ENVIRONMENTAL SCREENING SAMPLING

YDSP RESIDENTIAL DISTRICTS I & II AND TRIBAL OWNED BUILDINGS

Document Summary Review

Prepared for:

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RE: Environmental Screening Sampling for Residential Districts I & II and Tribal Owned Buildings El Paso, Texas and Socorro, Texas

Dear Mr. Cruz,

ESSCO Environmental, Inc. (ESSCO) is pleased to submit the following Environmental Screening Sampling (ESS) for twenty-nine (29) residences from Residential Districts I & II and thirteen (13) government buildings, to the Ysleta del Sur Pueblo – Tigua Indian Reservation of Texas (YdS Pueblo). This ESS is intended to provide and document information collected during the course of an investigation, as outlined in the Scope-of-Service, and provide an evaluation by a qualified professional based upon those findings. Specifically, to perform environmental sampling of indoor air quality, potable water quality, and soil for baseline analysis from representative area(s) for potential environmental concerns. This ESS may not provide adequate information for other purposes and was prepared on behalf of Ysleta del Sur Pueblo (YdS Pueblo), and may not be used by others without written permission from **ESSCO** and YdS Pueblo. If other parties wish to rely upon the information presented within this ESS, please have them contact **ESSCO** so that an understanding of our terms and conditions can be established.

I would like to thank you for the opportunity to provide you with our professional services and if you have any questions or require additional information, please feel free to contact either of the undersigned below.

Sincerely,

Isa C. Valdez
Environmental Scientist
ESSCO Environmental, Inc.

Emile G. Couroux, P.G., CAPM
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Attachments:
Copies (1)

EXECUTIVE SUMMARY

ESSCO Environmental, Inc. (**ESSCO**) conducted an Environmental Screening Study (ESS) on behalf of the Ysleta Del Sur Pueblo (YdSP). The purpose of the ESS was to quantify the environmental pollutants with potential high-risk chemicals, to which participants may be exposed to in the air they breathe, the water they use, and in the soil; either in the domestic or work environment. The chemicals classes included the Resource Conservation and Recovery Act (RCRA) eight (8) heavy metals, pesticides, herbicides, Volatile Organic Compounds (VOCs), and Environmental Tobacco Smoke (ETS) specifically the nicotine and 2-Ethylpyridine compounds.

The *ESS-Phase I* consisted of twenty-nine (29) residences screened from Residential District One and District Two. The houses were randomly selected and monitored for one (1) day. The sampling was composed of one (1) indoor air sample from the living room area, covering approximate a period of eight (8) hours, one (1) sample of tap water from the kitchen faucet, and one (1) soil sample from the main recreation outdoor area.

Overall, ETS was found to be below detected limits in all the twenty-nine (29) sampled residences through the YdSP community. Five (5) out of the sixty-one (61) VOCs were detected *above detection limits* across the residential sampling; however these compounds remained below the ***Limits for Air Contaminants.*** 1,2-Dichloroethane was the most prevalent VOC, occurring in 10% of all residences sampled. This compound is commonly found in polyvinyl chloride (PVC) pipes and houseware. Four (4) RCRA 8 heavy metals were detected above detection limits; ***however results did not exceed the Permissible Exposure Limits (PCLs)*** dictated by the Texas Commission of Environmental Quality (TCEQ). Arsenic (As), Barium (Ba), Chromium (Cr), and Lead (Pb) had similar averages concentrations among Districts One and Two. Heavy metals, such as As and Pb were not detected in the water residential sampling.

The *ESS-Phase II* consisted in the sampling of thirteen (13) Tribal Owned Buildings (TOBs) across the YdSP. The sampling was composed of one (1) indoor air sample, taken from the most-transited area for a period of eight (8) hours, one (1) sample of tap water from the water fountain, and one (1) soil sample from the main recreation outdoor area (if available). Based on the air analysis, two (2) sampled buildings (Speaking Rock Casino and Tigua Smoke Shop) out of the thirteen (13) were found to have above detection limits for nicotine, ***however below the permissible exposure limit (PEL)*** dictated by The Occupational Safety and Health Administration (OSHA).

Eleven (11) out of the sixty-one (61) VOCs were detected among the total number of TOBs sampled. Propylene was the most prevalent VOC and was present in 53% of the buildings sampled; this compound is usually associated with cleaning products. Toluene was similarly detected with high frequency, found in 31% of the buildings of the thirteen (13) sampled buildings across the YdSP. Five (5) RCRA 8 heavy metals were detected above detection limits (As, Ba, Cr, Pb, and Mercury [Hg]); ***however results did not exceed the PCLs***. Heavy metals in the water was not detected at the majority of sampled sites, with exception of the Health and Human Services building.

The ESS data results were in attainment of state and federal environmental standards; additionally based in terms of evaluation of health effect, toxicity guidance values for chronic health endpoints.

Based upon the data collected in the ESS, **ESSCO** has concluded that the YdSP community exposure to environmental pollutants in multiple environmental media (i.e., air, soil, and water) at the sampled

locations were below the permissible exposure limits or protected concentrations, determined by OSHA and TCEQ; either in the sampled residential districts or in the Tribal Owned Buildings.

This Executive Summary is provided solely for the purpose of an overview and is not meant to be relied upon as the primary source of information regarding the attached ESS, including attachments.

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1.0 INTRODUCTION

1.1 Purpose

ESSCO Environmental, Inc. (**ESSCO**) conducted an Environmental Screening Study (ESS) on behalf of the Ysleta Del Sur Pueblo (YdSP) in El Paso, Texas. The purpose of this ESS is to determine the levels of chemicals to which participants are exposed in the air they breathe, the water they use, and in the soil around their daily activities. The screening study quantified the exposure of YdSP residences to environmental pollutants in multiple environmental media (air, soil, and water) in the domestic or work environment (*Illustrated in Attachment I- Figure 1*). The ultimate goal of this project is to document distribution of exposure to potentially high-risk chemicals. Furthermore, to improve the accuracy of exposure assessments and identify potential mitigation approaches, if applicable.

In order to obtain a representative sample of the entire YdSP community, **ESSCO** employed a sampling framework, similar to an Environmental Protection Agency (EPA) National Human Exposure Assessment Survey (NHEXAS) study[1]. The ESS offers a relatively comprehensive exposure characterization of multiple chemicals and multiple pathways. The chemicals classes measured include heavy metals, pesticides, herbicides, volatile organic compounds (VOCs), and two (2) compounds commonly found in Environmental Tobacco Smoke (ETS), nicotine and 2-Ethylpyridine. U.S. EPA methods were used as guideline in the sampling procedures of this ESS and in gathering information regarding assessing the environmental concerns on the YdSP.

The *ESS-Phase I* consisted of twenty-nine (29) residences screened from Residential District One and District Two. The houses were randomly selected and monitored for one (1) day, in a period of eight (8) hours (*Illustrated in Attachment I-Figure 2*). Measurement techniques included participants completing a questionnaire, prepared by YdSP, to help identify possible sources of chemicals toxicants exposures and characterize major activity patterns relatable to home and work environments. Subsequently, multimedia environmental sampling was conducted at the selected residences. The *ESS-Phase II* consisted sampling of thirteen (13) Tribal Owned Buildings (TOB) across the YdSP tribal reservation (*Illustrated in Attachment I-Figure 3*).

Information gathered during the preparation of this ESS regarding personal information is to remain confidential and subject to the YdSP management. The ESS *Phase I* (Residential Districts Sampling) and *Phase II* (TOB Sampling) was requested by Mr. Evaristo A. Cruz, from the Environmental and Natural Resources Department of the YdSP.

1.2 Background Information

Multiple residential and workplaces monitoring studies have been conducted by the EPA in the past. These studies have encouraged the study of residential environmental for pesticides and VOCs[2] and

[1] Population-based exposure measurements in EPA region 5: A phase I field study in support of the national human exposure assessment survey (*Pellizzari et al., 1995*)
[2] Residential environmental measurements in the NHEXAS pilot study in Arizona: preliminary results for pesticides and VOCs (*Gordon et al., 1999*)

drinking water[3], to provide better estimates of exposure to pollutants, since people spend majority of their time indoors.

Residential Districts One and Two were studied to characterize pollutants, because residences may be potentially exposed to environmental pollutants, as the Districts were formerly agricultural land. The most common heavy metals encountered and in the environment and monitored for health concerns are the Resource Conservation Recovery Act metals (RCRA 8): arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag). Heavy metals in soil can originate from different sources; for instance, uncontaminated soils can occur from natural earth processes, such as weathering of the soil-forming rocks while other pollutants can originate from road traffic, household activities (insecticides/herbicides), agricultural, or industrial activity. The pollutants tend to accumulate on the soil's surface and can be transfer to the deeper soil layers and infiltrate into the groundwater table.

Another potential risk associated indirectly with human health is by consuming animal origin products or plants that are contaminated with heavy metals. Polluted soils affect directly to plants, soil-dwelling creatures, and specially the human health in general, if polluted soil is accidentally ingested. Playground areas represent a higher risk to children that are exposed to these areas, as traces of soil or sand can easily be ingested through the oral pathway.

According to historical aerial images[4] there exists a potential of herbicides and pesticides presence in the soil due to historical agricultural land use. Previous studies conducted in the U.S. showed that organophosphate (OP) pesticide have toxic endpoints and may have carcinogenic endpoints. The OP pesticides can be potential sources of acute toxicity, which involves acetylcholinesterase inhibition, with nausea, vomiting, difficulty breathing, blurred vision, confusion, and ultimately paralysis[5]. Low dose continuing exposure can lead to similar health effects, specifically to neurological symptoms[6]. Pesticides can have several routes of exposure pathways, as inhalation, dermal, contact, or ingestion.

Environmental Tobacco Smoke (ETS) is a mixture of over 4,000 compounds found in cigarettes. The two (2) significant compounds considered for the ESS are nicotine and 2-ethylpyridine[7] as well as Volatile Organic Compounds (VOC), which are found in cigarettes. Smoking has being recognized by the U.S. Department of Health, Education, and Welfare, as a major problem for public health, because of its mortality and morbidity. Furthermore, smoking can cause cancer, particular it has been associated with lung cancer, and other related illnesses include respiratory and heart diseases.

Although, in previous years, there has been a vast concern that smokers are not the only ones at risk from exposure to ETS; nonsmokers also are exposed to a similar toxic chemicals as a result in critical health effect. The term is also known as passive smoking, casually associated with lung cancer in non-smokers (people who never have smoked or former-smokers), and usually at high risk of illness if they live in an environment polluted by ETS. Children can act as passive smokers as well, by being

[3] The NHEXAS study in Arizona-introduction and preliminary results (Robertson et al., 1999)
[4] Historical Imagery available at Google Earth software
[5] Review of pesticides: chemistry, uses, and toxicology (*Salem, H and E.J. Olajos, 1988).*
[6] Pesticide Profiles: Toxicity, Environmental Impact, and Fate (*Karmin, 1997).*
[7] Characterization of environmental tobacco smoke (*Burton et al., 1989*)

exposed to ETS from parental smoking and is usually associated with an increased risk of respiratory disorders, such as asthma, pneumonia, pulmonary malfunction, and bronchitis.

Volatile Organic Compounds (VOCs) were also identified as chemical compounds of concern for this study and selected for air evaluation, since their importance in potential adverse health effects. Indoor air can become contaminated in several ways by VOCs. The most direct sources of contamination comes from household products, such as cleaners and cosmetics, among others. Exposure to VOCs, 1, 3-butadiene, benzene and formaldehyde, has been related to cancer risks[8]. Exposure to these toxic chemicals occurs mainly as a result of active and passive smoking. Other personal activities associated with exposure to VOCs is from motor vehicles and/or smog from storage of gasoline or driving. High doses can have a negative effect in the central nervous system, while low VOCs exposure have shown a high risk of leukemia and anemia in children[9]. Potential sources of VOCs includes vehicle emissions, burning cigarettes, cosmetics, building material, among others.

Safe and good quality water is the basis for human health. When polluted, water may become a precursor to diseases, such as cancer, which has been one of the most studied endpoint in the effects associated with exposure to certain chemicals in water. Water represents a media where pollutants can come into human contact, which can be through ingestion (drinking) and/or dermal (bathing) pathways. Potential presence of chemicals in the water has been previously studied[10]. Therefore the risk assessment for potential heavy metals concentration (for instance, As and Pb) in drinking water is necessary. Arsenic has been associated with skin cancer, cardiovascular, reproductive, and neurological health effects. Lead represents a heavy metal with major critical health effects, such as kidney problems and high blood pressure.

1.3 Scope-of-Services

ESSCO conducted the Scope-of-Services outlined in this ESS *Phase I* and *Phase II* in a manner consistent with the level of care ordinarily exercised by members of the environmental profession currently practicing under similar conditions in the region. This Scope-of-Services performed during the preparation of this ESS include:

Phase I –Environmental Screening Sampling on Residential District One and District Two:

1. Conduct sampling in 29 randomly selected residences through Tribal land. These areas were tested to identify any outstanding chemical profile that may contribute to environmental concerns. The environmental sampling consisted of:

    - One sample of soil from the primary recreation are outside the residence;
    - One sample of water from the kitchen water faucet; and
    - One air sample from the family room area covering a period of eight hours.

[8] VOC measurements in Canadian urban and rural areas: 1989-1990 (*Dann et al., 1992*)
[9] Comparison of risks from outdoor and indoor exposure to toxic chemicals (*Wallace, L.A., 1991)*
[10] Assessment of some Heavy Metals in Drinking Water Samples on Tunceli, Turkey (2010)

Phase II – Environmental Screening Study

1. Conduct sampling in thirteen (13) Tribal Owned Buildings. These areas were tested to identify any outstanding chemical profile that may contribute to environmental concerns. The environmental sampling consisted of:

    - One sample of soil from the primary recreation outside the building (when applicable);
    - One sample of water from the main faucet (when applicable); and
    - One indoor air sample from the most transited area covering a period of eight hours.

2.0 ENVIRONMENTAL SAMPLING METHOD

The ESS scoping objectives are to identify the presence of heavy metals, pesticides, herbicides, VOCs, and ETS. Two phases were approached: *Phase-I* refers to the Residential Environmental Sampling, while *Phase-II* to the Tribal Owned Building Environmental Sampling.

Table 1. Summary of collected samples

Media	***Concentration units***	***Number of Samples***
Phase I – Residential Sampling		
Indoor Air – VOC's and ETS	µg/tube	29
Soil - Residential	mg/kg	29
Tap water – kitchen faucet	mg//L	29
Phase II – Tribal Owned Buildings Sampling		
Indoor Air – VOC's and ETS	mg/m3-ppb	23
Soil - Residential	mg/kg	16
Tap water	mg/L	6

Phase-I used a probability-based sampling design (*Attachment I – Figure I*) to select random participants. The first stage of the *Phase-I* consisted of approaching 50 residences from the YdSP residential districts. An informative letter and a questionnaire (prepared by YdSP) was submitted via mail, inquiring about potential daily exposure to chemicals that may contribute to environmental concerns. Altogether, 29 residences from District One and District Two agreed to participate, eight (8) and twenty-one (21) households, respectively. Participants' subjects had informed consent about participation. The second stage involved the environmental sampling, conducted in 2015 from July 15 to July 29, including one sampling event in October 22. Each household sampling was composed of one (1) indoor air sample from the living room area, covering a period of eight hours, one (1) sample of tap water from the kitchen faucet, and one (1) soil sample from the main recreation outdoor area.

Phase-II was conducted at thirteen (13) Tribal Owned Buildings. The environmental sampling was conducted in 2015 from October 19 to October 22. This included the Tribal Administration (*TAB*), Tigua Business Center (*TBC*), Tigua Inc. (*TINC*), Tribal Court (*TCH*), Tribal Housing Agency (*THA*), Daycare (*DAY*), Health and Human Services (*HHS*), Tigua Indian Cultural Center (*TICC*), Tribal Empowerment Center (*TEC*), Recreation and Wellness Center (*REC*), Tigua Smoke Shop (*TSS*), Speaking Rock Entertainment Center (*SREC*), and Socorro Entertainment Center (*SOC*) Buildings.

Phase-II locations were subject to different environmental media samplings. The objective was to obtain one (1) indoor air sample taken from the most-transited area covering a period of eight hours, one (1) sample of tap water from the water fountain, and one (1) soil sample from the main recreation outdoor area, for screening analyses (if available).

For each location, refer to *Table 2*. SREC and SOC locations were sampled twice, due to the contrasting air conditions differing from day and night activities.

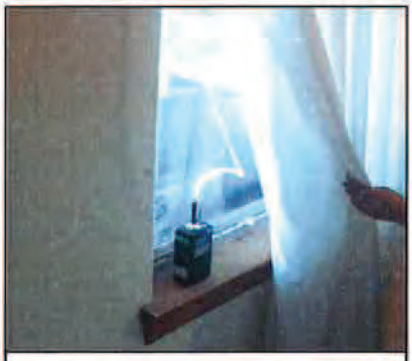
Table 2. Phase-II environmental sampling screening:

Tribal Buildings	Key	*Air*	*Soil*	*Water*
Tribal Administration	TAC	2	0	1
Tigua Business Center	TBC	1	0	1
Tigua Inc.	TINC	1	0	1
Tribal Court	TCH	1	0	1
Tribal Housing Agency	THA	1	0	1
Daycare	DAY	1	2	1
Health & Human Services	HHS	1	1	1
Tigua Indian Cultural Center	TICC	1	1	1
Empowerment Center	TEC	1	2	1
Recreation & Wellness Center	REC	1	0	1
Tigua Smoke Shop	TSS	1	0	1
Speaking Rock Entertainment Center	SREC	5	0	3
Socorro Entertainment Center	SOC	6	0	2
Total		**23**	**6**	**16**

2.1 Indoor Air Sampling

Indoor air sampling was conducted during the course of this project in accordance with the project specifications; two active air monitoring methods were employed at sampling areas depending on the sampling area and volume (i.e., residential room vs. public meeting area). Sixty-one compounds were selected for VOCs detection, on basis of their well-known presence in the environment, toxicity, carcinogenicity and mutagenicity. Additionally, nicotine and 2-ethylpyridine were sampled for ETS.

2.1.1 Residential Environmental Sampling



Picture 1. Depiction of the Air Check XR5000 and usual placement in the residence.

The residential indoor air sampling for toxic chemicals was accomplished by using the Air Check XR5000 sampler unit (*Illustrated in Picture 1*) and appropriate sorbent-tubes. During sampling, a calibrated pump was attached through a flexible tubing to the sorbent tubes to draw air, at a constant rate of 1.5 L/min in an integrated 8-hr sample, over a one (1) day period. Sorbents tubes consisted of two (2) types: a charcoal tube (6 X 70-mm, size) to target VOCs gases and a XAD-4 white (7 X 70-mm size) tube to target ETS. Each pump was placed in the Residential room area, usually vertically positioned with the sorbent tube exposed at approximately six (6) feet above the floor. Upon completion of sampling, the two (2) sorbent tubes were properly labeled and placed in a zip-seal bag at 4° C for storage before shipping to the analytical laboratory.

2.1.1.1 Sample Analysis

Air samples were extracted with specific EPA methods. The EPA 8270 C method was used to detect Environmental Tobacco Smoke, such as nicotine and 2-Ethylpyridine. VOCs were determined by the EPA Method 8260B, analyzed by Gas-Chromatography/Mass Spectrometry (GC/MS).

2.1.2 YdSP Tribal Owned Buildings Environmental Sampling

The TOBs indoor air sampling for toxic chemicals was accomplished by using two (2) air sampling methods: first, Environmental Tobacco Smoke (ETS) (Nicotine and 2-Ethylpyridine) was determined by using the Air Check 52 air sampler (*Illustrated in Picture 2)* with XAD-4 white (7 X 70-mm size) sorbent tube.

Picture 2. Depiction of the Air Check 52 and usual placement in the TOB.

Sampling was carried out at one (1) L/min to give an integrated 8-hr sample over a one (1) day period. The second method to analyze VOCs, consisted of the OSHA PV2120 Stainless Minican (*Illustrated in Picture 3*).

Each sampling event lasted approximately an average of eight (8) hour period. The sample was located inside the building, usually placed at high-transit locations. Effort was made to place sampling devices next-to-each other, however each location varied.

The Air Check 52 pump was calibrated before each sampling event. The mini-canister was properly pressurized, horizontally positioned at a higher elevation surface, with the air inlet exposed to the environment. Upon completion of sampling, the sorbent tube was properly labeled and placed in a zip-seal bag at 4° C for storage; the mini-canister was collected and properly sealed for storage prior to shipping to the analytical laboratory.

Picture 3. Depiction of the PV2120 Stainless Minican and usual placement on higher areas in the TOB.

2.1.2.1 Sample Analysis

The ETS concentrations were tested by Method 2551 through Gas-Chromatography. The VOCs concentrations were tested by EPA Method TO-15, analyzed by Gas-Chromatography/Mass Spectrometry. *Phase-II* sample analysis was completed by different laboratory than *Phase-I*, due to different pumps required for bigger areas and their sampling events.

2.2 Soil Sampling

A top soil yard composite sample was collected at all locations in *Phase-I* and six (6) locations in *Phase-II*. The composite sampling evaluated potential presence of heavy metal levels, herbicides, and pesticides in the soil. The specific sample locations were from locations of constant handling, such as the residential backyard for Phase-I and playing/garden area for Phase-II locations. The sampling method consisted of collecting a composite soil sample from the upper most 8 inches of soil utilizing a hand auger. All composite samples were placed in glass jars, sealed, properly labeled with location and sample analysis request and placed on ice for submittal to the analytical laboratory.

2.2.1 Sample Analysis

The RCRA 8 analysis was tested by the EPA Method 6010C, through Inductively Coupled Plasma-Atomic Emission Spectrometry and Method 7471B for Mercury by Cold-Vapor Technique. Pesticides were analyzed by Gas-Chromatography EPA Method 8081B and herbicides were analyzed by EPA Method 3550C by Ultrasonic Extraction.

2.3 Water Sampling

The *Phase-I* water samples were collected from main water drinking sources, to evaluate arsenic (As) and lead (pB) concentrations that may presence in the drinking water. *Phase-I* water was collected from kitchen faucets due to their frequent usage. The sampling method consisted of collecting a grab sample from the first use of the faucet, to be able to capture all potential metals settled in the water faucet. The water sample was placed in dedicated plastic bottle ware with nitric acid (HNO_3) and stored 4°C for submittal to the analytical laboratory.

The *Phase-II* water samples were collected from a drinking water fountains at different TOBs, such government buildings, entertainment areas, and recreation centers. Water was placed in dedicated plastic bottle ware with nitric acid (HNO_3) and stored 4°C for submittal to the analytical laboratory.

2.3.1 Sample analysis

The water was analyzed by SW 846 Method 6010C/ EPA Method 200.7 by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES). These methods are approved by the EPA under the Safe Drink Water Act.

3.0 ANALYSIS RESULTS

The ESS study involves the identification and measurement of different environmental contaminant classes in various media. The study was designed to provide screening data on the distribution of contaminants in the environment of Residential Districts One and District Two and at the YdSP Tribal Owned Businesses. Distribution of pollutant media concentrations are presented for the representative pathways for each pollutant, representing air, soil, and water.

3.1 Indoor Air

ETS and VOCs were selected as representative pollutants to screen for indoor air quality of the YdSP community. These pollutants are important from a public health standpoint because they have been related to the incidence of cancerous effects on human health[3, 7, 8]. The Occupational Safety and Health Administration (OSHA) eight (8) hour total weight average (TWA) permissible exposure limit (PEL) is 0.05 mg/m^3 and was used to evaluate potential concern for ETS.

3.1.1 Environmental Tobacco Smoke

The results of the *Phase-I* ETS monitoring indicate all households had a ***below detected limit*** status (i.e., <0.003 mg/m^3).

The results of the *Phase-II* monitoring indicate concentrations of ETS (nicotine) ***above detection limits; but below the PEL***. The detected concentrations of nicotine ranged from 0.004 mg/m^3 (SREC-VD) to 0.010 (SREC-NS), in two (2) TOBs, from six (6) sampling sites, specifically at the Speaking Rock casino and the Tigua Smoke Shop, refer to *Table 3* for detailed information.

Other sampled TOB indicate they were **below the detection limit** for ETS. Samples for 2-Ethenylpyridine were ***Non-detected at all sites***.

Table 3. Summary of *Phase II* - Indoor Nicotine Detected Concentrations in ESS

Building Sampled	Site Key	Nicotine Concentration (mg/m^3)	Nicotine OSHA PEL (mg/m^3)
Speaking Rock Cashiers Area	***SREC-CA***	0.009	0.5
Speaking Rock Main Entrance	***SREC-ME***	0.010	0.5
Speaking Rock No Smoking Area	***SREC-NS***	0.004	0.5
Speaking Rock Venue Area – Day Sample	***SREC-VD***	0.004	0.5
Speaking Rock Venue Area – Night Sample	***SREC-VN***	0.009	0.5
Tigua Smoke Shop	***TSS***	0.005	0.5

3.1.2 Volatile Organic Compounds

During the ESS, five (5) VOCs compounds were detected out of the sixty-one (61) VOCs compounds originally screened at the YdSP community. The Five (5) VOCs compounds were identified *above detection limits* among four (4) different residences in *Phase-I.* **Table 4** indicates all samples with above detection status, but observed to be ***below the Limits for Air Contaminants*** established by OSHA regulations.

Table 4. VOCs Occurrence and concentration in Residential Indoor Air Samples with above detection limits.

VOC Compound	Percentage of detects [1]	Average Concentration
1,2-Dichloro ethane	3/29 (10%)	1.21
Bromochloro methane	1/29 (3%)	881
Chloroform	1/29 (3%)	27.5
Chloromethane	1/29 (3%)	7.8
Toluene	1/29 (3%)	11

[1]Percentage of Samples measures above detection limit (Number of Residences with Above Detected Limits / Total Number of Residences)

- 1.2-Dichloro ethane was the most prevalent VOC, occurring at measurable levels in 10% of all residences sampled. The 1, 2-dichloroethene compound is commonly found in polyvinyl chloride (PVC) pipes, furniture upholstery, wall coverings, and houseware[11].

- Bromochloro methane, chloroform, chloromethane, and toluene were present in four (4) distinct residences with *above detection limits but* ***below the OSHA Limits for Air Contaminants***, across the YdSP community.

- Each detected concentration was observed among different houses, only chloromethane and toluene were detected in the same house.

The results of the monitoring study show a limited exposure of VOCs in *Phase II* with all TOBs measuring ***below the Limits for Air Contaminants*** status. The *Phase-II* evaluation detected eleven (11) VOCs out of the sixty-one (61) screened for.

- Toluene was the second VOC compound with more frequency detected. It was found in five (5) buildings out of the thirteen (13) sampled across YdSP, representing 31% of the buildings sampled (*Illustrated in Table 5*).

- SREC (72.7%) is the TOBs with the most VOCs detected.

[11] Toxic Substances Portal, Agency for Toxic Substances and Disease Registry.

- The buildings with higher detected limits but below the *Limits for Air Contaminants* were the *Socorro Entertainment Center (SEC)* and *Speaking Rock Entertainment Center (SREC)*. Illustrated in **Table 5**.

Table 5. Occurrence of VOCs in TOBs Indoor Air Samples with above detection limits.

Building Key	TAB	SREC	TBC	TINC	TCH	DAY	HHS	TICC	TEC	SOC	REC
Percentage of TOB Detection[1]	**36.4%** (4/11)	**72.7%** (8/11)	9.1% (1/11)	9.1% (1/11)	9.1% (1/11)	9.1% (1/11)	9.1% (1/11)	27.3% (3/11)	9.1% (1/11)	**36.4%** (4/11)	9.1% (1/11)

[1]Percentage of TOBs (Total Number of VOCs compounds above detection limits / Total Number of Identified VOCs [eleven {11} identified VOCs compounds out of the sixty-one {61} VOCs]).

Table 6. Occurrence and concentration of primary VOCs in TOB indoor air samples.

Compound	Percentage of detects [1]	Median Concentration (ppb)[2]	Percentage of TOB presence[3]
Propylene	14/23 (**61%**)	11	6/13 (**46%**)
Isopropyl alcohol	3/23 (13%)	62	3/13 (23%)
Acetone	6/23 (26%)	27.5	3/13 (23%)
Methylene chloride	2/23 (9%)	7.8	2/13 (15%)
Carbon disulfide	2/23 (9%)	11	2/13 (15%)
Methyl ethyl ketone	2/23 (9%)	6.8	1/13 (8%)
Cyclohexane	1/23 (4%)	28	1/13 (8%)
Toluene	7/23 (**30%**)	9.9	5/13 (**38%**)
Ethylbenzene	1/23 (4%)	21	1/13 (8%)
M & P-Xylene	1/23 (4%)	74	1/13 (8%)
O-Xylene	1/23 (4%)	37	1/13 (8%)

[1]Percentage of Samples measures above detection limit (Number of Samples Detected / Total Number of Samples Analyzed).

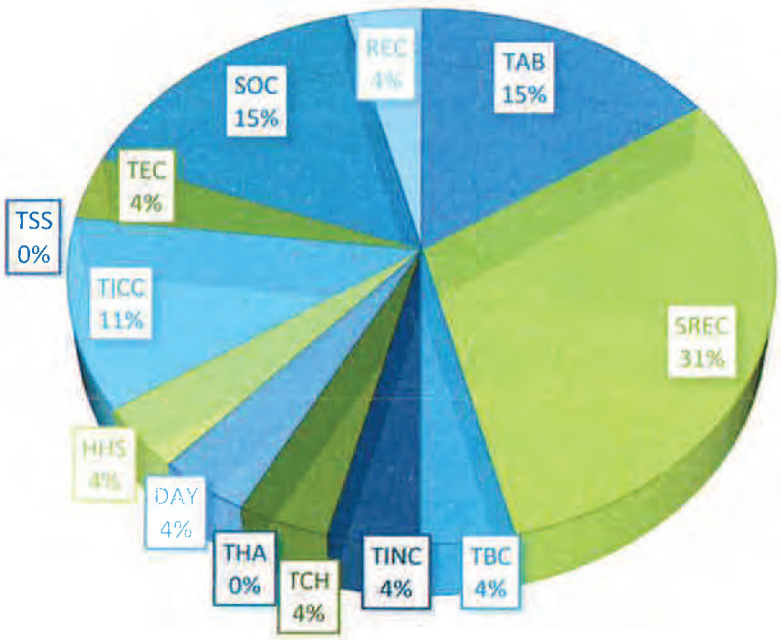
[2] Same Median concentration for the two methods used for results analysis. Percentage of Total Number of Samples Analyzed and Percentage of Total Number of Buildings Analyzed.

[3]Percentage of Averaged Samples measures above detection limit (Average of Detection Limits Samples of each TOB / Total Number of Buildings Analyzed)

- Propylene was the most prevalent VOC, occurring at measurable levels in 61% of all samples analyzed; even though it was present in 46% of the TOBs sampled as Illustrated in **Table 6**. This VOC compound is commonly associated with cleaning products[12].

- The TOBs with the highest propylene concentrations were the *Tigua Business Center (TBC), Daycare (DAY)*, and *Tigua Empowerment Center (TEC).*

- Scientific literature targets specific VOCs, such as benzene, toluene, and 1, 3-butadiene to evaluate the building health since these chemicals are recognized as potential health hazards[13].



Tribal Buildings	Key
Tribal Administration	TAC
Tigua Business Center	TBC
Tigua Inc.	TINC
Tribal Court	TCH
Tribal Housing Agency	THA
Daycare	DAY
Health & Human Services	HHS
Tigua Indian Cultural Center	TICC
Empowerment Center	TEC
Recreation & Wellness Center	REC
Tigua Smoke Shop	TSS
Speaking Rock Entertainment Center	SREC
Socorro Entertainment Center	SOC

Figure 1. Percentage of VOCs detected in TOBs

3.2 Soil

RCRA 8 Heavy metals, pesticides, and herbicides are the pollutants selected for this screening study from soils. The importance in acknowledging the effects of these pollutants is matter of public health. The most vulnerable segment of the population is considered to be preschool-age children, which tend to have a direct effect, since soil traces can be easily ingested by children.

[12] Sources of Propylene Glycol and Glycol Ethers in Air at Home (Hyunok, C. et al., 2010)
[13] Evaluation of health benefits for improving indoor air quality in workplace (Chau, C.K. et al., 2007)

The RCRA 8 Heavy metals were analyzed during the *Phase I* and *Phase II*. Results showed four (4) heavy metals elements identified above detection limits, out of the eight (8) originally sampled. They were compared between averaged concentrations of soil screening levels of District One, Two, and selected four (4) Tribal Owned Buildings (*Information Available in Attachment II*).

The environmental sampling showed Residential Districts One and Two were under the Protection Concentration Levels (PCLs) for Residential Soils, defined by the Texas Risk Reduction Program standards (TRRP). The most frequent detected heavy metals in the soil were Arsenic (As), Barium (Ba), Chromium (Cr), and Lead (Pb); ***however no results exceeded the PCLs***.

Phase I – 8 RCRA Heavy Metals sampled in twenty-nine (29) residences.

- Arsenic was present in fifteen (15) houses, representing 47.6% of the total sampled houses
  - Districts I and District II detected samples were five (5) and ten (10) sites, respectively. *Illustrated in Graphic I*
  - PCL level is 24 mg/kg.

- Barium was present in twenty-nine (29) houses, representing 100%
  - Districts I and District II detected samples were eight (8) and twenty-eight (28) sites, respectively. *Illustrated in Graphic 2*
  - PCL level is 8100 mg/kg.

- Chromium was present in nineteen (19) residences, representing 65.17%
  - Districts I and District II detected samples were five (5) and fourteen (14) sites, respectively. *Illustrated in Graphic 3*
  - PCL level is 33000 mg/kg.

- Lead was present at dissimilar distributions across the Residential Districts:
  - District I - it was observed in four (4) houses, representing a 50% houses of District I,
  - District II - it was observed in three (3) houses, representing a 14.28% houses of District II.
  - *Illustrated in Graphic 4*
  - PCL level is 500 mg/kg

Phase II - Based on the TOB analysis, five (5) heavy metals were detected out of the eight (8) RCRA heavy metals originally sampled. Concentrations of As, Ba, Cr, Pb, and Mercury (Hg) were found to be above detection limits; ***however no results exceeded the PCLs*** for Residential Soils, defined by the TRRP.

Heavy metals compounds in the topsoil are compared in *Graphics 1, 2, 3* and *4*:

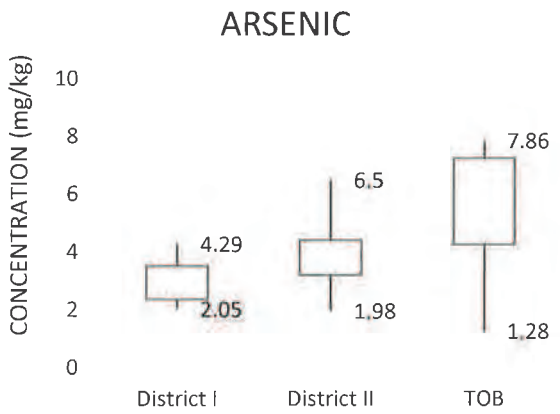
- Overall, arsenic concentrations in TOBs were higher than Residential Districts One and Two.

- Barium and chromium average concentrations are similar among Residential Districts and TOBs.

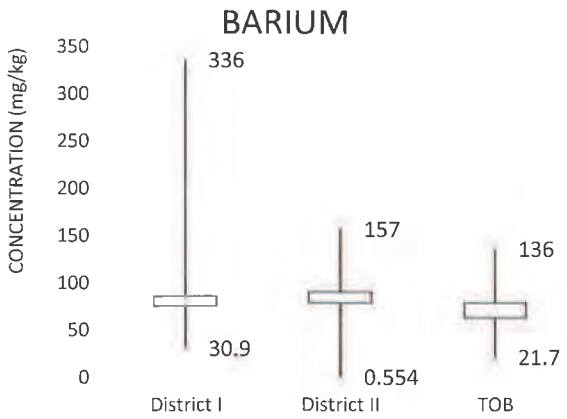
- The lead average detected levels, found in the TOBs topsoil, has the lowest concentration compared to Residential Districts One and Two.

- Mercury was detected at one site, in the *TICC* site, however results did not exceed the PCLs defined by the TRRP.

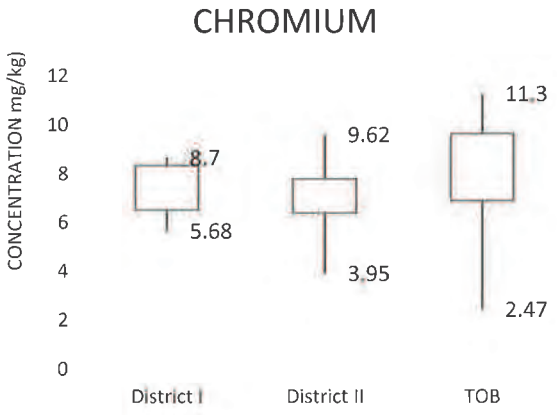
The four (4) graphs below represent the average concentrations of the heavy metals frequently detected in the YdSP communities; including Residential Districts One, Two, and TOB. The box plots represents the samples analyzed through the ESS, indicating the lowest and maximum concentrations found across the sampling spectrum:



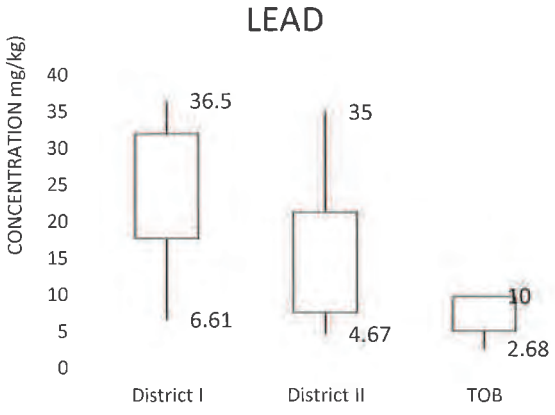
Graphic 1. Average concentrations of Arsenic found in soil samples, among screening sites.



Graphic 2. Average concentrations of Barium found in soil samples, among screening sites.



Graphic 3. Average concentrations of Chromium found in soil samples, among screening sites.



Graphic 4. Average concentrations of Lead found in soil samples, among screening sites.

3.3 Water

The Maximum Contaminant Levels (MCL) for Arsenic and Lead are 0.010 mg/L and 0.015 mg/L, respectively. The levels of arsenic and lead in *Phase – I* were not detected in any of the twenty-nine (29) water samples. At *Phase-II*, arsenic and lead were not detected at the majority of sampled sites, with exception of the HHS site, exhibiting a concentration of **0.0104 mg/L** of arsenic. (*Information Available in Attachment II*). This concentration of arsenic is at the MCL.

4.0 CONCLUSION AND DISCUSSION

ESSCO Environmental, Inc. (**ESSCO**) conducted an Environmental Screening Study (ESS) through the YdSP in El Paso, Texas. The purpose of the ESS is to determine the levels of chemicals to which participants are exposed in the air they breathe, the water they use, and in the soil around their daily activities. The chemical classes measured include heavy metals, pesticides, herbicides, VOCs, and ETS (nicotine and 2-Ethylpyridine).

The ESS data results were in attainment of state and federal environmental standards; additionally based in terms of evaluation of health effect, toxicity guidance values for chronic health endpoints. The ultimate goal is to document distribution of exposure to potentially high-risk chemicals for improving the accuracy of exposure assessments and to identify potential mitigation approaches, if applicable.

In Phase I – Environmental Sampling in Residential Districts One and Two, ETS was found to be below detection limits in all twenty-nine (29) sampled residences through the YdSP community. Five (5) VOCs were detected *above detection limits* across the residential sampling; however these compounds remain below the ***Limits for Air Contaminants.***

Four (4) RCRA 8 heavy metals were detected above detection limits; ***however results did not exceed PCLs***. Arsenic (As), Barium (Ba), Chromium (Cr), and Lead (Pb) had similar averages concentrations among Districts One and Two.

Heavy metals, such as As and Pb were not detected in the water residential sampling.

The Phase II – Environmental Sampling in Tribal Owned Buildings results indicated measurable constituents than the residential sampling. Based on the air analysis, two (2) sampled buildings (Speaking Rock Casino and Tigua Smoke Shop) out of the thirteen (13) were found to have above detection limits for nicotine, ***however below the Permissible Exposure Limits*** dictated by OSHA**.** Detected nicotine concentrations ranged from 0.004 mg/m^3 (SREC-VD) to 0.010 (SREC-ME). Eleven (11) VOCs were detected among the total number of buildings samples. Propylene was the most prevalent VOC, occurring at measurable levels in 61% of all samples evaluated; even though it was present in 53% of the buildings sampled.

The TOBs with the higher propylene concentrations were *TBC, DAY*, and *TEC*; this VOC is usually associated with cleaning products[14]. Toluene was similarly detected with high frequency, found in 31% of the buildings of the thirteen (13) sampled buildings across YdSP. The buildings with the highest toluene concentrations were the *SOC* and *SREC*. ***However results did not exceed the VOCs Limits for Air Contaminants***.

Five (5) RCRA 8 heavy metals were detected above detection limits (As, Ba, Cr, Pb, and Hg); ***however results did not exceed the PCLs***.

[14] Sources of Propylene Glycol and Glycol Ethers in Air at Home (Hyunok, C. et al., 2010)

Heavy metals in the water were not detected at the majority of sampled sites, with exception of the HHS site, which exhibited a concentration of arsenic at **0.0104 mg/L**. This concentration of arsenic is at the MCL.

Based upon the data collected in the ESS, **ESSCO** has concluded that the YdSP community exposure to environmental pollutants in multiple environmental media (i.e., air, soil, and water) at the sampled locations were below the permissible exposure limits or protected concentrations, determined by OSHA and TCEQ; either in the residential environment or in the Tribal Owned Buildings.

5.0 RECOMENDATIONS

The screening techniques used to measure the potential human exposure, evaluated the environmental compounds around the Residential Districts One and two and the Tribal Owned Buildings. **ESSCO** believes the analytical techniques used during the ESS provided sufficient indication of potential VOCs, RCRA 8 Heavy metals, and ETS concentrations among the areas sampled; however they were not sensitive enough to provide an accurate indication of pollutants' exposure at personal levels.

Some sampling devices were placed generally at isolated locations assessing only elevated areas, where concentrations might differ from lower air circulation areas, contributing to different pollutants measurements. Based upon the findings outlined within this EES, **ESSCO** recommends additional human exposure assessment to be conducted among employees; specifically at locations with frequent VOCs clusters, such as Tribal Owned Buildings: Socorro Entertainment Center and Speaking Rock Casino. It was observed the Phase-II TOBs VOCs concentrations were relative more frequent than to Residential Districts. The purpose would be to evaluate the human health risk in the need for more sensitive quantitative results to detect personal environmental exposure levels, with a more refined sample collection involving time integrated sampling.

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