Geosyntec
consultants

DRAFT
CLEANUP ACTION PLAN
Hexcel Parcels
KENT, WASHINGTON

August 31, 2018 (ECY rev 1-03-22)

Note: BSB CAP language & format incorporated into HXL's draft CAP.

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LIST OF ACRONYMS, ABBREVIATIONS, & TERMS

AO	Agreed Order
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BSB	B.S.B. Diversified Company, Inc. Property
CAP	Corrective Action Plan
CCA	Clear Creek Associates
cDCE	cis-1,2-dichloroethylene
CLARC	Cleanup Levels and Risk Calculation
CSM	Conceptual Site Model
CUL	Cleanup Level
Ecology	Washington State Department of Ecology
EISB	Enhanced In Situ Bioremediation
EO	Enforcement Order
FFS	Focused Feasibility Study
FRI	Focused Remedial Investigation
ft	Feet
Hexcel	Hexcel Corporation
Hexcel Parcels	Hexcel Parcels is inclusive of other non-source/residual contamination at the Site located hydraulically downgradient of Parcel G and north of South 200th Street
HGC	Hydro Geo Chem
Hytek	Hytek Finishes Company
gpm	gallons per minute
MCL	Maximum Contaminant Level
MDL	Analytical laboratory Method Detection Level
mg/kg	milligrams per kilogram (same as parts per million)
MNA	Monitored Natural Attenuation
MTCA	Model Toxics Control Act
O&M	Operations and Maintenance
Parcel G	Refers to B.S.B. Diversified, Inc. (BSB)
PCB	Polychlorinated Biphenyl
PV	Pore Volume
R	Retardation Factor
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
Site	Site means the same as "facility" (includes any area where a hazardous substance has come to be located).
SSPA	S.S. Papadopulos and Associates, Inc.

SVOC	Semi-volatile Organic Compound
TCE	Trichloroethene
TSDF	Treatment, Storage, Disposal Facility
EPA	Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
µg/L	micrograms per liter (same as parts per billion)

1.0 INTRODUCTION

1.1 Purpose

This *Cleanup Action Plan* (CAP) was prepared by Geosyntec Consultants on behalf of Hexcel Corporation (Hexcel) (see **General Location Map, Figure 1**), submitted to the Washington State Department of Ecology (Ecology), and then revised by Ecology. The CAP specifies the remedy for the non-source/residual contamination portions of the Kent Facility Site (Site) in Kent, Washington (see **Site Map, Figure 2**), which is principally on the Hexcel Plant 1 property and owned by Hexcel. The Hexcel Plant 1, located at 19819 84th Avenue South in Kent, Washington, includes Parcels A through E (see **Parcel Location Map, Figure 3**) and, is hydraulically downgradient of Parcel G, the B.S.B. Diversified, Inc. Property (BSB), which was historically the principal hazardous substances source area of the Site. Ecology previously selected a remedy for the BSB portion of the Site that has already been implemented. BSB is located on what is referred to as Parcel G[1].

This CAP specifies a remedy for the remediation of residual vinyl chloride (VC) in groundwater at Hexcel Plant 1, as well as other portions of the Site outside. This portion of the Site is referenced in this document as the "Hexcel Parcels[2]." The selected remedy for the Hexcel Parcels consists of monitored natural attenuation (MNA) with contingency for supplemental Enhanced In Situ Bioremediation (EISB). The CAP has been developed in accordance with the Model Toxics Control Act (MTCA) under Chapter 70.105D of the Revised Code of Washington (RCW) and Chapter 173 340 of the Washington Administrative Code (WAC). With the issuance of this CAP, a final remedy has been selected for of the Site.

The selected cleanup action is based on site-specific data provided in the Clear Creek Associates (CCA) 2018 Draft Focused Remedial Investigation (FRI) Summary Hexcel Plant 1, the 2018 Geosyntec Focused Feasibility Study (FFS) for Hexcel Plant, and documents referenced therein. The FRI and FFS documents are on file at Ecology's Northwest Regional Office located at 15700 Dayton Ave N, Shoreline, WA 98133-5910.

1.2 Document Organization

The work plan contains eight sections. The organization, structure, and the Site description follow the format used in BSB's CAP (B.S.B. Diversified, 2011, Exhibit A, Cleanup Action Plan). A brief description of each section is presented below.

- **Section 1 – Introduction.** Section 1 contains an overview of the CAP.

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- **Section 2 – Background.** Section 2 provides a summary of the Parcels A through G description and history, the investigations conducted, and the cleanup actions previously performed at the Hexcel Parcels and other areas addressed by this CAP.

- **Section 3 – Site Conditions.** Section 3 discusses the hydrogeology and groundwater conditions at the Hexcel Parcels.

- **Section 4 – Nature and Extent of Contamination.** Section 4 discusses the nature and extent of contamination in soil and groundwater at the Hexcel Parcels.

- **Section 5 – Risks to Human Health and the Environment.** Section 5 outlines contaminant sources, exposure pathways, and receptors to the Hexcel Parcels contamination.

- **Section 6 – Cleanup Standards.** Section 6 discusses groundwater CULs, points of compliance, and areas exceeding CULs.

- **Section 7 – Summary of Cleanup Action Alternatives Evaluated.** Section 7 presents the four cleanup action alternatives that were evaluated in the feasibility study.

- **Section 8 – Selected Cleanup Action.** Section 8 discusses the selected cleanup action, including the implementation approach and preliminary design considerations.

1.3 Declaration

In accordance with WAC 173-340-360(2)(a), the selected cleanup action meets the threshold requirements, is protective of human health and the environment, complies with applicable state and federal laws, and provide for compliance monitoring. The selected remedy is consistent with the preference of the State of Washington as stated in RCW 70.105D.030(1)(b) for permanent cleanup solutions.

1.4 Applicability

The cleanup standards and the selected cleanup action have been developed as an overall remediation process under Ecology oversight using MTCA authority; they should not be considered as setting precedents for other sites.

1.5 Administrative Record

The documents used to make the decisions discussed in this CAP are part of the administrative record for the Site. The entire administrative record for the Site is available for public review by

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appointment at Ecology's Northwest Regional Office. To review or obtain copies of the above documents, contact Sally Perkins (Public Disclosure Coordinator) at 206-594-0000.

2.0 BACKGROUND

2.1 Site Description

The Site includes Parcels A- G, as well as other non-source/residual contamination portions of the Site where Hazardous Substances have been deposited, stored, disposed of, placed, or otherwise come to be located, and former release locations of hazardous substances on Parcel G. Parcels A, B, C, D, and E are currently owned and controlled by Hexcel Corporation, located at 19819 84th Avenue South in Kent, Washington. Parcel F is currently owned and controlled by Carstens Carr Building, LLC, located at 8311 South 200th Street in Kent, Washington. Parcel G is currently owned and controlled by BSB, located at 8202 S. 200th Street in Kent, Washington (see **Parcel Location Map, Figure 3**). The other non-source/residual contamination portions of the Site include the area east of the Hexcel Parcels A-E (see **Site Map, Figure 2**).

Remedial action at the Site has been proceeding on different schedules, with different persons undertaking different remedial actions for different portions of the Site under three separate administrative orders. This work includes the source area and the non-source/residual contamination portions of the Site.

Source area: The FRI, FFS, and CAP have been completed with Parcel G (BSB), which is a source area of contamination. Parcel G is covered by Consent Decree No. 11-227288-5 (King County Superior Court, entered August 10, 2011) and an Ecology Dangerous Waste Management Permit ID #WAD076655182 for Remedial Corrective Action.

Non-source/residual contamination area: Hexcel's work at Parcels A through E are covered by MTCA Enforcement Order (EO) # DE2552 for the FRI and FFS. BSB and Hexcel are in a joint MTCA Order #DE2553 for a Downgradient Area Groundwater Investigation for the non-source/residual contamination portions of the Site outside of Parcels A-G.

The Hexcel FRI, FFS, and CAP cover the non-source/residual contamination portions of the Site.

2.2 Property Description

Hexcel is on King County Parcel No. 012204-9061 (the former Parcels A, B, C, D, and E), bounded on the south by South 200th Street, on the west by 81st Avenue South, on the north by South 196th Street, and on the east by 84th Avenue South located in Township 22 North, Range 4 East, Section 1H (latitude 47° 25' 22" North and longitude 122° 13' 51" West). The area surrounding the Hexcel Parcels is topographically flat and is zoned "Limited Industrial." Commercial and industrial park properties are located around the Hexcel Parcels. The Carr

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industrial facility (Parcel F) is located to the south of the Hexcel Parcels, and east and adjacent to Parcel G.

2.3 Property Ownership History

The Hytek Finishes Company (Hytek), a division of Criton Technologies, operated a metal finishing and electroplating plant at 8202 South 200th Street (now part of Hexcel). Criton Technologies also had an adjacent composite products manufacturing division named Heath Tecna Aerospace Company at 19819 84th Avenue South (also now part of Hexcel). This was an operating manufacturing facility.

The Hytek division ceased Treatment, Storage, and Disposal Facility (TSDF) operations regulated under the federal Resource Conservation and Recovery Act (RCRA) and Washington's Hazardous Waste Management Act in 1985.

In 1987, BSB obtained both the Hytek and Heath Tecna Aerospace divisions, currently referred as Parcels A through G (see **Parcel Location Map, Figure 3**). In 1988, BSB sold the Heath Tecna Aerospace division and Parcels A through F to the Phoenix Washington Corporation, a wholly owned subsidiary of Ciba-Geigy. The Phoenix Washington Corporation subsequently changed its name to Heath Tecna Aerospace Company. BSB relocated Hytek's operations and sold the division in 1989, retaining ownership of Parcel G.

In 1996, Hexcel had acquired Heath Tecna Aerospace Company, including Parcels A through F, and assumed obligations of Heath Tecna regarding Parcels A through F. This property has been used for industrial purposes since the mid-fifties. Parcel F, located adjacent to Parcel G to the east, was sold by Hexcel in August 2003 to Carr Prop II, LLC (and then later sold to Carstens Carr Building, LLC).

2.4 Historical Waste Treatment Operations

A variety of industrial and hazardous wastes that were generated on Parcels A through E were formerly treated and stored in a waste treatment area located on Parcel G. The waste treatment area was located in the northeast and southern portions of Parcel G; and within a parking lot, located in the northwest portion of the parcel. Waste handling reportedly occurred on Parcel G between the mid-1950s, when electroplating operations were begun on Parcels A through E, and 1985, when Hytek TSDF activities ceased.

Wastewater generated on Parcels A through E was transferred to Parcel G through pipes under South 200th Street (Hytek, 1985a). The pipe run entered the northeast corner of Parcel G and discharged into an equalizing lagoon; the discharged wastewater contained metals and inorganics. In 1981, approximately 40,000 gallons of wastewater was generated daily.

Parcel G housed impoundments, lagoons, and units for managing waste through treatment and disposal, including hazardous wastes. The wastes at Parcel G included chlorinated solvents, such

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as trichloroethene (TCE). Parcel G closed the storage and disposal units before 1988 (PES Environmental, Inc. (PES), 2005).

Parcels A through G were operated as a dangerous waste management facility on or after November 1980, when the facilities became subject to permitting under RCRA. Pursuant to a Post Closure Permit issued in 1988, BSB installed and operated a groundwater pumping system, which had extraction wells on the north side of Parcel G to control contaminated groundwater from that property and extraction wells on the east side of Parcels C, D, and E to prevent contaminated groundwater beneath Plant 1 from flowing off the Hexcel Parcels. BSB continued operating the system after Hexcel's acquisition of Parcels A through E.

In 2005 Ecology issued an Enforcement Order DE 2552 (EO) requiring Hexcel to take over operation of the portion of the groundwater extraction on the Hexcel Parcels and to conduct groundwater monitoring. The remedial actions at Hexcel Parcels are described in Section 5 of the FRI (CCA, 2018). The EO also required Hexcel to conduct and submit an FRI and an FFS.

While the FRI work was proceeding, BSB proposed a containment-based cleanup action for Parcel G (PES, 2008), which is considered to be the source of the contaminants on the Hexcel Parcels. Because the remedy on Parcel G would isolate the contaminant source and allow flushing and/or natural attenuation of the Hexcel Parcels' VC plume by ambient groundwater, it had the potential to result in a significant change in groundwater conditions at Plant 1 and to make some of the proposed FRI work unnecessary. Consequently, Ecology modified the FRI requirement in the EO in 2009 (Ecology, 2009). The modified FRI approach consisted of completing a vadose zone soil investigation, a compilation and evaluation of site investigation and monitoring data, and continued groundwater monitoring during the implementation of the BSB remedy. The Hydro Geo Chem (HGC) vadose zone soil investigation (HGC, 2010a) and the compilation and evaluation of site environmental data (HGC, 2010b) were submitted to Ecology in 2010.

In 2005, Ecology also issued Agreed Order No. DE 2551 (AO) to BSB for environmental actions on Parcel G, and in 2011, BSB entered into Consent Decree No. 11-2-27288-5 with Ecology. The Consent Decree implemented a partial Cleanup Action Plan for the Site, stipulating a remedy consisting of a surface cap and a sub-surface soil-bentonite cutoff wall for containment of contaminants on Parcel G, and the use of a zero valent iron reactor vessel or a carbon filter system to treat water removed from the containment zone for hydraulic gradient control. Construction of the Parcel G remedy was completed in 2012.

Hexcel conducted groundwater monitoring and operated the groundwater extraction system at Parcels A through E after the completion of the Parcel G remedy, which isolated the upgradient site contaminant source. Beginning in 2014, Hexcel conducted a sequence of shutdown tests at the CG-series groundwater extraction wells (the CG Well Shutdown Tests) and monitored water quality for any changes. The motivation for the shutdown of the groundwater extraction wells was

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that the groundwater being pumped met cleanup levels (CUL). Also in 2014, Hexcel implemented laboratory and field studies of in situ bioremediation and monitored natural attenuation. An Interim Action consisting of expanded pilot program utilizing EISB was implemented in 2017. The Hexcel Draft FFS proposed MNA with contingency for supplemental EISB as the cleanup action alternative to remediate VC present above cleanup standards in groundwater. A map of monitoring wells for the Hexcel Parcels is provided (see **Groundwater Monitoring Well Locations, Figure 4**).

2.5 Previous Investigations

Numerous site investigations have been conducted at the site over the past thirty years. The FRI Report (CCA, 2018) provides an account of the activities conducted from 1998 through 2017.

Section 4 of the FRI (CCA, 2018) summarizes these investigations, and provides a detailed account of more recent investigations and current conditions at the Hexcel Parcels. HGC Data Compilation and Evaluation (2010b) should be referred to if additional information is needed regarding the studies cited or data for specific contaminants. The description of historical conditions in the FRI is based on the following investigations and data sources reviewed by HGC (2010b).

- 1980-1981 EPA Site Investigation
- 1982 Hytek Phase 1 Investigation
- 1983-1984 Hytek Phase 2 Investigation
- 1984 Hytek Phase 3 Investigation
- 1985 Hytek Monitor Well Installation
- 1986 Hytek Soil Gas Survey
- 1987 Hytek Groundwater Investigation
- 1988 Hytek Polychlorinated Biphenyls (PCBs)
- 1989 BSB Pilot Recovery Program Investigation
- 1988 through 2005 Groundwater Monitoring by BSB
- 1992 Soil Sampling at Proposed Chemical Storage Facility
- 1995 Heath Tecna Facility Phase 1 Environmental Site Assessment
- 2000 Hexcel Facility Phase 1 Environmental Site Assessment
- 2002 Hexcel Facility Plant 1 Vaults Sludge and Water Sampling
- 2003 Hexcel Facility Source Investigation
- 2003 through 2009 Groundwater Monitoring by Hexcel
- 2003 Interim Technical Memorandum: Bioremediation Screening
- 2005 Interim Action Plan
- 2006 Hexcel Facility CNC Pad Soil Borings
- 2007 Development of Groundwater Cleanup Levels
- 2008 Deep Aquifer Investigation

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- 2008 Downgradient Area Groundwater Investigation
- 2008 Indoor Air Sampling at Plant 1
- 2009 Vadose Zone Soil Sampling
- 2010 Data Compilation and Evaluation, Hexcel Plant 1

In addition, subsequent Interim Actions extensively characterize the site geochemistry with respect to natural attenuation and feasibility of enhanced insitu bioremediation performance at the Hexcel Parcels. These interim actions were conducted from early 2014 through the summer of 2019. Section 2.6, Property Remediation, expounds on the details of these investigations by Geosyntec.

- 2015a Microcosm Study and Pilot Study Work Plan
- 2015b Update on Microcosm Study
- 2015c Work Plan Addendum: In Situ Bioremediation Pilot Test
- 2017 Enhanced In Situ Bioremediation Work Plan Addendum

2.6 Property Remediation

Section 5 of the FRI provides a comprehensive discussion of remedial actions performed at the Hexcel Parcels. The following is a summary of those actions.

From 1992 to 2009, BSB performed groundwater extraction at Parcel G via two wells (HYR-1 and HYR-2). The Parcel G groundwater extraction program removed contaminant mass, but did not provide complete control of contaminant migration onto the Hexcel Parcels. In 2012, BSB completed the installation of a low-permeability bentonite-soil slurry wall, significantly mitigating migration of residual chlorinated volatile organic compound (VOC) mass in the shallow aquifer onto the Hexcel Parcels.

Since 1992, groundwater extraction has been performed at the Hexcel Parcels through four groundwater extraction wells (CG-1 through CG-4). The remedy has provided hydraulic control of migration of dissolved VOCs and has also removed contaminant mass from the aquifer. Operation and performance have been documented in routine monitoring reports to Ecology. Following the control of the shallow aquifer source by BSB, and after consultation and approval by Ecology, Hexcel systematically turned off extraction wells as monitoring confirmed groundwater concentrations for VC fell below the MTCA A CUL (CCA, 2019). The four groundwater extraction wells were permanently shutdown in the following sequence: CG-1 on 5/8/2014; CG-2 on 9/4/2014; CG-3 on 2/5/2016; and, CG-4 on 12/22/2016. The CG-well shutdowns were done in advance of the expanded EISB pilot injections.

Naturally occurring biodegradation of TCE, cis-1,2-dichloroethylene (cDCE), and VC was described and investigated in 2003, as part of Hexcel's voluntary source investigation (HGC, 2003). The results of the assessment provided evidence that conditions were appropriate for biodegradation to be occurring at the site. Genetic marker testing in 2003 (HGC, 2004) confirmed

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the subsurface presence of Dehalococcoides, the primary microbe responsible for the dechlorination of VC and cDCE.

Following isolation of the Parcel G source, Hexcel implemented an EISB program to reduce concentrations of residual VOCs at the Site. The program included laboratory bench-scale testing that demonstrated the conceptual feasibility of EISB (Geosyntec, 2015a and 2015b). A pilot EISB injection study in the shallow aquifer in the vicinity of HEX-8 occurred in October 2015 followed by 6 months of groundwater monitoring (Geosyntec, 2015c). The positive results of the pilot test, including evidence of a viable microbial population and degradation of cDCE and VC, led to implementation of an expanded scale EISB field test (Geosyntec, 2017).

The expanded scale EISB field test was implemented in June 2017 in the area between PS-1 and CG-4 (see **Groundwater Monitoring Well Locations**, **Figure 4**). As of September 2019, the results of groundwater sampling (CCA, 2019) demonstrate the viability of EISB to reduce concentrations of residual VOCs; showing appropriate geochemical transitions, significant VOC reductions, and the production of ethene from the breakdown of VC (Geosyntec, 2018b). Groundwater monitoring for the expanded scale EISB field test continued through the second quarter of 2019 (Geosyntec, 2019).

3.0 SITE CONDITIONS

3.1 Environmental Setting

The Site lies in the Duwamish Valley between the Covington Plain on the east and the Des Moines Plain on the west. The Duwamish Valley is in the Duwamish-Green River Watershed, where major surface water bodies include the Green River, the Black River, the Duwamish River, Mill Creek, and Springbrook Creek. The closest surface water body to the Site is a ditch located about 2,000 feet northeast of the Hexcel Parcels (see **General Location Map, Figure 1**),

The Duwamish Valley is filled with over 300 feet of Quaternary alluvium interbedded with marine sand deposited after the last glaciation. Groundwater is found at shallow depths throughout the valley, with groundwater elevations in deeper wells generally higher than in shallower wells. Although 20 likely existing water supply wells were found within a 1-mile radius of the Hexcel Parcels, none are downgradient of the Hexcel Parcels. All water supply wells, with the exception of one well, are located east of Highway 167, and none are likely completed in the same hydrogeologic unit as the units investigated and monitored at the Hexcel Parcels.

3.2 Hydrogeology

Since the late 1980s, numerous environmental investigations (soil, soil gas and groundwater) have been completed at the Parcels A through E (CCA, 2018). The generalized

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hydrostratigraphy is a framework for the gross distribution of subsurface materials at Plant 1. Specific attributes of the units, such as average grain size, average thickness, and continuity, can vary spatially. The hydrogeologic units are presented in typical cross sections across Parcels A through E (see **East-West Cross Section**, **Figure 5**; and, **North-South Cross Section**, **Figure 6**). Material descriptions of the units and their relative permeability from the FRI (CCA, 2018) and the BSB CAP (B.S.B. Diversified, 2011, Exhibit A, Cleanup Action Plan) follow:

- Unit A is the shallowest unit and consists primarily of silt. Unit A extends from near the land surface to a depth of about 10 feet. The hydraulic conductivity of Unit A was reported by Sweet-Edwards/EMCON, Inc. (SEE)(1988) to be on the order of 1 x 10^{-4} centimeters per second (cm/s) or 0.3 feet per day (ft./day). Based on this information, the transmissivity of Unit A is approximately 3 feet squared per day (ft^2/d) or less.

- Unit B underlies Unit A and consists primarily of sand and silty sand. Unit B ranges in thickness from about 5 to 30 feet and extends to maximum depths of 35 to 40 feet below ground surface (bgs), and has been designated the Shallow Aquifer. Beneath the southern one-third of the Hexcel property, an intermediate silt (see Unit C, below) divides Layer B into two subunits. Beneath the northern two-thirds of the Hexcel property, the Unit C silt is only present discontinuous silt lenses. According to S.S. Papadopulos and Associates, Inc. (SSPA) (1993), Unit B is the most permeable unit beneath Plant 1 with an average transmissivity of 1,300 ft^2/day based on a single well test. This transmissivity and the range in thickness correspond to a hydraulic conductivity range of 43 to 260 ft/day. As a practical matter, SSPA (1993) found that a hydraulic conductivity range of 40 to 80 ft/day for Layer B best replicated the average behavior of measured water levels for calibration of a groundwater flow model of the area of Parcels A through G. SSPA (2003) changed the average hydraulic conductivity in the model to 51 ft/day during a subsequent model refinement.

- Unit C is present under Parcel G and the southern portion of the Hexcel Property at depths ranging from 35 to 40 ft bgs. Unit C consists of silt and silty sand. Unit C is not present on the northeast side of the Hexcel property (**North-South Cross Section**, **Figure 6**) or may be present only as discontinuous lenses as indicated by SSPA (1993). SSPA interpreted the transmissivity and hydraulic conductivity of Unit C to be on the order of 10 ft^2/day and 1 ft/day, respectively. Where present, Unit C is interpreted to be a low permeability layer that limits groundwater flow between Unit B and the underlying Unit D (PES, 2009b).

- Unit D is 10 to 30 feet thick and consists of sand to a depth of 65 to 70 ft bgs, and has been designated the Deep Aquifer beneath Parcel G. Both SEE (1988) and SSPA (1993) interpreted this unit to be less permeable than Unit B but more permeable than

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Unit C. The transmissivity of Unit D was reported to be 500 ft^2/day based on a single well test. SSPA (1993) identified calibrated transmissivities of 200 to 400 ft^2/day for Unit D and a corresponding hydraulic conductivity of 40 ft/day. Units B and D appear to form a continuous hydrogeologic unit north of the pinch-out of Unit C.

- Units E and F, underlying Unit D, consist of silty sand and silty clay, respectively. Unit F is an aquitard approximately 100 feet thick that separates the groundwater flow system in Units A to E from a deeper regional aquifer. Units E and F are not expected to contribute significantly to groundwater flow beneath the site. Similar to the Layer C silt, the silt and clay of transitional Layer E and Layer F serve as an aquitard to vertical groundwater flow and a restriction to the vertical transport of contaminants at the Hexcel Property.

3.3 Groundwater

3.3.1 Occurrence

Depth to groundwater at the Hexcel Parcels has varied from approximately 1.5 to 12 feet bgs, Water level fluctuations occur in response to seasonal changes in the distribution and rate of recharge and discharge throughout the region. Multiple water bearing zones have been identified, but the zones of primary groundwater flow and contaminant migration are the B- and D-Zones that are dominantly sand materials. The B- and D-Zones are separated by a silt layer beneath the Parcel G (see the Geologic Cross Sections in Figures 5 and 6). The silt layer does not extend to beneath the Hexcel Property, thus causing hydraulic communication between the B- and D-Zones.

3.3.2 Aquifer Properties

Horizontal hydraulic conductivities determined from a BSB short-term pumping test ranged from 43 to 56 feet/day (1.51×10^{-2} to 1.96×10^{-2} cm/s). An aquifer test conducted in a Layer D deep well on the Hexcel Parcels yielded horizontal hydraulic conductivity results of 57 to 85 feet/day (2×10^{-2} to 3×10^{-2} cm/s). BSB vertical hydraulic conductivity testing of the Layer B silt samples were 6.9×10^{-7} and 3.5×10^{-6} cm/s, respectively, and the vertical hydraulic conductivities of the Layer C silt samples were 1.3×10^{-7} to 2.6×10^{-7} cm/s. The vertical hydraulic conductivity of a Layer F soil sample collected east of 84th Avenue South was 3.6×10^{-7} cm/s.

3.3.3 Flow Direction and Velocity

Groundwater and surface water flow, generally, progresses northward toward Puget Sound. However, local fluctuations in groundwater direction occur. Historical groundwater flow direction varied from northeasterly to northwesterly depending on the operation of the Parcel G

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(HYR-1 and HYR-2) and the Hexcel Parcels (CG-1, CG-2, CG-3, and CG-4) groundwater extraction well systems. After the Parcel G soil-bentonite containment wall final remedy installation, and the shutdown of all of the groundwater extraction wells, equilibration of the groundwater flow around the containment wall was established. Monthly groundwater level measurement in the Hexcel Parcels shallow aquifer show a northerly to a slight northeasterly groundwater flow direction from 2017 through 2019.

Shallow groundwater beneath the Hexcel property flows in a northerly direction along the 81st Avenue South, and in a northwesterly direction along 84th Avenue South (see **Contour Map of Shallow Groundwater Elevations**, **Figure 7**). The Upper Layer D groundwater beneath the Site flows in a northerly direction Street (see **Potentiometric Surface, Upper Layer D**, **Figure 8**). The Lower Layer D groundwater beneath the Site flows in a westerly direction south of South 200th Street and in a northerly to westerly direction north of South 200th Street (see **Potentiometric Surface, Lower Layer D**, **Figure 9**).

Vertical hydraulic gradients are upward from the deep aquifer to the shallow aquifer. The flow directions in the deep aquifer in both, the upper and lower, portions of the deep aquifer beneath Parcel G is to the northeast (PES, 2017). The silt unit that separated the shallow and deep aquifers is only present on the southern end of the Hexcel Parcels (HGC, 2010b). The ambient groundwater flow gradient (i) is estimated to range from about 0.001 to 0.002 feet/feet. The groundwater seepage velocity (v) for groundwater flow based on site-specific data and estimated parameters suggest that groundwater migration velocities range from about 50 to 175 feet/year.

3.4 <u>Surface Water</u>

Northwest of the Hexcel Parcels is an engineered drainage ditch containing surface water that is tributary to Springbrook Creek. Surface flow in the ditch is northerly.

A consistent aspect of the groundwater elevation data in the vicinity of the ditch is a persistent northwest dipping hydraulic gradient indicating that if the ditch is a gaining reach it is recharged by groundwater from the east rather than groundwater flow from the vicinity of Plant 1. For this reason, there is no migration pathway between groundwater at Plant 1 and surface water.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 <u>Soil</u>

Soil analyses for both the vadose and saturated zones were evaluated with respect to MTCA Method A CULs for soil

4.1.1 **Vadose Zone Soil**

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Vadose zone soil investigations collected vadose zone soil samples for analysis of VOCs, PCBs, cyanide, metals, and petroleum hydrocarbons between 1984 and 2009.

4.1.1.1 Volatile Organic Compounds including methylene chloride and TCE were detected in some vadose zone soil samples at levels exceeding the MTCA Method A soil CUL during investigations in the 1980s. Subsequent investigations in 1991, 2003, and 2006 did not detect VOCs in soil at concentrations greater than MTCA Method A soil CULs for unrestricted land use. A vadose zone soil investigation conducted in 2009 as part of the phased FRI specifically sampled sites identified during the 1980s as having TCE detections greater than the MTCA Method A soil CUL (HGC, 2010a). The only TCE detection at these sites in 2009 was in one sample of vadose zone fill material beneath asphalt. The vadose zone samples collected in 2009 did not detect VOC soil concentrations in excess of MTCA Method A soil CULs nor did it replicate previously measured VOC concentrations. VOCs are not considered constituents of concern in vadose zone soil due to their lack of occurrence and their low concentration when detected.

4.1.1.2 The following metals were detected in vadose zone soil samples from various locations: arsenic, barium, total chromium, and lead. Hexavalent chromium was not detected. The concentrations of the metals detected in the vadose zone soils were below the MTCA Method A soil CULs for industrial properties for those metals with CULs. Based on the lack of metals concentrations in excess of MCTA CULs for soils, (HGC, 2010b) metals are not constituents of concern in vadose zone soil.

4.1.1.3 Cyanide was not detected in any of the discrete or composite vadose zone soil samples (HGC, 2010b).

4.1.1.4 HGC (2010b) evaluated Polychlorinated Biphenyls (PCBs) data with respect to the MCTA Method A soil cleanup level for industrial uses at the former Hytek building. Ecology's SITE97 statistical analysis tool was used to calculate a lognormal 95 percent upper confidence level mean concentration of 4.5 mg/kg. PCBs were detected at less than the MTCA Method A soil CUL for industrial use of 10 mg/kg. PCBs are not a constituent of concern in vadose zone soil at the former Hytek building (OHM, 1988a, and HGC, 2010b).

4.1.1.5 Petroleum Hydrocarbons were not detected in excess of MTCA Method A soil CULs for unrestricted land uses, and are not constituents of concern (HGC, 2010b).

4.1.2 Saturated Zone Soil

Saturated zone soil investigations between 1984 and 2006 collected saturated zone soil samples for analysis of VOCs, Semivolatile Organic Compounds (SVOCs), metals, and petroleum hydrocarbons. The sampling was conducted for various environmental investigations and in accordance with the EO.

4.1.2.1 Volatile Organic Compounds that exceeded MTCA soil CULs in historical saturated zone soil samples were methylene chloride and TCE. All other VOCs were at

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concentrations lower than applicable MTCA soil CULs. Methylene chloride was detected above MTCA soil CULs in three samples collected in 1984, but did not exceed soil CULs between 1987 and 2006. Methylene chloride is not considered a constituent of concern in saturated zone. TCE was detected at concentrations exceeding MTCA Method A soil CULs in 7 of 32 samples collected between 1984 and 2006. TCE is not considered a constituent of concern in saturated zone soil due to its low detection frequency and no detection of TCE in groundwater samples at Parcels A through E.

4.1.2.2 SVOCs were not detected in saturated zone soil samples collected (HGC, 2010b) and not a constituents of concern in saturated zone soils.

4.1.2.3 Metals detected in the saturated zone soil include arsenic, barium, total chromium, and lead at concentrations below the MTCA Method A soil CULs for industrial properties for constituents with CULs. Silver, cadmium, hexavalent chromium, mercury and selenium were not detected at minimum detection limits below MTCA soil CULs. With concentrations below MCTA soil CULs (HGC, 2010b), metals are not constituents of concern in saturated zone soil.

4.1.2.4 Petroleum Hydrocarbons including BTEX, gasoline-range, diesel-range, kerosene-range, and lube oil-range petroleum hydrocarbons were not detected in saturated zone soil samples collected in 2006 (HGC, 2010b). The detection limits for all analyses were below the applicable MTCA Method A soil CULs. Petroleum hydrocarbons are not considered to be constituents of concern.

4.1.3 Soil Gas

Soil gas sampling was conducted during two investigations. An investigation in 1986 detected DCE and TCE, but there are no MTCA guidelines for soil gas with which to compare these historical data. A soil gas survey beneath the Hytek building in 2003 detected acetone, 1,1-DCE, 2-butanone, cDCE, toluene, TCE, perchloroethene, and m,p-xylenes in more than 50 percent of the samples. None of the detected concentrations exceeded Occupational Safety and Health Administration or National Institute for Occupational Safety and Health permissible exposure limits for an 8-hour work day. The maximum total soil concentrations of VOCs determined from equilibrium partitioning calculations were less than potentially applicable MTCA Method A soil CULs. VOCs in soil gas are not considered constituents of concern due to their low concentrations with respect to permissible exposure limits and MTCA soil CULs.

4.1.4 Indoor and Outdoor Air

Indoor air sampling was conducted in 2008 to evaluate whether the groundwater VOC plume and soil gas levels beneath Parcels A through E posed a threat to workers from migration of VOCs in indoor air (HGC, 2008). Prior to sampling a screening level analysis determined that VC and TCE were the only VOC's that posed a risk based on their concentrations in groundwater or soil gas samples (HGC, 2007a).

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All VOC concentrations in the eight indoor and two outdoor air samples were below the Washington Industrial Safety and Health Act (WISHA) limits. VC was below detection limits in all of the indoor and outdoor samples at detection limits ranging from 0.26 $\mu g/m^3$ to 4.1 $\mu g/m^3$; well below the WISHA limit of 2,600 $\mu g/m^3$. TCE was detected in 3 indoor samples and 2 outdoor samples at concentrations between 1.2 μg/m3 to 1.8 $\mu g/ m^3$; well below the WISHA limit of 273,287 $\mu g/ m^3$.

The results of VOC sampling of indoor air at Parcel A through E indicated that VC was below detection limits and TCE was 4 to 5 orders of magnitudes less than the WISHA limits. The absence of VC in all samples indicates that VC flux by vapor intrusion does not occur or that it occurs only in negligible amounts. The occurrence of TCE at equivalent concentration in both indoor and outdoor air samples indicates that TCE in the indoor samples is likely derived from ventilation with outdoor air. The indoor and outdoor air TCE concentrations were consistent with background concentrations reported elsewhere for indoor and outdoor air (Washington State Department of Health, 2002). Based on the data from indoor and outdoor air sampling, HGC (2010b) concluded that the vapor intrusion pathway at Plant 1 is absent or negligible given the current land use.

4.2 Groundwater

HGC (2010b) reviewed and provided a compilation of analytical results for the Hexcel Property groundwater monitoring wells from 1982 through October 2009. Constituents monitored at one time or another in groundwater samples at the Hexcel Property included VOCs, SVOCs, metals, cyanide, PCBs, and organochlorine pesticides. In addition, groundwater monitoring data was collected in the Hexcel Parcel wells east of the Hexcel Property boundary (see list of reports below) and immediately outside and along the northern side of the Parcel G Soil-Bentonite containment wall. The Hexcel Property data results of the analysis of compiled groundwater data for SVOCs, metals, cyanide, PCBs, and organochlorine pesticides were as follows:

- HGC (2010b) concluded that SVOCs, not present in the groundwater samples, are not constituents of concern at the Hexcel Parcels.
- HGC (2010b) identified arsenic as the only metal detected at elevated concentrations in groundwater with respect to a MTCA Method A CUL for groundwater or an US Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) for drinking water. The only persistent occurrences of elevated arsenic were localized at upgradient wells HY-2, HY-4, and HEX-2 at the south end of the Hexcel Property. HGC (2010b) concluded that arsenic is not a constituent of concern because the groundwater sample concentrations in the Hexcel Property wells are similar to the background concentrations that exceed the MTCA Method A groundwater CUL related to a natural or an area-wide phenomenon.

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- HGC (2010b) concluded that cyanide is not a constituent of concern at the Hexcel Property based on its low detection frequency in groundwater samples.
- HGC (2010b) concluded that PCBs, which were not detected in the groundwater samples at the Hexcel Property, are not a constituent of concern in groundwater.
- HGC (2010b) concluded that organochlorine pesticides, which were not detected in the groundwater samples at the Hexcel Property, are not constituents of concern at the Hexcel Parcels in groundwater.

Additional Shallow Aquifer Groundwater Monitoring Investigation work includes:

- PES Environmental, Inc. 2007. Downgradient Area Groundwater Investigation Final Report, Agreed Order No. DE2553, Kent, Washington. February 14, 2007.
- PES Environmental, Inc. 2008. Downgradient Area Groundwater Investigation Final Report, Agreed Order No. DE2553, Kent, Washington. January 22, 2008.
- PES Environmental, Inc. 2015. Attachment B - Technical Memorandum, Shallow Aquifer Cleanup Action, BSB Property Consent Decree No. 11-2-27288-5, Kent, Washington. February 20, 2015.
- PES Environmental, Inc. 2019. Cleanup Progress Report, Second Quarter 2019, BSB Property, Kent, Washington, Consent Decree No. 11-2-27288-5. July 17, 2019.
- Geosyntec Consultants 2019. Second Quarter 2019 Eighth Quarter Monitoring Event, Enhanced *In Situ* Bioremediation Monitoring Report, Hexcel Plant 1 Facility, Kent, Washington, September, 2019.
- Clear Creek Associates. 2019. Environmental Monitoring Report September 2019, Hexcel Plant 1 Facility, Kent, Washington. December 5, 2019.
- Clear Creek Associates. 2021. Environmental Monitoring Report September 2019, Hexcel Plant 1 Facility, Kent, Washington. December 5, 2021.

Additional Parcel G Deep Aquifer Groundwater Monitoring Investigation work includes:

- PES Environmental, Inc. 2015. Technical Memorandum Parcel G Deep Aquifer Monitoring, BSB Property, Kent, Washington. February 20, 2015.
- PES Environmental, Inc. 2017. 2016 Data Transmittal and Summary, Parcel G Deep Aquifer Monitoring, BSB Property, Kent, Washington. April 7, 2017.

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4.2.1 Volatile Organic Compounds - Shallow Aquifer

The primary VOCs that have occurred in groundwater samples from shallow aquifer wells at levels potentially exceeding applicable standards are cDCE, VC, and TCE. TCE is an important VOC because nonaqueous phase TCE in groundwater at Parcel G acted as a source that resulted in elevated concentrations of TCE, cDCE and VC at the downgradient Hexcel Parcels. VC and cDCE are degradation byproducts of TCE, formed by the naturally occurring dechlorination of TCE in the subsurface.

Comparing the Hexcel Parcels historical distributions of VC, cDCE, and TCE with the current conditions indicates that there is a substantial reduction in the size of the groundwater plumes for these VOCs over time. The shrinkage of the plumes is due to natural attenuation and groundwater remedial actions between 1992 to present, which removed contaminant mass, isolated the source at Parcel G, and cut off the mass loading of dissolved VOC contaminants into the downgradient groundwater from Parcel G. Historical Shallow Aquifer Concentrations for VC, cDCE and TCE are shown in Figures 10, 11, and 12.

TCE, cDCE and VC are the VOCs detected historically in excess of potentially applicable standards in groundwater at the Hexcel Parcels. Historically, TCE has been detected in five Shallow Aquifer wells HEX-1, HEX-3, HEX-4, HEX-5, and HEX-6. Only monitoring well HEX-1 has TCE concentrations exceeding the MTCA A CUL of 5 µg/L. The highest HEX-1 monitoring well TCE concentration measured was 300 µg/L from groundwater samples collected on 3/4/2011. Subsequent monthly groundwater sampling and analysis showed a significant, and rapid decline in the HEX-1 TCE concentrations to below the MTCA A CUL within six months. TCE concentrations fell below the analytical laboratory Method Detection Level (MDL), and remained below the MDL, since January, 2012 (CCA, 2019).

All TCE concentrations detected in the other four Shallow Aquifer wells (HEX-3, HEX-4, HEX-5, and HEX-6) were lower than the MTCA A CUL. All concentrations in these four wells have remained below the MDL since January 2012 (CCA, 2019). The predominance of the TCE observations occurred during the time period when construction work took place at Parcel G for their final cleanup remedy. Dewatering performed for the Parcel G final remedy construction is assumed to have mobilized absorbed, residual TCE. The TCE was not detected before the construction dewatering and was not detected six-months after the dewatering finished.

As described by HGC (2010b), the number and magnitude of VOCs detected in groundwater decreased with time. Early groundwater monitoring detected methylene chloride, trans-1,2-DCE, 1,1-dichloroethene, and benzene in excess of potentially applicable standards. None of these constituents have been detected in excess of the MTCA Method A groundwater CULs in the Hexcel Parcel wells since October 2001. Groundwater monitoring analytical data indicate that cDCE is no longer a constituent of concern at the Hexcel Parcels, having been reduced to

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concentrations less than the CUL since 2014. Subsequent downgradient groundwater quality monitoring by PES (2019), Geosyntec (2019), and Clear Creek (2019) confirm these observations.

VC in groundwater remains a constituent of concern and is being addressed by natural attenuation and in situ biological remediation The historical and current remedial actions at the Hexcel Property are described in Section 5 of the FRI (CCA, 2018), in the Geosyntec (2019) Enhanced *In Situ* Bioremediation Monitoring Report, and summarized in Section 2.6 of this CAP. The 2021 groundwater quality monitoring data (PES, HGC, and CCA) show VC plumes substantially contained within the property boundary of the Hexcel Plant 1 Parcels. The multiple years of monthly, shallow groundwater contour maps indicate that the groundwater flow direction maximizes the natural attenuation time of the VC plume beneath the Hexcel Parcels in the shallow aquifer. The predominant groundwater flow path restricts the remnant VC groundwater plume to the boundaries of the Hexcel Parcels.

Site groundwater pH measurements range from 6.15 to 8.18, or from slightly acidic to slightly alkaline. The redox potential measurements range from -189 to -15.7 millivolts; indicating that reducing conditions predominate in the shallow aquifer. The data show that groundwater in the VC plume is circumneutral and reduced, which are chemically favorable for the reductive dechlorination of VC (Wiedemeier et. al., 1996). The subsequent downgradient groundwater quality monitoring by PES (2019), Geosyntec (2019), and Clear Creek (2021) confirm these observations, and indicate that VC is now the only VOC detected in excess of applicable MTCA A standards in the shallow groundwater at the Hexcel Parcels and centrally located on the Hexcel property for non-source/residual contamination portions of the Site.

4.2.2 Volatile Organic Compounds - Deep Aquifer

Monitoring wells in the deep aquifer were installed along the upgradient boundary of the Hexcel Parcels in response to the discovery of deep aquifer contamination at Parcel G, as described by PES (2010) and CCA (2011). Groundwater samples from some of the new aquifer wells installed after 2008 had exceedances of the VC groundwater CUL. The results of groundwater monitoring in the deep aquifer at the Hexcel Parcels are nearly all below CULs. Parcel G groundwater sampling downgradient, and outside of the containment wall along the south side of South 200th Street at HYCP-2d, HYCP-7d and HY-102 have no detections of VC from 2012 through 2016 (PES, 2017). Hexcel Parcels groundwater sampling downgradient of Parcel G, along the north side of South 200th Street at HEX-10, HEX-11, HEX-13, HEX—14 and HEX-15 have no VC detections above the VC MTCA A CUL from 2018 (years since no VC detections at the following wells: HEX-10 (2018); HEX-11 (2013); HEX-13 (2012); HEX-14 (2011); and, HEX-15 (2015). VC is detected at HEX-12. The VC concentration continues to decrease with time from a value of 20 µg/L in 2011 to 0.47 µg/L in 2021.

4.2.3 Concentration Trend Analysis for VC

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Since 2012, there have not been any detections of TCE (CCA, 2021). Since 2014, there have been no detections of cDCE above the EPA MCL (CCA, 2021). There is no MTCA Method A CULs for cDCE in groundwater (**WAC 173-340, Table 720-1, May, 2019**). As described in detail within the FRI, the primary source of chlorinated solvent impacts to the local environment occurred at the disposal sites on Parcel G (CCA, 2018). The interior well HEX-8 typically had the highest VC concentrations. The figures and tables in the September 2021 CCA Environmental Monitoring Report summarize historical and the September 2021 groundwater sampling results. These figures and tables provide historical concentrations trends of cDCE and VC at the following Shallow Aquifer groundwater quality monitoring wells at the Hexcel Parcels: CG-1 to CG-4; HEX-1-to-10; HY-7s, HY-7ss, Ks, and HY-9; and at the following deep aquifer wells: HEX-10 to HEX-15.

VC is the sole remaining constituent of concern (see FRI Section 4.2.2; CCA, 2018). The EISB expanded-scale pilot interim action has demonstrated a significant reduction in VC concentrations within the portion of the aquifer containing a residual zone of groundwater. This residual zone contained concentrations greater than 1 µg/L VC, including wells CG-4 and HEX-8.

In September 2021, VC was the only VOC detected at Plant 1 above the groundwater CUL (CCA, 2021). As shown in graphs of historical concentration data (**Appendix C.2 Tables; Figures 4-9**; CCA, 2021), VC concentrations have declined over time. All the wells have downward trending concentrations towards the VC MTCA A CUL or are already below the VC MTCA A CUL. Seven groundwater monitoring wells exceeded the MTCA Method A groundwater CUL of 0.2 µg/L, six shallow wells and one deep well (shallow wells HEX-3, HEX-4, HEX-6, HEX-7, HEX-9, and HY-7ss; deep well HEX-12 (CCA, 2021)). VC concentrations in the other groundwater monitoring wells at the Hexcel Parcels are less than the 1.0 µg/L MCL. The time series graphs show that VC concentrations declined by two to three orders of magnitude in many wells since 2003 and that concentrations in 2021 are at historically low levels (CCA, 2021).

The VC concentrations at the Hexcel Parcels have declined to non-detect (i.e., no detection down to the MDL) at the downgradient CG wells located on the eastern boundary of the Hexcel Parcels, along the western side of 84th Avenue South. Due in part to the intrinsic biodegradation of VC in the shallow aquifer at the Hexcel Parcels, natural attenuation reduced VC concentrations in wells CG-1, CG-2, CG-3, and CG-4 from as high as 750 µg/L in 1996 to less than the MTCA Method A CUL of 0.2 µg/L and eventually below the MDL (CCA, 2019). Groundwater monitoring wells HY-9, Ks and Ki (see **Parcel Location Map, Figure 3**), also located on the eastern boundary of the Hexcel Parcels along the eastern side of 84th Avenue South, have VC concentrations below the MTCA A CUL (wells HY-9 and Ki) or below the MDL (well Ks). The September 2021 Hexcel Environmental Monitoring Report (CCA. 2021) groundwater quality data confirms this conclusion with VC concentrations in both HEX-8 and CG-4 less than the MTCA Method A cleanup level of 0.2 µg/L (see **Table 1**).

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There is a decreasing trend in the concentration of VC in groundwater in samples from wells along South 200th Street, on the upgradient boundary of the Hexcel Parcels (shallow wells HEX-1, HEX-2, and HEX-3; and, deep wells HEX-10 through HEX-14). Only wells HEX-3 and HEX-12 have VC concentrations greater than the MTCA A VC CUL at 0.30 µg/L and 0.47 µg/L, respectively, based on the September 2021 groundwater quality samples collected (CCA, 2021). This data indicates the presence of back diffusion into groundwater from the fine grained soil matrix beneath the Hexcel Parcels or an ongoing loading of VC from offsite sources.

Shallow groundwater monitoring wells HEX-4 and HEX-5, located along 81st Avenue South on the western boundary of the Hexcel Parcels, also show a decreasing trend in the concentration of VC in groundwater in samples collected from these wells. The September 2021 VC concentrations for these wells are 0.31 µg/L and 0.11 µg/L respectively (CCA, 2021).

Interior groundwater monitoring wells (shallow wells HEX-6 through HEX-9, HY-7s and HY-7ss, and deep well HEX-15) exhibit a decreasing trend in the concentration of VC in groundwater samples collected. VC concentration data for HY-7s and HY-7ss illustrate large declines since the 1990s. VC concentrations at shallow wells HY-7s and HEX-8, and deep well HEX-15 are now below the MTCA A VC CUL (deep well HEX-15 has been below the MDL since 11/2010). The groundwater VC concentrations for other shallow wells are relatively close to the MTCA A VC CUL (HEX-6, 0.55 µg/L; HEX-7, 0.36 µg/L; HEX-9, 0.25 µg/L; and HY-7ss, 0.22 µg/L (CCA, 2021)).

The VC concentrations in the deep wells, with the exception of HEX-12, are now below the MTCA A VC CUL (CCA, 2021). The VC occurrence in deep aquifer HEX-12 is due to groundwater flow from Parcel G to Hexcel Parcels. PES (2011) provides a detailed review of water quality conditions in the deep aquifer on Parcel G.

The concentration of VC in groundwater flowing beneath the Hexcel Parcels is expected to be reduced to less than the groundwater CUL by the downgradient Hexcel Parcels' boundary through natural attenuation and, if necessary, the use of EISB. There is no potential for a downgradient offsite exposure because the future Corrective Action Plan will use monitored natural attenuation, possibly augmented by EISB, to reduce VC to acceptable levels. There is no potential for future residential and recreational exposures to VC in groundwater at the Hexcel Parcels because an environmental covenant would place deed restrictions on the types of acceptable land use and would inform future owners of environmental conditions .

4.3 Surface Water

Hexcel monitored water quality in samples from the ditch pursuant to the FRI work plan (HGC, 2005).

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- Twenty-one grab samples were collected from surface flow in the ditch between 2005 and 2013 and analyzed for VOCs. VOCs were not detected in any of the samples except for trace levels of common laboratory contaminants (see Appendix B of CCA, 2017 for data). Sampling of the ditch water was suspended with the permission of Ecology (Ecology, 2014).

Water elevation data indicate that the ditch is not on a flow path from Plant 1 and water quality sampling from the ditch over 10 years did not detect VOCs.

5.0 RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

5.1 Contaminant Sources and Migration Mechanisms

The FRI and FFS Reports presented a detailed evaluation of risk and exposure pathways for groundwater, soil, soil gas (i.e., potential vapor intrusion (VI) pathway), and surface water. The results of the evaluation are summarized as follows:

- **Groundwater** – Groundwater at, or potentially affected by the site, is not currently being used as drinking water and is not a reasonable future source of drinking water. The drinking water pathway is, therefore, incomplete.
- **Soil** – There is no evidence of the presence of VC in the soils exceeding soil screening levels. Thus, there are no unacceptable potential exposures associated with VC in soil.
- **Soil Gas** – No unacceptable indoor air exposures were identified for current or future land use.
- **Surface Water** – There is no evidence of the presence of VC in surface water, thus there is no risk associated with the potential exposure pathways and receptors identified in the FRI Report (CCA, 2018).

5.2 Exposure Pathways and Receptors

The conceptual site model (CSM), identifies the types and concentrations of hazardous substances, potential sources of hazardous substances, potentially contaminated media, and potential exposure pathways to provide a conceptual tool for decision making (WAC 173-340-

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200). This CSM for the shallow aquifer at Plant 1 (HGC, 2005) based on information in the data compilation and evaluation (HGC, 2010) and the data from the FRI (CCA, 2018).

5.3 Potential Hazardous Substances

The potential hazardous substance associated with the Hexcel Parcels is VC. Although various VOCs have been present historically, VC is the only VOC that occurs at current concentrations exceeding MTCA Method A CULs for groundwater. In September 2021, the detectable concentrations of VC measured in samples from the Hexcel Parcels wells ranged from < 0.075 to 0.6 µg/L. VC concentrations in groundwater are highest in the vicinity of well HEX-6. cDCE is often associated with VC in groundwater at concentrations less than the MTCA A CUL.

5.4 Potential Sources of Hazardous Substances

Potential historical sources of VOCs at Plant 1 are related to the leaks or disposal practices from the historical operations at the Hytek building and conveyances to Parcel G. There is no evidence of a current source at the Hexcel Parcels.

The VC and cDCE at the Hexcel Parcels are from a residual plume of contaminants from Parcel G. These VOCs were reduced through groundwater extraction remedial actions at Parcel G and Plant 1 between 1992 and 2016. A soil-bentonite containment wall was installed in 2012 at Parcel G to isolate the upgradient source. Groundwater flow to the upgradient boundary of the Hexcel Parcels still contains low levels of VC and cDCE due to residual contamination outside of the Parcel G isolation system (CCA, 2018). Natural attenuation is reducing the VC and cDCE to less than CUL as groundwater flows across the Hexcel Parcels.

5.5 Potentially Contaminated Media & Migration Mechanisms

The results of investigations and samplings of groundwater, saturated and vadose zone soils, soil gas, and indoor air are summarized in the FRI (HGC, 2010). The data indicate that groundwater containing VC is the primary contaminated media.

VC in groundwater is partitioned between the aqueous phase and aquifer material based on factors such as the contaminant concentration, contaminant specific partitioning coefficients, and the grain size and organic carbon content of soil. For this reason, areas with VC in groundwater can store and release VC within saturated soil, depending on the relative concentration gradients and chemical contrasts of the groundwater and aquifer solids. VC in groundwater can also

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partition into the vapor phase at the interface between the groundwater surface and unsaturated soil.

VC in groundwater at Hexcel Parcels is destroyed by naturally occurring biodegradation as described in the FRI (HGC, 2010). The degradation products of VC are the nonhazardous substances of ethene and carbon dioxide.

5.6 Potential Exposure Pathways

The VC contained in groundwater can migrate with the ambient groundwater flow system, sorb to sediment in the saturated zone, volatilize into soil gas in the vadose zone above the water table, or be destroyed by biologically mediated reductive dehalogenation.

Potential exposure points and exposure routes for VC are constrained by the current and future land uses at Plant 1. The current and planned future use of the Hexcel Plant 1 property is as an industrial facility for manufacturing. Potential receptors at Plant 1 would be adult workers that could come into contact with VC bearing environmental media during workplace activities. VC does not occur in downgradient the Hexcel Parcel wells east of the Hexcel Property at concentrations exceeding the MTCA Method A groundwater cleanup. The potential for an an exposure east of the Hexcel Property is negligible because the VC plume exceeding the groundwater cleanup standard is restricted to the Hexcel Plant 1 property and is not expected to migrate to the downgradient Hexcel Parcels in the future.

5.6.1 **Groundwater**

VC dissolved in groundwater can migrate by advection, dispersion, and diffusion. The concentration of VC in groundwater is reduced naturally by reductive dechlorination to destroy VC and dilution to reduce VC mass per unit volume of water. Both of these processes are active at Plant 1 and work to reduce the concentrations of VC in groundwater flowing beneath the Plant 1 property. Groundwater flow directions beneath the Hexcel Parcels are northerly (CCA, 2018).

Exposure to VC in groundwater at the Hexcel Parcels is limited to activities that can potentially bring workers in contact with groundwater, such as groundwater sampling and excavation below the water table. Dermal contact, ingestion and inhalation would be the potential exposure routes for VC affected groundwater. The risk of contacting, ingesting, or inhaling vapors from affected groundwater is negligible during groundwater sampling and construction because health and safety precautions are required and followed as a matter of standard operating procedure during

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those activities. The health and safety precautions include hazard recognition awareness and personal protective equipment training for the prevention of exposure to hazardous chemicals.

5.6.2 Saturated Zone Soil

Exposure to saturated zone soil containing sorbed VC is a possibility for construction activities that involve excavation below the water table, such as excavation, trenching, or drilling. Dermal contact, ingestion and inhalation are the potential exposure routes for affected saturated zone soil. The risk of contacting, ingesting, and inhaling vapors volatilizing from saturated soil during construction activities is negligible because health and safety precautions are followed as a matter of standard operating procedure. The health and safety precautions include hazard recognition awareness and personal protective equipment training for the prevention of exposure to hazardous chemicals.

5.6.3 Site Conceptual Model Summary

In summary, low levels of VC in groundwater and soil beneath the Hexcel Parcels are due to a residual groundwater contaminant plume from Parcel G. VC concentrations are declining due to installation of the Parcel G remedy, natural attenuation, and spot treatment with EISB. The majority of the Hexcel Parcels is paved or covered by buildings, which makes access to the subsurface limited except in the cases of subsurface environmental sampling or certain construction activities. Potential exposure to VC affected groundwater and saturated soil is limited to work activities for which health and safety protocols are established.

6.0 CLEANUP STANDARDS

Cleanup standards consist of three components:

- CULs (chemical concentrations);
- Points of compliance (at which the CULs must be met); and,
- Additional regulatory requirements.

Typically, preliminary cleanup standards are developed during the FRI, proposed cleanup standards for remedial alternative evaluation are presented in the FFS, and final cleanup standards are established during the CAP development process. The cleanup standards proposed in the FRI (CCA, 2018) and FFS Report (Geosyntec, 2018a) were developed in accordance with WAC 173-340-700 through -730. Based on Ecology's acceptance of the FRI and FFS Reports, the cleanup standards proposed in the FRI and FFS Reports will be the final cleanup standards for the site. The cleanup standards are presented in the following sections.

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6.1. IDENTIFICATION OF ARARS

MTCA requires that all cleanup actions comply with applicable state and federal laws (WAC 173-340-360(2)). MTCA defines applicable state and federal laws to include "legally applicable requirements" and "relevant and appropriate requirements." The Applicable or Relevant and Appropriate Requirements (ARARs) for the site are presented in **Table 2**.

6.2. CLEANUP LEVELS

The regulations implementing MTCA, Chapter 173-340 WAC, require groundwater CULs to be based on the highest beneficial use of the water under current and future conditions. The regulations presume that the highest beneficial use of groundwater at any site will be drinking water, per WAC 173-340-720(1). Based on evaluation of potential exposure pathways, the development of CULs for VC was limited to groundwater and groundwater to surface water pathways. Groundwater cleanup criteria were developed to be adequately protective of human health and aquatic organisms, and of humans that ingest these organisms. MTCA Method A groundwater and surface water CULs were compiled in accordance with WAC 173-340720(4) and WAC 173-340-730(3). The groundwater CULs are presented in **Table 3**.

The selection process required that the most stringent CUL from the groundwater and surface water ARARs be selected. As detailed in the FFS Report (Geosyntec, 2018a), the most stringent ARAR for VC in groundwater is 0.20 µg/L, which is the MTCA Method A standard formula value (**Table 3**).

6.3. POINTS OF COMPLIANCE

The point of compliance is defined by MTCA as the point or points where CULs shall be achieved (WAC 173-340-200). The point of compliance (POC) refers to the point or points where cleanup levels will be attained. The hydrogeology, natural geochemistry and nature of groundwater contamination on the Property (FRI, Clear Creek, 2018 and FFS, Geosyntec, 2018a) compliment MNA with contingency for EISB to address VC in groundwater. The standard point of compliance for the purposes of evaluating potential cleanup alternatives. The standard point of compliance for groundwater will be enforced at the site throughout all portions of the Hexcel Parcels outside Parcel G (WAC 173-340-720(8)(b)).

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7.0 SUMMARY OF CLEANUP ACTION ALTERNATIVES EVALUATED

7.1 Cleanup Action Objectives

This section provides a concise summary of the multiple step remedial evaluation process that was presented in the FFS Report (Geosyntec, 2018a), and culminated in the recommendation that MNA with a contingency for supplemental EISB as the preferred cleanup action alternative for the site. A variety of remedial and regulatory options for the Hexcel Parcels that have the potentially to accelerate the groundwater VOC cleanup were assessed. A key element in the analysis is optimizing the naturally occurring VOC biodegradation demonstrated through the Microcosm Study that confirmed that the natural attenuation occurring beneath the Hexcel Parcels is robust and a viable remediation option.

7.2 Process Overview & Conclusion

Following an initial identification and screening of potentially-applicable remedial technologies and process options, four remedial alternatives were developed. The four alternatives developed are listed below:

- Alternative 1: Site-wide groundwater extraction;
- Alternative 2: Full Scale EISB;
- Alternative 3: Site-wide MNA with contingency for supplemental EISB; and
- Alternative 4: Site-wide MNA.

These Alternatives represent an appropriate range of cleanup approaches capable of achieving the cleanup standards.

Each of the four Alternatives was subjected to a detailed evaluation using the two categories of cleanup action requirements under WAC 173-340-360: (i) threshold requirements and (ii) additional requirements. The criteria for the threshold and additional requirements are the following:

- Threshold Requirements (WAC 173-340-360(2)(a)): i) Protect Human Health and the Environment; ii) Comply with Cleanup Standards; iii) Comply with Applicable State and Federal Laws; and iv) Provide for Compliance Monitoring.
- Additional Requirements (WAC 173-340-360(2)(b)): i) Use Permanent Solutions to the Maximum Extent Practicable; ii) Provide for Reasonable Restoration Time Frame; and iii) Consider Public Concerns (**Table 4**).
- Groundwater Cleanup Actions (WAC 173-340-360(2)(c)).

Consistent with WAC 173-340-360(3)(e), a disproportionate cost analysis (DCA) was performed for the four Alternatives to determine which of these cleanup action alternatives is protective to

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the maximum extent practicable, and to determine if the incremental costs of higher cost remedies are proportionate to their anticipated incremental benefits. The evaluation criteria included protectiveness, permanence, cost, long-term effectiveness, management of short-term risks, implementability, and consideration of public concerns.

Through the FRI/FFS process, Alternative 3 (MNA with contingency for supplemental EISB) was found to be consistent with Ecology expectations and requirements for cleanup action alternatives, and is superior to Alternatives 1 (groundwater extraction), 2 (full-scale EISB), and 4 (MNA) based on the MTCA evaluation criteria, DCA, and cost. As such, Alternative 3 (MNA with contingency for supplemental EISB) was proposed as the recommended alternative for the site.

7.3 MTCA Threshold Requirement Evaluation of Cleanup Action Alternatives

Beginning with the recommended alternative, this section presents a brief description of each of the four cleanup action alternatives, including cost, and discusses the extent to which each alternative satisfies the MTCA Threshold Requirements for a cleanup action.

7.3.5 Alternative 3 – Site-Wide Monitored Natural Attenuation (MNA) with contingency for supplemental Enhanced In Situ Bioremediation (EISB)

Natural attenuation is the process by which natural processes clean up or attenuate contaminants in groundwater. The term "monitored natural attenuation," refers to the reliance on natural processes to achieve site-specific remedial objectives, with on-going monitoring. Natural attenuation processes include a variety of physical, chemical, and/or biological processes that, under favorable conditions, reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. These processes include biodegradation; dispersion; dilution; sorption; volatilization; and chemical or biological stabilization, transformation, or destruction of contaminants (USEPA, 1999). This MNA alternative is coupled with the EISB contingency that is further detailed in the Supplemental Enhanced In Situ Bioremediation Plan (Exhibit E of the Consent Decree).

Section 4.2.3 presented a concentration trend analysis for VC in groundwater at the Site. Since 2012, subsequent to completion of the source area actions at Parcel G, the mass of VC dissolved in groundwater has been subject to various fate and transport mechanisms that have influenced the observed distributions of VC. The VC concentrations along the flow path have been decreasing and will continue to decrease under the influence of the following mechanisms: (i) advective-based dispersion, (ii) recharge of groundwater that does not contain VC, (iii) sorption to aquifer solids, and (iv) abiotic and biotic VC transformation reactions.

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The time trend data were analyzed to estimate site-specific degradation rate constant (Geosyntec, 2018a). The degradation rate constant for HEX-8, the monitoring well with consistently highest VC concentration, was estimated based on curve fitting to declining concentrations since the beginning of 2015. Using the MTCA CUL for VC of 0.20 µg/L, it is anticipated that HEX-8 monitoring well will achieve the cleanup standard in approximately four years.

Alternative 3 was evaluated against the four minimum threshold requirements specified under MTCA. Based on the evaluation presented in the FFS Report (Geosyntec, 2018a), Alternative 3 is considered compliant with the four MTCA Threshold Requirements and meets the minimum requirements of an acceptable cleanup action.

7.3.6 Alternative 1 – Site-Wide Groundwater Extraction

The groundwater extraction alternative would be a continuation of the prior interim remedial action of site wide groundwater pumping. The extraction well system is located along the eastern Hexcel Parcels boundary. Extraction wells CG-4, CG-3, CG-2, and CG-1 are located from south to the north of the main plume along the Parcels A through E boundary. Each of the extraction wells is connected to a groundwater conveyance system that discharges to the municipal sanitary sewer system.

The capture zone width was estimated based on modeling the objective to capture groundwater containing VC above the CUL of 0.20 µg/L. The desired capture zone width for extraction system was approximately 500-1,000 feet. Groundwater modeling was used to estimate the extraction needed at each well to achieve the design capture width (SSPA, 1993, 2003). The extraction rate required to develop the appropriate capture width was determined to be 6,545 ft^3/day, or 34 gallons per minute (gpm) (SSPA, 1993, 2003).

Typically, groundwater extraction of multiple aquifer "pore volumes (PVs)" is required to achieve groundwater cleanup for chlorinated solvents, due to their sorption to aquifer materials. The restoration of groundwater requires that sufficient groundwater be flushed through the contaminated zone to remove dissolved contaminants and contaminants that will desorb from the aquifer material. The PV represents the actual volume of groundwater present within the pore space of the aquifer.

At many pump and treat sites, numerous PVs must be flushed through the contamination zone to attain cleanup standards (EPA, 1997). Assuming linear sorption, the absence of Nonaqueous Phase Liquid or soil source, no biodegradation, and no dispersion, the number of PVs required for restoration is a function of the retardation factor (R). The R is the ratio of the groundwater velocity to the dissolved VC transport velocity.

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It was estimated that the extraction system would have to extract ~10 PVs to achieve cleanup objectives (Geosyntec, 2018a). At the estimated extraction rates (34 gpm), the extraction system would operate for approximately 13.3 years.

Alternative 1 was evaluated against the four minimum threshold requirements specified under MTCA. Based on the evaluation presented in the FFS Report (Geosyntec, 2018a), Alternative 1 is considered compliant with the four MTCA Threshold Requirements and meets the minimum requirements of an acceptable cleanup action.

7.3.7 Alternative 2 – Full-Scale Enhanced In Situ Bioremediation

The full scale EISB alternative would cover the groundwater plume area above 0.2 µg/L concentration that is accessible to injection. Because of the active manufacturing activities at the site, the full scale EISB cannot target the entire groundwater plume above 0.2 µg/L (see **Site Map, Figure 2**). Based on the prior EISB pilot studies performed at the site, the depth of injection would be from approximately 15 to 30 feet below ground surface (bgs).

The performance of a full-scale EISB alternative is anticipated to be similar to the pilot and expanded field treatability deployment of EISB already performed at the Site. Because EISB does not increase the flow of groundwater, the rate of VC reduction in the groundwater plume outside the area of the EISB injections will be unaffected. These areas not subjected to EISB will continue to see concentrations declines at MNA rates, with remedy duration of about ~4 years, same as MNA.

It is anticipated that the VC mass reduction due to the EISB will enhance the attenuation process within the plume and downgradient of the EISB area. However, the effect of EISB on the downgradient plume edges, as well as areas unavailable to injection, is not likely to be significant (i.e., VC concentrations at the lateral and longitudinal extents of the plume are likely to decline at the same rate as predicted for Alternative 3 & 4). The remedial duration of Alternative 2 is likely ~4 years.

Alternative 2 was evaluated against the four minimum threshold requirements specified under MTCA. Based on the evaluation presented in the FFS Report (Geosyntec, 2018a), Alternative 2 is considered compliant with the four MTCA Threshold Requirements and meets the minimum requirements of an acceptable cleanup action.

7.3.8 Alternative 4 – Monitored Natural Attenuation

Natural attenuation is the process by which natural processes clean up or attenuate contaminants in groundwater. The term "monitored natural attenuation," refers to the reliance on natural processes to achieve site-specific remedial objectives, with on-going monitoring. Natural attenuation processes include a variety of physical, chemical, and/or biological processes that,

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under favorable conditions, reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. These processes include biodegradation; dispersion; dilution; sorption; volatilization; and chemical or biological stabilization, transformation, or destruction of contaminants (EPA, 1999).

Since the 2012 completion of the source area control actions for Parcel G, the mass of VOC dissolved in groundwater has been subject to various fate and transport mechanisms, which has influenced the observed distributions of VC (see **Historical...Concentrations in Shallow Aquifer**, **Figures 10 - 12**). Within the Site monitoring wells located in the Hexcel Parcels, concentration trends for cDCE and VC through September 2021, in general, continue decreasing towards or below the CUL (CCA, 2021) (see **September 2021...Groundwater Concentrations**, **Figures 13 & 14**). The VC concentrations along the flow path have been decreasing and will continue to decrease under the influence of the following mechanisms: (i) continued enhanced biodegradation, (ii) advective-based dispersion, (iii) recharge of groundwater that does not contain VC, (iv) sorption to aquifer solids.

The time trend data can be analyzed to estimate average site-specific degradation rate constants. Degradation rate constants were estimated for the PS-1 and HEX-8 using methods outlined in Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies (EPA, 2002). The degradation rate constant was estimated from trend plots for PS-1 and HEX-8 (see **Plots of VC concentrations versus time..., Figure 15**), which were based on the most recent monitoring results. Degradation rates of VC for HEX-6 and CG-4 were also estimated from trend plots (see **Plots of VC concentrations versus time..., Figure 16**). Using the VC Cleanup Standard of 0.20 µg/L, it is anticipated the cleanup standard will be achieved at these individual monitoring wells in between approximately 3 years and 7 years. These degradation rates for PS-1, HEX-8, and CG-4 are influenced by the recent expanded EISB field deployment, and will require recurring evaluation as new monitoring data are acquired.

Forecast graphs are plotted for future conditions based on historical data that are designed for remedial planning purposes (see **Plots of VC concentrations versus time...**, **Figure 15 & 16**). However, site groundwater conditions are subject to seasonal water level and geochemistry fluctuations that may affect actual future VC concentrations.

A plot of concentration of VC vs. distance to the Hexcel property boundary indicates that the estimated degradation rates and times will be effective in reaching cleanup standards in groundwater prior to groundwater migrating beyond the Hexcel property boundary (see **Plots of VC concentrations versus distance..., Figure 17**). The estimated travel time from HEX-8 to the property boundary is approximately seven years based on aquifer properties described in the FRI (CCA, 2018). Both the estimated travel time and data indicate sufficient time for MNA processes to meet remedial objectives. Groundwater quality monitoring (Clear Creek, 2021) trends show

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that the natural attenuation continues to reduce the VC concentrations in groundwater at the Hexcel Plant.

As pointed out in the FRI (Clear Creek, 2018), upgradient VC loading continues to occur from Parcel G. The plots of VC concentrations vs. time and distance (see **Plots of VC concentrations versus time...**, **Figure 15 & 16; and Plots of VC concentrations versus distance...**, **Figure 17**) indicate that at present this upgradient loading is interpreted to occur at a rate that is less than natural attenuation occurring in groundwater at the Hexcel Plant.

Alternative 4 was evaluated against the four minimum threshold requirements specified under MTCA. Based on the evaluation presented in the FFS Report (Geosyntec, 2018a), Alternative 4 is considered compliant with the four MTCA Threshold Requirements and meets the minimum requirements of an acceptable cleanup action.

Disproportionate Cost Analysis
A DCA was performed to determine which of the four cleanup action alternatives is protective to the maximum extent practicable. The estimated benefit of each alternative was quantified using the DCA criteria. For each cleanup action alternative, rating values ranging from 1 (least favorable) to 5 (most favorable) were assigned for each of the MTCA criteria.

The absolute ratings were adjusted using DCA weighting factors. The weighted ratings and the estimated benefit of each alternative were presented in the FFS Report (Geosyntec, 2018a). The estimated benefit of Alternative 3 (normalized to a value of 5) was 4.8. The estimated benefits of Alternatives 1 and 2 were each 3.9, and Alternative 4 resulted in an estimated benefit of 4.6. Alternative 3 is the highest rated alternative and is protective to the maximum extent practicable (**Table 4**).

7.4 Evaluation of Cleanup Action Alternatives

7.4.1 Reasonable Restoration Timeframe Analysis

The MTCA specified factors were considered in the FFS Report (Geosyntec, 2018a) to determine whether Alternative 3 (i.e., the highest rated alternative) provided for a reasonable restoration time frame. The analysis presented in the FFS Report, supports the estimated Alternative 3 restoration time frame, is considered reasonable, and based on the following:

- There are no future unacceptable risks at the Site.

- The evaluation of the geochemistry and EISB study after the installation of the Parcel G remedy, the decreasing groundwater VC concentrations beneath the Hexcel Parcels demonstrate a reasonable restoration time frame.

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• There are no anticipated effects on current uses that would result during the anticipated restoration time frame.

• There are no future uses anticipated that will negatively impacted by the presence of VC in the groundwater during the anticipated restoration time frame.

• Water supply by the City of Kent provides an effective and reliable means to prevent human exposure to VC in groundwater.

• The VC groundwater concentration time trend analysis, the first-order decay rates, the groundwater quality sampling data confirm that the natural processes are reducing the concentrations of VC at the Hexcel Parcels.

7.4.2 Alternative 3 Selection Considerations

Potential public concerns were considered in the FFS Report (Geosyntec, 2018a) including:

- There are no unacceptable risks currently at the Site;
- VC concentrations are declining and are less than cleanup levels at the Hexcel Parcels outside of Parcels A-E.
- Groundwater concentrations beneath Parcels A-E is estimated to meet VC cleanup levels in approximately four years;
- There are no use restrictions imposed by Alternative 3 that are not already met as a result of local municipal water supply;
- Alternative 3 does not require, or may require minimal, construction activities and thus will not inconvenience residents or property owners during implementation; and
- Alternative 3 is more sustainable than Alternatives 1 and 2, consuming substantially less energy, producing substantially less carbon dioxide emissions, and having by far the best safety/accident risk metric.

Additional consideration of public concerns will occur in the context of the public review and comment period.

8.0 SELECTED CLEANUP ACTION

8.1 Selected Cleanup Action

Based on the analyses presented in the FRI and FFS Reports (CCA, 2018; Geosyntec, 2018a), the recommended cleanup action alternative is Alternative 3 - Monitored Natural Attenuation with contingency for supplemental EISB. WAC 173-340-370 states the expectations that Ecology has for the development of cleanup action alternatives under WAC 173-340-350 and the selection of cleanup actions under WAC 173-340-360.

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If MNA does not perform to expectations, then there is a contingency for supplemental EISB injections. EISB optimizes the naturally occurring biodegradation of VOCs beneath the Hexcel Parcels. Figures 7, 8, and 9 show the historical natural attenuation of VOCs over time. VOC concentrations have significantly decreased over time as detailed in Section 4.2. If the decreasing concentration trends reverse, then an increase trend in VOC concentrations trigger the EISB contingency plan.

The injections include microorganisms, nutrients and geochemical amendments. EISB injections will use or modify, if necessary, the performance parameters established during the EISB Microcosm Study (Geosyntec, 2015a, b, c and 2017). The location and spacing of the injection points will form a transect extending through the lateral extent of the elevated VC concentrations.

Review of Ecology's expectations for cleanup action alternatives and the analysis presented in the FRI and FFS Reports (CCA, 2018; Geosyntec, 2018a), Alternative 3 is consistent with MTCA requirements and thus is proposed as the recommended alternative for the site.

Based on the cleanup action alternative evaluation (WAC 173-340-360), Ecology agrees Alternative 3 is the preferred alternative for implementation at the Property. The expectations for the selection and implementation of cleanup action alternatives (WAC 173-340-370) at the Property include:

- WAC 173-340-370(2): Minimize the need for long-term management of contaminated materials; such that, all hazardous substances will be destroyed, detoxified, and/or removed to concentrations below cleanup levels throughout sites containing small volumes of hazardous substances;

- WAC 173-340-370(4): Minimize the potential for migration of hazardous substances that prevents precipitation and subsequent runoff from coming into contact with contaminated soils and waste materials; and

- WAC 173-340-370(7): The natural attenuation of the hazardous substances include source control containment at the B.S.B. Diversified Property to the maximum extent practicable; contaminants left during the restoration time frame does not pose an unacceptable threat to human health or the environment; there is evidence that natural biodegradation or chemical degradation is occurring and will continue to occur at a reasonable rate at the site; and groundwater quality monitoring is conducted to ensure that the natural attenuation process is taking place and that human health and the environment are protected.

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8.2 Overall Implementation Approach

The final selection and implementation of Alternative 3, Monitored Natural Attenuation (MNA) with contingency for supplemental Enhanced In Situ Bioremediation (EISB), is the preferred cleanup action and will include the following general steps:

- Implementation of the Compliance Monitoring Plan (CMWP);
- Regular reporting of results to Ecology; Hexcel or a third party will conduct long-term operations, maintenance, and compliance monitoring activities; and
- Hexcel or a third party will conduct periodic reviews (WAC 173-340-429) to evaluate the effectiveness of the remediation. Additional remediation or contingency plans will be implemented if Ecology determines that contaminated groundwater above CULs is issuing from the Hexcel Parcels due to failure of the MNA and supplemental EISB.

8.3 Institutional Controls

Institutional controls will be incorporated in the cleanup action since contaminants exceeding the MTCA Method A cleanup levels will remain on the Property (WAC 173-340-440(4)(a)). The intent of the institutional controls will be to preserve the integrity of the cleanup action. Institutional controls will include filing an environmental covenant under chapter 64.70 RCW in the real property records to notify potential purchasers of the Property of this Cleanup Action Plan. For groundwater, an Environmental Covenant executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70.105D RCW, will be implemented that precludes the use of property groundwater for drinking water. The environmental covenant will limit activities that may create a new exposure pathway (e.g., indoor air pathway or subsurface worker pathway), result in the release of hazardous substances, or interfere with the integrity of the Cleanup Action without Ecology's written approval. The Environmental Covenant for property groundwater is anticipated to be an effective and reliable means to prevent human exposure to VC in groundwater. If CMP groundwater quality sampling determines VOC concentrations for all the wells are statistically determined to below CULs, then the Environmental Covenant maybe removed from the property.

8.4 Financial Assurances

Financial assurances will be established and maintained sufficient to implement this Cleanup Action Plan, including maintaining institutional and engineering controls on the Property and maintaining compliance monitoring (WAC 173-340-440(11); WAC 173-303-64620). WAC 173-340-440(11) states that "The department shall, as appropriate, require financial assurance mechanisms at sites where the cleanup action selected includes engineered and/or institutional controls." The purpose of the financial assurances is to cover costs associated with the operation and maintenance of the cleanup action, including institutional controls, compliance monitoring, and corrective measures.

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8.5 Substantive Requirements

Chapter 70.105D RCW exempts cleanup actions conducted under a consent decree from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 and of any laws requiring or authorizing local government permits or approvals. The selected cleanup action will be conducted in compliance with the substantive requirements of local government regulations. There are no federal or state permits required for the selected cleanup action.

8.6 Work Plans

Work plans for the selected cleanup action include:

- A Compliance Monitoring Plan (CMP) that includes a sampling and analysis plan, and a discussion of data analysis and evaluation procedures. The CMP discusses protection monitoring, performance monitoring, and confirmational monitoring (WAC 173-340 410) ;

- An Operation and Maintenance (O&M) plan (WAC 173-340 400(4)(c)), details the plans to ensure the effective operation of the selected cleanup action; and,

- Enhanced In Situ Bioremediation (EISB) Plan that covers the details, procedures, and implementation schedule for the MNA EISB contingency.

8.7 Periodic Review

Per WAC 173-340-420, a periodic review is required at sites where an institutional control is part of the cleanup action. The review is to be performed within 5 years of the start of cleanup and at a frequency no greater than every 5 years, thereafter. Since an institutional control is included in the selected cleanup action, a periodic review will be conducted to document the performance of the cleanup action and its protectiveness.

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TABLES

FIGURES