



Ensolum

January 03, 2025

Jeremy Espinoza

11049 W 44th Avenue, Suite 103

Wheat Ridge CO 80033

Project Name - KMG - Pioneer 4-12

Project Number - 09A1417854

Attached are your analytical results for KMG - Pioneer 4-12 received by Origins Laboratory November 22, 2024. This project is associated with Origins project number E4K0708-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory
303.433.1322
projectmanager@originslab.com



1725 Elk Place, Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

Ensolum
11049 W 44th Avenue, Suite 103
Wheat Ridge CO 80033

Jeremy Espinoza
Project Number: 09A1417854
Project: KMG - Pioneer 4-12

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
FL02(4-12)@5'	E4K0708-01	Soil	November 22, 2024 13:00	11/22/2024 16:02
FL02(4-12)@5'-V	E4K0708-02	Soil	November 22, 2024 13:00	11/22/2024 16:02
FL03(4-12)@5'	E4K0708-03	Soil	November 22, 2024 13:30	11/22/2024 16:02
FL03(4-12)@5'-V	E4K0708-04	Soil	November 22, 2024 13:30	11/22/2024 16:02

Origins Laboratory



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 Project: KMG - Pioneer 4-12

1725 Elk Place | Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

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440908

page 1 of 1

Client: Ensolium LLC
 Address: _____
 Project Manager: Jeremy Espinoza
 Project Name: PIONEER 4-12 WASHKAP
 Project Number: 09A1417854
 Telephone Number: _____
 Email Address: KMG Team
 Samples Collected By: Glenn Thompson

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Groundwater	Soil	Full Table 915-1	BTEXN	1,2,4/1,3,5-TMB	CPH-GRO/DRO-CORO	[ECpH/SAR]-SP, Boron	PH (Hold Volume)	Sample Instructions
				HCl	HNO ₃	Other	Unpreserved									
F102(4-12)5'-V	11/22/24	1300	3	X				X								
F102(4-12)5'-V		1300	3	X				X								
F103(4-12)5'-V		1330	3	X				X								
F103(4-12)5'-V		1330	3	X				X								

Relinquished By:

Date: 11/22/24

Time: 1602

Received By:

Date: 11/22/24

Time: 1602

Turnaround Time:
 Same Day 48 Hr 72 Hr Standard

3.3 Date Results Needed

Origins Laboratory

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Jeremy Espinoza
 Project Number: 09A1417854
 Project: KMG - Pioneer 4-12

Origins Laboratory F-012207-01-R1
Effective Date: 01/09/12

Sample Receipt Checklist

Origins Work Order: EHK0708 Client: ENSOLIUM
 Checklist Completed by: SHD KK Client Project ID: Pioneer
 Date/time completed: 11/22/24 Shipped Via: HO
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)
 Airbill #: N/A
 Matrix(s) Received: (Check all that apply): Soil/Solid Water Other: _____
 Cooler Number/Temperature: 1 3.3 °C _____ °C _____ °C (Describe) _____ °C
 Thermometer ID: 1007

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?	/			SD
Is there ice present (document if blue ice is used)	/			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		/		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		/		
Were all samples received intact ⁽¹⁾ ?	/			
Was adequate sample volume provided ⁽¹⁾ ?	/			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		/		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	/			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	/			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	/			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	/			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			/	
Are samples preserved that require preservation and was it checked ⁽¹⁾ ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)/(pH <2 for samples preserved with HNO ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)			/	
Additional Comments (if any):				

⁽¹⁾If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action in the additional comments (above) and the case narrative.

Reviewed by: SHD Date/Time Reviewed: 11/22/24

Origins Laboratory



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11049 W 44th Avenue, Suite 103
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Jeremy Espinoza
Project Number: 09A1417854
Project: KMG - Pioneer 4-12

FL02(4-12)@5'

11/22/2024 1:00:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-01 (Soil)

Boron (DTPA Sorbitol)

Boron	0.365		0.0987	mg/L	1	B4K2517	11/25/2024	11/26/2024	
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DRO/ORO by EPA 8015D

Diesel (C10-C28)	ND		25.0	mg/kg	1	B4K2243	11/22/2024	11/24/2024	Ua
Residual Range Organics (C28-C40)	ND		100	"	"	"	"	"	Ua

Surrogate: o-Terphenyl	116 %		50-150			"	"	"	
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GBTEX+TMBs by 8260D

1,2,4-Trimethylbenzene	ND		0.00200	mg/kg	1	B4K2245	11/22/2024	11/23/2024	Ua
1,3,5-Trimethylbenzene	ND		0.00200	"	"	"	"	"	Ua
Benzene	ND		0.00200	"	"	"	"	"	Ua
Ethylbenzene	ND		0.00200	"	"	"	"	"	Ua
Toluene	ND		0.00200	"	"	"	"	"	Ua
Xylenes, total	ND		0.00200	"	"	"	"	"	Ua
Gasoline Range Hydrocarbons	ND		0.200	"	"	"	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	112 %		70-130			"	"	"	
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 Project: KMG - Pioneer 4-12

FL02(4-12)@5'

11/22/2024 1:00:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-01 (Soil)

GBTEX+TMBs by 8260D

Surrogate: Toluene-d8	101 %		70-130			B4K22 45	11/22/2024	11/23/2024	
Surrogate: 4-Bromofluorobenzene	124 %		70-130			"	"	"	

Metals by Saturated Paste by EPA 6010

Calcium	12.1		0.499	meq/L	10	[CALC]	11/25/2024	11/27/2024	
Magnesium	3.45		0.823	"	"	"	"	"	
Sodium	3.99		0.435	"	"	"	"	"	

PAH by 8270E SIM

1-Methylnaphthalene	ND	0.00126	0.00383	mg/kg dry	1	2714592	12/04/2024	12/04/2024	U
2-Methylnaphthalene	ND	0.00126	0.00383	"	"	"	"	"	U
Acenaphthene	ND	0.00126	0.00383	"	"	"	"	"	U
Anthracene	ND	0.00126	0.00383	"	"	"	"	"	U
Benzo(a)anthracene	ND	0.00126	0.00383	"	"	"	"	"	U
Benzo(a)pyrene	ND	0.00126	0.00383	"	"	"	"	"	U
Benzo(b)fluoranthene	ND	0.00126	0.00383	"	"	"	"	"	U
Benzo(k)fluoranthene	ND	0.00126	0.00383	"	"	"	"	"	U
Chrysene	ND	0.00126	0.00383	"	"	"	"	"	U
Dibenzo(a,h)anthracene	ND	0.00126	0.00383	"	"	"	"	"	U
Fluoranthene	ND	0.00126	0.00383	"	"	"	"	"	U

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FL02(4-12)@5'

11/22/2024 1:00:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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GEL Laboratories, LLC

E4K0708-01 (Soil)

PAH by 8270E SIM

Fluorene	ND	0.00126	0.00383	mg/kg dry	1	2714592	12/04/2024	12/04/2024	U
Indeno(1,2,3-cd)pyrene	ND	0.00126	0.00383	"	"	"	"	"	U
Naphthalene	ND	0.00126	0.00383	"	"	"	"	"	U
Pyrene	ND	0.00126	0.00383	"	"	"	"	"	U

Surrogate: 5-alpha-Androstane 85 % 22-135 " " "

pH in Soil by 9045D

pH 7.65 pH Units 1 B4K2523 11/25/2024 11/26/2024

SAR by 20B Saturated Paste

SAR 1.43 0.0100 SAR 1 B4K2508 11/25/2024 11/27/2024

Specific Conductance Mod. 9050A

Specific Conductance (EC) 2.06 0.00500 mmhos/cm 1 B4K2523 11/25/2024 11/26/2024

Table 915 metals by EPA 6020B

Arsenic	0.870	0.273	mg/kg	10	B4K2246	11/22/2024	11/25/2024
Barium	13.9	9.42	"	"	"	"	"
Cadmium	0.148	0.0942	"	"	"	"	"

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Project: KMG - Pioneer 4-12

FL02(4-12)@5'

11/22/2024 1:00:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-01 (Soil)

Table 915 metals by EPA 6020B

Copper	17.1		9.42	mg/kg	10	B4K2246	11/22/2024	11/25/2024	
Lead	10.6		0.942	"	"	"	"	"	
Nickel	2.95		0.942	"	"	"	"	"	
Selenium	ND		0.245	"	"	"	"	"	
Silver	ND		0.0942	"	"	"	"	"	
Zinc	ND		34.8	"	"	"	"	"	

Total Metals by 7196A

Hexavalent Chromium	ND	0.155	0.388	mg/kg dry	1	2722488	12/20/2024	12/27/2024	U
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FL02(4-12)@5'-V

11/22/2024 1:00:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
 E4K0708-02 (Soil)

pH in Soil by 9045D

pH	7.89			pH Units	1	B4K2630	11/26/2024	11/27/2024	
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Project Number: 09A1417854
Project: KMG - Pioneer 4-12

FL03(4-12)@5'

11/22/2024 1:30:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-03 (Soil)

Boron (DTPA Sorbitol)

Boron	0.326		0.0983	mg/L	1	B4K2517	11/25/2024	11/26/2024	
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DRO/ORO by EPA 8015D

Diesel (C10-C28)	ND		25.0	mg/kg	1	B4K2243	11/22/2024	11/24/2024	Ua
Residual Range Organics (C28-C40)	ND		100	"	"	"	"	"	Ua

Surrogate: o-Terphenyl	116 %		50-150			"	"	"	
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GBTEX+TMBs by 8260D

1,2,4-Trimethylbenzene	ND		0.00200	mg/kg	1	B4K2245	11/22/2024	11/23/2024	Ua
1,3,5-Trimethylbenzene	ND		0.00200	"	"	"	"	"	Ua
Benzene	ND		0.00200	"	"	"	"	"	Ua
Ethylbenzene	ND		0.00200	"	"	"	"	"	Ua
Toluene	ND		0.00200	"	"	"	"	"	Ua
Xylenes, total	ND		0.00200	"	"	"	"	"	Ua
Gasoline Range Hydrocarbons	ND		0.200	"	"	"	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	113 %		70-130			"	"	"	
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FL03(4-12)@5'

11/22/2024 1:30:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-03 (Soil)

GBTEX+TMBs by 8260D

Surrogate: Toluene-d8	101 %		70-130			B4K22 45	11/22/2024	11/23/2024	
Surrogate: 4-Bromofluorobenzene	127 %		70-130			"	"	"	

Metals by Saturated Paste by EPA 6010

Calcium	3.59		0.499	meq/L	10	[CALC]	11/25/2024	11/27/2024	
Magnesium	1.20		0.823	"	"	"	"	"	
Sodium	2.53		0.435	"	"	"	"	"	

PAH by 8270E SIM

1-Methylnaphthalene	ND	0.00124	0.00376	mg/kg dry	1	2714592	12/04/2024	12/04/2024	U
2-Methylnaphthalene	ND	0.00124	0.00376	"	"	"	"	"	U
Acenaphthene	ND	0.00124	0.00376	"	"	"	"	"	U
Anthracene	ND	0.00124	0.00376	"	"	"	"	"	U
Benzo(a)anthracene	ND	0.00124	0.00376	"	"	"	"	"	U
Benzo(a)pyrene	ND	0.00124	0.00376	"	"	"	"	"	U
Benzo(b)fluoranthene	ND	0.00124	0.00376	"	"	"	"	"	U
Benzo(k)fluoranthene	ND	0.00124	0.00376	"	"	"	"	"	U
Chrysene	ND	0.00124	0.00376	"	"	"	"	"	U
Dibenzo(a,h)anthracene	ND	0.00124	0.00376	"	"	"	"	"	U
Fluoranthene	ND	0.00124	0.00376	"	"	"	"	"	U

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FL03(4-12)@5'

11/22/2024 1:30:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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GEL Laboratories, LLC

E4K0708-03 (Soil)

PAH by 8270E SIM

Fluorene	ND	0.00124	0.00376	mg/kg dry	1	2714592	12/04/2024	12/04/2024	U
Indeno(1,2,3-cd)pyrene	ND	0.00124	0.00376	"	"	"	"	"	U
Naphthalene	ND	0.00124	0.00376	"	"	"	"	"	U
Pyrene	0.00188	0.00124	0.00376	"	"	"	"	"	J

Surrogate: 5-alpha-Androstane 91 % 22-135 " " "

pH in Soil by 9045D

pH 7.78 pH Units 1 B4K2523 11/25/2024 11/26/2024

SAR by 20B Saturated Paste

SAR 1.63 0.0100 SAR 1 B4K2508 11/25/2024 11/27/2024

Specific Conductance Mod. 9050A

Specific Conductance (EC) 0.852 0.00500 mmhos/cm 1 B4K2523 11/25/2024 11/26/2024

Table 915 metals by EPA 6020B

Arsenic	1.49	0.284	mg/kg	10	B4K2246	11/22/2024	11/25/2024
Barium	45.1	9.78	"	"	"	"	"
Cadmium	0.111	0.0978	"	"	"	"	"

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Project: KMG - Pioneer 4-12

FL03(4-12)@5'

11/22/2024 1:30:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
E4K0708-03 (Soil)

Table 915 metals by EPA 6020B

Copper	ND		9.78	mg/kg	10	B4K2246	11/22/2024	11/25/2024	
Lead	5.69		0.978	"	"	"	"	"	
Nickel	3.91		0.978	"	"	"	"	"	
Selenium	ND		0.254	"	"	"	"	"	
Silver	ND		0.0978	"	"	"	"	"	
Zinc	ND		36.2	"	"	"	"	"	

Total Metals by 7196A

Hexavalent Chromium	ND	0.171	0.427	mg/kg dry	1	2722488	12/20/2024	12/27/2024	U
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 Project: KMG - Pioneer 4-12

FL03(4-12)@5'-V

11/22/2024 1:30:00PM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory
 E4K0708-04 (Soil)

pH in Soil by 9045D

pH	7.99			pH Units	1	B4K2630	11/26/2024	11/27/2024	
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Jeremy Espinoza
 Project Number: 09A1417854
 Project: KMG - Pioneer 4-12

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4K2243 - EPA 3550B										
Blank (B4K2243-BLK1)					Prepared: 11/22/2024 Analyzed: 11/22/2024					
Diesel (C10-C28)	ND	25.0	mg/kg							Ua
Residual Range Organics (C28-C40)	ND	100	"							Ua
Surrogate: o-Terphenyl	22		"	24.9		87.9	50-150			

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 Project: KMG - Pioneer 4-12

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2243 - EPA 3550B

LCS (B4K2243-BS1)

Prepared: 11/22/2024 Analyzed: 11/22/2024

Diesel (C10-C28)	1060	50.0	mg/kg	1000		106	70-130			
Residual Range Organics (C28-C40)	1140	200	"	1000		114	70-130			
Surrogate: o-Terphenyl	52		"	49.8		105	50-150			

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 Project Number: 09A1417854
 Project: KMG - Pioneer 4-12

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2243 - EPA 3550B

Matrix Spike (B4K2243-MS1)	Source: E4K0706-26		Prepared: 11/22/2024 Analyzed: 11/22/2024							
Diesel (C10-C28)	1050	50.0	mg/kg	1000	ND	105	70-130			
Residual Range Organics (C28-C40)	1110	200	"	1000	ND	111	70-130			
Surrogate: o-Terphenyl	47		"	49.8		95.5	50-150			

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 Wheat Ridge CO 80033

Jeremy Espinoza
 Project Number: 09A1417854
 Project: KMG - Pioneer 4-12

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2243 - EPA 3550B

Matrix Spike Dup (B4K2243-MSD1)	Source: E4K0706-26		Prepared: 11/22/2024 Analyzed: 11/22/2024							
Diesel (C10-C28)	1040	50.0	mg/kg	1000	ND	104	70-130	0.272	35	
Residual Range Organics (C28-C40)	1100	200	"	1000	ND	110	70-130	0.541	35	
Surrogate: o-Terphenyl	50		"	49.8		101	50-150			

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 Project: KMG - Pioneer 4-12

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2245 - EPA 5030 (soil)

Blank (B4K2245-BLK1)

Prepared: 11/22/2024 Analyzed: 11/22/2024

1,2,4-Trimethylbenzene	ND	0.00200	mg/kg							Ua
1,3,5-Trimethylbenzene	ND	0.00200	"							Ua
Benzene	ND	0.00200	"							Ua
Ethylbenzene	ND	0.00200	"							Ua
Naphthalene	ND	0.00380	"							Ua
Toluene	ND	0.00200	"							Ua
Xylenes, total	ND	0.00200	"							Ua
Gasoline Range Hydrocarbons	ND	0.200	"							Ua
Surrogate: 1,2-Dichloroethane-d4	0.13		"	0.125	106		70-130			
Surrogate: Toluene-d8	0.13		"	0.125	103		70-130			
Surrogate: 4-Bromofluorobenzene	0.16		"	0.125	125		70-130			

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Project Number: 09A1417854
Project: KMG - Pioneer 4-12

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2245 - EPA 5030 (soil)

LCS (B4K2245-BS1)

Prepared: 11/22/2024 Analyzed: 11/22/2024

1,2,4-Trimethylbenzene	0.0998	0.00200	mg/kg	0.100		99.8	70-130			
1,3,5-Trimethylbenzene	0.0968	0.00200	"	0.100		96.8	70-130			
Benzene	0.100	0.00200	"	0.100		100	70-130			
Ethylbenzene	0.0942	0.00200	"	0.100		94.2	70-130			
Naphthalene	0.119	0.00380	"	0.100		119	70-130			
Toluene	0.0975	0.00200	"	0.100		97.5	70-130			
o-Xylene	0.0975	0.00200	"	0.100		97.5	70-130			
m,p-Xylene	0.189	0.00400	"	0.200		94.7	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.15		"	0.125		117	70-130			
Surrogate: Toluene-d8	0.12		"	0.125		96.4	70-130			
Surrogate: 4-Bromofluorobenzene	0.12		"	0.125		98.0	70-130			

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Project: KMG - Pioneer 4-12

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2245 - EPA 5030 (soil)

Matrix Spike (B4K2245-MS1)	Source: E4K0706-26			Prepared: 11/22/2024 Analyzed: 11/23/2024						
1,2,4-Trimethylbenzene	0.0753	0.00200	mg/kg	0.100	ND	75.3	70-130			
1,3,5-Trimethylbenzene	0.0753	0.00200	"	0.100	ND	75.3	70-130			
Benzene	0.0707	0.00200	"	0.100	ND	70.7	70-130			
Ethylbenzene	0.0759	0.00200	"	0.100	ND	75.9	70-130			
Naphthalene	0.0880	0.00380	"	0.100	ND	88.0	70-130			
Toluene	0.0709	0.00200	"	0.100	ND	70.9	70-130			
o-Xylene	0.0754	0.00200	"	0.100	ND	75.4	70-130			
m,p-Xylene	0.153	0.00400	"	0.200	ND	76.4	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.13		"	0.125		107	70-130			
Surrogate: Toluene-d8	0.12		"	0.125		99.2	70-130			
Surrogate: 4-Bromofluorobenzene	0.13		"	0.125		104	70-130			

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Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2245 - EPA 5030 (soil)

Matrix Spike Dup (B4K2245-MSD1)

Source: E4K0706-26

Prepared: 11/22/2024 Analyzed: 11/23/2024

1,2,4-Trimethylbenzene	0.0823	0.00200	mg/kg	0.100	ND	82.3	70-130	8.81	20	
1,3,5-Trimethylbenzene	0.0823	0.00200	"	0.100	ND	82.3	70-130	8.86	20	
Benzene	0.0783	0.00200	"	0.100	ND	78.3	70-130	10.1	20	
Ethylbenzene	0.0837	0.00200	"	0.100	ND	83.7	70-130	9.83	20	
Naphthalene	0.0935	0.00380	"	0.100	ND	93.5	70-130	6.10	20	
Toluene	0.0792	0.00200	"	0.100	ND	79.2	70-130	11.0	20	
o-Xylene	0.0831	0.00200	"	0.100	ND	83.1	70-130	9.74	20	
m,p-Xylene	0.168	0.00400	"	0.200	ND	83.9	70-130	9.33	20	
Surrogate: 1,2-Dichloroethane-d4	0.13		"	0.125		107	70-130			
Surrogate: Toluene-d8	0.12		"	0.125		99.9	70-130			
Surrogate: 4-Bromofluorobenzene	0.13		"	0.125		103	70-130			

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 Project: KMG - Pioneer 4-12

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Metals by EPA 6000/7000 Series Methods - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2246 - EPA 3050B

Blank (B4K2246-BLK1)

Prepared: 11/22/2024 Analyzed: 11/25/2024

Arsenic	ND	0.290	mg/kg
Barium	ND	10.0	"
Cadmium	ND	0.100	"
Copper	ND	10.0	"
Lead	ND	1.00	"
Nickel	ND	1.00	"
Selenium	ND	0.260	"
Silver	ND	0.100	"
Zinc	ND	37.0	"

LCS (B4K2246-BS1)

Prepared: 11/22/2024 Analyzed: 11/25/2024

Arsenic	4.47	0.290	mg/kg	5.00	89.4	80-120
Barium	434	10.0	"	500	86.9	80-120
Cadmium	4.44	0.100	"	5.00	88.8	80-120
Copper	45.5	10.0	"	50.0	91.1	80-120
Lead	4.33	1.00	"	5.00	86.6	80-120
Nickel	4.43	1.00	"	5.00	88.6	80-120
Selenium	4.66	0.260	"	5.00	93.2	80-120
Silver	4.44	0.100	"	5.00	88.8	80-120
Zinc	42.9	37.0	"	50.0	85.8	80-120

Matrix Spike (B4K2246-MS1)

Source: E4K0706-21

Prepared: 11/22/2024 Analyzed: 11/25/2024

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Project: KMG - Pioneer 4-12

Metals by EPA 6000/7000 Series Methods - Quality Control
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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2246 - EPA 3050B

Matrix Spike (B4K2246-MS1)		Source: E4K0706-21			Prepared: 11/22/2024 Analyzed: 11/25/2024					
Arsenic	9.50	0.276	mg/kg	4.76	4.05	114	75-125			
Barium	595	9.52	"	476	22.8	120	75-125			
Cadmium	5.54	0.0952	"	4.76	0.0304	116	75-125			
Copper	64.0	9.52	"	47.6	4.88	124	75-125			
Lead	12.0	0.952	"	4.76	5.81	130	75-125			QM-07
Nickel	12.4	0.952	"	4.76	7.91	94.9	75-125			
Selenium	5.84	0.248	"	4.76	0.0959	121	75-125			
Silver	5.62	0.0952	"	4.76	ND	118	75-125			
Zinc	94.5	35.2	"	47.6	43.2	108	75-125			

Matrix Spike Dup (B4K2246-MSD1)		Source: E4K0706-21			Prepared: 11/22/2024 Analyzed: 11/25/2024					
Arsenic	9.60	0.274	mg/kg	4.72	4.05	117	75-125	1.06	20	
Barium	571	9.44	"	472	22.8	116	75-125	4.13	20	
Cadmium	5.66	0.0944	"	4.72	0.0304	119	75-125	2.12	20	
Copper	65.4	9.44	"	47.2	4.88	128	75-125	2.19	20	QM-07
Lead	11.8	0.944	"	4.72	5.81	127	75-125	1.62	20	QM-07
Nickel	14.0	0.944	"	4.72	7.91	129	75-125	12.0	20	QM-07
Selenium	5.36	0.246	"	4.72	0.0959	111	75-125	8.65	20	
Silver	5.72	0.0944	"	4.72	ND	121	75-125	1.71	20	
Zinc	102	34.9	"	47.2	43.2	124	75-125	7.34	20	

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 Project: KMG - Pioneer 4-12

Classical Chemistry Parameters - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B4K2508 - Saturated Paste Metals

Blank (B4K2508-BLK1)

Prepared: 11/25/2024 Analyzed: 11/27/2024

Calcium PPM	ND	10.0	mg/L						
SAR	ND	0.0100	SAR						
Magnesium PPM	ND	10.0	mg/L						
Sodium PPM	ND	10.0	"						

Duplicate (B4K2508-DUP1)

Source: E4K0706-17

Prepared: 11/25/2024 Analyzed: 11/27/2024

Calcium PPM	227	10.0	mg/L		140		47.0	50
SAR	ND	0.0100	SAR		14.8			200
Magnesium PPM	344	10.0	mg/L		266		25.6	50
Sodium PPM	1450	10.0	"		1290		11.7	50

Batch B4K2517 - DTPA Sorbitol Preparation

Blank (B4K2517-BLK1)

Prepared: 11/25/2024 Analyzed: 11/26/2024

Boron	ND	0.100	mg/L					
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Duplicate (B4K2517-DUP1)

Source: E4K0707-19

Prepared: 11/25/2024 Analyzed: 11/26/2024

Boron	0.132	0.101	mg/L		0.133		0.671	50
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Project: KMG - Pioneer 4-12

Saturated Paste - Quality Control
Origins Laboratory

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4K2523 - Saturated Paste pH/EC										
Blank (B4K2523-BLK1)					Prepared: 11/25/2024 Analyzed: 11/27/2024					
Specific Conductance (EC)	ND	0.00500	mmhos/cm							
Duplicate (B4K2523-DUP1)					Source: E4K0706-17 Prepared: 11/25/2024 Analyzed: 11/27/2024					
Specific Conductance (EC)	9.71	0.00500	mmhos/cm		8.55		12.8		25	
pH	8.33		pH Units		8.38		0.598		25	
Batch B4K2630 - Saturated Paste pH/EC										
Duplicate (B4K2630-DUP1)					Source: E4K0620-21 Prepared: 11/26/2024 Analyzed: 11/27/2024					
pH	8.77		pH Units		8.71		0.687		25	

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 Project: KMG - Pioneer 4-12

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2714592 - SW846 3541

BLANK (1205937341-BLK)

Prepared: 12/04/2024 Analyzed: 12/04/2024

Naphthalene	ND	0.00329	mg/kg				-			U
Benzo(k)fluoranthene	ND	0.00329	"				-			U
Pyrene	ND	0.00329	"				-			U
Indeno(1,2,3-cd)pyrene	ND	0.00329	"				-			U
Fluorene	ND	0.00329	"				-			U
Fluoranthene	ND	0.00329	"				-			U
Dibenzo(a,h)anthracene	ND	0.00329	"				-			U
Chrysene	ND	0.00329	"				-			U
2-Methylnaphthalene	ND	0.00329	"				-			U
Benzo(b)fluoranthene	ND	0.00329	"				-			U
1-Methylnaphthalene	ND	0.00329	"				-			U
Acenaphthene	ND	0.00329	"				-			U
Anthracene	ND	0.00329	"				-			U
Benzo(a)anthracene	ND	0.00329	"				-			U
Benzo(a)pyrene	ND	0.00329	"				-			U

Surrogate: 5-alpha-Androstane

0.159

"

0.165

97

22-135

LCS (1205937342-BKS)

Prepared: 12/04/2024 Analyzed: 12/04/2024

Pyrene	0.321	0.00332	mg/kg	0.332		97	38-117			
Benzo(b)fluoranthene	0.331	0.00332	"	0.332		100	39-123			
Indeno(1,2,3-cd)pyrene	0.340	0.00332	"	0.332		102	38-133			
Fluorene	0.315	0.00332	"	0.332		95	37-115			
Fluoranthene	0.327	0.00332	"	0.332		99	39-119			
Dibenzo(a,h)anthracene	0.335	0.00332	"	0.332		101	38-132			
1-Methylnaphthalene	0.316	0.00332	"	0.332		95	39-109			
Naphthalene	0.322	0.00332	"	0.332		97	38-109			
Benzo(a)pyrene	0.344	0.00332	"	0.332		103	39-127			

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2714592 - SW846 3541

LCS (1205937342-BKS)

Prepared: 12/04/2024 Analyzed: 12/04/2024

Benzo(a)anthracene	0.344	0.00332	mg/kg	0.332		104	42-120			
Anthracene	0.328	0.00332	"	0.332		99	41-117			
Acenaphthene	0.324	0.00332	"	0.332		98	41-112			
2-Methylnaphthalene	0.331	0.00332	"	0.332		100	39-110			
Benzo(k)fluoranthene	0.316	0.00332	"	0.332		95	40-122			
Chrysene	0.337	0.00332	"	0.332		102	42-117			

Surrogate: 5-alpha-Androstane 0.184 " 0.166 111 22-135

LCS D (1205937343-BKSD)

Prepared: 12/04/2024 Analyzed: 12/04/2024

Benzo(a)pyrene	0.289	0.00328	mg/kg	0.328		88	39-127	17	30	
Pyrene	0.267	0.00328	"	0.328		82	38-117	18	30	
Chrysene	0.282	0.00328	"	0.328		86	42-117	18	30	
Dibenzo(a,h)anthracene	0.280	0.00328	"	0.328		85	38-132	18	30	
Fluoranthene	0.274	0.00328	"	0.328		84	39-119	18	30	
Fluorene	0.261	0.00328	"	0.328		80	37-115	19	30	
Naphthalene	0.265	0.00328	"	0.328		81	38-109	19	30	
Indeno(1,2,3-cd)pyrene	0.283	0.00328	"	0.328		86	38-133	18	30	
Benzo(k)fluoranthene	0.262	0.00328	"	0.328		80	40-122	19	30	
Benzo(b)fluoranthene	0.279	0.00328	"	0.328		85	39-123	17	30	
1-Methylnaphthalene	0.262	0.00328	"	0.328		80	39-109	19	30	
2-Methylnaphthalene	0.274	0.00328	"	0.328		84	39-110	19	30	
Acenaphthene	0.263	0.00328	"	0.328		80	41-112	21	30	
Anthracene	0.276	0.00328	"	0.328		84	41-117	17	30	
Benzo(a)anthracene	0.284	0.00328	"	0.328		86	42-120	19	30	

Surrogate: 5-alpha-Androstane 0.164 " 0.164 100 22-135

MS (1205937344 S)

Source: 697614001

Prepared: 12/04/2024 Analyzed: 12/04/2024

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 Wheat Ridge CO 80033

Jeremy Espinoza
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 Project: KMG - Pioneer 4-12

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2714592 - SW846 3541

MS (1205937344 S)	Source: 697614001			Prepared: 12/04/2024 Analyzed: 12/04/2024						
Naphthalene	0.266	0.00339	mg/kg dry	0.339	<0.00112	78	16-126			
Benzo(k)fluoranthene	0.264	0.00339	"	0.339	<0.00112	78	18-138			
Indeno(1,2,3-cd)pyrene	0.282	0.00339	"	0.339	<0.00112	83	13-134			
Fluorene	0.260	0.00339	"	0.339	<0.00112	77	16-134			
Fluoranthene	0.276	0.00339	"	0.339	<0.00112	81	14-136			
Dibenzo(a,h)anthracene	0.279	0.00339	"	0.339	<0.00112	82	11-134			
Chrysene	0.280	0.00339	"	0.339	<0.00112	83	19-129			
Pyrene	0.268	0.00339	"	0.339	<0.00112	79	12-139			
1-Methylnaphthalene	0.267	0.00339	"	0.339	<0.00112	79	15-129			
Benzo(a)pyrene	0.290	0.00339	"	0.339	<0.00112	86	16-133			
Benzo(a)anthracene	0.286	0.00339	"	0.339	<0.00112	84	20-132			
Anthracene	0.277	0.00339	"	0.339	<0.00112	82	18-136			
Acenaphthene	0.264	0.00339	"	0.339	<0.00112	78	17-129			
2-Methylnaphthalene	0.279	0.00339	"	0.339	<0.00112	82	15-132			
Benzo(b)fluoranthene	0.276	0.00339	"	0.339	<0.00112	81	14-136			

Surrogate: 5-alpha-Androstane 0.165 " 0.169 0.144 97 22-135

MSD (1205937345 SD)	Source: 697614001			Prepared: 12/04/2024 Analyzed: 12/04/2024						
Dibenzo(a,h)anthracene	0.278	0.00339	mg/kg dry	0.339	<0.00112	82	11-134	0	30	
Fluoranthene	0.274	0.00339	"	0.339	<0.00112	81	14-136	1	30	
Fluorene	0.259	0.00339	"	0.339	<0.00112	76	16-134	0	30	
Indeno(1,2,3-cd)pyrene	0.281	0.00339	"	0.339	<0.00112	83	13-134	0	30	
Chrysene	0.282	0.00339	"	0.339	<0.00112	83	19-129	1	30	
Pyrene	0.267	0.00339	"	0.339	<0.00112	79	12-139	0	30	
Benzo(a)pyrene	0.287	0.00339	"	0.339	<0.00112	85	16-133	1	30	
Naphthalene	0.268	0.00339	"	0.339	<0.00112	79	16-126	1	30	
1-Methylnaphthalene	0.264	0.00339	"	0.339	<0.00112	78	15-129	1	30	

Origins Laboratory



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Ensolium
11049 W 44th Avenue, Suite 103
Wheat Ridge CO 80033

Jeremy Espinoza
Project Number: 09A1417854
Project: KMG - Pioneer 4-12

PAH by 8270E SIM - Quality Control
GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2714592 - SW846 3541

MSD (1205937345 SD)	Source: 697614001			Prepared: 12/04/2024 Analyzed: 12/04/2024						
Benzo(b)fluoranthene	0.278	0.00339	mg/kg dry	0.339	<0.00112	82	14-136	1	30	
Benzo(a)anthracene	0.283	0.00339	"	0.339	<0.00112	83	20-132	1	30	
Anthracene	0.274	0.00339	"	0.339	<0.00112	81	18-136	1	30	
Acenaphthene	0.266	0.00339	"	0.339	<0.00112	78	17-129	1	30	
2-Methylnaphthalene	0.275	0.00339	"	0.339	<0.00112	81	15-132	1	30	
Benzo(k)fluoranthene	0.263	0.00339	"	0.339	<0.00112	78	18-138	0	30	
Surrogate: 5-alpha-Androstane	0.170		"	0.170	0.144	100	22-135			

Origins Laboratory



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Ensolum
 11049 W 44th Avenue, Suite 103
 Wheat Ridge CO 80033

Jeremy Espinoza
 Project Number: 09A1417854
 Project: KMG - Pioneer 4-12

Total Metals by 7196A - Quality Control
GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2722488 - SW846 3060A										
BLANK (1205953276-BLK)					Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	ND	0.389	mg/kg				-			U
LCS (1205953277-BKS)					Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	3.64	0.366	mg/kg	3.66		99.5	80-120			
DUP (1205953278 D)					Source: E4K0708-01 Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	ND	0.388	mg/kg dry		<0.155		0-50	N/A	50	U
MS (1205953279 S)					Source: E4K0708-01 Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	3.08	0.388	mg/kg dry	3.88	<0.155	77.9	75-125			
DUP (1205953280 D)					Source: E4K0708-03 Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	ND	0.427	mg/kg dry		<0.171		0-50	N/A	50	U
MS (1205953281 S)					Source: E4K0708-03 Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	3.39	0.427	mg/kg dry	4.27	<0.171	77.9	75-125			
ILCS (1205953282-ILCS)					Prepared: 12/20/2024 Analyzed: 12/27/2024					
Hexavalent Chromium	8.41	0.399	mg/kg	7.98		105	80-120			

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Ensolum
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Wheat Ridge CO 80033

Jeremy Espinoza
Project Number: 09A1417854
Project: KMG - Pioneer 4-12

Notes and Definitions

Ua Sample is Non-Detect.

U Result not detected above the detection limit

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

J Greater than the detection limit but less than the reporting limit

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported on a wet weight basis.

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