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FINAL Technical Memorandum

To:	Paula Brown, Pieter Smeenk, Daryl McVey		
From:	Nicki Pozos	**Reviewed by:**	Mark Knudson
Date:	June 28, 2007	**WO#:**	7650A.00 T06
Subject:	City of Ashland Development of the Initial Distribution System Evaluation Plan - FINAL		

The purpose of this memorandum is to describe the process used to develop the Initial Distribution System Evaluation (IDSE) Plan for the City of Ashland. The IDSE is a requirement of the USEPA Stage 2 Disinfectants and Disinfection By-Products Rule (DBPR), which was promulgated in January 2006. The purpose of the IDSE is to identify new monitoring points representing the range of DBP levels in the City's distribution system, including the highest trihalomethane (THM) and haloacetic acid (HAA) levels.

Compliance Schedule

Based on the City's current population of 21,430 persons, the City is on "Schedule 3" under the Stage 2 DBPR, with the following compliance dates:

- October 1, 2007 - Submit IDSE Plan to USEPA
- September 30, 2009 - Complete standard monitoring. Monitoring may be initiated either once USEPA approval is received, or within one year of submission, if approval is not yet received.
- January 10, 2010 - Submit IDSE Report. The report will identify Stage 2 DBPR compliance sites based on the results of the IDSE monitoring.
- October 1, 2013 - Begin compliance monitoring

IDSE Plan Options and Approach

There are three options available to Ashland for completing an IDSE plan, as follows:

- **40/30 waiver**. Systems with no previous THM and HAA samples greater than 40 and 30 µg/L, respectively, are exempt from the IDSE. The City does not fall under this category.
- **System Specific Study (SSS)**. Systems may use either a distribution system hydraulic model or historical data to conduct an SSS. This option was not selected for the City as it requires the hydraulic model to meet stringent requirements and has high documentation requirements.

- **Standard Monitoring Plan (SMP).** The SMP is the default option for systems not suited to the other two options and was selected for the City. The SMP uses available information, including hydraulic model results, historical chlorine residual data, and the system configuration, to identify sites likely to have high THM and/or HAA levels.

A fourth option, the very small system waiver, is suitable only for communities serving less than 500 customers and is not applicable to Ashland.

Standard Monitoring Plan Requirements

For communities serving between 10,000 and 49,999 persons, the SMP requires the identification of eight IDSE sample sites, as follows:

- **One Entry Point Site**. Source water entry point sites should be located upstream of the first user.

- **Three High THM Sites**. High THM levels are generally associated with high water age and low chlorine residuals.

- **Two High HAA Sites.** High HAA levels are generally associated with the same factors as high THM levels. However, HAAs may be biodegraded by microorganisms in the distribution system, particularly in areas with very low chlorine residuals. In such systems, high HAA sites will be located in areas that have high water age, but also have at least a moderate chlorine residual.

- **Two Average Residence Time Sites.** The purpose of including the average residence time sites is to capture potentially high HAA sites in systems that have biodegradation. Average residence time sites may be identified using chlorine residuals and a hydraulic model.

The selected IDSE sample sites and the selection process are described in the IDSE Plan. The IDSE Plan also includes the following:

- **Identification of the Peak THM/HAA Month.** The peak THM/HAA month may be determined based on historical THM/HAA data, or alternately may be identified based on the peak temperature month.

- **Proposed IDSE Sampling Schedule.** For systems the size of the City, the IDSE sites must be sampled bimonthly for one year, for a total of 6 rounds of sampling. One of the sampling dates must be during the month of peak THM/HAA formation. Systems must specify the exact week during which they will conduct each sampling. Any deviations from the schedule must be explained in the IDSE Report.

- **Stage 1 DBPR Sampling Schedule**. Systems must specify the exact week during which they will conduct each sampling for Stage 1 DBPR compliance; any deviations must be explained in the IDSE Report.

IDSE Sample Site Selection

The evaluation of IDSE sample sites for the City was based on three sources of information, as summarized in Table 1:

- Water age calculated using the City's hydraulic model, as shown in Figure 1.
- Historical chlorine residual concentrations at Total Coliform Rule (TCR) monitoring locations.
- Historical THM and HAA concentrations at Stage 1 DBPR monitoring sites.

In addition, the sites were selected to provide good geographic representation of the City's distribution system.

Table 1 Total Coliform Rule Monitoring Sites
IDSE Plan
City of Ashland

Sample Site	Calculated Water Age (hrs)[1]	10th Percentile Chlorine Residual (mg/L)[2]	Average THM Level (mg/L)[3]	Average HAA Level (mg/L)[3]
1 - Crowson Reservoir	17	0.51	0.034	0.046
2 - 1221 Ashland Mine	22	0.26	0.039	0.044
3 - 361 Coventry	43	0.14	0.042	0.044
4 - 1275 Greenmeadows	305	0.00	0.044	0.031
5 - 699 Oak Knoll	39	0.26	-	-
6 - 625 Elkader	27	0.39	-	-
7 - 905 N. Mountain	36	0.20	-	-
8 - 440 Normal	32	0.20	-	-
9 - 281 East Main	31	0.44	-	-
Sample Site Average	61	0.27	0.040	0.041
System-Wide Average [4]	49	-	-	-

Notes:
1. Based on 800-hour model simulation run under current average day demand conditions.
2. Based on samples collected weekly between January 2002 and November 2006.
3. Based on quarterly samples collected between February 2002 and October 2006.
4. Based on averaging the age at all nodes in the hydraulic model.

As shown in Table 1, four of the TCR sites are used for Stage 1 DBPR monitoring and cannot be used for the IDSE; these include the sites with the two highest and two lowest water ages of all sites. Average historical THM levels were greatest for the two sites (Nos. 3 and 4) with the highest water age, consistent with expectations. Average historical HAA

levels were similar at three of the sites (Nos. 1 through 3), but were significantly lower at Site No. 4. This site also has a much greater water age than the remaining sites and had no detectable chlorine residual in 33 percent of samples. This pattern is consistent with biological degradation of HAAs at this site. The implication of finding biological degradation of HAAs in the City's system is that selected High HAA sites should have a significant chlorine residual (10th percentile chlorine concentration of 0.2 mg/L or greater).

The recommended sites with their rationales are summarized in Table 2. The information was entered into the IDSE forms to be submitted to the USEPA. The recommended sample locations are also shown in Figure 2.

Entry Point Site. A single entry point site is required. The entry point site should be located upstream of the first user and any reservoirs. As no TCR sites met this criterion, it was recommended that the City establish a new site or use another existing sample site meeting the criteria. The City selected an available sample site located at 422 Granite Street.

High THM Sites. Existing TCR Site No. 7 was selected as the first High THM site, as it had the lowest chlorine residuals and second highest water age of the available sites. The two remaining High THM sites were selected to represent areas with high water age that are not represented by the current TCR sites. The calculated water ages throughout the City's system are shown in Figure 1. High water age areas are concentrated in the following areas:

- Alsing Reservoir and service area (represented by Site No. 4, which is a Stage 1 monitoring site)
- Fallon Reservoir and service area (no TCR sites);
- Granite Reservoir (no TCR site); and
- Sub-pressure zones served by Granite Reservoir (represented by Site Nos. 3 and 4).

As there are no TCR sites in the area served by Fallon Reservoir, it was recommended that the City establish a new sample site in this area. City staff selected a sample location at 210 Sunnyview Street. It was recommended that the final high THM sample site be a new site located in the Alsing Reservoir service area. City staff selected a sample location at 990 Pinecrest Terrace. This site is ideal as it is located far from the existing TCR Site No. 4.

A High THM sample site at Granite Reservoir or at the nearest downstream service location was also considered. However, as the City plans to revise system operations to improve turnover in Granite Reservoir, water age likely not be high at this site in the future. Also, under current operations, water from Granite Reservoir affects only a very small portion of the system. Overall, a new sample site in the Alsing Reservoir service area was considered more representative of the highest THM concentrations in the City's distribution system.

High HAA Sites. Existing TCR Site Nos. 5 and 8 were selected as the two High HAA sites. These sites had the lowest chlorine residuals and highest water age of the remaining sites.

As it is likely that HAA biodegradation is occurring in the City's distribution system, the selected High HAA sites both have a 10th percentile chlorine residual of 0.2 mg/L or greater.

Average Residence Time Sites. The two remaining TCR Site Nos. 6 and 9 were selected as the two Average Residence Time Sites. Though the water age at these sites is somewhat less than the system average, they provide good geographic coverage of the City's system and are representative of "typical" conditions in the City's system.

Table 2 Proposed Standard Monitoring Sites IDSE Plan City of Ashland

Proposed Sample Site	Type of Site	Rationale
10 - 422 Granite (New Site)	Entry Point	New entry point site located upstream of the first user.
7 - 905 N. Mountain	High THM	Existing TCR site with lowest 10th percentile chlorine residual (0.20 mg/L) and second highest water age (36 hrs) of sites not used for Stage 1 monitoring.
5 - 699 Oak Knoll	High HAA	Existing TCR site with third lowest 10th percentile chlorine residual (0.26 mg/L) and highest water age (39 hrs) of sites not used for Stage 1 monitoring.
8 - 440 Normal	High HAA	Existing TCR site with lowest 10th percentile chlorine residual (0.20 mg/L) and third highest water age (32 hrs) of sites not used for Stage 1 monitoring. Provides representation of Granite Reservoir service area.
9 - 281 East Main	Average Residence Time	Existing TCR site with moderately high 10th percentile chlorine residual (0.44 mg/L) and moderate water age (31 hrs). Provides representation of Granite Reservoir service area.
6 - 625 Elkader	Average Residence Time	Existing TCR site with moderately high 10th percentile chlorine residual (0.39 mg/L) and moderate water age (27 hrs). Provides representation of Crowson Reservoir service area.
11 - 210 Sunnyview (New site)	High THM	New sample site. Provides representation of Fallon Reservoir service area, which has a water age > 100 hours and has no existing Total Coliform Rule or Stage 1 DBPR sample sites.
12 - 990 Pinecrest Terrace (New site)	High THM	New sample site. Provides representation of Alsing Reservoir service area, which has a water age > 100 hours and is not represented by the other proposed IDSE sample locations.

Identification of Sampling

The City's peak month was identified based on historical water temperature data collected daily for CT compliance at the City's Water Treatment Plant between July 2004 and November 2006. The temperature data are summarized below in Table 3. As shown in the table, the peak temperature month is August. As such, the sampling schedule must include sampling within the month of August. Sampling should be completed between October 1, 2008 and September 30, 2009. Sampling months will be as follows: October 2008, December 2008, February 2009, April 2009, June 2009, and August 2009. Specific sampling weeks were selected by City staff and are included in the attached IDSE forms.

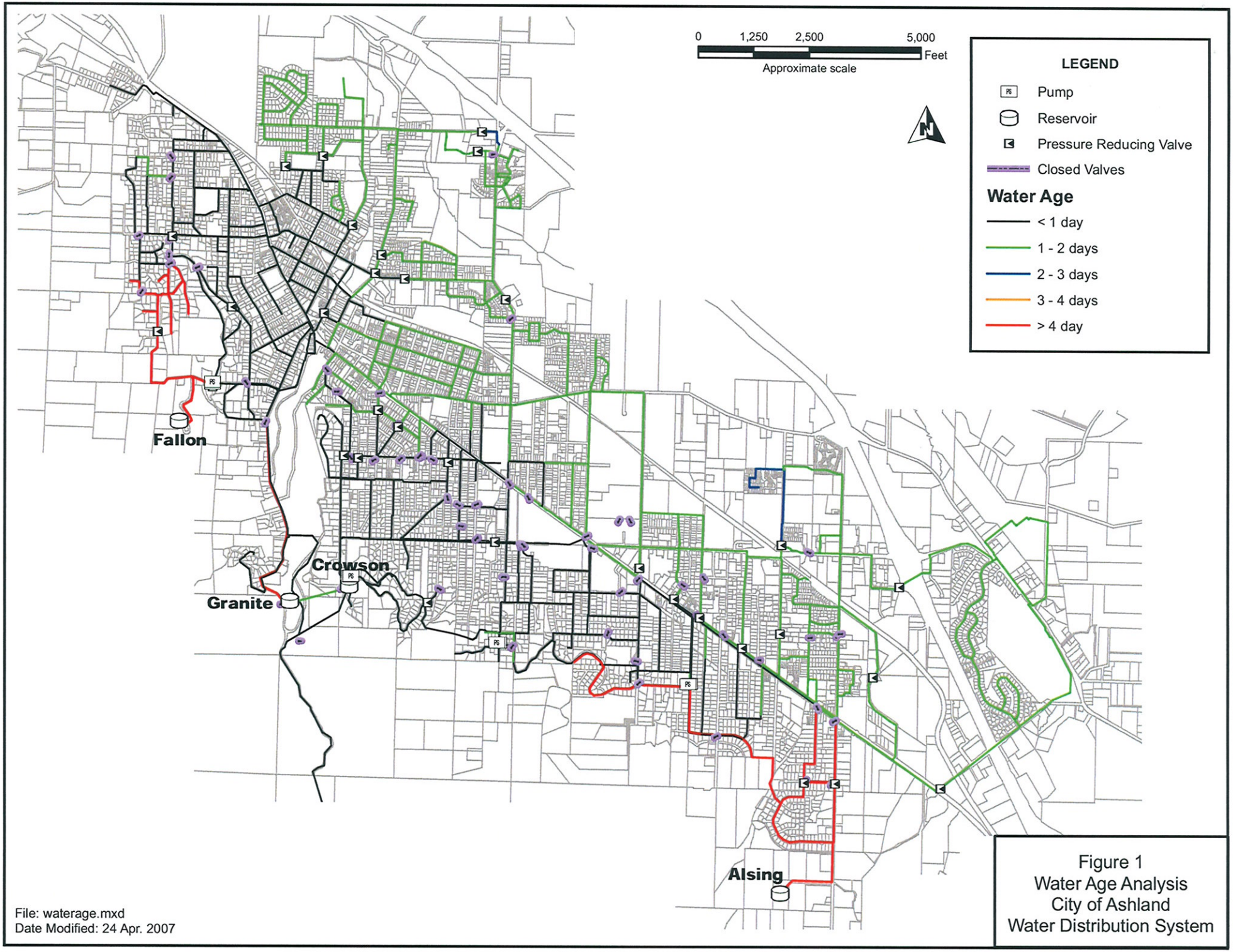
Stage 1 monitoring will also be conducted as usual during the standard monitoring period. Based on the City's current Stage 1 monitoring schedule, the sampling months will be as follows: November 2008, February 2009, May 2009, and August 2009. Specific sampling weeks were selected by City staff and are included in the attached IDSE forms.

Table 3 Average Monthly Water Temperatures
IDSE Plan
City of Ashland

Month	Average Monthly Temperature (°C)
January	4.3
February	4.5
March	4.9
April	5.9
May	7.0
June	8.3
July	11.1
August	16.9
September	16.0
October	11.9
November	7.7
December	4.8

IDSE Forms

The USEPA requires that standard forms be completed for submittal of the IDSE Plan. The forms were filled out by Carollo and are included as an attachment. The forms need to be submitted to the USEPA before October 1, 2007. Forms can be submitted as an attachment via email to stage2mdbp@epa.gov or submitted electronically via the IDSE tool (www.epa.gov/safewater/disinfection/stage2). It is beneficial to submit the forms as soon as possible to facilitate timely review and acceptance by the USEPA.



File: waterage.mxd
Date Modified: 24 Apr. 2007

Figure 1
Water Age Analysis
City of Ashland
Water Distribution System

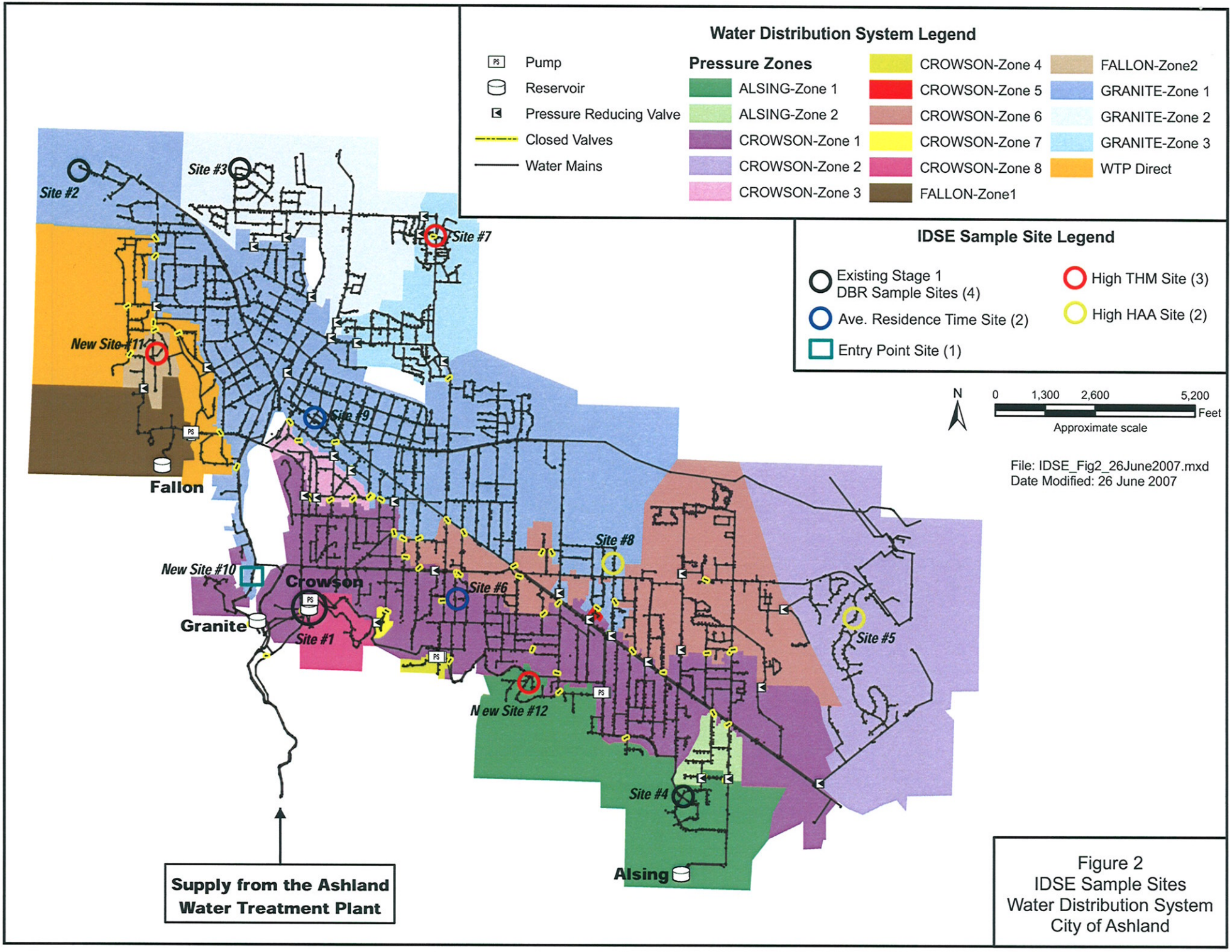


Figure 2
IDSE Sample Sites
Water Distribution System
City of Ashland