Feasibility Study

Holcim Inc. Site
Former Cement Manufacturing Plant
12207 East Empire Way
Spokane Valley, Washington 99216

for
Holcim (US) Inc.

November 1, 2013

GeoEngineers
Earth Science + Technology

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File No. 16316-001-02

November 1, 2013

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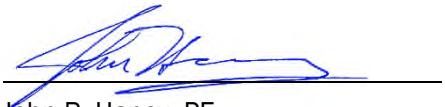

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EXECUTIVE SUMMARY

This report presents the Feasibility Study (FS) conducted for the Holcim, Inc. Site (herein referred to as the "site") located at 12207 East Empire Way in Spokane Valley, Washington. The site includes three properties: an approximate 21.5-acre former cement manufacturing plant owned by Holcim (US) Inc. (Holcim), a portion of the City of Spokane Valley park property (herein referred to as the "City property"), and a portion of the Neighborhood, Inc. Coyote Rock Development (herein referred to as the "Neighborhood Inc. property"). The City property and Neighborhood Inc. property are located adjacent to and north and west, respectively, of the Holcim property. The location of the site is shown on Vicinity Map, Figure 1. An aerial photograph/map of the site showing approximate property boundaries and tax parcels is shown on Site and Surrounding Properties, Figure 2.

The FS was conducted to develop and evaluate cleanup action alternatives to address contamination identified in the Remedial Investigation Report dated April 29, 2013 prepared for the site and select a preferred cleanup alternative. Holcim prepared this FS in compliance with the RI/FS Work Plan approved by Ecology pursuant to an Agreed Order for the site and in general accordance with the requirements defined by MTCA (Washington Administrative Code [WAC] 173-340-350). Ecology will select a cleanup action and prepare a cleanup action plan (CAP) for the Site.

Approximately 121,300 cubic yards (cy) of cement kiln dust (CKD) are located on the Holcim and City properties (109,000 and 12,300 cy, respectively). The CKD in some of these areas is characterized with concentrations of arsenic, cadmium, and lead at concentrations greater than MTCA Method A cleanup criteria for unrestricted land use. Additionally, some of the CKD on the Holcim and City properties has pH levels greater than 12.5, which would characterize as a dangerous waste as defined by the Dangerous Waste Regulations (Chapter 173-303 WAC). The Holcim and City CKD areas are referred to in this report as Areas A and B, respectively, and are shown on Areas Requiring Cleanup Evaluation, Figure 5.

Other smaller and scattered areas of contamination have been identified on the Holcim and Neighborhood Inc. properties, which are referred to in this report as Areas C and D, respectively, and also are shown on Figure 5. These smaller areas generally consist of shallow soil contaminated with arsenic, cadmium, lead, benzene, gasoline-range petroleum hydrocarbons, and/or polycyclic aromatic hydrocarbons. Approximately 1,279 and 2,300 cy of contaminated soil are located in Areas C and D, respectively.

In summary, about 125,000 cy of contaminated material is located at the site. Additionally, arsenic concentrations in groundwater exceed cleanup criteria, most frequently in well MW-2. The CKD deposit on the City property often is in contact with groundwater during high groundwater elevation periods (spring months) and likely is the source of elevated arsenic concentrations in groundwater.

Based on the initial screening, five remedial alternatives were developed during the FS. In general, the remedial alternatives ranged from complete removal of all contaminated material for off-site disposal to capping in place of all contaminated material, with combinations of both. Of these five alternatives, Alternative 5, a hybrid alternative, is the preferred alternative. This alternative consists of excavating contaminated material from Areas B, C, and D, placing this excavated material in Area A on the Holcim property, capping the combined materials, and conducting long-term monitoring.

This alternative achieves a high level of protection to human health and the environment, complies with state and federal laws, and provides a reasonable degree of permanence. Comparison of the remedial alternatives and ranking of each alternative are shown in Evaluation of Cleanup Action Alternatives, Table 5 and Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives, Table 6.

Alternative 5 generally will include the following activities:

- Remove CKD from the City property (Area B) and place on the Holcim property (Area A). The City property will be backfilled and covered with topsoil and hydroseeded. This would reduce the potential for metals, particularly arsenic, to leach into groundwater.
- Removed contaminated material from the smaller, scattered areas on the Holcim and Neighborhood, Inc. properties (Areas C and D) and place on the Holcim property (Area A). This will reduce the potential for dermal contact with metals on the Neighborhood Inc. property and metals and other contaminants on the Holcim property. The excavations on the Neighborhood Inc. property will be backfilled to grade and restored to current conditions.
- The combined contaminated material would be placed with the current Holcim CKD area (Area A), then capped with about one foot of gravel material and six inches of topsoil, which would be hydroseeded. The Holcim site would remain fenced and secured.
- This alternative would result in long-term groundwater monitoring and cap inspection because contamination remains on site. For cost comparative purposes, groundwater monitoring will be conducted quarterly for one year following completion of the remedial action, then annually for an additional 24 years (25 years total). Cap inspection would be conducted quarterly for 25 years. A restrictive covenant would be placed on the deed to the Holcim property.

1.0 INTRODUCTION

This report presents the Feasibility Study (FS) conducted for the Holcim, Inc. Site (herein referred to as the "site") located at 12207 East Empire Way in Spokane Valley, Washington. The site includes three properties: an approximate 21.5-acre former cement manufacturing plant owned by Holcim (US) Inc. (Holcim), a portion of the City of Spokane Valley park property (herein referred to as the "City property"), and a portion of the Neighborhood, Inc. Coyote Rock Development (herein referred to as the "Neighborhood Inc. property"). The City property and Neighborhood Inc. property are located adjacent to and north and west, respectively, of the Holcim property. The location of the site is shown on Vicinity Map, Figure 1. An aerial photograph/map of the site showing approximate property boundaries and tax parcels is shown on Site and Surrounding Properties, Figure 2.

The Holcim property was developed and operated as a cement manufacturing plant from 1910 through 1967 and later used as a cement distribution terminal from 1967 to 2002. During operational history, cement kiln dust (CKD), a by-product of the manufacturing process, was deposited on the site. One large CKD deposit (about 109,000 cubic yards) is located on the Holcim property and a smaller CKD deposit (about 12,300 cubic yards) is located on the City property. The CKD often contains arsenic, cadmium, and lead at concentrations that exceed unrestricted land use cleanup criteria, as set forth the in the Model Toxics Control Act (MTCA); in addition, some CKD contains pH levels greater than 12.5.

An Agreed Order (AO) was negotiated between the Washington State Department of Ecology, Holcim, and the City of Spokane Valley (AO No. 8549 dated August 22, 2011); both Holcim and the City were listed as potentially liable parties (PLPs). The AO required Holcim to prepare and submit a Remedial Investigation/Feasibility Study (RI/FS) for the site to comply with the AO Scope of Work and the Ecology-approved RI/FS Work Plan. The RI was prepared under separate cover (dated April 29, 2013).

This FS was conducted to develop and evaluate cleanup action alternatives to address contamination identified in the RI Report and select a preferred cleanup alternative. Holcim prepared this FS in compliance with the RI/FS Work Plan approved by Ecology pursuant to the AO and in general accordance with the requirements defined by MTCA (Washington Administrative Code [WAC] 173-340-350). Ecology will select a cleanup action and prepare a cleanup action plan (CAP) for the site.

2.0 SITE BACKGROUND

2.1. Site Description

The site comprises about 24 acres, including about 21.5 acres on the Holcim property and slightly more than 1 acre each on the City and Neighborhood Inc. properties. The site is bounded by undeveloped (park) land owned by the City and the Spokane River to the north and east, light industrial, municipal, and commercial properties to the south, and a partially developed residential area to the west.

The Spokane River flows northwest on the east side of the site, abruptly turns southwest on the west side of the site and generally flows west downstream of the site. Ground surface elevations on the

Holcim property are roughly 20 to 50 feet higher than elevations on the City and Neighborhood Inc. properties. Most of the site is vacant and covered with low brush or trees. A rail spur, formerly used during plant operations, is located on the southern half of the Holcim property; the rail spur currently is not connected to any operating rail lines. The Centennial Trail, an asphalt-paved recreational trail, is located on the City property parallel to the river.

The cement plant layout is presented as it appeared in 1974 (prior to demolition in 2006) in Pre-Demolition Site Layout and Current Parcel Boundaries, Figure 3, which shows the former site buildings on the Holcim property, present property boundaries, and adjacent property tax parcel boundaries and current ownership. Although vegetation covers most of the area of CKD deposition (north of the rail spur), some CKD is visible in the aerial photograph background (primarily on the City property) and appears as a light tan color.

The properties to the west of the Holcim property formerly were owned and operated by the Spokane Sand and Gravel Company, which mined aggregate from the area; these properties currently are being developed into single- and multi-family residential units. Based on historical photographs of the area, the ground elevation west of the site was higher than current conditions. Excavation of these properties during aggregate mining and grading activities conducted during recent residential development has resulted in a steep grade along the west boundary of the Holcim property.

The City of Spokane Valley owns the undeveloped land to the north and east of the Holcim property, also referred to as Myrtle Point. The Centennial Trail courses through the land and generally is aligned parallel to both the Spokane River and the eastern and northern Holcim property boundaries. Historic aerial photographs also indicate that Myrtle Point was mined for aggregate at one time. A deposit of off-site CKD, measuring about 300 to 400 feet long (east-west) and 100 feet wide, is located on the City property directly north of the Holcim property, likely in a formerly excavated area. Elevation differences between the northern Holcim property boundary and the off-site CKD deposit range from about 15 to 30 feet.

The properties south of the Holcim property (from east to west) include: Meidling Concrete, Inc., a concrete construction company (parcels owned by Meidling/Wills PRTN and Hawkins, J.L. and S.); Road Products, Inc. (parcels owned by Lawless LLC), which manufactures paints and other road surfacing materials; the Irvin Water District #6, which includes a water supply well; T-2 Services, Inc., a welding shop; the Spokane County Division of Engineering and Roads; and the Empire Industrial Park, LLC. These properties formerly were part of the cement manufacturing plant property.

The Holcim property lies approximately 1,985 feet above mean sea level (MSL), although elevations drop to the north to about 1,940 feet above MSL and, to a lesser extent, to the east and west. The Holcim property and the CKD deposit on the City property are currently surrounded by chain-link fences, except for the extreme western strip of land (the former rail spur is referred to as the “flag pole” due to its shape) on the Holcim property (see Figures 2 and 3).

2.2. Historical Operations and Site Use

Numerous cement companies, several of which were successors to predecessor companies, have operated at and/or owned the Holcim property including: International Portland Cement Company (1910–1932), Spokane Portland Cement Company (1933–1954), Ideal Cement Company

(1955–1977), Ideal Basic Industries Cement Division (1978–1992), Holnam Inc. (1993–2000), Holnam Trucking Terminal Facility (2001), Holnam Cement Hydraulic (2002) and Holcim (2003–present). Several structures were located at the Holcim property including a crushing mill and rotary kiln, offices and laboratory, coal and clinker storage buildings and sheds, precipitator building, packhouse, machine shop, crusher building, numerous storehouses and storage sheds, silos, truck wash and wash house, and a water tower. Rail spurs, sidings, and lines were located at and adjacent to the Holcim property; and at least two elevated rail spurs terminated on the west portion of the plant. No records from the cement manufacturing timeframe are known to exist.

Several buildings were demolished between 1970 and 1974 including the mill and kiln, the office and laboratory, coal storage building, precipitator building, and crusher building. During the operating period as a cement distribution terminal, powdered cement was delivered via rail, stored in silos, and loaded onto trucks. Remaining buildings primarily were used for storing powdered cement. In 2006, the remaining structures were demolished.

Based on a review of historical aerial photographs, CKD was landfilled in the north portion of the site during the latter operating period as a cement manufacturing plant (from about the mid-1950s to 1967). A review of historical topographic maps and aerial photographs indicates CKD was placed on naturally-occurring lower grades, gradually filling the north portion of the site until it was roughly level with the overall plant grade. Landfilling activities stopped upon cessation of cement manufacturing in 1967.

2.3. Environmental Setting

2.3.1. Geologic Setting and Soil Conditions

Geologic maps indicate the site is underlain by Glacial Flood-Channel Deposits, predominantly gravel (Qfcg). This geologic unit was deposited during prehistoric catastrophic ice-age flooding at the end of the last ice age, about 10,000 years ago. The Qfcg geologic unit is described as a thickly-bedded to massive mixture of boulders, cobbles, gravel and sand with localized beds and lenses of sand and silt. Boulders can be more than 5 feet diameter. The color is typically gray to yellowish gray or light brown.

Basement rocks near the site generally consist of metasedimentary rocks of the Precambrian (greater than about 570 million years ago [MA]) Belt Supergroup and the Priest River Complex. Precambrian rocks were intruded by granitic plutonic rocks during the Mesozoic (245 to 65 MA) and Tertiary (65 to 1.5 MA).

Basement rocks are stratigraphically overlain by basalt flows associated with the Columbia River Basalt Group (CRBG). The CRBG was deposited during an extended period of Miocene (23 to 5 MA) volcanism that extruded a series of very fluid lava flows. The lava flowed from north-northwest trending fissures as much as 90 miles long which were located primarily in northeastern Oregon and southeast Washington (Hooper, 1982). The resulting basalt deposits are hundreds to thousands of feet thick in some areas of eastern Washington and extend throughout the Columbia Plateau. As the basalt flowed into the Spokane area (which is situated near the eastern terminus of the CRBG), it filled preexisting depressions, lapping onto elevated areas of older, uplifted metamorphic and igneous rocks. Steptoes (vertical formations extending above the surrounding surface) were formed

where knobs of the underlying "basement" rock were completely encircled by the Columbia River Basalt flows.

The CRBG has been subdivided into five formations that include, from oldest to youngest, the Imnaha Basalt, Picture Gorge Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt. Two of these formations, the Grande Ronde and Wanapum, have been identified within the Spokane area (Drost and Whiteman, 1986). The area surrounding the site was situated near the eastern margin of the area inundated by CRBG basalt flows. As a result, the CRBG near the site occurs as relatively thin and discontinuous outcroppings of Wanapum Formation. CRBG flows are interbedded with sedimentary rocks associated with the Latah Formation.

Near the site, bedrock primarily is overlain by Pleistocene glaciofluvial (flood) deposits, which consist of unsorted mixtures of silt, sand, gravel, cobbles and boulders. Flood deposits reach thicknesses of up to 1,000 feet and form the Spokane Valley/Rathdrum Prairie (SVRP) Aquifer. Near the site, depth to bedrock is thought to be on the order of 200 feet below ground surface (Kahle and Bartolino, 2007).

As indicated above, in general, surface soil conditions consist of gravel and/or crushed rock surfacing. According to the United States Department of Agriculture Natural Resources Conservation Service (NRCS), the site is underlain by the Garrison Gravelly Loam, 0 to 5 percent slopes (Unit GgA). The NRCS describes the GgA soil unit as "very deep, somewhat excessively drained soil situated on nearly level to gently sloping terraces. It formed in glacial outwash mixed with volcanic ash in the upper part. Typically the surface layer is gravelly loam 15 inches thick. The subsoil is very gravelly loam, 29 inches thick. The substratum is very gravelly loamy coarse sand to a depth of 60 inches."

2.3.2. Hydrogeologic Setting

The site is underlain by at least two aquifers. These aquifers occur within: (1) unconsolidated glaciofluvial sediments; and (2) basement rocks. Groundwater within unconsolidated sediments near the site generally occurs within glaciofluvial sediments associated with the SVRP Aquifer, which covers a land area of about 408 square miles in Idaho and Washington. The SVRP Aquifer is a prolific, sole-source aquifer that is unconfined throughout much of its length and reaches a saturated thickness of as much as 500 feet within the Spokane Valley (CH2M Hill, 1998).

Overall, hydraulic conductivity estimates in the SVRP Aquifer range from 0.01 to 0.07 feet per second, transmissivity estimates range from 0.05 to 70 square feet per second, and groundwater velocity estimates range from 0.01 to 80 feet per day. The SVRP Aquifer recharge area includes the drainage basins of the St. Maries River, the St. Joe River, and the Coeur d'Alene River. Smaller recharge volumes are attributed to direct infiltration of precipitation, outdoor water use, septic discharge, and stormwater infiltration. The SVRP Aquifer primarily discharges to the Spokane River, the Little Spokane River, vertically to underlying bedrock aquifers, and to water supply wells.

2.3.2.1. BASEMENT ROCK AQUIFER

Groundwater occurs in basement rocks in fractured and/or weathered zones. Porosity, hydraulic conductivity, and transmissivity generally are low. Water wells penetrating the basement rock aquifer typically can be expected to yield several gallons per minute.

2.3.2.2. GROUNDWATER CONDITIONS

Groundwater elevations in the unconsolidated SVRP Aquifer underlying the site typically are highest in late spring months and decrease to their lowest elevations in late summer and fall. Spring increases in groundwater elevation typically result from snowmelt and associated groundwater recharge in upgradient recharge areas. Historic water level data, as well as sediment composition, suggest that groundwater beneath the site is in hydraulic connection with the Spokane River and groundwater levels are primarily controlled by river stage. As a result, groundwater elevations measured in site wells have fluctuated seasonally more than 16 feet in conjunction with river stage. Depth to groundwater, as measured in groundwater monitoring wells located on the higher elevation Holcim portion of the site, has ranged from about 43 to 74 feet below ground surface (bgs). Depth to groundwater, as measured in groundwater monitoring wells located in the lower elevation portions of the site (City and Neighborhood, Inc. properties), has ranged from about 10 to 32 feet bgs.

The interpreted groundwater flow direction beneath the site is complex and reflects the site's location on the inside of a meander within a losing portion of the Spokane River. As a result, site groundwater flow typically is directed away from the Spokane River. Groundwater generally flows to the west-northwest in the east portion of the site; to the south-southeast in the central portion of the site; and to the southwest in the west portion of the site. Although shallow groundwater elevations vary seasonally beneath the site, the distribution in hydraulic gradient and the interpreted groundwater flow regime remains generally consistent throughout the year. See Groundwater Elevations and Inferred Flow Directions, August 28, 2012, Figure 4 for a depiction of the interpreted groundwater flow beneath the site.

2.4. Current and Likely Future Land Use

The Holcim property currently is vacant and fenced. The City property is parkland and used for recreational purposes; the portion of the City property on the site is fenced. The Centennial Trail is located along the river and there are several access points for recreational river users (primarily kayakers) in the vicinity of Myrtle Point. The Neighborhood, Inc. property is residential, and properties south of the Holcim property are commercial or industrial in nature. Site use on properties surrounding the Holcim property is unlikely to change. The Holcim property and adjacent properties to the west and south currently are zoned Mixed Use Center, and the City property currently is zoned Parks Open Space according to the City of Spokane Valley.

Surface conditions at the Holcim property primarily consist of vegetated areas, concrete pavement, and small areas of unvegetated soil. Much of the Holcim property is vegetated with grasses and native plants; with a few small trees in the eastern and southwestern portions of the property. Unvegetated soil is located in areas where CKD is present at the ground surface, generally near the center of the property. The southern portion of the Holcim property is partially paved.

An abandoned rail spur is located in the center of the Holcim property; the spur arcs east-west directly south of the CKD deposit and north of the paved areas. The rail line has been dismantled in the west portion of the Holcim property, although several wood railroad ties remain. Remnants of an elevated rail spur and associated berm, including used wood railroad ties, are located in the south-southwest portion of the Holcim property. The elevated rail spur berm includes demolition debris (concrete), bricks, rubble, and other building materials.

The Holcim property currently is surrounded by a chain-link fence, except for the extreme western portion of the property: a narrow strip of land that formerly was a continuation of the rail spur.

3.0 SUMMARY OF SITE CONDITIONS

This section provides a summary of site assessment and remedial investigation results, the contaminants of concern (COC), exposure pathways and receptors, and locations and media requiring cleanup action evaluation.

3.1. Summary of Site Assessment and Remedial Investigation Activities

Environmental site characterization activities have been conducted at the site since 2007. Initial assessment activities at the Holcim property in April and May 2007 and on the City property in November 2007. Site assessment and limited soil excavation activities were conducted in November 2007 in the southwest portion of the Holcim site and on the adjacent Spokane County property. Subsequent assessment activities were conducted on the City property in 2008. Quarterly groundwater monitoring has been performed at the site since 2007 and a CKD pilot test was conducted at the site in 2010. In 2012 and 2013, RI activities were conducted on the Holcim, City, and Neighborhood, Inc. properties, and along the north bank of the Spokane River.

In 2007, site investigation activities were initiated to assess site conditions; 71 subsurface explorations at the site were part of the initial investigation and included direct-push borings, sonic borings, test pits, and hand-auger borings. Groundwater monitoring wells (MW-1 through MW-4) were installed in four borings. Thirty-eight (38) explorations were located on the Holcim property and 33 were located on the City property. The initial investigation also included surface debris sample collection, conducting three groundwater monitoring/sampling events, and conducting two surface water sampling events. Results of the investigation revealed the presence of two CKD deposits with a collective volume estimated (at that time) to be about 165,000 cubic yards. Geochemical analyses of past soil samples demonstrated that some areas beneath and adjacent to the CKD deposits contained arsenic, cadmium, and lead at concentrations greater than the MTCA Method A unrestricted land use cleanup criteria. Several CKD samples contained pH levels higher than 12.5, which could characterize some of the CKD deposits as dangerous waste based on the corrosivity characteristic. Results of the initial site assessment are provided in *Site Assessment Report* (GeoEngineers, March 21, 2008).

In November 2007, approximately 300 cubic yards of arsenic-contaminated soil was removed from the southwest portion of the Holcim property to facilitation installation of a sanitary sewer utility. Assessment activities conducted in May and June 2007 were utilized to characterize the soil for disposal and guide the excavation activities and procedures. Results of these activities are listed in Appendix C of the aforementioned *Site Assessment Report*.

In 2008, a supplemental site characterization investigation was conducted on the City property. Soil samples were collected from four borings drilled outside of the City CKD deposit and submitted for laboratory analysis. Groundwater monitoring wells (MW-5 through MW-8) were installed in the borings. Investigation results are provided in *Groundwater Well Installation and Monitoring report, May 2008 to August 2008* (GeoEngineers, November 6, 2008).

Holcim collaborated with Waste Management, Inc. to perform a pilot test on CKD samples collected from the site (City and Holcim properties) to assess the viability of using site CKD as a means to stabilize metals-contaminated soil at their Chemical Waste landfill in Arlington, Oregon. The test revealed the CKD could not be used as stabilizing agent, primarily because the large CKD particle size could not be mixed thoroughly within the soil matrix and the CKD soil did not consistently maintain the high pH necessary to stabilize metals-contaminated soil when subjected to the US Environmental Protection Agency's (EPA) Toxic Characteristic Leaching Procedure extraction Method 1311. Results of the pilot test are included in *Pilot Test Results* (GeoEngineers, November 22, 2010).

RI activities were conducted at the site in 2012 and 2013. The primary purpose of the RI activities was to: further identify the lateral and vertical extent of contamination in areas where that was not adequately defined; further refine and estimate the volume of CKD deposits; assess subsurface conditions with respect to contaminant and CKD distribution in soil and groundwater; and install two additional groundwater monitoring wells in the downgradient portion of the site. A total of 51 soil probes, 2 soil borings, 2 groundwater monitoring wells, and 2 hand-auger borings were used to assess subsurface conditions. Additionally, three groundwater monitoring events were conducted. Results of the RI activities are included in *Remedial Investigation Report*, (GeoEngineers, April 29, 2013).

Groundwater and surface water monitoring activities have been conducted on a generally quarterly basis since May 2007; results are documented in numerous groundwater monitoring reports. In summary, groundwater samples collected from most of the site wells during these events have not contained detectable concentrations of cadmium or lead. However, samples from a few wells have contained arsenic concentrations greater than MTCA Method A cleanup levels, MW-2 typically, MW-3 rarely, MW-4 occasionally, and MW-8 rarely. During the monitoring event in November 2012, which was the second event that included downgradient monitoring wells (MW-9 and MW-10), total and dissolved arsenic concentrations in wells MW-9 and MW-10 were less than MTCA Method A cleanup levels.

Samples collected from the Spokane River both upstream and downstream of the site consistently contained background lead concentrations, occasionally contained detectable arsenic concentrations and did not contain detectable cadmium concentrations. Levels of groundwater and surface water pH typically range between 6.0 and 8.0, although pH levels exceeding 9.0 were observed in May 2008 in wells MW-1 and MW-2 and in July 2008 in wells MW-2 and MW-3.

3.2. Contaminants of Concern

The primary COC include metals (arsenic, cadmium, and lead) associated with the CKD and soil mixed with CKD on the City and Holcim properties. In this FS, this source is referred to as "CKD". Although not listed as a contaminant in MTCA, the corrosive characteristics of some CKD (high pH) would designate portions of the CKD as a Washington State dangerous waste (WAC 173-303-090(6)). Other areas of the site contained smaller pockets of contaminants which were not associated with CKD deposits based on visual observations of pH levels of the soil; in this FS, these areas are referred to as Areas C and D on the Holcim and Neighborhood Inc. properties, respectively. These COC include arsenic, cadmium, lead, gasoline-range petroleum hydrocarbons (GRPH), benzene, and carcinogenic polycyclic aromatic hydrocarbons (cPAH).

Some samples from some groundwater monitoring wells at the site have contained arsenic concentrations greater than MTCA Method A cleanup criteria. Currently, there are no known active groundwater supply wells at the site; therefore, there is no current use of groundwater beneath the site. Numerous resource protection wells are maintained at the site for the purpose of monitoring groundwater conditions underlying the site. A well owned and operated by the Irvin Water District is located south (crossgradient) of the site. Arsenic appears to be the only COC in groundwater.

Surface water does not appear to be impacted by site contaminants. The CKD deposits, particularly the deposit on City property, which are exposed at the surface, could create an exposure to wind-borne dust.

In summary, the COC for soil include arsenic, cadmium, lead, GRPH, benzene, and cPAH; and the COC for groundwater is limited to arsenic.

3.3. Exposure Pathways and Receptors

The CKD deposits on the Holcim and City properties are exposed in some places at the surface, which could result in transport via stormwater runoff and wind-borne dust. Isolated pockets of CKD on the Neighborhood Inc. property are located beneath the ground surface; therefore, transport via stormwater runoff or wind-borne dust is unlikely. Direct contact exposure with CKD is also possible, with exposure to humans and burrowing animals.

Contaminants might also be leached and/or transported to the water table from the CKD deposit on the City property during seasonal periods of high groundwater elevations when groundwater is in contact with the CKD deposit (typically late spring). Contaminant migration to groundwater from the CKD deposit on the Holcim property is unlikely based on data from prior assessment activities and the RI. Elevations at the base of the CKD deposit on the Holcim property ranged from about 20 to 50 feet higher than groundwater elevations; metals concentrations and pH levels typically decreased to background conditions about 2 to 3 feet below the base of the CKD deposit.

Some non-CKD areas were impacted with petroleum hydrocarbons, benzene, cPAH, and arsenic, which were typically identified in shallow soil. COC in these areas also could be transported via stormwater runoff and wind-borne dust. Direct contact with COC is also possible, with exposure to humans and burrowing animals. It is unlikely that COC in non-CKD areas will leach to groundwater based on the overall low concentrations and distance to groundwater.

Direct (human) contact with contaminated groundwater is possible, but no drinking water sources were identified within about ½-mile downgradient of the site.

Potential exposure pathways related to soil, groundwater, and surface water are discussed below; further, exposure pathways deemed to be incomplete were not considered further in this FS. The following potential exposure pathways and receptors include:

- Ecological
    - Direct contact with contaminated CKD/soil, groundwater, and surface water – small mammals, birds, fish, other aquatic species, soil biota, plants.

- Ingestion of contaminated CKD/soil and surface water – small mammals, birds, fish, other aquatic species.
- Ingestion of plants or fauna that have ingested or absorbed contaminants from the site – predatory small mammals, birds, fish, other aquatic species.

- Human
  - Dermal contact with contaminated CKD/soil during excavation work – on-site workers;
  - Dermal contact with contaminated CKD/soil – adjacent off-site workers, trespassers, recreational users, and adjacent residents;
  - Dermal contact with contaminated groundwater removed from on-site monitoring wells – on-site workers;
  - Dermal contact with and inhalation of contaminated windblown dust during excavation work– on-site workers, adjacent off-site workers, trespassers, recreational users, and adjacent residents; and
  - Dermal contact with contaminated surface water runoff – on-site workers, adjacent off-site workers, recreational users, and adjacent residents.

3.4. Locations and Media Requiring Cleanup Action Evaluation

This section identifies the locations and environmental media (soil and groundwater) at the site that require evaluations. Based on the results of the RI, the following areas are evaluated in the FS: (1) CKD deposit on Holcim property for arsenic, cadmium, and lead; (2) CKD deposit on City property for arsenic, cadmium, and lead; (3) shallow soil in southeast portion of the site (near explorations G-1, DP-44, and DP-70) for gasoline-range petroleum hydrocarbons, benzene, lead, and cPAH; (4) shallow soil in south and southeast portion of the site for arsenic and benzene; (5) isolated areas of soil on the Neighborhood, Inc. property for arsenic, cadmium, and lead; (6) soil with pH levels greater than 12.5; (7) areas near monitoring wells MW-4, MW-7, MW-8, and MW-10; and (8) groundwater beneath the site for arsenic.

Note that soil with pH levels greater than 12.5 (item #6 above) was limited to and confined within the CKD deposits on the Holcim and City properties (items #1 and #2 above); therefore, it is not specifically listed in the table below.

Soil samples collected during the drilling of wells MW-4, MW-7, MW-8, and MW-10 each contained arsenic concentrations greater than MTCA Method A cleanup criteria (ranging from about 20 to 67 milligrams per kilogram [mg/kg]). Arsenic concentrations in samples collected from MW-7 and MW-8 were slightly greater than the MTCA Method A cleanup criteria of 20 mg/kg from soil samples collected from about 13 feet below grade (both concentrations were less than 21 mg/kg). These detections were not associated with CKD and might be considered de minimis. However, they are included as areas requiring cleanup based on exceedence of cleanup levels. The arsenic detections in wells MW-4 and MW-10 were about 29 and 67 mg/kg; both were collected at depths between 3 and 5 feet below grade.

Locations for the areas with COC listed in this section and in the table below are shown on Areas Requiring Cleanup Evaluation, Figure 5.

Location	COCs	Approximate Depth (feet)	Media (Soil – Estimated Volume, Groundwater – Estimated Area)	Description
CKD Deposit on Holcim Property – Referred to as Area A	Arsenic, cadmium, lead	0 to 25 ft	Soil; approximately 109,000 cy and 250,900 sf	Large CKD area that is partially exposed at surface. Base of CKD is at least 30 feet above groundwater. A portion of CKD has pH >12.5, which would designate as state DW if removed from the site.
CKD Deposit on City Property – Referred to as Area B	Arsenic, cadmium, lead	0 to 10 ft	Soil; approximately 12,300 cy and 40,400 sf	CKD area that is fully exposed at surface. Base of CKD often is in contact with groundwater during spring months. Large portion of CKD has pH >12.5, which would designate as DW if removed from the site.
Southeast Portion of Site – Referred to as Area C	Gasoline-range petroleum hydrocarbons, benzene, lead, cPAH	0 to 3 ft: 2 ft deep at DP-44, DP-70 and G-1; 3 ft deep at DP-42	Soil; approximately 104 cy and 1,260 sf	Isolated areas of shallow contaminated soil near borings DP-42, DP-44, DP-70, and G-1. Assumes each area is 314 sf (20-foot diameter)
South Portion of Site – also Referred to as Area C	Arsenic, benzene	0 to 10 ft: 2 ft deep at DP-57; 3 ft deep at DP-59; 5 ft deep at DP-25, DP-66, and DP-67; and 10 ft deep at DP-60	Soil; approximately 1,175 cy and 6,340 sf	Isolated areas of shallow contaminated soil near borings DP-25, DP-57, DP-59, DP-60, DP-66, and DP-67. Assumes three areas of 314 sf (20-foot diameter) and one area of 5,400 sf
Isolated Metals on Neighborhood Inc. Property – Referred to as Area D	Arsenic, cadmium, lead	0 to 15 feet: 8 ft deep in area near MW-9 and DP-84; and 15 ft deep at DP-82	Soil; approximately 2,300 cy and 7,500 sf	Shallow contaminated soil near borings MW-9 and DP-84 (7,200 sf) and DP-82 (314 sf – assumes 20-foot diameter)
Metals on Holcim Property near wells MW-4, MW-7, MW-8, and MW-10.	Arsenic	About 13 feet deep near MW-7 and MW-8; about 3 to 5 feet deep near MW-4 and MW-10	Soil; approximately 464 cy and 1,256 sf	Isolated areas of shallow contaminated soil near MW-4 and MW-10 (58 cy each) and near MW-7 and MW-8 (175 cy each)

Location	COCs	Approximate Depth (feet)	Media (Soil – Estimated Volume, Groundwater – Estimated Area)	Description
Groundwater Near Wells MW-2 and MW-9	Arsenic	About 70 ft deep at MW-2 and about 25 deep at MW-9	Water. Area not determined.	Groundwater quality impacted by arsenic; concentrations often are highest during spring months.

4.0 CLEANUP STANDARDS

Cleanup standards consist of: (1) cleanup levels that are protective of human health and the environment; and (2) the point of compliance at which the cleanup levels must be met. Under MTCA, final cleanup standards for the site will be established under the CAP, which will be prepared after completion of the FS. Preliminary cleanup standards presented in this section are adopted for the purpose of developing cleanup action objectives for the site.

Summary of Preliminary Cleanup Standards
Soil Cleanup standards based on MTCA Method A for unrestricted land use and standard MTCA point of compliance: ground surface to a depth of 15 feet. Soil cleanup standards also are based on protection of groundwater; therefore, the point of compliance is throughout the soil column from the ground surface to groundwater.
Groundwater Cleanup standards are based on MTCA Method A for protection of drinking water and the standard point of compliance will be all groundwater beneath the site from the top of the saturated zone to bedrock.

4.1. Cleanup Levels

Preliminary cleanup levels for the COC are summarized in the table below. Soil cleanup levels are based on MTCA Method A Soil Cleanup Levels [WAC 173-340-740] and Chapter 173-340 WAC Table 740-1 for unrestricted land use. Cleanup levels for unrestricted land use are applicable because (1) portions of the site currently are either residential or parkland; (2) the site does not meet the industrial criteria in WAC 173-340-745; (3) current zoning is for Mixed Use (which includes industrial but also other uses); and (4) the future use on the Holcim property might include non-industrial uses.

Cleanup levels for groundwater are based on drinking water protection. Preliminary groundwater cleanup levels were selected from MTCA Method A Cleanup Levels Groundwater WAC 173-340-720(3) and Chapter 173-340 WAC Table 720.1.

COC	Soil	Groundwater
Gasoline-Range Petroleum Hydrocarbons	100 mg/kg	Not a COC in groundwater
Benzene	0.03 mg/kg	Not a COC in groundwater
cPAHs	0.1 mg/kg	Not a COC in groundwater
Arsenic	20 mg/kg	5 µg/L

COC	Soil	Groundwater
Cadmium	2 mg/kg	Not a COC in groundwater
Lead	250 mg/kg	Not a COC in groundwater

4.2. Points of Compliance

Under MTCA, the point of compliance is the point or location on a site where cleanup levels must be attained. The points of compliance for the affected media will be approved by Ecology and presented in the CAP. However, it is necessary to identify points of compliance to evaluate the effectiveness of the cleanup action alternatives in the FS. This section describes the proposed points of compliance for soil and groundwater.

4.2.1. Soil

The standard point of compliance for soil cleanup levels to protect humans from direct contact will be throughout the soil column from the ground surface to 15 feet below ground surface, in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). The standard point of compliance for preliminary soil cleanup levels based on protection of groundwater shown in the table above will be throughout the soil column [WAC 173-340-740(6)(b)]. For cleanup actions that involve containment of hazardous substances, soil cleanup levels will typically not be met inside containment areas [WAC 173-340-740(6)(f)].

For potential terrestrial ecological exposures, MTCA regulations allow a conditional point of compliance to be established from the ground surface to 6 feet (the biologically active zone according to MTCA default assumptions), provided institutional controls are used to prevent excavation of deeper soil [WAC 173-340-7490(4)(a)]. Accordingly, in areas of the site where potential ecological exposures are a concern, and where appropriate institutional controls can be implemented, a conditional point of compliance for soil concentrations protective of terrestrial ecological receptors may be proposed throughout the soil column from the ground surface to 6 feet. For cleanup actions that involve containment of hazardous substances, soil cleanup levels will typically not be met inside containment area(s) [WAC 173-340-740(6)(f)].

4.2.2. Groundwater

The standard point of compliance for groundwater cleanup levels will be all groundwater beneath the site from the top of the saturated zone to the lowest depth which could be affected by the site {WAC 173-340-720(8)(b)}, which likely is bedrock.

5.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

This section identifies the remedial action objectives and the initial screening of remedial alternatives for the site. An evaluation of the alternatives is presented in “Section 6.0.”

5.1. Remedial Action Objectives

MTCA requires that cleanup actions meet the threshold requirements identified in WAC 173-340-360. According to this section of the code, the cleanup action shall:

- Protect human health and the environment - Each remedial alternative is assessed for its ability to protect present and future public health, safety, welfare, and the environment.
- Comply with cleanup standards – Proposed cleanup standards are identified in "Section 4.1." The MTCA cleanup regulation specifies that a cleanup action alternative that does not comply with cleanup standards is an "interim action" not a "cleanup action."
- Comply with applicable state and federal laws.
- Provide for compliance monitoring – The cleanup action must provide for monitoring to verify that the cleanup action remains effective over time.
- Use permanent solutions to the maximum extent practicable – Permanent solutions are those in which cleanup standards can be met without further action being required such as long-term monitoring and inspection or institutional controls.
- Provide for a reasonable restoration time frame – This refers to the estimate of time required to achieve cleanup standards or other performance standards.
- Consider public concerns – This FS of remedial alternatives will seek to address the potential technical and administrative concerns of state and local regulatory entities.

The primary remedial action objective (RAO) is to mitigate human exposure to soil and groundwater contaminants by dermal contact and ingestion. A secondary, although equally important, RAO is to prevent ecological receptors (plants and animals) from exposure to contaminants.

5.2. General Categories of Response Actions and Initial Screening

The general categories of response actions identified for the site include the following:

- No Action
- Institutional Controls
- Engineering Controls
- Off-site Disposal

Screening of Response Actions and Removal Alternatives, Table 1 presents a summary and comparison of the general categories of response action alternatives identified for the site. Response action alternatives that were retained after the initial screening process were evaluated for the threshold requirements identified in WAC 173-340-360.

5.2.1. No Action

The no action alternative does not achieve the remedial action objectives because it does not protect present and future public health, safety, and welfare, and the environment. Therefore, this remedial alternative is eliminated from further consideration.

5.2.2. Institutional Controls

Institutional controls involve the placement of access barriers such as fencing and barricades to motorized and non-motorized travel, as well as withdrawal or restrictions on development of affected lands from future use (i.e., deed restrictions). The primary purpose of these controls is to minimize

development and human activities on contaminated areas and provide protection to an implemented solution. The utilization of institutional controls does not, in itself, achieve the stated goals and objectives of the remedial action, but can protect the remedy that is implemented on site. The institutional controls alternative as a stand-alone alternative has been screened from further consideration, but the implementation of institutional controls in conjunction with other alternatives such as on-site containment or placement of a cover will be considered.

5.2.3. Engineering Controls

The engineering controls evaluated for this FS involve the use of containment technologies that serve as source control. These controls prevent or reduce the migration of contaminants off site via the erosion/wind pathways. The engineering controls do not affect the chemical composition of the contaminated materials nor do they reduce the toxicity of the materials. Engineering controls include such measures as capping, placement of a coarse permeable barrier (to eliminate access to contaminated soil from burrowing animals), placement of a low-permeability (geotextile) liner, and revegetation.

Cap and cover designs can vary in complexity from simple soil covers to multi-layered covers associated with Resource Conservation and Recovery Act (RCRA) caps. RCRA cap performance standards are addressed in RCRA landfill closure regulations and are overly stringent for this site, because the location or contaminant characteristics do not warrant the increased expenditures associated with multi-layered capping specifications. Additionally, the projected future land use can be considered during the selection of containment cap specifications.

Placement of a low-permeability liner would reduce the infiltration of precipitation through contaminated material; although, empirical data from site assessment activities indicates that contaminants likely are not leaching from CKD through the infiltration pathway. A liner can also be placed to mark the boundary between contaminated material and placement of clean fill for a cap. A liner also might be less expensive than a coarse permeable layer depending on design considerations and material costs at the time of construction.

Revegetation activities involve promoting plant growth, performing grading activities, and additional soil amendments and nutrients to facilitate vegetative growth. Revegetation should include species native to the area and consist of a variety of grasses and forbs. If necessary, some type of watering system would be provided. The establishment of vegetative covers reduces the infiltration of moisture into and through the contaminated soils through the natural evapotranspiration associated with plant growth processes. Typically, plants selected for inclusion in revegetation processes are comprised of plant types and communities that can establish in contaminated soil.

The use of engineering controls is retained as a stand-alone remedial alternative and in conjunction with other alternatives.

5.2.4. Off-Site Disposal

Off-site disposal options include excavation, treatment, and transport of contaminated soil to an engineered, permitted landfill or excavation and transport of contaminated soil to engineered, permitted landfill that accepts dangerous waste (specifically dangerous waste only carrying the code WSC2 for solids with a pH greater than 12.5). Off-site disposal options include transporting treated

hazardous waste to the Airway Heights Landfill in Medical Lake, Washington, (20 miles from site) which is a Subtitle D facility or transporting non-treated dangerous waste to the a landfill in Arlington, Oregon, (225 miles from site) which is approved to accept WSC2 Washington State dangerous waste.

5.3. Description of Remedial Alternatives

Based on the initial screening, five remedial alternatives were developed. Summary of Quantities Used in Feasibility Study, Table 2 presents a summary of quantities used in the FS to evaluate each alternative. The five comprehensive remedial alternatives provide an appropriate range of permanent cleanup actions for contaminated soil at the site (refer to Comparison of Remediation Options, Table 3). The proposed alternatives are:

- Alternative 1: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B), transport to and dispose at an approved Subtitle D facility in Arlington, Oregon. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transport to and dispose at a Subtitle D facility in Medical Lake, Washington. Backfill excavated areas on the City and Neighborhood, Inc. properties.
- Alternative 2: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B) and chemically stabilize on site (lower the pH) such that it does not designate as dangerous waste. Excavate contaminated soil from Holcim and Neighborhood, Inc. properties (Areas C and D). Transport stabilized CKD and contaminated soil to a Subtitle D facility in Medical Lake, Washington for disposal. Backfill excavated areas on the City and Neighborhood, Inc. properties.
- Alternative 3: Cover (cap) Holcim and City property CKD (Areas A and B) and contaminated soil on Holcim and Neighborhood, Inc. properties (Areas C and D) with clean fill material, and implement restrictive covenants on the deeds.
- Alternative 4: Excavate City property CKD (Area B), place on Holcim CKD area (Area A), and cover (cap) combined CKD on Holcim property with clean fill material. Excavate contaminated soil from the Holcim and Neighborhood Inc. properties (Areas C and D) and transport to a Subtitle D facility in Medical Lake, Washington for disposal. Backfill excavated areas on the City and Neighborhood, Inc. properties. Implement a restrictive covenant on the deed for the Holcim property.
- Alternative 5: Excavate City property CKD (Area B) and contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D), place on Holcim CKD area (Area A), and cover Holcim CKD area with clean fill material. Backfill excavated areas on the City and Neighborhood, Inc. properties. Implement a restrictive covenant on the deed for the Holcim property.

Alternatives 1, 2, 4 and 5 are evaluated with options for no backfilling and backfilling of excavations on the Holcim property. Alternatives 1, 2, 4, and 5 also assume that 6 inches of topsoil will be place on top of backfill or cap at the City property.

5.3.1. Alternative 1 – Excavate Holcim And City Property CKD And Transport To an Approved Subtitle D Facility In Arlington, Oregon; And Excavate Holcim And Neighborhood Inc. Contaminated Soil And Transport To Subtitle D Facility In Medical Lake, Washington

Comprehensive removal and off-site disposal of CKD is the most effective remedial alternative for managing risk and provides the highest level of protection by removing the source material. The cost

of this action is about $11, 200,000. The estimated volume and weight of CKD fill at the two properties are as follows (assumes 1.1 tons/cy):

- Holcim property: 109,000 cubic yards (119,900 tons).
- City property: 12,300 cubic yards (13,530 tons).
- Combined properties: 121,300 cubic yards (133,430 tons).

The estimated volume of non-CKD contaminated soil at the Holcim and Neighborhood Inc. properties is 3,580 cubic yards (6,086 tons based on 1.7 tons/cy).

Excavated areas are backfilled with non-contaminated fill material (optional for Holcim property). Excavated area on City property is also covered with 6 inches of topsoil and hydroseeded.

This alternative provides for protection of human health and the environment as a permanent cleanup action. Areas where CKD and non-CKD contaminated soil is removed can be redeveloped without deed restrictions.

5.3.2. Alternative 2 – Excavate Holcim And City Property CKD And Chemically Stabilize; Excavate Holcim And Neighborhood Inc. Contaminated Soil; And Transport Excavated Material To Subtitle D Facility In Medical Lake, Washington

This remedial alternative provides a high level of protection to human health and the environment by chemically stabilizing the contaminated soil prior to removing. Although the permanence of a comprehensive soil stabilization and removal with off-site disposal is high. The estimated cost is about $9,800,000.

Excavated areas are backfilled with non-contaminated fill material (optional for Holcim property). Excavated area on City property is also covered with 6 inches of topsoil and hydroseeded.

This alternative provides for protection of human health and the environment as a permanent cleanup action. Areas where CKD and non-CKD contaminated soil is removed can be redeveloped without deed restrictions.

5.3.3. Alternative 3 – Cover Holcim And City Property CKD; Cover Holcim And Neighborhood Inc. Contaminated Soil; And Implement A Restrictive Covenant On The Deeds

This alternative provides source control using an engineered cap. CKD and non-CKD contaminated soil on the Holcim, City and Neighborhood Inc. properties is covered with approximately 1 foot of imported, non-contaminated fill material (including about 8 inches of 4-inch minus quarry spalls and 4 inches of gravel) and 6 inches of hydroseeded topsoil.

This alternative provides for protection of human health and the environment as an engineered cleanup action. A restrictive covenant is placed on the deed for the properties and long term compliance monitoring is implemented. The cost for Alternative 3 is about $1,600,000.

5.3.4. Alternative 4 – Excavate CKD On City Property And Place On Holcim Property With Holcim CKD; Cover CKD On Holcim Property; Excavate Holcim And Neighborhood Inc. Contaminated Soil And

Transport To Subtitle D Facility; And Implement A Restrictive Covenant On The Deed For The Holcim Property

This remedial alternative provides a higher level of protection to human health and the environment than Alternative 3 and provides the highest level of protection for the City and Neighborhood Inc. properties and the areas on the Holcim property outside the CKD area. This alternative provides source control using an engineered cap. The combined City and Holcim CKD are consolidated on the Holcim property and covered with approximately 1 foot of imported, non-contaminated fill material (including about 8 inches of 4-inch minus quarry spalls and 4 inches of gravel) and 6 inches of hydroseeded topsoil.

This alternative provides for protection of human health and the environment as a permanent cleanup action for City and Neighborhood Inc. properties and the areas on the Holcim property outside the CKD area, and an engineered cleanup action for the CKD area on the Holcim property. A restrictive covenant is placed on the deed for the Holcim property and long term compliance monitoring is implemented. Areas where CKD and contaminated soil are removed can be redeveloped without deed restrictions. The cost for this alternative is about $2,200,000.

5.3.5. Alternative 5 – Excavate CKD On City Property And Holcim And Neighborhood Inc. Contaminated Soil And Place On Holcim Property With Holcim CKD; Cover CKD On Holcim Property; And Implement A Restrictive Covenant On The Deed For The Holcim Property

This remedial alternative provides a slightly lower level of protection to human health and the environment than Alternative 4 and continues to provide the highest level of protection for the City and Neighborhood Inc. properties and the areas on the Holcim property outside the CKD area. This alternative provides source control using an engineered cap. CKD and contaminated soil are consolidated on the Holcim property and covered with approximately 1 foot of imported, non-contaminated fill material (including about 8 inches of 4-inch minus quarry spalls) and 6 inches of hydroseeded topsoil.

This alternative provides for protection of human health and the environment as a permanent cleanup action for City and Neighborhood Inc. properties and the areas on the Holcim property outside the CKD area, and an engineered cleanup action for the CKD area on the Holcim property. A restrictive covenant is placed on the deed for the Holcim property and long term compliance monitoring is implemented. Areas where CKD and contaminated soil are removed can be redeveloped without deed restrictions. This alternative is estimated to cost about $2,000,000.

6.0 EVALUATION CRITERIA

This section presents a description of the threshold requirements for cleanup actions under MTCA and the additional criteria used in this FS to evaluate the cleanup action alternatives.

6.1. Threshold Requirements

Cleanup actions performed under MTCA must comply with several basic requirements. Cleanup action alternatives that do not comply with these criteria are not considered suitable cleanup actions. As provided in WAC 173-340-360(2)(a), the four threshold requirements for cleanup actions must:

- Protect human health and the environment;
- Comply with cleanup standards (WAC 173-340-700 through -760);
- Comply with applicable state and federal laws (WAC 173-340-710); and
- Provide for compliance monitoring (WAC 173-340-410 and WAC 173-340-720 through -760).

6.1.1. Protection of Human Health and the Environment

The results of cleanup actions performed under MTCA must ensure that both human health and the environment are protected.

6.1.2. Compliance with Cleanup Standards

Compliance with cleanup standards requires, in part, that cleanup levels are met at the applicable points of compliance. If a remedial action does not comply with cleanup standards, the remedial action is an interim action, not a cleanup action. When a cleanup action involves containment of soils with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the cleanup action may be determined to comply with cleanup standards, provided the requirements specified in WAC 173-340-740(6)(f) are met.

Cleanup alternatives must also comply with applicable or relevant and appropriate requirements (ARARS) in accordance with WAC 173-340-710. An evaluation of the ARARs potentially applicable to each remedial alternative was completed and is summarized in Table 4. The remedial alternatives evaluated in this FS comply with the intent of these laws and statutes and are protective of human health and the environment.

6.1.3. Compliance with Applicable State and Federal Laws

Cleanup actions conducted under MTCA must comply with applicable state and federal laws. The term "applicable state and federal laws" includes legally applicable requirements and those requirements that Ecology determines to be relevant and appropriate as described in WAC 173-340-710.

6.1.4. Provision for Compliance Monitoring

The cleanup action must allow for compliance monitoring in accordance with WAC 173-340-410. Compliance monitoring consists of protection monitoring, performance monitoring and confirmational monitoring. Protection monitoring is conducted to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action. Performance monitoring is conducted to confirm that the cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards. Confirmational monitoring (groundwater and/or soil) is conducted to confirm the long-term effectiveness of the cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained.

6.2. Other MTCA Requirements

Under MTCA, when selecting from the alternatives that meet the minimum requirements described above, the alternatives shall be further evaluated against the following additional criteria:

Use permanent solutions to the maximum extent practicable [WAC 173-340-360(2)(b)(i)]. MTCA requires that when selecting from cleanup action alternatives that fulfill the threshold requirements, the selected action shall use permanent solutions to the maximum extent practicable [WAC 173-340-360(2)(b)(i)]. MTCA specifies that the permanence of these qualifying alternatives shall be evaluated by balancing the costs and benefits of each of the alternatives using a "disproportionate cost analysis" in accordance with WAC 173-340-360(3)(e). The criteria for conducting this analysis are described in Section 6.3 below.

Provide a reasonable restoration time frame [WAC 173-340-360(2)(b)(ii)]. In accordance with WAC 173-340-360(2)(b)(ii), MTCA places a preference on those cleanup action alternatives that, while equivalent in other respects, can be implemented in a shorter period of time. MTCA includes a summary of factors to be considered in evaluating whether a cleanup action provides for a reasonable restoration time frame [WAC 173-340-360(4)(b)].

Consideration of public concerns [WAC 173-340-360(2)(b)(iii)]. Ecology will consider public comments submitted during the FS process when making its preliminary selection of an appropriate cleanup action alternative. This preliminary selection is subject to further public review and comment when the proposed remedy is published in the draft CAP.

6.3. MTCA Disproportionate Cost Analysis

The MTCA disproportionate cost analysis (DCA) is used to evaluate which of the alternatives that meet the threshold requirements are permanent to the maximum extent practicable. This analysis involves comparing the costs and benefits of alternatives and selecting the alternative with incremental costs that are not disproportionate to the incremental benefits. The evaluation criteria for the disproportionate cost analysis are specified in WAC 173-340-360(2) and WAC 173-340-360(3), and include protectiveness, permanence, cost, long-term effectiveness, management of short-term risks, implementability and consideration of public concerns.

As outlined in WAC 173-340-360(3)(e), MTCA provides a methodology that uses the criteria below to determine whether the costs associated with each cleanup alternative are disproportionate relative to the incremental benefit of the alternative above the next lowest-cost alternative. The comparison of benefits relative to costs may be quantitative, but will often be qualitative. When possible for this FS, quantitative factors such as mass of contaminant removed or percentage of area of impacts remaining were compared to costs for the alternatives evaluated, but many of the benefits associated with the criteria described below were necessarily evaluated qualitatively. Costs are disproportionate to benefits if the incremental costs of the more permanent alternative exceed the incremental degree of benefits achieved by the other lower-cost alternative [WAC-173-340-360(e)(i)]. Where two or more alternatives are equal in benefits, Ecology selects the less costly alternative [WAC 173-340-360(e)(ii)(c)].

Each of the MTCA criteria used in the DCA is described below.

6.3.1. Protectiveness

The overall protectiveness of a cleanup action alternative is evaluated based on several factors. First, the extent to which human health and the environment are protected and the degree to which

overall risk at a site is reduced are considered. Both on-site and off-site risk reduction resulting from implementing the alternative are considered.

6.3.2. Permanence

MTCA specifies that when selecting a cleanup action alternative, preference shall be given to actions that are "permanent solutions to the maximum extent practicable." Evaluation criteria include the degree to which the alternative permanently reduces the toxicity, mobility or mass of hazardous substances; the effectiveness of the alternative in destroying the hazardous substances; the reduction or elimination of hazardous substance releases and sources of releases; the degree of irreversibility of waste treatment processes; and the characteristics and quantity of treatment residuals generated.

6.3.3. Cost

The analysis of cleanup action alternative costs under MTCA includes all costs associated with implementing an alternative including design, construction, long-term monitoring and institutional controls. Costs are intended to be comparable among different alternatives to assist in the overall analysis of relative costs and benefits of the alternatives. The costs to implement an alternative include the cost of construction, the net present value of any long-term costs and agency oversight costs. Long-term costs include operation and maintenance costs, monitoring costs, equipment replacement costs and the cost of maintaining institutional controls. Unit costs used to develop overall remediation costs for this FS were derived using a combination of published engineering reference manuals (i.e., R.S. Means); construction cost estimates solicited from applicable vendors and contractors; a review of actual costs incurred during similar applicable projects; and professional judgment.

6.3.4. Long-Term Effectiveness

Long-term effectiveness is a parameter that expresses the degree of certainty that the alternative will be successful in maintaining compliance with cleanup standards over the long-term performance of the cleanup action. The MTCA regulations contain a specific preference ranking for different types of technologies that will be considered as part of the comparative analysis. The ranking places the highest preference on technologies such as reuse/recycling, treatment, immobilization/solidification, and disposal in an engineered, lined, and monitored facility. Lower preference rankings are applied for technologies such as on-site isolation/containment with attendant engineered controls, and institutional controls and monitoring.

6.3.5. Management of Short-term Risks

Evaluation of this criterion considers the relative magnitude and complexity of actions required to maintain protection of human health and the environment during implementation of the cleanup action. Cleanup actions carry short-term risks such as potential mobilization of contaminants during construction or safety risks typical of large construction projects. Some short-term risks can be managed through best practices during project design and construction, while other risks are inherent to project alternatives and can offset the long-term benefits of an alternative.

6.3.6. Implementability

Implementability is an overall metric expressing the relative difficulty and uncertainty of implementing the cleanup action. Evaluation of implementability includes consideration of technical factors such as the availability of mature technologies and experienced contractors to accomplish the cleanup work. It also includes administrative factors associated with permitting and completing the cleanup.

6.3.7. Consideration of Public Concerns

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative addresses those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations that may have an interest in or knowledge of the site. In particular, public concerns for this site generally would be associated with environmental issues and cleanup action performance, which are addressed under other criteria such as protectiveness and permanence.

7.0 EVALUATION AND COMPARISON OF CLEANUP ALTERNATIVES

This section provides an evaluation and comparative analysis of cleanup action alternatives developed for the site. The alternatives are evaluated with respect to the MTCA evaluation criteria described in "Section 6.0" and then compared to each other relative to its expected performance under each criterion. The components of the five remedial alternatives are described above in "Section 5.3" and summarized in Table 3. Detailed evaluation of the alternatives is presented in Evaluation of Cleanup Action Alternatives, Table 5, and the results of the evaluation are summarized in Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives, Table 6.

In order to evaluate reasonableness of costs, planning level estimates were developed for each remedial alternative. While adequate for decision making purposes, final cost estimates will depend on the scope of the final remedial design. Please note that (1) the estimated costs for each alternative are considered to be within a margin of +/- 20 percent; (2) unit costs were derived from RS Means (2013) or from local vendors; (3) long-term monitoring and maintenance costs beyond 25 years are not included in the estimates; and (4) costs are based on 2013 dollars.

7.1. Threshold Requirements

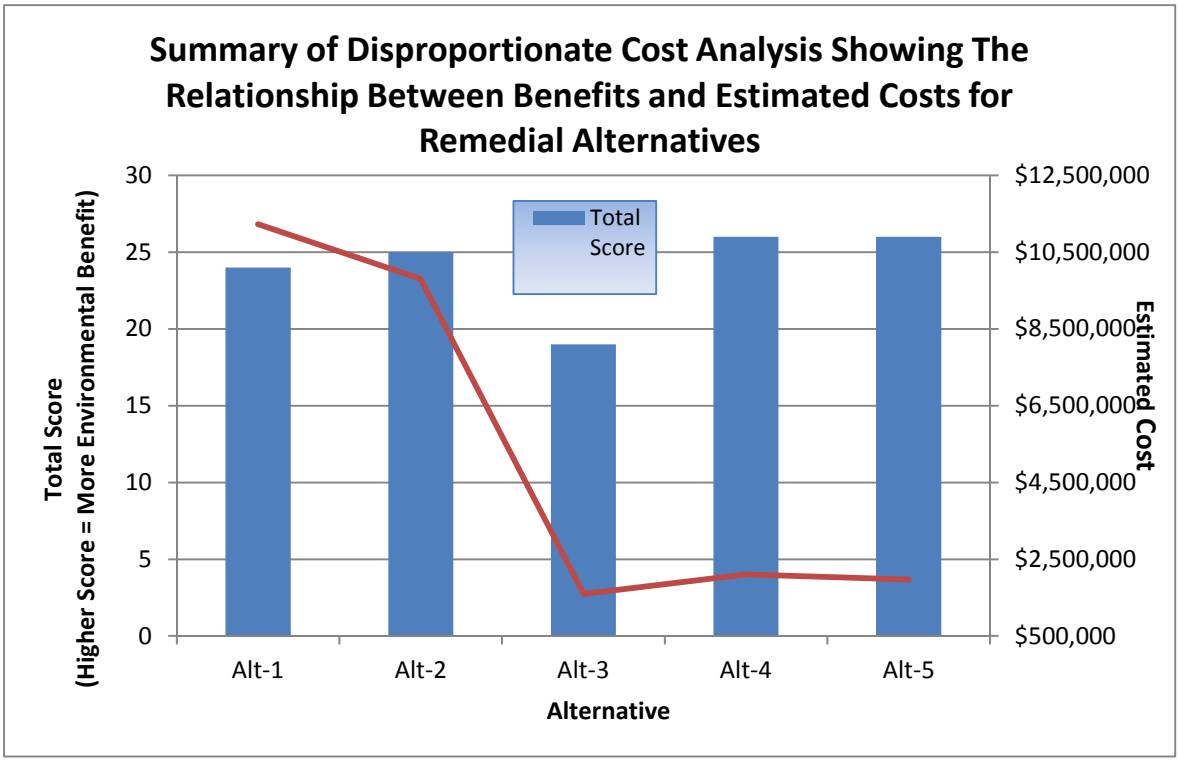
All five alternatives developed in this FS meet each of the four MTCA threshold requirements described for cleanup actions: protection of human health and the environment, compliance with cleanup standards, compliance with applicable state and federal regulations and provision for compliance monitoring.

Alternatives 1 and 2 use soil removal to the greatest extent, resulting in complete removal, to the extent feasible, of CKD exceeding cleanup levels throughout the site. Alternatives 1 and 2 are thus the most permanent solution and forms the baseline cleanup action alternative [WAC 173-340-350(8)(c)(ii)(A) and 173-340-360(3)(e)(ii)(B)].

Alternatives 4 and 5 are more permanent solutions than Alternative 3, because Alternatives 4 and 5 both include excavation of the CKD on the City and Neighborhood Inc. properties.

7.2. MTCA Disproportionate Cost Analysis

As discussed in "Section 6.3", the MTCA analysis of disproportionate costs is used to determine which cleanup alternative meets threshold requirements and is permanent to the maximum extent practicable. The remedial alternatives were evaluated based on the relative benefits ranking factors of the DCA. Using a numeric scoring scale of 1 (lowest) to 5 (highest) and the methodology described above in "Section 7.0" and in Table 5, each individual criterion is evaluated based on how it applies to each alternative. Table 6 presents the analysis of these results, including the summation of the resulting scores for each alternative and the determination of disproportionate cost. The conclusions of this evaluation are summarized in the following sections and the graph below.



7.3. Protectiveness

Remedial Alternatives 1 and 2 achieve the highest level of protectiveness as a result of achieving the maximum feasible removal of CKD and contaminated soil. Alternatives 3 through 5 achieve lower levels of protectiveness relative to Alternatives 1 and 2 because those three alternatives result in CKD remaining on site. Alternative 3 includes no removal of CKD or contaminated soil and Alternatives 4 and 5 include removal of City CKD and placement, and capping, on the Holcim CKD area. Alternatives 4 and 5 are more protective than Alternative 3 because removal of the City CKD from its current location is more protective of groundwater. Alternatives 1 and 2 are equally protective because contaminated material is permanently removed from the site. .

7.4. Permanence

Remedial Alternatives 1 and 2 achieve a high level of permanence by removing much of the mass of contamination that poses the greatest risk to human health and the environment and containment within a lined landfill. Alternatives 4 and 5 have a higher level of permanence than Alternative 3 based on removal of the City property CKD and the contaminated soil from their current locations. Alternative 2 is more permanent than Alternative 1 because Alternative 2 includes toxicity reduction.

7.5. Cost

For purposes of this evaluation, higher cost equates to lower scoring. Alternative 3 is the lowest cost alternative and therefore ranks highest. Alternative 1 is the highest cost alternative and therefore ranks lowest. The cost estimates for Remedial Alternatives 1 through 5 were developed as described in "Section 5.3" and are presented in Tables 7 through 11, respectively these include costs for 5 years of monitoring for Alternatives 1 and 2 and 25 years of monitoring for Alternatives 3 through 5. For cost comparison purposes, the costs presented below assume that excavations on the Holcim property will not be backfilled.

- Remedial Alternative 1 has an estimated cost of approximately $11,800,000.
- Remedial Alternative 2 has an estimated cost of approximately $9,800,000.
- Remedial Alternative 3 has an estimated cost of approximately $1,600,000.
- Remedial Alternative 4 has an estimated cost of approximately $2,200,000.
- Remedial Alternative 5 has an estimated cost of approximately $2,000,000.

7.6. Long-Term Effectiveness

Long-term effectiveness of the alternatives has relative rankings similar to those described above for the permanence category. The long-term effectiveness relies on using proven technologies to remove contaminant mass. Alternatives that rely completely (Alternative 3) or partially (Alternatives 4 and 5) on capping and/or institutional controls to protect human health and the environment have lower long-term effectiveness because of the need to monitor and the potential to revisit the cleanup action in the event of failure. Alternatives 1 and 2 rely on removal of the contaminant mass from the site to the greatest extent practicable and therefore achieve the highest level of long-term effectiveness; Alternative 2 is slightly more effective because the toxicity (high pH) is reduced.

7.7. Management of Short-Term Risks

Remedial Alternatives 1 and 2 have the highest short-term risks because of the large amounts of excavated material and length of the remedial action. Alternative 2 has more short-term risks than Alternative 1 because of the chemical stabilization process. Alternative 3 has the least short-term risks because no soil is disturbed. Alternatives 4 and 5 are similar in terms of short-term risk; they have a higher risk than Alternative 3 because soil is excavated, but less risk than Alternatives 1 and 2 because lesser amounts of soil are excavated.

7.8. Technical and Administrative Implementability

All five remedial alternatives are generally implementable using commonly available methods. Alternatives 1 and 2 rank as the least technically implementable because of the significant amount of materials and resources necessary to conduct those remedial actions. Alternative 3 is perhaps most technically implementable (a cap), but least administratively implementable because of the necessity of multiple deed restrictions. Alternatives 4 and 5 rate technically higher than Alternatives 1 and 2 because of the lesser amount of resources necessary to conduct the remedial action and rank administratively higher than Alternative 3 because only one deed restriction is necessary. All of the alternatives will require some form of minor, short-term disruption of normal activities, such as additional traffic or temporary closing of the Centennial Trail.

7.9. Consideration of Public Concerns

The remedial alternatives proposed for the site are generally expected to be acceptable to the public. Alternatives 1 and 2 are most acceptable because material is removed; these alternatives are ranked equally. Alternatives 4 and 5 are acceptable because contamination is contained on private property; these alternatives are ranked equal. Alternative 3 is the least acceptable because CKD remains in place on public property.

7.10. Reasonable Restoration Time Frame

The restoration time frame for all of the proposed Remedial Alternatives is expected to be on the order of one to three years. This time frame includes project design, permitting, contracting and construction. Alternatives 3, 4 and 5 require long-term cap monitoring.

8.0 RECOMMENDED REMEDIAL ACTION

Based on the Disproportionate Cost Analysis, remedial Alternative 5 is the preferred alternative. Alternatives 1 and 2 had the highest costs without a proportional increase in environmental benefits. Alternative 3 had the lowest costs, but was least protective. Alternatives 1 and 2 had the highest total environmental benefit scores (excluding costs); however, Alternatives 4 and 5 had the lower costs and provide a similar environmental benefit to the more expensive Alternatives 1 and 2. Alternative 5 has an equal benefit to Aternative 4, but a lower cost. In compliance with MTCA [WAC 173-340-360(3)(e)(ii)(c)], Alternative 5 should be the preferred remedial alternative.

9.0 REFERENCES

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GeoEngineers, 2011. Work Plan, Remedial Investigation/Feasibility Study. Holcim Inc. Site, Spokane Valley, Washington. November 18, 2011.

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State of Washington Department of Ecology, 2011. Agreed Order No. 8549. August 22, 2011.

TABLES

GeoEngineers

Table 1

Screening of Response Actions and Removal Alternatives

Holcim Inc. Site

Spokane Valley, Washington

General Response Action	Description	Screening Comments
No Action	No action	Current condition, no risk reduction.
Institutional Controls	Placement of access barriers, deed restriction	Does not accomplish remedial action objective as a stand-alone alternative. Will be used in conjunction with other alternatives.
Engineering Controls	Capping, revegetation	Minimizes human health and ecological risks, minimizes migration potential, long-term compliance monitoring required.
Off-Site Disposal	Excavation, stabilization and disposal at Subtitle D facility (CKD); excavation and disposal at Subtitle D facility (non-CKD)	Eliminates on-site risk, permanent solution, high cost.
	Excavation and disposal at an approved Subtitle D facility (CKD with a pH greater than 12.5 must be disposed at a facility approved to accept Washington State dangerous wastes carrying the code "WSC2")	Eliminates on-site risk, permanent solution, high cost.
	Excavation and recycling at Subtitle C facility (CKD used as a stabilizing agent); excavation and disposal at Subtitle D facility (non-CKD)	Eliminates on-site risk, permanent solution, high cost.

Notes:

Shading represents remedial actions eliminated from consideration

Table 2

Summary of Quantities Used in Feasibility Study

Holcim Inc. Site

Spokane Valley, Washington

Item	Quantity				Units[1]	Assumptions
	Holcim Property	City Property	Neighborhood Inc. Property	Site Totals (Holcim City, and Neighborhood Inc. Properties)		
CKD Areas (Holcim and City Properties Areas A and B)						
Areal extent of CKD	250,900	40,400	0	291,300	sf	Defined as soil that exceeds MTCA Method A unrestricted land use soil cleanup levels.
Volume of CKD (in-situ)	109,000	12,300	0	121,300	cy	Based on average of numerous engineering estimates and computer-generated volume calculations.
Mass of CKD (in-situ)	119,900	13,530	0	133,430	ton	Assumes 1.1 tons/cy based on geotechnical data.
Volume of backfill to replace excavated CKD (Alternatives 1 and 2)	109,000	12,300	0	121,300	cy	Equals amount removed.
Mass of backfill to replace excavated CKD (Alternatives 1 and 2)	185,300	20,910	0	206,210	ton	Assumes Holcim and City properties are backfilled. Alternative costs assume no backfill at Holcim property. Backfill material assumed to be 1.7 tons/cy.
Volume of gravel/quarry spall caps over CKD areas (Alternatives 3 through 5)[1]	9,293	1,496	0	10,789	cy	Volume of a 1-foot gravel/quarry spall cap above CKD areas.
Mass of gravel/quarry spall caps over CKD areas (Alternatives 3 through 5)	18,585	2,993	0	21,578	ton	Mass of gravel/quarry spall cap above CKD areas. Assumes 2 tons/cy.
Volume of topsoil cover over CKD areas (Alternatives 1-5 for City property and Alternatives 3-5 for Holcim property)	4,646	748	0	5,394	cy	Volume of a 0.5-foot topsoil cover above areal extent of contaminated soil.
Mass of topsoil cover over CKD areas (Alternatives 1-5 for City property and Alternatives 3-5 for Holcim property)	5,576	898	0	6,473	ton	Assumes 1.2 ton/cubic yard for imported material.
Other Contaminated Soil Areas (Holcim and Neighborhood Inc. Properties Areas C and D)						
Areal extent of contaminated soil	7,600	0	7,500	15,100	sf	Defined as soil that exceeds MTCA Method A unrestricted land use soil cleanup levels.
Volume of contaminated soil (in-situ)	1,279	0	2,300	3,579	cy	Contamination depth varies.

Item	Quantity				Units[1]	Assumptions
	Holcim Property	City Property	Neighborhood Inc. Property	Site Totals (Holcim City, and Neighborhood Inc. Properties)		
Mass of contaminated soil (in-situ)	2,174	0	3,910	6,084	ton	Assumes 1.7 ton/cy; typical for in-place Valley soil.
Volume of select backfill to replace excavated soil (Alternatives 1, 2, 4, 5)	1279	0	2300	3,579	cy	Equals amount removed.
Mass of select backfill to replace excavated soil (Alternatives 1, 2, 4, 5)	2174	0	3910	6,084	ton	Backfill material assumed to be 1.7 tons/cy
Volume of gravel/quarry spall cap (Alternative 3)[1]	281	0	278	559	cy	Volume of a 1-foot gravel /quarry spall cap above contaminated soil
Mass of gravel cap (Alternative 3)	422	0	417	839	ton	Mass of cap above contaminated soil. Assumes 2 tons/cy
Volume of topsoil cover (Alternative 3)	141	0	139	280	cy	Volume of a 0.5-foot topsoil cover above areal extent of contaminated soil.
Mass of topsoil cover (Alternative 3)	169	0	167	336	ton	Assumes 1.2 ton/cubic yard for imported material.
Erosion Control						
Length for erosion control	2,920	1,500		4,420	ft	Perimeter of area containing contaminated soil.

Notes

[1]For the purposes of the FS, it is assumed that vegetated caps will consist of a gravel and quarry spall barrier (to prevent burrowing animals from contacting contaminated materials) beneath hydroseeded topsoil. Alternatively, cobbles or a low-permeability liner could be installed to serve the same function. These options should be considered during the design to determine which is the less expensive option.

Table 3

Comparison of Remediation Options

Holcim Inc. Site

Spokane Valley, Washington

Remedial Method	Conceptual Description	Benefits	Limitations	Relative Cost	Construction Feasibility	Duration of O&M	Impacts to Future Development, Adjacent Land Uses	Recommended for Further Consideration
Remedial Alternatives Eliminated from Further Consideration								
No Action	No change to existing conditions.	Low cost.	Provides no active source control or waste volume reduction. Does not address downwind migration of contaminants. Does not address community Unlikely to provide restoration.	Low	Easy	Very long (greater than 20 years)	High. Site will be generally unusable, potential for wind-blown migration of contaminants to adjacent land.	**NO** - Does not meet MTCA requirements for cleanup
Institutional Controls (as a stand-alone alternative)	Institutional controls, including a restrictive covenant and fencing, would be established for the remedial area to mitigate dermal contact exposure to metals-contaminated soil and restrict groundwater removal from the site. In this scenario, there would be no active remedial measures.	Non-invasive and relatively low cost. Provides some control on potential exposure to contaminated media.	Provides no active source control or waste volume reduction. Does not address downwind migration of contaminants. Unlikely to provide restoration.	Low	Easy	Very long (greater than 20 years)	High. Site will be generally unusable, potential for wind-blown migration of contaminants to adjacent land.	**NO** - Lowest MTCA preference, doesn't treat source or create barrier
Remedial Alternatives Retained for Further Evaluation								
Alternative 1: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B), transport and dispose at an approved Subtitle D facility. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transport to a Subtitle D facility.	Excavate Holcim and City CKD (Areas A and B) and transfer via truck to an approved Subtitle D facility (Arlington, Oregon). Soil will be profiled in batches for appropriate disposal. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transfer via truck to a Subtitle D facility (Spokane, Washington). Backfill and hydroseed City property. Backfill Neighborhood Inc. property. Holcim property backfill optional. Groundwater monitoring for 5 years.	**Excavation:** Permanent cleanup option with little to no long-term on-site liability. Batch testing will minimize volume of soil to be disposed as hazardous waste. No restrictive covenant.	Resource intensive. Expensive. Lengthy.	High	Moderate	Short (5 years)	Low	**YES** - High MTCA Preference
Alternative 2: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B), and stabilize (lower pH). Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D). Transport excavated material to a Subtitle D facility.	Excavate Holcim and City CKD (Areas A and B) and chemically stabilize on site such that it does not classify as dangerous waste. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D). Transport via truck for disposal at a Subtitle D facility. Backfill and hydroseed City property. Backfill Neighborhood Inc. property. Holcim property backfill optional. Groundwater monitoring for 5 years.	**Excavation:** Permanent cleanup option with little to no long-term on-site liability. Treating soil will eliminate need to dispose soil as hazardous waste. No restrictive covenant.	Resource intensive. Expensive. Lengthy because CKD is consolidated and hardened; crushing likely would be necessary as part of treatment. Treatability study will be required to document effectiveness. Treatability area footprint. Treatability process will be slow compared to other alternatives.	High	Difficult	Short (5 years)	Low	**Yes** - High MTCA Preference, However, Very Difficult to Implement
Alternative 3: Cover (cap) CKD on Holcim and City properties (Areas A and B) and contaminated soil on Holcim and Neighborhood Inc. properties (Areas C and D) on site with clean fill material. Implement a restrictive covenant.	Place an vegetated cap over the Holcim and City CKD (Areas A and B) and contaminated soil on Holcim and Neighborhood Inc. properties (Areas C and D). Restoration includes reseeding the cap. Restrictive covenant would be placed on deeds. Groundwater and cap monitoring for 25 years.	**Capping:** Limits exposure to casual user of property. Addresses downwind concerns. Least costly.	Might not address groundwater contamination issue if CKD remains on City property. Does not return property to unrestricted use. Barrier will require maintenance. Effects of plant uptake and redistribution of contaminants not established.	Low	Easy	Very long (greater than 25 years)	High. Site will generally be unusable. Low to moderate impact on development of adjacent property.	**YES** - Retain

Remedial Method	Conceptual Description	Benefits	Limitations	Relative Cost	Construction Feasibility	Duration of O&M	Impacts to Future Development, Adjacent Land Uses	Recommended for Further Consideration
Alternative 4: Excavate City property CKD (Area B), place on Holcim CKD area (Area A), and cover combined CKD on Holcim Property with clean fill material. Implement a restrictive covenant. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transport to Subtitle D facility.	Excavate CKD from City property (Area B) and place material on Holcim CKD area (Area A). Place a vegetated cap on the Holcim CKD. Backfill the City excavation with imported material. Excavate contaminated soil from Areas C and D and transport via truck to a Subtitle D facility. Backfill areas C and D with imported material. Hydroseed disturbed areas. Place a restrictive covenant on deed for Holcim property.	**Excavation:** Permanent cleanup option with little to no long-term on-site liability for City and Neighborhood Inc. properties. Capping at Holcim limits exposure to casual user of property. Addresses downwind concerns. Other contaminated soil is removed.	Does not return Holcim property to unrestricted use. Barrier will require maintenance. Effects of plant uptake and redistribution of contaminants not established.	Low to Moderate	Easy to Moderate	Very long (greater than 25 years)	City and Neighborhood Inc. properties: Low Holcim Property: High. Site will generally be unusable.	**YES** - Retain
Alternative 5: Excavate City property CKD (Area A) and contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D), place on Holcim CKD area (Area A), and cover Holcim CKD area with clean fill material. Implement a restrictive covenant.	Excavate CKD from City property (Area B) and place material on Holcim CKD area (Area A). Excavate contaminated soil from Holcim and Neighborhood properties (Areas C and D) and place on Holcim CKD area. Backfill excavated areas with imported material. Hydroseed disturbed areas. Place a vegetated cap on the Holcim CKD. Place a restrictive covenant on deed for Holcim property.	**Excavation:** Permanent cleanup option with little to no long-term on-site liability for City and Neighborhood Inc. properties. Capping at Holcim limits exposure to casual user of property. Addresses downwind concerns.	Does not return Holcim property to unrestricted use. Barrier will require maintenance. Effects of plant uptake and redistribution of contaminants not established.	Low to Moderate	Easy to Moderate	Very long (greater than 25 years)	City and Neighborhood Inc. properties: Low Holcim Property: High. Site will generally be unusable.	**YES** - Retain

Table 4

Summary of ARARs

Holcim Inc. Site
Spokane Valley, Washington

ARAR	Regulated Activity	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Evaluation
Spokane Valley Codes							
Municipal Code 7.05	Nuisances (Noise and Dust)	Applies	Applies	Applies	Applies	Applies	Dust control must be implemented to comply with this code. Noise abatement might be required depending on work activities and areas,
Municipal Code 22.150	Stormwater Management Regulations	Applies	Applies	Applies	Applies	Applies	Stormwater runoff requirements for development in Spokane Valley
Municipal Code 24.50	Land Disturbing Activities (TESC and Grading)	Applies	Applies	Applies	Applies	Applies	Grading activities and TESC must comply with this regulation.
Spokane County Codes							
Title 8	Health and Sanitation	Applies	Applies	Does Not Apply	Applies	Applies	Waste disposal must comply with this regulation.
Title 9	Rights of Way	Might Apply	Might Apply	Might Apply	Might Apply	Might Apply	Might be needed depending on the location of the work.
Washington State							
Washington Administrative Code 173-201A	Water Quality Standards for Surface Waters	Applies	Applies	Applies	Applies	Applies	MTCA requires cleanup actions comply with applicable regulations.
Washington Administrative Code 173-303	Dangerous Waste Management	Applies	Applies	Applies	Applies	Applies	Some CKD material designates as a dangerous waste based on a pH greater than 12.5.
Washington Administrative Code 173-304	Solid Waste Handling Standards	Does Not Apply	Does Not Apply	Does Not Apply	Does Not Apply	Does Not Apply	The facility was operated and CKD was placed prior to 1985, when WAC 173-304 was promulgated. Therefore compliance with these regulations is not required.
Washington Administrative Code 173-340	Toxic Waste Cleanup (MTCA)	Applies	Applies	Applies	Applies	Applies	The remedial action will be conducted under MTCA. Remedial alternatives will comply with MTCA regulations.
Washington Administrative Code 173-350	Solid Waste Handling Standards	Does Not Apply	Does Not Apply	Applies	Applies	Applies	According to Ecology, limited purpose landfill regulations in WAC 173-350 would apply to the Holcim and City properties if CKD is capped in-place.
Washington Administrative Code 197-11 and 173-802	State Environmental Policy Act	Applies	Applies	Applies	Applies	Applies	A SEPA review is required for projects with potential significant environmental impacts.
RCW 90.48	Water Pollution Control (Construction Stormwater Permit)	Applies	Applies	Applies	Applies	Applies	A Stormwater Pollution Prevention Plan (SWPPP) is required for each remediation alternative.
Federal Regulations							
Title 40 Code of Federal Regulations 131	Water Quality Standards (National Toxics Rule)	Applies	Applies	Applies	Applies	Applies	MTCA requires cleanup actions comply with applicable regulations.
Title 40 Code of Federal Regulations 141	Drinking Water Regulations	Applies	Applies	Applies	Applies	Applies	MTCA requires cleanup actions comply with applicable regulations.
Title 40 Code of Federal Regulations 260-268	Hazardous Waste (RCRA)	Applies	Applies	Applies	Applies	Applies	MTCA requires cleanup actions comply with applicable regulations.
Title 33 of United States Code, Chapter 26	Water Pollution Control (Clean Water Act)	Applies	Applies	Applies	Applies	Applies	MTCA requires cleanup actions comply with applicable regulations.

Table 5

Evaluation of Cleanup Action Alternatives

Holcim Inc. Site

Spokane Valley, Washington

Alternative Numbers	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Alternative Descriptions	Alternative 1: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B), transport and dispose at an approved Subtitle D facility. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transport to a Subtitle D facility.	Alternative 2: Excavate CKD (dangerous waste) from Holcim and City properties (Areas A and B), and stabilize (lower pH). Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D). Transport excavated material to a Subtitle D facility.	Alternative 3: Cover (cap) CKD on Holcim and City properties (Areas A and B) and contaminated soil on Holcim and Neighborhood Inc. properties (Areas C and D) on site with clean fill material. Implement a restrictive covenant.	Alternative 4: Excavate City property CKD (Area B), place on Holcim CKD area (Area A), and cover combined CKD on Holcim Property with clean fill material. Implement a restrictive covenant. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transport to Subtitle D facility.	Alternative 5: Excavate City property CKD (Area A) and contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D), place on Holcim CKD area (Area A), and cover Holcim CKD area with clean fill material. Implement a restrictive covenant.
	Excavate Holcim and City CKD (Areas A and B) and transfer via truck to an approved Subtitle D facility (Arlington, Oregon). Soil will be profiled in batches for appropriate disposal. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D) and transfer via truck to a Subtitle D facility (Spokane, Washington). Backfill and hydroseed City property. Backfill Neighborhood Inc. property. Holcim property backfill optional. Groundwater monitoring for 5 years.	Excavate Holcim and City CKD (Areas A and B) and chemically stabilize on site such that it does not classify as dangerous waste. Excavate contaminated soil from Holcim and Neighborhood Inc. properties (Areas C and D). Transport via truck for disposal at a Subtitle D facility. Backfill and hydroseed City property. Backfill Neighborhood Inc. property. Holcim property backfill optional. Groundwater monitoring for 5 years.	Place an vegetated cap over the Holcim and City CKD (Areas A and B) and contaminated soil on Holcim and Neighborhood Inc. properties (Areas C and D). Restoration includes reseeding the cap. Restrictive covenant would be placed on deeds. Groundwater and cap monitoring for 25 years.	Excavate CKD from City property (Area B) and place material on Holcim CKD area (Area A). Place a vegetated cap on the Holcim CKD. Backfill the City excavation with imported material. Excavate contaminated soil from Areas C and D and transport via truck to a Subtitle D facility. Backfill areas C and D with imported material. Hydroseed disturbed areas. Place a restrictive covenant on deed for Holcim property.	Excavate CKD from City property (Area B) and place material on Holcim CKD area (Area A). Excavate contaminated soil from Holcim and Neighborhood properties (Areas C and D) and place on Holcim CKD area. Backfill excavated areas with imported material. Hydroseed disturbed areas. Place a vegetated cap on the Holcim CKD. Place a restrictive covenant on deed for Holcim property.
Approximate Volume of Contaminated Soil Removed (cubic yards)	124,879	124,879	none	15,879	15,879
Area of Capped Containment (square feet)	none	none	291,300	250,900	250,900
Alternative Ranking Under MTCA					
1. Compliance with MTCA Threshold					
Protection of Human Health and the Environment	Yes- Alternative will protect human health and the environment	Yes- Alternative will protect human health and the environment	Yes - Alternative will protect human health and the environment. Residual CKD managed with capping and institutional controls.	Yes - Alternative will protect human health and the environment. Residual CKD and other contaminated soil managed with capping and institutional controls.	Yes - Alternative will protect human health and the environment. Residual CKD and other contaminated soil managed with capping and institutional controls.
Compliance with Cleanup Standards	Yes - contaminated CKD will be removed to the extent feasible. Potentially contaminated groundwater addressed by excavation of CKD.	Yes - contaminated CKD will be removed to the extent feasible. Potentially contaminated groundwater addressed by excavation of CKD.	Unlikely - Alternative is expected to comply with soil cleanup standards through capping. Contaminated groundwater may not be addressed if arsenic leaches from City CKD during periods of elevated groundwater table.	Yes - Alternative is expected to comply with soil cleanup standards through combination of excavation and capping. Contaminated soil and groundwater addressed by excavation of City-property CKD.	Yes - Alternative is expected to comply with soil cleanup standards through combination of excavation and capping. Contaminated soil and groundwater addressed by excavation of City-property CKD.
Compliance with Applicable State and Federal Regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations
Provision for Compliance Monitoring	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation).	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation).	Yes - Alternative includes provision for compliance monitoring (i.e., long-term cap monitoring).	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation and long-term cap monitoring).	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation and long-term cap monitoring).

2. Restoration Time Frame									
	Initial restoration timeframe is relatively short. Cleanup implementation would take more than one year (estimated at 70 weeks). Groundwater monitoring expected for 5 years.		Initial restoration timeframe is relatively short. Cleanup implementation would take more than one year (estimated at 80 weeks). Groundwater monitoring expected for five years.		Initial restoration timeframe for soil is relatively short (estimated at 10 weeks). Groundwater and cap monitoring expected for 25 years.		Initial restoration timeframe for soil is relatively short (estimated at 12 weeks). Groundwater and cap monitoring expected for 25 years.		Initial restoration timeframe for soil is relatively short (estimated at 12 weeks). Groundwater and cap monitoring expected for 25 years.	
3. Disproportionate Cost Analysis - Relative Benefits Ranking[1]		**Score**		**Score**		**Score**		**Score**		**Score**
Protectiveness	Achieves highest level of protectiveness.	5	Achieves the highest level of protectiveness.	5	Achieves general protectiveness. This alternative is the least protective because CKD remains at City property (Area B), which could leach metals to groundwater and because contamination remains on Neighborhood Inc. property (Area D).	2	Achieves overall protectiveness. This alternative is less protective than Alternatives 1 and 2 because it relies on long term maintenance of surface caps. Additional protection is provided by removing contaminated soil from Areas C and D and placing it off-site in a permitted landfill.	3	Achieves overall protectiveness. This alternative is less protective than Alternatives 1 and 2 because it relies on long term maintenance of surface caps.	3
		Score		**Score**		**Score**		**Score**		**Score**
Permanence	This alternative achieves permanent reduction in toxicity and volume of hazardous substances at site because it removes CKD from Areas A and B and contaminated soil from Areas C and D to the extent feasible. CKD disposed at landfill is untreated and maintains high pH (dangerous waste), thus this alternative is less permanent than Alternative 2.	4	Achieves highest level of permanence. Most permanent reduction in toxicity and volume of hazardous substances because it removes CKD from Areas A and B and contaminated soil from Areas C and D to the extent feasible and CKD is treated to address dangerous waste characteristics.	5	Reduces the mobility of CKD and contaminated soil with capping. Likely will not address potential for metals to leach from CKD deposit on City property during seasonal high groundwater elevations.	1	Achieves permanent reduction in toxicity and volume of contaminated soil at the City and Neighborhood Inc. properties. CKD at the Holcim property would be isolated/contained by a surface cap thereby reducing mobility.	3	Achieves permanent reduction in toxicity and volume of contaminated soil at the City and Neighborhood Inc. properties. CKD/contaminated soil would be isolated/contained by a surface cap on the Holcim property thereby reducing mobility.	3
Long-Term Effectiveness	CKD from Areas A and B and soil from Areas C and D would be permanently removed from the site and disposed. Some CKD would retain dangerous waste characteristics when disposed at a permitted facility.	4	CKD from Areas A and B and soil from Areas C and D would be permanently removed from the site, treated to address dangerous waste characteristics, and disposed at a permitted facility.	5	Capping and institutional controls are used to minimize human contact with CKD and contaminated soil left in place in Areas A through D. Long-term effectiveness depends on maintaining integrity of caps.	1	CKD would be permanently removed from the City property (Area B). Contaminated soil from Areas C and D would be removed from Holcim and Neighborhood Inc. properties. Capping and institutional controls are used to minimize human contact with contaminated soil left in place. Long-term effectiveness depends on maintaining integrity of cap on the Holcim property.	3	CKD would be permanently removed from the City property (Area B). Contaminated soil from Areas C and D would be removed from current locations on Holcim and Neighborhood Inc. properties. Capping and institutional controls are used to minimize human contact with contaminated soil left in place. Long-term effectiveness depends on maintaining integrity of cap on the Holcim property.	3
Management of Short-Term Risks	This alternative involves excavation of large volumes of material, related over-the-road truck traffic for disposal, and transport of some dangerous waste. Therefore, this alternative presents higher short term risks than Alternatives 3 through 5.	3	This alternative has the highest short-term risks because of the large volume of material to be excavated, treated on site, and transported off site for disposal.	2	The construction of surface caps in general present less short term risks than excavation and off-site disposal.	5	Excavation and transportation of excavated CKD from City property (Area B) and contaminated soil from Areas C and D on Holcim and Neighborhood Inc. properties present short term risks.	4	Excavation and transportation of excavated CKD from City property (Area B) and contaminated soil from Areas C and D on Holcim and Neighborhood Inc. properties present short term risks.	4

Technical and Administrative Implementability	Implementable, technically possible, off-site disposal facilities are available, access for eathwork and transportation equipment is good. The volume of trucks available to transport material off-site will be a limiting factor to the timeframe of construction and likely would prolong construction activities.	2	Implementable, technically possible, off-site disposal facilities are available, access for eathwork and transportation equipment is good. The volume of trucks available to transport material off-site will be a limiting factor to the timeframe of construction. A treatability study will be necessary to determine the quantity of reagent required to reduce pH to levels less than dangerous waste criteria while at the same time not mobilizing metals. CKD is no longer granular but is consolidated and hardened. Treatment would likely require crushing the CKD prior to pH adjustment.	1	Implementable but relies on long term maintenance. Less administratively implementable than Alternatives 4 or 5 because restrictive covenants would be required on the City and Neighborhood, Inc. properties.	3	Implementable but relies on long term maintenance. More easily administratively implementable than Alternative 3 because of smaller cap area and only one restrictive covenant required for the Holcim property.	4	Implementable but relies on long term maintenance. Most easily administratively implementable because there is no off-site transport of contaminated materials and smaller cap area than Alternative 3. Only one restrictive covenant required for the Holcim property.	4
Consideration of Public Concerns	Public acceptance of this alternative is likely because contaminated soil is removed from the site.	5	Public acceptance of this alternative is likely because contaminated soil is removed from the site.	5	Public may be concerned that CKD will remain in place, especially on City-owned property. Potential continued source to groundwater may also be a concern.	2	Public may be concerned that CKD will remain in place on Holcim property; however, CKD and contaminated soil will be removed from City and Neighborhood Inc. properties.	4	Public may be concerned that CKD will remain in place on Holcim property; however, CKD and contaminated soil will be removed from City and Neighborhood Inc. properties.	4
Total Score		23		23		14		21		21

Notes

[1]Alternatives were scored using a scale of 1 to 5 with a score of 1 being the least amount of benefits provided by the alternative and a score of 5 being the most amount of benefits provided by the alternative.

Table 6

Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives

Holcim Inc. Site

Spokane Valley, Washington

	Alternative 1: Complete Excavation of Areas A through D and Off-Site Disposal at approved Subtitle D Facilities	Alternative 2: Complete Excavation of Areas A through D, CKD Stabilization, and Off-Site Disposal at Subtitle D Facility	Alternative 3: Cap In-Place in All Locations	Alternative 4: Excavate City CKD (Area B) and Cap with Holcim CKD On-Site, Dispose Other Contaminated Soil from Areas C and D at Subtitle D Facility	Alternative 5: Excavate City CKD (Area B) and Contaminated Soil from Areas C and D, Cap All Excavated Material at Holcim CKD Area
Alternative Ranking Under MTCA					
1. Compliance with MTCA Threshold Criteria[1]	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2. Restoration Time Frame	Initial restoration time frame for soil is relatively short. Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) at completion of cleanup activities.	Initial restoration time frame for soil is relatively short. Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) at completion of cleanup activities.	Initial restoration time frame for soil is relatively short. Soil cleanup levels would not be met because contaminated soil would be located within 15 feet of the ground surface. However, the dermal contact pathway would be eliminated with a protective cap.	Initial restoration time frame for soil is relatively short. Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) except the Holcim CKD area at completion of cleanup activities. However, the dermal contact pathway would be eliminated with a protective cap.	Initial restoration time frame for soil is relatively short. Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) except the Holcim CKD area at completion of cleanup activities. However, the dermal contact pathway would be eliminated with a protective cap.
3. Disproportionate Cost Analysis Relative Benefits Ranking					
Protectiveness	5	5	2	3	3
Permanence	4	5	1	3	3
Cost[2]	1	2	5	5	5
Long-Term Effectiveness	4	5	1	3	3
Management of Short-Term Risks	3	2	5	4	4
Technical and Administrative Implementability	2	1	3	4	4
Consideration of Public Concerns	5	5	2	4	4
Total of Scores	**24**	**25**	**19**	**26**	**26**
4. Disproportionate Cost Analysis					
	$11,226,857	**$9,807,091**	**$1,618,620**	**$2,188,575**	**$1,979,601**
Costs Disproportionate to Incremental Benefits	Yes	Yes	No	No	No
Restrictive Covenant	None	None	City, Holcim, Neighborhood Inc.	Holcim	Holcim
Practicability of Remedy	Least Practicable	Least Practicable	Practicable	Practicable	Practicable
Remedy Permanent to Maximum Extent Practicable	Yes-permanent remedy	Yes-most permanent remedy	Yes	Yes	Yes
Overall Alternative Ranking	**4th**	**3rd**	**5th**	**2nd**	**1st**

Notes:

[1]WAC 173-340-360(2)(a)

[2]Low cost is a benefit

Table 7

Alternative 1: Excavate CKD (Dangerous Waste) from Holcim and City Properties (Areas A and B), Transport and Dispose at an approved Subtitle D Facility. Excavate Contaminated Soil from Holcim and Neighborhood Inc. Properties (Areas C and D) and Transport to a Subtitle D Facility

Holcim Inc. Site
Spokane Valley, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Permitting/Design/Regulatory Oversight				
Permitting[3]	lump	$20,000.00	1	$20,000
Design, work plan and procurement[3]	lump	$60,000.00	1	$60,000
Regulatory oversight costs	lump	$30,000.00	1	$30,000
			Task Sub-Total	**$110,000**
Additional Assessment				
Work plan and implementation	lump	$10,000.00	1	$10,000
Additional laboratory testing	lump	$6,000.00	1	$6,000
Report preparation	lump	$4,000.00	1	$4,000
			Task Sub-Total	**$20,000**
Field Oversight				
Construction monitoring/oversight	day	$1,500.00	353	$529,548
Batch samples	ea	$100.00	100	$10,000
Closure samples	ea	$100.00	100	$10,000
			Task Sub-Total	**$549,548**
Excavate and Transport CKD to an approved Subtitle D Landfill (Holcim Property - Area A)				
Excavation and loading on trucks	cy	$2.25	109,000	$245,250
Transportation	ton	$46.20	119,900	$5,539,380
Disposal (Subtitle D Landfill - no treatment)[4]	ton	$23.21	119,900	$2,782,447
			Task Sub-Total	**$8,567,077**
Excavate and Transport CKD an approved Subtitle D Landfill (City Property - Area B)				
Excavate and load	cy	$7.00	12,300	$86,100
Transportation	ton	$46.20	13,530	$625,086
Disposal (Subtitle D Landfill - no treatment)[4]	ton	$23.21	13,530	$313,983
			Task Sub-Total	**$1,025,169**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Excavate and Transport Area C-Contaminated Soil to Subtitle D Landfill (Holcim Property)				
Excavate and load	cy	$2.48	1,279	$3,166
Transportation	ton	$7.20	2,174	$15,653
Disposal (Subtitle D Landfill)[5]	ton	$28.17	2,174	$61,248
			Task Sub-Total	**$80,066**
Excavate and Transport Area D-Contaminated Soil to Subtitle D Landfill (Neighborhood Inc. Property)				
Excavate and load	cy	$2.48	2,300	$5,693
Transportation	ton	$7.20	3,910	$28,152
Disposal (Subtitle D Landfill)[5]	ton	$28.17	3,910	$110,156
			Task Sub-Total	**$144,001**
Backfill Entire CKD Remedial Excavation (Holcim Property)- Note: Optional Item				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$13.60	163,500	$2,223,600
			Task Sub-Total	**$2,223,600**
Backfill Entire CKD Remedial Excavation, Cover with Topsoil (City Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	18,450	$250,920
Purchase, transport, and place topsoil	ton	$30.15	898	$27,075
Hydroseeding	sf	$0.08	40,400	$3,232
			Task Sub-Total	**$281,227**
Backfill Entire Area C-Contaminated Soil Areas (Holcim Property) - Note: Optional Item				
Purchase, transport, place, and compact select fill	ton	$13.60	1,919	$26,098
			Task Sub-Total	**$26,098**
Backfill Entire Area D-Contaminated Soil Areas (Neighborhood Inc. Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	3,450	$46,920
			Task Sub-Total	**$46,920**
Incidentals				
Erosion control	lf	$7.00	4,420	$30,940
Dust suppressant (water) during construction	day	$300.00	353	$105,910
Site Restoration	LS	$75,000.00	1	$75,000
			Task Sub-Total	**$211,850**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Maintenance and Monitoring (5 Years)				
8 Quarters Groundwater Monitoring (Yr 1 -Quarterly, then Annual)[6]	event	$6,000.00	8	$48,000
Monthly Inspection/Quarterly Reporting	event	$1,500.00	60	$90,000
Irrigation - automated pop-up sprinkler system	acre	$3,000.00	1	$3,000
Water costs	annual	$2,000.00	5	$10,000
			Task Sub-Total	**$151,000**
Reporting				
Remedial action report	lump	$40,000.00	1	$40,000
			Task Sub-Total	**$40,000**
			Total Estimated Costs for Alternative 1 (includes Holcim Backfill)	**$13,476,556**
			Total Estimated Costs for Alternative 1 (does not include Holcim Backfill)	**$11,226,857**

Notes:

[1]Unit costs derived from either RS Means (2004) or estimates from local vendors. Estimated costs are considered to be within a margin of +/- 20 percent.

[2]Please refer to Table 2 for assumptions used to generate material quantities

[3]Permitting and design costs for this alternative are expected to be less than the remaining alternatives because this alternative does not have an on-sight treatment or capping com

[4]Assumes disposal at a facility located in Arlington, Oregon.

[5]Assumes disposal at a facility located in Medical Lake, Washington.

[6]Actual sampling frequency will depend on when groundwater cleanup levels are achieved.

sf = square feet; sy = square yard; cy = cubic yard; lf = linear foot; lump = lump sum estimate

Table 8

Alternative 2: Excavate CKD (Dangerous Waste) from Holcim and City Properties (Areas A and B), and Stabilize (Lower pH). Excavate Contaminated Soil from Holcim and Neighborhood Inc. Properties (Areas C and D). Transport Excavated Material to a Subtitle D Facility

Holcim Inc. Site
Spokane Valley, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Permitting/Design/Regulatory Oversight				
Permitting	lump	$30,000.00	1	$30,000
Design, work plan and procurement	lump	$80,000.00	1	$80,000
Regulatory oversight costs	lump	$30,000.00	1	$30,000
			Task Sub-Total	**$140,000**
Additional Assessment				
Work plan and implementation	lump	$10,000.00	1	$10,000
Additional laboratory testing	lump	$6,000.00	1	$6,000
Report preparation	lump	$4,000.00	1	$4,000
			Task Sub-Total	**$20,000**
Field Oversight				
Construction monitoring/oversight	day	$1,500.00	403	$604,500
Batch samples	ea	$100.00	100	$10,000
Closure samples	ea	$100.00	100	$10,000
			Task Sub-Total	**$624,500**
Excavate, Treat and Transport CKD to Subtitle D Landfill (Holcim Property - Area A)				
Excavate and load	cy	$2.48	109,000	$269,775
Chemical Stabilization (CKD)	ton	$25.00	109,000	$2,725,000
Transportation	ton	$7.20	119,900	$863,280
Disposal (Subtitle D Landfill - with treatment)[3]	ton	$28.17	119,900	$3,377,943
			Task Sub-Total	**$7,235,998**
Excavate and Transport CKD to Subtitle D Landfill (City Property - Area B)				
Excavate and load	cy	$2.48	12,300	$30,443
Chemical Stabilization (CKD)	ton	$25.00	12,300	$307,500
Transportation	ton	$7.20	13,530	$97,416
Disposal (Subtitle D Landfill - with treatment)[3]	ton	$28.17	13,530	$381,181

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
			Task Sub-Total	**$816,539**
Excavate and Transport Area C-Contaminated Soil to Subtitle D Landfill (Holcim Property)				
Excavate and load	cy	$2.48	1,279	$3,166
Transportation	ton	$7.20	2,174	$15,653
Disposal (Subtitle D Landfill)[3]	ton	$28.17	2,174	$61,248
			Task Sub-Total	**$80,066**
Excavate and Transport Area D-Contaminated Soil to Subtitle D Landfill (Neighborhood Inc. Property)				
Excavate and load	cy	$2.48	2,300	$5,693
Transportation	ton	$7.20	3,910	$28,152
Disposal (Subtitle D Landfill)[3]	ton	$28.17	3,910	$110,156
			Task Sub-Total	**$144,001**
Backfill Entire CKD Remedial Excavation (Holcim Property)- Note: Optional Item				
Purchase, transport, place, and compact select fill	ton	$13.60	163,500	$2,223,600
			Task Sub-Total	**$2,223,600**
Backfill Entire CKD Remedial Excavation, Cover with Topsoil (City Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	18,450	$250,920
Purchase, transport, and place topsoil	ton	$30.15	898	$27,075
Hydroseeding	sf	$0.08	40,400	$3,232
			Task Sub-Total	**$281,227**
Backfill Entire Area C-Contaminated Soil Areas (Holcim Property) - Note: Optional Item				
Purchase, transport, place, and compact select fill	ton	$13.60	1,919	$26,098
			Task Sub-Total	**$26,098**
Backfill Entire Area D-Contaminated Soil Areas (Neighborhood Inc. Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	3,450	$46,920
			Task Sub-Total	**$46,920**
Incidentals				
Erosion control	lf	$7.00	4,420	$30,940
Dust suppressant (water) during construction	day	$300.00	403	$120,900
Site Restoration	LS	$75,000.00	1	$75,000
			Task Sub-Total	**$226,840**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Maintenance and Monitoring (5 Years)				
8 Quarters Groundwater Monitoring (Yr 1 -Quarterly, then Annual)[4]	event	$6,000.00	8	$48,000
Monthly Inspection/Quarterly Reporting	event	$1,500.00	60	$90,000
Irrigation - automated pop-up sprinkler system	acre	$3,000.00	1	$3,000
Water costs	annual	$2,000.00	5	$10,000
			Task Sub-Total	**$151,000**
Reporting				
Remedial action report	lump	$40,000.00	1	$40,000
			Task Sub-Total	**$40,000**
			Total Estimated Costs for Alternative 2 (includes Holcim Backfill)	$12,056,789
			Total Estimated Costs for Alternative 2 (does not include Holcim Backfill)	$9,807,091

Notes:

[1]Unit costs derived from either RS Means (2004) or estimates from local vendors. Estimated costs are considered to be within a margin of +/- 20 percent.

[2]Please refer to Table 2 for assumptions used to generate material quantities

[3]Assumes disposal at a facility located in Medical Lake, Washington.

[4]Actual sampling frequency will depend on when groundwater cleanup levels are achieved.

sf = square feet; sy = square yard; cy = cubic yard; lf = linear foot; lump = lump sum estimate

Table 9

Alternative 3: Cover (Cap) CKD on Holcim and City Properties (Areas A and B) and Contaminated Soil on Holcim and Neighborhood Inc. Properties (Areas C and D) on Site with Clean Fill Material. Implement a Restrictive Covenant

Holcim Inc. Site
Spokane Valley, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Permitting/Design/Regulatory Oversight				
Permitting	lump	$30,000.00	1	$30,000
Design, work plan and procurement	lump	$80,000.00	1	$80,000
Regulatory oversight costs	lump	$30,000.00	1	$30,000
			Task Sub-Total	**$140,000**
Additional Assessment				
Work plan and implementation	lump	$10,000.00	1	$10,000
Additional laboratory testing	lump	$6,000.00	1	$6,000
Report preparation	lump	$4,000.00	1	$4,000
			Task Sub-Total	**$20,000**
Field Oversight				
Construction monitoring/oversight	day	$1,500.00	50	$75,000
			Task Sub-Total	**$75,000**
Construct Vegetated Cap (Holcim Property CKD Areas - Area A)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	13,939	$314,324
Purchase, transport, and place topsoil	ton	$30.15	5,576	$168,116
Hydroseeding	sf	$0.08	250,900	$20,072
			Task Sub-Total	**$502,513**
Construct Vegetated Cap (City Property CKD Areas - Area B)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	2,244	$50,602
Purchase, transport, and place topsoil	ton	$30.15	898	$27,075
Hydroseeding	sf	$0.08	40,400	$3,232
			Task Sub-Total	**$80,909**
Construct Vegetated Cap (Holcim Property Area C-Contaminated Soil Areas)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	422	$9,516
Purchase, transport, and place topsoil	ton	$30.15	169	$5,095

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Hydroseeding	sf	$0.08	7,600	$608
			Task Sub-Total	**$15,219**
Construct Vegetated Cap (Neighborhood Inc. Property Area D-Contaminated Soil Areas)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	417	$9,403
Purchase, transport, and place topsoil	ton	$30.15	167	$5,035
Hydroseeding	sf	$0.08	7,500	$600
			Task Sub-Total	**$15,038**
Incidentals				
Erosion control	lf	$7.00	4,420	$30,940
Dust suppressant (water) during construction	day	$300.00	50	$15,000
Site Restoration	LS	$75,000.00	1	$75,000
			Task Sub-Total	**$120,940**
Institutional Controls				
Outside Counsel[3]	LS	$15,000.00	1	$15,000
Consulting Support	LS	$5,000.00	1	$5,000
			Task Sub-Total	**$20,000**
Maintenance and Monitoring (5 Years)				
8 Quarters Groundwater Monitoring (Yr 1 -Quarterly, then Annual)	event	$6,000.00	8	$48,000
Monthly Inspection/Quarterly Reporting	event	$1,500.00	60	$90,000
Irrigation - automated pop-up sprinkler system	acre	$3,000.00	7	$21,000
Water costs	annual	$2,000.00	5	$10,000
Occasional repair/regrading	event	$10,000.00	2	$20,000
			Task Sub-Total	**$189,000**
Maintenance and Monitoring (20 Additional Years)				
Annual Groundwater Monitoring[4]	event	$6,000.00	20	$120,000
Quarterly Inspection/Quarterly Reporting	event	$2,500.00	80	$200,000
Water costs	annual	$2,000.00	20	$40,000
Occasional repair/regrading	event	$10,000.00	4	$40,000
			Task Sub-Total	**$400,000**
Reporting				
Remedial action report	lump	$40,000.00	1	$40,000
			Task Sub-Total	**$40,000**
			Total Estimated Costs for Alternative 3	**$1,618,620**

Notes:

[1]Unit costs derived from either RS Means (2004) or estimates from local vendors. Estimated costs are considered to be within a margin of +/- 20 percent.

[2]Please refer to Table 2 for assumptions used to generate material quantities

[3]Outside counsel costs are anticipated to be greater than Alternatives 4 and 5 because capping will take place on neighboring properties with different owners.

[4]Actual sampling frequency will depend on when groundwater cleanup levels are achieved.

sf = square feet; sy = square yard; cy = cubic yard; lf = linear foot; lump = lump sum estimate

Table 10

Alternative 4: Excavate City Property CKD (Area B), Place on Holcim CKD Area (Area A), and Cover Combined CKD on Holcim Property with Clean Fill Material. Implement a Restrictive Covenant. Excavate Contaminated Soil from Holcim and Neighborhood Inc. Properties (Areas C and D) and Transport to Subtitle D Facility

Holcim Inc. Site
Spokane Valley, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Permitting/Design/Regulatory Oversight				
Permitting	lump	$30,000.00	1	$30,000
Design, work plan and procurement	lump	$80,000.00	1	$80,000
Regulatory oversight costs	lump	$30,000.00	1	$30,000
			Task Sub-Total	**$140,000**
Additional Assessment				
Work plan and implementation	lump	$10,000.00	1	$10,000
Additional laboratory testing	lump	$6,000.00	1	$6,000
Report preparation	lump	$4,000.00	1	$4,000
			Task Sub-Total	**$20,000**
Field Oversight				
Construction monitoring/oversight	day	$1,500.00	60	$90,000
Closure samples	ea	$100.00	50	$5,000
			Task Sub-Total	**$90,000**
Excavate and Transport CKD to Holcim CKD Area (City Property - Area B)				
Excavation, transportation, and placement	cy	$8.25	12,300	$101,475
			Task Sub-Total	**$101,475**
Excavate and Transport Area C-Contaminated Soil to Subtitle D Landfill (Holcim Property)				
Excavation	cy	$3.83	1,279	$4,892
Loading and Transportation	ton	$9.60	2,174	$20,870
Disposal (Subtitle D Landfill)[3]	ton	$28.17	2,174	$61,248
			Task Sub-Total	**$87,011**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Excavate and Transport Area D-Contaminated Soil to Subtitle D Landfill (Neighborhood Inc. Property)				
Excavation	cy	$3.83	2,300	$8,798
Loading and Transportation	ton	$9.60	3,910	$37,536
Disposal (Subtitle D Landfill)[3]	ton	$28.17	3,910	$110,156
			Task Sub-Total	**$156,490**
Backfill Entire CKD Remedial Excavation, Cover with Topsoil (City Property - Area B)				
Purchase, transport, place, and compact select fill	ton	$13.60	18,450	$250,920
Purchase, transport, and place topsoil	ton	$30.15	898	$27,075
Hydroseeding	sf	$0.08	40,400	$3,232
			Task Sub-Total	**$281,227**
Backfill Entire Area C-Contaminated Soil Areas (Holcim Property) - Note: Optional Item				
Purchase, transport, place, and compact select fill	ton	$13.60	1,919	$26,098
			Task Sub-Total	**$26,098**
Backfill Entire Area D-Contaminated Soil Areas (Neighborhood Inc. Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	3,450	$46,920
			Task Sub-Total	**$46,920**
Construct Vegetated Cap with Topsoil (Holcim Property CKD Areas)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	13,939	$314,324
Purchase, transport, and place topsoil	ton	$30.15	5,576	$168,116
Hydroseeding	sf	$0.08	250,900	$20,072
			Task Sub-Total	**$502,513**
Incidentals				
Erosion control	lf	$7.00	4,420	$30,940
Dust suppressant (water) during construction	day	$300.00	60	$18,000
Site Restoration	LS	$75,000.00	1	$75,000
			Task Sub-Total	**$123,940**
Institutional Controls				
Outside Counsel	LS	$5,000.00	1	$5,000
Consulting Support	LS	$5,000.00	1	$5,000
			Task Sub-Total	**$10,000**
Maintenance and Monitoring (5 Years)				
8 Quarters Groundwater Monitoring (Yr 1 -Quarterly, then Annual)	event	$6,000.00	8	$48,000
Monthly Inspection/Quarterly Reporting	event	$1,500.00	60	$90,000
Irrigation - automated pop-up sprinkler system	acre	$3,000.00	7	$21,000

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Water costs	annual	$2,000.00	5	$10,000
Occasional repair/regrading	event	$10,000.00	2	$20,000
			Task Sub-Total	**$189,000**
Maintenance and Monitoring (20 Additional Years)				
Annual Groundwater Monitoring[4]	event	$6,000.00	20	$120,000
Quarterly Inspection/Quarterly Reporting	event	$2,500.00	80	$200,000
Water costs	annual	$2,000.00	20	$40,000
Occasional repair/regrading	event	$10,000.00	4	$40,000
			Task Sub-Total	**$400,000**
Reporting				
Remedial action report	lump	$40,000.00	1	$40,000
			Task Sub-Total	**$40,000**
Total Estimated Costs for Alternative 4 (includes Holcim Other Contaminated Soil Backfill)				**$2,214,674**
Total Estimated Costs for Alternative 4 (does not include Holcim Other Contaminated Area Backfill)				**$2,188,575**

Notes:

[1]Unit costs derived from either RS Means (2004) or estimates from local vendors. Estimated costs are considered to be within a margin of +/- 20 percent.

[2]Please refer to Table 2 for assumptions used to generate material quantities

[3]Assumes disposal at a facility located in Medical Lake, Washington.

[4]Actual sampling frequency will depend on when groundwater cleanup levels are achieved.

sf = square feet; sy = square yard; cy = cubic yard; lf = linear foot; lump = lump sum estimate

Table 11

Alternative 5: Excavate City Property CKD (Area A) and Contaminated Soil from Holcim and Neighborhood Inc. Properties (Areas C and D), Place on Holcim CKD Area (Area A), and Cover Holcim CKD Area with Clean Fill Material. Implement a Restrictive Covenant

Holcim Inc. Site

Spokane Valley, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Permitting/Design/Regulatory Oversight				
Permitting	lump	$30,000.00	1	$30,000
Design, work plan and procurement	lump	$80,000.00	1	$80,000
Regulatory oversight costs	lump	$30,000.00	1	$30,000
			Task Sub-Total	**$140,000**
Additional Assessment				
Work plan and implementation	lump	$10,000.00	1	$10,000
Additional laboratory testing	lump	$6,000.00	1	$6,000
Report preparation	lump	$4,000.00	1	$4,000
			Task Sub-Total	**$20,000**
Field Oversight				
Construction monitoring/oversight	day	$1,500.00	60	$90,000
Closure samples	ea	$100.00	50	$5,000
			Task Sub-Total	**$95,000**
Excavate and Transport CKD to Holcim CKD Area (City Property - Area B)				
Excavation, transportation, and placement	cy	$8.25	12,300	$101,475
			Task Sub-Total	**$101,475**
Excavate and Transport Area C-Contaminated Soil to Holcim CKD Area (Holcim Property)				
Excavation, transportation, and placement	cy	$8.25	1,279	$10,552
			Task Sub-Total	**$10,552**
Excavate and Transport Area D-Contaminated Soil to Holcim CKD Area (Neighborhood Inc. Property)				
Excavation, transportation, and placement	cy	$8.25	2,300	$18,975
			Task Sub-Total	**$18,975**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Backfill Entire CKD Remedial Excavation, Cover with Topsoil (City Property - Area B)				
Purchase, transport, place, and compact select fill	ton	$13.60	18,450	$250,920
Purchased, transported, placed topsoil	ton	$30.15	898	$27,075
Hydroseeding	sf	$0.08	40,400	$3,232
			Task Sub-Total	**$281,227**
Backfill Entire Area C-Contaminated Soil Areas (Holcim Property) - Note: Optional Item				
Purchase, transport, place, and compact select fill	ton	$13.60	1,919	$26,098
			Task Sub-Total	**$26,098**
Backfill Entire Area D-Contaminated Soil Areas (Neighborhood Inc. Property)				
Purchase, transport, place, and compact select fill	ton	$13.60	3,450	$46,920
			Task Sub-Total	**$46,920**
Construct Vegetated Cap with Topsoil (Holcim Property CKD Areas)				
Purchase, transport, place, and compact gravel/quarry spalls	ton	$22.55	13,939	$314,324
Purchased, transported, placed topsoil	ton	$30.15	5,576	$168,116
Hydroseeding	sf	$0.08	250,900	$20,072
			Task Sub-Total	**$502,513**
Incidentals				
Erosion control	lf	$7.00	4,420	$30,940
Dust suppressant (water) during construction	day	$300.00	60	$18,000
Site Restoration	LS	$75,000.00	1	$75,000
			Task Sub-Total	**$123,940**
Institutional Controls				
Outside Counsel	LS	$5,000.00	1	$5,000
Consulting Support	LS	$5,000.00	1	$5,000
			Task Sub-Total	**$10,000**
Maintenance and Monitoring (5 Years)				
8 Quarters Groundwater Monitoring (Yr 1 -Quarterly, then Annual)	event	$6,000.00	8	$48,000
Monthly Inspection/Quarterly Reporting	event	$1,500.00	60	$90,000
Irrigation - automated pop-up sprinkler system	acre	$3,000.00	7	$21,000
Water costs	annual	$2,000.00	5	$10,000
Occasional repair/regrading	event	$10,000.00	2	$20,000
			Task Sub-Total	**$189,000**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Maintenance and Monitoring (20 Additional Years)				
Annual Groundwater Monitoring[3]	event	$6,000.00	20	$120,000
Quarterly Inspection/Quarterly Reporting	event	$2,500.00	80	$200,000
Water costs	annual	$2,000.00	20	$40,000
Occasional repair/regrading	event	$10,000.00	4	$40,000
			Task Sub-Total	**$400,000**
Reporting				
Remedial action report	lump	$40,000.00	1	$40,000
			Task Sub-Total	**$40,000**
Total Estimated Costs for Alternative 5 (includes Holcim Other Contaminated Soil Backfill)				**$2,005,700**
Total Estimated Costs for Alternative 5 (does not include Holcim Other Contaminated Area Backfill)				**$1,979,601**

Notes:

[1]Unit costs derived from either RS Means (2004) or estimates from local vendors. Estimated costs are considered to be within a margin of +/- 20 percent.

[2]Please refer to Table 2 for assumptions used to generate material quantities

[3]Actual sampling frequency will depend on when groundwater cleanup levels are achieved.

sf = square feet; sy = square yard; cy = cubic yard; lf = linear foot; lump = lump sum estimate

FIGURES

GeoEngineers

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Feet

Notes:
1. The locations of all features shown are approximate.
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Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 11 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Remedial Investigation
Holcim Inc. Site
Spokane Valley, Washington

GeoEngineers

Figure 1

Office: SPOK Path: P:\161631600\GIS\021631600102_Figure1.mxd CRC Map Revised: November 21, 2012

Reference: Aerial photo provided by ESRI Data Online. Tax parcel boundaries provided by Spokane County Tax Assessor's Office.

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Site and Surrounding Properties

Holcim Inc. Site
Spokane Valley, Washington

GeoEngineers

Figure 2

Map Revised: November 21, 2012
Path: W:\Spokane\Projects\16\16316001\GIS\02\16316001600102_Site_Surrounding Properties_Figure2.mxd CRC
OfficeLocation: SPOK

Legend

- Holcim Property Boundary
- Tax Parcels
- Temporary Fencing

Map Revised: November 21, 2012

Path: P:\16\16316001\GIS\02\16316001020_Site_PreDemo.mxd CRC

OfficeLocation: SPOK

Reference: 1974 aerial photo provided by Spokane County GIS Department. Tax parcel boundaries provided by Spokane County Tax Assessor's Office, downloaded 2011.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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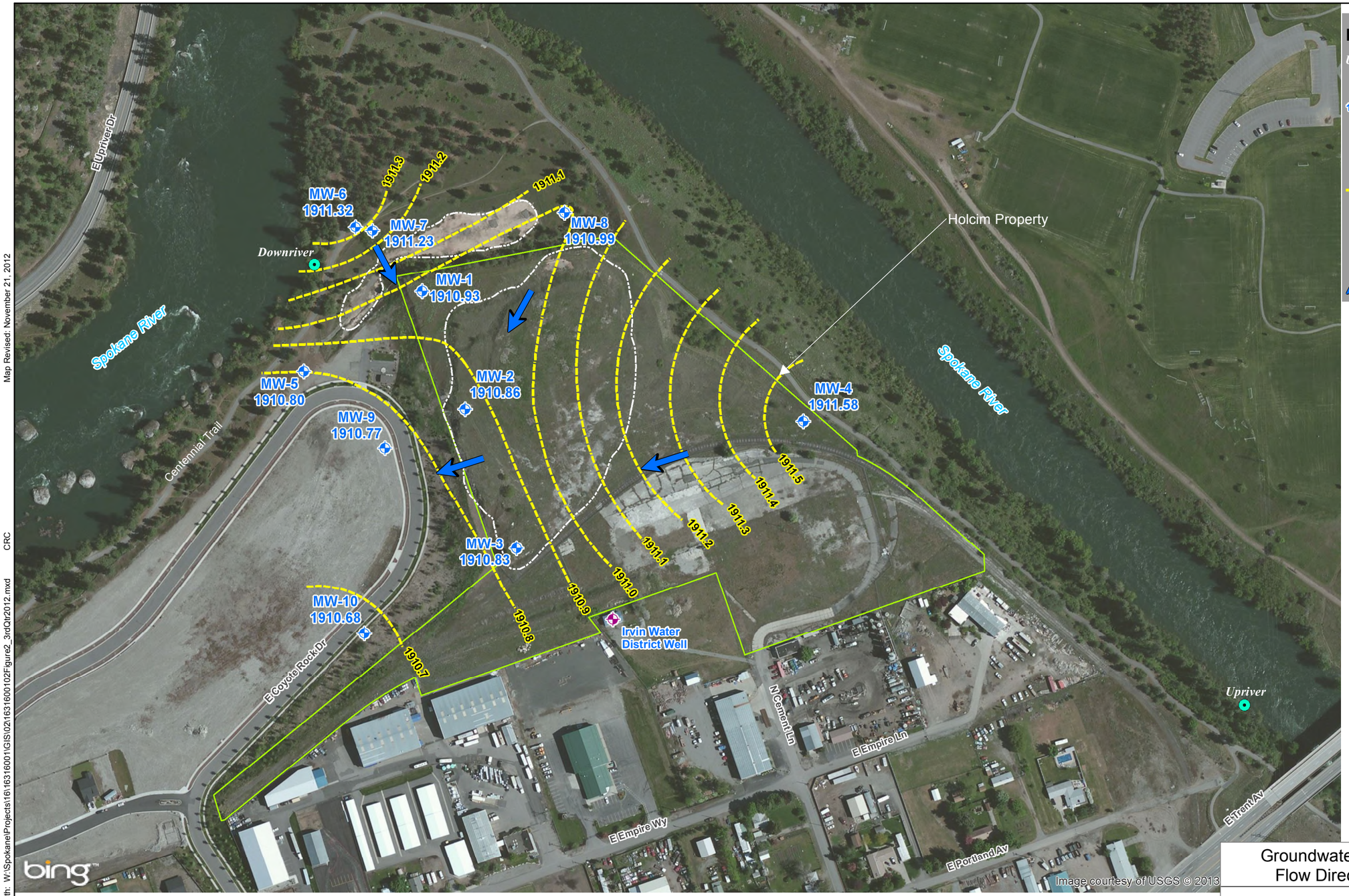
Pre-Demolition Site Layout and Current Parcel Boundaries

Holcim Inc. Site
Spokane Valley, Washington

GeoEngineers

Figure 3



Legend

- *Upriver* — Approximate location of Spokane River surface water sample
- MW-1 1910.93 — Monitoring well location, well number and groundwater elevation (feet)
- Water Supply Well
- Interpreted groundwater elevation contour, 0.1-foot interval (feet)
- Approximate Limits of Contiguous CKD Fill
- Holcim tax parcel boundary
- Interpreted groundwater flow direction

Reference:
Monitoring well locations were surveyed by Thomas, Dean & Hoskins, Inc.
X-Y coordinates of well locations are referenced to NAD-83 (1991 adjustment). Elevations are referenced to NAVD-88.
Aerial photo provided by Bing, ESRI Online Data Services. Tax parcel boundaries provided by Spokane County Tax Assessor's Office, downloaded April 16, 2007.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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Groundwater Elevations and Inferred Flow Directions, August 28, 2012

Holcim Inc. Site
Spokane Valley, Washington

GeoEngineers

Figure 4

Map Revised: November 21, 2012
Path: W:\Spokane\Projects\16\16316001\GIS\02\16316001\02Figure2_3rdQtr2012.mxd
OfficeLocation: SPOK CRC

Legend

- MW-1 — Monitoring well location and well number
- Water Supply Well
- Approximate Limits of Contiguous CKD Fill
- pH > 12.5. pH greater than 12.5 Designates a Dangerous Waste per Dangerous Waste Regulations.
- Metals Contamination in CKD Greater than MTCA Method A Cleanup Level
- PAH, Benzene, or GRPH contamination greater than MTCA Method A Cleanup Level
- Metals Contamination in Soil Greater than MTCA Method A Cleanup Level
- Holcim Property Boundary
- Tax Parcels

Reference: Aerial photo provided by ESRI Data Online. Tax parcel boundaries provided by Spokane County Tax Assessor's Office, downloaded September 20, 2011.

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Sample locations along north side of Spokane River are not shown on this map.
4. Metals include one or more of the following: arsenic, cadmium, and lead

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Areas Requiring Cleanup Action

Holcim Inc. Site
Spokane Valley, Washington

GeoEngineers

Figure 5

Map Revised: November 21, 2012
Path: W:\Spokane\Projects\16\16316001\GIS\02\16316001602_HolcimExplorations_Cleanup_Areas.mxd
CRC
OfficeLocation: SPO

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