MEMORANDUM

To: Mr. Robert Williams, R.G.
Department of Environmental Quality
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Date: July 28, 2011

RE: Proposed TGA On-site Ramp Down
Cascade Corporation's TGA Remedy

Introduction

This memorandum, submitted on behalf of Cascade Corporation, describes ramp down actions for the on-site Troutdale Gravel Aquifer (TGA) Remedy area. This memorandum is a companion document to the *Proposed Off-site Drilling and VOC Flux Evaluation memorandum* dated July 28, 2011, which addresses work in the vicinity of the TGA erosional truncation. These proposals are part of the TGA remedy pre-closure phase and are designed to streamline the monitoring well network in areas where remedy goals have been achieved and to further evaluate an off-site area where volatile organic compounds (VOCs) historically migrated downward into the TSA.

The following text includes a brief summary of TGA treatment history and goals, an overview of on-site remedy performance, an assessment of Remedial Action Objectives (RAOs) attainment, and a proposal for on-site ramp-down well decommissionings.

On-site Treatment History and Remedial Goals

On-site TGA remedial actions have been implemented since the late 1980's to remove, contain, and biologically degrade chlorinated VOCs in the subsurface. They have included:

- Industrial well and underground storage tank (UST) decommissionings
- Source area soil removal actions
- On-site perimeter pumping, plume containment, and treatment
- Source area vapor, DNAPL, and groundwater extraction and treatment
- Full scale source area bioremediation injections, and
- Follow-up polishing bioremediation injections.

These on-site actions have removed and degraded VOCs in the subsurface to levels that attain remedy goals delineated as RAOs in the Department of Environmental Quality's (DEQ's) *TGA Record of Decision*

(ROD)[1]. A primary measurement of RAO attainment is the reduction of VOC concentrations below remedy cleanup levels. Groundwater cleanup levels were identified in the *TGA ROD* and are summarized below for the VOC Constituents of Concern (COC), tetrachloroethene (PCE), trichloroethene (TCE), *cis*-1,2-dichloroethene (cDCE), and vinyl chloride (VC):

TGA Groundwater VOC Cleanup Levels (MCLs)	
PCE	5.0 μg/L
TCE	5.0 μg/L
cDCE	70 μg/L
VC	2.0 μg/L

On-site Groundwater Restoration Overview

Nine TGA remedy wells are located on-site (EX-1, EX-7, EX-10, EX-13, MW-6b, MW-27s, RW-2, RW-4, and RW-5) and one is located north/adjacent to the on-site area (MW-9i), as shown in Figure 1. Of these ten wells, eight were sampled in the February 2011 semiannual round[2], with VOC concentrations that were non-detectable or below cleanup levels in all samples except for one VC detection in EX-1, as summarized below. TCE and VC concentrations in February 2011 are shown in Figures 2 and 3.

TGA On-site Groundwater VOCs -Feb. 2011			
	No. On-site Wells/Samples	No. Below MCL	No. Above MCL
PCE	8/8	8	0
TCE	8/8	8	0
cDCE	8/8	8	0
VC	8/8	7	1

During 2010, a total of 32 on-site well samples were collected, including samples from each of the ten on-site wells. VOC concentrations were non-detectable or below cleanup levels for all VOC COCs except one TCE detection above 5 μg/L in RW-4 in February 2010 and one VC detection above 2 μg/L in EX-1 in November 2010, as listed on the table below.

[1] *TGA Record of Decision*, DEQ, December 1996.

[2] Per the remedy monitoring schedule in Table 2-2, *2010 Year-End Semiannual Performance Report*, February 2011.

TGA On-site Groundwater VOCs in 2010			
	No. On-site Wells/Samples	No. Below MCL	No. Above MCL
PCE	10/32	32	0
TCE	10/32	31	1
cDCE	10/32	32	0
VC	10/32	31	1

Analytical results for February 2010 through February 2011 are shown in Table 1. These data confirm several years of compliant and near-compliant on-site water quality following full-scale and polishing bioremediation treatment that has been applied since 2004.

Source Area Five-Year Groundwater Restoration

VOC groundwater concentrations for each of the on-site wells during the last five years are listed on Table 2. These data demonstrate that TGA restoration has been substantially achieved beneath the on-site remedy area. The results are discussed below in order of former source location.

Former Source Area 1. Source Area 1 is located west of the facility building, where waste coolant was historically stored in two former USTs. One well remains in Area 1 (EX-1), while all other Area 1 wells have been decommissioned due to stable, compliant groundwater restoration in this area.

PCE, TCE, and cDCE concentrations in EX-1 have remained consistently below cleanup levels in each of the 14 samples collected since August 2006, while VC levels fluctuated slightly above and below the cleanup level. This well is the only on-site location where VC currently remains above the cleanup level. An excess quantity of emulsified oil bioremediation substrate was injected into Area 1 in 2006 to provide a long term, low mobility, treatment and sorptive medium, likely contributing to the localized distribution of VC near EX-1. The presence of non-detectable to compliant VC levels at downgradient locations reflects conditions protective of off-site TGA groundwater quality.

Former Source Area 2. Area 2 is located near the northwest corner of the facility building, where degreasing activities historically occurred. Two wells remain in Area 2, including EX-10, inside the facility building, and EX-7, near the north loading dock. All other Area 2 wells have been decommissioned due to stable, compliant restoration following 2006 full-scale bioremediation treatment.

In well EX-10, PCE, TCE, and cDCE concentrations have remained non-detectable or detectable at compliant levels since August 2006. VC has also remained at compliant levels in 13 of the 17 sampling events since August 2006. In downgradient well EX-7, PCE, cDCE, and VC concentrations have remained consistently below compliant levels throughout the last five years.

TCE in EX-7 has also remained at compliant levels in 12 of the 15 samples collected in the last five years, with TCE consistently below the detection limit in all five samples collected since February 2010. EX-10

and EX-7 received polishing bioremediation treatment beginning in 2008 and 2009, respectively, to provide additional remedial assurance.

Former Source Area 3. PCE was historically the primary VOC contaminant in this area and was treated through emulsified oil injections into EX-13 in 2004. After that time, parent compounds PCE and TCE degraded to daughter products VC, ethene, and ethane. Residual VCs were subsequently treated with biopolishing substrate injections to stimulate complete degradation to ethene and ethane. As a result, VC concentrations declined further and have remained below the detection limit in six of the seven samples collected since February 2009.

In nearby well MW-27s, TCE, cDCE, and VC have remained consistently below the cleanup levels for the last five years. PCE concentrations in MW-27s fluctuated slightly above and below the cleanup level in 2006 and 2007 and have subsequently remained at compliant levels.

Former Source Area 4. This area includes the North Ditch and nearby vicinity and is located near the northern perimeter of the facility. The North Ditch historically received contaminants via storm water runoff. Wells RW-2 and MW-6b are located north of Source Area 2 and wells RW-4 and RW-5 are located north of Source Area 1. These wells received polishing bioremediation treatment beginning in 2008 by introducing mobile and then low-mobility treatment substrates to further expedite final restoration in this vicinity. Well MW-9i is located north of the North Ditch and has not received bioremediation treatment.

PCE concentrations have remained compliant in four of the five wells noted above, with compliant levels in RW-4 since August 2007; cDCE has remained near or below the cleanup level during the last five years in each of the wells, with the exception of two detections above the cleanup level at MW-9i in 2008; VC has remained non-detectable in most samples collected in these wells during the last five years; and TCE concentrations have varied for each of the wells during the last five years, but have remained below the cleanup level in over 60 percent of the Area 4 groundwater samples collected during this period. Average TCE concentrations for these wells have steadily declined since 2006 (5.9 μg/L in 2006; 4.3 μg/L in 2007; 2.3 μg/L in 2008; 1.5 μg/L in 2009; 0.63 μg/L in 2010), remaining below the cleanup level since 2007.

Summary. The groundwater quality data collected during the past five years reflect substantial cleanup progress and restoration of former TGA VOC source areas. With a few limited exceptions, cleanup levels have been attained in Areas 1, 2, 3, and 4. In Area 1 at EX-1, a localized area of VC detection remains, and in Area 4 TCE concentrations have been variable with some detections above the cleanup level during the past 5 years, but have on an average basis remained below the cleanup level since 2007.

On-site Remedial Action Objectives

TGA Remedy RAOs are presented in Table 3. RAOs 1 through 6 address the goals of TGA groundwater restoration and protection of surface water and TSA groundwater quality[3].

The primary TGA groundwater exposure and migration pathways occur off-site near the TGA and CU 1 erosional truncation, where TGA groundwater discharges to Shepard Spring and to the underlying TSA. Historically, TGA VOCs discharged into the TSA in this area. Consequently, the primary performance goal at on-site locations is to protect off-site TGA groundwater quality for the subsequent protection of surface water and TSA water quality. This goal is met by the attainment of remedy cleanup levels at almost all on-site TGA well locations.

The on-site vertical distribution of VOCs above cleanup levels was historically restricted to the Upper TGA gravel horizon, except near the on-site northern perimeter, where plume interception pumping drew contaminants down into the Lower TGA sandstone. The on-site Upper TGA gravel is approximately 50 to 40 feet thick and the Lower TGA sandstone is approximately 10 feet thick. They are underlain by approximately 5 feet or less of fine-grained Siltstone Transition Zone (STZ) deposits and approximately 50 feet of CU 1, comprised of claystone, siltstone, and sandstone[4].

The absence of significant contamination in the Lower TGA, the presence of approximately 50 feet of CU 1, and the low CU 1 vertical hydraulic conductivity estimates[5] reflect on-site conditions protective of the underlying TSA.

A localized historical on-site pathway existed from the TGA to the TSA through the casing of an industrial supply well before it was decommissioned in 1991. Upper TSA groundwater quality in this area is monitored at TSA well MW-19(ds). MW-19(ds) is screened near the base of the Upper TSA and reports low TCE levels that have fluctuated above and below the cleanup level in recent years, as shown in Figure 4. The average TCE concentration in this well is 5.6 μg/L for 2010 and 2011. The low

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[3] Note: Additional RAOs 7 and 8 address the remediation of unsaturated soil to protect groundwater quality to protect potential exposure pathway receptors. These goals were previously achieved through soil removal, soil vapor extraction, and surface capping.

[4] *TGA 2002 Annual Performance Report* (Prowell Environmental and Pegasus Geoscience, February 28, 2002).

[5] CU 1 vertical hydraulic conductivity estimates = 0.0002 ft/day, per the east Multnomah County groundwater flow model and 0.00011 ft/day to 0.077 ft/day, per the *Phase 3 Remedial Investigation / Feasibility Study*, EMCON, March 10, 1995).

concentrations and the absence of a vertical concentration gradient in this well[6] indicate the absence of a current pathway concern.

In summary, the on-site groundwater conditions meet the TGA remedy RAOs and the overall goals of on-site TGA groundwater restoration, off-site TGA groundwater protection, surface water quality protection, and protection of the underlying TSA and its uses.

Proposed Ramp-down Well Decommissionings

Due to the successful attainment of on-site aquifer restoration, the on-site TGA well network is no longer needed for assessing remedy performance and is recommended for decommissioning. As a result, we propose, subject to DEQ's approval, decommissioning the ten wells shown in Figure 1 (including EX-1, EX-7, EX-10, EX-13, MW-6b, MW-9i, MW-27s, RW-2, RW-4, and RW-5), in accordance with Oregon Administrative Rules, Chapter 690, Division 240. Construction details for these wells are shown in Table 4.

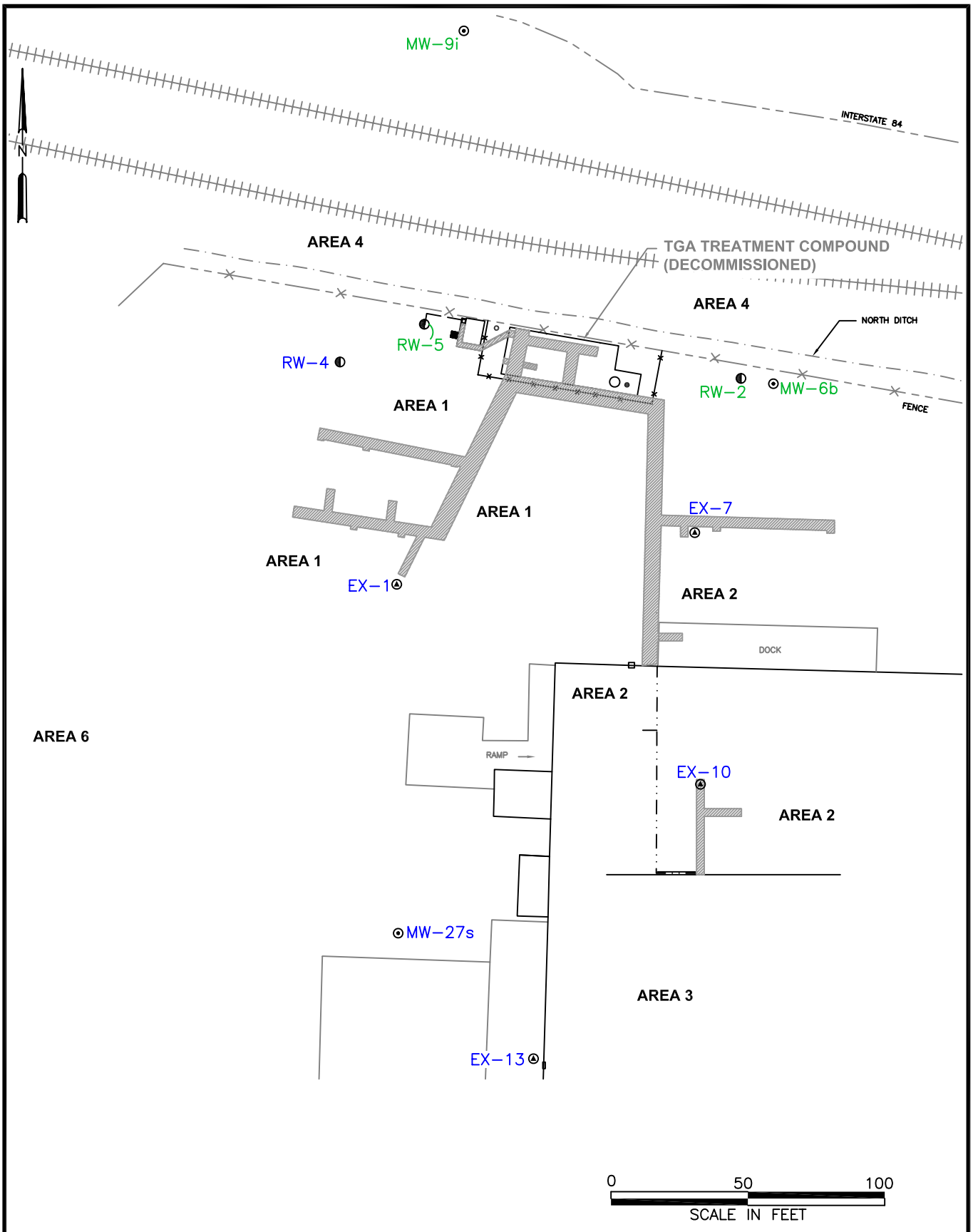
All work will be performed by an Oregon-licensed driller after obtaining Oregon Water Resource Department (OWRD) start card authorizations. Specific decommissioning methods will be determined by the licensed drilling company and the OWRD, as applicable to specific well conditions. DEQ will be notified before field activities begin and a report of methods and records will be submitted to DEQ following completion of the work.

Attachments:

Figure 1. On-site Well Locations
Figure 2. TCE Concentrations – February 2011
Figure 3. VC Concentrations – February 2011
Figure 4. TCE Concentration Profile Upper TSA Well MW-19(ds)
Table 1. On-site Groundwater VOC Concentrations February 2010 – February 2011
Table 2. On-site Groundwater VIC Concentrations February 2006 – February 2011
Table 3. Remedy Action Objectives
Table 4. Construction Details for Wells Proposed to be Decommissioned

cc: John Cushing, Cascade Corporation
Charles Andrews, S.S. Papadopulos & Associates, Inc.

[6] See MW-19(ds) vertically-profiled sampling results in the *Semiannual Performance Report: April 1 through September 30, 2010, TSA Remedy*, Prowell Environmental and Landau Associates, November 30, 2010.



E X P L A N A T I O N

▲ ◐ ⊙ TGA WELL

UPPER TGA WELLS SHOWN IN BLUE

LOWER TGA WELLS SHOWN IN GREEN

Figure 1
On-Site Well Locations
Cascade Corporation – TGA Remedy

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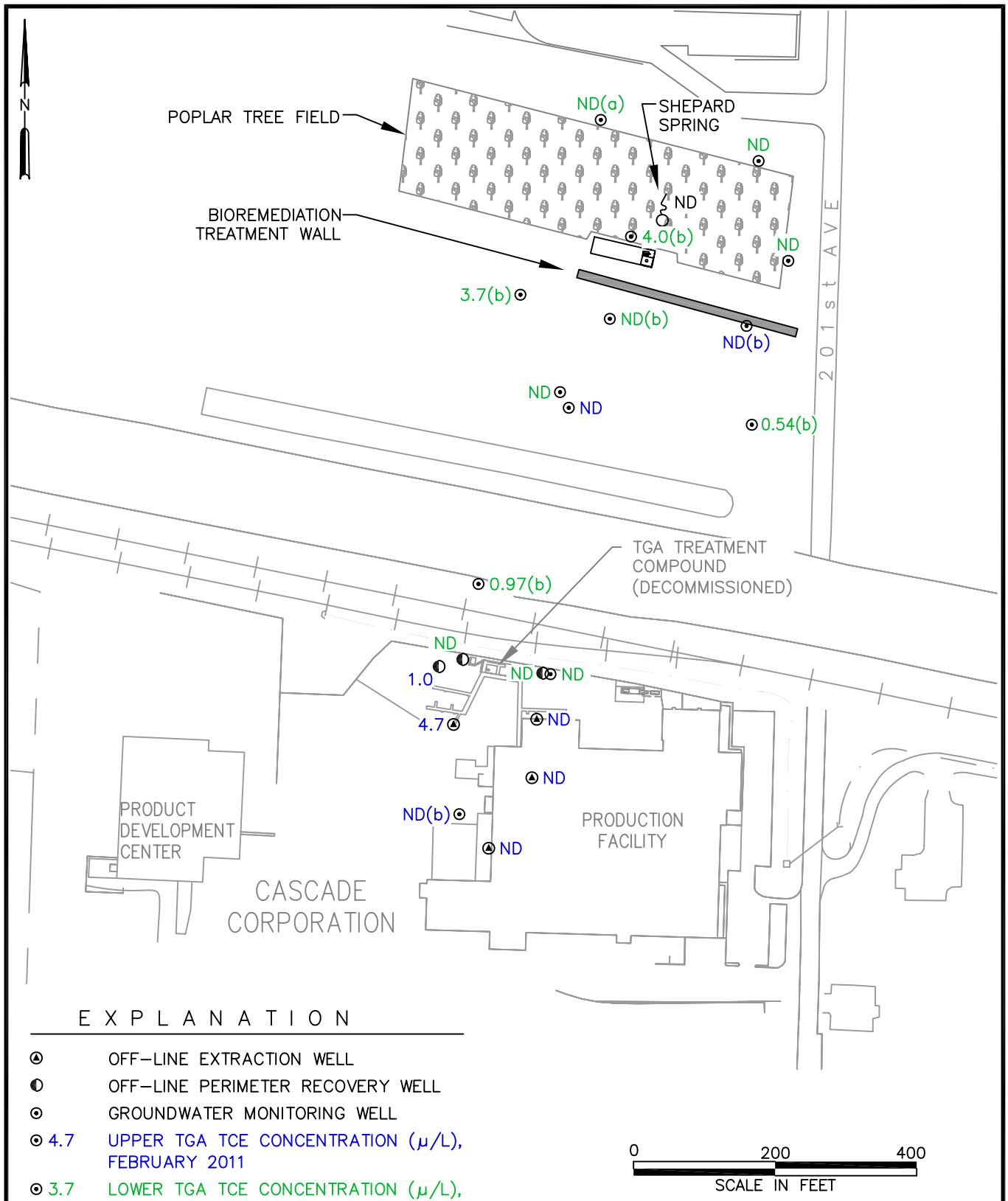

EXPLANATION

⊙	OFF–LINE EXTRACTION WELL
◐	OFF–LINE PERIMETER RECOVERY WELL
⊙	GROUNDWATER MONITORING WELL
⊙ 4.7	UPPER TGA TCE CONCENTRATION (µ/L), FEBRUARY 2011
⊙ 3.7	LOWER TGA TCE CONCENTRATION (µ/L), FEBRUARY 2011
ND	TCE NOT DETECTED AT DETECTION LIMIT
(a)	LAST SAMPLED AUGUST 2009
(b)	LAST SAMPLED AUGUST 2010

NOTE: WHERE SAMPLE COLLECTED IN DUPLICATE, HIGHER CONCENTRATION IS SHOWN.

Figure 2
TCE Concentrations – February 2011
Cascade Corporation – TGA Remedy

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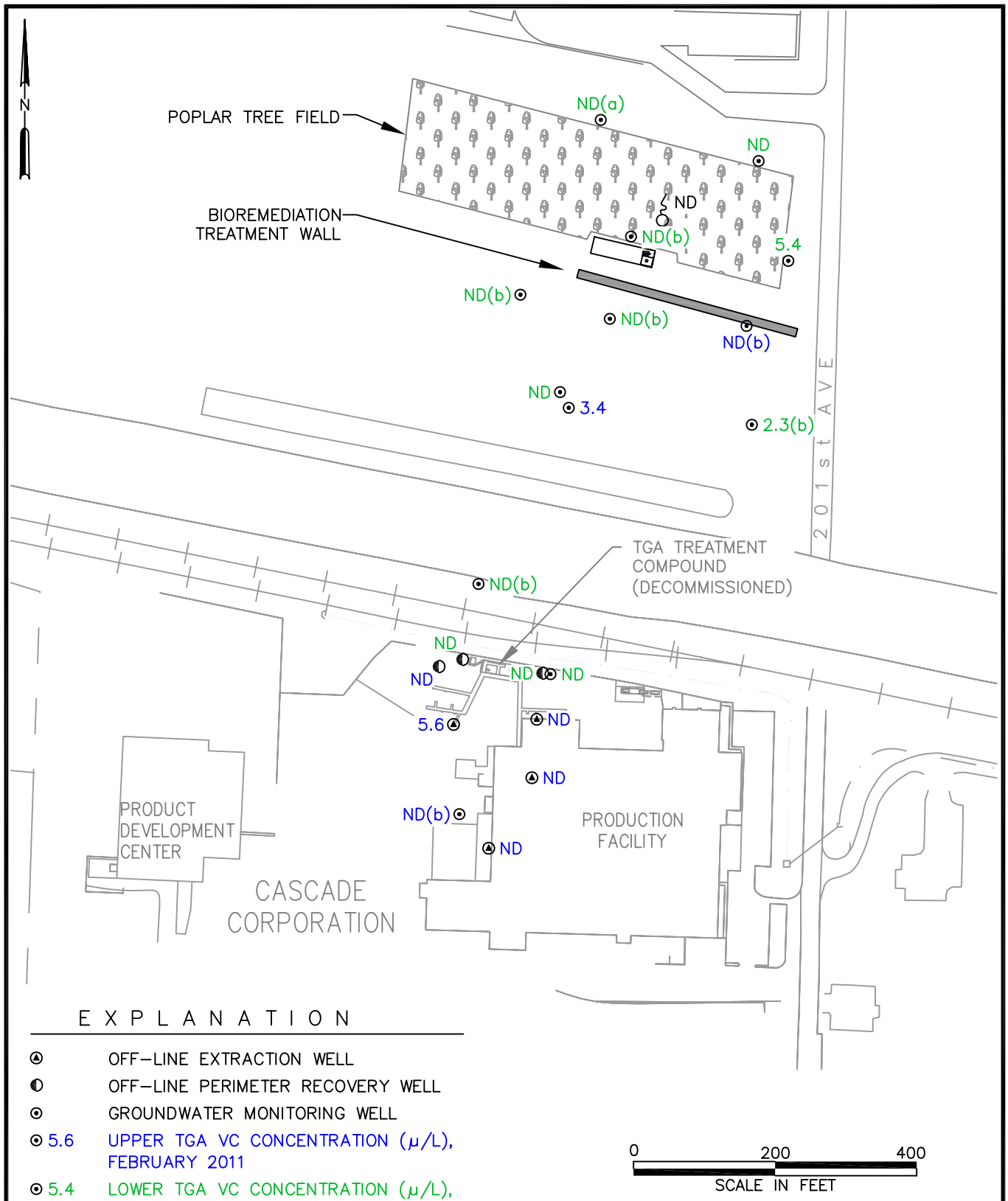

NOTE: WHERE SAMPLE COLLECTED IN DUPLICATE, HIGHER CONCENTRATION IS SHOWN.

Figure 3
VC Concentrations – February 2011
Cascade Corporation – TGA Remedy

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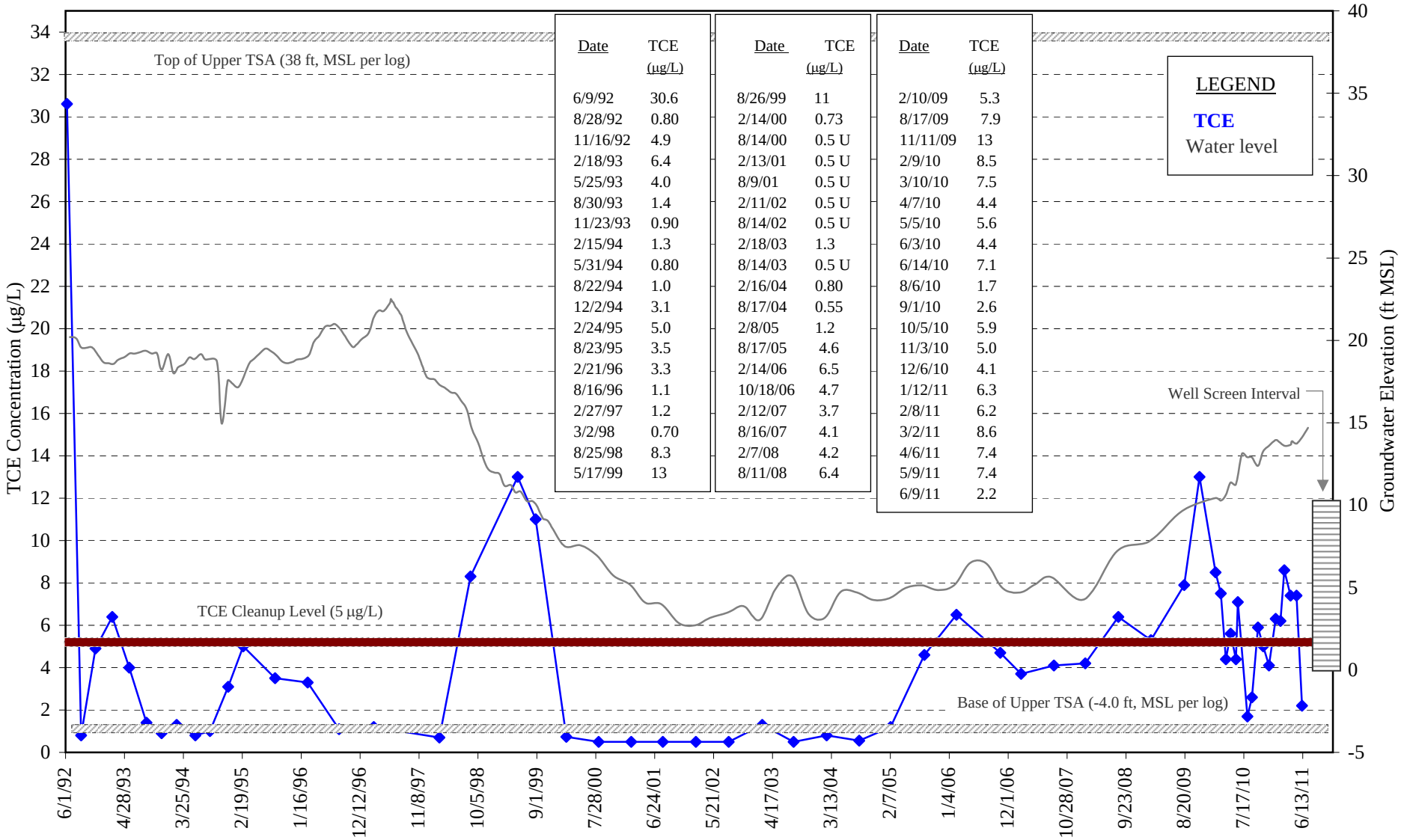
Figure 4
TCE Concentration Profile
Upper TSA Well MW-19(ds)
Cascade Corporation



Date	TCE (µg/L)
6/9/92	30.6
8/28/92	0.80
11/16/92	4.9
2/18/93	6.4
5/25/93	4.0
8/30/93	1.4
11/23/93	0.90
2/15/94	1.3
5/31/94	0.80
8/22/94	1.0
12/2/94	3.1
2/24/95	5.0
8/23/95	3.5
2/21/96	3.3
8/16/96	1.1
2/27/97	1.2
3/2/98	0.70
8/25/98	8.3
5/17/99	13

Date	TCE (µg/L)
8/26/99	11
2/14/00	0.73
8/14/00	0.5 U
2/13/01	0.5 U
8/9/01	0.5 U
2/11/02	0.5 U
8/14/02	0.5 U
2/18/03	1.3
8/14/03	0.5 U
2/16/04	0.80
8/17/04	0.55
2/8/05	1.2
8/17/05	4.6
2/14/06	6.5
10/18/06	4.7
2/12/07	3.7
8/16/07	4.1
2/7/08	4.2
8/11/08	6.4

Date	TCE (µg/L)
2/10/09	5.3
8/17/09	7.9
11/11/09	13
2/9/10	8.5
3/10/10	7.5
4/7/10	4.4
5/5/10	5.6
6/3/10	4.4
6/14/10	7.1
8/6/10	1.7
9/1/10	2.6
10/5/10	5.9
11/3/10	5.0
12/6/10	4.1
1/12/11	6.3
2/8/11	6.2
3/2/11	8.6
4/6/11	7.4
5/9/11	7.4
6/9/11	2.2

NOTES: Where TCE concentrations are below reporting limit, reporting limit is shown. Highest TCE concentration shown where sample collected in duplicate.
Top of well screen = 9.8 ft, MSL (screen length = 10 feet).

Mound Area TCE Profile Plots.xls

Table 1
On-site Groundwater VOC Concentrations
February 2010 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
Area 1 Well									
EX-1	2/3/10	0.5	U	4.9		4.1		0.52	
EX-1	5/11/10	0.5	U	4.5		8.8		0.58	
EX-1	8/3/10	0.5	U	0.5	U	14		1.6	
EX-1	11/9/10	0.5	U	4.9		22		**4.5**	
EX-1	2/9/11	0.5	U	4.7		31		**5.6**	
Area 2 Wells									
EX-7	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-7	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-7	8/2/10	0.5	U/R-04	0.5	U/R-04	0.5	U/R-04	0.5	U/R-04
EX-7	11/9/10	0.5	U	0.5	U	0.62		0.5	U
EX-7	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
EX-10	2/3/10	0.5	U	0.5	U	2.9		1.7	
EX-10	8/3/10	0.5	U	0.5	U	0.97		0.5	U
EX-10	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
Area 3 Wells									
EX-13	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	8/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	11/9/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	2/9/11	2.5	U	2.5	U	2.5	U	2.5	U
MW-27s	8/3/10	0.5	U	0.5	U	0.70		0.5	U
Area 4 Wells									
MW-6b	2/3/10	0.70		1.1		0.5	U	0.5	U
MW-6b	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
MW-6b	8/2/10	0.5	U	0.5	U	1.2		0.5	U
MW-6b	11/9/10	0.5	U	0.5	U	1.2		0.5	U
MW-6b	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
MW-9i	8/3/10	0.5	U	0.97		1.1		0.5	U
RW-2	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2 Dup	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2 Dup	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2	8/2/10	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04
RW-2 Dup	8/2/10	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04
RW-2	11/9/11	10	U	10	U	10	U	10	U
RW-2 Dup	11/9/11	10	U	10	U	10	U	10	U
RW-2	2/9/11	5.0	U	5.0	U	5.0	U	5.0	U
RW-2 Dup	2/9/11	5.0	U	5.0	U	5.0	U	5.0	U

Table 1
On-site Groundwater VOC Concentrations
February 2010 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
RW-4	2/3/10	3.9		**7.8**		3.7		0.5	U
RW-4	5/11/10	0.99		1.4		7.3		0.5	U
RW-4	8/3/10	0.5	U	0.5	U	2.9		0.5	U
RW-4	11/9/10	0.67		0.90		0.60		0.5	U
RW-4	2/9/11	0.5	U	1.0		1.6		0.5	U
RW-5	2/3/10	0.5	U	0.74		0.5	U	0.5	U
RW-5	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-5	8/2/10	0.5	U	0.61		0.70		0.5	U
RW-5	11/9/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-5	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U

NOTES:

Bold denotes concentration above TGA groundwater cleanup level.

TGA remedy cleanup levels are per DEQ's TGA Record of Decision, 1996.

µg/L = micrograms/liter; L = laboratory qualifier; Dup = duplicate sample; U = not detected at method reporting limit;

R-04 = reporting levels elevated due to dilution necessary for analysis (method detection limit reported)

Table 2
On-site Groundwater VOC Concentrations
February 2006 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
Area 1 Well									
EX-1	2/2/06	19		130	D	220	D	2.9	
EX-1	4/6/06	20		140	D	280	D	6.0	
EX-1	5/8/06	25		150	D	270	D	2.5	
EX-1	8/21/06	0.5	U	1.3		27		1.9	
EX-1	11/13/06	0.5	U	0.87		5.6		0.5	U
EX-1	2/15/07	0.5	U	1.2		44		3.7	
EX-1	5/22/07	0.5	U	0.5	U	16		1.5	
EX-1	8/27/07	0.5	U	0.5	U	9.5		5.4	
EX-1	2/12/08	0.5	U	1.0		10		6.5	
EX-1	8/18/08	0.5	U	0.5	U	5.6		3.2	
EX-1	2/11/09	0.5	U	3.1		23		5.6	
EX-1	8/12/09	0.5	U	0.5	U	3.3		2.3	
EX-1	2/3/10	0.5	U	4.9		4.1		0.52	
EX-1	5/11/10	0.5	U	4.5		8.8		0.58	
EX-1	8/3/10	0.5	U	0.5	U	14		1.6	
EX-1	11/9/10	0.5	U	4.9		22		4.5	
EX-1	2/9/11	0.5	U	4.7		31		5.6	
Area 2 Wells									
EX-7	2/15/06	3.0		4.2		1.3		0.5	U
EX-7	5/8/06	2.8		4.6		1.3		0.5	U
EX-7	8/17/06	2.4		5.4		1.5		0.5	U
EX-7	11/14/06	1.6		3.3		0.87		0.5	U
EX-7	12/7/06	2.5		4.7		1.7		0.5	U
EX-7	1/4/07	0.5	U	0.5	U	0.5	U	0.5	U
EX-7	2/20/07	2.0		5.7		3.2		0.5	U
EX-7	5/24/07	1.9		3.5		1.2		0.5	U
EX-7	8/15/07	1.3		2.8		1.4		0.5	U
EX-7	8/6/09	0.81		20		22		0.50	
EX-7	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-7	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-7	8/2/10	0.5	U/R-04	0.5	U/R-04	0.5	U/R-04	0.5	U/R-04
EX-7	11/9/10	0.5	U	0.5	U	0.62		0.5	U
EX-7	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
EX-10	2/15/06	4.0		6.9		3.7		0.5	U
EX-10	5/8/06	4.1		5.6		6.3		0.5	U
EX-10	7/17/06	1.6		8.6		2.6		0.5	U
EX-10	8/17/06	0.51		2.2		6.2		0.5	U
EX-10	9/7/06	0.5	U	0.52		11		0.5	U
EX-10	10/26/06	0.5	U	0.5	U	2.7		0.5	U
EX-10	11/16/06	0.5	U	0.5	U	5.2		0.5	U
EX-10	12/7/06	0.5	U	0.5	U	5.3		0.5	U
EX-10	1/4/07	0.5	U	0.5	U	2.9		0.5	U

Table 2
On-site Groundwater VOC Concentrations
February 2006 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
EX-10	2/19/07	0.5	U	0.5	U	9.7		0.57	
EX-10	5/29/07	0.5	U	0.5	U	8.9		0.63	
EX-10	8/15/07	0.5	U	1.1		9.7		7.0	
EX-10	2/13/08	0.5	U	0.56		4.5		8.7	
EX-10	8/18/08	0.5	U	0.5	U	2.6		2.7	
EX-10	2/11/09	0.5	U	0.5	U	7.4		5.7	
EX-10	8/11/09	0.5	U	0.5	U	1.2		0.5	U
EX-10 Dup	8/11/09	0.5	U	0.5	U	1.0		0.5	U
EX-10	2/3/10	0.5	U	0.5	U	2.9		1.7	
EX-10	8/3/10	0.5	U	0.5	U	0.97		0.5	U
EX-10	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
Area 3 Wells									
EX-13	2/2/06	0.5	U	3.6		110	D	22	
EX-13	5/8/06	0.5	U	0.5	U	62	D	83	D
EX-13	8/21/06	0.5	U	0.73		74	D	120	D
EX-13	11/15/06	0.5	U	0.5	U	49		69	D
EX-13	2/15/07	0.5	U	0.5	U	55	D	120	D
EX-13	5/23/07	0.5	U	0.5	U	31		48	
EX-13	8/27/07	0.5	U	0.5	U	15		63	
EX-13	2/12/08	0.5	U	0.5	U	57		53	
EX-13	8/18/08	0.70		0.56		69		33	
EX-13	2/11/09	0.5	U	0.5	U	0.78		0.5	U
EX-13	8/12/09	0.5	U	0.5	U	16		4.0	
EX-13	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	8/3/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	11/9/10	0.5	U	0.5	U	0.5	U	0.5	U
EX-13	2/9/11	2.5	U	2.5	U	2.5	U	2.5	U
MW-27s	2/15/06	4.2		1.6		0.5	U	0.5	U
MW-27s	8/30/06	8.5		2.2		0.91		0.5	U
MW-27s	2/21/07	3.9		1.3		0.5	U	0.5	U
MW-27s	8/27/07	8.1		2.3		0.98		0.5	U
MW-27s Dup	8/27/07	7.9		2.1		0.96		0.5	U
MW-27s	8/19/08	2.9		1.1		2.3		0.5	U
MW-27s Dup	8/19/08	3.1		1.1		2.3		0.5	U
MW-27s	8/11/09	2.8		0.96		0.5	U	0.5	U
MW-27s	8/3/10	0.5	U	0.5	U	0.70		0.5	U
Area 4 Wells									
MW-6b	2/20/06	1.3		11		5.6		1.2	
MW-6b	8/30/06	2.1		15		6.5		0.5	U
MW-6b	2/21/07	1.5		11		4.0		0.5	U
MW-6b Dup	2/21/07	1.2		7.7		2.8		0.5	U

Table 2
On-site Groundwater VOC Concentrations
February 2006 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
MW-6b	8/27/07	4.1		9.5		5.9		0.5	U
MW-6b	8/19/08	1.4		2.4		1.4		0.5	U
MW-6b	8/11/09	0.5	U	18		63		52	
MW-6b	2/3/10	0.70		1.1		0.5	U	0.5	U
MW-6b	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
MW-6b	8/2/10	0.5	U	0.5	U	1.2		0.5	U
MW-6b	11/9/10	0.5	U	0.5	U	0.5	U	0.5	U
MW-6b	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U
MW-9i	2/20/06	0.61		3.1		1.2		0.5	U
MW-9i	5/9/06	0.98		7.5		13		0.5	U
MW-9i	8/29/06	1.5		10		14		0.5	U
MW-9i	11/15/06	0.87		6.1		9.7		0.5	U
MW-9i	2/19/07	1.5		13		25		0.5	U
MW-9i	5/29/07	1.1		10		17		0.5	U
MW-9i	8/28/07	0.63		4.8		7.1		0.5	U
MW-9i	8/18/08	0.5	U	2.5		1.5		0.5	U
MW-9i	8/11/09	0.5	U	1.3		1.4		0.5	U
MW-9i	8/3/10	0.5	U	0.97		1.1		0.5	U
RW-2	2/15/06	1.5		4.3		120	D	0.69	
RW-2	5/8/06	0.82		2.2		58		0.5	U
RW-2	8/17/06	1.5		4.2		61	D	0.5	U
RW-2	11/9/06	1.5		3.4		31		0.5	U
RW-2	2/14/07	1.9		4.4		62		0.5	U
RW-2	5/24/07	1.5		3.6		51		0.5	U
RW-2	8/15/07	1.9		3.8		27		0.5	U
RW-2	2/12/08	2.5		5.2		59		0.5	U
RW-2	8/18/08	2.5		23		74	D	0.5	U
RW-2	10/9/08	2.2		14		65		0.5	U
RW-2	2/11/09	0.5	U	5.1		14		0.74	
RW-2	8/11/09	0.5	U	0.67		6.2		13	
RW-2 Dup	8/11/09	0.5	U	0.66		6.5		13	
RW-2	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2 Dup	2/3/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2 Dup	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-2	8/2/10	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04
RW-2 Dup	8/2/10	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04	5.0	U/R-04
RW-2	11/9/10	10	U	10	U	10	U	10	U
RW-2 Dup	11/9/10	10	U	10	U	10	U	10	U
RW-2	2/9/11	5.0	U	5.0	U	5.0	U	5.0	U
RW-2 Dup	2/9/11	5.0	U	5.0	U	5.0	U	5.0	U
RW-4	2/15/06	8.6		30		9.5		0.5	U
RW-4	5/8/06	8.2		24		6.2		0.5	U

Table 2
On-site Groundwater VOC Concentrations
February 2006 - February 2011
Cascade Corporation - TGA Remedy

Sample Location	Sample Date	Tetrachloro-ethene		Trichloro-ethene		*cis* -1,2-Dichloroethene		Vinyl Chloride	
		(µg/L)	L	(µg/L)	L	(µg/L)	L	(µg/L)	L
Groundwater Cleanup Levels		**5.0**		**5.0**		**70**		**2.0**	
RW-4	8/22/06	6.2		18		2.9		0.5	U
RW-4	11/9/06	6.8		16		2.5		0.5	U
RW-4	2/14/07	8.8		26		4.2		0.5	U
RW-4	5/24/07	9.7		27		5.7		0.5	U
RW-4	8/27/07	4.8		12		3.9		0.5	U
RW-4	11/14/07	0.82		2.8		43		1.5	
RW-4	2/12/08	0.5	U	0.5	U	35		6.2	
RW-4	5/8/08	0.5	U	0.5	U	25		16	
RW-4	8/18/08	0.5	U	0.5	U	3.3		1.3	
RW-4	2/11/09	0.5	U	0.57		2.3		4.4	
RW-4	8/11/09	0.5	U	0.5	U	6.0		4.5	
RW-4	2/3/10	3.9		7.8		3.7		0.5	U
RW-4	5/11/10	0.99		1.4		7.3		0.5	U
RW-4	8/3/10	0.5	U	0.5	U	2.9		0.5	U
RW-4	11/9/10	0.67		0.90		0.60		0.5	U
RW-4	2/9/11	0.5	U	1.0		1.6		0.5	U
RW-5	2/15/06	3.1		13		35		0.5	U
RW-5	5/8/06	2.6		11		18		0.5	U
RW-5	8/22/06	3.2		15		14		0.5	U
RW-5	11/9/06	2.7		7.6		9.2		0.5	U
RW-5	2/14/07	2.5		8.5		4.7		0.5	U
RW-5	5/24/07	2.4		7.5		4.9		0.5	U
RW-5	8/20/07	2.9		8.3		16		0.5	U
RW-5	2/13/08	1.5		3.4		2.3		0.5	U
RW-5	8/19/08	0.5	U	0.5	U	0.5	U	0.99	
RW-5	2/10/09	0.5	U	1.4		2.2		6.9	
RW-5	8/11/09	0.5	U	0.89		2.3		2.6	
RW-5	2/3/10	0.5	U	0.74		0.5	U	0.5	U
RW-5	5/11/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-5	8/2/10	0.5	U	0.61		0.70		0.5	U
RW-5	11/9/10	0.5	U	0.5	U	0.5	U	0.5	U
RW-5	2/9/11	0.5	U	0.5	U	0.5	U	0.5	U

NOTES:

TGA remedy cleanup levels are per DEQ's TGA Record of Decision, 1996.

µg/L = micrograms/liter; L = laboratory qualifier; Dup = duplicate sample; D = sample diluted to bring concentration within calibration limit; U = compound not detected at posted method reporting limit; R-04 = reporting levels elevated due to dilution necessary for analysis (method detection limit reported).

One out of range TCE detection occurred in EX-7 in Aug. 2009, exceeding the concentration range since 1998.

Out of range detections also occurred in Aug. 2009 in wells MW-6b (for TCE and VC) and RW-2 (VC).

Table 3
Remedy Action Objectives
Cascade Corporation - TGA Remedy

RAO No. 1	"Restore the TGA to background or the lowest protective concentrations, if feasible, in a reasonable time. If this is not feasible, minimize the areal extent of the TGA that contains contaminants above maximum contaminant levels (MCLs), 1 X 10^{-6} excess cancer risk, or a hazard quotient of 1.0 (whichever is more protective), and provide long-term containment for areas where concentrations are above MCLs or risk-based levels."
RAO No. 2	"Prevent ingestion of TGA groundwater or surface water that contains contaminants at concentrations above MCLs or acceptable risk-based levels."
RAO No. 3	"Protect environmental receptors by preventing discharge of TGA groundwater to surface water at VOC concentrations that may exceed ambient water quality criteria."
RAO No. 4	"Prevent the further spread of contamination in the TGA to the extent practicable."
RAO No. 5	"Protect groundwater quality in the TSA."
RAO No. 6	"Allow existing uses of groundwater resources in east Multnomah County."
RAO No. 7	"Prevent direct contact with unsaturated soil that has contaminant concentrations exceeding risk-based protective cleanup levels."
RAO No. 8	"Reduce contaminant concentrations in, and prevent contaminant migration from, unsaturated soil to the extent necessary to achieve the groundwater RAOs defined above."

NOTES:

Source: *TGA Record of Decision* (DEQ, December 1996).

Table 4
Construction Details for Wells Proposed to be Decommissioned
Cascade Corporation - TGA Remedy

Well No.	Completed Date	Total Well Depth	Borehole Diam.	Casing Diam.	A or B[a]	Ground Surface Elevation	Top of Well Casing Elevation	Boring Depth	Screen Interval	Screen Material
		(ft, bgs)	(inches)	(inches)		(ft, MSL)	(ft, MSL)	(ft, bgs)	(ft, bgs)	
EX-1	9/16/94	25	8	4	B	142.6	142.1	27.4	10.4-25.0	SS
EX-7	6/30/95	25.1	8	4	B	142.2	141.8	25.9	5.1-25.0	SS
EX-10	12/28/94	25.2	6	2	B	145.9	145.4	25.6	5.4-25.2	SS
EX-13	2/1/91	22.5	6	2	B	145.6	145.4	23.0	7-22	S 40 PVC
MW-6b	10/20/88	45.9	6	2	B	140.8	140.6	45.9	30-45	PVC
MW-27s	9/13/94	28	8	4	B	144.0	143.6	30.0	12.9-27.3	S 40 PVC
RW-2	3/13/92	53	10	6	B	141.0	140.6	55.0	20-30 30-55	SS
RW-4	1/30/96	32	8	4	B	141.0	140.1	32.4	10.8-30.4	SS
RW-5	10/18/88	49	8 / 6	2	B	140.6	140.1	49.0	34-48	PVC

NOTES:

[a] A = well completion is above-grade; B = well completion is flush-mount.

ft, bgs = feet below ground surface; ft, MSL = feet mean sea level; SS = stainless steel.