

**Final Summary Report for the South Globe Area  
Medical Monitoring Program  
Denver, Colorado**

**Prepared by:  
Colorado Department of Public Health and Environment**

**November 2004**



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# **SOUTH GLOBE MEDICAL MONITORING PROGRAM**

## **1.0 OVERVIEW AND BACKGROUND**

Medical testing has been offered to people living in residential neighborhoods near the Asarco Globe plant since 1994. Tests to screen for exposure to the metals arsenic, cadmium, and lead have been offered at no cost to community members as part of the consent decree settlement between the State of Colorado and Asarco, Inc. The primary objectives of this medical monitoring program have been to provide information to people in the community on their own health status and to screen for increased exposure related to cleanup of soil in their yards. In addition to offering free medical testing, the program provides a physician who is available to help community members understand their test results, recognize general risk factors important to metal exposure, and recommend appropriate medical follow-up for anyone with an elevated test result.

Program objectives and specific components of the Medical Monitoring Program were developed with the assistance of an advisory group, consisting of community members, city, state, and federal representatives, health professionals with expertise in environmental epidemiology and occupational medicine, and an Asarco representative.

Medical testing focused initially on residential neighborhoods near the Asarco Globe plant site. The target area included residential blocks where historical exposure was evident, based on the presence of a “footprint” area where elevated levels of metals in the soil were detected. The original target area was defined by the geographic boundaries of I-70 to the south, I-25 to the west, 64<sup>th</sup> Avenue to the north, and the South Platte River to the east (now referred to as the “North Globe” area). Elevated levels of arsenic, cadmium, and lead were detected in soil samples collected at many residential properties in the neighborhood north of I-70, with levels of cadmium in soil being the most consistently elevated metal and encompassing the largest geographic area. All residents living within the North Globe target area were contacted and offered testing in the spring of 1994 before any soil cleanup activities began in the community. A second round of testing was offered to each participant at the time contaminated soil was removed from their property.

Cleanup of all residential properties within the original target area was completed in October 1999. However, subsequent soil sampling required under the terms of the Consent Decree revealed elevated levels of metals in soil in several blocks south of the original target area. Soil testing in the residential neighborhood south of I-70 indicated the presence of elevated levels of arsenic and lead, with no high concentrations of cadmium being detected. As a result of a settlement between

residents living in south Globeville (south of I-70) and Asarco, medical monitoring was offered at several clinics in March, April, and May 2000 to residents in the geographic area bounded by I-70 to the north, I-25 to the west, 43<sup>rd</sup> Avenue to the south, and Washington and 38<sup>th</sup> Avenue to the east, identified as the South Globe target area. Summary results for all individuals tested from the South Globe neighborhood, prior to any soil removal and cleanup, were reported previously in the report *Annual Summary Report of the Globe Medical Monitoring Program for 2000* (ENSR, June 2002). The 2002 report also provided a comparison of test results for North Globe and South Globe program participants.

The 2004 report presents a final summary of program participation and results of medical monitoring in South Globe residents. All testing was completed in December 2003. Final physician consultations were completed in the spring of 2004.

### **1.1 Program Objectives**

Objectives for the Globe Medical Monitoring Program were established by a Medical Monitoring Advisory Group (MMAG) in 1992 and are as follows:

1. The medical monitoring program was to establish a baseline of biological indices for residents prior to soil remediation in order to determine whether any adverse effects could be detected through subsequent monitoring conducted during the course of on-going remediation activities.
2. The monitoring program was designed to provide a service to the community by providing individual clinical services and information about metals-related health issues for current and former individual community members.
3. Follow-up, physician consultation, and education were offered to all individuals who participated in the program. Medical staff was available at least on a part-time basis to interpret laboratory results as needed, address community concerns and questions, encourage participation in the medical monitoring program, and to provide general education to the community about metal exposures.

### **1.2 Description of Population Tested**

The program provided medical monitoring services for two distinct population groups, baseline and voluntary participants. These groups were established and defined by the MMAG. These two population groups, and subsets within those groups, are described below.

### 1.2.1 Baseline Population

This target population is defined as those individuals residing in the geographic area (also known as the south “footprint” or target area) with boundaries as follows:

- I-70 (north);
- Washington and 38<sup>th</sup> Avenue (east);
- 43<sup>rd</sup> Avenue (south); and
- I-25 (west).

All residents in the South Globe target neighborhood were encouraged to participate in the medical testing program before remediation of contaminated soils began in the community. Select summary results for the baseline test population are provided in this 2004 report as a comparison to medical monitoring results for other test populations described below. A detailed summary of all baseline test results was reported previously in the 2002 annual report.

### 1.2.2 Elective Population

Persons living within the South Globe target area who did not elect to be tested until after the community soil cleanup began in May 2000 were still eligible to receive medical testing and physician consultation, but are referred to as the Elective Population, to distinguish them from residents tested before any soil disturbance began.

### 1.2.3 Remediation Population

This population group is a subset of the Baseline Population and includes those individuals in the footprint area who were initially tested prior to the start-up of any soil remediation activities in the South Globe neighborhood and who returned for a retest shortly after soil remediation activities were completed at their residence or on their block. This retesting was performed to evaluate potential exposures to metals during soil excavation.

During the 2001-2003 construction seasons, program staff contacted each residence eligible for remediation follow-up testing. To be contacted, the residents had to have participated in the baseline testing prior to the start of remediation of community soils. Program staff visited each eligible home before remediation began on an individual’s property and explained the importance of having the follow-up tests. Each eligible residence was contacted two times. If no one was at home, the staff left an "Information" card, printed in Spanish and English, at the home. The card provided directions to the Concentra Medical Center, where testing was

available, and a phone number so the resident could call for an appointment. When the staff found someone at home, they explained the follow-up testing, answered questions, and then gave the resident the information card with directions to Concentra.

#### 1.2.4 Voluntary Population

This population group is composed of individuals who were current or former workers in the Globeville area, former Globeville residents, or frequent visitors to the footprint area who had specific health concerns related to exposure from the Globe Plant. While the medical monitoring program initially gave priority to testing residents within the target area, the program also specifically targeted outreach and recruitment to all business owners and employees who may have worked in the Globeville area and had concerns about exposure to metals-contaminated soils. In the fall of 2002, CDPHE provided information to all local businesses via a mass mailing. A flyer, which could be posted in a common area, was provided to each business. The flyer provided information to workers and business owners about the opportunity to be tested at the Concentra clinic, at their convenience, and at no cost to the worker.

### **1.3 Tests Available to Program Participants**

The Baseline, Voluntary, and Elective Populations were tested for both short and long term exposure to three metals- arsenic, lead, and cadmium. Tests offered were:

- Urine testing for arsenic, cadmium, creatinine, and beta-2-microglobulin
- Blood testing for lead and cadmium; and
- Hair testing for arsenic.

The urine test measures the amount of two metals, arsenic and cadmium. A urine cadmium test reflects cumulative long-term exposure (over the course of many years), while a urinary arsenic test reflects exposure within the past several days or less. Beta-2-microglobulin is a protein measured in the urine as an indicator of possible kidney damage. This protein can be elevated for many reasons, one of which is damage to the kidney due to cadmium exposure. Other reasons for an elevated beta-2-microglobulin test, not related to metal exposures, include various types of kidney disease, diabetes, high blood pressure, presence of a fever, and use of certain antibiotics or other medications. Creatinine is a breakdown product of normal metabolism, associated mainly with muscle mass and is excreted in the urine at a relatively constant rate. This test is used both to evaluate whether a urine sample is suitable for testing and to adjust the concentration of metals in urine for differences in dilution, so that results between individuals are more comparable.

The blood test measures the amount of lead and cadmium present in the blood and reflects exposure over the past several months.

For the South Globe community, hair samples were also collected to better assess past arsenic exposures. Hair arsenic levels can indicate exposure to arsenic for up to several months prior to sampling, depending on hair length. Urine arsenic levels generally only reflect exposure over the past few days prior to the test (half-life of arsenic in urine of approximately 72 hours or less). Therefore, urine arsenic testing is most useful as a biomonitoring tool when exposure occurs virtually every day. Exposures that occur intermittently, however, such as people working or playing in yards with arsenic-contaminated soils, may be better captured with hair data, in some circumstances. Unlike urine, however, hair can be contaminated by direct contact with arsenic in the environment (i.e., in soil or dust), which might lead to an overestimation of true internal arsenic exposure. Also, hair arsenic levels do not correlate well with estimates of risk for illness caused by arsenic, unless exposure is quite high and the hair level is at or above 1.0 µg/g. This indicates that hair arsenic levels would not be expected to correlate with risk for illness, unless they are at least 10 times higher than the action level of 0.1 µg/g established for this program. However, hair arsenic levels can be an important tool to help identify persons with unusual exposure to arsenic present in their environment, especially if the exposures occur on an intermittent basis.

Levels of lead and cadmium in blood, levels of cadmium, arsenic, low molecular weight proteins (beta-2 microglobulin), and creatinine in urine, and arsenic in hair are determined by laboratory analysis and compared to action levels. The action levels shown in Table 1 were established by the MMAG based on typical reference ranges or population “norms” published by the Centers for Disease Control and Prevention (CDC) and reported in the National Health and Nutrition Examination Surveys (NHANES) and other available sources. Program action levels for lead and cadmium tests are based on well-established reference values from these national testing programs conducted by federal public health agencies. Action levels for arsenic tests, however, must be regarded as somewhat more uncertain because this metal has not been included in these on-going national surveillance programs. Action levels for arsenic in hair and urine were established with guidance and input from CDC, with the goal of selecting a value representing the upper end (i.e., 90<sup>th</sup> to 95<sup>th</sup> percentile) of the range of values seen in other studies for unexposed populations in the U.S. This approach is consistent with the approach used to establish action levels for other tests. The term "action level" is not meant to indicate a level of exposure causing illness, but rather is a level at which the program physician needs to recommend some further activity to reduce individual exposure, which can include retesting, personal interview, or additional medical testing and evaluation.

All program participation was voluntary and testing services were provided at no cost to participants.

## **2.0 PROGRAM COMPONENTS AND ACTIVITIES**

Specific components of the South Globe medical monitoring program have been described previously in detail in the 2002 report and include the following:

- Outreach and Education
- Soliciting Participation
- Sample Collection at Concentra Health Clinic
- Laboratory Analysis at CTQ Lab in Quebec, Canada
- Follow-up Testing and Physician Consultation
- Environmental Investigation

The focus of the program from 2001-2004 was on (a) follow-up testing and case management for individuals from the Baseline or Elective Population who had an elevated test result; (b) solicitation of individuals eligible for remediation testing; and (c) outreach to workers in the community with concerns about exposure to community soils. These elements are the focus of this report.

### **2.1 Follow-Up Testing and Physician Consultation**

As part of routine case management, a program staff person contacted any participant who had a confirmed test result above the program action level to schedule an appointment to meet with the program physician. The program physician was available by conference call or went to the participant's home if he/she was not able to come to the field office but requested a personal consultation. The physician discussed the test results with the participant and took a thorough history to determine the possible causes of the elevation. The program physician was also available to any participant who wished to discuss either general or other metals-related health concerns. Depending on the physician's findings, he recommended one of the following:

- Continued monitoring to track trends in test levels;
- Environmental investigation of metal levels in the home;
- Referral to a physician specialist, toxicologist, or other medical expert;
- No further follow-up or action needed; or
- Referral to other (non-program related) health care provider.

## **2.2 Environmental Investigations**

Recommendations for further environmental investigations were made at the program physician's request for several homes where participants had persistent elevated arsenic test results, to provide information to participants about whether exposure was likely to be occurring due to elevated levels of arsenic within their home. Dust sampling protocols were developed in accordance with U.S. Environmental Protection Agency (USEPA) standard operating procedures for environmental dust sampling in homes. All home investigations were conducted by an industrial hygienist, who collected environmental samples in or around the home to help determine the probable exposure source in residents in the household. Soil and dust samples were also collected at homes outside of the Globe neighborhood, where levels of arsenic in soil and dust were not historically impacted by the Globe Plant. These comparison or "control" homes were selected or matched to those from the Globe area based on similar age of housing and similar proximity to high traffic areas. Findings of these investigations are summarized in the results section of this report (see section 3.3).

## **2.3 Solicitation of Workers**

During 2001-2003, the program also specifically targeted outreach and recruitment to business owners and employees who worked in the Globeville area and had concerns about exposure to metals-contaminated soils. CDPHE provided information to all local businesses via a mass mailing, which contained a flyer with general information about metals exposure, and which provided information to workers and business owners about the opportunity to be tested at the Concentra clinic, at their convenience, and at no cost to the worker.

## **2.4 Data and Confidentiality**

All medical test results and all personal identifying information are regarded as confidential information and protected as such. A written report of all individual test results was sent to each participant, or the parent or legal guardian, along with a letter explaining the results, and, if necessary, a request to arrange for a consultation with the program physician. Test results were only sent to a participant's personal physician at the request of the participant.

Specific individuals at CDPHE are identified as a point of contact to receive all lab results. The only data that may be released or reported are summary statistics of group results. At no time will any names or other personal identifying information be released without prior written authorization from individual participants. All documents released by the medical monitoring program are reviewed for content of confidential information in order to maintain strict control of this information. The individual test results are also entered into a secure computer database along

with other participant demographic information and exposure history. All paper records are stored in locked, fireproof file cabinets.

## **2.5 Quality Assurance/Quality Control**

The medical monitoring program, in conjunction with the contract laboratory, uses several methods to ensure the quality of test results. Several quality control procedures were selected in the development of this program to ensure sample integrity, as well as precision and accuracy of the results. The following quality control methods are employed for this program:

- **Control samples:** The laboratory obtains samples of blood and urine with known amounts of lead, arsenic, cadmium, and analyzes these along with samples submitted from program participants. These control samples are used to ensure that the laboratory equipment is accurately measuring the level of each analyte. If the control sample results fall outside a specific range of values, the participant samples and controls are reanalyzed.
- **Duplicate samples:** The laboratory repeats the analysis of selected samples to ensure the precision of laboratory results.
- **Split samples:** As required by the medical monitoring program contract, 5 percent of the samples received are split into two samples and one of the split samples is sent to an outside laboratory for duplicate analysis. The results of the two analyses are compared to ensure the accuracy of the program results.
- **Spiked samples:** The medical monitoring program obtains samples with known levels of each analyte from an outside laboratory. These samples then travel through the entire sample collection and shipping process to the laboratory as blind samples that appear as routine samples to the laboratory. The analysis of these samples reveals any contamination during the sampling process, any degradation of the samples during shipping, or analysis problems at the laboratory.
- **Proficiency testing:** The program's analytical laboratory (CTQ) is required to participate in a proficiency testing program. This program provides an external quality control check on the laboratory's ability to test blood cadmium, blood lead, urine cadmium, urine arsenic, and urine beta-2-microglobulin. Results of the proficiency testing were provided to CDPHE's QA/QC officer on an ongoing basis throughout the life of the program.

### **3.0 PROGRAM TEST RESULTS**

#### **3.1 Program Participation**

A total of 278 individuals were tested as part of the South Globe Medical Monitoring Program. The 278 participants consisted of the following:

- Baseline 146
- Voluntary Population 69
- Elective Population 63

Of the 278 participants, 127 were male, 151 were females; 188 were adults, 89 were children below the age of 18 years old, 30 were 6 years old or younger (one person did not provide an age or date of birth). Each of these 278 participants visited the program 1 or more times resulting in 388 program visits from 2000-2003, with 78 of these visits occurring from 2001-2003. This information is referenced in Tables 2-4. In addition, two phone consultations with the program physician were conducted in 2004.

According to 1990 census data, there are an estimated 828 residents living in the footprint area. In addition to the 278 individuals from the South Globe area who received medical monitoring testing services, 51 individuals living in the South Globe target area were tested previously through the North Globe program, for a total of 329 tested from the target area. This is a 40 percent participation rate.

#### **3.2 Remediation, Elective, and Voluntary Population Test Results for 2001-2003**

##### 3.2.1 Remediation Population Testing

Thirteen individuals requested remediation testing from 2001-2003 (see Table 5). Among these 13 individuals, two participants, one of whom was a child, had an elevated hair arsenic test. The child was tested periodically for two years and showed continued moderate elevations in their hair arsenic level until after their property was remediated, at which time the level returned to below the program action level. The adult, who had a slightly elevated hair arsenic test result, chose not to return for a retest.

Two participants from the same household had elevated levels of cadmium in their urine, and one individual from this household also had an elevated blood cadmium test. One individual within this household was a current smoker, and the other had smoked in the past. These individuals were

long-time residents who had a garden, but, because soil cadmium levels were low at this property and are low in the South Globe neighborhood as a whole, consumption of garden produce is not believed to be the source of their cadmium exposure. None of the individuals tested from the Remediation Population had an elevated blood lead or urine arsenic test.

### 3.2.2 Elective Population

Twenty-four individuals from this group participated in testing from 2001-2003. Of these, four individuals had an elevated hair arsenic test. Three of these individuals were children from the same family. Follow-up environmental investigation of potential arsenic sources within the home was recommended for this family, but the family declined additional services and has since moved from the neighborhood. The fourth individual with an elevated hair arsenic test was a child under the age of 15 years old who lived at a residence with a high soil arsenic level (maximum concentration of 181 ppm arsenic). Repeat tests were not available for this child. No other tests were elevated for individuals tested from the Elective Population from 2001-2003. Results for all participants from the Elective Population tested during the South Globe program are summarized in Table 10.

### 3.2.3 Voluntary Population

As shown in Table 6, fifteen of the individuals tested from 2001-2003 were from the voluntary population. Four of these participants consisted of persons who frequently visited the area or lived north of I-70 in Globeville (the “other” category), four were former Globe Area residents, and seven were workers. Of these voluntary participants, none had confirmed blood lead or urinary arsenic results. One participant had an elevated blood cadmium test, but this individual declined further participation. Smoking status was not known for this individual. The program specifically targeted outreach and recruitment to business owners and employees who may have worked in the Globeville area and had concerns about exposure to metals-contaminated soils. Of the nine workers tested as part of the South Globe Medical Monitoring Program, seven were tested after the targeted mailing was sent to area businesses in the fall of 2002 (see Table 7). One worker initially had an elevated urine cadmium test result, but tested below the program action level on the confirmatory test. One worker had a marginally elevated hair arsenic test and chose not to be retested after consultation with the program physician. All other test results for individuals from the Voluntary Population tested from 2001-2003 were below the program action levels. Results for all participants from the Voluntary Population are shown in Table 9.

### **3.3 Results of Environmental Investigations and In-Home Dust Testing**

In several circumstances where at least one household member exhibited evidence of unusual arsenic exposure based on elevated hair and/or urine arsenic tests, the program physician recommended an environmental investigation which included sampling of arsenic in house dust to determine whether this could be a source of exposure contributing to elevated arsenic levels. Nine homes were identified in the South Globe area with a total of 14 individuals with persistent hair and/or urine arsenic elevations, which qualified for environmental testing. Of these, six households containing 10 persons with arsenic elevations agreed to participate. A composite dust sample was collected from several living areas of each house and submitted for trace analysis for arsenic. Four homes, located in the general Denver metropolitan area but not within the South Globe target neighborhood, were selected as controls. As shown in Table 8, the range of average arsenic levels in dust for target homes was <3.3 ppm to 6.9 ppm, while in control homes the range was 1.9 ppm to 9.9 ppm. Levels of arsenic in dust did not differ between target homes and control homes and were within the range expected for non-exposed homes, based on a review of available studies within the U.S. (range reported from 4-52 ppm).

### **4.0 PROGRAM SUMMARY AND CONCLUSIONS**

Individuals with test results above the action level were invited to participate in ongoing medical surveillance and, in some cases, environmental investigation of their home, to help determine the likely cause of their exposure and to provide guidance on ways to prevent or mitigate that exposure. The South Globe program focused primarily on exposure to lead and arsenic because these were the metals that were the most consistently detected in soils at high levels in this target area. Follow-up activities during the final three years of the program consisted of the following primary activities:

- Follow-up testing for metals exposure and physician consultation
- Active outreach and recruitment of area workers
- Environmental investigation of arsenic levels in certain homes where residents had persistent elevations at levels significantly higher than the majority of those tested.

#### **Lead Exposure**

None of the participants tested from the South Globe area who provided a blood sample have had a test result above the program action levels of 10 µg/dl for children and 25 µg/dl for adults. Children under the age of 7 years old are identified by the CDC as the age group most at risk from the effects of elevated blood lead; however, recruitment of this group has been low, with only eight

young children, 6 years old or younger, receiving a blood lead test.

### **Arsenic Exposure**

None of the participants tested from 2001-2003 had an elevated urinary arsenic test result. Over the life of the South Globe program, only one person has had a urine arsenic level above the program action level. That individual was a former resident who had an elevated level on initial testing, which was not confirmed on subsequent testing two months later.

As reported previously, urinary arsenic levels in adults tend to correlate with recent dietary intake of fish or seafood, while higher levels are not associated with fish consumption for children. Several children with higher than average urinary arsenic levels and/or elevated hair arsenic test levels lived at properties with high concentrations of arsenic in soil, indicating the potential for increased exposure from their home environment, but the small number of young children from the South Globe target area that elected to be tested limits our ability to assess likely risk factors for this group.

From 2001-2003, hair arsenic continued to be the test with the greatest number of results exceeding the program action level. This may, in part, be due to the uncertainty described previously in establishing an appropriate reference level for this test. As shown in Table 11, the distribution of test results was quite similar for participants from the Baseline, Elective, and Voluntary Populations, with 20-30% having hair arsenic test results below the laboratory detection limit and 60-70% testing below 0.05 ug/g. Approximately 95% of all participants from these three population groups tested below 0.15 ug/g and 99% testing below 0.2 ug/g. The distribution of test results for the Remediation Population group was somewhat different, with test results being shifted slightly higher (approximately 10% of tests below the detection limit; 90% below 0.2 ug/g; 95% below 0.5 ug/g), however these differences may well be due to the small number of individuals in the Remediation Population compared to the other groups, rather than differences in exposure or contact with arsenic in soil at the time of testing. Overall, levels of arsenic measured in hair in both adults and children were well below a level associated with health effects (i.e., approximately 1.0 µg/g and higher), with only one adult testing above this level.

### **Environmental Testing**

In several circumstances, where at least one household member exhibited evidence of unusual arsenic exposure based on test results from hair and/or urine arsenic testing, the program physician recommended an environmental investigation which included sampling of arsenic in

house dust to determine whether this could be a source of exposure contributing to elevated arsenic levels. Levels of arsenic in dust did not differ between target homes and control homes and were within the range expected for non-exposed homes in the U.S. We conclude that elevated hair and urine levels among persons in these target households are not due to elevated levels of arsenic in dust inside the home. At some of the target homes where elevated levels of arsenic in hair were detected, arsenic levels in soil were above remediation action levels and may have contributed to the elevated test result, although it is not possible to determine whether increased exposure to arsenic was likely due to actual ingestion exposure or external contamination of the hair shaft. On-going follow-up testing was recommended by the program physician for individuals with persistent elevations until after soil cleanup was completed or until levels were determined to be below program action levels.

**Table 1. Program Action Levels**

The following are action levels recommended by CDPHE, with advice from the MMAG and CDC. The term "action level" does not mean a person is ill, but indicates a level at which the program physician needs to recommend some further action or activity which can include retesting, personal interview, exposure investigation or additional toxicological evaluation.

Test Type	Action Level
Blood Lead - Children (0-18 years of age)	$\geq 10 \mu\text{g/dl}$
Blood Lead - Adults	$> 25 \mu\text{g/dl}$
Blood Cadmium	$> 2 \mu\text{g/l}$
Urine Cadmium	$> 2 \mu\text{g/l}$ or $> 2 \mu\text{g/g cr}$
Urine B-2-microglobulin	$> 300 \mu\text{g/l}$ or $> 300 \mu\text{g/g cr}$
Urine Creatinine	$< 0.5 \text{ gm/l}$ or $> 3.0 \text{ gm/l}$
Urine Specific Gravity	$< 1.005$ or $> 1.030$
Urine Arsenic (non-dietary)	$> 20 \mu\text{g/l}$ or $> 20 \mu\text{g/g cr}$
Hair Arsenic <sup>1</sup>	$> 0.1 \mu\text{g/g}$

<sup>1</sup> Generally, a risk for health problems caused by arsenic is not expected to increase when hair arsenic is below 1.0  $\mu\text{g/g}$ . Levels below this threshold are an indication of increased exposure to arsenic in an individual's environment, but may be due to either ingestion exposure or external contamination of the hair shaft.

**Table 2. New Program Participants by Year, Gender, and Age <sup>1</sup>**

	<b>2000</b>	<b>2001-2003</b>
<b>Male</b>	105	22
<b>Female</b>	134	17
<b>Adults</b>	165 <sup>2</sup>	23
<b>Children 7-18 years old</b>	40 <sup>2</sup>	10
<b>Children &lt; 7 years old</b>	33 <sup>2</sup>	6

1 - The number of new participants does not include individuals receiving repeat follow-up testing or those retested after remediation of their property.

<sup>2</sup> - One participant did not provide a date of birth.

**Table 3. Program Participation by Population Group**

	<b>2000</b>	<b>2001-2003</b>
<b>Voluntary Population</b>	54	15
<b>Baseline Population</b>	146	NA
<b>Elective Population</b>	39	24
<b>Total Program Participants</b>	239	39

NA = Not Applicable

**Table 4. Number of Participant Visits<sup>1</sup>**

	<b>2000</b>	<b>2001-2003</b>
<b>Male</b>	140	45
<b>Female</b>	170	33
<b>Adults</b>	221	46
<b>Children 7-18 years old</b>	57	20
<b>Children &lt; 7 years old</b>	32	12
<b>Voluntary Population</b>	65	18
<b>Baseline Population</b>	227	14
<b>Elective population</b>	3	28
<b>Remediation Population</b>	15	18
<b>Total Visits</b>	310	78

<sup>1</sup> These numbers include retests and consultations with the program physician.

**Table 5. Remediation Testing Participation<sup>1</sup>**

	<b>2000</b>	<b>2001-2003</b>
<b>Number of Individuals Participating in Remediation Testing</b>	15	13

1 – Totals include individuals who had a baseline test as part of the North Globe Medical Monitoring Program and returned for a second round of testing when their property was cleaned up under the South Globe Program.

**Table 6. Voluntary Population Program Participants**

	<b>2000</b>	<b>2001-2003</b>
<b>Former Residents</b>	20	4
<b>Former &amp; Current Workers</b>	2	7
<b>Other<sup>1</sup></b>	32	4

<sup>1</sup> Examples: Lives north of I-70, visits Globe area frequently.

**Table 7. Test Results for Workers**

<b>Parameter</b>	<b>Total Number of Individuals with a Valid Test</b>	<b>Average Test Result<sup>1,2</sup></b>	<b>Number of Individuals with Results Above the Action Level</b>
<b>Blood Lead (Ages &gt;6 Years)</b>	9	2.4 µg/dl	0
<b>Blood Cadmium</b>	7	0.35 µg/L	0
<b>Urine Arsenic</b>	8	2.0 µg/g	0
<b>Urine Cadmium</b>	6	0.61 µg/g	1
<b>Hair Arsenic</b>	9	0.04 µg/g	1

<sup>1</sup> Assumes that all levels less than the detection limit were one-half the detection limit.

<sup>2</sup> Urine tests are creatinine corrected where appropriate for individuals greater than or equal to 15 years of age.

**Table 8. Results of Environmental Investigations of Arsenic Levels in Dust**

<b>Target or Control Home</b>	<b>Dust concentration (ppm)</b>	<b>Soil concentration (ppm)</b>
Target	6.9	9.0
Target	<3.3	32
Target	2.3	115
Target	3.7	129
Target	4.2	7
Target	4.2	20
Control	8.8	18.8
Control	1.9	16.2
Control	9.9	<10
Control	9.7	<10

ppm = parts per million

**Table 9. South Globe Medical Monitoring Results Summary - Voluntary Population**

<b>Parameter</b>	<b>Total Number of Individuals with a Valid Test</b>	<b>Average Test Result<sup>1,2</sup></b>	<b>Number of Individuals with Results Above the Action Level</b>
<b>Blood Lead (Ages 0-6 Years)</b>	2	2.3 µg/dL	0
<b>Blood Lead (Ages &gt;6 Years)</b>	58	1.4 µg/dL	0
<b>Blood Cadmium</b>	58	0.26 µg/L	3 (4.3%)
<b>Urine Arsenic (non-dietary)</b>	54	1.5 µg/g	1 (2.5%) <sup>3</sup>
<b>Urine Cadmium</b>	52	0.41 µg/g	1
<b>Hair Arsenic (total)</b>	66	0.03 µg/g	9 (13.6%)

<sup>1</sup> Assumes that all levels less than the detection limit were one-half the detection limit.

<sup>2</sup> Urine tests are creatinine corrected where appropriate for individuals greater than or equal to 15 years of age.

<sup>3</sup> Not confirmed by retest.

**Table 10. South Globe Medical Monitoring Results Summary - Elective Population**

<b>Parameter</b>	<b>Total Number of Individuals with a Valid Test</b>	<b>Average Test Result<sup>1,2</sup></b>	<b>Number of Individuals with Results Above the Action Level</b>
<b>Blood Lead (Ages 0-6 Years)</b>	3	3.5 µg/dL	0
<b>Blood Lead (Ages &gt;6 Years)</b>	49	2.1 µg/dL	0
<b>Blood Cadmium</b>	51	0.27 µg/L	1 (2.0%)
<b>Urine Arsenic (non-dietary)</b>	49	0.8 µg/g	0
<b>Urine Cadmium</b>	48	0.33 µg/g	1 (2.1%)
<b>Hair Arsenic (total)</b>	62	0.04 µg/g	8 (12.9%)

<sup>1</sup> Assumes that all levels less than the detection limit were one-half the detection limit.

<sup>2</sup> Urine tests are creatinine corrected where appropriate for individuals greater than or equal to 15 years of age.

**Table 11. Distribution of Hair Arsenic Test Results**

<b>Distribution of test results</b>	<b>Baseline (n=144)</b>	<b>Elective (n=61)</b>	<b>Voluntary (n=68)</b>	<b>Remediation (n=23)</b>
Percent < detection limit	21	30	29	9
Percent < 0.05 ug/g	71	59	72	57
Percent < 0.10 ug/g (action level)	90	75	87	78
Percent < 0.15 ug/g	97	92	94	87
Percent < 0.20 ug/g	99	95	97	87
Percent < 0.50 ug/g	100	98	100	91
Percent < 0.80 ug/g	100	100	100	96
Percent < 1.0 ug/g	100	100	100	96

n = number of individuals within each population group

Symbol “<” = less than

ug/g = Micrograms of arsenic per gram of hair