	0	--	--	--	--	3 E-8
	Benzo(a)pyrene	ug/kg	19	211	ca	--	0	--	--	--	--	9 E-8
SVOCs	Benzo(b)fluoranthene	ug/kg	21	2,110	ca	--	0	--	--	--	--	1 E-8
	Benzo(g,h,i)perylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Benzo(k)fluoranthene	ug/kg	--	21,100	ca	--	0	--	--	--	--	--
	Benzoic acid	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Benzyl alcohol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Benzyl butyl phthalate	ug/kg	420	>100,000	nc	--	0	--	--	--	0.0042	--
	bis(2-Chloroethoxy) methane	ug/kg	--	--	--	--	--	--	--	--	--	--
	bis(2-Chloroethyl) ether	ug/kg	--	575	ca	--	0	--	--	--	--	--
	bis(2-Chloroisopropyl) ether	ug/kg	--	7,350	ca	>100,000	0	--	--	--	--	--
	bis(2-Ethylhexyl) phthalate	ug/kg	140	>100,000	ca	>100,000	0	--	--	--	0.0014	1 E-9
	bis(p-Chlorophenyl) disulfide	ug/kg	--	--	--	--	--	--	--	--	--	--
	bis(p-Chlorophenyl) sulfone	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Carbazole	ug/kg	--	86,200	ca	--	0	--	--	--	--	--
	Chrysene	ug/kg	24	>100,000	ca	--	0	--	--	--	--	2 E-10
	Dibenzo(a,h)anthracene	ug/kg	--	211	ca	--	0	--	--	--	--	--
	Dibenzofuran	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Dibutyl phthalate	ug/kg	50	>100,000	nc	--	0	--	--	--	0.0005	--
	Diethyl phthalate	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Dimethyl phthalate	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Di-n-octyl phthalate	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Diphenyl sulfone	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Fluoranthene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Fluorene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Hexachlorobenzene	ug/kg	49	1,080	ca	>100,000	0	--	--	--	0.00049	5 E-8
	Hexachlorocyclopentadiene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Hydroxymethyl phthalimide	ug/kg	--	--	--	--	--	--	--	--	--	--
	Indeno(1,2,3-cd)pyrene	ug/kg	--	2,110	ca	--	0	--	--	--	--	--
	Isophorone	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--	--
	Naphthalene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Nitrobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	N-nitrosodi-n-propylamine	ug/kg	--	246	ca	--	0[i]	--	--	--	--	--
	N-nitrosodiphenylamine	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--	--
	o-Cresol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Octachlorostyrene	ug/kg	41	--	--	--	--	--	--	--	--	--
	p-Chloroaniline	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	p-Chlorothiophenol	ug/kg	--	--	--	--	--	--	--	--	--	--
	Pentachlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--

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TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 12 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect^a	Industrial PRG^c	PRG Basis	Secondary Industrial PRG^c	Count of Detects > PRG	Max. Bkgrd^d	Count of Detects > Bkgrd	Above Bkgrd?^{e}	Non-Cancer Hazard Index^f	Incremental Lifetime Cancer Risk^g
	Pentachlorophenol	ug/kg	--	9,000	ca	>100,000	0	--	--	--	--	--
	Phenanthrene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Phenol	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Phenyl Disulfide	ug/kg	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenyl Sulfide	ug/kg	--	--	--	--	--	--	--	--	--	--
	Phthalic acid	ug/kg	--	--	--	--	--	--	--	--	--	--
	p-Nitroaniline	ug/kg	--	82,100	ca	>100,000	0	--	--	--	--	--
	Pyrene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Pyridine	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	--	7,280	ca	>100,000	0	--	--	--	--	--
	1,1,1-Trichloroethane	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,1,2,2-Tetrachloroethane	ug/kg	--	929	ca	>100,000	0	--	--	--	--	--
	1,1,2-Trichloroethane	ug/kg	--	1,610	ca	>100,000	0	--	--	--	--	--
	1,1-Dichloroethane	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,1-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,1-Dichloropropene	ug/kg	--	--	--	--	--	--	--	--	--	--
	1,2,3-Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--	--
	1,2,3-Trichloropropane	ug/kg	--	76	ca	79,000	0	--	--	--	--	--
	1,2,4-Trichlorobenzene	ug/kg	0.9	>100,000	nc	--	0	--	--	--	0.000009	--
	1,2,4-Trimethylbenzene	ug/kg	0.57	>100,000	nc	--	0	--	--	--	0.0000057	--
	1,2-Dibromo-3-chloropropane	ug/kg	--	2,020	ca	11,000	0	--	--	--	--	--
	1,2-Dichlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,2-Dichloroethane	ug/kg	--	603	ca	28,000	0	--	--	--	--	--
	1,2-Dichloroethylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	1,2-Dichloropropane	ug/kg	--	742	ca	21,000	0	--	--	--	--	--
	1,3,5- Trichlorobenzene	ug/kg	--	--	--	--	--	--	--	--	--	--
	1,3,5-Trimethylbenzene	ug/kg	--	69,700	nc	--	0	--	--	--	--	--
	1,3-Dichlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,3-Dichloropropane	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	1,4-Dichlorobenzene	ug/kg	--	7,870	ca	>100,000	0	--	--	--	--	--
	2,2,3-Trimethylbutane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,2-Dichloropropane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,2-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,3-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2,4-Dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2-Chlorotoluene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	2-Nitropropane	ug/kg	--	--	--	--	--	--	--	--	--	--
	2-Phenylbutane	ug/kg	--	--	--	--	--	--	--	--	--	--
	3,3-dimethylpentane	ug/kg	--	--	--	--	--	--	--	--	--	--
	3-ethylpentane	ug/kg	--	--	--	--	--	--	--	--	--	--

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
	3-Methylhexane	ug/kg	--	--	--	--	--	--	--	--	--	--
	4-Chlorothioanisole	ug/kg	--	--	--	--	--	--	--	--	--	--
	4-Chlorotoluene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Acetone	ug/kg	16	>100,000	nc	--	0	--	--	--	0.00016	--
	Acetonitrile	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
VOCs	Benzene	ug/kg	--	1,410	ca	>100,000	0	--	--	--	--	--
	Bromobenzene	ug/kg	--	92,200	nc	--	0	--	--	--	--	--
	Bromodichloromethane	ug/kg	--	1,830	ca	>100,000	0	--	--	--	--	--
	Bromomethane	ug/kg	--	13,100	nc	--	0	--	--	--	--	--
	Carbon disulfide	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Carbon tetrachloride	ug/kg	--	549	ca	7,300	0	--	--	--	--	--
	Freon 11	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Freon 12	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Freon 113	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Chlorobenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Chlorobromomethane	ug/kg	--	--	--	--	--	--	--	--	--	--
	Chlorodibromomethane	ug/kg	--	2,550	ca	>100,000	0	--	--	--	--	--
	Chloroethane	ug/kg	--	6,490	ca	>100,000	0	--	--	--	--	--
	Chloroform	ug/kg	--	470	ca	>100,000	0	--	--	--	--	--
	Chloromethane	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	cis-1,2-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	cis-1,3-Dichloropropylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Cymene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Dibromomethane	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Dichloromethane	ug/kg	--	20,500	ca	>100,000	0	--	--	--	--	--
	Ethylbenzene	ug/kg	0.24	>100,000	nc	--	0	--	--	--	0.0000024	--
	Hexachloro-1,3-butadiene	ug/kg	--	22,100	ca	>100,000	0	--	--	--	--	--
	Hexachloroethane	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--	--
	Hexane, 2-methyl-	ug/kg	--	--	--	--	--	--	--	--	--	--
	Isopropylbenzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	m,p-Xylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Methyl disulfide	ug/kg	--	--	--	--	--	--	--	--	--	--
	Methyl ethyl ketone	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Methyl iodide	ug/kg	--	--	--	--	--	--	--	--	--	--
	Methyl isobutyl ketone	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Methyl n-butyl ketone	ug/kg	--	--	--	--	--	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	ug/kg	--	70,000	ca	>100,000	0	--	--	--	--	--
	n-Butyl benzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	n-Heptane	ug/kg	--	--	--	--	--	--	--	--	--	--
	n-Propyl benzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--

TABLE 2
SOIL DATA AND SCREENING-LEVEL RISK ASSESSMENT RESULTS SUMMARY
TRONOX PARCELS A/B INVESTIGATION
CLARK COUNTY, NEVADA
(Page 14 of 14)

Parameter of Interest	Chemical	Result Unit	Max. Detect[a]	Industrial PRG[c]	PRG Basis	Secondary Industrial PRG[c]	Count of Detects > PRG	Max. Bkgrd[d]	Count of Detects > Bkgrd	Above Bkgrd?[e]	Non-Cancer Hazard Index[f]	Incremental Lifetime Cancer Risk[g]
VOCs	o-Xylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Styrene (monomer)	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	tert-Butyl benzene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Tetrachloroethylene	ug/kg	--	1,310	ca	>100,000	0	--	--	--	--	--
	Toluene	ug/kg	0.65	>100,000	nc	--	0	--	--	--	0.0000065	--
	trans-1,2-Dichloroethylene	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	trans-1,3-Dichloropropylene	ug/kg	--	--	--	--	--	--	--	--	--	--
	Tribromomethane	ug/kg	--	>100,000	ca	>100,000	0	--	--	--	--	--
	Trichloroethylene	ug/kg	--	115	ca	>100,000	0	--	--	--	--	--
	Vinyl acetate	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
	Vinyl chloride	ug/kg	--	746	ca	>100,000	0	--	--	--	--	--
	Xylenes (total)	ug/kg	--	>100,000	nc	--	0	--	--	--	--	--
								Total Non-Cancer Hazard Index:			0.25	
								Total Incremental Lifetime Cancer Risk:				9 E-7

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data se

b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.

c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs. Several chemicals have both cancer and non-cancer toxicity criteria. For these chemicals USEPA calculates PRGs for both cancer and non-cancer endpoints; however only the lower value is published in its PRG table. The other value is included in a separate spreadsheet table. This other value is shown on this table as the 'Secondary Industrial PRG' and is included in the screening-level risk assessment calculations.

d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).

e - Based on results of statistical comparison tests performed between shallow background and site datasets.

f - Non-cancer hazard indices were calculated by dividing the maximum detected value by its PRG (or secondary PRG). The total non-cancer hazard index is the sum of all chemical-specific hazard indices.

g - Theoretical upper-bound incremental lifetime cancer risks were calculated by were calculated by dividing the maximum detected value by its PRG (or secondary PRG) times 1E-6. The total incremental lifetime cancer risk is the sum of all chemical-specific cancer risks.

h - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).

i - Asbestos results shown are for long protocol structures (>10um).

j - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

[redacted]

TRX

11/15/07

call re: Parcels A/B

→ Keith Bailey
→ Susan Crowley

---

ideas re: NFA

→ perhaps provide NFA → once asbestos is removed
could this be a condition

→ 1PM tomorrow to discuss asbo
  → risk assessment
  → dig it up

→ send out call in # [illegible] #

Shannon Harbour

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Thursday, November 15, 2007 12:50 PM
To: Shannon Harbour
Cc: Brian Rakvica; susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox Parcels A/B Asbestos - Status Figure
Attachments: Tronox_Parcel-A_Amphibole Figure.pdf; Tronox_Parcel-B_Amphibole.pdf

Shannon/Brian:

Per recent discussions, I am attaching two maps, for parcels A and B showing amphibole asbestos data to date. We are waiting on 3 more results that we expect to get by tomorrow.

I would like to discuss our next steps strategy wil you when you have a moment., given the criticality of this site.

Thanks

Ron

Asbestos Sample Location

🟢 0 Long Amphibole Fibers
🟡 1 Long Amphibole Fiber
🟠 2 Long Amphibole Fibers
🟤 4 Long Amphibole Fibers
⚪ Not Analyzed Yet

Note: Location TSB-AR-11 had 8 chrysotile long fibers detected; TSB-AR-08 had 6 chrysotile long fibers detected.

February 2007 Aerial from AirPhotoUSA.

BEC / Tronox Sampling and Analysis Plan
BMI Common Areas, Henderson, Nevada

FIGURE

AMPHIBOLE ASBESTOS RESULTS - PARCEL "A"

Basic Environmental
COMPANY

Prepared by: MKJ
Date 11/15/07
JOB No. 0069073
FILE: GIS/BEC/TRONOX/FIGURE_.MXD

Asbestos Sample Location

- ● 0 Long Amphibole Fibers
- ○ 1 Long Amphibole Fiber

Note: Location TSB-BJ-01 had 19 chrysotile long fibers detected; TSB-BJ-02 had 9 chrysotile long fibers detected; TSB-BJ-05 had 3 chrysotile long fibers detected; TSB-BR-04 had 2 chrysotile long fibers detected; and TSB-BR-05 had 3 chrysotile long fibers detected.

February 2007 Aerial from AirPhotoUSA.

BEC / Tronox Sampling and Analysis Plan
BMI Common Areas, Henderson, Nevada

FIGURE

AMPHIBOLE ASBESTOS
RESULTS - PARCEL "B"

Basic Environmental
COMPANY

Prepared by: MKJ
Date 11/13/07
JOB No. 0069073
FILE: GIS/BEC/TRONOX/FIGURE_.MXD

FINAL

Meeting Minutes

Project: Tronox (TRX)
Location: Conference Call
Time and Date: 9:00 AM, Wednesday, November 14, 2007
Meeting Number: ---
In Attendance:

NDEP:	Brian Rakvica, Shannon Harbour
Hackenberry Associates:	Paul Hackenberry (consultant to NDEP)
Tronox:	Tom Reed, Susan Crowley
Environmental Answers:	Keith Bailey (consultant to TRX)
ENSR:	Dave Gerry, Brian Ho, Sally Bilodeau, Mike Flack, Ed Krish (consultants to Tronox)

1. The purpose of this conference call was to discuss NDEP's conditional approval of the Revised Work Plan to Evaluate Effective Groundwater Capture at Tronox Extraction Systems (Revised Work Plan).
2. TRX provided draft cross sections of the Interceptor, Athens Road, and Seep Area well fields for discussion purposes during the conference call.
3. TRX indicated that a Response To Comments (RTC) will be submitted to the NDEP by November 30, 2007. **ACTION ITEM.**
4. TRX and NDEP discussed comments in NDEP's October 3, 2007 response to the Revised Work Plan as outlined below.
5. Comment 1: TRX will use "barrier wall" in all future documents.
6. Comment 3: TRX stated that a pumping test will be conducted for EX-1 as this is the only well that is proposed for groundwater pumping as a supplement to the Interceptor Well Field. TRX will correct well nomenclature for final submittal for consistency with the current well nomenclature.
7. Comment 4: as follows,
    a. 4a: TRX will respond with additional text for clarification
    b. 4b: TRX indicated that the cross sections will be submitted with the RTC.
    c. 4c: TRX will collect core samples for vertical gradient analysis. ASTM number will be provided in RTC.
    d. 4d: TRX stated that additional wells proposed in work plan should provide data needed to address this comment.
    e. 4e: TRX stated that additional wells proposed in work plan should provide data needed to address this comment.
    f. 4f: TRX stated that there is no transition zone between the Muddy Creek Formation and the Alluvium in the vicinity of the Interceptor Well Field.
    g. 4g: NDEP to provide BRC block diagrams to TRX for an example. **ACTION ITEM.**
8. Comment 5: as follows:
    a. 5a: NDEP stated that TRX should investigate the impact of other flows around the barrier wall. TRX acknowledged this request, indicating the

    proposed wells on the east and west end of barrier were proposed to address this concern.
   b. 5b: NDEP comments are based on the need for TRX to provide data to corroborate the terms and statements TRX provided in the Revised Work Plan. TRX stated that a simple mass balance provided in the revised work plan shows that the injected stabilized Lake Mead water is the "significant" component for the expansion of the 100 ppm contour line.

9. Comment 6b: TRX stated that this comment should be addressed by the proposed wells.
10. Comment 7: NDEP cautioned TRX that modeling is only one line of evidence. TRX will explore additional lines of evidence for support, especially demonstration of inward flow. TRX indicated that the wells proposed for the Athens Road Well Field were located to address the concern over demonstration of inward flow.
11. Comment 9: TRX will supply cross sections with RTC. TRX additionally stated that some wells may look like they are not screened appropriately as they were projected onto the plane of the cross section and are screened in the appropriate formations.
12. Comment 10: as follows,
    a. 10a: NDEP requests a discussion of the mass balance instead for just concentration contours.
    b. 10b: TRX will not halt injection of the Lake Mead water during the "mining" of wells M70, M71, and M72 for the removal of the "dead zone" water. The combined pumping rate for these wells is expected to be 1 – 2 gpm. These wells are 2 inch diameter wells. TRX stated that the injection rate for the Lake Mead water has decreased from 60 gpm to 25 gpm; therefore, the groundwater mounding due to the injection has diminished and may affect the expected pumping rate for M70, M71, and M72. Wells will be monitored on a regular schedule for contaminant concentrations during pumping. Monitoring may be conducted on-site and for perchlorate only.
13. Comment 12b: TRX does not believe that the different flow paths can be separated and that not enough work to the north had been completed to determine channelization. TRX stated that there intent was to bracket expected seepage velocities. Language will be included in the RTC to show the ranges of values for seepage velocities determined from previous work.
14. TRX stated that the reduction in the injection efficiency of the trenches for the injection of Lake Mead water well be addressed by either excavation/refurbishing existing trenches or excavation of a new trench. TRX will notify NDEP of decision in RTC. NDEP recommended contacting BWPC for these activities.
15. TRX requested clarification on whether NDEP will accept demonstration of 95% or greater mass capture at each of the well fields as acceptable for compliance. The NDEP stated that 95% mass capture is still the benchmark for compliance; however, TRX and NDEP should meet to discuss the determination of the boundaries of the target capture zone for each well field. This will directly effect the calculation of mass removal at the well fields.
16. NDEP will send the reference for GPRA. **ACTION ITEM.**

17. Well Rehabilitation Program, TRX states that a layer of caliche seems to be interfering with well efficiency. TRX plans to swab individual wells but will not utilize a camera to investigate any wells. TRX stated that if the well fields are achieving over 95% mass capture, then well efficiency shouldn't be an issue.
18. TRX stated that the horizontal hydraulic conductivity for the MCF was used to that the groundwater calculated equaled the groundwater extracted at the well field. TRX stated that if the vertical hydraulic conductivity is used then the calculated value would be less than the actual value. TRX stated that upgradient water line leaks could account for additional water though TRX states these leaks have been infrequent.
19. TRX will begin implementation of the Revised Work Plan on November 26, 2007.

Shannon Harbour

From: Brian Rakvica

Sent: Wednesday, November 14, 2007 8:47 AM

To: 'Keith Bailey'; 'Crowley, Susan'

Cc: Shannon Harbour; Brian Rakvica; 'TeriLCopeland@aol.com'; pblack@neptuneinc.org; paul.duffy@neptuneinc.org; hackenberry@sbcglobal.net

Subject: TRX Phase A and B path forward

Importance: High

Susan and Keith,

Regarding Keith's voicemail from 11/12/07, NDEP proposes the following:

Perhaps it would be beneficial for a small group of us to sit down and go through an evaluation area or two. Perhaps an EA that is complex, such as EA08.

The small group would encompass: Shannon Harbour, Brian Rakvica, Teri Copeland, Paul Black and Paul Hackenberry (it is possible that all three of the consultants may not attend) to represent the NDEP. From TRX we would expect Susan Crowley, Keith Bailey, Lisa Bradley and whomever else would be the best suited for this discussion.

It is my understanding that Keith and Susan have the most knowledge regarding the specifics of sources; configuration; and processes.

TRX should be prepared to discuss each source area within the EA. This discussion would include such things as: chemicals associated with each source area; pathways of release from each source area (e.g.: are there any buried sumps or pipes); and what are our unknowns.

If we can come to consensus this would give TRX an idea of the type of exercise that NDEP would conduct for each EA. Perhaps TRX can more effectively document this thought process than NDEP.

It would be helpful to have the revised Figure with all of the sampling locations on it for this meeting.

Also, if there is a way to easily reference the project chemical data (tables; database; and/or figures) that would be good to have access to at the meeting.

Perhaps as a follow up it would be useful for some sub-set of the group to visit the Site to see the configuration of the sources.

Please advise.

Thanks,

Brian

Brian A. Rakvica, P.E.
Supervisor, Special Projects Branch

Bureau of Corrective Actions
Nevada Division of Environmental Protection
2030 East Flamingo Road, Suite 230
Las Vegas, Nevada 89119
tel: 702-486-2850 x 247
e: brakvica@ndep.nv.gov
fax: 702-486-5733 (please note the new fax number)

Shannon Harbour

From: Crowley, Susan [Susan.Crowley@tronox.com]
Sent: Wednesday, November 14, 2007 8:54 AM
To: Shannon Harbour; Brian Rakvica
Cc: Bilodeau, Sally; dgerry@ensr.aecom.com; Flack, Mike; Reed, Tom; ekrish@frontiernet.net; Keith Bailey; Stater, Rick
Subject: DRAFT Cross Sections Showing Proposed Wells
Attachments: DRAFT Figure Athens Road and Proposed Wells.pdf; DRAFT Figure Barrier Wall and Proposed Wells.pdf; DRAFT Figure Seep and Proposed Wells.pdf

Shannon,
To support our teleconference discussion this morning – please find the attached cross sections. Talk to you soon.
Thanks.

TRONOX LLC
Susan Crowley
PO Box 55
Henderson, NV 89009
office 702.651.2234
cell 702.592.7727
efax 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

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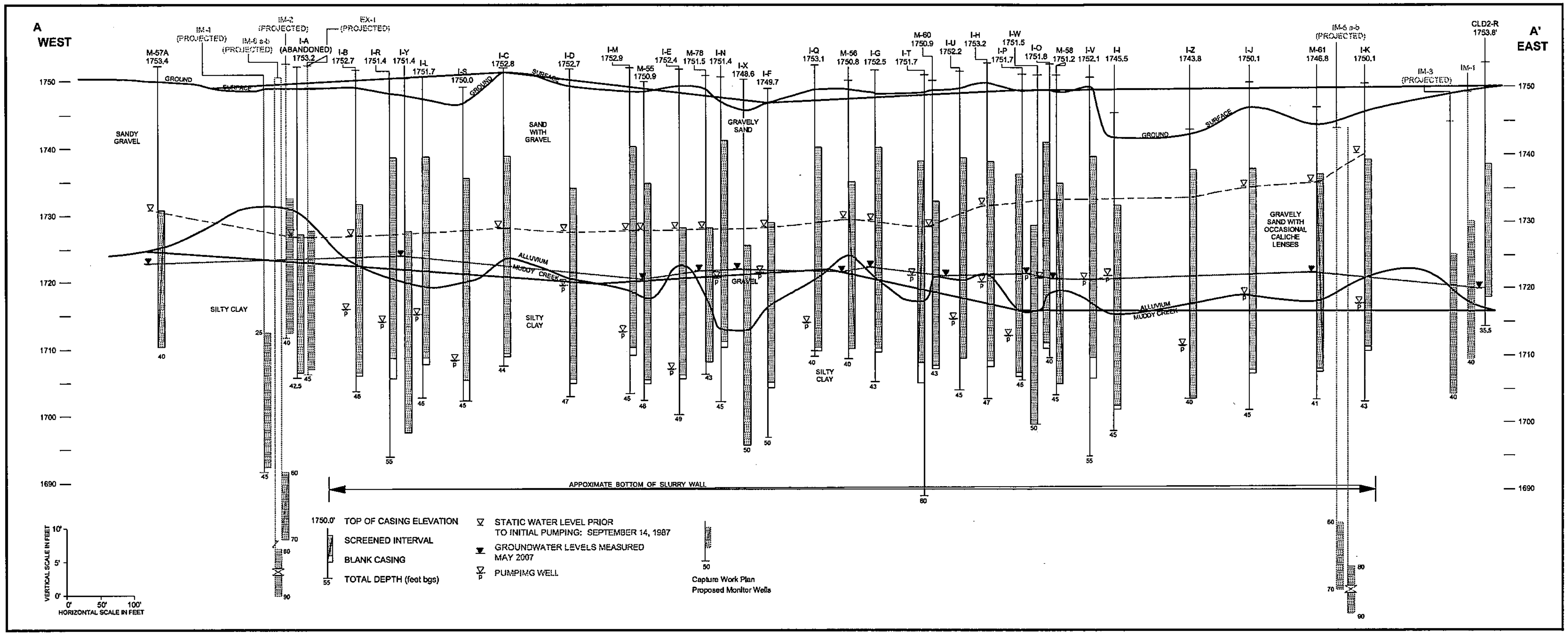
Thank you.



DESIGNED BY: E. Krish
DRAWN BY: T. Burke
CHECKED BY: E. Krish

ENSR | AECOM

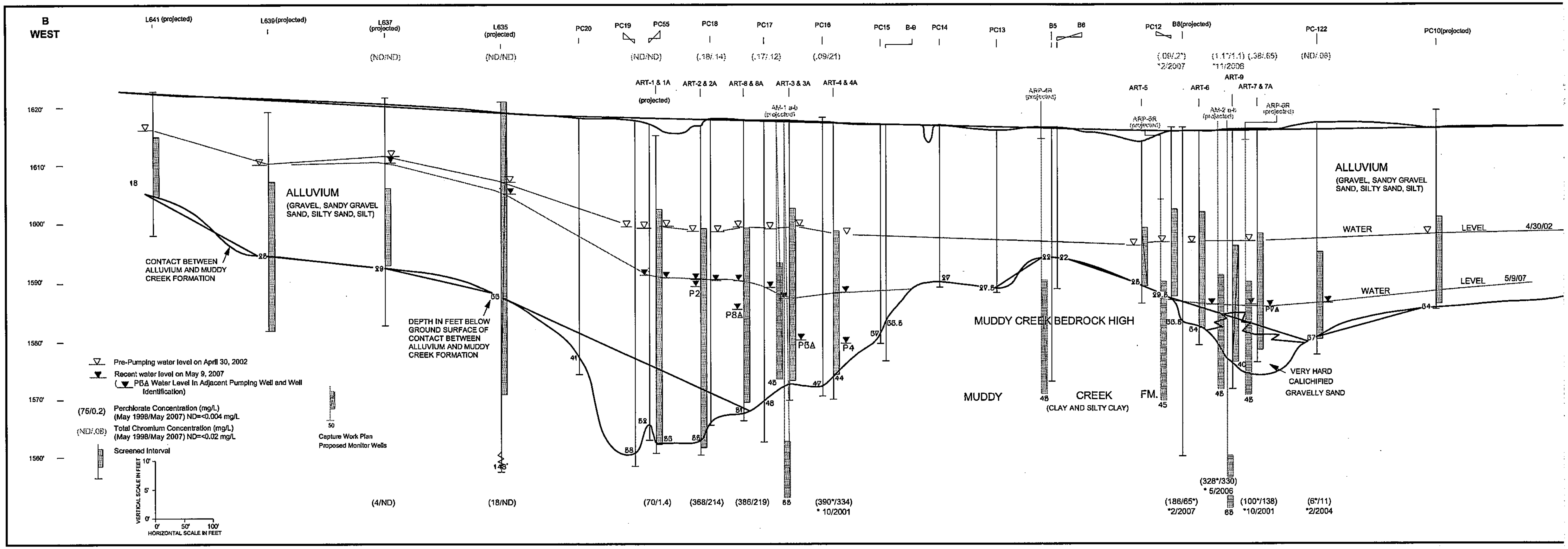
ENSR CORPORATION
1220 AVENIDA ACASO
CAMARILLO, CALIFORNIA 93012

WEST - EAST HYDROGEOLOGIC CROSS SECTION A-A' INTERCEPTOR WELL FIELD MAY 2007

Annual Performance Report

FIGURE NUMBER
2

SHEET NUMBER
X


B
WEST
1620'
1610'
1600'
1590'
1580'
1570'
1560'
L641 (projected)
L639 (projected)
L637 (projected)
L635 (projected)
PC20
PC19
PC55
PC18
PC17
PC16
PC15
B-9
PC14
PC13
B5
B6
PC12
B8 (projected)
PC-122
PC10 (projected)
(ND/ND)
(ND/ND)
(ND/ND)
(.18/.14)
(.17/.12)
(.09/21)
(.09/.2*)
*2/2007
(1.1*/1.1)
*11/2006
(.38/.65)
(ND/.08)
ART-1 & 1A
(projected)
ART-2 & 2A
ART-8 & 8A
ART-3 & 3A
ART-4 & 4A
AM-1 a-b (projected)
ARP-4R (projected)
ART-5
ARP-5R (projected)
ART-6
AM-2 a-b (projected)
ART-9
ART-7 & 7A
ARP-6R (projected)
ALLUVIUM
(GRAVEL, SANDY GRAVEL SAND, SILTY SAND, SILT)
ALLUVIUM
(GRAVEL, SANDY GRAVEL SAND, SILTY SAND, SILT)
WATER LEVEL 4/30/02
WATER LEVEL 5/9/07
CONTACT BETWEEN ALLUVIUM AND MUDDY CREEK FORMATION
DEPTH IN FEET BELOW GROUND SURFACE OF CONTACT BETWEEN ALLUVIUM AND MUDDY CREEK FORMATION
MUDDY CREEK BEDROCK HIGH
MUDDY CREEK FM.
(CLAY AND SILTY CLAY)
VERY HARD CALICHIFIED GRAVELLY SAND
18
25
29
55
41
58
52
53
55
51
48
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57
53.5
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40
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48
48
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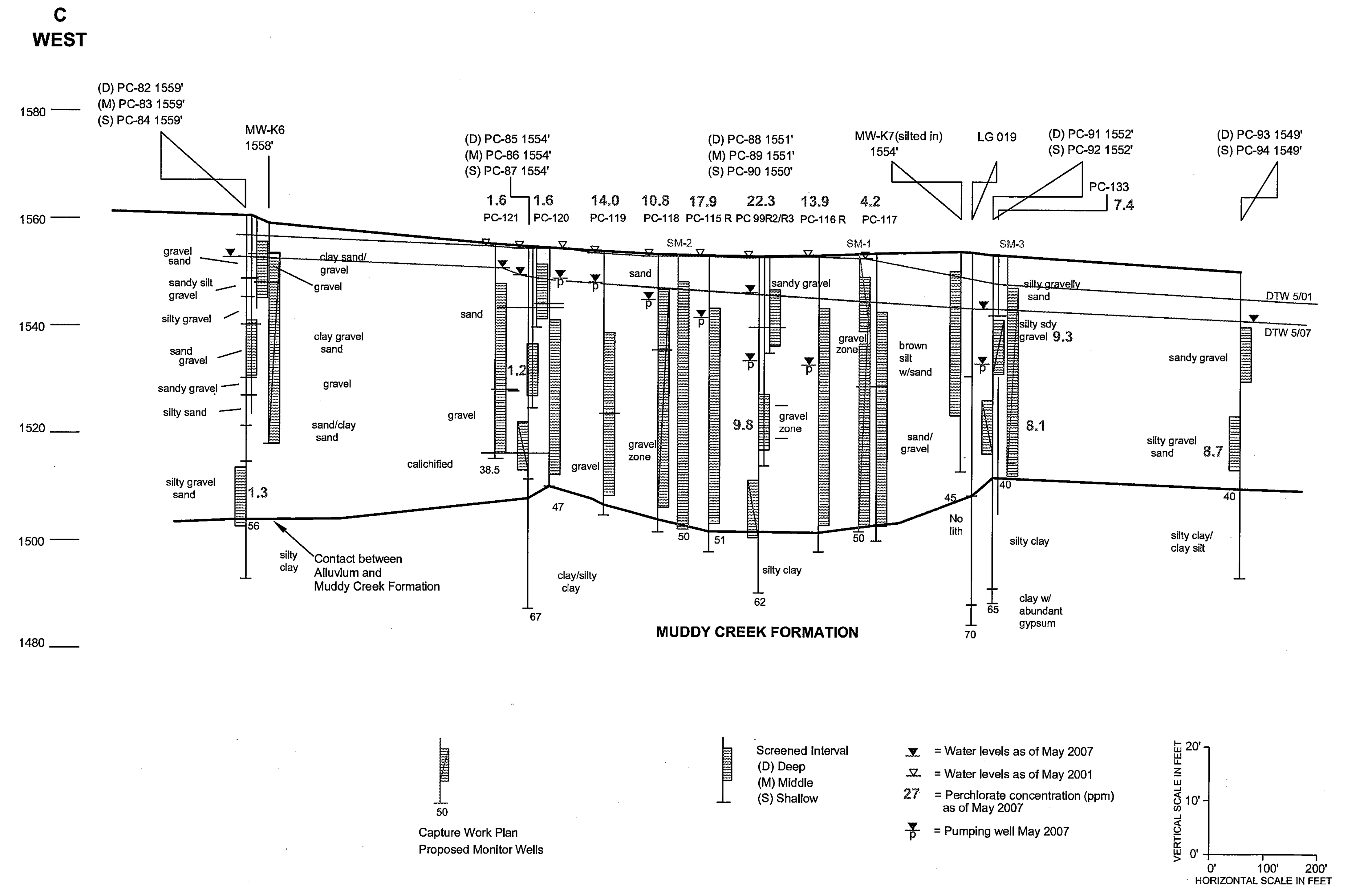
54
148'
P2
P8A
P3A
P4
P7A
(4/ND)
(18/ND)
(70/1.4)
(368/214)
(386/219)
(390*/334)
* 10/2001
(186/65*)
*2/2007
(328*/330)
* 5/2006
(100*/138)
*10/2001
(6*/11)
*2/2004
Pre-Pumping water level on April 30, 2002
Recent water level on May 9, 2007
(P8A Water Level In Adjacent Pumping Well and Well Identification)
(75/0.2) Perchlorate Concentration (mg/L) (May 1998/May 2007) ND=<0.004 mg/L
(ND/.08) Total Chromium Concentration (mg/L) (May 1998/May 2007) ND=<0.02 mg/L
Screened Interval
50
Capture Work Plan Proposed Monitor Wells
VERTICAL SCALE IN FEET
0'
5'
10'
HORIZONTAL SCALE IN FEET
0'
50'
100'



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WEST - EAST HYDROGEOLOGIC CROSS SECTION C-C' SEEP WELL FIELD MAY 2007

Annual Performance Report
Tronox Facility, Henderson, Nevada

SCALE:	DATE:	PROJECT NUMBER:
as noted	8/8/2007	04020-023-110

FIGURE NUMBER:
4

SHEET NUMBER:
X

Meeting Minutes

Project: Tronox
Location: Conference Call
Time and Date: 8:30 AM, Friday, November 9, 2007
Meeting Number: ---
In Attendance:
  NDEP: Brian Rakvica, Shannon Harbour
  Hackenberry Associates: Paul Hackenberry (consultant to NDEP)
  Neptune and Company: Paul Black, Paul Duffy (consultants to NDEP)
  Environmental Toxicologist: Teri Copeland (consultant to NDEP)
  Environmental Answers: Keith Bailey (consultant to Tronox)
  ENSR: Dave Gerry, Brian Ho, Lisa Bradley, Sally Bilodeau, Gerry Hels, Robert Kennedy, Carmen Caceres-Schnell, Mike Flack, Elizabeth Perry (consultants to Tronox)

1. The purpose of this conference call was to discuss NDEP's draft comments (Draft Comments) on the Phase A Source Area Investigation and Phase B Work Plan and how these could affect TRX's proposed field schedule for Phase B (proposed November commencement).
2. The NDEP provided draft comments to the group for discussion purposes only. The NDEP noted that the draft comments are to be considered very preliminary, repetitious, and not reconciled with the revised Table 1-1 and revised Plate I-2.
3. Statistics, the NDEP and TRX agreed to have their consultants discuss the statistical comments on a separate call, most of which appear to be minor.
4. Adequacy of characterization
    a. The NDEP clarified that the NDEP is not trying to state that all source areas haven't been characterized; however, the NDEP is stating that this has not been demonstrated. NDEP has not been able to reconcile all of the information to determine if all source areas require additional characterization.
    b. TRX stated that revised Table 1-1 and revised Plate I-2 were submitted to address the source area data adequacy issue. The NDEP stated that a review of these new items had not been completed but on-going. NDEP also stated that Plate I-2 should include the locations of the historic borings. In addition, NDEP anticipates spending a lot of time reviewing Table 1-1 and trying to correlate this to information that is in the CSM.
    c. TRX stated that information and/or data for some of the LOUs has not been located but that references for available data can be found in the CSM. For example, some areas have been issued No Further Action Determinations (NFAD)suggesting that data was collected but that data could not necessarily be located.
    d. TRX stated that the direction given for the revised Plate I-1 and Table 1-1 was that each LOU would have an associated Phase A or Phase B boring so that validated data would be on record associated with each LOU.
    e. TRS believes that approximately 15 LOUs have received NFADs although there this number may be higher. TRX understands that these NFADs may have been

rescinded but received the direction from NDEP that it was acceptable to use historical detected concentrations but could not use historical non-validated non-detects. TRX to investigate and report LOUs with historic NFADs on Table 1-1.

   f. NDEP indicated that the review of Table 1-1 will include a comparison of the Description of Chemicals Identified and Historical Investigations column with the CSM.
      i. If an LOU is identified as poorly characterized, then a broad suite of analytes is appropriate; otherwise, site data could be used to reduce the analytical suites requested.
      ii. Based on the effort for the comparison to the CSM, the NDEP estimates approximately one additional month to complete the review of this document.
   g. TRX stated that the mobilization for the Phase B SAP will be postponed pending NDEP's final comments.
   h. TRX stated that a table similar to revised Table 1-1 will be submitted for groundwater.
   i. TRX clarified that samples collected for the Phase 2 parcels are located at the surface and 10 feet below ground surface (fbgs).
   j. TRX will submit an addendum document to the Phase A Report and Phase B Work Plan document to address some of NDEP draft comments.

5. Radionuclides – soil,
   a. The NDEP stated that TRX's Radium 226 (Ra-226) and Radium 228 (Ra-228) do not correspond with the BRC/TIMET background dataset; however, there appears to be a discrepancy in the BRC/TIMET background dataset. NDEP is researching for an explanation for this discrepancy including analysis preparation method.
   b. Alpha spectrometry (Alpha) vs. Gamma spectrometry (Gamma), TRX stated that NDEP agreed to Gamma with 10% Alpha for thorium and uranium species. Additionally, TRX stated that Alpha was not used for Ra-226 and Ra-228 soils analysis only Gamma. It was noted that this is a possible source of discrepancy in the data sets (TRX versus background). NDEP suggested that TRX perhaps back quantitate the radium data based on the alpha analyses and see if this provides better resolution.
   c. The NDEP pointed out that the Ra-226 and Ra-228 fail background comparisons but that the other radionuclides do not and that if the radionuclides are in secular equilibrium, then all or none of the radionuclides would fail.
   d. The NDEP suggested that TRX identify which samples are deep (i.e. Muddy Creek vs. Alluvium). If samples are identified as deep samples, then they should be removed from the current background analysis until comparable data has been collected. It was also noted that this does not address the issue of secular equilibrium.
   e. The NDEP suggested addressing the Gamma, deep samples and secular equilibrium issues to reconcile background.
6. Radionuclides – groundwater,
   a. TRX stated that they have proposed analysis for radionuclides in groundwater in the Phase B WP.

   b. TRX stated that they observed elevated uranium and thorium on the eastern portion of the site, which may be associated with TIMET.
   c. The NDEP noted that M29, located near Unit 6 in the southeast portion of the site, contained the highest uranium concentrations. NDEP noted that this was omitted from the report.
   d. The NDEP noted that M120, located on the southern portion of the site, contained elevated detections of several compounds that have not been observed at the other plant sites.
   e. The NDEP considers that an unexplained radionuclide source exists, which prompted comments for additional radionuclide sampling of soil.
7. Asbestos,
   a. NDEP will provide sample calculations for asbestos. **ACTION ITEM.**
   b. NDEP located the raw data for asbestos thereby addressing Draft Comment 90.b.
   c. NDEP stated that analytical sensitivity for asbestos can be reduced by collecting more samples and would hence reduce the calculated risk.
   d. NDEP stated that the upper confidence boundary on the counts should be used in the calculations and that the counts should be included on the summary table.
   e. TRX indicated that several asbestos detections had been reported for the Parcels A & B Phase II Investigation. The asbestos samples were still being analyzed.
   f. TRX indicated that asbestos sampling proposed in the Phase B WP should be expanded to include Evaluation Area (EA) 4 and EA10.
   g. TRX raised some ideas about alternate counting rules. NDEP noted that this has regional ramifications and needs discussion.
   h. NDEP and TRX agreed to have their consultants discuss technical issues on a separate call, if necessary.

NDEP and TRX stated that asbestos will probably be the driver in a risk assessment.

8. Risk Assessment and EAs,
   a. TRX stated that they met with the NDEP early prior to document submittal proposing the 11 EAs and that NDEP approved this approach. The NDEP stated that there is a difference between evaluation areas and an exposure area for risk assessment. The NDEP also stated that the NDEP approved this approach with the caveat that approval ultimately depended upon the submitted data. The NDEP was expecting relative homogeneity of the EAs.
   b. TRX stated that they are using a random exposure scenario for a receptor in each EA. NDEP stated that this was not consistent with other industrial scenarios and that there is potential for a receptor to be exposed to a smaller area.
   c. NDEP suggested TRX look at the data and determine if different EAs are warranted and that the goal for the delineation of EAs should be the largest exposure area that can be justified based on data and receptor exposure.
   d. TRX stated that the Beta Ditch was separated into a separate EA.
   e. NDEP noted that TRX does not know the future use of the entire site so that an unrestricted industrial exposure scenario is appropriate.
   f. NDEP noted that if the risk assessment is conducted prior to remediation, then hot spots will have to be separated into smaller exposure areas. Additionally, TRX could combine exposure areas after remediation (hence achieving homogeneity).
9. Analytical suites,

   a. NDEP stated that the full standard suite of metals (32 metals used in Phase A) should be used in the Phase B WP.
      i. Tungsten and titanium have potential source areas on-site.
      ii. Silver (and other metals) could be eliminated if TRX can demonstrate data adequacy on a source area basis.
   b. NDEP stated that TRX proposed reduction in analytes is based on the assumption that the source areas have been adequately characterized. The NDEP does not concur with this assumption at this time.
   c. TRX will propose a reduction in the 32 metals list **ACTION ITEM.**

10. Data validation and data usability (Draft Comments 48 – 52),
    a. NDEP understands that some of these comments may be addressed in the DVSR.
    b. NDEP stated that the text of the Phase A report indicates that data was excepted if most of the data "generally" had acceptable detection limits. This is not acceptable to the NDEP. Each data point should be evaluated for usability.
    c. TRX stated that they would not use any data identified as rejected in the DVSR.
    d. NDEP provided discussion and examples of how usability differs from validation.
    e. TRX stated that this will be explicitly addressed at the time of risk assessment.
11. Schedule, TRX will not proceed with Phase B WP but will continue to review the Draft Comments to see if "Phases" of characterization could be commenced (i.e. soil gas investigation).

DRAFT

November 9, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to: *Phase A Source Area Investigation Results, Tronox Facility, Henderson, Nevada*
Dated September 27, 2007

Dear Ms. Crowley,

The NDEP …TBD

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Stan Smith, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Attachment A

1. General comment, in order to facilitate a faster review to accommodate TRX's schedule, the NDEP only reviewed the Phase A Results portion of the Report as it supports Appendix I (Phase B Sampling and Analysis Plan). The following comments reflect this type of review.
2. General comment, the NDEP noted several sections of the Report that were repetitious:
    a. Section 6 and Appendix I: repetitious text and figures
    b. Section 5.3 and Appendices G and K: repetitious text
    c. Tables ES-1 and 5-35: duplicate tables
    d. Tables 5-29 and 5-30: repetitious data

   The NDEP did not review these sections for consistency only as each of these sections pertained to Appendix I.
3. General comment, due to the magnitude and complexity of the subject document, these comments should not be considered exhaustive.
4. General comment, it is noted that the Phase A Source Area Investigation and Phase B Work Plan are based on the premise that in the future the land will be used for industrial/commercial purposes. The text throughout uses the language that "deed restrictions may be used to ensure that Site use remains industrial/commercial." It appears to the NDEP the only way to assure the future use would be to place deed restrictions or institutional controls on the land sold.
5. General comment, for all references please use primary sources.
6. General comment, Sections in the Phase A Report and Phase B Work Plan are duplicative.
7. General comment, the Phase A Report and Phase B Work Plans are not well integrated with the CSM, refer to comments below.
8. General comment, the report focuses on assessing which site-related chemicals (SRCs) are adequately characterized and which are not. The focus should be on which sources are adequately characterized and which sources are not.
9. General comment, all known or potential source areas should have some level of characterization. There appear to be many known or potential source areas for which data points are not presented. It also appears that sample locations, while perhaps in the vicinity of a source, are not tied to specific source features. If historical data are being used to eliminate a known or potential source area from further investigation, then those data should be included in the Source Area Investigation report.
10. General comment, the NDEP understands that the goals of the Phase A Investigation were along the lines of collecting an initial round of characterization data to determine if chemicals or possibly EAs could be eliminated from the next round (Phase B) of sampling. Given the data, the latter does not appear possible, and is not proposed. However, the former is proposed not only for suites of chemicals, but also for individual chemicals from within suites. Given the general paucity of characterization data for a site that has 69 or more possible sources of release of contamination, the elimination of individual chemicals from suites does not seem reasonable; however, the elimination of some suites of chemicals, for which contamination was not expected based on the CSM, and nearly all the data are non-detects or background, may be reasonable.
11. General comment, the CSM has not played a strong enough role for site characterization decisions. It appears that one of the primary decision criteria is whether a sample result

exceeds a target threshold concentration. Consideration of key CSM components for each source/exposure area must be given when assessing data adequacy.

12. General comment, exposure areas are the decision unit for risk-based characterization and risk-based remedial action decisions. Exposure areas have not been specifically identified and do not appear to be considered in the site characterization decisions made in the report. It is not clear to the NDEP that "evaluation areas" are the same as "exposure areas". In addition, the risk assessments appear to be targeted at each EA. However, each EA is considerably larger than a typical industrial/commercial exposure unit, in which case performing a RA across an entire EA requires that the distribution of contaminants is statistically similar across the EA. If not, source areas potentially the size of an exposure unit can be missed, and essentially averaged away with uncontaminated areas. It is important to define exposure units as well as the EAs within which there are likely to be many possible exposure units. It is also important to tie the EAs and exposure units to the CSM, and hence to the spatial distribution of contamination that is expected to be found. If this is done, then the need to characterize all or most of the source areas might become more apparent.
13. General comment, the assessment of data adequacy and data gaps appears to be on a site-wide, chemical-by-chemical basis, when it should be on a source-by-source basis. If a particular sample point is relevant to more than one source, then it should be included in the dataset for each relevant source.
14. General comment, RAGS and the primary USEPA guidance for site characterization that is cited in RAGS (USEPA, 1988) provide specific guidance regarding characterization of sources and of overall nature and extent. These guidance documents identify the following data collection objectives for risk assessment: definition of source areas of contamination, the potential pathways of migration, and the potential receptors and associated exposure pathways to the extent necessary to (1) determine the potential risk to human health and the environment and (2) develop and evaluate remedial alternatives. It is not clear that the guidance has been appropriately applied and that the data collection objectives are consistent with the guidance.
15. General comment, regarding radionuclides, the NDEP has the following comments:
    a. It is not clear with the current data that characterization can be considered complete. In particular, the Radium-226 (Ra-226) site data appear to be elevated verus background, and the uranium (U) data seem to be greater than background as a metal, but less than background as isotopes. Some explanation is required
    b. Further research shows that the Ra-226 issue (also for Ra-228) is one of lack of comparability of the data. This is not noted in the data validation or data usability reports. The background Ra-226 data were collected using alpha-spectroscopy analysis, whereas gamma-spec was used for the site data. Gamma-spectroscopy is notoriously poor at measuring radium isotopes accurately. Since the Ra-226 data appear greater than background, it would seem that some further work is needed.
    c. Further research shows that the U issue might be more of an issue in the background dataset than in the site dataset. NDEP calculated uranium by mass from the isotopic data, and found a reasonable match for the TRONOX data, but not for the background data. The indication is that the background uranium metal data are problematic. This is a preliminary finding that requires further research into the methods used for the background data to try to understand the reason for the differences

16. General comment, NDEP noted that TRX uses 20ft as a depth for delineating differences in geology. Based on the CSM, the thickness of the alluvium is seen to differ across the site. Therefore the differences as a function of depth are not useful unless the differences in geology are taken into account. (e.g. page 5-26, second full paragraph).
17. Executive Summary and Section 1.0, pages ES-1 through 1-1, reference is made to "suspected source areas", but a comprehensive list of these areas was not found in the report. Samples were collected from "27 source areas" for the Phase A investigation. The report needs to be more explicit as to how these 27 areas were selected and whether there are other source areas that require characterization. The Phase A and Phase B "source" investigations need to focus on the source areas as the decision units, as these investigations are "source area" investigations.
18. Executive Summary and Section 1.0, pages ES-1 through 1-1, data evaluation areas are based on anticipated future uses (i.e., areas that may be leased or sold as separate parcels in the future). Data evaluation should be based on source characterization in conjunction with exposure areas (see further comments under Sections 5 and 6).
19. Executive Summary, Page ES-4, first full paragraph, first sentence, TRX states "As it is likely that future industrial/commercial development will occur at the Site, the Site has been subdivided into evaluation areas (EAs)." It is not clear how a future land-use scenario of industrial/commercial development necessitates the division of the Site into evaluation areas. Please explain how this is relevant to the Source Area Investigation.
20. Section 1.1, page 1-1, TRX states "The objective of the Phase A Source Area Investigation was to characterize the SRCs at 27 suspected source areas on Tronox property…The goal of the investigation was to develop data that can be used to refine the conceptual site model (CSM), to characterize site conditions, and to provide data for future risk assessments." Here the stated objective for the Phase A Source Area Investigation was to characterize SRCs on-Site, however, the goal for the investigation was to refine the CSM which includes off-Site receptors, but no data was collected for the potential off-Site receptor.
21. Section 2.4.3, page 2-3, 1st paragraph, next last sentence, it is noted that this discussion does not account for recharge due to infrastructure; i.e., leakage from water lines, sewer lines, ponds, etc.
22. Section 2.4.3, page 2-3, Alluvial Aquifer, 3rd and 4th paragraphs, it is noted that the discussion in these paragraphs appears to have little to do with the Tronox Facility.
23. Section 2.4.3, page 2-4, Muddy Creek Aquifer, 1st paragraph, TRX states "Most shallow wells drilled into the shallow Muddy Creek also demonstrate an upward hydraulic gradient (ENSR 2005)." Please clarify if this statement implies that the hydraulic head in the shallow TMCf is at a higher elevation than in the alluvial aquifer.
24. Section 3.3.4, page 3-4, TRX states that "one sample of manganese tailings was collected" but it appears that 27 samples were actually collected. The language describing the sampling of the tailings and ore piles needs to be clarified.
25. Section 3.3.5, page 3-5, bulleted soil analysis methods, please note that the NDEP previously commented (NDEP letter dated October 24, 2006, comment #21) on the proposed API methods; Tronox subsequently responded with revised methods for the specified analyses. It appears that Tronox defaulted to the API methods that were not approved by the NDEP. Because the analyses are completed NDEP requests that Tronox demonstrate the API methods are currently supported by a professional organization. Tronox is referred to Appendix A of the subject document, pages 37 of 73 and 41 of 73.

26. Section 3.10, page 3-12, second bullet, TRX states that M111 is not longer accessible for the collection of groundwater. Please discuss in the next Remedial Performance Report the schedule for the plugging and abandonment of well M111 and whether the well will be scheduled for replacement.
27. Section 4.0, page 4-1, general comments, the NDEP has the following comments:
    a. Data should be presented in association with the specific source. Detail for the sources (e.g., location of specific features relevant to sample locations) should be provided on the figures.
    b. Although this section is entitled "Findings", discussion of the results is very minimal and lacking for many groups of chemicals. Perhaps this is because the data evaluation criteria are presented in report sections that follow this section.
28. Section 5.0, page 5-1, 1st bullet, please explain how "rare" is defined. This comment also applies to Appendix I, Section 4.3, page 4-1, 3rd bullet.
29. Section 5.1, page 5-2, TRX states "Groundwater in the region is not used as a drinking water supply." This is a very broad and inaccurate statement depending upon how one defines "region." For example, the reviewer would consider the Las Vegas Valley as the region and the Site a local area. In addition, regardless of current use, all waters of the State are considered potential sources of drinking water.
30. Section 5.1, pages 5-2 and 5-3, because of the diversity of the site sources, it is inadequate to simply defer to a site-wide general CSM to support data adequacy decisions. Based on information provided in the report (and supporting documents), it appears that key CSM components (e.g., source type, source-related chemicals, release mechanisms, migration pathways from the source to exposure points, etc) are not similar for all sources.
31. Section 5.1.1, page 5-3, this section does not provide enough detail regarding site sources. Rather, it references the CSM report (ENSR, 2005), which describes site sources on the basis of eight "parameters": perchlorate, chlorate, TDS-conductivity, chromium, manganese, boron, hydrocarbons, and "miscellaneous" (a category for which "the specific chemical or chemicals of concern did not appear to be widespread"). Based on the critical importance of each and every source area to the site characterization, the following should be included in the report: (1) a detailed description of each source, including key CSM components for the source (2) the existing data associated with the source, and (3) decisions regarding whether the source is adequately characterized based on source-specific features, exposure points, and the data. Expansion of Table 1-1 to include migration pathways and evaluation area would be very helpful to this end.
32. Section 5.1.2, page 5-3, 2nd paragraph, TRX states "Vadose zone transport of SRCs within the vadose zone to groundwater requires a sufficiently large release, followed by the necessary gas chemical environment (so that not all of the release is attenuated) and sufficient infiltration to transport the chemical through the unsaturated zone to reach the groundwater." This statement is not very clear and does not necessarily accurately describe vadose zone transport. Later in the same paragraph various transport mechanisms are discussed that contradict this statement. Please clarify what is intended.
33. Section 5.1.2, page 5-3, 3rd and 4th paragraphs, wind blown dust is identified as a potential pathway and Figure 5-1 identifies off-Site residents as potential receptors. Section 5.1.3, page 5-4, 2nd paragraph identifies off-site receptors. Yet there is no discussion of predominant wind direction at the Site and there are no off-Site soil samples. This issue requires additional consideration.

34. Section 5.1.2, page 5-3, 2nd paragraph, last sentence, TRX states "As discussed in the CSM report, advective groundwater transport of SRCs in the alluvium takes place primarily within alluvial paleochannels incised within the Muddy Creek Formation." It is noted that this statement has nothing to do with vadose zone transport. Also, note that emphasis was added where the NDEP corrected the above statement.
35. Section 5.1.2, page 5-3, last paragraph on page, last sentence on page, it is noted that this description makes the discharge sound past tense and requires clarification.
36. Section 5.1.2, page 5-3 and 5-4, this section describes general transport pathways for chemicals in soil and groundwater at the site. What is lacking is source-specific information. For example, if a release occurred (or may have occurred) to surface soil from a drum, TRX needs to demonstrate that the associated soil samples placed at locations and depths are representative of the release, source-specific transport pathways, and human exposure points.
37. Section 5.1.3, page 5-4, TRX states that "construction/utility workers may be exposed to soils up to 15 ft bgs". All tables relating to direct contact reference soils 0 to 10 ft bgs. Please clarify this discrepancy. Additionally, please note that "up to 15 ft bgs" as an exposure depth is reference many times throughout the report. The NDEP will not restate this comment for each instance but TRX response should address all instances of this reference.
38. Section 5.1.3, page 5-4, 1st paragraph. "Portions of the Site may be leased or sold in the future, however, deed restrictions *will* be used to ensure that Site use remains industrial/commercial. Therefore, comparison levels for soil based on an industrial exposure scenario are appropriate for use here." It is noted that for the assumption in the second sentence to be true the first sentence must be worded as changed (emphasis added).
39. Section 5.1.3, page 5-4, 1st paragraph, TRX states that "Groundwater in the region is not used as a drinking water supply." Refer to comment above. This comment also applies to Section 5.7, page 5-34, 3rd paragraph of the section.
40. Section 5.1.3, page 5-4, 2nd paragraph, TRX states "Therefore, potential receptors include on-Site outdoor workers, on-Site indoor workers, on-Site construction workers, off-Site residents…" Section 1.0, page 1-1, 2nd paragraph. The Phase A Source Area Investigation includes a preliminary characterization of Site-related chemicals (SRCs) in both soil and groundwater and the development of geologic data along five, sub-parallel, east-west transects across the Site." As noted previously, the CSM includes off-Site residents; however, the Phase A Work Plan does not include samples to characterize wind-blown dust to areas off-Site.
41. Section 5.1.3, page 5-4, last paragraph, TRX states "Currently, there is no direct exposure to on-Site groundwater as it is not used as a source of drinking water." What about the exposure to on-site workers at the Interceptor Well Field; *e.g.*, inhalation and/or dermal contact during operation and maintenance?
    a. This comment also applies to Section 5.2.1.2, page 5-7, 2nd paragraph.
    b. This comment also applies to Section 5.7, page 5-34, 3rd paragraph of the section.
42. Section 5.1.4, page 5-4, evaluation areas (EAs) have been identified based on areas that may be leased or sold as separate parcels in the future. While that information may be of use to Tronox, NDEP expects that the HRA will evaluate data based on source areas and exposure areas. To optimize the use of the HRA results in remedial action planning, exposure areas should be based on the smallest areas that exceed de minimis risk that also meet land-use

specific exposure area criteria. Exposure areas should be considered as a key component in site investigation strategy.

43. Section 5.1.4, page 5-5, 4th paragraph last sentence, TRX states "Deed restrictions will be used, as necessary, to ensure that Site use remains industrial/commercial." Emphasis was added to denote the NDEP's suggested change for this sentence.
44. Section 5.2, pages 5-5 and 5-6, to reiterate, the comparison levels should represent only one line of evidence for data adequacy determination. Source-specific and exposure considerations previously noted by the reviewers should play a key role.
45. Section 5.2.1.1, page 5-6, please note that USEPA Region IX has generally required a 1 mg/kg cleanup level for PCBs.
46. Section 5.2.2.2, page 5-10, please note that the cited value for O_a from USEPA is incorrect. It appears that this may be a typographic error (0.12 versus 1.2). **Please verify if this error affects any conclusions within the report or work plan.**
47. Section 5.2.3, pages 5-10 and 5-11, Table 5-4, the text and table state that the comparison level for carcinogens that don't have MCLs is based on a risk of 1 x 10-6, but it appears that the values listed for those chemicals are one-tenth of the USEPA Target Groundwater Concentration listed in Table 2c of USEPA 2002. Accordingly, the values listed in Table 5-4 of the report (for these carcinogens) are based on a risk of 1 x 10-7.
48. Section 5.3, pages 5-11 and 5-12, the NDEP has the following comments:
    a. Part B of the USEPA data usability guidance (USEPA, 1992a) is not cited in the report. This volume should be used as the basis for evaluating radionuclide data usability.
    b. The report re-assigns criterion numbers (I through VI) that are inconsistent with USEPA guidance. For example, the second sentence of Appendix K states "Criterion III of the data usability evaluation process addresses whether the project analytical methods and detection limits are sufficient for the intended uses of the data" but USEPA Criterion IV is the evaluation step for analytical methods and detection limits. To be consistent with the guidance used and to minimize confusion, the data usability (DU) evaluation should follow the format of the USEPA guidance (USEPA, 1992b) and include the six DU criteria as defined in that guidance:
        Criterion I: Reports to Risk Assessor[1]
        Criterion II: Documentation
        Criterion III: Data Sources
        Criterion IV: Analytical Methods and Detection Limits
        Criterion V: Data Review
        Criterion VI: Data Quality Indicators
49. Section 5.3.4, page 5-15, reporting limits for all samples and for all source areas should not be evaluated as a group for which "generally" the detection limits are acceptable. For each case where a detection limit exceeds a relevant risk-based concentration (or best achievable analytical RL), an evaluation of that data point should be made and the data point should be designated as "usable" or "not usable".

text implies that not each data pt. reviewed & decided usability - b/c section needs to be altered

50. Section 5.3.5, page 5-16, the NDEP has the following comments:

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[1] All reports relied on should be identified as a component of Criterion I. The reviewers recognize that the primary report relied upon for the DU evaluation is the current report. However, this step should still be included to document that the minimum requirement for report components are met. Additional reports include the CSM and the Phase A Investigation Work Plan.

   a. This section of the report refers the reviewer to Appendix E and Appendix G. Appendix E is limited to a table which summarizes the NDEP certification status of laboratories used. This is not relevant to DU evaluation Criterion VI (Data Quality Indicators) for risk assessment. Appendix G, entitled "Data Validation Summary Report" was not included in Volume II of the hardcopy report[2]. Unless Appendix G includes an evaluation of the minimum criteria listed in USEPA DU guidance for Criterion VI this DU criterion has not been adequately addressed.

   Should have fixed on revised disk

   b. NDEP requires that the appropriate DQIs be identified for each data point. For each instance where laboratory QA/QC values (relevant to the DQIs) exceed laboratory control limits, the data should be identified as usable or not usable for risk-based site characterization.

51. Section 5.3.6.1, page 5-16, NDEP requires that each instance where laboratory quality control data were not met be identified and discussed as part of the DU evaluation. Each of these data points should be determined to be usable or not usable for risk-based site characterization.
52. Section 5.3.6.3, pages 5-16 and 5-17, Text in this section states "For the most part, the frequency of rejection was low…with the following exceptions." NDEP requires that each instance where data are flagged as rejected be identified and discussed. Each of these data points should be determined to be usable or unusable for risk-based site characterization.
53. Section 5.3.7, page 5-19, this section does not provide an adequate evaluation of the adequacy of the Phase A data for characterizing site sources.
54. Section 5.4, page 5-19, please note that a site-wide frequency of detection is of limited value for assessing data adequacy. This parameter tells us nothing about whether or not a source has been characterized adequately. Source-specific CSM components, sample locations relative to source features and exposure points, and sample results relative to risk benchmarks provide a better basis for decisions regarding site characterization and data gaps.
55. Section 5.5, page 5-22, the NDEP has the following comments:
    a. While comparison of source-specific data to background concentrations may support decisions regarding extent, this information must be used in conjunction with other information such as sample locations relative to source features and exposure points.
    b. Conclusions for this section are made on the basis of specific chemicals. Conclusions should be made on a source-by-source basis, since the objective of the investigation was to characterize sources.
56. Section 5.5.1, page 5-22, second bullet, TRX discusses "selected parameters" for comparison between the "Upgradient" and Phase A datasets. Justification should be provided for the selection of this subset of parameters.
57. Section 5.5.1, TRX states that the data presented in TRX's Upgradient Investigation Report (revised September 2007) was used for comparison of soil samples collected within the Muddy Creek Formation (MCF). To date, the NDEP has not approved this dataset or the conclusions presented in the Upgradient Investigation Report; therefore, the NDEP does not approve using the data for background comparison purposes at this time. Until the Upgradient Investigation Report has been approved by the NDEP, all data will have to be compared to other approved background datasets.

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[2] Note: the DVD included in the hardcopy report was not readable.

58. Section 5.5.2, page 5-23, the NDEP has the following comments:
    a. The NDEP believes that although many statistical tests are described here, the text does not provide adequate an adequate description of each test in terms of underlying concepts and what the tests and results mean.
    b. Third bullet, TRX states that the "non-parametric 95th percentile" was calculated for the BRC/COH dataset for use as a comparison level for "certain evaluations of the Phase A data". Clarification on how and for what evaluations this 95th percentile was used should be provided.
    c. Sixth bullet, please note that the correct way to denote the referenced software in regular text is GiSdT.
59. Section 5.5.2, page 5-24, the NDEP has the following comments:
    a. Second bullet, TRX does not reference t-test results. Please note that the t-test is very robust to deviations from assumptions, especially with the large sample sizes and could be run even when the data are found to not be normal.
    b. Third bullet, TRX should note that the Gehan test is not an approximation; it is a method for assigning ranks when there are non-detected data and may also be referred to as the Gehan modification to the Wilcoxon Rank Sum test. Additionally, please note that Gehan is spelled incorrectly as "Gehran" throughout the document.
    c. Fourth bullet, second dash, the inclusion of perchlorate data here is inconsistent with the chemicals listed in 5.5.1.
60. Section 5.5.3, page 5-24, third paragraph, the NDEP has the following comments:
    a. TRX should adjust the alpha level due to the usage of multiple uncorrelated tests with additional adjustment based on the large sample sizes.
    b. TRX should use spatial plots of the four high values that are referenced in this section.
61. Section 5.5.3.1, page 5-24, TRX states in the title of this section that Phase A soils from 0 – 15 fbgs were compared to background for use in the direct contact risk evaluation but then only uses 0 – 10 fbgs in the tables for direct contact comparison. TRX should clarify this discrepancy.
62. Section 5.5.3.1, page 5-25, chromium section, the NDEP has noted that the test results indicate that there is a distribution shift between the Site data and the background, which should be taken into account when formulating a strategy for dealing with this contamination. However, it appears that only the tail of the distribution is being taken into account.
63. Section 5.5.3.2, page 5-25, the NDEP has the following comments:
    a. TRX should provide additional explanation and/or clarification in this section. For example, TRX referenced metals using three different terms: metals, inorganics, and parameters.
    b. TRX included Ra-226 in the list on inorganics that "may be elevated relative to the background dataset". TRX should provide an explanation for the inclusion of Ra-226 on this list.
64. Section 5.5.3.3, page 5-26, third full paragraph, the NDEP does not fully follow TRX's reasoning in this paragraph. The main purpose of investigating the soil to groundwater pathway is to determine the total mass of contamination that has the potential to leach to groundwater. Therefore it is plausible that the elevated measure of central tendency might represent a larger mass of contamination to be leached than the existence of several high values or hotspots.

65. Section 5.6, pages 5-26 and 5-27, conclusions for this section are made on the basis of specific chemicals. Conclusions should be made on a source-by-source basis, since the objective of the investigation was to characterize sources. Analysis of soil characterization results by evaluation area (EA) is also inadequate, since EAs are based on areas that may be leased or sold as separate parcels in the future and not based on sources and/or specific exposure areas (e.g., 0.5 acre for worker receptors).
66. Section 5.6.3, page 5-28, the NDEP has the following comments:
    a. Arsenic bullet, the NDEP does not agree with TRX's summary of arsenic and conclusion presented in this section and does not believe the summary and conclusion are acceptable based on the data. Specifically, TRX should state how all samples are greater than the direct contact comparison level yet only 4 samples were determined to exceed background. TRX should provide appropriate justification for this type of conclusion.
    b. Hexavalent chromium bullet, it should be stated why background comparisons cannot be made.
67. Section 5.6.4, page 5-28, TRX should state the frequency of detection in terms of a percentage.
68. Section 5.6.12, page 5-31, the NDEP has the following comments:
    a. TRX states that "An evaluation of the results for the direct contact pathway only has been conducted by evaluation area (EA)." However, these results should be assessed based on the characterization of the source area(s) in the context of the conceptual model. In the absence of this type of an approach, some of the source areas may be adequately characterized.
    b. General comment, each of the EAs proposed by TRX should be evaluated in the context of a risk assessment. As such, things like data adequacy need to be addressed before any of the other results can be considered.
    c. TRX's current approach also presumes that all of the potential sources have been adequately characterized, which is questioned by the NDEP.
69. Section 5.7, pages 5-34 and 5-35, as a component of the data usability evaluation, the comparability and representativeness of the two rounds of groundwater data, for all analytical suites, should be evaluated. If it cannot be documented that the November/December 2006 data and the May 2007 data together represent temporal and spatial variation for the analytical suites, then further characterization of groundwater is likely needed.
70. Section 5.8, page 5-41, the NDEP has the following comments:
    a. Conclusions for this section are made on the basis of specific chemicals. Conclusions should be made on a source-by-source basis, since the objective of the investigation was to characterize sources.
    b. Specific chemicals are identified for "further characterization" but the locations of the data gaps for leaching assessment are not identified. The results of the data analysis conducted in this section should be presented such that source areas with and without data gaps are specifically identified.
71. Section 5.8.1, page 5-41, second bullet, TRX uses of the word "significantly" in the first sentence of this bullet. In general, when discussing the relative value with respect to a threshold, the concept of "significantly above a threshold" should be reserved for statistical calculations to avoid confusion.
72. Section 5.8.1, the term "MBAS" not defined in document. Please define.

73. Section 5.8.7, page 5-43, TRX does not provide sufficient justification for the lack of further characterization for phase B.
74. Section 5.10, page 5-46, TRX should provide a more comprehensive evaluation of historical data. Even if not validated, the historical data can provide critical information to guide future sampling and analysis.
75. Section 5-11, page 5-46, the NDEP believes that the current state of the Phase A investigation is such that source areas are potentially inadequately characterized; therefore, TRX should present a risk-based approach that focuses on specific exposure areas with homogeneous conditions.
76. Section 5.9, page 5-45, the NDEP notes that soil gas characterization should include the full suite of VOCs (e.g., USEPA Method 8260B or USEPA Method TO-15).
77. Section 5.10, page 5-46, 1st paragraph, TRX states "The selection of the sample locations for the Phase A investigation were based on areas that were potentially impacted or identified as being impacted by constituents associated with past activities on the Tronox property including the 69 LOUs identified on the Site." Additionally, Section 5.11, page 5-46, 2nd paragraph, TRX states "Because the Phase A sampling program was a comprehensive investigation targeted at the source areas at the Site, it is concluded that the SRCs never detected in soil or groundwater are considered adequately characterized, and further sampling for these SRCs in Phase B is not necessary." The NDEP has noted that the Phases A and B investigations appear to leave fairly large areas of the Site with no soil samples. Also, although the CSM discusses the wind-blown dust pathway, this pathway does not appear to have been considered in the sample locations either on- or off-Site.
78. Section 5.10, page 5-46, this section (and corresponding sub-sections) do not address the site sources adequately and it appears that specific site sources are not assessed in the data gap analysis process. In particular, the NDEP did not find characterization adequacy evaluations for sources that were not included in the Phase A investigation.
79. Section 6.1, page 6-2, the objective of Phase B of the source area investigation should be to fill data gaps for sources that have not been fully characterized. This objective is not identified in the report. The objective stated in this section is "to characterize the general extent of SRCs present in environmental media at concentrations above the conservative comparison levels". Characterization of extent cannot be accomplished without adequate characterization of the specific sources.
80. Section 6.1, page 6.2, 1st paragraph, TRX states "The objective of Phase B of the source area investigation is to collect sufficient data to conduct risk assessments for the Site, and to characterize the general extent of SRCs present in environmental media at concentrations above the conservative comparison levels. The risk assessments will be used as the basis for decision-making for the Site." The CSM as developed in Section 5.1 includes potential off-Site receptors; however, the discussion here appears to exclude this potential receptor.
81. Section 6.1, page 6-2, 2nd paragraph. "…deed restrictions *will* be used to ensure that Site use remains industrial/commercial." Emphasis was added to denote the NDEP's suggested change for this sentence.
82. Section 6.2, page 6-2, documentation has not been adequately provided that all sources have been adequately characterized such that additional site investigation for soil can be limited to a "short list" of SRCs.
83. Section 6.3, pages 6-4 and 6-5, this section states that the evaluation of the EAs will be risk-based. The EAs are not based on sources, but on areas that may be leased or sold as separate

parcels in the future. Risk-based evaluation cannot be accomplished without adequate characterization of all source areas and defensible demarcation of exposure areas.

84. Section 6.5, page 6-6, the NDEP has the following comments:
    a. It appears that many of the sources that were not characterized in the Phase A investigation have also been excluded in the Phase B investigation.
    b. The Phase B investigation should target full suites. For example, cumulative risk or hazard index is assessed for a specific exposure area that also must consider source location. If Phase B sample locations are not co-located (within the same exposure area) with the Phase A samples, it will be difficult to support the combining of partial analytical suites from different investigations. This is also true for VOCs, which additionally must address breakdown products within exposure areas.
85. Section 7.0, References. Several of the references appear incomplete, for example:
    a. Page 7-3, 3rd NDEP reference,
    b. Page 7-4, 7th USEPA reference, and
    c. Page 7-4, last USEPA reference on page.
    d. Please delete "Data Visibility" from the USEPA, 1992a citation.
    e. Please replace "Data Visibility" with "Data Usability" for the USEPA 1992b citation.
86. Figures the NDEP has the following comments:
    a. Figure 5-1, the primary sources, their locations, and release mechanisms are not adequately characterized.
    b. Figure 5-3, there is no "comparison level" presented on this Figure. Appropriate "comparison levels" should be presented on all figures. This is a global comment which applies to all Figures, Plates and future Deliverables.
    c. Figure 5-5, TRX states that MCF value is the 95th percentile of the "background dataset". According to the text, the "background" data used for the MCF came from the Upgradient Investigation Report. The NDEP has not approved the Upgradient Investigation Report; therefore, the data collected for this report has not been approved to date and should not be used for comparison purposes at this time.
    d. Figure 5-6, same as comment for Figure 5-5.
    e. Figure 6-1; this figure indicates that groundwater impacts at Las Vegas Wash are minimal. This may be true when compared to upgradient concentrations but perchlorate, for example, is above an applicable comparison level.
    f. Figures 6-7 through 6-26, These figures and their titles (e.g. "Proposed Phase B Sample Locations and Potential Arsenic Source Areas") imply that Tronox is identifying source areas based on the Phase A analytical data, rather than based on historic information regarding actual source locations and features.
87. Tables, the NDEP has the following comments:
    a. General comment, TRX did not provide a table for the comparison of the Phase A data to background.
    b. Table 1-1, the NDEP has the following comments:
        i. Please expand and resubmit this table to include applicable sampling locations (historic and future), applicable evaluation area, and migration pathway.
        ii. Regarding the chemical suites listed across the top of the page, please explain if these are the suites of interest of suites that have been sampled for.

   c. Table 5-10, the NDEP has the following comments:
      i. The NDEP requests that future tables similar to Table 5-10 be separated into smaller tables that correspond to the subsections in the Results of Statistical Evaluations section (Section 5.5.3.).
      ii. The Gehan test should have been used instead of running the WRS test because the Gehan tests defaults to the WRS when the FOD is 100%.
      iii. The NDEP found TRX's presentation of the results for the statistical comparison tests fairly convoluted. The WRS test was performed two-sided and typically these types of distribution comparison tests are performed as a one-sided test with the alternative hypothesis being that site is greater than background. Conceptually this is the only formulation of the alternative hypothesis that makes sense. Consequently, the results that are presented for the "WRS A>bkgd" are derived from an incorrect formulation of the hypotheses. For example, when chromium is considered, all of the Slippage, and Quantile tests indicate that the various aspects of the site distribution are elevated relative to background; however, the "WRS A>bkgd" test result indicates (according to the wording in the foot note of table 5-10) that "there the probability that the Phase A dataset is greater than the reference dataset is 0.679." This is a consequence of an illogical formulation of the alterative hypotheses. (In addition, this is an incorrect interpretation of the meaning of the p-value.) The interpretation of the test result for the WRS is for differences with respect to the median, not the dataset itself, as implied by the footnote in table 5-10. The NDEP suggests that future plans for statistical analyses be informally submitted to the Division for review before moving forward with any subsequent statistical analyses.
      iv. General comment, the t-test is relatively robust with respect to deviations from normality. This is especially true will large sample size as is the case here. In addition, tests for normality can be somewhat unreliable and the results of the t-test are useful to some extent even for non-normal data.
      v. Table 5-10, please explain the motivation for the application of the quantile test at 0.5. Specifically, how might this provide addition information relative to the WRS.
   d. Table 5-16 is cut off on the end of the page.
   e. Table 5-15, this table should contain the background value used by TRX for comparison purposes.
   f. Tables 5-18 through 5-28, NDEP has the following comments:
      i. These tables should contain column with background comparison level.
      ii. Please compare direct contact depth range for consistency with text.
   g. Table 5-24, AS9-10, TRX lists the concentration of benzo(a)pyrene at $4.50(10^{-2})$ mg/kg. The comparison level for benzo(a)pyrene is listed as $2.11(10^{-2})$ mg/kg. TRX indicates that this concentration is not consistent with background concentrations but does not recommend additional characterization, which is contrary to procedures stated within the text of the report. Please clarify this discrepancy.

88. Appendix H, the NDEP has the following comments:
   a. General comment, the histograms should be presented will all the tail data in separate bars. Instead, for a number of histograms there is a significant portion of the tail of

the distribution that is presented in a single bar. One of the drawbacks of this type of presentation is a loss of information regarding the tail of the distribution. Additionally, for the discrepancies that exist between datasets, these histograms fail to provide an adequate depiction of the distribution of the dataset with the smaller sample size. Side-by-side box plots of the paired datasets may be a more useful presentation of these datasets.

  b. General comment, it would be helpful if there was an index for the reviewer to be able to locate plots within this Appendix.
  c. Page 5 of 57, arsenic appears elevated relative to background concentrations for soils in the alluvium. Please note that the NDEP has not listed every instance where Site concentrations appear elevated versus background or upgradient conditions.
  d. Page 6 of 57, arsenic appears elevated relative to the TRX Upgradient Study.
  e. Pages 11 and 12 of 57, boron appears elevated relative to background and upgradient conditions.
  f. Page 32 of 57, Ra-226 data appears elevated versus background. It is noted, however, that the data presented has not been broken apart by depth. See also comments above regarding possible analytical issues.
  g. Pages 45 and 46 of 57, uranium (as a metal) appears elevated relative to background and upgradient conditions. See also comments above regarding possible analytical issues.
  h. Pages 47, 48 and 49 of 57, isotropic uranium was not presented by depth interval, this requires additional investigation. See also comments above regarding possible analytical issues.

89. Appendix I, NDEP has the following comments:
  a. Section 2.0, page 2-1, the NDEP has the following comments:
    i. TRX states that Table I2-1 shows planned use for the Evaluation Areas (EAs). Table I2-1 does not state planned use. Please correct this discrepancy.
    ii. Text of Section 2.0 of Appendix I is not consistent with Section 5.1.3 for the expected exposure depth for direct contact for a construction worker. Please correct this discrepancy.
    iii. Section 2.0, page 2-1, two potential receptors are identified and neither receptor is expected to have contact with groundwater. Refer to comment above.
  b. Section 2.1, page 2-2, NDEP has noted that TRX is suggesting duplicitous effort for direct contact characterization between the Phase B SAP and "Phase II" SAPs for Parcels B, C, D, F, and G.
  c. Section 2.1, page 2-2, Figure I2-2, examination of Figure I2-2 and Plate 1-1 shows that, for example, there are portions of exposure areas EA-1, EA-3, and EA-4 that only have one sample each. Portions of EA-3 and apparently all of EA-4 are shown on Plate 1-1 as potential source areas that are less defined.
  d. Section 2.3.1, page 2-3, 1st bullet, please explain how the "unaffected" areas will be identified.
  e. Section 2.3.1, page 2-4, Step 2, the NDEP believes that it will require more than TDS and uranium data to identify background groundwater quality in wells. Also, any approval of this work plan does not imply approval of the well locations on Figure I2-4 as background groundwater quality.

f. Section 2.3.1, page 2-4, Step 2, Table I2-5, determination of background groundwater quality will likely require a complete analysis of general inorganic chemistry. Thus, magnesium and potassium should be added to the metals. Please clarify that alkalinity will be reported as bicarbonate, carbonate, and hydroxide separately.
g. Section 2.3.1, page 2-4, Step 3, Tronox must submit a list of the wells identified in this step to the NDEP for approval as use a background groundwater monitoring wells. In addition, information must be provided regarding existing chemical data for these wells. See also comments below regarding Table I2-4 and Figure I2-4.
h. Section 2.4, page 2-5, regarding the depth of soil gas samples, it is requested that TRX collect soil gas samples at a depth equal to the bottom of the basement of the buildings for samples SG36-20; SG37-20; SG38-20 and SG41-20.
i. Section 3.0, general comment, it is the belief of the NDEP that Section 3.0 is unnecessary as this Section should default to the project SOPs and QAPP. If there are deviations proposed these should be made explicitly clear. In addition, deviations would necessitate changes to existing SOPs and the QAPP.
j. Section 3.4, page 3-4, the reference to Appendix B should be changed to Table I2-8.
k. Section 3.8.1.4, page 3-6, TRX states "Equipment rinsate blanks will be collected each day from water used as the final rinse of decontaminated sampling equipment." This sentence is under the heading of "Field Blank Samples" and should be corrected.
l. Tables, the NDEP has the following comments:
    i. Table I2-2, Figure I2-2 and Figure I2-3, the NDEP has the following comments:
        1. Please note that NDEP's requests for additional sampling are based upon the following: TRX Phase A soil analytical data; TRX Phase A groundwater analytical data; data from adjacent properties; historic (soil and groundwater) data from the TRX Site; the TRX CSM and professional judgment.
        2. Regarding the analytical suite for metals, it is necessary to complete analyses for the full, standard suite of metals. NDEP does not concur with the use of a limited suite of metals as discussed previously with TRX.
        3. Regarding the analytical suite known as radionuclides, please note that the NDEP has not been able to determine whether or not additional analysis is necessary. Elevated concentrations of radionuclides in groundwater have not been explained and the source has not been identified. TRX should consider this matter during the implementation of the SAP.
        4. Regarding the suite identified as "wet chemistry" the same analyses as proposed on Table I2-3 (as modified by the NDEP's comments below).
        5. Regarding the chemical suites identified as perchlorate, metals, and wet chemistry: the NDEP requests that these analyses be completed at all locations and all depths. This request is based upon the following:
            a. The prevalence of these compounds throughout the TRX Site and the BMI Complex as a whole.
            b. The prevalence of these compounds in groundwater beneath the Site.
            c. The lack of characterization data for a number of sources at the TRX Site.
        6. Regarding dioxin and furan analyses, TRX has proposed to not collect any additional samples for dioxin and furan analysis. Based upon the reasons

cited above as well as two co-located, elevated detections of dioxins/furans at locations SA15 and SA16 additional analysis is requested as follows: please collect samples for dioxin/furan analysis at the following locations: SA58, SA60, SA63, SA64, SA65, SA70, SA72, SA73, and SA86. These samples should be collected and analyzed in a manner consistent with the Phase A data.

7. Regarding SVOC and PAH analyses, the NDEP has the following comments:
    a. TRX has proposed to not collect any additional samples for SVOC and PAH analysis. Based upon the reasons cited above as well as elevated detections of SVOC and PAH at locations SA11 and SA15 additional analysis is requested as follows: please collect samples for SVOC and PAH analysis at the following locations: SA43, SA44, SA45, SA50, SA53, SA58, SA60, SA64, SA65, SA70, SA101 and SA102.
    b. The depths of analysis should be in the surface/near-surface (to be consistent with the remainder of the scope of work) and at the 10' below ground surface (bgs) depth interval.
    c. It appears that this analysis is being driven by hexachlorobenzene.
    d. To address these classes of compounds please conduct either EPA 8270 (SIM) or EPA method 8081A analysis whichever affords the lower detection limit.
8. Regarding hexavalent chromium analyses, the NDEP has the following comments:
    a. Please add hexavalent chromium analysis at the following locations: SA30, SA32, SA36, SA37, SA43, SA44, SA45, SA50, SA51, SA53, SA58, SA60, SA62, SA63, SA64, SA65, SA70, SA71, SA72, SA73, SA74, SA79, SA80, SA81, SA84, SA94, SA103, and SA109.
    b. In addition, please add sample locations in the vicinity of location SA25 (unless this is addressed by the existing Phase II scope of work); north of locations SA04, SA05, and SA06; and west of location SA04.
    c. The depths of analysis should be in the surface/near-surface (to be consistent with the remainder of the scope of work) and at the 10' below ground surface (bgs) depth interval.
9. Regarding VOCs the NDEP has the following comments:
    a. Please add VOC analysis at the following locations: SA28, SA30, SA39 through SA51, SA53 through SA58, SA60, SA63 through SA70, SA72, SA73, SA78, SA85, SA86, SA95, SA112, SA113, SA114, and SA115.
    b. In addition, please add sample locations in the vicinity of locations: SA02, SA05, SA18, SA21, SA25 and SA27 (unless this is addressed by the existing Phase II scope of works).
    c. The depths of analysis should be in the surface/near-surface (to be consistent with the remainder of the scope of work) and at the 10' below ground surface (bgs) depth interval.
10. Regarding organochlorine pesticides (OCPs) the NDEP has the following comments:

        a. Please add OCP analysis at the following locations: SA 46, SA48, SA49, SA55, SA56, SA57, SA66, SA67, SA68, SA69, SA78, SA85, and SA95.
        b. In addition, please add sample locations in the vicinity of location SA25 (unless this is addressed by the existing Phase II scope of work); and in the vicinity of locations SA18 and SA21.
        c. The depths of analysis should be in the surface/near-surface (to be consistent with the remainder of the scope of work) and at the 10' below ground surface (bgs) depth interval.
    11. Regarding asbestos the NDEP has the following comments:
        a. Please add asbestos analysis in the following locations: SA29, SA30, SA32, SA34, SA36, SA37, SA38, SA39, SA44, SA45, SA48 through SA57, SA60, SA64 through SA70, SA72, SA73, SA74, SA77, SA80, SA81, SA84, SA85, SA86, SA95, SA96, SA103, SA104, SA105, SA106, and SA110.
        b. In addition, please add sample locations in the vicinity of location SA18.

ii. Table I2-3, the NDEP has the following comments:
    1. Please note that NDEP's requests for additional sampling are based upon the following: TRX Phase A soil analytical data; TRX Phase A groundwater analytical data; data from adjacent properties; historic (soil and groundwater) data from the TRX Site; the TRX CSM and professional judgment.
    2. Regarding the suite identified as metals, it is necessary to complete analyses for the full, standard suite of metals. NDEP does not concur with the use of a limited suite of metals as discussed previously with TRX.
    3. Regarding the analytical suite known as radionuclides, please note that the NDEP has not been able to determine whether or not additional analysis is necessary. Elevated concentrations of radionuclides in groundwater have not been explained and the source has not been identified. TRX should consider this matter during the implementation of the SAP.
    4. Regarding the chemical suites identified as perchlorate, metals and wet chemistry: the NDEP requests that these analyses be completed at all locations and all depths. This request is based upon the following:
        a. The prevalence of these compounds throughout the TRX Site and the BMI Complex as a whole.
        b. The prevalence of these compounds in groundwater beneath the Site.
        c. The lack of characterization data for a number of sources at the TRX Site.
    5. Please delete BTEX analysis and complete full suite VOC analysis wherever BTEX analysis is proposed. For example, locations SA40, SA41, SA42, SA43, SA44, SA46 and SA47. VOC analysis should be completed for all depths at these locations.
    6. Please delete hexachlorobenzene analysis and cover this chemical via the suite labled as "PAHs (EPA 8270 (SIM))" or "OCPs (8081A)" whichever affords the lower detection limit. For example, locations SA54, SA64,

SA69, and SA86. Analysis should be completed at all depths for these locations.

7. Regarding PAHs, please note the following:
    a. The method proposed is actually SVOC (SIM) analysis. It is expected that the full, standard suite of SVOCs will be analyzed.
    b. Please add PAH analysis at the following locations (all depths): SA40, SA41, SA42, SA43, SA44, SA45, SA46, SA47, SA50, SA53, SA54, SA58, SA60, SA64, SA65, SA69, SA70, and SA86.
8. Regarding VOCs, please complete VOC analysis at all sub-surface depth intervals at the following locations: SA29, SA33, SA35, SA36, SA37, SA38, SA40, SA41, SA42, SA43, SA44, SA46, SA47, SA52, SA54; SA58 through SA78; and SA86.
9. Regarding "Wet Chemistry", please add potassium to the analyte list.
10. Regarding "OCPs", please complete OCP analysis at the following locations (all depths): SA29, SA30; SA39 through SA45; SA48, SA49, SA50, SA51, SA53, SA54, SA55, SA58, SA60, SA62, SA63, SA64, SA65, SA66; SA69 through SA78; SA82,SA85 and SA86.

iii. Table I2-4, the NDEP has the following comments:
1. TRX needs to determine the screened intervals for wells that are proposed to be sampled.
2. Many of these wells are located in areas of known impacts, it is noted that these wells will not be useful for the purposes of establishing groundwater quality.

iv. Table I2-5, the NDEP has the following comments:
1. Please add Thorium232 analysis for the radionuclides.
2. Please add magnesium and potassium to "wet chemistry" analysis.

v. Table I2-6, the NDEP has the following comments:
1. Please complete perchlorate; hexavalent chromium; and wet chemistry analyses in all wells. As discussed, it is noted that some of these wells may be addressed by a quarterly sampling event conducted by TRX. If so, NDEP advises TRX not to duplicate efforts.
2. Please complete metals analysis in all wells. Please insure that the full, standard suite of metals is conducted, consistent with NDEP comments above.
3. Please add VOC analysis in the following wells: CLD1R; CLU1; H11; H48; H49A; M29; M39; M48; M52; M84; M88; M95; M103; M126; MC3; MC45; MC53; MC62; MC65; MC66; MW6R; PC21A; and PC40.
4. Please add the following to "wet chemistry" analysis: potassium and alkalinity (total, bicarbonate and carbonate).
5. Regarding radionuclides the NDEP has the following comments:
    a. Please add radionuclide analyses in the following wells: CLD1R; CLD2R; CLU1; H38; H48; H49A; M02A; M07B; M13; M17A; M19; M21; M23; M25; M31A; M38; M39; M44; M48; M61; M64; M67; M68; M75; M76; M77; M78; M79; M83; M84; M88; M92; M93; M94; M95 through M102; M110; M111R; M117; M118; M122 through M124; M126; M127; M128; MC3; MC32; MC53; MC55; MC59;

MC62; MC65; MC66; MW6R; PC21A; PC33; PC34; PC37; PC40; PC54; PC64; and PC72.

6. Regarding OCPs, please add analyses at the following locations: CLD1R through CLD4R; H11; H48; H49A; M05A; M07B; M23; M44; M48; M92 through M96; M98 through M102; M124; M126; M128; MC3; MC32; MC45; MC53; MC55; MC59; MC62; MC65; MC66; MW6R; PC21A; PC33; PC34; PC37; PC40; PC54; PC64; and PC72.

vi. Table I2-8, please note that the analyte list must include the full TO-15 list of compounds.

vii. Table I3-1, it is the assumption of the NDEP that this Table is consistent with the approved project QAPP. Please confirm this.

m. Figures, the NDEP has the following comments:

i. Figure I2-4, none of the wells that are proposed for analysis are truly upgradient of the Site. These wells may not be useful for establishing background groundwater conditions.

n. Plates, the NDEP acknowledges that TRX submitted a revised Plate I-1 on November 7, 2007.

o. Appendix to Appendix I, the NDEP has the following comments:

i. TRX should not generate an Appendix to an Appendix. This should be an Attachment to an Appendix.

ii. NDEP assumes that these field forms are consistent with the approved SOPs. Please clarify if there are deviations.

~~90.~~ Appendix J, the NDEP has the following comments:

a. It appears that there are errors in the calculations contained in this Appendix. Additional details are provided below.

found

b. ~~The raw data are~~ not presented. The raw data are the counts of asbestos fibers, not the ~~analytical sen~~sitivities. Please provide this information in future calculations.

c. The analytical sensitivities have been used directly as concentrations (multiplied by the number of fibers detected). It is not clear what the UCLs on the lab reports represent. It is also not clear that the UCLs have been used (it appears as though they have not been used). The raw data are counts that are assumed to follow a Poisson distribution. The UCLs should be calculated based on the counts, and should be used in the risk assessment. This does not appear to have been done.

d. Analytical sensitivity has not been aggregated across samples (within an EA, since an EA is the decision unit for the risk assessment as presented). Analytical sensitivity is, essentially, a measure of variance, and should be pooled across samples that are used in the same risk assessment.

e. On performing the asbestos risk assessment for EA7, we find that the risks presented in the report underestimate the actual risk by more than one order of magnitude. Examples calculations are attached.

f. Section 1.1, first paragraph, the text states that all the information from the lab reports are presented in Table J-1 – this is not the case. The most important data, the raw counts of asbestos fibers, are not included.

g. Section 1.1, first paragraph, last 2 sentences, these sentences are incorrect. Non-detects are reported as zero fibers found. The analytical sensitivity is irrelevant to this statement. Also, a non-detect does not indicate that asbestos is not a problem in these Evaluation Areas as stated. In fact, this statement makes no sense given that the detections of asbestos fibers across the site, and given knowledge that most sites in the BMI Complex have asbestos detections. The analytical sensitivity is not low enough to show risk below 10-6, meaning that not enough data have been collected to prove such a low risk, or the risk simply is not that low. Because of the nature and distribution of asbestos at the site, it is important that UCLs of the counts are used as inputs to the asbestos risk assessments RME endpoint.

- h. Also, there is a recording error in the lab reports between samples SA-23 and SA-24.
- i. Table J-6, footnote "a" references Table 8-2, more information needs to be given as to the location of this table.
- j. Due to the errors listed above it may be necessary to collect additional asbestos data in the future. As noted above, the NDEP has requested additional asbestos sampling in the areas where impacts are known. TRX can revise these calculations and discuss this issue with the NDEP while the Phase B work is being implemented or this can be addressed during the development of the Phase B Report. NDEP suggests the former be explored by TRX.

91. Appendix M, Table M-1, the Standard Methods checks on the inorganic groundwater chemistry were properly implemented.
92. Addendum, TRX submitted revised Plate I-2 (Sample Locations and LOUs) and revised Table I-1 on November 6, 2007. The NDEP has the following comments:
    - a. TRX should note that the NDEP did not review revised Table I-1 in comparison to other proposed sampling tables (Tables I2-2, I2-3). The analyses proposed on revised Table I-1 should be superseded by the Tables I2-2 and I2-3 as modified by the above comments.
    - b. TRX has proposed additional borings based on Table I-1. TRX should add the following analyses at each of the following locations:
        - i. SA120: asbestos
        - ii. SA121: asbestos
        - iii. SA122: none
        - iv. SA123: asbestos
        - v. SA124: VOCs, asbestos
        - vi. SA125: VOCs, asbestos
        - vii. SA126: wet chemistry
        - viii. SA127: asbestos
        - ix. SA128: hexavalent chromium, SVOCs and PAHs
        - x. SA129: hexavalent chromium, SVOCs and PAHs
        - xi. SA130: hexavalent chromium, SVOCs and PAHs
        - xii. SA131: hexavalent chromium, SVOCs and PAHs
        - xiii. SA132: wet chemistry, asbestos
        - xiv. SA133: perchlorate, asbestos
        - xv. SA134: wet chemistry, OCPs, asbestos
        - xvi. SA135: perchlorate, asbestos
        - xvii. SA136: asbestos
        - xviii. SA137: wet chemistry
        - xix. SA138: metals, hexavalent chromium, wet chemistry, asbestos

c. TRX identified Phase A and Phase B boring locations as being associated with particular LOUs. The NDEP has the following comments:
    i. As noted above, the basis for the selection of these particular locations is not clear and additional documentation to tie these locations to the CSM may address the NDEP's concerns. *Examples* are provided below and this should not be considered a comprehensive list.
    ii. LOU2, additional borings may be required to fully characterize this source area.
    iii. LOU4, SA29 should be identified as a potential step-out sample to the south.
    iv. LOU16 & LOU17, additional samples (at least one boring in each former pond area) may be required to fully characterize these source areas.
    v. LOU19, SA72 is located in LOU31 and not adjacent to AP-5 as stated in comments column.
    vi. LOU37, SA08 does not seem to be located close enough to be considered as characterizing this source area.
    vii. LOU39, SA101 does not seem to be located close enough to be considered as characterizing this source area.
    viii. LOU44, additional borings may be required to fully characterize this source area.
    ix. LOU49, SA136 is located between the two areas identified as LOU 48 and is not within or adjacent to LOU49. Additional borings may be required to fully characterize this source area.
    x. LOU50, SA136 is located between the two areas identified as LOU 48 and is not within or adjacent to LOU50. Additional borings may be required to fully characterize this source area.

d. In the Evaluation of Historical Investigations column in Table I-1 for LOU44, M29 is identified as "inaccessible for safety reasons and will not be sampled in the future". TRX should provide a schedule for plugging and abandonment and propose a replacement well for this area.

REFERENCES CITED:

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Emergency and Remedial Response, October. http://www.epa.gov/superfund/resources/remedy/pdf/540g-89004-s.pdf

USEPA, 1992a. Guidance for Data Usability in Risk Assessment (Part B), Final. Office of Emergency and Remedial Response, May. http://www.epa.gov/oswer/riskassessment/datause/partb.htm

USEPA, 1992b. Guidance for Data Usability in Risk Assessment (Part A), Final. Office of Emergency and Remedial Response, April. http://www.epa.gov/oswer/riskassessment/datause/parta.htm

Shannon Harbour

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Thursday, November 08, 2007 7:50 AM
To: Shannon Harbour; Brian Rakvica
Cc: susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox Parcels A/B Data
Attachments: Tronox_ParcelsA-B_DataSummary-Industrial.xls

Shannon/Brian:

In preparation for our meeting tomorrow morning (after your 8:30 AM Tronox meeting), to discuss the data for the Parcels A/B sampling, I am enclosing the data summary thus far. Asbestos data are still trickling in and I will bring with me the latest compilation of that data through the end of today.

See you tomorrow.

Thanks

Ranajit

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 1 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
Dioxins/Furans	TCDD TEF[e]	pg/g	32	32	100%	0.73	472	–	–	1,000	0	–	–	TSB-BJ-05-0
Asbestos[f]	Chrysotile	Structures	8	5	63%	0	8	–	–	–	–	–	–	TSB-AR-11-0
	Amphibole	Structures	8	0	0%	0	0	–	–	–	–	–	–	–
General Chemistry	Bromide	mg/kg	64	28	44%	0.69	7.8	2.5	3.1	–	–	–	–	TSB-AJ-02-10
	Bromine	mg/kg	64	28	44%	1.4	15.7	5.1	6.3	–	–	–	–	TSB-AJ-02-10
	Chlorate	mg/kg	64	17	27%	1.4	17	5.1	6.3	–	–	–	–	TSB-BR-02-10
	Chloride	mg/kg	64	62	97%	3.3	2210	2	206	–	–	1,110	9	TSB-AR-06[illegible]UP
	Chlorine	mg/kg	64	62	97%	6.6	4410	4.1	411	–	–	–	–	TSB-AR-06-[illegible]UP
	Chlorite	ug/kg	3	0	0%	–	–	220	250	–	–	–	–	–
	Fluoride	mg/kg	64	41	64%	0.39	4.3	1	1.3	36,900	0	2.5	3	TSB-BJ-04-10
	Nitrate (as N)	mg/kg	64	64	100%	0.33	229	0.2	10.4	–	–	102	1	TSB-AR-06-0-DUP
	Nitrite (as N)	mg/kg	64	1	2%	0.45	0.45	0.2	0.25	–	–	0.21	1	TSB-AJ-03-0
	Orthophosphate as P	mg/kg	64	2	3%	2	2	5.1	6.3	–	–	–	–	TSB-AR-11-0
	Perchlorate	ug/kg	64	63	98%	53.4	41600	40.6	2480	>100,000	0	–	–	TSB-BJ-03-10
	Sulfate	mg/kg	64	64	100%	9.1	8870	5.1	265	–	–	4,130	1	TSB-AR-12-10
Glycols/Alcohols	Ethanol	ug/kg	64	0	0%	–	–	250	310	–	–	–	–	–
Metals	Aluminum	mg/kg	64	64	100%	6780	9750	10.1	12.5	>100,000	0	15,300	0	TSB-BJ-01-0
	Antimony	mg/kg	64	54	84%	0.11	0.42	1	1.3	409	0	0.5	0	TSB-BR-02-0
	Arsenic	mg/kg	64	64	100%	2.3	5.8	2	2.5	1.6	64	7.2	0	TSB-BR-04-10
	Barium	mg/kg	64	64	100%	148	269	4.1	5	66,600	0	836	0	TSB-BJ-01-10
	Beryllium	mg/kg	64	64	100%	0.41	0.65	0.2	0.25	1940	0	0.89	0	TSB-BJ-01-10
	Boron	mg/kg	64	0	0%	–	–	20.3	25	>100,000	0	11.6	0	TSB-BR-06-10
	Cadmium	mg/kg	64	52	81%	0.069	0.59	0.1	0.13	451	0	0.13	22	TSB-BJ-02-0
	Calcium	mg/kg	64	64	100%	15600	75300	101	125	–	–	82,800	0	TSB-AR-13-10
	Chromium (Total)	mg/kg	64	64	100%	7.3	17	2	2.5	448	0	16.7	1	TSB-BR-0[illegible]
	Chromium (VI)	mg/kg	61	25	41%	0.18	0.58	1	1.3	64	0	0.32	4	TSB-BJ-04[illegible]
	Cobalt	mg/kg	64	64	100%	4.6	7.5	0.41	0.5	1,920	0	16.3	0	TSB-BR-02-0
	Copper	mg/kg	64	64	100%	11.3	31	2	2.5	40,900	0	30.5	1	TSB-BR-02-0
	Iron	mg/kg	64	64	100%	10100	17200	10.1	12.5	>100,000	0	19,700	0	TSB-BJ-02-0
	Lead	mg/kg	64	64	100%	6.5	136	0.61	0.75	800	0	35.1	2	TSB-BR-03-0
	Lithium	mg/kg	64	56	88%	10.9	22.6	10.1	26.4	20,400	0	26.5	0	TSB-AR-13-10
	Magnesium	mg/kg	64	64	100%	6690	13600	101	125	–	–	17,500	0	TSB-BR-05-10
	Manganese	mg/kg	64	64	100%	218	668	0.41	0.5	19,500	0	1,090	0	TSB-BR-02-0
	Mercury	ug/kg	64	40	63%	7.3	17.5	33.8	41.7	–	–	110	0	TSB-BJ-04-0
	Molybdenum	mg/kg	64	31	48%	0.48	1.4	1	1.3	5,110	0	2.0	0	TSB-AR-04-10
	Nickel	mg/kg	64	64	100%	11.2	23.7	1	1.3	20,400	0	30	0	TSB-AJ-02-0
	Niobium	mg/kg	64	2	3%	1.6	2	5.1	6.3	–	–	2.8	0	TSB-AR-08-0
	Palladium	mg/kg	64	64	100%	0.3	1.2	0.2	0.25	–	–	1.5	0	TSB-AR-13-10
	Phosphorus (as P)	mg/kg	64	64	100%	527	1510	101	125	–	–	2,010	0	TSB-BR-02-0

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 2 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Platinum	mg/kg	64	0	0%	–	–	0.2	0.25	–	–	0.099	0	–
Metals	Potassium	mg/kg	64	64	100%	2040	4800	20.3	25	–	–	3,890	5	TSB-AR-06-0-DUP
	Selenium	mg/kg	64	0	0%	–	–	1	1.3	5,110	0	0.60	0	–
	Silicon	mg/kg	64	64	100%	128	1320	50.7	62.6	–	–	4,150	0	TSB-AR-02-0
	Silver	mg/kg	64	64	100%	0.081	0.82	0.41	0.5	5,110	0	0.26	1	TSB-BR-03-0
	Sodium	mg/kg	64	64	100%	244	1720	40.6	50.1	–	–	1,320	5	TSB-AR-06-0
	Strontium	mg/kg	64	64	100%	120	487	1	1.3	>100,000	0	808	0	TSB-AR-[illegible]
	Sulfur	mg/kg	64	26	41%	443	5980	1010	2550	–	–	–	–	TSB-AR-12-10
	Thallium	mg/kg	64	0	0%	–	–	0.41	0.5	68	0	1.8	0	TSB-BR-06-10
	Tin	mg/kg	64	56	88%	0.4	1.5	0.41	0.5	>100,000	0	0.80	4	TSB-BR-02-0
	Titanium	mg/kg	64	64	100%	504	982	1	1.3	>100,000	0	1,010	0	TSB-BJ-02-0
	Tungsten	mg/kg	64	0	0%	–	–	1	1.3	–	–	2.5	0	TSB-BR-06-10
	Uranium	mg/kg	64	64	100%	0.69	3.1	0.2	0.25	204	0	2.7	3	TSB-AR-13-10
	Vanadium	mg/kg	64	64	100%	24.2	53.4	2	2.5	1,020	0	59.1	0	TSB-BJ-02-0
	Zinc	mg/kg	64	64	100%	25.9	211	4.1	5	>100,000	0	121	2	TSB-BJ-01-0
	Zirconium	mg/kg	64	64	100%	4.9	27.3	20.3	25	–	–	179	0	TSB-BJ-02-10
Organochlorine Pesticides	2,4-DDD	ug/kg	64	4	6%	2	17	1.7	19	–	–	–	–	TSB-BR-01-0
	2,4-DDE	ug/kg	64	11	17%	2.1	150	1.7	19	–	–	–	–	TSB-BR-01-0
	4,4-DDD	ug/kg	64	2	3%	7.5	18	1.7	19	9,950	0	–	–	TSB-BJ-05-0
	4,4-DDE	ug/kg	64	19	30%	1.8	310	1.7	19	7,020	0	–	–	TSB-BR-01-0
	4,4-DDT	ug/kg	64	10	16%	2.3	99	1.7	19	7,020	0	–	–	TSB-BR-01-0
	Aldrin	ug/kg	64	0	0%	–	–	1.7	19	101	0	–	–	–
	alpha-BHC	ug/kg	64	0	0%	–	–	1.7	19	359	0	–	–	–
	alpha-Chlordane	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	beta-BHC	ug/kg	64	31	48%	1.7	190	1.7	19	1,260	0	–	–	TSB-BR-[illegible]
	Chlordane	ug/kg	64	0	0%	–	–	17	190	–	–	–	–	–
	delta-BHC	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	Dieldrin	ug/kg	64	0	0%	–	–	1.7	19	108	0	–	–	–
	Endosulfan I	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	Endosulfan II	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	Endosulfan sulfate	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	Endrin	ug/kg	64	1	2%	7	7	1.7	19	>100,000	0	–	–	TSB-BR-01-0
	Endrin aldehyde	ug/kg	64	2	3%	2.7	3.6	1.7	19	–	–	–	–	TSB-AR-12-0
	Endrin ketone	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	gamma-Chlordane	ug/kg	64	0	0%	–	–	1.7	19	–	–	–	–	–
	Heptachlor	ug/kg	64	0	0%	–	–	1.7	19	383	0	–	–	–
	Heptachlor epoxide	ug/kg	64	0	0%	–	–	1.7	19	189	0	–	–	–
	Lindane	ug/kg	64	0	0%	–	–	1.7	19	1,740	0	–	–	–
	Methoxychlor	ug/kg	64	0	0%	–	–	3.3	37	>100,000	0	–	–	–

Parameter of Interest	**Chemical**	**Result Unit**	**Total Count**	**Detect Count**	**Detect Frequency**	**Min. Detect**[a]	**Max. Detect**[a]	**Min. Non-Detect Limit**[b]	**Max. Non-Detect Limit**[b]	**Industrial PRG**	**Count of Detects > PRG**[c]	**Max. Bkgrd**	**Count of Detects > Bkgrd**[d]	**Location of Max. Detect**
	Toxaphene	ug/kg	64	0	0%	–	–	68	760	1,570	0	–	–	–

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 4 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
Petroleum Hydrocarbons	TPH (as Gasoline)	mg/kg	64	0	0%	–	–	0.1	0.13	–	–	–	–	–
	TPH (as Diesel)	mg/kg	64	0	0%	–	–	25	31	–	–	–	–	–
	Oil/Grease	mg/kg	64	0	0%	–	–	203	250	–	–	–	–	–
Radionuclides	Radium-226	pCi/g	64	64	100%	0.837	1.48	0.0487	0.0944	0.026	64	2.36	0	TSB-AJ-01-10
	Radium-228	pCi/g	64	64	100%	1.4	2.13	0.0978	0.18	0.15	64	2.94	0	TSB-BR-06-0
	Thorium-228	pci/g	64	63	98%	0.973	2.17	0.1	0.1	0.26	63	2.28	0	TSB-BR-06-0
	Thorium-230	pci/g	64	64	100%	0.308	2.03	0.1	0.1	20	0	3.01	0	TSB-AR-[illegible]
greater than bkgrd but w/in noise →	Thorium-232	pci/g	64	63	98%	1.1	2.36	0.1	0.1	19	0	2.23	1	TSB-BR-[illegible]
	Uranium-233/234	pci/g	64	64	100%	0.225	2.31	0.6	0.6	32	0	2.84	0	TSB-AR-02-10
	Uranium-235/236	pci/g	64	28	44%	0.0141	0.0509	0.6	0.6	0.40	0	0.21	0	TSB-AR-02-10
	Uranium-238	pci/g	64	64	100%	0.125	1.26	0.6	0.6	1.8	0	2.37	0	TSB-AR-02-10
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	1,2-Diphenylhydrazine	ug/kg	64	0	0%	–	–	330	410	2,150	0	–	–	–
	1,4-Dioxane	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	1-Nonanal	ug/kg	64	0	0%	–	–	10	13	–	–	–	–	–
	2,2'-/4,4'-Dichlorobenzil	ug/kg	64	0	0%	–	–	330	2800	–	–	–	–	–
	2,4,5-Trichlorophenol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2,4,6-Trichlorophenol	ug/kg	64	0	0%	–	–	330	410	61,600	0	–	–	–
	2,4-Dichlorophenol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2,4-Dimethylphenol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2,4-Dinitrophenol	ug/kg	64	0	0%	–	–	1600	2000	>100,000	0	–	–	–
	2,4-Dinitrotoluene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2,6-Dinitrotoluene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2-Chloronaphthalene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2-Chlorophenol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	2-Methylnaphthalene	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	2-Nitroaniline	ug/kg	64	0	0%	–	–	1600	2000	>100,000	0	–	–	–
	2-Nitrophenol	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	3,3'-Dichlorobenzidine	ug/kg	64	0	0%	–	–	1600	2000	3,830	0	–	–	–
	3-Methylphenol & 4-Methylphenol	ug/kg	64	0	0%	–	–	670	830	–	–	–	–	–
	3-Nitroaniline	ug/kg	64	0	0%	–	–	1600	2000	82,100	0	–	–	–
	4-Bromophenyl phenyl ether	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	4-Chloro-3-Methylphenol	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	4-Chlorophenyl phenyl ether	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	4-Nitrophenol	ug/kg	64	0	0%	–	–	1600	2000	–	–	–	–	–
	Acenaphthene	ug/kg	64	10	16%	65	1000	51	63	>100,000	0	–	–	TSB-AJ-01-10
	Acenaphthylene	ug/kg	64	0	0%	–	–	100	130	–	–	–	–	–
	Acetophenone	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	Aniline	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Anthracene	ug/kg	64	0	0%	–	–	30	38	>100,000	0	–	–	–
SVOCs	Azobenzene	ug/kg	64	0	0%	–	–	330	410	15,700	0	–	–	–
	Benzenethiol	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	Benzo(a)anthracene	ug/kg	64	1	2%	55	55	15	19	2,110	0	–	–	TSB-AR-01-0-DUP
	Benzo(a)pyrene	ug/kg	64	1	2%	19	19	15	19	211	0	–	–	TSB-BJ-03-0
	Benzo(b)fluoranthene	ug/kg	64	1	2%	21	21	15	19	2,110	0	–	–	TSB-BJ-03-0
	Benzo(g,h,i)perylene	ug/kg	64	0	0%	–	–	30	38	–	–	–	–	–
	Benzo(k)fluoranthene	ug/kg	64	0	0%	–	–	15	19	21,100	0	–	–	–
	Benzoic acid	ug/kg	64	0	0%	–	–	1600	2000	>100,000	0	–	–	–
	Benzyl alcohol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Benzyl butyl phthalate	ug/kg	64	4	6%	42	420	330	410	>100,000	0	–	–	TSB-BJ-04-0
	bis(2-Chloroethoxy) methane	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	bis(2-Chloroethyl) ether	ug/kg	64	0	0%	–	–	330	410	575	0	–	–	–
	bis(2-Chloroisopropyl) ether	ug/kg	64	0	0%	–	–	330	410	7,350	0	–	–	–
	bis(2-Ethylhexyl) phthalate	ug/kg	64	2	3%	37	140	330	410	>100,000	0	–	–	TSB-BR-03-0
	bis(p-Chlorophenyl) disulfide	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	bis(p-Chlorophenyl) sulfone	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Carbazole	ug/kg	64	0	0%	–	–	330	410	86,200	0	–	–	–
	Chrysene	ug/kg	64	2	3%	18	24	15	19	>100,000	0	–	–	TSB-BJ-03-0
	Dibenzo(a,h)anthracene	ug/kg	64	0	0%	–	–	30	38	211	0	–	–	–
	Dibenzofuran	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Dibutyl phthalate	ug/kg	64	1	2%	50	50	330	410	>100,000	0	–	–	TSB-BR-03-0
	Diethyl phthalate	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Dimethyl phthalate	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Di-n-octyl phthalate	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Diphenyl sulfone	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Fluoranthene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Fluorene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Hexachlorobenzene	ug/kg	64	1	2%	49	49	330	410	1,080	0	–	–	TSB-BR-01-0
	Hexachlorocyclopentadiene	ug/kg	64	0	0%	–	–	1600	2000	>100,000	0	–	–	–
	Hydroxymethyl phthalimide	ug/kg	64	0	0%	–	–	330	410	–	–	–	–	–
	Indeno(1,2,3-cd)pyrene	ug/kg	64	0	0%	–	–	15	19	2,110	0	–	–	–
	Isophorone	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Naphthalene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Nitrobenzene	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	N-nitrosodi-n-propylamine	ug/kg	64	0	0%	–	–	330	410	246	0[g]	–	–	–
	N-nitrosodiphenylamine	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	o-Cresol	ug/kg	64	0	0%	–	–	330	410	>100,000	0	–	–	–
	Octachlorostyrene	ug/kg	64	1	2%	41	41	330	410	–	–	–	–	TSB-BR-01-0

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	p-Chloroaniline	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	p-Chlorothiophenol	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
SVOCs	Pentachlorobenzene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Pentachlorophenol	ug/kg	64	0	0%	--	--	1600	2000	9,000	0	--	--	--
	Phenanthrene	ug/kg	64	0	0%	--	--	30	38	--	--	--	--	--
	Phenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Phenyl Disulfide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Phenyl Sulfide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Phthalic acid	ug/kg	64	0	0%	--	--	1600	2000	--	--	--	--	--
	p-Nitroaniline	ug/kg	64	0	0%	--	--	1600	2000	82,100	0	--	--	--
	Pyrene	ug/kg	64	0	0%	--	--	30	38	>100,000	0	--	--	--
	Pyridine	ug/kg	64	0	0%	--	--	670	830	>100,000	0	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	5	6.3	7,280	0	--	--	--
	1,1,1-Trichloroethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1,2,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	5	6.3	929	0	--	--	--
	1,1,2-Trichloroethane	ug/kg	64	0	0%	--	--	5	6.3	1,610	0	--	--	--
	1,1-Dichloroethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1-Dichloropropene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,2,3-Trichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,2,3-Trichloropropane	ug/kg	64	0	0%	--	--	5	6.3	76	0	--	--	--
	1,2,4-Trichlorobenzene	ug/kg	64	1	2%	0.9	0.9	5	6.3	>100,000	0	--	--	TSB-AJ-01-10
	1,2,4-Trimethylbenzene	ug/kg	64	34	53%	0.23	0.57	5	6.3	>100,000	0	--	--	TSB-AR-13-10
	1,2-Dibromo-3-chloropropane	ug/kg	64	0	0%	--	--	10	13	2,020	0	--	--	--
	1,2-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,2-Dichloroethane	ug/kg	64	0	0%	--	--	5	6.3	603	0	--	--	--
	1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
	1,2-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	742	0	--	--	--
	1,3,5- Trichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,3,5-Trimethylbenzene	ug/kg	64	0	0%	--	--	5	6.3	69,700	0	--	--	--
	1,3-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,3-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,4-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	7,870	0	--	--	--
	2,2,3-Trimethylbutane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,2-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,2-Dimethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,3-Dimethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,4-Dimethylpentane	ug/kg	64	0	0%	--	--	20	25	--	--	--	--	--
	2-Chlorotoluene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	2-Nitropropane	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
	2-Phenylbutane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	3,3-dimethylpentane	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
VOCs	3-ethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	3-Methylhexane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	4-Chlorothioanisole	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	4-Chlorotoluene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Acetone	ug/kg	64	9	14%	6.5	16	20	25	>100,000	0	--	--	TSB-BJ-01-[illegible]
	Acetonitrile	ug/kg	64	0	0%	--	--	50	63	>100,000	0	--	--	--
	Benzene	ug/kg	64	0	0%	--	--	5	6.3	1,410	0	--	--	--
	Bromobenzene	ug/kg	64	0	0%	--	--	5	6.3	92,200	0	--	--	--
	Bromodichloromethane	ug/kg	64	0	0%	--	--	5	6.3	1,830	0	--	--	--
	Bromomethane	ug/kg	64	0	0%	--	--	10	13	13,100	0	--	--	--
	Carbon disulfide	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Carbon tetrachloride	ug/kg	64	0	0%	--	--	5	6.3	549	0	--	--	--
	Freon 11	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Freon 12	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--
	Freon 113	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Chlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Chlorobromomethane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Chlorodibromomethane	ug/kg	64	0	0%	--	--	5	6.3	2,550	0	--	--	--
	Chloroethane	ug/kg	64	0	0%	--	--	10	13	6,490	0	--	--	--
	Chloroform	ug/kg	64	0	0%	--	--	5	6.3	470	0	--	--	--
	Chloromethane	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--
	cis-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	cis-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Cymene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Dibromomethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Dichloromethane	ug/kg	64	0	0%	--	--	5	6.3	20,500	0	--	--	--
	Ethylbenzene	ug/kg	64	3	5%	0.2	0.24	5	6.3	>100,000	0	--	--	TSB-AR-07-10
	Hexachloro-1,3-butadiene	ug/kg	64	0	0%	--	--	330	410	22,100	0	--	--	--
	Hexachloroethane	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Hexane, 2-methyl-	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Isopropylbenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	m,p-Xylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl disulfide	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl ethyl ketone	ug/kg	64	0	0%	--	--	20	25	>100,000	0	--	--	--
	Methyl iodide	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl isobutyl ketone	ug/kg	64	0	0%	--	--	20	25	>100,000	0	--	--	--

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Methyl n-butyl ketone	ug/kg	64	0	0%	--	--	20	25	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	ug/kg	64	0	0%	--	--	5	6.3	70,000	0	--	--	--
	n-Butyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	n-Heptane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
VOCs	n-Propyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	o-Xylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Styrene (monomer)	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	tert-Butyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Tetrachloroethylene	ug/kg	64	0	0%	--	--	5	6.3	1,310	0	--	--	--
	Toluene	ug/kg	64	11	17%	0.24	0.65	5	6.3	>100,000	0	--	--	TSB-BR-06-10
	trans-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	trans-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Tribromomethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Trichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	115	0	--	--	--
	Vinyl acetate	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Vinyl chloride	ug/kg	64	0	0%	--	--	5	6.3	746	0	--	--	--
	Xylenes (total)	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.

b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.

c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs.

d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).

e - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).

f - Asbestos results shown are for long protocol structures (>10um). Not all asbestos data are in yet from EMSL.

g - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

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November 8, 2007

Ms. Shannon Harbour, P.E.
Nevada Division of Environmental Protection
Bureau of Corrective Actions
2030 E. Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

Subject: Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcel "H" Site and Errata Pages for Phase 2 Sampling and Analysis Plans to Conduct Soil Characterization, Tronox Parcels "C", "D" and "F" Sites, Henderson, Nevada

Dear Shannon:

On behalf of Tronox, Basic Environmental Company (BEC) is pleased to enclose the following:

1. A Sampling and Analysis Plan for Phase 2 sampling for Parcel H, following the usual format;

2. Errata pages for the previously submitted *Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization for Tronox Parcels "C" and "D."* These errata pages should be used to replace pages in the previously submitted Plan for these parcels. They are provided per the request in NDEP's letter dated October 29, 2007, requesting the addition of three new judgmental samples. The errata pages consist of the following for the Parcels "C" and "D" Sampling and Analysis Plan:

- Pages 4 and 5 of the text (changes consist of additional bullets for the three judgmental samples added in response to NDEP comments dated October 29, 2007)
- Figure 2 (added three additional judgmental sample locations)

3. Errata pages for the previously submitted *Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization for Tronox Parcel "F"*. These errata pages should be used to replace pages in the previously submitted Plan for this parcel. They are provided per the request in NDEP's letter dated October 9, 2007, requesting the addition of a new judgmental sample. The errata pages consist of the following for the Parcel "F" Sampling and Analysis Plan:

- Page 4 of the text (changes consist of one additional bullet for the judgmental sample added in response to NDEP comments dated October 9, 2007)
- Figure 2 (added one additional judgmental sample location)

875 West Warm Springs Road, Henderson, Nevada 89011 • Phone 702.567.0400 • Fax 702.567.0473

Also enclosed are electronic versions of each of the Sampling and Analysis Plans. If you have any question, please call me at 626-382-0001.

Sincerely,

Ranajit Sahu

Ranajit (Ron) Sahu, CEM
Project Manager

cc: Brian Rakvica, NDEP, BCA, Las Vegas, NV 89119
Jim Najima, NDEP, BCA, Carson City, NV 89701
Susan Crowley, Tronox

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Ranajit Sahu November 8, 2007

Dr. Ranajit Sahu, C.E.M. (No. EM-1699, Exp. 10/07/2009) Date
BRC Project Manager

11/9/07

Brian Rakvica

From: Ranajit (Ron) Sahu [sahuron@earthlink.net]
Sent: Thursday, November 08, 2007 7:50 AM
To: Shannon Harbour; Brian Rakvica
Cc: susan.crowley@tronox.com; okbailey@flash.net
Subject: Tronox Parcels A/B Data
Attachments: Tronox_ParcelsA-B_DataSummary-Industrial.xls

Shannon/Brian:

In preparation for our meeting tomorrow morning (after your 8:30 AM Tronox meeting), to discuss the data for the Parcels A/B sampling, I am enclosing the data summary thus far. Asbestos data are still trickling in and I will bring with me the latest compilation of that data through the end of today.

See you tomorrow.

Thanks

Ranajit

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 1 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
Dioxins/Furans	TCDD TEF[e]	pg/g	32	32	100%	0.73	472	--	--	1,000	0	--	--	TSB-BJ-05-0
Asbestos[f]	Chrysotile	Structures	8	5	63%	0	8	--	--	--	--	--	--	TSB-AR-11-0
	Amphibole	Structures	8	0	0%	0	0	--	--	--	--	--	--	--
General Chemistry	Bromide	mg/kg	64	28	44%	0.69	7.8	2.5	3.1	--	--	--	--	TSB-AJ-02-10
	Bromine	mg/kg	64	28	44%	1.4	15.7	5.1	6.3	--	--	--	--	TSB-AJ-02-10
	Chlorate	mg/kg	64	17	27%	1.4	17	5.1	6.3	--	--	--	--	TSB-BR-02-10
	Chloride	mg/kg	64	62	97%	3.3	2210	2	206	--	--	1,110	9	TSB-AR-06- UP
	Chlorine	mg/kg	64	62	97%	6.6	4410	4.1	411	--	--	--	--	TSB-AR-06- UP
	Chlorite	ug/kg	3	0	0%	--	--	220	250	--	--	--	--	--
	Fluoride	mg/kg	64	41	64%	0.39	4.3	1	1.3	36,900	0	2.5	3	TSB-BJ-04-10
	Nitrate (as N)	mg/kg	64	64	100%	0.33	229	0.2	10.4	--	--	102	1	TSB-AR-06-0-DUP
	Nitrite (as N)	mg/kg	64	1	2%	0.45	0.45	0.2	0.25	--	--	0.21	1	TSB-AJ-03-0
	Orthophosphate as P	mg/kg	64	2	3%	2	2	5.1	6.3	--	--	--	--	TSB-AR-11-0
	Perchlorate NO	ug/kg	64	63	98%	53.4	41600	40.6	2480	>100,000	0	--	--	TSB-BJ-03-10
	Sulfate	mg/kg	64	64	100%	9.1	8870	5.1	265	--	--	4,130	1	TSB-AR-12-10
Glycols/Alcohols	Ethanol	ug/kg	64	0	0%	--	--	250	310	--	--	--	--	--
Metals	Aluminum	mg/kg	64	64	100%	6780	9750	10.1	12.5	>100,000	0	15,300	0	TSB-BJ-01-0
	Antimony	mg/kg	64	54	84%	0.11	0.42	1	1.3	409	0	0.5	0	TSB-BR-02-0
	Arsenic	mg/kg	64	64	100%	2.3	5.8	2	2.5	1.6	64	7.2	0	TSB-BR-04-10
	Barium	mg/kg	64	64	100%	148	269	4.1	5	66,600	0	836	0	TSB-BJ-01-10
	Beryllium	mg/kg	64	64	100%	0.41	0.65	0.2	0.25	1940	0	0.89	0	TSB-BJ-01-10
	Boron	mg/kg	64	0	0%	--	--	20.3	25	>100,000	0	11.6	0	TSB-BR-06-10
	Cadmium ok	mg/kg	64	52	81%	0.069	0.59	0.1	0.13	451	0	0.13	22	TSB-BJ-02-0
	Calcium	mg/kg	64	64	100%	15600	75300	101	125	--	--	82,800	0	TSB-AR-13-10
	Chromium (Total) OK	mg/kg	64	64	100%	7.3	17	2	2.5	448	0	16.7	1	TSB-BR-0
	Chromium (VI) OK	mg/kg	61	25	41%	0.18	0.58	1	1.3	64	0	0.32	4	TSB-BJ-0
	Cobalt	mg/kg	64	64	100%	4.6	7.5	0.41	0.5	1,920	0	16.3	0	TSB-BR-02-0
	Copper OK	mg/kg	64	64	100%	11.3	31	2	2.5	40,900	0	30.5	1	TSB-BR-02-0
	Iron	mg/kg	64	64	100%	10100	17200	10.1	12.5	>100,000	0	19,700	0	TSB-BJ-02-0
	Lead ok	mg/kg	64	64	100%	6.5	136	0.61	0.75	800	0	35.1	2	TSB-BR-03-0
	Lithium	mg/kg	64	56	88%	10.9	22.6	10.1	26.4	20,400	0	26.5	0	TSB-AR-13-10
	Magnesium	mg/kg	64	64	100%	6690	13600	101	125	--	--	17,500	0	TSB-BR-05-10
	Manganese	mg/kg	64	64	100%	218	668	0.41	0.5	19,500	0	1,090	0	TSB-BR-02-0
	Mercury	ug/kg	64	40	63%	7.3	17.5	33.8	41.7	--	--	110	0	TSB-BJ-04-0
	Molybdenum	mg/kg	64	31	48%	0.48	1.4	1	1.3	5,110	0	2.0	0	TSB-AR-04-10
	Nickel	mg/kg	64	64	100%	11.2	23.7	1	1.3	20,400	0	30	0	TSB-AJ-02-0
	Niobium	mg/kg	64	2	3%	1.6	2	5.1	6.3	--	--	2.8	0	TSB-AR-08-0
	Palladium	mg/kg	64	64	100%	0.3	1.2	0.2	0.25	--	--	1.5	0	TSB-AR-13-10
	Phosphorus (as P)	mg/kg	64	64	100%	527	1510	101	125	--	--	2,010	0	TSB-BR-02-0

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 2 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Platinum	mg/kg	64	0	0%	--	--	0.2	0.25	--	--	0.099	0	--
Metals	Potassium	mg/kg	64	64	100%	2040	4800	20.3	25	--	--	3,890	5	TSB-AR-06-0-DUP
	Selenium	mg/kg	64	0	0%	--	--	1	1.3	5,110	0	0.60	0	--
	Silicon	mg/kg	64	64	100%	128	1320	50.7	62.6	--	--	4,150	0	TSB-AR-02-0
	Silver	mg/kg	64	64	100%	0.081	0.82	0.41	0.5	5,110	0	0.26	1	TSB-BR-03-0
	Sodium	mg/kg	64	64	100%	244	1720	40.6	50.1	--	--	1,320	5	TSB-AR-06-0
	Strontium	mg/kg	64	64	100%	120	487	1	1.3	>100,000	0	808	0	TSB-AR-[illegible]0
	Sulfur	mg/kg	64	26	41%	443	5980	1010	2550	--	--	--	--	TSB-AR-1[illegible]0
	Thallium	mg/kg	64	0	0%	--	--	0.41	0.5	68	0	1.8	0	TSB-BR-06-10
	Tin OK	mg/kg	64	56	88%	0.4	1.5	0.41	0.5	>100,000	0	0.80	4	TSB-BR-02-0
	Titanium	mg/kg	64	64	100%	504	982	1	1.3	>100,000	0	1,010	0	TSB-BJ-02-0
	Tungsten	mg/kg	64	0	0%	--	--	1	1.3	--	--	2.5	0	TSB-BR-06-10
	Uranium OK	mg/kg	64	64	100%	0.69	3.1	0.2	0.25	204	0	2.7	3	TSB-AR-13-10
	Vanadium	mg/kg	64	64	100%	24.2	53.4	2	2.5	1,020	0	59.1	0	TSB-BJ-02-0
	Zinc OK	mg/kg	64	64	100%	25.9	211	4.1	5	>100,000	0	121	2	TSB-BJ-01-0
	Zirconium	mg/kg	64	64	100%	4.9	27.3	20.3	25	--	--	179	0	TSB-BJ-02-10
Organochlorine Pesticides	2,4-DDD	ug/kg	64	4	6%	2	17	1.7	19	--	--	--	--	TSB-BR-01-0
	2,4-DDE	ug/kg	64	11	17%	2.1	150	1.7	19	--	--	--	--	TSB-BR-01-0
	4,4-DDD	ug/kg	64	2	3%	7.5	18	1.7	19	9,950	0	--	--	TSB-BJ-05-0
	4,4-DDE	ug/kg	64	19	30%	1.8	310	1.7	19	7,020	0	--	--	TSB-BR-01-0
	4,4-DDT	ug/kg	64	10	16%	2.3	99	1.7	19	7,020	0	--	--	TSB-BR-01-0
	Aldrin	ug/kg	64	0	0%	--	--	1.7	19	101	0	--	--	--
	alpha-BHC	ug/kg	64	0	0%	--	--	1.7	19	359	0	--	--	--
	alpha-Chlordane	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	beta-BHC	ug/kg	64	31	48%	1.7	190	1.7	19	1,260	0	--	--	TSB-BR-[illegible]
	Chlordane	ug/kg	64	0	0%	--	--	17	190	--	--	--	--	--
	delta-BHC	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	Dieldrin	ug/kg	64	0	0%	--	--	1.7	19	108	0	--	--	--
	Endosulfan I	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	Endosulfan II	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	Endosulfan sulfate	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	Endrin	ug/kg	64	1	2%	7	7	1.7	19	>100,000	0	--	--	TSB-BR-01-0
	Endrin aldehyde	ug/kg	64	2	3%	2.7	3.6	1.7	19	--	--	--	--	TSB-AR-12-0
	Endrin ketone	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	gamma-Chlordane	ug/kg	64	0	0%	--	--	1.7	19	--	--	--	--	--
	Heptachlor	ug/kg	64	0	0%	--	--	1.7	19	383	0	--	--	--
	Heptachlor epoxide	ug/kg	64	0	0%	--	--	1.7	19	189	0	--	--	--
	Lindane	ug/kg	64	0	0%	--	--	1.7	19	1,740	0	--	--	--
	Methoxychlor	ug/kg	64	0	0%	--	--	3.3	37	>100,000	0	--	--	--

Table 1
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Soil Results Summary

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Toxaphene	ug/kg	64	0	0%	–	–	68	760	1,570	0	–	–	–

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary
Page 4 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
Petroleum Hydrocarbons	TPH (as Gasoline)	mg/kg	64	0	0%	--	--	0.1	0.13	--	--	--	--	--
	TPH (as Diesel)	mg/kg	64	0	0%	--	--	25	31	--	--	--	--	--
	Oil/Grease	mg/kg	64	0	0%	--	--	203	250	--	--	--	--	--
Radionuclides	Radium-226	pCi/g	64	64	100%	0.837	1.48	0.0487	0.0944	0.026	64	2.36	0	TSB-AJ-01-10
	Radium-228	pCi/g	64	64	100%	1.4	2.13	0.0978	0.18	0.15	64	2.94	0	TSB-BR-06-0
	Thorium-228	pci/g	64	63	98%	0.973	2.17	0.1	0.1	0.26	63	2.28	0	TSB-BR-06-0
	Thorium-230	pci/g	64	64	100%	0.308	2.03	0.1	0.1	20	0	3.01	0	TSB-AR-[illegible]
	Thorium-232	pci/g	64	63	98%	1.1	2.36	0.1	0.1	19	0	2.23	1	TSB-BR-[illegible]
	Uranium-233/234	pci/g	64	64	100%	0.225	2.31	0.6	0.6	32	0	2.84	0	TSB-AR-02-10
	Uranium-235/236	pci/g	64	28	44%	0.0141	0.0509	0.6	0.6	0.40	0	0.21	0	TSB-AR-02-10
	Uranium-238	pci/g	64	64	100%	0.125	1.26	0.6	0.6	1.8	0	2.37	0	TSB-AR-02-10
SVOCs	1,2,4,5-Tetrachlorobenzene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	1,2-Diphenylhydrazine	ug/kg	64	0	0%	--	--	330	410	2,150	0	--	--	--
	1,4-Dioxane	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	1-Nonanal	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
	2,2'-/4,4'-Dichlorobenzil	ug/kg	64	0	0%	--	--	330	2800	--	--	--	--	--
	2,4,5-Trichlorophenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2,4,6-Trichlorophenol	ug/kg	64	0	0%	--	--	330	410	61,600	0	--	--	--
	2,4-Dichlorophenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2,4-Dimethylphenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2,4-Dinitrophenol	ug/kg	64	0	0%	--	--	1600	2000	>100,000	0	--	--	--
	2,4-Dinitrotoluene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2,6-Dinitrotoluene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2-Chloronaphthalene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2-Chlorophenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	2-Methylnaphthalene	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	2-Nitroaniline	ug/kg	64	0	0%	--	--	1600	2000	>100,000	0	--	--	--
	2-Nitrophenol	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	3,3'-Dichlorobenzidine	ug/kg	64	0	0%	--	--	1600	2000	3,830	0	--	--	--
	3-Methylphenol & 4-Methylphenol	ug/kg	64	0	0%	--	--	670	830	--	--	--	--	--
	3-Nitroaniline	ug/kg	64	0	0%	--	--	1600	2000	82,100	0	--	--	--
	4-Bromophenyl phenyl ether	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	4-Chloro-3-Methylphenol	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	4-Chlorophenyl phenyl ether	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	4-Nitrophenol	ug/kg	64	0	0%	--	--	1600	2000	--	--	--	--	--
	Acenaphthene	ug/kg	64	10	16%	65	1000	51	63	>100,000	0	--	--	TSB-AJ-01-10
	Acenaphthylene	ug/kg	64	0	0%	--	--	100	130	--	--	--	--	--
	Acetophenone	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Aniline	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Anthracene	ug/kg	64	0	0%	--	--	30	38	>100,000	0	--	--	--
SVOCs	Azobenzene	ug/kg	64	0	0%	--	--	330	410	15,700	0	--	--	--
	Benzenethiol	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Benzo(a)anthracene	ug/kg	64	1	2%	55	55	15	19	2,110	0	--	--	TSB-AR-01-0-DUP
	Benzo(a)pyrene	ug/kg	64	1	2%	19	19	15	19	211	0	--	--	TSB-BJ-03-0
	Benzo(b)fluoranthene	ug/kg	64	1	2%	21	21	15	19	2,110	0	--	--	TSB-BJ-03-0
	Benzo(g,h,i)perylene	ug/kg	64	0	0%	--	--	30	38	--	--	--	--	--
	Benzo(k)fluoranthene	ug/kg	64	0	0%	--	--	15	19	21,100	0	--	--	--
	Benzoic acid	ug/kg	64	0	0%	--	--	1600	2000	>100,000	0	--	--	--
	Benzyl alcohol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Benzyl butyl phthalate	ug/kg	64	4	6%	42	420	330	410	>100,000	0	--	--	TSB-BJ-04-0
	bis(2-Chloroethoxy) methane	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	bis(2-Chloroethyl) ether	ug/kg	64	0	0%	--	--	330	410	575	0	--	--	--
	bis(2-Chloroisopropyl) ether	ug/kg	64	0	0%	--	--	330	410	7,350	0	--	--	--
	bis(2-Ethylhexyl) phthalate	ug/kg	64	2	3%	37	140	330	410	>100,000	0	--	--	TSB-BR-03-0
	bis(p-Chlorophenyl) disulfide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	bis(p-Chlorophenyl) sulfone	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Carbazole	ug/kg	64	0	0%	--	--	330	410	86,200	0	--	--	--
	Chrysene	ug/kg	64	2	3%	18	24	15	19	>100,000	0	--	--	TSB-BJ-03-0
	Dibenzo(a,h)anthracene	ug/kg	64	0	0%	--	--	30	38	211	0	--	--	--
	Dibenzofuran	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Dibutyl phthalate	ug/kg	64	1	2%	50	50	330	410	>100,000	0	--	--	TSB-BR-03-0
	Diethyl phthalate	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Dimethyl phthalate	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Di-n-octyl phthalate	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Diphenyl sulfone	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Fluoranthene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Fluorene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Hexachlorobenzene	ug/kg	64	1	2%	49	49	330	410	1,080	0	--	--	TSB-BR-01-0
	Hexachlorocyclopentadiene	ug/kg	64	0	0%	--	--	1600	2000	>100,000	0	--	--	--
	Hydroxymethyl phthalimide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Indeno(1,2,3-cd)pyrene	ug/kg	64	0	0%	--	--	15	19	2,110	0	--	--	--
	Isophorone	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Naphthalene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Nitrobenzene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	N-nitrosodi-n-propylamine	ug/kg	64	0	0%	--	--	330	410	246	0[g]	--	--	--
	N-nitrosodiphenylamine	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	o-Cresol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Octachlorostyrene	ug/kg	64	1	2%	41	41	330	410	--	--	--	--	TSB-BR-01-0

Table 1
Tronox Parcels A/B Investigation
Soil Results Summary

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	p-Chloroaniline	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	p-Chlorothiophenol	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
SVOCs	Pentachlorobenzene	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Pentachlorophenol	ug/kg	64	0	0%	--	--	1600	2000	9,000	0	--	--	--
	Phenanthrene	ug/kg	64	0	0%	--	--	30	38	--	--	--	--	--
	Phenol	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Phenyl Disulfide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Phenyl Sulfide	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	Phthalic acid	ug/kg	64	0	0%	--	--	1600	2000	--	--	--	--	--
	p-Nitroaniline	ug/kg	64	0	0%	--	--	1600	2000	82,100	0	--	--	--
	Pyrene	ug/kg	64	0	0%	--	--	30	38	>100,000	0	--	--	--
	Pyridine	ug/kg	64	0	0%	--	--	670	830	>100,000	0	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	5	6.3	7,280	0	--	--	--
	1,1,1-Trichloroethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1,2,2-Tetrachloroethane	ug/kg	64	0	0%	--	--	5	6.3	929	0	--	--	--
	1,1,2-Trichloroethane	ug/kg	64	0	0%	--	--	5	6.3	1,610	0	--	--	--
	1,1-Dichloroethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,1-Dichloropropene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,2,3-Trichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,2,3-Trichloropropane	ug/kg	64	0	0%	--	--	5	6.3	76	0	--	--	--
	1,2,4-Trichlorobenzene	ug/kg	64	1	2%	0.9	0.9	5	6.3	>100,000	0	--	--	TSB-AJ-01-10
	1,2,4-Trimethylbenzene	ug/kg	64	34	53%	0.23	0.57	5	6.3	>100,000	0	--	--	TSB-AR-13-10
	1,2-Dibromo-3-chloropropane	ug/kg	64	0	0%	--	--	10	13	2,020	0	--	--	--
	1,2-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,2-Dichloroethane	ug/kg	64	0	0%	--	--	5	6.3	603	0	--	--	--
	1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
	1,2-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	742	0	--	--	--
	1,3,5- Trichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	1,3,5-Trimethylbenzene	ug/kg	64	0	0%	--	--	5	6.3	69,700	0	--	--	--
	1,3-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,3-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	1,4-Dichlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	7,870	0	--	--	--
	2,2,3-Trimethylbutane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,2-Dichloropropane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,2-Dimethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,3-Dimethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	2,4-Dimethylpentane	ug/kg	64	0	0%	--	--	20	25	--	--	--	--	--
	2-Chlorotoluene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	2-Nitropropane	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
	2-Phenylbutane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	3,3-dimethylpentane	ug/kg	64	0	0%	--	--	10	13	--	--	--	--	--
VOCs	3-ethylpentane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	3-Methylhexane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	4-Chlorothioanisole	ug/kg	64	0	0%	--	--	330	410	--	--	--	--	--
	4-Chlorotoluene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Acetone	ug/kg	64	9	14%	6.5	16	20	25	>100,000	0	--	--	TSB-BJ-01-10
	Acetonitrile	ug/kg	64	0	0%	--	--	50	63	>100,000	0	--	--	--
	Benzene	ug/kg	64	0	0%	--	--	5	6.3	1,410	0	--	--	--
	Bromobenzene	ug/kg	64	0	0%	--	--	5	6.3	92,200	0	--	--	--
	Bromodichloromethane	ug/kg	64	0	0%	--	--	5	6.3	1,830	0	--	--	--
	Bromomethane	ug/kg	64	0	0%	--	--	10	13	13,100	0	--	--	--
	Carbon disulfide	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Carbon tetrachloride	ug/kg	64	0	0%	--	--	5	6.3	549	0	--	--	--
	Freon 11	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Freon 12	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--
	Freon 113	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Chlorobenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Chlorobromomethane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Chlorodibromomethane	ug/kg	64	0	0%	--	--	5	6.3	2,550	0	--	--	--
	Chloroethane	ug/kg	64	0	0%	--	--	10	13	6,490	0	--	--	--
	Chloroform	ug/kg	64	0	0%	--	--	5	6.3	470	0	--	--	--
	Chloromethane	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--
	cis-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	cis-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Cymene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Dibromomethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Dichloromethane	ug/kg	64	0	0%	--	--	5	6.3	20,500	0	--	--	--
	Ethylbenzene	ug/kg	64	3	5%	0.2	0.24	5	6.3	>100,000	0	--	--	TSB-AR-07-10
	Hexachloro-1,3-butadiene	ug/kg	64	0	0%	--	--	330	410	22,100	0	--	--	--
	Hexachloroethane	ug/kg	64	0	0%	--	--	330	410	>100,000	0	--	--	--
	Hexane, 2-methyl-	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Isopropylbenzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	m,p-Xylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl disulfide	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl ethyl ketone	ug/kg	64	0	0%	--	--	20	25	>100,000	0	--	--	--
	Methyl iodide	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Methyl isobutyl ketone	ug/kg	64	0	0%	--	--	20	25	>100,000	0	--	--	--

Table 1

Tronox Parcels A/B Investigation

Soil Results Summary

Page 8 of 8

Parameter of Interest	Chemical	Result Unit	Total Count	Detect Count	Detect Frequency	Min. Detect[a]	Max. Detect[a]	Min. Non-Detect Limit[b]	Max. Non-Detect Limit[b]	Industrial PRG	Count of Detects > PRG[c]	Max. Bkgrd	Count of Detects > Bkgrd[d]	Location of Max. Detect
	Methyl n-butyl ketone	ug/kg	64	0	0%	--	--	20	25	--	--	--	--	--
	MTBE (Methyl tert-butyl ether)	ug/kg	64	0	0%	--	--	5	6.3	70,000	0	--	--	--
	n-Butyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	n-Heptane	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
VOCs	n-Propyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	o-Xylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Styrene (monomer)	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	tert-Butyl benzene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Tetrachloroethylene	ug/kg	64	0	0%	--	--	5	6.3	1,310	0	--	--	--
	Toluene	ug/kg	64	11	17%	0.24	0.65	5	6.3	>100,000	0	--	--	TSB-BR-06-10
	trans-1,2-Dichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	trans-1,3-Dichloropropylene	ug/kg	64	0	0%	--	--	5	6.3	--	--	--	--	--
	Tribromomethane	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Trichloroethylene	ug/kg	64	0	0%	--	--	5	6.3	115	0	--	--	--
	Vinyl acetate	ug/kg	64	0	0%	--	--	5	6.3	>100,000	0	--	--	--
	Vinyl chloride	ug/kg	64	0	0%	--	--	5	6.3	746	0	--	--	--
	Xylenes (total)	ug/kg	64	0	0%	--	--	10	13	>100,000	0	--	--	--

a - Range of detections include estimated values of detect results between the detection limit and reporting limit. As such some minimum detected concentrations may be below the minimum reporting limit. In these cases the respective sample results are flagged in the data set.

b - The quantitation limits shown include samples which had detections. For screening purposes, the detection limit was used for comparison to the screening levels.

c - From USEPA Region 9 preliminary remediation goals (PRG) table, Oct. 2004 (and the 2007 USEPA radionuclide PRG webpage; http://epa-prgs.ornl.gov/radionuclides). Values used are industrial soil PRGs.

d - Values used are the maximum from the shallow soils background dataset presented in the Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (BRC/TIMET 2007).

e - Agency for Toxic Substances and Disease Registry (ATSDR) action level of 1.0 parts per billion (ppb).

f - Asbestos results shown are for long protocol structures (>10um). Not all asbestos data are in yet from EMSL.

g - Reporting limits exceed industrial PRGs; however, in all cases MDL is below PRG.

Shannon Harbour

From:	Keith Bailey [okbailey@flash.net]
Sent:	Tuesday, November 06, 2007 7:46 AM
To:	Shannon Harbour; Brian Rakvica; 'Paul Black'; paul.duffy@uaf.edu; TeriLCopeland@aol.com
Cc:	'Gerry, Dave'; 'Caceres-Schnell, Carmen'; 'Ho, Brian'; gHels@ensr.aecom.com; 'Bilodeau, Sally'; susan.crowley@tronox.com; 'Bradley, Lisa'
Subject:	Table 1-1 Historic Proposed Soil Eval of LOUs (2).xls
Attachments:	Table 1-1 Historic Proposed Soil Eval of LOUs (2).xls

Shannon and Brian,

In an effort to simplify review of the Tronox Phase A report/Phase B work plan, we have prepared the attached Table in Excel format. A corresponding map is also being sent to each of you by Fed Ex for delivery this morning. The Table shows each of the LOU's (and US Vanadium) along with the corresponding sampling already completed and the sampling being proposed as part of the Phase B work plan. The table is readable when printed on 11x17 paper. Note that in response to Teri's comment requesting that each LOU should have an associated soil sample, we have added several borings beyond those proposed in the original Phase B work plan (additions are marked on the Table with an asterisk).

We hope that the new Table and Map will clarify the scope of the Phase B effort in time for our conference call this Friday, and will allow NDEP approval for Tronox/ENSR to proceed with the Phase B sampling later this month.

As usual, if you have questions or comments, please feel free to call me at (405) 216-9213 or my cell phone at (405) 246-6818. I will be flying to Henderson this afternoon so the cell number is most likely to catch me. Susan Crowley is not available this week. She is on a cruise and will not return until next Monday Nov. 12th.

Keith

Shannon Harbour

From: Shannon Harbour
Sent: Tuesday, November 06, 2007 8:18 AM
To: 'Keith Bailey'; Brian Rakvica
Cc: 'Crowley, Susan'; 'Bilodeau, Sally'; 'Ed Krish'; 'Flack, Mike'; 'Reed, Tom'
Subject: RE: Schedule for Tronox Interceptor Well Rehab

Keith,

TRX's proposal below is acceptable to the NDEP.

Sincerely,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

From: Keith Bailey [mailto:okbailey@flash.net]
Sent: Tuesday, November 06, 2007 8:08 AM
To: Shannon Harbour; Brian Rakvica
Cc: 'Crowley, Susan'; 'Bilodeau, Sally'; 'Ed Krish'; 'Flack, Mike'; 'Reed, Tom'
Subject: Schedule for Tronox Interceptor Well Rehab

Shannon,

NDEP comments to previous Tronox submissions call for Tronox to provide a schedule of well rehabilitation to NDEP by November 5th (Comment 3d of NDEP letter dated October 5, 2007). We also have a conference call scheduled for November 14th to discuss the Tronox groundwater Capture Plan. Tronox proposes that we roll the rehab discussion into the Capture Plan call, since overall capture will be impacted by both new and old well issues.

Please let me know if this is acceptable to NDEP.

Thanks.

Keith

ENSR | AECOM

ENSR
1220 Avenida Acaso, Camarillo, California 93012-8738
T 805.388.3775 F 805.388.3577 www.ensr.aecom.com

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2007 NOV -6 P 12:01

Letter of Transmittal

Attention: Mr. Brian Rakvica

Date: November 5, 2007

Project Reference: Tronox Phase B Work Plan

Project number: 04020-023-430

We are sending you the following:

Number of originals	**Number of copies:**	**Description:**
1		Map of Tronox LOUs and Sample Locations

Remarks

Enclosed is a map showing LOUs on the Tronox site with sample locations for your review. A companion table listing each LOU along with the SRCs of concern and a brief description of the Phase A Source Area Investigation sample locations and the proposed Phase B sample locations will be sent to you via e-mail.

Please call me if you have questions at (805) 388-3775.

Brian D. Ho

Signature

bho@ensr.aecom.com

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 29, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcels "C" and "D" Site, Henderson, Nevada, Revision 1 (dated September 19, 2007)

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-referenced Phase 2 Sampling and Analysis Plan (Phase 2 SAP) and finds that the document is acceptable with the following exceptions to be addressed in the resulting investigation report:

- Scope of Work, Task 1: Field Implementation and Figure 2, TRX lists and illustrates the proposed judgmental samples, respectively. The NDEP has reviewed Figure 2 and requests the following samples:
  - <u>Parcel C, grid cell C-C1</u>: in drainage feature just north of road (northern corner of cell), possible collection point for runoff from groundwater treatment system area.
  - <u>Parcel C, grid cell C-C1</u>: in drainage feature with white staining (southern end, west of the middle of the cell), historic french drain location.
  - <u>Parcel C, grid cell C-E1</u>: in drainage feature with white staining (southern end, west of the middle of the cell), historic french drain location.

  Please add a judgmental sample in these locations and submit errata pages for the above-referenced report prior to the commencement of field work that addresses the addition of these samples (e.g. page 4, Figure 2, etc.).
- Table 1, the NDEP has noted that this table does not indicate all of the chemicals that are listed on TRX's March 2006 site related chemicals (SRC) list but that all SRCs are proposed to be analyzed.

Please contact the undersigned with questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

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NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 29, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcel "G" Site, Henderson, Nevada (dated September 27, 2007)

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified report and finds that the document is acceptable with the following exception noted for the administrative record:

- Table 1, the NDEP has noted that this table does not indicate all of the chemicals that are listed on TRX's March 2006 site related chemicals (SRC) list but that all SRCs are proposed to be analyzed.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Answers, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Olin Chlor Alkali, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin Corporation, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Brian Rakvica

From: Bilodeau, Sally [SBilodeau@ensr.aecom.com]
Sent: Monday, October 22, 2007 4:40 PM
To: Bilodeau, Sally; Shannon Harbour; Crowley, Susan; Keith Bailey; Gerry, Dave; Brian Rakvica
Subject: RE: Tronox Phase B Soil and Groundwater sampling locations Plate
Attachments: phaseBfieldmap-noSG.pdf

Team,
Attached is the Plate I-1 Proposed Phase B Soil and Groundwater Sample Locations
Hard copies are being sent also

Shannon,
Please feel free to forward this pdf copy to Teri Copeland, Paul Hackenberry, Paul Duffy, and Paul Black
Hard copies will also be sent directly to them

From: Bilodeau, Sally
Sent: Monday, October 22, 2007 3:15 PM
To: 'Shannon Harbour'; Crowley, Susan; Keith Bailey; Gerry, Dave
Subject: RE: Tronox Phase B all sample points map

Shannon,
We can do whatever you want.
Figure 12-2 has the EA boundaries, do you want those on the new map as well?
It will be printed at a size approximately 2 feet by 3 feet so it is legible with or without the air photo.
It will be called Plate I-1 and will have Proposed Phase B Soil and Groundwater Sample Locations
(no soil gas)

From: Shannon Harbour [mailto:sharbour@ndep.nv.gov]
Sent: Monday, October 22, 2007 3:03 PM
To: Bilodeau, Sally; Crowley, Susan; Keith Bailey; Gerry, Dave
Subject: RE: Tronox Phase B all sample points map

Sally,

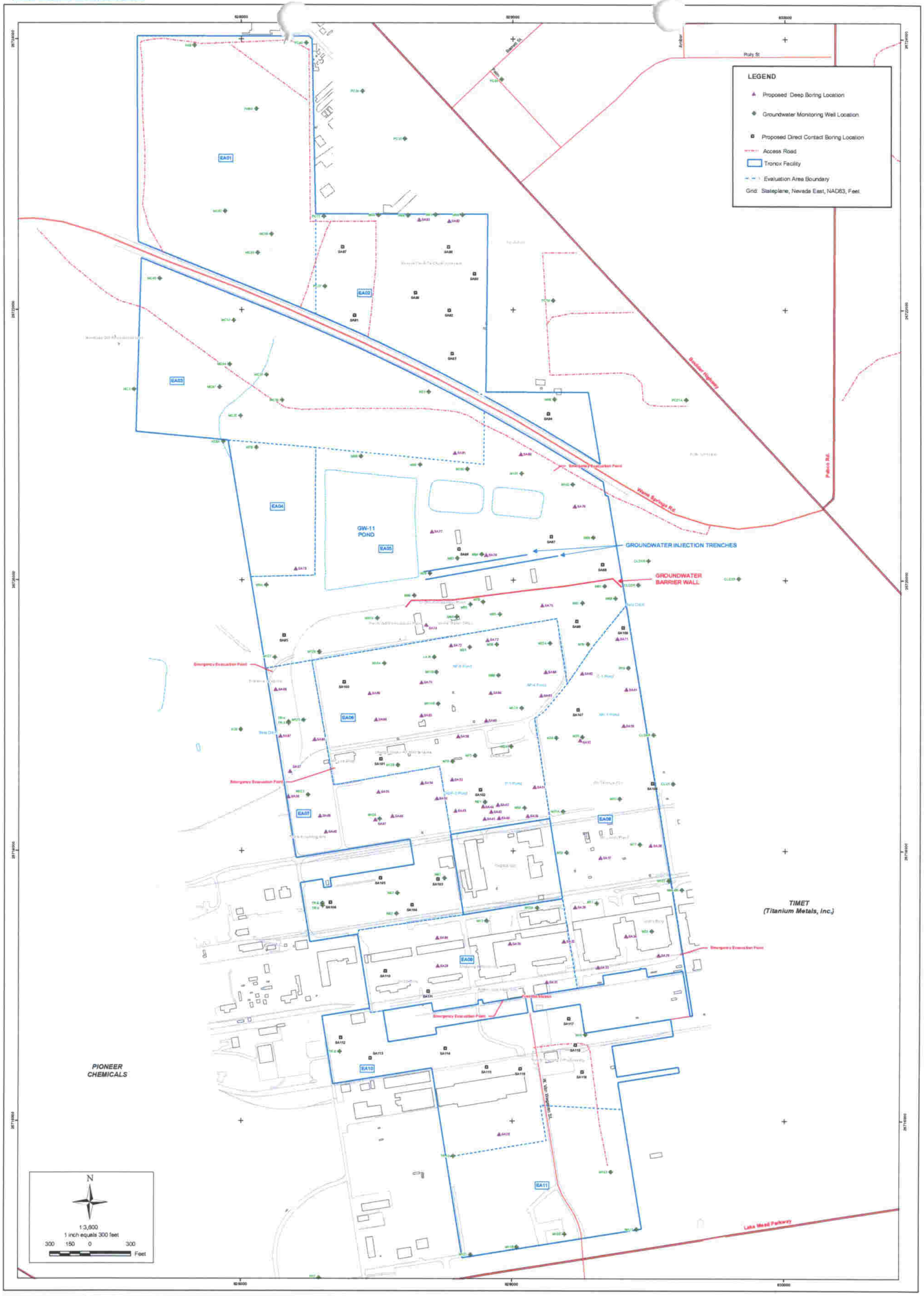
Is there any way to have this map but without the soil gas sampling locations as you stated below and a base layer like Figure I2-2 (i.e. without the aerial photo). I think that would be a lot more legible. Also, please provide larger maps to Teri Copeland, Paul Hackenberry, Paul Duffy, and Paul Black as well as to Brian and myself. Let me know if you need addresses.

Thanks,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
NDEP BCA-Las Vegas Office

From: Bilodeau, Sally [mailto:SBilodeau@ensr.aecom.com]
Sent: Monday, October 22, 2007 2:48 PM
To: Crowley, Susan; Keith Bailey; Gerry, Dave; Shannon Harbour
Subject: Tronox Phase B all sample points map

Team,
Attached is a Phase B all sample points map for your use.
I am making one with the soil gas points removed as requested.
Hard copies can be provided shortly, just let me know how many to send.



PROPOSED PHASE B SOIL AND GROUNDWATER SAMPLE LOCATIONS

PHASE B SOURCE AREA INVESTIGATION
TRONOX FACILITY
HENDERSON, NEVADA

SCALE:	DATE:	PROJECT NUMBER:
1:3,600	10/22/2007	04020-023-430

SHEET NUMBER: 1

PLATE NUMBER: I-1

ENSR | AECOM

ENSR CORPORATION
1220 AVENIDA ACASO
CAMARILLO, CALIFORNIA 93012
PHONE: (805) 388-3775
FAX: (805) 388-3577
WEB: HTTP://WWW.ENSR.AECOM.COM

DESIGNED BY:	B. Ho
DRAWN BY:	T. McAdam/M. Scop
CHECKED BY:	B. Ho
APPROVED BY:	B. Ho

REVISIONS

NO.:	DESCRIPTION:	DATE:	BY:

TRONOX

Shannon Harbour

From: Shannon Harbour
Sent: Wednesday, October 17, 2007 10:15 AM
To: 'Crowley, Susan'
Cc: Brian Rakvica; Keith Bailey; 'David Gratson'
Subject: RE: 070919_DVSR_Annual_Rpt (2).doc

Susan,

The NDEP approves the extension for the submittal of the Revised DVSR for the Annual Remedial Performance Report (Aug 2007) from October 18, 2007 to November 19, 2007.

Sincerely,
Shannon

Shannon Harbour, P.E.
Special Projects Branch
Bureau of Corrective Actions
NDEP-Las Vegas Office
2030 E Flamingo Rd Suite 230
Las Vegas, NV 89119
702-486-2850 x 240 (work)
702-486-5733 (fax) - note the new fax number

From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Wednesday, October 17, 2007 9:58 AM
To: Shannon Harbour
Cc: Brian Rakvica; Keith Bailey
Subject: 070919_DVSR_Annual_Rpt (2).doc

Shannon,
NDEP provided comments re the DVSR for the Annual Remedial Performance report in mid-September. For your convenience these are attached. In response to those comments, Tronox requested a set of full "CLP-like" packages for 10% of the analytical reports providing results that went into our remedial progress evaluation. These packages were delivered to us late last week and we are now performing the data validation for those. This validation should be complete by mid-November. We request an extension of the due date for the revised DVSR (which would include the 10% full package validation) from October 18th to November 19th to allow the validation process to be completed. Please let us know if this is OK? Thanks.

Susan Crowley
TRONOX LLC
PO Box 55
Henderson, NV 89009
p 702.651.2234
ef 405.302.4607
email susan.crowley@tronox.com

It's the set of our sails, not the force of the gales, that determines the way we go.

If you are not the intended recipient of this e-mail message, any use, distribution or copying of the message is prohibited. Please let me know immediately by return e-mail if you have received this message by mistake, then delete the e-mail message. Thank you.

Tronox Confidentiality Notice!
If you are not the intended recipient of this e-mail message, any use, distribution or copying of the message is prohibited.
Please let me know immediately by return e-mail if you have received this message by mistake, then delete the e-mail message.
Thank you.

TRONOX

Susan Crowley
Staff Environmental Specialist

(702) 651-2234
fax (405) 302-4607
susan.crowley@tronox.com

October 15, 2007

Ms. Shannon Harbour
Nevada Division of Environmental Protection
2030 East Flamingo Road, Suite 230
Las Vegas, Nevada 89119-0818

2007 OCT 18 A 11:30

RECEIVED

Dear Ms. Harbour:

Subject: Tronox LLC ECA Quarterly Report – Third Quarter 2007

Pursuant to Section XIII of the Consent Agreement, signed September 5, 1996, between Nevada Division of Environmental Protection (NDEP) and Tronox LLC (Tronox), we submit the following quarterly status report for the Henderson facility's Environmental Conditions Assessment (ECA).

Activities Conducted, 07-01-07 to 09-30-07

Conceptual Site Model:
- CSM remains unchanged until additional data justifies revisions

Upgradient Investigation Results:
- September 27 – Tronox transmits Upgradient Investigation report response to NDEP comments, together with revised executive summary, revised conclusions, and revised statistical histograms to NDEP.

Phase A - Source Area Investigation
- September 28 – Tronox submits the Phase A – Source Area Investigation Results report together with the Phase B – Source Area Investigation Workplan to NDEP for review.

QAPP and SOPs:
- July - September – Project-wide QAPP is in preparation, as well as Tronox-specific SOPs based on NDEP-approved BRC SOPs.

Community Involvement Plan
- August 30 - Tronox responds to comments and submits a revised Community Involvement Plan (CIP) to NDEP.
- September 18 – NDEP finds the CIP acceptable and requests an updated Fact Sheet by November 2.

Groundwater Capture Evaluation Work Plan
- August 30 – Tronox submits Revised Groundwater Capture Evaluation Work Plan and responses to June 26, 2007 NDEP comments.

Other

- July 13 – Tronox issued 2nd Quarter - 2007 ECA Status Report to NDEP.
- August 30 – Tronox submits *2007 Annual Remedial Performance Report – Perchlorate and Chromium Remediation Programs – July 2006 through June 2007* to NDEP.
- September 19 – NDEP provides comments on the data validation summary report (DVSR) for the Tronox *2007 Annual Remedial Performance Report.*

Please feel free to call me at (702) 651-2234, if you have any questions. Thank you.

Sincerely,

SMCrowley

Susan M. Crowley
Staff Environmental Specialist

Overnight Mail

Cc: See attached document distribution list

C:\smc\My
Documents\Documen
Doc Distribution

Tronox Document Distribution List Updated: 28-Aug-07

Document Name: ECA Quarterly Update

Name		Firm	Distribution		
(Last, First)			Hard	e-Copy	Cvr Only
Croft	Todd	NDEP	X		
King	Val	NDEP	X		
Najima	Jim	NDEP	X		
Rakvica	Brian	NDEP	X		
Sous	Nadir	NDEP			
Tinney	Al	NDEP	X		
Palm	Jon	NDEP	X		
Harbour	Shannon	NDEP	X		
Pohlmann	Brenda	COH	X		
Conaty	Barry	COH Counsel	X		
Durr	Paul	DAQEM			
Hunsaker	Ross	DAQEM			
Beckstead	Richard	DAQEM			
Jorgenson	Carolyn	DAQEM Counsel			
Mrowka	Rob	CCCP	X		
Mulroy	Pat	SNWA			
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Liesing	Joe	SNWA			
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Compliance Coordinator		DAQEM			
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Reed	Tom	Tronox	X		
Hurst	Elizabeth	Tronox Counsel	X		
Stater	Rick	Tronox	X		
Crowley	Susan	Tronox	X		
Bailey	Keith	Environ Answers	X		
Krish	Ed	ENSR	X		
Bilodeau	Sally	ENSR	X		
Gerry	Dave	ENSR	X		
Lambeth	Jeff	Veolia			
McDaniel	Tom	Veolia			
Cheung	Mary	Veolia			
Guerriero	Joe	AIG	X		
Giroux	Barry	GEI	X		
Stowers	Kirk	Broadbent			
		ERM			
Sahu	Rahnijit	BMI	X		
Crouse	George	Syngenta	X		
Erickson	Lee	Stauffer	X		
Kelly	Joe	Montrose			
Sundberg	Paul	Montrose	X		
Gibson	Jeff	AmPac			
Sylvia	Chris	Pioneer	X		
Wilkinson	Craig	Timet	X		
Mack	Joel	Montrose Counsel			

SH

TRONOX

Susan Crowley
Staff Environmental Specialist

(702) 651-2234
Fax (405) 302-4607
susan.crowley@tronox.com

October 9, 2007

RECEIVED
NDEP
LAS VEGAS
03-10-08A10:42 RCVD

Mr. Nadir Sous
Nevada Division of Environmental Protection
2030 East Flamingo Road, Suite 230
Las Vegas, NV 89119-0818

Subject: New UV System – Drawings and Operations Manual

Dear Mr. Sous:

Please find attached the drawings and operations manual associated with the newly installed UV equipment.

If you have questions or comments on this transmittal, please call me at (702) 651-2234 or call Keith Bailey at (405) 775-6526. Thank you.

Sincerely,

Susan Crowley
Staff Environmental Specialist

Overnight Express Mail

cc (without attachments): Please see attached distribution sheet

Smc/Drawings n Manual of New UV System to Sous 10-07.doc

C:\smc\My
Documents\Document

Tronox. Adding value beyond the product.
8000 West Lake Mead Parkway, Henderson, Nevada 89015 • P.O. Box 55, Henderson, Nevada 89009

Tronox Document Distribution List

Updated: 28-Aug-07

Document Name: Perchlorate Project General Docs *

* If docs are small then e-versions will not be produced and all will be distributed a hard copy

Name		Firm	Distribution		
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Croft	Todd	NDEP	X		
King	Val	NDEP			
Najima	Jim	NDEP			
Rakvica	Brian	NDEP	X		
Sous	Nadir	NDEP	X		
Tinney	Al	NDEP			
Palm	Jon	NDEP			
Harbour	Shannon	NDEP	X		
Pohlmann	Brenda	COH			
Conaty	Barry	COH Counsel			
Durr	Paul	DAQEM			
Hunsaker	Ross	DAQEM			
Beckstead	Richard	DAQEM			
Jorgenson	Carolyn	DAQEM Counsel			
Mrowka	Rob	CCCP			
Liang	Sun	MWD			
Mulroy	Pat	SNWA			
Goff	Mike	SNWA			
Liesing	Joe	SNWA			
Kaplan	Mitch	EPA, Reg 9			
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Reed	Tom	Tronox			
Hurst	Elizabeth	Tronox Counsel			
Stater	Rick	Tronox			
Crowley	Susan	Tronox	X		
Bailey	Keith	Environ Answers	X		
Krish	Ed	ENSR			
Bilodeau	Sally	ENSR			
Gerry	Dave	ENSR			
Lambeth	Jeff	Veolia	X		
McDaniel	Tom	Veolia			
Cheung	Mary	Veolia			
Guerriero	Joe	AIG			
Giroux	Barry	GEI			
Stowers	Kirk	Broadbent			
Sahu	Rahnijit	BMI			
Crouse	George	Syngenta			
Erickson	Lee	Stauffer			
Kelly	Joe	Montrose			
Sundberg	Paul	Montrose			
Gibson	Jeff	AmPac			
Sylvia	Chris	Pioneer			
Wilkinson	Craig	Timet			
Mack	Joel	Montrose Counsel			

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 9, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcel "F" Site, Henderson, Nevada, Revision 1 (dated September 19, 2007)

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-referenced Phase 2 Sampling and Analysis Plan (Phase 2 SAP) and finds that the document is acceptable with the following exceptions to be addressed in the resulting investigation report:

1. Table 1, the NDEP noted that data for TR-5 was not listed on this table as requested. Please provide this data in the investigation report. In addition, please provide discussion on included data that includes comments on comparability and applicability of the data.
2. Response to comments (RTC) 2.d, TRX states that no further evaluation of the vapor intrusion pathway is recommended for this part of the Phase 2 SAP because the depth to groundwater and that soil vapor sampling will conducted under another work plan. The NDEP acknowledges that the soil vapor will be addressed in another work plan but cautions that this data may be needed to facilitate a No Further Action Determination (NFAD).
3. RTC 7.e, TRX states that the mobile aboveground storage tank (AST) was on the adjacent TIMET property and appears to be empty with "some solid residue in the bottom". Please discuss what materials were in this tank. The NDEP has observed this tank on the northeast corner of grid F-B2. Please add a judgmental sample in this location. In addition, please state what actions TRX proposes for use or disposal of this AST. Please submit errata pages for the above-referenced report prior to the commencement of field work that addresses the addition of this sample (e.g. page 4, Figure 2, etc.).

Please contact the undersigned with questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Environmental Questions LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Brian Rakvica

From: Brian Rakvica
Sent: Friday, October 05, 2007 1:59 PM
To: 'Kennedy, Robert'
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; David Gratson
Subject: RE: Holding time for hexavalent chromium analyses

Robert,

Sorry, my mistake.

Sounds good.

Thanks,

Brian

From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Friday, October 05, 2007 1:58 PM
To: Brian Rakvica
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; David Gratson
Subject: RE: Holding time for hexavalent chromium analyses

Brian,

Method 218.6 can provide QLs equivalent to Method 7199.

The alkaline digestion prep is only for soils. We will continue to use EPA 3060A / EPA 7199 combination with all the previously agreed upon holding times for the soils.

Thanks again,

Robert Kennedy
Senior Project Chemist

ENSR
2 Technology Park Drive
Westford, MA 01886-3140
T 978-589-3324 F 978-589-3282
www.ensr.aecom.com

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Friday, October 05, 2007 4:51 PM
To: Kennedy, Robert
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; David Gratson
Subject: RE: Holding time for hexavalent chromium analyses

Robert,

If Method 218.6 provides adequate quantitation limits it is acceptable for the Phase B.

Does this also utilize the alkaline digestion prep method (3060)?

Thanks,

Brian

From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Friday, October 05, 2007 1:39 PM
To: Brian Rakvica
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; David Gratson
Subject: RE: Holding time for hexavalent chromium analyses

Brian,

Thanks for your prompt reply.

Tronox is providing Cr(VI) data by EPA 218.6 only for the routine monitoring Influent and Effluent samples currently.
Most of this data is provided for Tronox's NPDES permit as required by the Clean Water Act program.

If EPA Method 218.6 is acceptable for the RCRA program groundwater analyses in Phase B of the Source Area Investigation, then I want to be sure that the CWA program changes in the holding time for Cr(VI) described in my original email are also acceptable for the Phase B analyses.

Your response below indicates NDEP does not want Tronox to use a modified EPA 7199 with the holding time extended.
Please confirm that using EPA Method 218.6, with the 28 day holding time as described in the Federal Register citation below, will be acceptable to NDEP for the Tronox Phase B Source Area Investigation analyses of Cr(VI) in groundwater.

Thanks again for your help. Please call me if you have questions about this request.

Robert Kennedy
Senior Project Chemist

ENSR
2 Technology Park Drive
Westford, MA 01886-3140
T 978-589-3324 F 978-589-3282
www.ensr.aecom.com

From: Brian Rakvica [mailto:brakvica@ndep.nv.gov]
Sent: Friday, October 05, 2007 11:01 AM
To: Kennedy, Robert
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; David Gratson
Subject: RE: Holding time for hexavalent chromium analyses

Robert,

It appears that TRONOX is already using method 218.6 with the 28 day holding time. For the 2007 Annual Performance Report for Perchlorate and Chromium, July 2006 - June 2007 TRX used two hex chromium methods. For that project they used both methods 218.6 and 7196 (a non Ion Chromatography method).

NDEP would recommend that you continue to use method 218.6 rather than attempt to modify and get a non-standard method approved thru the certification program.

Please advise if this will meet TRX's needs.

Thanks,

Brian

From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Thursday, October 04, 2007 2:44 PM
To: Brian Rakvica
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave
Subject: Holding time for hexavalent chromium analyses

Brian,

This is a follow-up to our discussion about the possibility of extending the holding time for hexavalent chromium in groundwater at the Tronox Henderson site.

The reason for asking is that the field crew always has a logistical problem collecting the well water samples for Cr(VI) late enough in the day and shipping them to the lab for receipt early enough the next day to complete the analysis within 24 hours. Exceedances of the 24hr holding time are frequent at all the labs we have used and the data ends up being qualified as estimated or sometimes even rejected during validation.

Recently EPA modified the holding time for Cr(VI) by EPA Method 218.6 in the March 12, 2007 Federal Register. See http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-1073.pdf on page 11236 and the footnote on page 11239.

The new 28 day extended holding time is conditional. Samples must be filtered immediately and preserved with an ammonium sulfate buffer as specified in Method 218.6.

EPA has been peppered with questions about this rule and created a webpage to answer them. See http://www.epa.gov/waterscience/methods/update/questions-cr6.html

EPA Method 218.6 is essentially equivalent to EPA 7199 but OSW has not approved a similar holding time extension for EPA 7199 yet. ENSR is requesting NDEP that we be allowed to filter and preserve samples in the field per the EPA requirements above and extend the holding time to 28 days for Cr(VI) analysis in groundwater by EPA 7199. A second option would be to use EPA 218.6 proper with the extended holding time for all the groundwater analyses, but we would prefer to cite EPA 7199 for the extensive groundwater sampling this fall given that some of our labs are not yet certified in NV for 218.6 and we have made an effort to keep all the methods SW-846/ RCRA based if possible.

If you have any questions or would like to discuss the details please call me.

Thanks for considering this request. We are currently planning our field effort for the Phase B sampling in early November and a decision about this, one way or the other, would be very helpful. I look forward to hearing from you soon.

Robert Kennedy
Senior Project Chemist

ENSR
2 Technology Park Drive
Westford, MA 01886-3140
T 978-589-3324 F 978-589-3282
www.ensr.aecom.com

Brian Rakvica

From: Brian Rakvica
Sent: Friday, October 05, 2007 8:01 AM
To: 'Kennedy, Robert'
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave; Shannon Harbour; 'David Gratson'
Subject: RE: Holding time for hexavalent chromium analyses

Robert,

It appears that TRONOX is already using method 218.6 with the 28 day holding time. For the 2007 Annual Performance Report for Perchlorate and Chromium, July 2006 - June 2007 TRX used two hex chromium methods. For that project they used both methods 218.6 and 7196 (a non Ion Chromatography method).

NDEP would recommend that you continue to use method 218.6 rather than attempt to modify and get a non-standard method approved thru the certification program.

Please advise if this will meet TRX's needs.

Thanks,

Brian

From: Kennedy, Robert [mailto:rkennedy@ensr.aecom.com]
Sent: Thursday, October 04, 2007 2:44 PM
To: Brian Rakvica
Cc: Ho, Brian; Bilodeau, Sally; Gerry, Dave
Subject: Holding time for hexavalent chromium analyses

Brian,

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The reason for asking is that the field crew always has a logistical problem collecting the well water samples for Cr(VI) late enough in the day and shipping them to the lab for receipt early enough the next day to complete the analysis within 24 hours. Exceedances of the 24hr holding time are frequent at all the labs we have used and the data ends up being qualified as estimated or sometimes even rejected during validation.

Recently EPA modified the holding time for Cr(VI) by EPA Method 218.6 in the March 12, 2007 Federal Register. See http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-1073.pdf on page 11236 and the footnote on page 11239.

The new 28 day extended holding time is conditional. Samples must be filtered immediately and preserved with an ammonium sulfate buffer as specified in Method 218.6.

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If you have any questions or would like to discuss the details please call me.

Thanks for considering this request. We are currently planning our field effort for the Phase B sampling in early November and a decision about this, one way or the other, would be very helpful. I look forward to hearing from you soon.

Robert Kennedy
Senior Project Chemist

ENSR
2 Technology Park Drive
Westford, MA 01886-3140
T 978-589-3324 F 978-589-3282
www.ensr.aecom.com

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 5, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Annual Remedial Performance Report for Chromium and Perchlorate, Tronox LLC, Henderson, Nevada
Dated August 29, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified performance report and provides comments in Attachment A. These comments should be addressed in future performance report submittals (quarterly, semi-annual, and annual) as relevant. TRX should additionally provide an annotated response-to-comments letter as part of the next performance report submittal unless otherwise noted. Alternately, many of these issues could be discussed in a telephone conference or meeting. Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
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Keith Bailey, Environmental Answers LLC, 3229 Persimmon Creek Drive, Edmond, OK 73013
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Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
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Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
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Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Michael Bellotti, Olin, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Curt Richards, Olin, PO Box 248 1186 Lower River Road, Charleston TN 37310-0248
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Attachment A

1. General comment, the NDEP requests that TRX report the flow and contaminant loading capacities of each of the groundwater treatment systems in future performance reports.
2. General comment, the NDEP has noted many instances of TRX using words like "clean", "low", and "significantly" without quantification. Please quantify statements using relative words, such as these, in future report submittals. The NDEP has noted some examples of this in the following comments.
3. Section 2.1, Interceptor Well Field Area, NDEP has the following comments:
    a. TRX states that "clean Lake Mead water" is injected for artificial recharge to the area north of the barrier wall. Please quantify what is meant by "clean". There is an incremental concentration of perchlorate in Lake Mead water which has varied over time. For clarity it would be helpful to understand this range of inputs.
    b. TRX states the "mound" created by the injection of Lake Mead water into the infiltration trenches north of the barrier wall has been "dissipating". Discuss how and/or why this is occurring.
    c. TRX states that the formation contact at both ends of the barrier wall was remapped and confirmed the presence of "inter-channel Muddy Creek ridges at both ends of the barrier wall". Please provide the information that was used for this remapping.
    d. TRX proposed to use video techniques to investigate well inefficiencies suggested by the groundwater elevation data differences between the Interceptor wells and adjacent monitoring wells. Additionally, TRX proposes to rehabilitate well screens as necessary. Please provide a schedule for this investigation and rehabilitation **by November 5, 2007.**
4. Section 3.1, Chromium Plume Configuration, TRX states that the highest total chromium concentration reported north of the recharge trenches was 4.0 mg/L. Please state which well this concentration is associated with.
5. Section 3.1.1, On-Site Interceptor Well Field Area, NDEP has the following comments:
    a. TRX states that the total chromium concentration from January 2002 to May 2007 has decreased 94.7% but in the follow sentence states that the decrease was 97.4%. It appears that one of these statements may be a typographic error; please clarify which percentage is correct.
    b. TRX states that the concentration of perchlorate for groundwater monitoring well M-100 in January 2002 was 9.2 mg/L. Appendix A does not list any data for January 2002. Please clarify.
    c. TRX calculated the percent decrease from January 2002 to May 2007 for total chromium in monitoring well M-100. TRX then used this percent decrease to determine that a maximum of 1.6 gpm of groundwater at 9.2 mg/L total chromium could be flowing around the barrier wall. This calculation assumes that the groundwater concentration for total chromium flowing around the barrier wall is 9.2 mg/L. Please discuss this assumption. As part of this discussion, TRX should consider the groundwater containing less than 0.1 mg/L that is traveling around the east and west ends of the barrier wall. This groundwater could contribute to the concentration reduction observed in M-100.
    d. TRX states that "…leaking around the barrier wall to keep M-23 at 0.24 mg/L (total chromium)". Appendix A and Plate 6 show M-23 with a total chromium

concentration of 0.88 mg/L and M-100 with a total chromium concentration of 0.24 mg/L. Please clarify if the text should reference M-100 instead of M-23.

  e. TRX states that "the barrier wall also acts as an effective barrier to the downgradient flow of highly-impacted groundwater." Please quantify what is meant "highly-impacted groundwater".
  f. TRX states that by using the well triplet M-74, CLD1-R, and CLD2-R near the eastern end of the barrier wall that a local groundwater flow direction of N20W, which flows from the east onto TRX property. TRX additionally states that there is "an unsaturated Muddy Creek fine-grained-facies bedrock high that separates the eastern end of the barrier wall from CLD2-R. Plate 3 illustrates this Muddy Creek ridge as extending between CLD2-R and M-74. Please explain how the flow direction calculated using these three wells is valid if they are separated by a subsurface feature.
  g. Please provide the information indicating the locations of the "unsaturated Muddy Creek fine-grained-facies ridges" to the west and east sides of the barrier wall.
  h. TRX states that "water levels have been dropping in M-68 – 14.4 feet of drawdown since 1987 (Table 2) – and in CLD2-R." Please note and revise the text that drawdown information and calculations are provided in Table 1. Additionally, TRX does not provide the historical groundwater elevation data for CLD2-R. Please provide the historical data collected at CLD2-R in Appendix A in future performance reports. In addition, please note that the NDEP believes that statements regarding drawdown are of limited use. These statements taken out of context of regional groundwater level trends do not confirm capture. It is expected that this issue and all other capture related issues will be addressed via the capture zone analysis being conducted separately.

6. Section 3.2, On-Site Chromium Treatment System, the NDEP has the following comments:
   a. TRX reports the amount influent water to the Groundwater Treatment Plant (GWTP) is a million gallons in the month of May but predominantly uses gallons per minute (gpm) throughout the rest of the document. The NDEP requests that TRX report in consistent units throughout the document.
   b. TRX discusses that it appears that total chromium, in the form of suspended solids, appears to be passing through the chromium treatment system but is being captured in the GAC vessels. NDEP notes that GAC is a very inefficient method to filter solids. In addition, if this was occurring, it would seem that the GAC vessels would eventually become filled with solids. Please explain TRX's methodology for mitigating this situation.
   c. TRX states that the "chromium impacted groundwater" is ultimately discharged as "clean effluent". Please quantify what is meant by "clean effluent".
   d. TRX discusses that "all total and hexavalent chromium analyses, except two, have been non-detect". It is suggested that these anomalies be discussed in future reporting,.
7. Section 3.3, Potential On-Site Interim Chromium Remediation, TRX states that they will discuss treatment alternatives with NDEP by October 1, 2007. To date, TRX has not initiated this discussion. Alternatively, TRX additionally proposed the pumping of groundwater wells M-70 and M-71 in the Revised Work Plan to Evaluate Effective Groundwater Capture at Tronox Extraction Systems (dated August 29, 2007). NDEP has

responded to this issue in a response to the above-referenced Work Plan in a letter dated October 3, 2007. Please address this issue as requested in the October 3, 2007 letter. It is suggested that TRX consider expansion of the clarification capacity and possibly adding filtration to the discharge of the chromium treatment unit.

8. Section 4.1.1, Interceptor Well Field Area, the NDEP has the following comments:
    a. TRX states that the three components of this well field have "significantly" reduced the amount of perchlorate in the downgradient groundwater. Please quantify what is meant by "significantly".
    b. TRX uses "low" to describe the perchlorate concentrations in the area of the recharge trenches. Please quantify what is meant by "low".
    c. TRX calculated the percent decrease of the perchlorate concentration downgradient of the barrier wall from approximately 1,000 mg/L in July 1998 to less than 100 mg/L currently. TRX then used this percent decrease to determine that a maximum of 6 gpm of 1,000 mg/L perchlorate could be flowing around the barrier wall. This calculation assumes that the groundwater concentration for perchlorate flowing around the barrier wall is 1,000 mg/L. Please discuss this assumption. As part of this discussion, TRX should consider the groundwater containing less than 10 mg/l and 25 mg/l which is traveling around the east and west ends of the barrier wall, respectively. This groundwater could certainly contribute to the expansion of the less than 100 mg/l zone of perchlorate.
9. Section 4.1.2, Athens Road Well Field Area, TRX refers to the model completed by the NDEP's contractor; however, TRX does not recognize all of the data gaps identified by the model. TRX should acknowledge these data gaps or discuss how these data gaps have been addressed in future performance reports.
10. Section 4.3, On-Site Perchlorate Remediation, please include an explanation of the transfer process from AP-5 pond to GW-11.
11. Figures, the NDEP has the following comments and suggestions:
    a. Figure 2, West – East Hydrogeologic Cross Section A-A' Interceptor Well Field May 2007, TRX illustrates a Tertiary Muddy Creek formation (TMCf) high on the west and east ends of the barrier wall. The text in Section 2.1 states that this area was "recently remapped". Please provide the information used for the remapping of this area.
    b. Figure 7, Tronox Henderson Groundwater Treatment Block Flow Diagram, in Section 3.2, TRX states that the influent to the GWTP includes "about 25 gpm from GW-11" but Figure 7 states that the influent to GWTP includes only "about 20 gpm" from GW-11. Please revise accordingly.
    c. Figure 7, TRX states that the three activated carbon vessels "remove organics which could harm bacteria". Please discuss this matter with the NDEP and provide analytical data to substantiate this statement. NDEP does not have sufficient assurance that TRX is monitoring the performance of the carbon vessels in a manner that will be protective of the FBR system.
    d. Figure 7, please add a notation to indicate where the "FBR Influent" and "FBR Effluent" samples are taken.
12. Tables, the NDEP has the following comments and suggestions:
    a. Table 2, Interceptor Well Discharge Rates (GPM), the NDEP has the following comments:

    i. TRX reports a total discharge rate for the Interceptor Wells listed in Table 2 of 64.2 gpm for June 2007. In Table 7, Groundwater Chromium Treatment Data July 2006 to June 2007 reports an average flow of 2.78 million gallons for June 2007 to the GWTP. Figure 7 shows that the inflow to the GWTP is the combination of the Interceptor Wells discharge plus approximately 20 gpm from pond GW-11. If the flow discharge rate from Table 2 is added to the approximately 20 gpm from pond GW-11, the inflow to the GWTP is 84.2 gpm (3.64 million gallons for June 2007). Please clarify this discrepancy.
    ii. TRX lists a "NI = Not operational" as a footnote in this table but uses "NO" in the table. Please revise as necessary.
  b. Table 6, Well PC-119 appears to have been turned off, please explain.
  c. Table 7, Groundwater Chromium Treatment Data July 2006 to June 2007, the NDEP requests that this table be combined with Table 8 with the following column headings (units): Month, Average Influent Flow to GWTP (gpm), Average Total Cr Influent Concentration to GWTP (mg/L), Average CrVI Effluent Concentration from GWTP (mg/L), Average Total Cr Effluent Concentration from GWTP (mg/L), Average Influent Flow to FBR (gpm), Average CrVI Influent Concentration from FBR (mg/L), Average Total Cr Influent Concentration to FBR (mg/L), CrVI Effluent Concentration from FBR (mg/L), Average Total Cr Effluent Concentration to FBR (mg/L).
  d. Table 8, July 2006 To June 2007 Weekly Chromium (mg/L) in FBR Influent and Effluent, please combine with Table 7 (please see above comment). Also note that the TRX does not need to have a column for detection limits if they report the concentrations as less than the numerical value of the detection limit (e.g. <0.0001).
  e. Table 8, it appears that there is a mechanism that is removing chromium between the influent and effluent of the FBR. Please explain what this mechanism is.
  f. Table 9, Perchlorate Removed from the Surface and Groundwater, please add total chromium removed to this table.
  g. Table 10, July 2006 to June 2007 Weekly Perchlorate in FBR Influent and Effluent, the NDEP requests that this table be revised to have the following column headings (units): Month, Average Influent Flow (gpm), Average Perchlorate Influent Concentration (mg/L), and Average Perchlorate Effluent Concentration. Additionally, TRX does not need to have a column for detection limits if they report the concentrations as less than the numerical value of the detection limit (e.g. <0.0001).

13. Appendix A, the NDEP has requested that TRX provide all available data in an electronic format for each performance report. To date, the electronic data has not been complete; numerous wells and historic data have not been included.
14. Appendix D, the NDEP has the following comments:
    a. TRX Response to March 29, 2007 NDEP comments of the Semiannual Performance Report Dated February 26, 2007, the NDEP has the following comments:
        i. In response to comments (RTC) 14.a, TRX states that they will "review and set-up procedures for the graphical representations … to unify scales and ranges where practical." The NDEP did not observe any of the scales in Appendix B of the Annual Report to be unified. Please note that NDEP's original comment

    was for all future performance reports that contain these graphs and not just future Semiannual Performance Reports.
    - ii. RTC 17, TRX states that they will provide all parts of their database used for the development of the report. This information was not included.
  - b. TRX RTC for NDEP's July 2, 2007 Comments on the Quarterly Performance Report dated May 29, 2007:
    - i. RTC 4, no update on monitoring wells ARP-4, ARP-5, and ARP-6 was included in the text of the report.
    - ii. RTC 18, the NDEP originally requested that TRX submit a schedule for and clarification on the intended procedures for the recommended pump test on M-71 and M-72. In the Annual Performance Report, TRX has recommended pumping wells M-70 and M-71 but did not provide a schedule or recommended procedures. As previously stated above, the NDEP has responded to this issue in a response letter dated October 3, 2007. Please address this issue as requested in the October 3, 2007 letter.

15. Appendix F, NDEP has the following comments that should be addressed under separate cover (in a Sampling and Analysis Plan) and submitted by **November 16, 2007**:
    - a. General comment, please note that the sampling plan is subject to change pending the submittal of additional data.
    - b. General comment, the issues outlined below would likely be addressed most effectively in a meeting.
    - c. The NDEP has noted on Plates 2, 6, 7, etc. that there are concentration and groundwater elevation data for wells not listed in Appendix F. Please add a table listing these wells that includes, at a minimum the owner of the wells, whether the respective owner of the well obtains and analyzes the sample and provides the data to TRX, and what analytical data TRX receives (or for what analytes does TRX sample).
    - d. Table F-4, NDEP requests the following:
      - i. The addition of total chromium analysis for the following wells: H-48, H-58A, MC53, and MC65.
      - ii. The addition of wells AA-01, LG025, BEC-1, POU3, and AA-11 to the annual sampling schedule.
      - iii. The rationale for limiting the number of samples collected for chlorate and nitrate analysis as compared to the number of samples collected for perchlorate.
      - iv. The rationale for the limited number of samples collected for Cr-VI analysis.
    - e. A separate table listing all wells required to be sampled by permits, AOC, etc., the required frequency of sampling, and the analytes required.
    - f. Figure F-2, TRX notes that PC-10 has been plugged and abandoned in Table F-4, please verify the status of the well and remove PC-10 from Figure F2 if not useable.
    - g. Figure F-4, please add the following wells to this figure: H-48, H-58A, MC53, and MC65.
    - h. TRX proposes weekly sampling from the pumping wells at the Seep and Athens Well Fields but only quarterly sampling from the pumping wells at the Interceptor Well Field. Please discuss the rationale for the difference in sampling frequency.
    - i. TRX proposes monthly sampling for several wells not associated with a well field. Please provide the rationale for this sampling frequency for these wells.

j. TRX proposes monthly sampling for several wells associated with a well field but are not pumping wells. Please provide the rationale for this sampling frequency for these wells.

TRONOX + SCOP meeting

10/4/07
7:30AM

→ attendance : per list

→ noted: construction dewatering will occur + contain
various contaminants

→ **noted:** SCOP will likely be the permit holder for
dewatering permits

→ noted: Alan Tinney - writing NPDES permit for SCOP
and would write all dewatering permits

→ noted contaminated water → @ Pabco / CoH alignment
and beneath the water

→ schedule : - in final design - currently
- CoH forcemain - start mid-2008
due to construction of CC Parks trailhead

→ noted this will be very close to the existing TRX
pipelines and many other utilities

→ dewatering - quantity? not calculated yet
↳ may be able to use CoH RIBS to
reinject dewatering water

→ TRX concern re: Seep area flows during this if reinjected could cause more water in Seep

→ noted Seep usually dry April ~ October and this is the best time to dewater

→ also noted w/ Tamarisk removal this may be different next year

→ it is expected that dewatering will only occur few weeks

→ discuss TRX mixing zone
  → TRX doesn't know what flow they need in the Wash to achieve mixing
  → Mn, Fe, TDS, others
  → TRX is re-evaluating right now, next few weeks
  →

→ COH WRF on-line ~ mid-2008
  → noted Birding Ponds will also be higher quality
  →

→ noted NDEP ok with SCOP dumping to RIBS if City is not using RIBs + causing a problem

3

10/4/07

<u>FBR capacity</u>

chemical - very high
hydraulic - 1000 gpm

- disc. dewatering to the Wash - problematic, BWC suggests **RIBs**
- if discharge to CoH RIBs - would likely be a modification to exist permit <u>or</u> with CWC
- disc. permitting of north side - different phases of permits
- TRX - spends → over $5m / year to operate FBR
- Start up 2012 → flow rates 30-50 mgd in Wash plus 20 mgd base flow

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 3, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Revised Work Plan to Evaluate Effective Groundwater Capture at Tronox Extraction Systems, Tronox LLC, Henderson, Nevada
Dated August 29, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's Work Plan identified above and provides comments in Attachment A. The NDEP has received and reviewed the aforementioned Deliverable and finds that the Deliverable is acceptable. Please note that the comments provided below should be reviewed and incorporated into the capture zone evaluation report. It is requested that TRX review the comments below and schedule a meeting with the NDEP by **October 31, 2007.** This meeting can be in-person or via telephone.

Please contact the undersigned with any questions at sharbour@ndep.nv.gov or (702) 486-2850 x 240.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:bar:sh

CC: Jim Najima, NDEP, BCA, Carson City
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Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110
Paul Hackenberry, Hackenberry Associates, LLC, 550 W. Plumb Lane B425, Reno, Nevada 89509

Attachment A

1. General comment: TRX interchangeably uses the terms "slurry wall" and "barrier wall" in the text and figures of the Work Plan. Please resolve this terminology in future Deliverables.
2. General comment: the NDEP did not note the reference of any standard operating procedures (SOPs) in the Work Plan. Please provide references for all applicable, approved SOPs by **October 24, 2007**. If new SOPs are needed please forward them to the NDEP as soon as possible for review.
3. General comment, please discuss if any hydraulic testing will be conducted in the wells that are proposed to be installed (e.g.: slug testing or pump testing) **at the meeting referenced in the cover letter.**
4. Section 2.1.1, Performance Evaluation, Flow Budget, the NDEP has the following comments (please note that these comments are also applicable to Appendix B):
    a. TRX states that "The presumed upward flow of groundwater is further enhanced by the pumping upgradient of the barrier. Given this enhancement to upward flow, it would be anticipated that perchlorate mass if present within the upper portion of the Muddy would be locally influenced in the vicinity of the barrier and interceptor well field." The first sentence starts with a presumption about upward flow and the second sentence starts with the upward flow as a "given." Please clarify what is meant by this statement and if this refers to the unconfined portion of the Muddy Creek formation or the confined portions.
    b. TRX states that the "Groundwater in the Muddy Creek, subsequently "dammed up" behind the groundwater barrier wall…" Please provide a cross-section of the Interceptor Well Field including the as-built dimensions of the barrier wall for a comparison of well depths versus the depth of the barrier wall and the depths of the geologic units.
    c. TRX states that the "Groundwater flowing vertically and "daylighting" from the Muddy Creek upwards into the incised alluvial channels up-gradient from the slurry wall. The third flow element is included in the budget, since the estimates of flow from the alluvium and Muddy Creek dammed behind the barrier do not adequately account for the water being pumped at the interceptor well field. The calculations and input parameters are provided in Appendix B." If this is truly a vertical flow component then the hydraulic conductivity used should not be the same as the horizontal hydraulic conductivity. Vertical hydraulic conductivity is typically several orders of magnitude less than horizontal hydraulic conductivity. It is suggested that TRX collect this data as part of the implementation of the Work Plan. **Please discuss this matter with the NDEP at the meeting referenced in the cover letter.**
    d. Please consider that the existence of water dammed up behind the barrier wall and water mounded in the "dead zone" may produce a downward gradient into the Muddy Creek formation.
    e. Please consider that the density of the water may produce a downward gradient into the Muddy Creek formation.
    f. Please consider installing several co-located wells which are screened in the various portions of the unconfined aquifer (e.g.: the Quaternary alluvium; the transition zone; and the Tertiary Muddy Creek formation). **Please discuss this matter with the NDEP at the meeting referenced in the cover letter.**

   g. Please develop a block diagram for each well field which demonstrates the relationships between the water bearing zones and utilizes existing gradients and density data. If sufficient information is not available to develop these block diagrams the scope of work for this Work Plan should be revised. **Please discuss this matter with the NDEP at the meeting referenced in the cover letter.**

5. Section 2.1.1, Performance Evaluation, Downgradient Concentration Declines over Time, the NDEP has the following comments:
   a. The NDEP does not believe that the recharge water is "totally" responsible for the expansion of the area containing less than100 mg/L perchlorate but a contributing factor. Incremental analysis using either concentrations or pumping rates does not adequately demonstrate what is responsible for the expanding area of < 100 mg/L perchlorate. The NDEP suggests that this analysis requires a mass balance approach.
   b. TRX calculated the percent decrease of the perchlorate concentration downgradient of the barrier wall from approximately 1,000 mg/L in July 1998 to less than 100 mg/L currently. TRX then used this percent decrease to determine that a maximum of 6 gpm of 1,000 mg/L perchlorate could be flowing around the barrier wall. This calculation assumes that the groundwater concentration for perchlorate flowing around the barrier wall is 1,000 mg/L. Please discuss this assumption. As part of this discussion, TRX should consider the groundwater containing less than 10 mg/l and 25 mg/l which is traveling around the east and west ends of the barrier wall, respectively. This groundwater could certainly contribute to the expansion of the less than 100 mg/l zone of perchlorate.
   c. TRX states that "clean Lake Mead water" is injected for infiltration to the area north of the barrier wall. Please quantify what is meant by "clean". There is an incremental concentration of perchlorate in Lake Mead water which has varied over time. For clarity it would be helpful to understand this range of inputs.
   d. Additionally see Appendix A, RTC 12 below.
6. Section 2.1.3, Data Gaps and Proposed Additional Evaluation, the NDEP has the following comments:
   a. In the second bullet, TRX proposes the installation of two monitoring wells at the east and west ends of the barrier wall to demonstrate the existence of an upward gradient from the MCFf to the alluvium. As noted above, the NDEP additionally suggests that core samples should be collected and tested for vertical hydraulic conductivity from the proposed monitoring wells to be installed in the Tertiary Muddy Creek formation (TMCf). The assessed vertical hydraulic conductivity should then be substituted into Table B-1 for the "Muddy Creek Upflow" to be used for calculations.
   b. In the last paragraph of section, TRX states that "Though not a data gap…" The NDEP believes that a data gap does exist in this area; however, the NDEP does acknowledge that proposed monitoring wells IM-2 and IM-4 are being installed to address the data gap to the west of the barrier wall and that the purpose for installing proposed extraction well, IEX-1, is for remediation and not necessarily for additional characterization.
7. Section 2.2, Athens Road Well Field, the NDEP has the following comments:
   a. In this Section and throughout the Work Plan, TRX refers to the model completed by the NDEP's contractor, however, TRX does not recognize all of the data gaps identified by the model. Examples follow.

   b. The model states "Perchlorate concentration data for key well positions do not appear to indicate complete ARF capture is being achieved. The results of this analysis are not consistent with the results of the particle tracking exercise described above, which indicated that all particle pathways end at extraction well locations, and that "complete capture" is achieved."
   c. The Model also states "Additional modeling efforts beyond those described herein, pending the discovery of significantly different data, may include expanding the model to three dimensions (e.g., simulating interaction between Qal and MCf or the Muddy Creek transition zone). Also, calibration of the current solute transport model may be warranted in the case of modified project objectives (e.g., more precise evaluation of mass removal efficiency is deemed necessary).
   d. Another noted limitation of the model was stated as "Given the large hydraulic conductivity contrast between the Qal and MCf, groundwater flow and solute transport are inferred to be largely dominant in the alluvium. However, some degree of communication is presumed to occur."

8. Section 2.2.1, Performance Evaluation, Overlapping Cones of Depression, TRX states that "Overlapping cones of depression are evident from data collected from adjacent piezometers and monitoring wells, indicating that the well field has developed a capture zone sufficient to encompass the width of the plume in this area." Please note that drawdown does not equal capture. The NDEP suggests that it would be more accurate to state "Overlapping cones of depression are evident from data collected from adjacent piezometers and monitoring wells, indicating that the well field has developed an area of drawdown sufficient to encompass the width of the plume in this area."
9. Table 1, the NDEP requests that TRX prepare and submit cross-sections which present the proposed locations and depths of the new wells relative to existing wells, geologic units and saturated thicknesses. Please provide this at the meeting referenced in the cover letter.
10. Appendix A, the NDEP has the following comments:
    a. Response to comment (RTC) 12, the NDEP has the following comments:
        i. The NDEP acknowledges TRX's RTC but please note that the RTC does not rebut the implication that dilution could also be a factor in the concentration decline.
        ii. In Section 2.1.1 Performance Evaluation, Flow Budget, TRX states that "The slurry wall, installed in 2001, has dramatically improved groundwater capture. Current capture rates of about 65 gpm are double those before the wall was installed." Please reconcile the above-statement with RTC 12.
        iii. Additionally see comments above for Section 2.1.1.
    b. RTC 14, TRX proposes to "mine" wells M-70 and M-71 by pumping contaminated groundwater from the "dead zone" north of the barrier wall allowing the injected Lake Mead water to "migrate further into this area and assist in lowering the groundwater concentrations via flushing or dilution. In Section 2.1.3, TRX proposes to pump wells M-70 and M-71 and monitor the perchlorate concentration over time to "demonstrate the slurry wall is continuous and does not leak significantly along its length". The NDEP does not understand that if TRX is expecting the infiltration of Lake Mead water into this area, thereby reducing the contaminant concentrations, how pumping M-70 and M-71 will demonstrate the integrity of the barrier wall.

Please explain if the injection of Lake Mead water will be halted during these pump tests. Please clarify. **This matter must be discussed at the meeting requested in the cover letter.**

11. Appendix B, the NDEP has the following comments:
    a. Table B-1, as noted previously, the NDEP does not agree with the use of a horizontal hydraulic conductivity to calculated vertical flow.
    b. Table B-2, the NDEP noted that the electronic version provided with the original document included a duplicate of Table B-1 instead of Table B-2. Please provide a corrected electronic version of this Work Plan to the NDEP by **October 24, 2007**.
12. Appendix C, the NDEP has the following comments:
    a. TRX states that "… Lake Mead water containing very low concentrations of total chromium and perchlorate has moved a sufficient distance in the groundwater to a monitor well…" Please quantify what is meant by "very low concentrations of total chromium and perchlorate" and "sufficient distance".
    b. In Table C-1, TRX reports groundwater velocities ranging from 1.1 ft/d to 12.3 ft/d. Please discuss if separate groundwater velocities should be calculated for the alluvium, alluvial channels, and the inter-channel areas.
    c. The NDEP requests that the seepage velocity be calculated using hydraulic parameters for comparison. It is requested that TRX also collect physical parameter data in applicable geologic units during the implementation of this Work Plan (e.g.: dry bulk density, specific gravity, etc.). **Please discuss this matter with the NDEP at the meeting referenced in the cover letter.**

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations.

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

October 1, 2007

Legal Copy Cats & Printing
300 4th Street
Las Vegas, Nevada 89101

RE: **Copying Job**
NDEP Bureau of Corrective Actions:
Tronox (former Kerr-McGee) Files

Dear Sir/Madam:

- The accompanying files are the property of the State of Nevada, Division of Environmental Protection (NDEP). They are **ORIGINAL** official state case files, and are irreplaceable. Two reports have been submitted for copying.

- Andrea Havens of Converse Consultants has requested copies of the accompanying files.

- Please make one set of copies in the same order as they have been presented to you. Please maintain the page-to-page order of the files. Double sided originals may be copied to single sided sheets if it makes your process easier and more cost effective.

- Please assure that the exact order of the files and their contents are maintained throughout the process. This is **very** important. Please separate the copies from the originals.

- Please return originals to the NDEP office. The copies will be sent to Andrea Havens of Converse Consultants.

- The Nevada Division Project Officer responsible for these files is Shannon Harbour who can be reached in the Las Vegas Office at 486-2850 ext 240. Please call with any questions.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Special Projects Branch
Bureau of Corrective Actions, NDEP

2030 E. Flamingo Road, Suite 230 • Las Vegas, Nevada 89119 • p: 702.486.2850 • f: 702.486.2863 • www.ndep.nv.gov
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FINAL

Meeting Minutes

To: Clean Water Coalition Team & NDEP **Date:** September 21, 2007

From: Converse Consultants **Project No:** 98-33506-05 Tasks 3 & 6

INFORMATIVE DISCUSSION ON GROUNDWATER QUALITY WITH THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

THE POTENITAL INFLUENCE ON DESIGN & CONSTRUCTION PHASES OF THE PROPOSED CWC-SCOP COH FORCEMAIN

Attendees:

Name	Company/Agency	Phone number
Todd Croft	Department of Conservation & Natural Resources, NDEP	702-486-2850
Shannon Harbour	Department of Conservation & Natural Resources, NDEP	702-486-2850
John Worlund	Converse (by phone)	360-592-3080
Anna Draa	Converse	702 269-8336
Andrea Havens	Converse	702-269-8336
Rob Gegenheimer	Converse	702-269-8336

The meeting held on Friday, September 21st, 2007 was a continuation of discussions related to groundwater quality and the potential for dewatering related issues during construction and operation of the Systems Conveyance and Operations Program (SCOP). This meeting was initiated to develop a working relationship between Converse (acting on behalf of the CWC) and the Nevada Division of Environmental Protection (NDEP) in order to prepare for groundwater conditions along the SCOP alignment, specifically those areas along the City of Henderson (COH) Forcemain, which may have the potential to impact design, construction and/or facility operation.

Current Perchlorate Conditions

NDEP provided a brief history of known areas of groundwater contamination, specifically perchlorate plumes along the COH Pumping Station and Forcemain alignments. Currently, Groundwater Characterization Reports have been submitted to the CWC and NDEP for these areas summarizing groundwater quality as encountered in monitoring wells installed by Converse. Converse briefly discussed water quality results in regards to the known areas of contamination (specifically perchlorate) at which time NDEP described current mitigation strategies operated by various entities in the general vicinity of the proposed alignments. A general idea of the approximate total contributions of perchlorate to the Las Vegas Wash as of the Fall of 2007 was summarized as shown below.

Perchlorate Contributions to the LV Wash (lbs/day)	**Possible Source**
~ 35	Tronox Plume
~ <5	AMPAC Plume
~ ≤10	Return flow
~ 10	Groundwater underflow
~ 15	LV Wash Bank Storage
~ 10	Others
Total Perchlorate Loading to the LV Wash = ~ 60 – 90 lbs/day	

Currently, the Las Vegas Wash (Wash) has less than 100 pounds per day of perchlorate loading. In the past, perchlorate loading requirements for return flow related to construction dewatering Temporary Discharge Permits have been based on ~10% of the current perchlorate mass flux in the Wash. Considering this, it may be assumed that future construction dewatering discharges to the wash could not exceed ~10 pounds per day of perchlorate. During the planning stages for construction dewatering, estimates are needed for the timing, duration, volume and concentrations of contaminated water anticipated. With the cooperation of NDEP, Converse will research previous studies conducted specifically to characterize aquifer conditions near the vicinity of the proposed COH force main. The findings of this literature review will determine if further aquifer testing is required.

NDEP described possible alternatives for the treatment of water containing perchlorate, citing the specific systems currently in use by Tronox (formerly Kerr McGee) and American Pacific (AMPAC). The agreed upon strategy for risk management will be to learn as much as possible about the current treatment systems employed by both Tronox and AMPAC in preparation for the development of a dewatering plan. NDEP agreed to schedule one or two days worth of meetings with the entities at NDEP's office in a timely manner that would allow for discussions to occur independently between the CWC Team, NDEP and the entities including, but not limited to the COH, Tronox, AMPAC and the Southern Nevada Water Authority (SNWA).

Dewatering Discussion Topics

1) One suggestion made by NDEP would be to utilize the COH's rapid infiltration basins (RIBs) during the SCOP dewatering operations, specifically the basins located on the northeastern corner of the RIBs adjacent to the bird viewing area. The COH has two other RIB fields: P2 RIB field located to the east of Pabco Road and the Southern RIB field located 1.5 miles south of the P2 RIBs. NDEP stated that the Southern RIB field has already been taken out of service. The Bird Viewing Area RIB field is located up-gradient of one of Tronox's extraction well fields (Seep Area Well Field) and may represent an opportunity to manage construction dewatering without adversely impacting perchlorate mass flux to the Wash.

In addition to perchlorate, other groundwater contaminants could be treated prior to pumping into the RIBs as necessary. Other strategies could be utilized involving the number and amount of RIBs used. It might be possible to alter the COH's usage schedule to allow for dewatering water to be placed in select ponds, taking advantage of the full potential of the ponds. Currently the COH does not utilize their RIB fields to full capacity throughout all seasons allowing for the possibility of temporarily diverting treated waste water to other pond fields to accommodate dewatering activities. NDEP stated that once the new Water Reclamation Facility (WRF) is online these RIB fields will be taken off-line; however, the COH will still have to supply water to support the bird sanctuary. Water produced during the SCOP dewatering operations could possibly be used by the COH to supplement water required to support the sanctuary. Later in the meeting there was a brief discussion about the possibility of using the COH wetlands as a long term treatment mechanism by using groundwater instead of or in conjunction with the treated effluent as a water source to support the bird sanctuary.

It was not clear as to when the Birding Area RIB field is scheduled to go off-line. NDEP is under the impression that the RIB field will be off-line by March 2009 when it is Converse's understanding that the CWC would begin construction in March of 2008. Converse stated that the P2 RIB field may not be an optimal site for utilization during dewatering operations because of potential impacts to the surrounding areas (adjacent residential areas to the east) and the proximity to the proposed area of dewatering. Altering the groundwater gradient may capture water from the adjacent ponds making dewatering problematic.

2) Once the RIBs are no longer in use, the groundwater table within the vicinity of the COH force main could rise as a result of residential and commercial development. Therefore, design of the COH force main should include features (e.g. water stops) that prevent preferential flow of contaminated groundwater along the pipeline.

3) Tronox (as Kerr McGee) initially operated an off-site temporary ion exchange (IX) system to remove perchlorate. About 400 gpm of capacity is located near MW-7 and very close to the proposed COH force main alignment. The balance of the system (an additional ~

700 gpm) is located on the Tronox plant site. The off-site IX system was used from 1999 until 2005 when the current fluidized bed biological (FBR) system became operational. Both IX systems are "mothballed" and are not currently in use. The potential for short term use during construction could be explored with Tronox.

Tronox currently discharges by a pipeline from the current on-site FBR perchlorate treatment system into a small drainage where it commingles with COH and Timet discharge waters before entering the wash. The current force main alignment crosses this discharge pipeline and drainage and may raise issues related to continuing operation of these outfalls during construction by CWC. Additionally, Converse stated that the drop points for the reach traversing the wash have not been determined. NDEP indicated that currently Tronox has the capacity to go off-line (i.e. not discharge to the Wash) for a couple of days because of the capacity to store effluent in an on-site line pond (GW-11). NDEP stated that Tronox's discharge point has been relocated once and likely will not be relocated again.

4) NDEP informed us that Tronox's 5 year long NPDES permit, which allows them to discharge 1,000 gpm to the wash will expire in 3 years. Once the permit expires and the proposed COH force main and SCOP pipeline are on-line, the volume of water within the wash will be substantially reduced, altering the water quality of the Wash. Perhaps the CWC could accommodate Tronox's discharge (1,000 gpm) as a tie into the COH's force main portion of the SCOP system. NDEP suggested that a tie in to the SCOP pipeline with an access port would allow for direct sampling of treated water. Any arrangement for comingling of discharges would require NDEP Bureau of Water Pollution Control concurrence and specific agreements regarding responsibility for any violations to protect all parties..

5) The proposed location of the COH force main pipeline potentially impacts several other underground utility lines. Specifically, several pipelines which transport (1) raw water from Tronox's well field to their plant facility 3 miles to the south, (2) treated water back from the Tronox facility for discharge to the Wash, (3) one or more pipelines for effluent from the COH WRF to discharge to the Wash and (4) Timet/Pitman bypass pipeline. Additional utilities are likely present and may include a COH effluent pipeline to the P2 RIB field.

The following issues will need to be addressed by the COH pipeline design team: Does the current design acknowledge these pipelines and the associated risks of constructing an additional pipeline in its vicinity? Are there options for placement along the right (east) of the road an option? Is the proposed design complete for this portion of the alignment and are the plans for the associated utilities included in the plans?

6) NDEP discussed issues regarding previous dewatering practices used by SNWA during construction of the Bostic Weir grade control structure and other grade control structures. Previously, water produced from dewatering was allowed to infiltrate back into the ground adjacent to the wash (within the coarse grained sediments of the flood plain) in temporary infiltration galleries. During that time the amount of perchlorate loading returned to the Wash through temporary construction dewatering discharge was higher, allowing for the 10% concept to accommodate a larger mass of perchlorate. Dewatering water in excess of the amount that could be discharged to the Wash was managed through these temporary nearby infiltration galleries. Now, current loading options do not allow such a strategy.

7) AMPAC currently operates an in-situ biological treatment system, which was designed by a firm called Geosyntex. A number of pilot studies were run prior to selecting the current operational design. The location of their facility (extraction and injection wells) is west of the proposed alignment. There is less likely to be any direct interference between the AMPAC operations and the proposed COH force main than with the Tronox operation. It would be appropriate to confirm the exact location of current and any proposed operations with AMPAC. AMPAC and/or their consultant may also have useful information on in-situ treatment as options for the CWC project.

8) Other issues include the amount of TDS that will be encountered in Reach 3. It is anticipated to be very high concentration and relatively low volume. NDEP indicated they are looking into mitigating alternatives but as a practical matter the option is utilizing evaporation as the "treatment". NDEP also recommended seeking advice from SNWA regarding their plans for new construction and dewatering along the wash.

Action Items:

1) Converse to set up an account with Legal Copycats and submit requests to NDEP in order to obtain copies of reports, which include previous studies by various companies regarding perchlorate (and chromium), modeling of the wash and geophysical profiles., Following our meeting several reports were suggested by NDEP as initial steps towards obtaining available data to begin this process. Converse will make an appointment with NDEP to spend possibly a day or two going through files identifying further reference materials for copying. This literature review will determine if the need for aquifer testing is required within the COH Forcemain proposed alignment and aid in the estimation of dewatering volumes.

2) Converse to contact SNWA regarding in-place long term groundwater monitoring programs and/or planned programs specific to the Las Vegas Wash shallow groundwater system in attempt to minimize the duplication of efforts to characterize and monitor groundwater-surface water interactions. Information will aid in the preparation of a Draft Groundwater Monitoring Plan for the SCOP project. Converse will also discuss current SNWA dewatering strategies and treatment methods associated with on-going grade control structures along the wash for guidance.

3) NDEP offered to schedule talks involving Al Tinney (NDEP) and the CWC Team with several groups including but not limited to: SNWA, COH (Brenda Pohlmann and operations managers), Tronox and AMPAC individually to assess current treatment conditions and the possibility of mutually beneficial treatment practices. A summary of issues to be discussed with various organizations includes:

- SNWA (existing data, overlap with CWC monitoring plan, their plans for managing construction related dewatering)
- Tronox (interface with the current biological treatment system, their infrastructure, existing mothballed ion exchange system, outfall management during construction, possible long term co-operation)
- AMPAC (especially their consultant on in situ treatment information, possible interference with their infrastructure)
- COH (use of RIB ponds, issues related to long term use of water in future for bird viewing wetlands or park, infrastructure interference during construction and dewatering (including outfall).
- NDEP (NPDES/UIC issues, historic Data from various studies, short and long term water management/treatment issues)

4) It is likely that a follow-up meeting will be required with groups of stakeholders depending upon the issues to be resolved. The concept was to set up the initial meetings in the next couple of weeks. Follow-up meetings are likely to require more lead time for NDEP participation. NDEP indicated they typically required several weeks notice and will not be able to meet during the week on Nov 5th, 2007.

Parameter	Reporting Limit*	Discharge Permit	PS-3	COH-107	MW-7**	COH 2B-1	COH-4	COH-3	COH-2	COH-2	COH-1	COH-1	T9A-1
Profile I NPDES			5/9/2007	5/9/2007	11/6/2001	1/18/2007	5/10/2007	5/10/2007	5/29/2002	5/10/2007	5/31/2002	5/11/2007	3/2/2007
VOCs (ug/L)	2.0 - 5.0 (ug/L)	Appendix B	Note 1	Note 3	Note 4	ND	NT	NT	NT	NT	NT	NT	ND
SVOCs (ug/L)	10.0 - 50.0 (ug/L)	Appendix B	Note 2	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Metals													
Aluminum	1.2 (mg/L)	0.05-0.2	32	42	0.27	0.26	4.8	0.5	NT	1.5	NT	0.42	8.7
Antimony	0.0005 (mg/L)	0.006	0.0013	0.0013	ND	ND	ND	ND	NT	ND	NT	ND	ND
Arsenic	0.005 (mg/L)	0.05	0.088	0.12	0.08	0.09	0.019	0.0026	0.0098	0.14	0.005	0.015	0.04
Barium	0.005 (mg/L)	2	0.38	0.41	0.024	0.02	0.059	0.0067	NT	0.027	NT	0.026	0.11
Beryllium	0.02 (mg/L)	0.004	0.0013	0.0016	ND	ND	ND	ND	NT	ND	NT	ND	ND
Boron	5.0 (mg/L)	NA	1.5	2.5	2.8	NT	6.9	9.6	NT	12	NT	9.2	ND
Cadmium	0.0005 (mg/L)	0.005	0.0014	0.00083	ND	ND	0.0029	ND	NT	0.0035	NT	ND	ND
Calcium	0.50 (mg/L)	NA	760	620	510	279	480	470	NT	530	NT	490	460
Chromium	0.0005 (mg/L)	0.1	0.076	0.1	0.021	0.004	0.013	0.0032	NT	0.0084	NT	0.0063	0.0096
Copper	0.001 (mg/L)	1.3	0.04	0.041	ND	ND	0.054	0.037	NT	0.044	NT	0.076	0.013
Iron	0.25 (mg/L)	0.3-0.6	21	30	0.15	0.22	3.1	0.29	NT	1.2	NT	0.65	7.8
Lead	0.001 (mg/L)	0.015	0.014	0.018	ND	ND	ND	ND	NT	ND	NT	ND	0.007
Magnesium	0.10 (mg/L)	125-150	290	290	320	58.3	7500	3800	NT	7000	NT	6700	270
Manganese	0.25 (mg/L)	0.05-0.1	0.61	0.57	0.78	0.32	1.5	0.068	NT	1.4	NT	0.52	0.3
Mercury	0.0002 (mg/L)	0.002	ND	ND	ND	ND	ND	ND	NT	ND	NT	ND	ND
Nickel	0.005 (mg/L)	0.1	0.042	0.042	ND	0.013	0.021	0.013	NT	0.015	NT	0.017	0.027
Potassium	5.0 (mg/L)	NA	71	74	45	38.2	7300	1900	NT	4500	NT	4600	290
Selenium	0.0005 (mg/L)	0.05	0.29	0.13	0.04	0.05	0.022	0.18	NT	0.053	NT	0.033	0.014
Silver	0.0005 (mg/L)	0.05	0.0012	0.00079	ND	ND	ND	0.0031	NT	ND	NT	0.0075	ND
Sodium	20.0 (mg/L)	NA	660	700	1020	48.5	16000	4800	NT	15000	NT	10000	5500
Thallium	0.0005 (mg/L)	0.002	ND	ND	ND	ND	ND	ND	NT	ND	NT	ND	ND
Zinc	0.01 (mg/L)	5	0.16	0.012	ND	0.02	0.072	ND	NT	0.075	NT	ND	0.04
Inorganic Non-Metals													
Bicarbonate as CaCO3	5.0 (mg/L)	NA	110	120	130	190	82	130	NT	92	NT	120	86
Alkalinity, Total as CaCO3	5.0 (mg/L)	NA	110	120	130	190	82	130	NT	92	NT	120	86
Chloride	500 (mg/L)	250-400	1100	780	1400	1610	30000	7300	NT	24000	NT	18000	390
Fluoride	1.0 (mg/L)	2.0 - 4.0	0.62	0.5	1.1	1.01	ND	ND	NT	ND	NT	ND	3.6
Nitrate as N (mg/L-N)	0.05 (mg/L)	10	67.4	95.8	9.6	12.6	ND	ND	NT	ND	NT	ND	0.38
Perchlorate (ug/L)	≤ 10 (ug/L)	Note 5 4 - 18	7570	4390	8400	18300	Note 6 ND (RL=100)	Note 7 ND (RL=40)	Note 8 ND (RL = 50)	ND	42	Note 9 ND (RL=80)	38
pH	1.0 (pH Units)	6.5-8.5	7.34	7.61	7.24	7.19	7.61	7.37	NT	7.48	NT	7.26	7.19
Sulfate (mg/L)	1000 (mg/L)	250-500	2000	2500	2700	2511	45000	21000	NT	44000	NT	36000	3000
TDS (mg/L)	10 (mg/L)	500-1000	4700	5500	6360	6910	120000	39000	71400	97000	9550	69000	5000
TSS (mg/L)	10.0 (mg/L)	NA	NT	NT	NT	NT	NT	NT	18	NT	19.6	NT	NT
Total Phosphorus (mg/L-P)	0.02 (mg/L)	NA	1.6	1.6	0.073	0.13	1.1	0.11	NT	0.45	NT	0.36	0.69
Pesticides (ug/l)													
Aldrin	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
alpha-BHC	0.025 (ug/L)	Appendix B	ND	ND	0.14	ND	NT	NT	NT	NT	NT	NT	ND
beta-BHC	0.025 (ug/L)	Appendix B	ND	ND	0.14	ND	NT	NT	NT	NT	NT	NT	ND
delta-BHC	0.025 (ug/L)	Appendix B	ND	ND	0.19	ND	NT	NT	NT	NT	NT	NT	ND
Chlordane	0.025 (ug/L)	2	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Alpha-chlordane	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
4,4-DDD	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
4,4-DDE	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
4,4-DDT	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	NT
Dieldrin	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endosulfan I	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endosulfan II	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endosulfan Sulfate	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endrin	0.05 (ug/L)	2	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endrin aldehyde	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Endrin ketone	0.05 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
gamma-BHC (Lindane)	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
gamma-Chlordane	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Heptachlor	0.025 (ug/L)	0.4	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Heptachlor epoxide	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Methoxychlor	0.025 (ug/L)	Appendix B	ND	ND	ND	ND	NT	NT	NT	NT	NT	NT	ND
Toxaphene	2.5 (ug/L)	Appendix B	NT	NT	ND	NT	NT	NT	NT	NT	NT	NT	ND
Gross Alpha (pCi/L)	5.0 (pCi/L)	NA	85.3	77	11	37.2	ND	ND	NT	ND	NT	ND	32.2
Gross Beta (pCi/L)	5.0 (pCi/L)	NA	93.6	150	34.7	35.2	5610	1470	NT	4220	NT	4940	77.2

NA = Not Applicable; ND = Not Detected; NT = Not Tested

Wells aranged spatially from south (left) to north (right). Water Quality Data obtained in 2007 highlighted in green.

*Reporting Limit Units consistent throughout data in adjacent cells.

**MW-7 is not accessible for sampling as of May of 2007; the casing has been damaged and the well has caved in.

COH-1A & SNWA-2 Wells were dry as of May of 2007; no groundwater sample collected.

Note 1. VOCs detected (Chloroform = 67 ug/L), with Reporting Limits of 5.0 ug/L.

Note 2. SVOCs detected (Di-n-butylphthalate = 82 ug/L), all with Reporting Limits of 10.0 ug/L.

Note 3. VOCs detected (Chloroform = 82 ug/L & Tetrachloroethene, PCE = 6 ug/L), all with Reporting Limits of 5.0 ug/L.

Note 4. VOCs detected (Chloroform = 9.9 ug/L), with Reporting Limit of 5.0 ug/L.

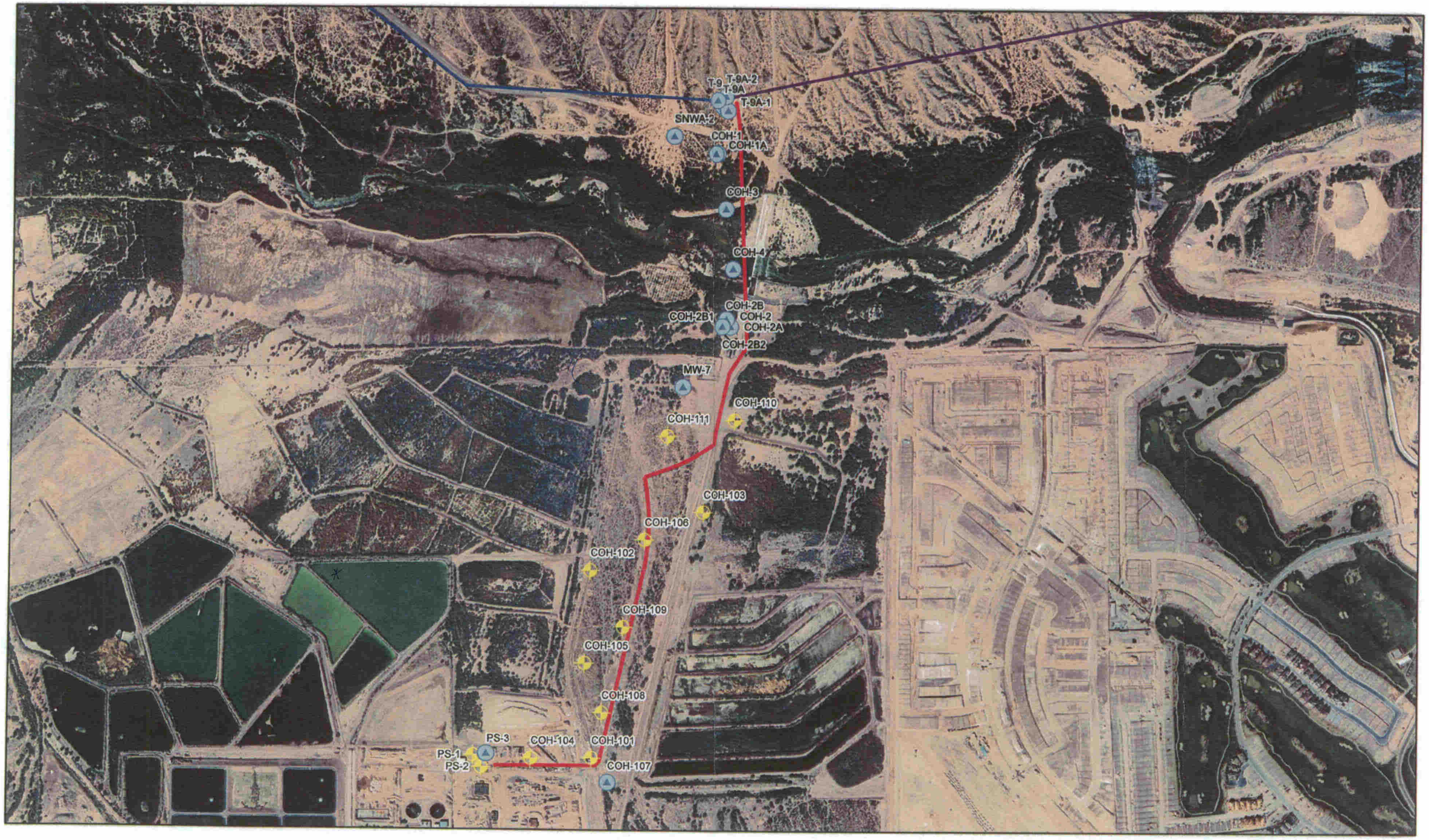
Note 5. A MCL for perchlorate has not been promulgated; NDEP's provisional action level is 18 ug/L.

Note 6. Sample ND, Reporting Limit = 100 ug/L. Elevated TDS levels prohibit the detection of perchlorate below the Reporting Limit.

Note 7. Sample ND, Reporting Limit = 40 ug/L. Elevated TDS levels prohibit the detection of perchlorate below the Reporting Limit.

Note 8. Sample ND, Reporting Limit = 50 ug/L. Elevated TDS levels prohibit the detection of perchlorate below the Reporting Limit.

Note 9. Sample ND, Reporting Limit = 80 ug/L. Elevated TDS levels prohibit the detection of perchlorate below the Reporting Limit.



N

LOCATION OF SUBSURFACE EXPLORATIONS

COH Pumping Station
CWC-SCOP
Clark County Area, Nevada

Scale: 1"= 500'	File Name: COH_forcemain
Date: 06/12/07	Project No.: 98-33506-05
Created By: KJP	Drawing No.: 1
Checked By: REP	
Approved By:	

Converse Consultants
Over 60 Years of Dedication and Geotechnical and Environmental Services

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NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

September 19, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Data Validation Summary Report (DVSR) for the *TRONOX Annual Performance Report for Chromium and Perchlorate, Henderson, Nevada July 2006 to June 2007.*
Dated August 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's Data Validation Summary Report (DVSR) identified above and provides comments in Attachment A. A revised DVSR should be submitted based on the comments found in Appendix A by **October 18, 2007**. TRX should additionally provide an annotated response-to-comments letter as part of the revised DVSR.

Please contact the undersigned with any questions at (702) 486-2850 x 240 or sharbour@ndep.nv.gov.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
Rob Mrowka, Clark County Comprehensive Planning, PO Box 551741, Las Vegas, NV, 89155-1741
Ranajit Sahu, BRC, 311 North Story Place, Alhambra, CA 91801
Rick Kellogg, BRC, 875 West Warm Springs, Henderson, NV 89011
Mark Paris, Landwell, 875 West Warm Springs, Henderson, NV 89011
Craig Wilkinson, TIMET, PO Box 2128, Henderson, Nevada, 89009-7003
Kirk Stowers, Broadbent & Associates, 8 West Pacific Avenue, Henderson, Nevada 89015
George Crouse, Syngenta Crop Protection, Inc., 410 Swing Road, Greensboro, NC 27409
Nick Pogoncheff, PES Environmental, 1682 Novato Blvd., Suite100, Novato, CA 94947
Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Attachment A

1. Section 2.0, the DVSR indicates that the data were subject to limited data validation (i.e. Tier 2) due to the absence of complete data packages with raw data. The NDEP has the following comments:
    a. The DVSR indicates that the limited data validation is consistent with the NDEP guidance on data validation of 2006. However, the NDEP guidance also requires at least 10% of the data to undergo full data validation – to the level of raw data. Thus, this data validation has not met the NDEP requirements.
    b. TRX should request the full raw data reports from MWH for at least 10% of the data from this report and these data should then be validated as follows (where applicable) for inclusion in the DVSR:
        i. 100% validation of Initial and Continuing Calibration,
        ii. Random recalculation (10-20%) of reported results versus raw data, and
        iii. 100% validation of Interference Check Sample (data reporting forms), ICP Serial Dilution (data reporting forms), Reporting Limits (ensure they include appropriate sample weights, moisture, dilution).
2. Section 3.7, the NDEP has the following comments:
    a. The DVSR states that the nitrate results for the influent/effluent sample pair collected on 1/29/2007 were qualified and estimated due to the absence of a CCV. This is consistent with laboratory report SDG 194620; however, please note that the absent CCV also applies to nitrite in this SDG although the results were below the detection limits for this analyte.
    b. The DVSR states that the samples were reanalyzed outside of the holding time with similar results as the original. However, this could not be confirmed since the analysis date and SDG for this reanalysis was not provided. Please provide the SDG under which the reanalysis was performed and include those laboratory reports in the report if they are not currently provided
3. Table E-3, the NDEP has the following comments:
    a. Sample M – 36 (analyzed on 05/03/07 from laboratory report SDG 203591) in Table E-3 contains a discrepancy in the "DQI" column for Holding Time and then refers to the associated "DQI Result" as 108% RPD. Since the issue is holding time, an RPD value is not applicable. The "DQI Result" would normally be reported in days if the DQI issue was holding time. In addition, upon checking the SDG report from the laboratory there appears to be no problem with holding time. Please correct this discrepancy.
    b. Samples from laboratory report SDG 203746 (ART-1 through ART - 8) were noted as qualified due to an exceedance of the TDS holding time requirement. The laboratory report stated that these samples were initially analyzed within holding time and re-analysis was outside the holding time. Additionally, the DVSR should include some indication of why these samples required reanalysis and whether similar results were obtained if the data are at all comparable. Please address these comments in the DVSR.
    c. Laboratory report SDG 192802 shows the analysis for nitrate is slightly past the 1-day holding time. This sample was not included with those listed in the Table E-3. Please correct this discrepancy.

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

September 19, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcels "G" Site, Henderson, Nevada
Dated August 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's Phase 2 Sampling and Analysis Plan (SAP) identified above and provides comments in Attachment A. A revised Phase 2 report should be submitted based on the comments found in Appendix A. Please advise the NDEP regarding the schedule for this resubmittal. TRX should additionally provide an annotated response-to-comments letter as part of the Revised Phase 2 submittal.

Please contact the undersigned with any questions at (702) 486-2850 x 240 or sharbour@ndep.nv.gov.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Tronox, Inc, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
Brenda Pohlmann, City of Henderson, PO Box 95050, Henderson, NV 89009
Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
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Lee Erickson, Stauffer Management Company, P.O. Box 18890, Golden, CO 80402
Chris Sylvia, Pioneer Americas LLC, PO Box 86, Henderson, Nevada 89009
Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Attachment A

1. General comment, the Figures do not show the relationship of Parcel "G" (Site) to surrounding source areas. TRX has identified most of these source areas in their CSM: however, transparency is lacking in this document. Please provide a map showing the Site in comparison to these source areas.
2. Background, the NDEP provides the following comments:
   a. TRX states that this Site is in "the vicinity of BMI Industrial Companies". The Site is located on TRX property and in the vicinity of other BMI Industrial Companies. Please revise the text accordingly.
   b. TRX states that two monitoring wells (TR-7 and TR-8) are located within the Site. TRX additionally states that monitoring well data from TR-8 indicated that concentrations of monitored chemicals are "generally low to non-detect". Please provide a table listing the concentration data available from all of the monitoring wells located on and in the immediate vicinity of the Site.
   c. TRX states that the concentration of chloroform in TR-8 was 2,500 ppb. Please provide a discussion on the vapor intrusion pathway in relation to future land use including development and construction activities.
   d. TRX proposes to focus sampling on the upper five feet of soil since five feet of fill will be imported to bring the Site to grade for construction. Please note that deed restrictions may need to be placed on the Site to facilitate a No Further Action Determination (NFAD).
3. Scope of Work, Task 1: Field Implementation, see the following comments:
   a. The reference for the BRC Field Sampling and Standard Operating Procedures (FSSOP) should be updated.
   b. TRX states that dioxins and furans are not proposed for to be analyzed because of no indication of any surface impacts. The NDEP believes that dioxin/furan impacts are expected throughout the BMI Complex and it is necessary to include their analysis for surface soils.
   c. The reference for the quality assurance project procedure (QAPP) should be updated.
4. Scope of Work, Task 2: Data Evaluation, please add SOP 40 to the QAPP reference.
5. Schedule, 1st paragraph, please verify that the 28-day turn around time is applicable to all analytes (i.e.: asbestos, radionuclides).
6. The following comments are based on a May 11, 2007 letter from the NDEP, Re: Nevada Division of Environmental Protection Response to: *Phase I Environmental Site Assessment – Approximately 182 Acres of land* (Phase I), dated March 5, 2007. These comments were generated for the "four acre parcel" (currently labeled as Parcel "G" in the Phase 2 SAP).
   a. TRX's contractor Basic Remediation Company (BRC) stated during a site visit with the NDEP that there is an earthen stormwater basin of unknown origin/use located on this parcel (predominately located in grid G-A2). Please discuss any information found regarding this basin. Also, please add a judgmental sample in this area.
   b. BRC identified the electrical vault on this parcel as unknown ownership and use during a site visit with the NDEP. NDEP noted that it appears to be in line with the WAPA cable tunnel. Please discuss the ownership and use of this vault.
7. Table 1, the NDEP has noted numerous errors on this table in respect to TRX's site related chemical (SRC) list. For example, (please note that this is not a complete list):

a. 1,2 Dichlorobenzene; 1,3 Dichlorobenzene; and 1,4 Dichlorobenzene are not listed on Table 1.
b. 2-Methylnaphthalene, bis(2-Ethylhexyl) phthalate, and Dimethyl phthalate are not indicated as being on the TRX SRC list even though they are listed on the March 2006 SRC list for TRX.

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Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

September 18, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Revised Response to: *Community Involvement Plan for Tronox LLC, Henderson, Nevada*, dated August 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's above-identified Community Involvement Plan and finds that the document is acceptable. However, the NDEP has noted that the factsheet for TRX has not been updated since February 1, 2006; therefore, please submit an updated factsheet by **November 2, 2007**. Please contact the undersigned with any questions at (702) 486-2850 x 240 or sharbour@ndep.nv.gov.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

SH:sh

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Todd Croft, NDEP, BCA, Las Vegas
Keith Bailey, 3229 Persimmon Creek Drive, Edmond, OK 73013
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
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Mitch Kaplan, U.S. Environmental Protection Agency, Region 9, mail code: WST-5, 75 Hawthorne Street, San Francisco, CA 94105-3901
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Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

September 12, 2007

Susan Crowley
Tronox LLC
PO Box 55
Henderson, Nevada 89009

Re: **Tronox LLC (TRX)**
NDEP Facility ID #H-000539
Nevada Division of Environmental Protection Response to:
Phase 2 Sampling and Analysis Plan to Conduct Soil Characterization, Tronox Parcels "F" Site, Henderson, Nevada
Dated August 28, 2007

Dear Ms. Crowley,

The NDEP has received and reviewed TRX's Phase 2 Sampling and Analysis Plan (SAP) identified above and provides comments in Attachment A. A revised Phase 2 report should be submitted based on the comments found in Appendix A. Please advise the NDEP regarding the schedule for this resubmittal. TRX should additionally provide an annotated response-to-comments letter as part of the Revised Phase 2 submittal.

Please contact the undersigned with any questions at (702) 486-2850 x 240 or sharbour@ndep.nv.gov.

Sincerely,

Shannon Harbour, P.E.
Staff Engineer III
Bureau of Corrective Actions
Special Projects Branch
NDEP-Las Vegas Office

CC: Jim Najima, NDEP, BCA, Carson City
Brian Rakvica, NDEP, BCA, Las Vegas
Keith Bailey, Tronox, Inc, PO Box 268859, Oklahoma City, Oklahoma 73126-8859
Sally Bilodeau, ENSR, 1220 Avenida Acaso, Camarillo, CA 93012-8727
Barry Conaty, Akin, Gump, Strauss, Hauer & Feld, L.L.P., 1333 New Hampshire Avenue, N.W., Washington, D.C. 20036
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Paul Sundberg, Montrose Chemical Corporation, 3846 Estate Drive, Stockton, California 95209
Joe Kelly, Montrose Chemical Corporation of CA, 600 Ericksen Avenue NE, Suite 380, Bainbridge Island, WA 98110

Attachment A

1. General comment, the Figures do not show the relationship of Parcel "F" to surrounding source areas. TRX has identified most of these source areas in their CSM: however, transparency is lacking in this document. Please provide a map showing Parcel "F" in comparison to these source areas.
2. Background, the NDEP provides the following comments:
    a. TRX indicates that the aboveground storage tanks (ASTs) located south of the Site "...are at a different elevation – and therefore there is limited possibility that spills from the tanks would have affected the surface to 10 foot elevation of the Site." The text does not specify whether the tanks are higher or lower that the Site. The NDEP notes that these tanks are higher than Parcel F. It is unclear how this difference in elevation would prevent a release from these ASTs to the Site. Please revise and clarify this statement.
    b. TRX states that this Site is in "the vicinity of BMI Industrial Companies". The Site is located on TRX property and in the vicinity of other BMI Industrial Companies. Please revise the text accordingly.
    c. TRX states that several monitoring wells are located within the Site. TRX additionally states that monitoring well data from TR-6 indicated that concentrations of monitored chemicals are "generally low to non-detect". Please provide a table listing the concentration data available from all of the monitoring wells located on and in the immediate vicinity of the Site.
    d. TRX states that the concentration of chloroform in TR-6 was 2,500 ppb. Please provide a discussion on the vapor intrusion pathway in relation to future land use including development and construction activities.
    e. TRX proposes to focus sampling on the upper five feet of soil since five feet of fill will be imported to bring the Site to grade for construction. Please note that deed restrictions may need to be placed on the Site to facilitate a No Further Action Determination (NFAD).
3. Scope of Work, Task 1: Field Implementation, see the following comments:
    a. The reference for the BRC Field Sampling and Standard Operating Procedures (FSSOP) should be updated.
    b. Please note and revise text accordingly that dioxins/furans are listed on the TRX SRC list dated March 2006.
    c. The reference for the quality assurance project procedure (QAPP) should be updated.
4. Scope of Work, Task 2: Data Evaluation, add SOP 40 to QAPP reference.
5. Schedule, 1st paragraph, please verify that the 28-day turn around time is applicable to all analytes (i.e.: asbestos, radionuclides).
6. Figure 2, the NDEP observed that judgmental samples are not located on all seemingly disturbed areas on the provided aerial photograph (e.g. disturbed area in grid F-B2 between TSB-FR-05 and TSB-FJ-03, disturbed area in grid F-B1 between TSB-FR-02 and TSB-FJ-04, etc.). Please add samples to these areas or discuss rationale for not sampling these areas in the text.
7. The following comments are based on a May 11, 2007 letter from the NDEP, Re: Nevada Division of Environmental Protection Response to: *Phase I Environmental Site Assessment – Approximately 182 Acres of land* (Phase I), dated March 5, 2007. These comments were

generated for portions of APN 178-12-401-009 and 178-13-101-002 as shown in Figure 3 of the Phase I (currently labeled as Parcel "F" in the Phase 2 SAP)

  a. Figure 3 in the Phase I, the NDEP has the following comments:
     i. There appears to be large piles of debris that are not labeled on Figure 3. These had been removed by the time the NDEP had completed a site visit. It is necessary to correlate these piles to aerial photographs and investigate these areas, as necessary. Please discuss and illustrate on Figure 2 of the Phase II SAP.
     ii. As noted above it is imperative that TRX identify and discuss the features displayed on Figure 3.
  b. There is a building foundation on Parcel "F", which appears similar to the peat building that was destroyed on the TIMET parcel. Please discuss what the use of this building was.
  c. TRX states that there is electrical equipment on Parcel "F" in a fenced area. The ownership and condition of this equipment needs to be assessed and reported in the Phase II SAP.
  d. It is the understanding of the NDEP that the former Hardesty Chemical/ AMECCO operation may have occurred directly south of Parcel "F". Please discuss this.
  e. A mobile aboveground storage tank is located on Parcel "F". Please discuss this.

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STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

MEMORANDUM

DATE: September 12, 2007

TO: Chad Schoop, Bureau of Water Pollution Control

FROM: Shannon Harbour, P.E.
Bureau of Corrective Actions, Las Vegas Office

SUBJECT: Hunter Village – Final Map

I have reviewed the map showing the aforementioned Parcels with respect to their location near known areas of contamination. The area that you have highlighted is in the vicinity of the BMI Common Areas and the BMI Plant Site Area.

The BMI Plant Site area and the BMI Common Areas are active corrective actions cases (Facility ID#: H-000119, H-000125, H-000536, H-000537, H-000538, H-000539, H-000540, H-000688, and H-000855) and are undergoing extensive investigations. The on-going investigation through remediation phases likely will occur over a number of years. The BMI Plant Site is occupied by several companies including Titanium Metals Corporation, Tronox LLC, Pioneer-Stauffer Corporation, Montrose Corporation and a number of small businesses. Future plans call for the BMI Upper and Lower Ponds portion of the BMI Common Areas to be remediated to levels protective of public health. The current property owner plans to develop that site once the remediation is complete. The investigation through remediation phases likely will occur over a number of years. Currently, the BMI Upper and Lower Ponds area is fenced and access is restricted.

A number of contaminants are known to occur within the soil at these sites and within the groundwater beneath and down gradient of these sites. Some of these contaminants may be naturally derived whereas others are a direct result of historic use of the sites. The plant sites are still active. The active corrective action files are available for review within our Las Vegas offices. Interested parties may contact Brian Rakvica at (702) 486-2850 x 247 to review applicable files in the Las Vegas office.

Development of the areas immediately surrounding these current and former sites should take into account the presence of various contaminants and the historic through current land uses of other nearby properties.

cc: Jim Najima, Chief, Bureau of Corrective Actions, NDEP, Carson City, NV
Brian Rakvica, Bureau of Corrective Actions, NDEP, Las Vegas, NV
Brenda Pohlmann, Environmental Programs Manager, City of Henderson, PO Box 95050, Henderson, NV 89009

Shannon Harbour

From: Brian Rakvica
Sent: Monday, September 10, 2007 3:23 PM
To: Crowley, Susan; Shannon Harbour
Cc: Keith Bailey; Kennedy, Robert; Gerry, Dave; Bilodeau, Sally; dgratson@neptuneinc.org
Subject: RE: DVSR's for Tronox Phase A Sampling - Inclusive of May 2007 Sample Set

Susan,

Thanks...received and forwarded to Dave Gratson

Brian

From: Crowley, Susan [mailto:Susan.Crowley@tronox.com]
Sent: Mon 9/10/2007 3:07 PM
To: Shannon Harbour
Cc: Brian Rakvica; Keith Bailey; Kennedy, Robert; Gerry, Dave; Bilodeau, Sally; dgratson@neptuneinc.org
Subject: DVSR's for Tronox Phase A Sampling - Inclusive of May 2007 Sample Set

Shannon,
We had promised to forward a revised DVSR to NDEP which covered the collective of the Tronox Phase A sampling, inclusive of the May 2007 sampling. The relevant files are attached. The largest file has been zipped so that I can deliver these via e-mail. Please reply positively if this e-mail makes it to you – I'll then know you have this revised body of data for Dave Gratson to review. Thanks.

For your convenience ... I've included our responses to the NDEP's first round of comments directly in this e-mail. Please see below.

Susan Crowley
TRONOX LLC
PO Box 55
Henderson, NV 89009
p 702.651.2234
ef 405.302.4607
email susan.crowley@tronox.com

****

NDEP's comments on the DVSR are provided below:

General comment, the ENSR data validators were quite thorough so the NDEP generally agreed with their qualifiers and validation.

General comment, having the tables in Excel was also convenient.

1. Section 3.2, page 8. The DVSR states, "The nondetect results for tert-butyl alcohol in 204 samples were qualified as estimated (UJ) because the minimum RRF requirement of 0.05 was not met in the associated ICALs." This may indicate that the sensitivity for this analyte is not being met and the reporting limit should be raised. This issue should be investigated with the laboratory.

Response:
Examination of the raw calibration data for t-butyl alcohol revealed adequate area counts and signal to noise ratios in the extracted ion current profiles for the lowest calibration standard. The lowest calibration standard for this analyte was below the reporting limit and therefore sufficient sensitivity was demonstrated to report the nondetect results as estimated (UJ) rather than rejected.

2. Section 3.3, page 10. The DVSR states, "Potential positive isobaric interferences were associated with detections for a total of 148 samples and these results were qualified as estimated with a possible high bias (J+) in the absence of other reasons for qualification. The qualified metals include manganese (52 samples), nickel (42 samples), strontium (45 samples), and zinc (3 samples)." Review of Table E-7 shows that many of these results have been qualified with a J (no positive sign). Please clarify this text or correct the Tables and database.

Response:
Some final qualifiers for these results were adjusted to estimated without the positive bias (J) based on uncertainties in the bias introduced by other reason codes listed for qualification such as low matrix spike recoveries. If the matrix spike revealed bias was low and the possible isobaric interference bias was high then the overall bias sign was eliminated because the direction of the bias cannot be determined .

3. Section 3.5, pages 11-12. A large number of sample results were censored ("negated") as a result of blank contamination. The effect of censoring these results seems acceptable with a few exceptions. There are several analytes in which the resulting reporting limit, after censoring, is above or near important risk or apparent background values. Some of these sample and analyte combinations are provided below.

Sample ID	SDG	Analyte	Result	Units	Qualifiers
SA25-15	ENSR110306	Cadmium	0.068	mg/kg	U
EB110706	ENSR110306	Copper	1.6	ug/l	U
M55	ENSR120506	Copper	6	ug/l	U
M55D	ENSR120506	Copper	6	ug/l	U
SA25-15	ENSR110306	Copper	8.9	mg/kg	UJ
M11	ENSR120506	Manganese	93.5	ug/l	UJ
M11D	ENSR120506	Manganese	96.0	ug/l	UJ
M39	ENSR120506	Manganese	208	ug/l	UJ
M48	ENSR120506	Manganese	20.9	ug/l	UJ
M55	ENSR120506	Manganese	37.4	ug/l	UJ
M55D	ENSR120506	Manganese	54.6	ug/l	UJ
M95	ENSR120506	Manganese	68.9	ug/l	UJ
M12A	ENSR120506	Thallium	7.8	ug/l	U

These results, at a minimum, should be examined in depth to determine whether there is sufficient blank influence to justify censoring when they may be important data for any future decisions. All mercury and nitrate (in soil) values should also be carefully reviewed for similar issues.

A number of blank values in Table E-9 are negative (e.g. selenium). It is unclear why the associated sample would need to be censored when the blanks have negative values. These results should be reviewed and a justification provided for censoring when the blanks are negative.

Response:
ENSR reexamined the qualifiers applied to these metals and agrees that the results for Cd and Cu in SA25-15 should not have been censored since the reported concentrations of these metals exceed their respective action levels. These analytes were removed from Table E-9 and corrections were made to the database. The remaining groundwater results for Cu, Mn, and Tl in the table above were correctly censored according to the EPA validation guidelines given the contamination in

associated blanks as described in the data validation memoranda. An independent check of these metal concentrations is now available in the results from the May 2007 groundwater resampling of the Phase A wells. This reduces the risk of censoring based on isolated and anomalous blank results.

The majority of the mercury results qualified based on blank contamination were not negated by ENSR. However, ENSR considered the nondetect (U) results reported by the laboratory to be estimated, for an overall qualifier of UJ. Mercury results negated at the detected concentrations were correctly qualified based on the associated action levels derived from laboratory blank contamination as explained in the validation memoranda. The five negated nitrate in soil results were close to the detection limit and were all below the associated equipment blank results for nitrate.

In the cases where negative blank values resulted in qualifier addition, e.g.selenium, it was only to indicate the laboratory applied nondetect qualifier (U) was estimated (changed to UJ) due to the associated negative blanks. No positive detections for Se were negated based on negative blank results.

4. Total TEQ Values, Form 3 versus Database. There appears to be slight differences in the Total TEQ values. The values reported by CAS-Houston, on Form 3, are different from those in the database provided. For example, in the file e report E0600829.pdf, page 4 of 6, the Total TEQ for sample SA5-0.5 is 17.1. The value in the database is 15.09. Similar differences are noted for other Total TEQ values. Please review these data and provide an explanation for these differences or correct the database.

Response:
TEQ results from the Form3 data calculated by CAS-Houston were based on the outdated 1988 WHO TEFs. ENSR's risk assessors recalculated the TEQs based on the most recent WHO revised TEFs published in 2006. Most of the apparent reduction in TEQ comes from the change of the TEFs for 2,3,4,7,8-pentachlorodibenzofuran from 0.5 to 0.3 and the change of the 1,2,3,7,8-pentachlorodibenzofuran TEF from 0.05 to 0.03. In the case of sample SA5-0.5 the results for these congeners account for 1.68 and 0.37, respectively, of the total TEQ reduction (which is slightly offset by the octachloro congeners TEF increase from 0.0001 to 0.0003).

5. Filtered versus unfiltered database. Included in the DVSR package was an Access database that contained both filtered and unfiltered results. These two databases were compared and it was noted that the filtered database contained only 31 results for perchlorate, compared to 137 for the unfiltered with the following conditions for the unfiltered database: detect = Y, Result Type = TRG, Sample Type = N). Some of the differences between the filtered and unfiltered database appear to be due to removal of samples where results were taken at multiple depths. For example, the filtered database contains only two perchlorate records for sample SA02: SA2-0.5 and SA2-60. Yet the unfiltered database contains detected results at six different depths. Also, no results for sample SA10 were found in the filtered database. These results are not consistent with the Tronox filtering rules, please review the databases and provided clarification or corrections.

Response:
The filtered flat database table query was corrected and the file was regenerated. The corrected table was provided by Tronox to NDEP on 6/28/07 along with the relational database. The latest version will be provided again with the final Source Area Investigation Phase A report.

These comments should be addressed in the finalized DVSR. A response to comments before that time or with the finalized DVSR is also requested.

Thanks,

Brian

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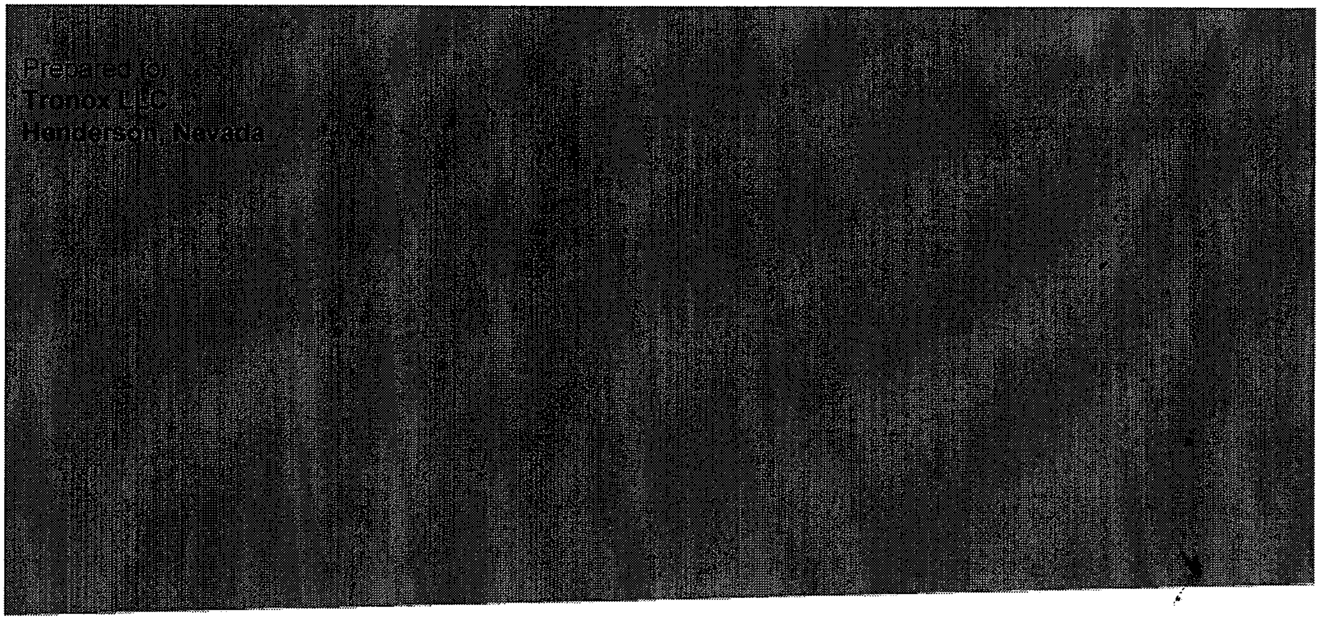

Prepared for
Tronox LLC
Henderson, Nevada

Appendix E
Data Validation Summary Report

ENSR Corporation
September 7, 2007**Document No.: 04020-023-402**

ENSR | AECOM

Prepared for:
Tronox LLC
Henderson, Nevada

Appendix E
Data Validation Summary Report

Prepared By Robert Kennedy
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Reviewed By

ENSR Corporation
September 2007
Document No.: 04020-023-402

ENSR | AECOM

Contents

Acronyms and Abbreviations

%D	Percent difference or percent drift
%R	Percent recovery
%RSD	Percent relative standard deviation
ASB	Analytical Services Branch
BHC	Hexchlorocyclohexane
CCV	Continuing calibration verification
CDD	Chlorinated Dibenzo-p-Dioxins
CDF	Chlorinated Dibenzofurans
CLP	Contract Laboratory Program
COC	Chain of custody
DCB	Decachlorobiphenyl
DQI	Data quality indicator
DRO	Diesel range organics
EDD	Electronic data deliverables
EMPC	Estimated Maximum Possible Concentrations
EPA	U.S. Environmental Protection Agency
EPN	O-Ethyl-O-p-nitrophenyl benzene thiophosphonate
GC/MS	Gas Chromatography/Mass Spectrometry
GRO	Gasoline range organics
HT	Holding time
ICAL	Initial calibration
ICP	Inductively Coupled Plasma
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
ICS	Interference check sample
ID	Identification
IS	Internal standard
LCL	Lower control limit
LCS	Laboratory control sample
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols Manual
MBAS	Methylene-Blue Active Substances MCL Maximum contaminant levels
MDL	Method detection limit

Acronyms and Abbreviations (Cont'd)

Mn	Manganese
MS/MSD	Matrix spike/matrix spike duplicate
ND	Not detected
NDEP	Nevada Department of Environmental Protection
NFG	National Functional Guidelines
NS	Not spiked
ORO	Oil range organics
PAH	Polycyclic aromatic hydrocarbons
prep	Preparation
PRG	Preliminary Remediation Goals
QAPP	Quality Assurance Project Plan
QC	Quality control
r2	Correlation coefficient
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
RPD	Relative percent difference
RRF	Relative response factor
SDG	Sample Delivery Group
SRC	Site-Related Chemical
STL	Severn Trent Laboratories
SVOC	Semivolatile organic carbon
TCMX	Tetrachlorometaxylene
TDS	Total dissolved solids
TOC	Total organic carbon
TSS	Total suspended solids
UCL	Upper control limit
VOC	Volatile organic carbon

1.0 Introduction

The purpose of formally validating the Phase A Source Area Investigation laboratory results was to determine the suitability of the data for potential use in the conceptual site model, risk assessment, and other future on-site environmental assessments.

Severn Trent Laboratories (hereafter abbreviated as STL) in St. Louis, Missouri, was the primary laboratory contracted by Tronox for the Phase A Source Area Investigation chemical analyses. STL-St. Louis performed the majority of the chemical analyses for this project and contracted the remaining analyses to the following laboratories within the STL network:

- STL-Richland in Richland, WA performed all the radiochemical analyses;
- STL-LA in Los Angeles, CA performed the hexavalent chromium analyses;
- STL-Sacramento in Sacramento, CA performed the total organic carbon (TOC) and perchlorate analyses; and
- STL-Savannah in Savannah, GA performed the Methylene-Blue Active Substances (MBAS) analyses.

Analysis for dioxins and asbestos was performed by the following laboratories:

- Columbia Analytical Services facility in Houston, TX performed all dioxin analyses; and
- EMSL Analytical, Inc., in Westmont, NJ performed all asbestos analyses.

2.0 Data Validation Process

The laboratory results for the Phase A Source Area Investigation were subjected to formal data validation as described in the Workplan Section 5.1 and following the guidance on data validation provided by the Nevada Department of Environmental Protection (NDEP) for the BMI Plant Sites (NDEP 2006). The data from each laboratory were submitted as Contract Laboratory Program (CLP)-like data packages in PDF format and EQuIS ® format electronic data deliverables (EDDs). The EDDs were imported into an EQuIS ® database specifically created for this project. ENSR validated the data using the hard copy data package and subsequently entered the validation qualifiers into the database. Results were compared to the goals stated in the Phase A Source Area Investigation Workplan (ENSR, September 2006), hereafter referred to as the "Workplan," and the Draft Quality Assurance Project Plan (ENSR, August 2006) hereafter referred to as the "QAPP."

A comprehensive ("full") data validation was performed on 15 of the 68 laboratory Sample Delivery Groups (SDGs), and the remainder underwent a more limited validation as described below. The goal of a minimum of 10% full validation that was established for the project was exceeded in order to encompass the complete set of samples analyzed for the full Site-Related Chemical (SRC) list and to validate SDGs covering every matrix type and analytical fraction. This ensured that some data for every analytical method utilized during the Phase A Source Area Investigation were subjected to full data validation. Limited validation consisted of reviewing the following data elements contained in laboratory summary data forms (and did not generally include raw data review):

- Agreement of analyses conducted with chain-of-custody (COC) requests

- Holding times and sample preservation
- Initial and continuing calibrations
- Laboratory blanks/equipment blanks/field blanks/trip blanks
- Surrogate recoveries
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Laboratory duplicate results
- Field duplicate results
- Quantitation limits and sample results

Full validation consisted of reviewing to the level of raw data all of the elements covered in the limited validation plus the following elements where applicable as defined by the analytical methods:

- Mass spectrometer tuning
- Gas Chromatography/Mass Spectrometry (GC/MS) performance checks
- Interference check sample (ICS) results
- Inductively Coupled Plasma (ICP) serial dilution results
- Internal standard performance
- Compound or element or asbestos fiber identification
- Peak integration and mass spectral matches
- Chemical yield (tracers and carriers)
- Calculation and transcription verifications

Analytical data were evaluated with reference to the National Functional Guidelines (NFG; EPA 1994, 1999 and 2004) and other method-appropriate validation guidance documents, as well as the Region 9 Superfund Data Evaluation/Validation Guidance (EPA 2001), the above-mentioned NDEP Guidance on Data Validation (NDEP 2006), the quality control (QC) criteria specified in the QAPP (ENSR, August 2006), and Phase A Source Area Investigation Workplan (ENSR, September 2006). The Regional and National Functional Guidelines were modified to accommodate the non-CLP methodologies. The specific guidelines used for the various methods were as follows:

- Inorganic analytical data were evaluated with reference to "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (EPA 1994, 2004)

- Organic analytical data were evaluated with reference to the "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1999)

- Dioxin data were evaluated with reference to "USEPA Analytical Services Branch (ASB) National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review," EPA-540-R-05-001 (EPA 2005)

- Radiochemical analytical data were evaluated with reference to the Department of Energy "Evaluation of Radiochemical Data Usability" (DOE 1997) and the "Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP)," (NUREG 2004).

In general, the validation qualifiers and definitions employed were based on those used by the U.S. Environmental Protection Agency (EPA) in the documents mentioned above. The "B" and "JB" qualifiers used exclusively for the radiochemical data were based on the radiochemical documents (DOE 1997 and NUREG 2004) cited above and professional judgment. An additional qualifier "K" was added to denote EMPC results in the dioxin data. Validation qualifiers and definitions are listed in **Table E-1**. A reason code was assigned to all the applications of validation qualifiers for this project. The reason codes and their explanations are listed in **Table E-2**. These codes were entered in the project database for each application of a validation qualifier that changed a laboratory qualifier or modified a result value to indicate the primary reason(s) for data qualification. Where multiple reason codes were assigned to a single result then professional judgment was used to determine the most appropriate overall qualifier and bias sign, if any. Conversions of the laboratory reported "ND" for not detected to the "U" flag in the database and the laboratory-applied "J" or ("B" for metals) qualifier to indicate results less than the reporting limit but greater than the method detection limit (MDL) are generally not discussed in this report. These laboratory qualifiers were standardized and migrated to the validation qualifier field so that the "J" qualifier, unless applied by a validator for other reasons discussed below and documented with a reason code, always indicates a result is estimated because it is less than the reporting limit but greater than the MDL.

Data validation was organized by laboratory report SDG and analytical fraction. For each separate SDG/ fraction combination, a data validation memorandum was written by a validator and reviewed by a peer at ENSR's Westford, MA office. These memoranda are included on CD-ROM as PDF documents and sorted by ENSR Identification (ID), which is correlated with the laboratory SDGs listed in **Table E-4**. **Table E-4** specifies data validation memorandum number (ENSR memo ID) and indicates each analysis group by analytical fraction as well as the laboratory that performed the analyses. A few analyses were subcontracted by STL-Louis to STL-Denver, STL-Savannah, and STL-LA, and STL-Sacramento and are not listed separately in this table because results were combined into a single SDG by the STL-St. Louis laboratory. The relationship between sample ID, matrix, collection date, and SDG numbers is described in **Table E-3** and sorted by sample ID. **Table E-3** and **Table E-4** are provided on CD as Excel spreadsheets that can be resorted to assist the data user in locating validation information for any particular sample, SDG, or analysis fraction. Results from the May 2007 ground water sampling event have been appended to the bottom of the revised data validation tables. All groundwater samples were collected unfiltered except those designated with the –F suffix in the Sample ID.

3.0 Data Validation Results

The data validation qualifiers and reason codes were used to indicate all the data in the database where results were qualified as a result of validation. This information was sorted by the QC review elements listed below:

- Holding times and sample preservation
- Initial and continuing calibrations
- Mass spectrometer tuning
- ICS results
- Laboratory blanks/equipment blanks/field blanks
- Surrogate recoveries
- LCS/LCSD results
- MS/MSD results

- Internal standard performance
- Laboratory duplicate results
- Field duplicate results
- ICP serial dilution results
- Quantitation limits and sample results
- GC/MS performance checks
- Compound or element or asbestos fiber identification
- Peak integration and mass spectral matches
- Chemical yield (Tracers and Carriers)
- Calculation and transcription verifications

Tables E-5 through **E-17** list all the results qualified based on QC problems identified with regard to holding times, calibrations, interference check sample results, serial dilutions, blanks, LCS results, MS results, surrogate spike recoveries, internal standard performance, laboratory duplicates, field duplicates, quantitation problems, and rejected data points, respectively. Reason codes for each qualifier assignment have been provided in each table. Where available, a numerical data quality indicator (DQI) result value, such as percent recovery for matrix spikes, and acceptance criteria have been added to the tables in columns to the right of the reason codes per NDEP's request. No QC problems were identified that resulted in qualification of results based on mass spectrometer tuning, compound identification, peak integration, or chemical yield of tracers and carriers. The data validation summary results table contents are sorted by sample ID and SDG to assist the data user in locating the associated data validation memoranda. The data validation memoranda discuss the application of qualifiers in more detail. **Table E-1** through **Table E-17** are provided on CD as Excel spreadsheets that can be resorted to assist the data user in locating validation information for any particular sample, SDG, method, or analyte. The results in each table will be summarized separately in sections below.

3.1 Holding Times and Sample Preservation

Holding times (HTs) were derived from the EPA methods utilized and listed in the QAPP and Workplan, and were calculated beginning at the time of sample collection. The majority of analyses were performed within the method-specified HTs. Exceptions are listed in **Table E-5** and summarized below based on method, analyte, and frequency of qualification. The DQI values for actual analysis HT are calculated from collection to analysis and expressed in days unless otherwise specified in this table. Actual preparation (abbreviated as prep) HTs are calculated from sample collection to preparation initiation. Method-required HT criteria for preparation and analysis are listed in the last two columns. HTs for some wet chemistry parameters lacking a soil-specific EPA-defined HT were based on the aqueous HT. For these wet chemistry parameters the actual analysis HTs were based on the time from the leaching preparation to analysis.

The most frequent HT exceedance problems were for cyanide analysis. STL-St. Louis attributed these exceedances to instrument problems. A total of 73 nondetect results for cyanide were rejected because the actual time elapsed between sample collection and analysis (shown in Table E-5 column "Actual Analysis Holding Time") was more the twice the method-defined HT and therefore met the validation criterion of "grossly exceeded." A total of 43 nondetect results for cyanide were qualified as estimated (UJ) because although the method-defined HT was exceeded, it was not grossly exceeded as defined above. Three positive results for cyanide in equipment blanks were qualified as estimated (J or J-) due to HT exceedances.

Results for 60 dioxin/furan congeners and homologs were qualified as estimated (J or UJ) due to reanalysis after the sample extract HT expired.

All 52 of the water pH measurements performed by the laboratory were qualified as estimated (J) due to exceeding the method-defined HT of "immediately" and interpreted as within 15 minutes in **Table E-5**.

Hexavalent chromium results for water samples exceeded the 24-hour HT for analysis in a total of 82 samples. Within this sample group, 57 hexavalent chromium detections were qualified as estimated (J) and 22 nondetect results were qualified as estimated (UJ) because the HT was exceeded, but not grossly exceeded (twice the nominal HT). Results for three field QC samples (equipment and field blanks) were rejected due to gross HT exceedance. Required HTs for hexavalent chromium in soil are not clearly specified in EPA methods 3060A, 7196A, and 7199. After correspondence with NDEP, an HT of 28 days for soil prior to digestion and 4 days for soil digestates prior to analysis was agreed upon for this project. No HT exceedances for hexavalent chromium in soil were discovered during validation.

TOC results for 34 samples were qualified as estimated (J/UJ) based on HT exceedances that did not exceed twice the nominal HT for nondetect results. One equipment blank TOC result was rejected due to grossly exceeding the method HT (twice the nominal HT).

Methanol, ethanol, and ethylene glycol results for 33 samples were qualified as estimated (J/UJ) based on HT exceedances that did not exceed twice the nominal HT.

All the volatile organic compound (VOC) results for five soil samples were qualified as estimated (J/UJ) due to HT exceedances of 1 to 2 days. The VOC results for two equipment blanks were qualified as estimated (J/UJ) because they were not properly acid preserved and the default HT criterion was changed to 7 days for these unpreserved samples.

The organophosphorus pesticide results for two equipment blanks were qualified as estimated (UJ) due to preparatory HT exceedances of four to five days.

Bromide and chloride results in one water sample were qualified as estimated and possibly biased low (J-) due to HT exceedances. Ortho-phosphate and nitrate detected results were qualified as estimated (J) due to HT exceedances in one equipment blank. Nondetect nitrite results were rejected in four samples, and an ortho-phosphate nondetect result was rejected in one water sample due to gross HT exceedances. The nondetect result for total dissolved solids (TDS) in one equipment blank was rejected due to gross HT exceedance, and the positive result for TDS and total suspended solids (TSS) in one well water sample was estimated as possibly biased low (J-). Nondetect results for MBAS in four field QC samples were rejected due to gross HT exceedances.

Nondetect results for gasoline range organics (GRO) in 10 soil samples, two equipment blanks, and one trip blank were qualified as estimated (UJ) due to HT exceedances of one to three days.

3.2 Instrument Calibration and Tuning

Table E-6 lists the sample results that were qualified based on exceeded calibration criteria. The nature of the numerical DQI result value is defined by the DQI limit criteria; for instance, percent relative standard deviation (%RSD) limits, minimum relative response factor (RRF), and correlation coefficient (r^2) criteria are from method- or NFG-defined initial calibration (ICAL) requirements. Likewise, percent difference or percent drift (%D) limits and percent recovery (%R) limits are from method- or NFG-defined continuing calibration verification (CCV) requirements. Calibration criteria for validation were derived from both the analytical methods and the validation references listed in Section 2.

In some cases calibration data met the method QC requirements, but results were qualified based on professional judgment and the validation guidelines. The compound t-butyl alcohol did not meet the minimum RRF requirement applied to all VOC analytes in the NFGs in the associated initial calibrations. EPA Method 8260 does not require a minimum RRF for t-butyl alcohol; therefore, the nondetect results reported for this compound were qualified but not rejected on the basis of professional judgment. Examination of the raw calibration data for t-butyl alcohol revealed adequate area counts and signal to noise ratios in the extracted ion current profiles for the lowest calibration standard. The lowest calibration standard for this analyte was below the reporting limit and therefore sufficient sensitivity was demonstrated to report the nondetect results as estimated (UJ) rather than rejected. In most cases the NFG guidance is used to determine the data elements qualified, and the EPA reference methods provide the numerical criteria for comparison.

Qualified data are summarized and discussed in the paragraphs below by method, analyte, and frequency of qualification. No data were rejected based on calibration issues, and no data required qualification on the basis of instrument tuning.

The nondetect results for t-butyl alcohol in 204 samples were qualified as estimated (UJ) because the minimum RRF requirement of 0.05 was not met in the associated ICALs.

The positive and nondetect results were qualified as estimated (J and UJ, respectively) for the following compounds because the %RSD in the associated ICAL exceeded the 15% maximum: bromomethane in 29 samples, 4-methyl-2-pentanone in 16 samples, 1,2-dibromo-3-chloropropane in 16 samples, dichlorodifluoromethane in 181 samples, chloromethane in 180 samples, chloroethane in 180 samples, 2-hexanone in 167 samples, trichlorofluoromethane in 162 samples.

The positive and nondetect results for 36 out of the 67 volatile organic target compounds in 13 samples were qualified as estimated (J and UJ, respectively) because the %RSD in the associated ICAL exceeded the 15% maximum.

The positive and nondetect results for the following compounds were qualified as estimated (J and UJ, respectively) because the %D in the associated CCVs exceeded the 25% maximum: t-butyl alcohol in 46 samples; 1,2-dibromo-3-chloropropane in 20 samples; 1,2-dichloroethane in 4 samples; 1,3,5-trimethylbenzene in 15 samples; 2-hexanone in 6 samples; 2-methyoxy-2-methyl butane in 6 samples; 4-isopropyltoluene in 2 samples; 4-methyl-2-pentanone in 51 samples; acetone in 17 samples; bromochloromethane in 1 sample; bromomethane in 46 samples; dichlorodifluoromethane in 13 samples; ethyl tert-butyl ether in 8 samples; isopropyl ether in 8 samples; methylene chloride in 21 samples; n-butylbenzene in 14 samples; n-propylbenzene in 37 samples; sec-butylbenzene in 44 samples; trichlorofluoromethane in 55 samples; and xylenes (total) in 6 samples.

The nondetect results for indeno(1,2,3-cd)pyrene in 34 samples and pyridine in one sample were qualified as estimated (UJ) because the %RSD in the associated ICALs exceeded the 15% maximum. The nondetect results for pyridine in six samples were qualified as estimated (UJ) because the %D in the associated CCVs exceeded the 20% maximum.

The nondetect results for ethanol in five samples, for methanol in 14 samples, and for ethylene glycol in 27 samples were qualified as estimated (UJ) because the %D in the associated CCVs exceeded the 15% maximum.

The nondetect results for the following compounds were qualified as estimated (UJ) because the %D in the associated CCVs exceeded the 15% maximum: 4,4'-DDT in four samples; endrin ketone in four samples; methoxychlor in 22 samples; 4,4'-DDD in three samples; toxaphene in three samples; endosulfan sulfate in one sample; and heptachlor in two samples.

The nondetect results for Naled in 79 samples were qualified as estimated (UJ) because the correlation coefficients for the associated ICALs were below the 0.99 criterion and/or the %D in the associated CCVs exceeded the 15% maximum, The nondetect results for the following compounds were qualified as estimated (UJ) because the %D in the associated CCVs exceeded the 15% maximum: EPN in 32 samples, Azinphos-methyl in 33 samples, Demeton-S in 32 samples, Stirphos in 23 samples, Ronnel in 26 samples, ethyl parathion in 11 samples, Dimethoate in 11 samples, Diazinon in 10 samples, Famfur in 15 samples, Coumaphos in 19 samples, Trichloronate in five samples, Chlorpyrifos in five samples, methyl parathion in five samples, Phorate in five samples, Tokuthion in four samples, and Fensulfonothion in three samples.

The positive result for sodium in sample GWSA9 was qualified as estimated and possibly biased low (J-) because the %R in the associated CCV was below 90 %R. The positive results for tungsten in sample M48 and for strontium in the Mn tailings sample were qualified as estimated (J) because the %R in the associated CCV for each of these analytes was greater than 110 %R. The positive results for mercury in twelve groundwater samples were qualified as estimated and possible biased high (J+) because the %R in the associated CCV for each of these analytes was greater than 110 %R. . The positive results for uranium in four groundwater samples were qualified as estimated and possible biased high (J+) because the %R in the associated CCV for each of these analytes was greater than 110 %R.

Results for the total tetrachlorodibenzo-p-dioxins, total pentachlorodibenzo-p-dioxins, and total hexachlorodibenzo-p-dioxins in sample SA18-0.5 were qualified as estimated (J) by the validator because the reported result was less than the lowest calibration standard but greater than the estimated detection limit and these results had not been qualified by the laboratory. In addition, four samples were qualified as estimated (J) for octachlorodibenzo-p-dioxin because the %D in the associated CCVs exceeded the 35% maximum.

The result for chloride in sample GWSA9 was qualified as estimated (J) by the validator because the reported result was greater than the highest calibration standard, thus exceeding the calibration range for this analyte.

3.3 Interference Check Sample Results

ICS results were reviewed during full validation of the metals data for method SW-846 6020. **Table E-7** lists the sample results that were qualified based on ICS results. Interference check sample results for metals in mass spectrometric datasets can indicate a possibility of isobaric interference from the common metals aluminum, calcium, iron, and magnesium. This potential interference can be either positive or negative, and the DQI value indicates the bias of the interference obtained from the laboratory QC summary forms.

Potential positive isobaric interferences were associated with detections for a total of 147 samples, and these results were qualified as estimated with a possible high bias (J+) in the absence of other reasons for qualification. The qualified metals include Mn (51 samples), nickel (47 samples), strontium (46 samples), and zinc (three samples). Note some final qualifiers for these results were adjusted to estimated without the positive bias (J) based on uncertainties in the bias introduced by other reason codes listed for qualification such as low matrix spike recoveries.

Results associated with potential negative isobaric interferences were qualified as estimated biased low (J-) for detected (positive) sample results when < 10x the absolute value of the negative result for the interfering analyte. Nondetect sample results were qualified as estimated (UJ). Nondetect results for selenium were qualified as estimated (UJ) in 11 samples.

3.4 Serial Dilution

Serial dilution results were reviewed during full validation of the metals data for method SW-846 6020. **Table E-8** lists the sample results that were qualified based on serial dilution nonconformances. The DQI value for serial dilutions is the %D between the original and diluted result. The maximum %D acceptance criterion is defined by the method. It should be noted that an indication of bias may be shown for some of these results due to cumulative nonconformances.

The serial dilution %D for aluminum exceeded the acceptance criterion for three soil samples and one water sample. The associated 44 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for aluminum.

The serial dilution %D for calcium exceeded the acceptance criterion for two soil samples and one water sample. The associated 28 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for calcium.

The serial dilution %D for cobalt exceeded the acceptance criterion for three soil samples. The associated 44 soil sample results were therefore qualified as estimated (J/UJ) for cobalt.

The serial dilution %D for copper exceeded the acceptance criterion in one water sample. The associated nine water sample results were therefore qualified as estimated (J/UJ) for copper.

The serial dilution %D for iron exceeded the acceptance criterion in three soil samples and one water sample. The associated 44 soil and nine water sample results were therefore qualified as estimated (J/UJ) for iron.

The serial dilution %D for magnesium exceeded the acceptance criterion in three soil samples and one water sample. The associated 44 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for magnesium.

The serial dilution %D for manganese exceeded the acceptance criterion for two soil samples and one water sample. The associated 28 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for manganese.

The serial dilution %D for nickel exceeded the acceptance criteria for two soil samples and one water sample. The associated 28 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for nickel.

The serial dilution %D for potassium exceeded the acceptance criterion for two soil samples and one water sample. The associated 44 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for potassium.

The serial dilution %D for sodium exceeded the acceptance criterion for two soil samples and one water sample. The associated 27 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for sodium.

The serial dilution %D for strontium exceeded the acceptance criterion for two soil samples and one water sample. The associated 28 soil and 10 water sample results were therefore qualified as estimated (J/UJ) for strontium.

The serial dilution %D for titanium exceeded the acceptance criterion in three soil samples and one water sample. The associated 44 soil and eight water sample results were therefore qualified as estimated (J/UJ) for strontium.

The serial dilution %D for zinc exceeded the acceptance criteria in one water sample. The associated 10 water sample results were therefore qualified as estimated (J/UJ) for zinc.

3.5 Blank Contamination

In general, laboratory and field blanks were free of contamination. **Table E-9** lists the sample results that were qualified based on contamination in laboratory blanks (such as method blanks, initial calibration blanks, and continuing calibration blanks) or field QC blanks (such as trip blanks, field blanks, and equipment blanks). The blank result value associated with each qualified sample result is given in the column to the right of the reason codes. When multiple cases of contamination in different blanks associated with a given sample were found, the blanks were evaluated in the following order: (1) laboratory blanks were first applied to field QC blanks and field samples; (2) field blank sample results were then applied to equipment blanks; and (3) equipment blank results were then applied field sample results. Qualified results are discussed in the paragraphs below based on type of blank, frequency of qualification, method, and analyte.

Laboratory Blanks

The inorganic analyte group most frequently qualified based on laboratory blanks were the metals. A total of 509 sample results were negated (U) or estimated (J/UJ) based on the presence (positive or negative) of 22 different metals in the laboratory blanks. The numerical value associated with nondetects in this dataset is based on the MDL, therefore the metals blank actions from the 1994 NFG rules were applied.

The organic analyte group most frequently qualified based on laboratory method blanks were the VOCs. A total of 129 sample results were negated (U) based on the presence of the common laboratory contaminants methylene chloride, acetone, and toluene. The majority of these negations were based on the presence of toluene in the laboratory method blanks. Results for six soil samples were also negated based on the presence of 1,4-dichlorobenzene in laboratory method blanks.

Other results negated or qualified as estimated based on laboratory blanks include 25 anions, 18 MBAS , five polycyclic aromatic hydrocarbons (PAHs), four dioxin homologs, three TDS, two cyanide, one TOC, and five radionuclide results.

Field QC Blanks

A total of 87 anions results, 147 metals, 47 alkalinity, 10 TSS, eight VOC, four Ra-226, five Ra-228, and three Th-230 results were negated or qualified as estimated based on equipment blank contamination.

A total of 31 anions, 16 metals, six TOC, two VOC, and two radionuclide results were negated or qualified as estimated based on field blank contamination.

3.6 Surrogate Recoveries

Surrogate recoveries met acceptance criteria for the majority of the organic analytes. **Table E-12** lists the sample results that were qualified during validation based on surrogate spike recoveries that were outside the acceptance criteria. The DQI result value is %R. The acceptance criteria are based on the laboratory's statistical lower control limit (LCL) and upper control limit (UCL). A total of 387 results were qualified based on surrogate recovery nonconformances. The qualifications are summarized below based on the surrogate and analyte group affected.

The recovery of surrogate 1,2-dichloroethane-d4 was above the UCL in the VOC analysis in 11 water samples. Target analyte detections in the associated samples were qualified as estimated and possibly biased high (J+) except where other reason codes for the same sample analyte rendered the bias uncertain and only the estimated qualifier (J) was applied.

The recovery of surrogate bromofluorobenzene was above the UCL in the VOC analysis of water sample M98, and therefore the two detected analytes in this sample were qualified as estimated with a possible high bias (J+).

The surrogates 2-fluorobiphenyl and nitrobenzene-d5 were recovered below the LCL in the semivolatile organic carbon (SVOC) analysis of two water samples (M100 and GWSA2). All associated analytes for these samples were nondetects and qualified as estimated (UJ) with the exception of bis(2-ethylhexyl)phthalate and di-n-butyl phthalate in GWSA2, which were detected but qualified as estimated and possibly biased low (J-). The recovery of surrogate terphenyl-d14 was also below the LCL in sample GWSA2.

The recovery of surrogates decachlorobiphenyl (DCB) and tetrachlorometaxylene (TCMX) were above the UCL in soil sample SA11-0.5 analyzed for organochlorine pesticides due to significant matrix interferences; therefore, all the associated analytes were qualified as estimated and possible biased high (J+) when detected and also as estimated when reported as nondetect (UJ). DCB recovery alone was also elevated in samples SA25-0.5 and SA9-0.5. For these samples, only detected analyte results were qualified as estimated and possibly biased high (J+). TCMX recovery alone was elevated in water sample M5A. All associated analytes for this sample were qualified as estimated and possibly biased high (J+). DCB recovery was also elevated due to matrix interferences in sample SA9-20, and therefore the associated Aroclor detection was qualified as estimated and possibly biased high (J+).

The recovery of surrogate chlormefos was below the LCL in four samples (SA11-0.5, SA13-0.5, SA16-0.5, and SA26-0.5) analyzed for organophosphorus pesticides. No target analytes were detected in these samples, so all the nondetect results were qualified as estimated (UJ).

3.7 Laboratory Control Samples

LCS and LCSD recoveries met QC acceptance criteria for the majority of analyses. **Table E-10** lists the results that were qualified based on LCS and LCSD recoveries that exceeded QC acceptance criteria. The numerical DQI value is the LCS or LCSD %R. The acceptance criteria were the laboratories statistical LCL and UCL. No results were rejected based on LCS/LCSD recovery results. A total of 429 results were qualified based on LCS and LCSD recovery nonconformances.

The VOCs were the most frequently qualified analyte group based on LCS/LCSD recovery nonconformances. A total of 291 associated results were qualified as estimated (UJ), all of them nondetects, based on LCS or LCSD recoveries below the LCL. The small group of analytes qualified includes 1,1-dichloroethene, chloroethane, methyl-tert-butyl-ether, methylene chloride, trans-1,2-dichloroethene, trichlorofluoromethane, vinyl chloride, and total xylenes. The results for t-butyl alcohol were qualified even though they were not spiked (NS) because the average RRF for the ICAL did not meet the minimum NFG criterion, and no recovery information is available to confirm adequacy of response independent of the calibration standards.

Radionuclides were the next most frequently qualified analyte group based on LCS/LCSD results. Associated results for Ra-226 and/or Ra-228 in 28 soil samples were qualified as estimated with a possible high bias (J+) based on an LCS recovery above the UCL. Ra-228 in 50 water samples and Ra-226 in two water samples were also qualified as estimated with a possible low bias (J-/UJ) or estimated (J/UJ), respectively, based on low LCS recovery results. Results for U-235/236 and U-238 in a single soil sample were also qualified as estimated and possibly biased low (J-/UJ) based on poor LCS recovery.

Cyanide results for 19 associated samples, all nondetects, were qualified as estimated (UJ) based on two low LCS recovery results. STL-St. Louis noted frequent QC result excursions for cyanide, possibly due to instrument problems.

Naphthalene results, all nondetects, from the SVOC analyses for 10 associated samples were qualified as estimated (UJ) based on a low LCS recovery. A single TOC result in one water sample was qualified as an estimated nondetect (UJ) due to a low associated LCS recovery.

3.8 Matrix Spikes

MS and MSD recoveries met the QC acceptance criteria for the majority of analyses. **Table E-11** lists the sample results qualified based on MS and/or MSD recoveries that were outside the laboratory acceptance criteria or required additional qualification per the NFG rules. When more than one MS applied to a sample, a range of recovery outliers are shown in **Table E-11**. A separate column is used to designate low recovery and high recovery values that were outside acceptance limits.

The majority of test methods had qualifications applied based on MS and/or MSD recovery nonconformances. The following paragraphs summarize the exceedances and qualifications applied based on MS/MSD recovery results. In summary, 128 out of 2,678 results were rejected due to MS/MSD recovery issues. Qualified data are summarized and discussed in the paragraphs below by method, analyte, and frequency of qualification.

Approximately 80% of the MS/MSD recovery exceedances (2,154 out of 2,678 qualified results) for this project applied to metals analysis by SW-846 method 6020. Results were qualified as J, J+, J-, UJ, or R due to the spike recovery results outside acceptance limits. Due to a significant number of recoveries outside acceptance limits, the MS/MSD soil sample results (a total of 10 MS/MSDs) were evaluated as a cumulative group based on matrix similarities. This grouping excluded samples identified as Mn Ore and Mn Tailing, since they are considered a unique matrix. If at least 50% (i.e., at least one MS or MSD recovery failure in five or more MS/MSD pairs) failed QC criteria for any metal, all soil samples were qualified for that particular analyte based on the group failure rate. More than 50% of the soil sample MS/MSD pairs reported for antimony, boron, chromium, cobalt, magnesium, nickel, sodium, tungsten, vanadium, and zinc had MS/MSD pairs resulting in <75% recoveries. These samples were qualified as J- or UJ. In some cases, the results were qualified as estimated (J) when another QC element indicated a conflicting bias. More than 50% of the soil MS/MSD pairs reported for barium, copper, and strontium resulted in <75% or >125% recoveries. These results are qualified as J, J-, or UJ depending on the associated MS recoveries and the impact of other QC qualifications. At least one MS and/or MSD result exhibited <30% recovery for barium, magnesium, and strontium in soil samples. Groundwater samples and the Mn ore and Mn tailing samples were qualified based on batch MS/MSD QC associations. Sixty one groundwater results were rejected due to <30% recovery of MS and/or MSD for antimony, chromium, iron, and vanadium. Fifteen mercury soil and water samples (analyzed by SW-846 method 7470 or 7471) were qualified J, J-, J+, or UJ due to high or low MS/MSD recoveries. No mercury results were rejected.

Several wet chemistry parameters (bicarbonate alkalinity, total alkalinity, perchlorate, ammonia-nitrogen, cyanide, hexavalent chromium, specific conductance, bromide, chlorate, chloride, nitrate-nitrogen, nitrite-nitrogen, orthophosphate, sulfate, and TOC) were qualified for MS/MSD recovery exceedances. A total of 369 wet chemistry results were qualified due to MS/MSD recovery exceedances. Of these, 61 results for ammonia-nitrogen, cyanide, bromide, chlorate, or nitrite were rejected due to <30% MS/MSD recovery.

A total of 113 radiochemical results (Ra-226, Ra-228, Th-230, uranium-233/234, and uranium- 235/236) were qualified as J, J+, J-, JB, or UJ due to matrix spike recovery problems. No radiochemical results were rejected.

A total of 29 organic results in five analyte groups (VOCs, SVOCs, fuel alcohols, GRO, and organochlorine pesticides) were qualified as estimated. Seven VOC, SVOC, or organochlorine pesticide results were rejected due to <10% MS/MSD recovery.

3.9 Internal Standards

Internal standard (IS) performance was reviewed during full validation of the Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) and GC/MS data. **Table E-13** lists all the results qualified during validation based on IS performance. All internal standard areas were within acceptance criteria in the fully validated ICP/MS metals analyses. All internal standard areas were within acceptance criteria in the fully validated VOC and SVOC analyses with the exception of perylene-d12 in one sample (SA10-30) and 1,4-dichlorobenzene-d4 in another sample (SA25-10). Only nondetect results were associated with these internal standards. These associated results were qualified as estimated (UJ).

3.10 Laboratory Duplicates

The evaluation of laboratory duplicate precision included an assessment of the agreement between LCS and LCSDs; MS and MSDs; and matrix duplicates, as measured through the calculation of relative percent difference (RPD). **Table E-14** lists the results qualified during validation based on laboratory duplicate precision. The DQI result value and RPD limit given in the columns to the right of the reason code are the RPD between the laboratory duplicate results and the RPD maximum derived from the method or laboratory SOP requirements. A total of 496 records were qualified based on nonconformances with respect to these precision criteria. Qualified results are summarized below based on method, analyte type, and frequency of qualification.

The following results were qualified as estimated (J) based on poor precision between laboratory duplicates: 295 metals, 49 VOCs, 42 organophosphorus pesticides, 21 PCBs, 19 nitrate, 18 Th-232, 12 Th-230, 15 TSS, nine Ra-226, five ammonia, five uranium isotopes, three GRO, one Th-228, one diesel range organic (DRO), and one ethylene glycol.

3.11 Field Duplicates

The results of all soil and groundwater field duplicate pairs collected during the Phase A Source Area Investigation were evaluated during validation. RPDs were compared to the objectives established in the QAPP of 30% RPD for aqueous samples and 50% RPD for solid samples. **Table E-15** lists the results qualified during validation based on field duplicate precision nonconformances.

A total of 210 associated field sample result values, including 177 soil samples and 33 water samples, were qualified as estimated based on field duplicate result RPDs that exceeded the QAPP criteria. Associations for inorganic analytes detected in soil samples were based on common boring location. Qualified analytes or analyte groups for the soil matrix include alkalinity in 51 samples, anions in 48 samples, metals in 37 samples, perchlorate in 13 samples, TOC in 13 samples, U-233/234 in three samples, pesticides in eight samples, and oil range organics (ORO) or acetone in two samples. For aqueous matrices only TSS in 24 samples, Th isotopes in seven samples, and bromoform in two samples were qualified as estimated based on poor field duplicate precision.

3.12 Quantitation

Table E-16 lists the results that were qualified during validation based on quantitation issues. Quantitation issues include addition of qualifiers for result values between the detection limit and reporting limit when not so qualified by the laboratory, addition of qualifiers and revised results selection based on differences between the primary and confirmatory columns for pesticide analyses, special qualifiers for dioxin quantitation problems, and overlapping area count issues for DRO analyses. This information is summarized and discussed in the paragraphs below by reason for qualification, frequency of qualification, and analyte type.

Some of the radionuclide results reported by STL-Richland were not qualified as estimated (J) if the activity value was between the detection limit and project reporting limit. In order to be consistent with the reporting style for all the other analytes, the J qualifier was added during validation if the activity result was between the detection limit and project reporting limit. For this reason, 115 results for Ra-226, 13 results for Th-228, six results for Ra-228 were qualified.

For some of the pesticide analytes, the result value difference between the primary and confirmatory columns exceeded the 40% criterion. These results were reported by STL-St. Louis based on the lower value in the absence of obvious interferences. To conform with the requirements of EPA 8000B Section 7.10.4.2, the validator chose the higher of these two values for reporting and qualified the results as estimated (J). For this reason a total of four results for beta-BHC and 4,4'-DDE, three results for 4,4'-DDT, delta-BHC, methoxychlor, and dimethoate; two results for alpha-BHC, heptachlor, and endrin aldehyde; and one result each for gamma-BHC, 4,4'-DDD, gamma-chlordane, and demeton-o were qualified as estimated.

For a few of the dioxin/furan congeners and homologs , special qualification was performed by the validator. Results for two hexachlorodibenzodioxin congeners and one pentachlorodibenzofuran congener were qualified as Estimated Maximum Possible Concentrations (EMPC) based on incomplete conformity to the ion abundance ratio criteria. The dioxin and furan NFGs state that "If ion abundance criteria are not satisfied, qualify the detects as unusable "R" and use professional judgment to qualify non-detects." It also states that "professional judgment should be used in determining the proper identification of analytes." Rather than deem the results as unusable "R," the validator took a conservative approach and using professional judgment reported these EMPC results qualified as estimated (J), since the method allows for compounds that do not meet ion abundance ratios to be reported as EMPCs. In addition, the laboratory "K" qualifier was retained during validation for an overall qualification of "JK," since the identification of this compound may be uncertain. It should be noted that the TEQ results from the Form3 data calculated by CAS-Houson were based on the 1988 WHO TEFs. ENSR risk assessors recalculated the TEQs based on the WHO revised TEFs published in 2006 (WHO 2006) For the DRO and ORO results in a single soil sample, the results were qualified by the validator as estimated and biased high (J+) due to overlapping retention time ranges used by STL-St. Louis for this analysis. The overlapping ranges resulted in some "double counting" of the same area for both analytes.

Corrected phosphate results were provided by the laboratory after a qualitative error was discovered in the raw ion chromatography data. Two ion chromatographs were used and one (4000 IC) was not calibrated for chlorate. Phosphate and chlorate coeluted on his instrument, resulting in reporting of chlorate as phosphate. Reevaluation of the IC datasets for both instruments eliminated most of the apparent phosphate detections. A few phosphate results (SA11-10, SA11-20, and SA15-20) were qualified as estimated due to chromatographic interference by elevated sulfate concentrations.

3.13 Rejected Results

Table E-17 lists all of the 164 sample data points that were rejected as unusable during validation. Rejected results values were removed from the database; hence, the result column appears empty. The reasons these results were rejected were discussed in previous Sections 3.1 and 3.8. This information is summarized and discussed in the paragraphs below by reason for rejection, frequency of rejection, and by analyte.

Many of theses results (88 values) were nondetects rejected based on HT exceedances. Cyanide was the most affected analyte given that 98 results were rejected for HT and/or a combination of HT and failing MS recovery. For these rejected cyanide analyses, both the HT and spike recovery problems were due to laboratory instrument problems. Three results for hexavalent chromium, four results for MBAS, one for nitrate, four for nitrite, one for ortho phosphate, one for TDS, and one for TOC were also rejected; however, all of these aqueous results, except for the nitrite results in water samples M13 and PC40, pertained only to field QC samples.

A greater number of nondetect results (128 total) were rejected based on low MS recoveries. Some of these low spike recoveries were for cyanide (36 associated results), and it is likely that instrument problems, rather than matrix effects, were the cause of the low spike recovery. Ammonia nondetect results in 15 soil samples were rejected based on batch association with a single MS failure. Nondetect results for iron in 44 associated water samples were rejected based on very low MS recoveries. In particular, the filtered groundwater samples displayed very low iron matrix spike recoveries as a consistent matrix effect. Nondetect results for vanadium in nine associated water samples were rejected based on a single low MS recovery. Nondetect results for total chromium in seven water samples were rejected based on associated low MS recoveries. Nondetect results for nitrite in six soil samples and one water sample were rejected based on associated low MS recoveries. Nondetect results for styrene, acenaphthylene, and antimony in different pairs of associated water samples were rejected based on low MS recoveries. Nondetect results for chlorate in a pair of associated soil samples were rejected based on poor MS recoveries. Single nondetect results for bromide and heptachlor were rejected in the associated water and soil samples, respectively, due to low MS recoveries.

4.0 Evaluation of Data Quality Indicators

Data validation information was used to evaluate the DQIs of precision, accuracy, representativeness, comparability, completeness, and sensitivity for results in the Henderson Phase A Source Area Investigation dataset. Each of these DQI parameters is discussed in the sections below.

4.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions. Field precision was assessed through the collection and measurement of field duplicates and expressed as the RPD of the sample and field duplicate pair results. The field duplicate RPD results that caused the application of validation qualifiers are discussed in Section 3.11 of this report and listed in **Table E-15**. In general the field duplicate precision was acceptable for all analytes. A limited analyte data set was qualified as estimated but usable and represents only 0.67% of the total field sample results dataset.

Laboratory precision was assessed through the RPD results for matrix duplicates, LCS/LCSD pairs, and MS/MSD pairs. Laboratory precision nonconformances that resulted in the application of validation qualifiers are discussed in Section 3.10 of this report and listed in **Table E-14**. In general, the laboratory duplicate precision was acceptable. Results associated with these duplicates were qualified as estimated but usable and represent only 1.2% of the total data points. No data were rejected based on precision problems.

4.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. Laboratory accuracy was assessed during the validation using the recoveries of positive control samples (i.e., MS and MSD, LCS and LCSD, and surrogate spikes). The spike recoveries that resulted in the application of validation qualifiers are discussed in Sections 3.6, 3.7, and 3.8 of this report and listed in **Tables E-10, E-11** and **E-12**. In general the laboratory accuracy was acceptable. No data were rejected based on LCS/LCSD or surrogate spike recovery. The number of rejected data points based on MS recovery accuracy (a total of 128 results) is 0.3% of the total number of data points, and the number of qualified points (excluding rejected results) based on all spike recovery types represents 8.7% of the total data points collected.

Accuracy is also indirectly addressed via the negative control samples for field activities (i.e., trip, equipment, and field blanks), as well as laboratory negative control samples such as method blanks and calibration blanks. Based on blank results validation, 1083 results were qualified as described in Section 3.5, which represents only 2.9% of the total data points collected. No data were rejected based on blank results.

Bias as a component of accuracy is also evaluated with the validation of HT, calibration, interference check sample, serial dilution, internal standard performance, and quantitation results discussed in Sections 3.1, 3.2, 3.3, 3.4, 3.9, and 3.12 of this report. Collectively these evaluations resulted in the qualification of 10.6% and the rejection of 0.2% of the total data points.

Evaluation of the remaining QC elements that contribute to accuracy, such as mass spectrometer tuning, compound or element identification, peak integration and mass spectral matches, chemical yield, and calculation/transcription verifications, did not result in the qualification or rejection of any data points during validation.

4.3 Representativeness

Representativeness is the measure of the degree to which data suitably represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Aspects of representativeness addressed during validation include the review of sample collection information in the COC documentation, conformity of laboratory analyses to Workplan intentions, adherence of the documented laboratory procedures to method requirements, and completeness of the laboratory data packages. Most of the issues identified during this evaluation did not result in the qualification of laboratory data but did involve resubmittals of data from the laboratories to correct problems that were discovered during the validation process. All of these issues were resolved. Other aspects of data representativeness, such as adherence to recommended HTs, instrument calibration requirements, as well as field and laboratory precision assessments, are discussed in Sections 3.1, 3.2, 3.10, and 3.11 of this report.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that were or should have been collected. Valid data are defined as all the data points judged to be usable (i.e., not rejected, as a result of the validation process).

Field completeness is defined as the percentage of samples actually collected versus those intended to be collected per the Workplan. The goal stated in the QAPP for this project was greater than 90% field completeness. A comparison of the Workplan sample tables with the database sample IDs indicates that actual field completeness was 99%, exceeding the goal established for the project. This field completeness calculation is based on the total analytical suites scheduled in the Workplan compared to the COC requests sent to the laboratories. Planned samples from depths that were excluded due to the water table depth were not included in the calculation. All COC requests were faithfully executed by the laboratories with the minor exceptions detailed in the data validation memoranda.

Laboratory completeness is defined as percentage of valid data points versus the total expected from the laboratory analyses. The objective stated in the QAPP for this project was greater than 95% laboratory completeness. Actual laboratory completeness was 100% on the basis of sample analysis (i.e., all requested analyses were performed and reported by the laboratories), and 99.5% completeness based on valid data.

4.5 Comparability

Comparability is a qualitative expression of the measure of confidence that two or more data sets may contribute to a common analysis. Because this project was an initial site investigation for most of the parameters, involving new wells and new soil borings, there was no well characterized historical data set for comparisons with the exception of the Upgradient Investigation performed by Tronox in 2006. Comparability of data within the investigation was maximized by using standard methods for sampling and analysis, reporting data, and data validation. In general, standard Resource Conservation and Recovery Act (RCRA) program methods from SW-846 were employed for all analyses with the exception of methods for which no SW-846 method exists (e.g., some wet chemistry and radiochemical parameters). In this event alternate EPA or other accepted methods were utilized. To eliminate interlaboratory variability, analyses were distributed amongst the laboratories on a method basis. No instances of multiple methods for the same analyte/matrix pair occurred in the finalized dataset. The Upgradient and Souce Area studies used identical or equivalent methods for all analytes except some metals in the Upgradient were analyzed by Inductively Coupled Plasma/Atomic Emission Spectrometry (ICP/AES) and all metals in the Source Area were analyzed by ICP/MS with the exception of mercury. Results from ICP/AES and ICP/MS are regarded as comparable by EPA although the ICP/MS is in generally more sensitive.

The comparability of the uranium and thorium isotope data between the Upgradient and Source Area soil results datasets appears to have been impacted by a difference in preparatory methods utilized by GEL (Upgradient) and STL-Richland (Phase A Source Area). The statistical comparison of the Upgradient and Source Area datasets, discussed in Section 5.4 of this report, indicated a significant low bias in the Phase A Source Area uranium (U) and thorium (Th) results relative to the Upgradient data. Investigation of the digestion procedures used by GEL and STL-Richland revealed that the GEL digestion uses hydrofluoric acid (HF) and the STL digestion does not use HF. Both digestions are complaint with the MARLAP and HASL-300 methods but the GEL procedure using HF is probably more aggressive and dissolves silicate mineral grains, releasing the U and Th within these grains for analysis, whereas the STL digestion using nitric acid and hydrogen peroxide does not completely dissolve all silicate mineral grains.

4.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest and particularly the capability of measuring a constituent at low levels. For the EPA methods employed in this project, sensitivity is measured by the MDL and reporting limit (RL). Both nominal MDLs and RLs were provided by the laboratories in the laboratory data packages and were verified during validation. Reporting limits in general were adjusted for sample quantitation limits based on the low point of calibration and corrected for sample-specific factors such as exact aliquot size, dry weight for soils, dilutions, etc. The laboratories were instructed to report estimated (J flagged) results if concentrations above the MDL but below the RL were detected. Reporting limits for metals were based on the adjusted MDL values for this project.

To determine if the adjusted reporting limits for all project analytes were low enough to meet the project sensitivity requirements, a comparison of the project regulatory comparison levels, based on 1/10 of the EPA Region 9 Preliminary Remediation Goals (PRGs) for industrial soils and state and Federal water maximum contaminant levels (MCLs), was made with all the adjusted laboratory RLs associated with nondetect results. This analysis is described in Section 5 of the Phase A Source Area Investigation Report. In general the methods selected were sufficiently sensitive to meet the risk-based comparison level goals in soil samples. For the water analyses, the minimum RLs associated with nondetect results exceeded the comparison levels for 49 analytes as described in Table 5-5. This comparison is conservative because the laboratories adjusted MDLs were lower for most of these analytes. The RLs and MDLs provided by the laboratories for this analyte set are typical of the methods employed and significantly lower detection limits are not routinely achievable using certified methods.

5.0 Conclusions

One hundred percent of the laboratory data for the Phase A Source Area Investigation were validated using standardized guidelines and procedures recommended by EPA and NDEP. Eighty percent of the results for this project were accepted as reported by the laboratory without additional qualification based on validation actions and should be considered valid for all decision-making purposes.

A subset of the laboratory results was qualified during validation, and those results are summarized in **Tables E-5 to E-17**. The qualified data are grouped in these tables based on the reason for qualification (see **Table E-2**) and the qualifier symbols or flags applied (see **Table E-1**). Twenty percent of the results of the total analytical dataset for this project were qualified as estimated due to minor QC problems with precision, accuracy, and representativeness. Based on guidance in the EPA data usability document (EPA 1992), estimated data are considered usable with the appropriate interpretation (e.g., consideration of the potential bias).

The results that were rejected due to more serious QC problems, such as gross HT violations and low spike recoveries, constituted only 0.5% of the analytical dataset for this project. These rejected results are considered unusable and should not be used for decision-making purposes. Details of the rejected results are discussed in Section 3.13 of this report. Most of the rejected results pertain to nondetects for cyanide that were rejected on the basis of HT exceedances or poor MS recovery or both. All the qualified results were evaluated with respect to the data quality indicators and compared to the QAPP and Workplan goals. Details of this evaluation are discussed in Section 4 of this report. Based on the results of data validation, the overall goals for data quality were achieved for this project.

6.0 References

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Memorandum

Date: April 16, 2007; Revised September 7, 2007

To: Dave Gerry/Camarillo

From: Sheena Blair/Westford

Subject: Data Validation, Inorganic Analyses
Source Area A Sampling
Tronox LLC Henderson, Nevada
STL-St. Louis SDG ENSR 111006

Distribution: Robert Kennedy/Westford 04020-023-403 File

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SUMMARY

Limited validation was performed on the data for 54 soil samples and five equipment blanks analyzed for all or a subset of the following parameters:

- Bromide by SW-846 method 9056A
- Chloride by SW-846 method 9056A
- Chlorate by SW-846 method 9056A
- Nitrate-nitrogen by SW-846 method 9056A
- Nitrite-nitrogen by SW-846 method 9056A
- Sulfate by SW-846 method 9056A
- Orthophosphate by SW-846 method 9056A
- Total cyanide by SW-846 method 9012A
- pH by SW-846 methods 9040 and 9045C
- Hexavalent chromium by SW-846 method 7199
- Specific conductance by SW-846 method 9050
- Total organic carbon (TOC) by SW-846 method 9060
- Perchlorate by EPA method 314.1
- Ammonia-nitrogen by EPA method 350.1
- Total alkalinity by EPA method 310.1
- Bicarbonate alkalinity by EPA method 310.1 (calculated from total and carbonate alkalinity)
- Carbonate alkalinity by EPA method 310.1
- Total dissolved solids (TDS) by EPA method 160.1
- Total suspended solids (TSS) by EPA method 160.2
- Methylene blue active substances (MBAS) by EPA method 425.1 and Standard Methods 5540C

The samples were collected at the Henderson site in Henderson, NV on November 9, 10, and 13-15, 2006 and submitted to Severn Trent Laboratories in St. Louis, MO (STL-St. Louis) for analysis. STL-St. Louis subcontracted the hexavalent chromium analyses to its facility in Los Angeles, CA (STL-LA), TOC and perchlorate to its facility in West Sacramento, CA (STL-Sacramento), and MBAS to its facility in Savannah, GA (STL-Savannah). All sample results were reported by STL-St. Louis under sample delivery group (SDG) ENSR 111006.

The analytical data were evaluated with reference to the "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (October 2004 and February 1994), the Region 9 Superfund Data Evaluation/Validation Guidance, NDEP Guidance on Data Validation (5/06), and the quality control (QC) criteria specified in the Quality Assurance Project Plan (QAPP). The Regional and National Functional Guidelines were modified to accommodate the non-CLP methodologies.

In general, the data appear valid as reported and may be used for decision making purposes. However, some data in this dataset were rejected based on holding time exceedances and/or low matrix spike recoveries. Selected other results were qualified due to nonconformance with certain QC criteria (see discussion below).

SAMPLES

The samples included in this review are listed below:

Sample IDs	Sample IDs
SA11-0.5	SA23-20
SA11-0.5D (field duplicate of SA11-0.5)	SA23-20D (field duplicate of SA18-0.5)
SA11-10	SA3-0.5
SA11-20	SA3-0.5D (field duplicate of SA3-0.5)
SA11-30	SA3-10
SA12-0.5	SA3-20
SA12-10	SA3-30
SA12-20	SA3-40
SA12-30	SA4-0.5
SA16-0.5	SA4-10
SA16-10	SA4-20
SA16-20	SA4-30
SA16-30	SA4-40
SA17-0.5	SA5-0.5
SA17-0.5D (field duplicate of SA17-0.5)	SA5-10
SA17-10	SA5-20
SA17-20	SA5-30
SA17-25	SA5-37
SA18-0.5	SA6-0.5
SA18-0.5D (field duplicate of SA18-0.5)	SA6-0.5D (field duplicate of SA6-0.5)
SA18-10	SA6-10
SA18-20	SA6-20
SA18-30	SA6-30
SA21-0.5	SA6-35
SA21-10	EB110906 (equipment blank)
SA21-20	EB111006 (equipment blank)
SA21-20D (field duplicate of SA21-200	EB111306 (equipment blank)

Sample IDs	Sample IDs
SA21-30	EB111406 (equipment blank)
SA23-0.5	EB111506 (equipment blank)
SA23-10	

REVIEW ELEMENTS

Sample data were reviewed for the following elements, where applicable to the method:

- Agreement of analyses conducted with chain-of-custody (COC) requests
- Holding times and sample preservation
- Initial and continuing calibrations
- Method blanks/equipment blanks/field blanks
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Laboratory duplicate results
- Field duplicate results
- Quantitation limits and sample results

DISCUSSION

Agreement of Analyses Conducted with COC Requests

The sample reports were checked to verify that the results corresponded to analytical requests as designated on the COC. The following discrepancy was found:

Please note that hexavalent chromium analyses were performed by STL-St. Louis by method 7196 and by STL-LA by method 7199. ENSR has made the decision to report the hexavalent chromium data reported by STL-LA since 7199 was the method originally requested for this analysis in the QAPP and the lower reporting limit for this method meets the DQOs. It was also thought that the detected results by method 7199 are higher and present a more conservative approach in reporting the data. The hexavalent chromium results reported from method 7196 were therefore marked as not reportable to avoid confusion.

Holding Times and Sample Preservation

In general the samples were analyzed within the method-specified holding times (HTs). Listed below are the sample IDs, the sample analyses performed outside of the method-specified HTs, and the actions taken.

- Since it was not included in the data package, STL-St. Louis was contacted and asked to provide documentation for the soil leaching procedure (e.g., dates performed, prep amount and final volume). However, according to STL-St. Louis "The soil sample DI leach for anions is not documented. It is the laboratory's standard practice to analyze the leached samples no more than 24 hours from the DI leach", and "that a standard 5 grams of soil sample were leached into 50 mL of DI water". Although HTs were evaluated using that information and no validation actions were required, it could not be determined whether or not sample analyses actually met holding times.

- The HT for aqueous pH is stated as "analyze immediately", which means sample pH should be determined at the time of sample collection. Since pH measurements were taken for all of the equipment blank samples in this data set after receipt at the laboratory, the pH results for EB110906, EB111006, EB111306, EB111406, and EB111506 were qualified as estimated (J).
- The MBAS and nitrite-nitrogen analyses for sample EB111006 and the nitrate-nitrogen, nitrite-nitrogen and orthophosphate analyses for sample EB111306 were performed beyond 2 x the method-specified HT of 48 hours. Nondetects were reported for nitrate-nitrogen, nitrite-nitrogen, orthophosphate and/or MBAS for samples EB111006 and EB111306. These nondetects were rejected (R).
- The nitrate-nitrogen analysis for sample EB111006 was performed beyond 2x the method-specified HT of 48 hours. The positive nitrate-nitrogen result for sample EB111006 was qualified as estimated, biased low (J-).
- The cyanide analysis for sample EB111406 was performed beyond 2x the method-specified HT of 14 days. The positive cyanide result for sample EB111406 was qualified as estimated, biased low (J-).
- The cyanide analysis for samples EB110906, EB111006, and EB111506 was performed beyond 1x but <2x the method-specified HT of 14 days. The nondetect cyanide results for samples EB110906, EB111006, and EB111506 were qualified as estimated (UJ).
- The dissolved hexavalent chromium analysis for samples EB111006 and EB111506 was performed beyond 1x but <2x the method-specified HT of 24 hours. The nondetect dissolved hexavalent chromium results for samples EB111006 and EB111506 were qualified as estimated (UJ).

The cooler temperatures upon receipt at all laboratories ranged from -2.6 to 4°C, some of which fell below the acceptance criteria of 4 ± 2°C. No validation action was taken for these minor nonconformances other than this notation.

According to the STL-St. Louis “Condition Upon Receipt Forms”, chemical preservation was acceptable. However, no documentation of pH verifications was included in the data package. No validation action was taken except for this notation.

Initial and Continuing Calibrations

All criteria were met for the calibration curves, and the initial and continuing calibration verification (ICV/CCV) standards (where applicable to the methods) except as noted. The initial sulfate analysis for sample SA6-0.5D was not bracketed by acceptable CCVs. The sample was re-analyzed with acceptable CCVs. The laboratory reported the results from both analyses on the Form1; the result from the initial analysis was marked as not reportable by the validator. No other validation action was taken on this basis.

Method Blanks/Equipment Blanks/Field Blanks

Several equipment blanks, two field blanks, and a pump blank were collected in association with the soil samples in this data set. The field blank was the source water used for all equipment blanks and therefore, blanks were evaluated in the following order:

- Method blanks were first applied to the equipment blanks, field blank, and field samples (soil and groundwater).
- Then field blank sample results were applied to all equipment blanks.
- The equipment blank sample results were applied to the field samples (soils).
- The pump blank was collected for informational purposes only.

Target analytes were not detected in the method blanks associated with the samples in this data set except as noted. Selected target analytes remained in the equipment blanks and field blank after qualification of those samples due to laboratory and/or field blank contamination. The following tables summarize the analytes, the concentrations detected, and the associated samples.

Blank/Prep Batch	Analyte	Conc. Detected (mg/kg)
Method Blank/6348227 Method Blank/6348349 Method Blank/6348383	Chloride	0.34
Method Blank/7004101	Orthophosphate	1.4
Associated samples: All soil samples by analyte and prep batch.		

Blank/Prep Batch	Analyte	Conc. Detected (mg/L)
Method Blank/7008036	Chloride	0.046
Method Blank/6322193	Chloride	0.025
Method Blank/6333429	Chloride	0.040
Associated samples: All aqueous samples by analyte and prep batch.		

Field blank FB110206 (reported under SDG 110306) was submitted in association with the equipment blanks in this data set. Selected target analytes remained sample FB110206 after qualification of the sample by the associated laboratory blanks. The following table summarizes the analytes, the concentrations detected, and the associated equipment blanks.

Blank	Analyte	Conc. Detected (mg/L)
FB110206	Chloride	0.13
	Nitrate-nitrogen	0.064
	Sulfate	0.29
	TOC	0.44
Associated samples: EB110906, EB111006, EB111306, EB111406, EB111506		

Selected target analytes remained in the equipment blanks after qualification of those samples by the associated laboratory blanks and field blank. The following table summarizes the analytes, the concentrations detected, and the associated samples.

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Blank	Analyte	Conc. Detected (mg/L)
EB110906	Total Alkalinity	58.0
	Bicarbonate Alkalinity	58.0
	Nitrate-nitrogen	0.037
	Ammonia-nitrogen	226 (µg/L)
	Perchlorate	2.8 (µg/L)
EB111006	Orthophosphate	0.19
	Nitrate-nitrogen	0.021
	Ammonia-nitrogen	125 (µg/L)
	Perchlorate	1.1 (µg/L)
EB111306	Perchlorate	1.1 (µg/L)
EB111406	Total Cyanide	6.4 (µg/L)
	Nitrate-nitrogen	0.090
EB111506	Nitrate-nitrogen	0.17
Associated samples: All soil samples by analyte and collection date. Blank contamination was calculated in mg/kg based on 5 gm of soil leached into 50 mL DI water.		

Sample results were qualified as follows:

For blank results >the reporting limit (RL):

- Positive sample results ≥ method detection limit (MDL) but ≤ RL were qualified as nondetect (U) at the RL.
- Positive sample results > RL but < 10x the blank result were qualified as estimated high (J+).
- Positive sample results that were ≥ 10x the blank result were accepted unqualified.

For blank results ≥ MDL but ≤ RL:

- Nondetects were accepted unqualified.
- Positive sample results ≥ MDL but ≤ RL were qualified as nondetect (U) at the RL.
- Positive sample results > RL and < the Action Level (AL) (determined by professional judgment) of 5x the blank contamination level were qualified as undetected (U) at the reported concentration.

Since both the HT exceedance and equipment blank contamination for the nitrate-nitrogen result for sample EB111006 resulted in qualification, the positive nitrate-nitrogen result in sample EB111006 was flagged with a "J" rather than with a "J-".

It should be noted that the MBAS sample and laboratory blank results were reported down to the (MDL). The validator chose to apply blank actions based on the February 1994 National Functional Guidelines rather than the 2004 guidelines since all nondetect results were reported at the MDL. The qualifiers associated with the blank actions however are consistent with the 2004 guidelines. An Action Level (AL) was established for MBAS at 5x the highest concentration detected and was used to qualify sample data. The following table summarizes the analyte, the concentrations detected, and the associated samples.

Blank/Batch	Analyte	Conc. Detected (mg/kg)
Method Blank/680-60319	MBAS	0.10 (mg/L)
Method Blank/680-60643	MBAS	2.2
Associated samples: All samples by batch number.		

Sample results were qualified as follows:

For positive blank contamination:

- Positive sample results ≤ the positive AL were qualified as nondetect (U) at the reported concentration.
- Positive sample results > AL and nondetects were accepted unqualified.

MS/MSD Results

The laboratory performed MS or MS/MSD analyses on selected samples in this data set. The following table lists the samples and the analytes spiked.

Soil	
Sample IDs	**Analyte**
SA16-20	Chlorate,
SA6-0.5	Chloride, Hexavalent Chromium, Sulfate, Bromide, Chlorate, Total Cyanide, Nitrate-nitrogen, Nitrite-nitrogen, Ammonia-nitrogen, Perchlorate, Orthophosphate, TOC
SA6-0.5D	Chloride, Hexavalent Chromium, Sulfate, Bromide, Chlorate, Total Cyanide, Nitrate-nitrogen, Nitrite-nitrogen, Ammonia-nitrogen, Perchlorate, Orthophosphate, TOC
SA16-30	Total Cyanide
SA16-0.5	Hexavalent Chromium, Ammonia-nitrogen
SA3-0.5	Hexavalent Chromium
SA17-0.5	Hexavalent Chromium, Chlorate
SA4-40	Bromide, Chlorate, Chloride, Total Cyanide, Nitrate-nitrogen, Nitrite-nitrogen, Ammonia-nitrogen, Perchlorate, Orthophosphate, Sulfate, TOC
Aqueous	
Sample IDs	**Analyte**
EB111306	Ammonia-nitrogen, Dissolved Hexavalent Chromium
EB111006	Total Cyanide, Dissolved Hexavalent Chromium
EB110906	Dissolved Hexavalent Chromium
EB111506	Dissolved Hexavalent Chromium

The %Rs and/or RPDs (where applicable) met the QC acceptance criteria except as noted below:

Sample ID	Analyte	MS %R	QC Limits %R	Actions (Detects/Nondetects)
SA16-30	Total Cyanide	52	90-110	J-/UJ
Associated samples: All soil samples in prep batch 6325305				

Sample ID	Analyte	MS/MSD/RPD %R	QC Limits %R	Actions (Detects/Nondetects)
SA4-40	Total Cyanide	7.6/ok/171	90-110/30	J/R
Associated samples: All soil samples in prep batch 6331257 except SA6-0.5D				

Sample ID	Analyte	MS %R	QC Limits %R	Actions (Detects/Nondetects)
SA6-0.5D	Sulfate	137	75-125	J+/UJ
Associated samples: All soil samples in prep batch 6348068				

Sample ID	Analyte	MS/MSD %R	QC Limits %R	Actions (Detects/Nondetects)
SA6-0.5D	Chlorate	88/89	90-110	J-/UJ
Associated samples: All soil samples in prep batch 6353331 plus SA4-40				

It should be noted that the chlorate result for sample SA4-40 was also qualified. The sample specific MS/MSDs had low recoveries, however, it was unclear from the information provided if the detected sample result (119 mg/kg) was >4x the amount of spike added. The validator used professional judgment and qualified the result as estimated (J-).

Sample ID	Analyte	MS/MSD %R	QC Limits %R	Actions (Detects/Nondetects)
SA17-0.5D	Chlorate	76/79	90-110	J-/UJ
Associated samples: All soil samples in prep batch 7004284				

Sample ID	Analyte	MS/MSD %R	QC Limits %R	Actions (Detects/Nondetects)
SA16-0.5D	Ammonia-nitrogen	76/73	90-110	J-/UJ
SA6-0.5	Ammonia-nitrogen	69/78	90-110	J-/UJ
SA6-0.5	Ammonia-nitrogen	64/67	90-110	J-/UJ
SA4-40	Ammonia-nitrogen	39/35	90-110	J-/UJ
Associated samples: All soil samples in this data set				

Batch MS or MS/MSD analyses were also performed on samples from other clients for all parameters. Although this practice is acceptable, the results could not be directly applied to the samples analyzed in this data package because of possible differences in the sample matrix and type. No validation action was taken on this basis.

A MS/MSD analysis was not performed for MBAS. Precision and accuracy in the laboratory was demonstrated by the LCS/LCSD analyses.

Laboratory Duplicate Results

Laboratory duplicate analyses were only performed on the following samples and for the following analytes in this data set. The other parameters in this data set did not have associated laboratory duplicate analyses. Thus, for parameters without an associated laboratory duplicate, the LCS/LCSD and/or the MS/MSD demonstrated precision in the laboratory (see discussions above).

The following table lists the samples and the analytes. All RPDs met the QC acceptance criteria.

Soil	
Sample IDs	**Analyte**
SA3-0.5	Hexavalent Chromium
SA16-30	Total Cyanide
SA6-0.5	Hexavalent Chromium, Chloride, Sulfate, pH
SA6-0.5D	Hexavalent Chromium, Chloride, Sulfate, pH
SA17-0.5	Hexavalent Chromium
SA4-40	pH
SA16-20	Chlorate
Aqueous	
Sample IDs	**Analyte**
EB111006	Total Cyanide, Dissolved Hexavalent Chromium
EB110906	Dissolved Hexavalent Chromium
EB111306	Dissolved Hexavalent Chromium
EB111506	Dissolved Hexavalent Chromium

Field Duplicate Results

Samples SA11-0.5/SA11-0.5D, SA17-0.5/SA17-0.5D, SA18-0.5/SA18-0.5D, SA21-20/SA21-20D, SA23-20/SA23-20D, SA3-0.5/SA3-0.5D, and SA6-0.5/SA6-0.5 were submitted as the field duplicate pairs with this data set. The following tables summarize the RPDs for the detected analytes in the field duplicate samples.

Analyte	SA11-0.5 (mg/Kg)	SA11-0.5D (mg/Kg)	RPD
Orthophosphate	409	997	84
Total Alkalinity	1000	1500	40
Bicarbonate Alkalinity	662	1100	50
Carbonate Alkalinity	339	402	17
Chlorate	1300	1410	8
Chloride	136	317	80
Hexavalent Chromium	2.1	2.1	0
Nitrate-nitrogen	1.1	3.5	104

Analyte	SA11-0.5 (mg/Kg)	SA11-0.5D (mg/Kg)	RPD
Nitrite-nitrogen	2.0	2.3 U	NC
Perchlorate	62500 (µg/kg)	72400 (µg/kg)	15
Sulfate	93.6	199	72
TOC	6500	8700	29
pH	9.8 (pH units)	8.8 (pH units)	11
Associated samples: All samples collected at boring SA11			

The RPD for nitrite-nitrogen was not calculable (NC) due to a nondetect result for the field duplicate sample. Precision was deemed acceptable since the detected sample result was <10x the sample quantitation limit (SQL). The RPDs for orthophosphate, chloride, and nitrate-nitrogen were acceptable since the sample and duplicate results were <10x the SQL with the absolute difference between the results < 8x the SQL. The RPD for sulfate exceeded the QC acceptance limit of <50% for a solid matrix. Positive and nondetect sulfate results for samples SA11-0.5, SA11-0.5D, SA11-10, SA11-20, and SA11-30 were qualified as estimated (J and UJ, respectively). The remaining RPDs met the QC acceptance limits.

Analyte	SA3-0.5 (mg/Kg)	SA3-0.5D (mg/Kg)	RPD
Total Alkalinity	999	566	55
Bicarbonate Alkalinity	675	296	78
Carbonate Alkalinity	324	269	19
Chloride	0.90	1.0	11
Total Hexavalent Chromium	0.11	0.21 U	NC
Perchlorate	1880 (µg/kg)	1540 (µg/kg)	20
Sulfate	7.2	8.6	18
TOC	2780	2680	4
pH	8.8 (pH units)	8.8 (pH units)	0
Associated samples: All samples for boring SA3			

The RPD for total hexavalent chromium was NC due to a nondetect result for the field duplicate sample. Precision was deemed acceptable since the detected sample result was <10x the SQL. The RPDs for total and bicarbonate alkalinity were acceptable since the sample and duplicate results were <10x the SQL with the absolute difference between the results < 8x the SQL. The remaining RPDs met the QC acceptance limits.

Analyte	SA17-0.5 (mg/Kg)	SA17-0.5D (mg/Kg)	RPD
Orthophosphate	11.0	9.0	20
Total Alkalinity	685	608	12

Analyte	SA17-0.5 (mg/Kg)	SA17-0.5D (mg/Kg)	RPD
Bicarbonate Alkalinity	524	499	5
Carbonate Alkalinity	160	109	38
Chloride	8.7	8.1	7
Hexavalent Chromium	0.58	1.2	70
Nitrate-nitrogen	0.48	0.77	46
Nitrite-nitrogen	0.95	0.25	117
Perchlorate	366 (µg/kg)	302 (µg/kg)	19
Sulfate	28.8	24.9	15
TOC	3900	4900	23
MBAS	2.4 U	2.4	NC
pH	9.6 (pH units)	9.6 (pH units)	0
Associated samples: All samples for boring SA17			

The RPD for MBAS was NC due to a nondetect result for the field sample. Precision was deemed acceptable since the detected field duplicate result was <10x the SQL. The RPDs for total hexavalent chromium and nitrite-nitrogen were acceptable since the sample and duplicate results were <10x the SQL with the absolute difference between the results < 8x the SQL. The remaining RPDs met the QC acceptance limits.

Analyte	SA18-0.5 (mg/Kg)	SA18-0.5D (mg/Kg)	RPD
Total Alkalinity	442	541	20
Bicarbonate Alkalinity	357	450	23
Carbonate Alkalinity	84.8	90.1	6
Chlorate	10.2	4.7	74
Chloride	543	287	62
Nitrate-nitrogen	5.7	3.8	40
Perchlorate	3850 (µg/kg)	1590 (µg/kg)	83
Sulfate	163	129	23
TOC	5400	6900	24
pH	7.7 (pH units)	8.6 (pH units)	0
Associated samples: All samples for boring SA18			

The RPD for chlorate was acceptable since the sample and duplicate results were <10x the SQL with the absolute difference between the results <8x the SQL. The RPDs for perchlorate and chloride exceeded the QC acceptance limit of <50% for a solid matrix. Positive and nondetect perchlorate and chloride results for samples SA18-0.5, SA18-0.5D, SA18-10, SA18-20, and SA18-30 were qualified as estimated (J and UJ, respectively). The remaining RPDs met the QC acceptance limits.

Analyte	SA21-20 (mg/Kg)	SA21-20D (mg/Kg)	RPD
Orthophosphate	2.3	1.4	49
Total Alkalinity	1360	562	83
Bicarbonate Alkalinity	1160	470	85
Carbonate Alkalinity	195	91.8	72
Chloride	378	299	23
Nitrate-nitrogen	0.93	0.71	27
Sulfate	1600	1800	12
TOC	7200	5800	22
MBAS	2.1 U	2.2	NC
pH	8.3 (pH units)	8.3 (pH units)	0
Associated samples: All samples for boring SA21			

The RPD for MBAS was NC due to a nondetect result for the field sample. Precision was deemed acceptable since the detected field duplicate result was <10x the SQL. The RPDs for total, carbonate, and bicarbonate alkalinity exceeded the QC acceptance limit of <50% for a solid matrix. Positive and nondetect total, carbonate, and bicarbonate alkalinity results for samples SA21-0.5, SA21-10, SA21-20, SA21-20D, and SA21-30 were qualified as estimated (J and UJ, respectively). The remaining RPDs met the QC acceptance limits.

Analyte	SA6-0.5 (mg/Kg)	SA6-0.5D (mg/Kg)	RPD
Total Alkalinity	3610	1760	69
Bicarbonate Alkalinity	2970	1410	71
Carbonate Alkalinity	637	352	58
Chloride	5.1	8.5	50
Hexavalent Chromium	0.22	0.13	51
Nitrate-nitrogen	0.48	0.27	56
Perchlorate	239 (µg/kg)	426 (µg/kg)	56
Sulfate	115	116	1
TOC	9100	4300	72
MBAS	2.4	2.2 U	NC
pH	9.6 (pH units)	9.5 (pH units)	1
Associated samples: All samples for boring SA6			

The RPD for MBAS was NC due to a nondetect result for the field duplicate sample. Precision was deemed acceptable since the detected sample result was <10x the SQL. The RPDs for perchlorate, total hexavalent chromium, nitrate-nitrogen, and TOC were acceptable since the sample and duplicate results were <10x the SQL with the absolute difference between the results < 8x the SQL. The RPDs for total, carbonate, and bicarbonate alkalinity exceeded the QC acceptance limit of <50% for a solid matrix. Positive and nondetect for total, carbonate, and bicarbonate alkalinity results for samples SA6-0.5, SA6-0.5D, SA6-10, SA6-20, SA6-30, and SA6-35 were qualified as estimated (J and UJ, respectively). The remaining RPDs met the QC acceptance limits.

Quantitation Limits and Sample Results

Dilutions were performed for selected parameters due to matrix interference and/or elevated concentrations of these analytes present in the samples. Nondetect results were reported at elevated detection limits due to matrix interferences present in the samples. The following table lists the samples, analytes, and the dilutions required.

Sample ID	Analyte	Dilution Factor
SA16-0.5	Perchlorate, Sulfate	10x
SA16-30	Orthophosphate, Nitrate-nitrogen, Sulfate	10x
	Chloride, Nitrite-nitrogen	20x
	Perchlorate	2000x
SA23-0.5	Perchlorate	5x
SA23-10	Perchlorate	2x
	Chloride, Nitrite-nitrogen	10x
SA23-20	Chloride, Nitrite-nitrogen	10x
	Sulfate	20x
	Perchlorate	100x
SA23-20D	Chloride	10x
	Sulfate	20x
	Perchlorate	50x
SA11-0.5	Orthophosphate, Chloride, Nitrite-nitrogen	10x
	Perchlorate	100x
SA11-0.5D	Orthophosphate, Bromide, Chloride Nitrate-nitrogen, Nitrite-nitrogen, Sulfate	10x
	Perchlorate	100x
SA11-10	Hexavalent Chromium	2x
	Bromide, Nitrite-nitrogen, Sulfate	10x
	Orthophosphate, Chloride	20x
	Perchlorate	500x
SA11-20	Nitrate-nitrogen, Nitrite-nitrogen	10x
	Orthophosphate, Chloride	20x
	Perchlorate	500x
SA11-30	Orthophosphate, Chloride, Nitrite-nitrogen	10x
	Perchlorate	100x
SA12-0.5	Perchlorate	10x
SA12-10	Perchlorate, Sulfate	10x

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Sample ID	Analyte	Dilution Factor
SA12-20	Perchlorate	20x
SA12-30	Nitrite-nitrogen	10x
	Chloride	20x
	Perchlorate	200x
SA3-0.5	Perchlorate	2x
SA3-0.5D	Perchlorate	2x
SA3-10	Perchlorate	20x
SA3-20	Chloride, Nitrite-nitrogen, Perchlorate, Sulfate	10x
SA3-30	Nitrate-nitrogen, Nitrite-nitrogen	10x
	Chloride, Sulfate	20x
SA3-40	Chloride, Nitrite-nitrogen, Sulfate	10x
SA6-10	Perchlorate	5x
SA6-20	Perchlorate	5x
	Sulfate	10x
SA6-30	Bromide, Chloride, Nitrate-nitrogen, Nitrite-nitrogen, Perchlorate	10x
	Sulfate	100x
SA5-0.5	Perchlorate	20x
SA5-10	Orthophosphate, Bromide, Chloride, Nitrate-nitrogen, Nitrite-nitrogen, Sulfate	10x
	Perchlorate	200x
SA5-20	Orthophosphate, Bromide, Nitrate-nitrogen, Nitrite-nitrogen, Sulfate	10x
	Chloride	50x
	Perchlorate	100x
SA5-30	Orthophosphate, Bromide, Nitrate-nitrogen, Nitrite-nitrogen, Sulfate	10x
	Chloride	20x
	Perchlorate	50x
SA5-37	Bromide, Nitrate-nitrogen, Nitrite-nitrogen, Sulfate	10x
	Orthophosphate	20x
	Perchlorate	500x
SA4-0.5	Perchlorate	5x
SA4-20	Perchlorate	5x
	Bromide, Chloride	10x
SA4-30	Sulfate	10x
	Perchlorate	50x
SA4-40	Chloride, Sulfate	10x
	Perchlorate	10x
SA17-0.5D	Perchlorate	5x
SA17-25	Chloride, Sulfate	10x
	Perchlorate	20x
SA18-0.5	Perchlorate	5x

Sample ID	Analyte	Dilution Factor
	Bromide, Nitrate-nitrogen, Sulfate	10x
	Chloride, Nitrate-nitrogen	50x
SA18-0.5D	Perchlorate	2x
	Chloride, Nitrite-nitrogen	10x
SA18-10	Perchlorate	5x
	Chloride, Nitrite-nitrogen, Sulfate	50x
SA18-20	Perchlorate	5x
	Sulfate	10x
	Chloride, Nitrite-nitrogen	50x
SA18-30	Chloride, Nitrite-nitrogen, Sulfate	10x
SA21-0.5	Perchlorate	5x
SA21-10	Nitrite-nitrogen	10x
	Chloride, Sulfate	50x
SA21-20	Chloride, Nitrite-nitrogen, Sulfate	10x
SA21-20D	Chloride, Nitrite-nitrogen, Sulfate	10x
SA21-30	Perchlorate	5x
	Chloride, Nitrite-nitrogen, Sulfate	10x
SA6-35	Bromide, Chloride, Sulfate, Nitrate-nitrogen, Nitrite-nitrogen	10x

Nondetect sample results were reported at the adjusted SQL and flagged with a “U”.

Phosphate results for soil samples SA11-10 and SA11-20 were qualified as estimated due to significant chromatographic interference by the sulfate in these samples. These results for phosphate may be false positives due to this sulfate interference.

The following laboratory qualifiers were removed during data validation in order to avoid confusion with the validated results.

Laboratory Qualifiers	Laboratory Definition
J	Method blank contamination. The associated method blank contains the target analyte at a reportable level. (STL-Louis)
J	Estimated result > MDL< SQL (STL-Savannah)
B	Estimated result. Result is less than the RL (STL-Louis)
B	Method blank contamination STL-Savannah)
Q	Elevated reporting limit. The reporting limit is elevated due to high analyte levels.
G	Elevated reporting limit. The reporting limit is elevated due to matrix interference.
H	HT exceeded

Note in the absence of other qualification during validation, the STL-Louis laboratory B qualifiers were converted to J qualifiers, and the STL-Savannah laboratory qualifiers remained as J to maintain consistency with the organic methods and generic data validation summary report (DVSR) qualifier definitions.

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Selected reporting limits did not meet the limits stated in the QAPP. No validation action was taken other than this notation.

Brian Rakvica

From: Brian Rakvica
Sent: Tuesday, September 11, 2007 7:10 AM
To: 'bgiroux@mcgin.com'
Subject: FW: AA-27 Revised Borelog Memo
Attachments: SB-27 MEMORANDUM 09-06-07 w attach 09-07-07.pdf

Brian G,

Can you take a look at this?

Please advise re: schedule.

Thanks,

Brian R

From: Ranajit (Ron) Sahu [mailto:sahuron@earthlink.net]
Sent: Monday, September 10, 2007 11:56 AM
To: Brian Rakvica
Subject: AA-27 Revised Borelog Memo

Brian:

Before I send this out to all of the folks on the All Companies call, I wanted you to see it. Do you want me to send it to you and Jim formally with hardcopy and CD etc? Please let me know.

Thanks

Ranajit