9.0 FLOODS

Multnomah County is subject to flooding from several distinct flood sources, including:

1) overbank flooding from the Columbia River, Willamette River and Sandy River,
2) overbank flooding from the numerous smaller streams in Multnomah County,
3) potential floods from dam failures, and
4) local storm water drainage flooding.

Flooding events from the above possible flood sources have very different characteristics.

Floods on the Columbia River may occur from late fall through June, but are most common in late spring (May and June) when large contributions from snowmelt increase flows. Because the drainage area is very large, about 240,000 square miles, flood events are governed by the total rainfall and snowmelt over periods of a week or more. Multnomah County is protected from Columbia River floods by levees maintained by the Multnomah Drainage District #1, Sandy Drainage Improvement Company, Columbia Drainage District and the Sauvie Island Drainage District. The probability of levee failures is generally low, based on the construction and height of the levees, but extreme flood events could result in overtopping of the levees and/or levee failures. See Section 9.3 for further discussion of these levees.

Floods on the Willamette River may also occur from late fall through spring, with flooding most common in late fall and winter months. Floods on the Willamette arise from extended periods of rainfall, typically with contributions from snowmelt. Because the drainage area, about 11,000 square miles, is much smaller than that of the Columbia River, floods on the Willamette River are governed by total rainfall and snowmelt over shorter time periods, from a few days to a week or so. Parts of Multnomah County are protected from flooding on the Willamette River by levees and floodwalls maintained by the Port of Portland.

Flooding events on the Columbia River and Willamette River often occur at the same time, although the severity of flooding may differ.

Floods along the Sandy River and the small creeks in Multnomah County typically occurs from late fall or winter storms with intense rainfall, with flooding sometimes exacerbated by snow-melt runoff. Because the drainage areas are small, the streams' response time to rainfall is rapid and flood events tend to be governed by the amount of rainfall in relatively short periods of a few hours to a day or two. None of these smaller waterways have levees or flood walls. Flooding these

smaller waterways often occurs without flooding on the Columbia River and Willamette River, although flood events may also coincide. See Section 9.2 for further discussion of overbank flooding from these sources.

Flooding from failures of one or more dams along the Columbia River or the Willamette River and their tributaries is relatively unlikely because the dams are generally well-designed and well-maintained. However, the fact that a dam failure is possible, it cannot be ignored. See Section 9.5 for further discussion of possible dam failures.

In addition to overbank flooding from the above waterways, portions of Multnomah County are also subject to localized storm water drainage. Storm water drainage flooding occurs when inflows of storm water exceed the conveyance capacity of the local storm water drainage system. See Section 9.5 for further discussion of localized storm water drainage flooding.

9.1 Historical Floods in Multnomah County

Historically, flooding has occurred in the Multnomah County area throughout the recorded history. Flooding from the Columbia River was frequent in the 19th century and early 20th century, but has been greatly mitigated by the construction of extensive levee systems. Flooding has also occurred along the Sandy River and along the numerous smaller local creeks in Multnomah County.

Significant floods occurred on the Columbia River and Multnomah River in 1861, 1880, 1881, 1909, 1913, 1927, 1928, 1942, 1946, 1948, 1961, 1964/1965, 1996 and 2007. The construction of flood control infrastructure on the Columbia River and Willamette River has reduced, but not eliminated, the potential for major flood events on these rivers.

Notable historical flood events affecting Multnomah County include:

- 1948. Memorial Day flood on the Columbia River. This flood destroyed the town of Vanport, a community of 18,000 people. Lower elevations in Multnomah County, including portions of the Columbia River Highway, and especially the Sandy River delta area also experienced substantial flood damages.
- 1964. Christmas Day flood on the Sandy River. This flood damaged or destroyed about 750 homes along the Sandy River. In Multnomah County, the Columbia River Highway was washed out at the east end of the Beaver Creek Bridge.
- 1996. Major flooding occurred throughout almost the entire state in February from a combination of warm temperatures, heavy snowpack and four days of record breaking rain. Flooding was extensive in Multnomah County with widespread closures of major highways and secondary roads.

- 1999. Widespread flooding occurred on smaller rivers and streams which arose from heavy snowfalls in late January followed by warm temperatures and heavy rains in February. In addition to flood damage, there were numerous landslides and mudslides. The Historic Columbia River Highway east of the Sandy River Bridge was covered with slides coming from the cliffs above. One such mudslide pushed an entire house into the Sandy River resulting in the death of one person.
- 2007. Severe storms with flooding, winds, mudslides and landslides occurred between December 1st and December 17th. Many roads were closed and there were significant damages to public infrastructure, homes and businesses.
- 2009. On January 1st, Portland received 3.04 inches of rain from a warm tropical storm ("Pineapple Express") which combined with extensive snowmelt from heavy snowfall in December. Flood elevations in Johnson Creek were the second highest recorded and flooding also occurred on other streams in Multnomah County.

Figure 9.1
Vanport Flood of 1948

9.2 Flood Hazards and Flood Risk: Within Mapped Floodplains

9.2.1 Overview

The FEMA Flood Insurance Rate Maps (FIRMs) delineate the regulatory (100-year) floodplain areas. The maps for Multnomah County were updated on December 18, 2009.

FEMA floodplain maps typically include the following types of areas:

1. **Zone AE**: Areas with a 1% annual chance of flooding with detailed flood hazard data, including base flood elevations (the elevation of the 100-year flood).

2. **Zone A**: Unnumbered A-Zones, within 100-year flood plain, but without detailed flood hazard data (no base flood elevations).

3. **Zone AH**: Flood depths of 1 to 3 feet (usually areas of ponding), including base flood elevations.

4. **Zone X (Shaded)**: Areas of 0.2% annual chance flood (500-year flood), areas of 1% annual chance flood (100-year flood) with average depths of less than 1 foot, or with drainage areas of less than 1 square mile and areas protected by levees from the 1% annual chance flood.

5. **Zone X (Unshaded)**: Areas determined to be outside of the 0.2% annual chance flood (500-year flood).

The FEMA mapped floodplains (2009 Map) within Multnomah County are shown as Figures 9.2 and 9.3 on the following pages.

The FEMA floodplain maps delineate the 100-year floodplain boundaries and other potentially flood-prone areas as defined above. The 100-year flood is the flood with a 1% chance of being exceeded in any given year. A 1% annual chance of flooding corresponds to about a 26% chance of flooding in a 30-year time period. Detailed floodplain boundaries are shown on the Flood Insurance Rate Maps.

The FEMA Flood Insurance Study and Flood Insurance Rate Maps include a large number of terms of art and acronyms. A good summary of the terms used in flood hazard mapping is available on the FEMA website at:

http://www.fema.gov/pdf/floodplain/nfip_sg_appendix_d.pdf

Figure 9.2
FEMA-Mapped Floodplains within Multnomah County – West

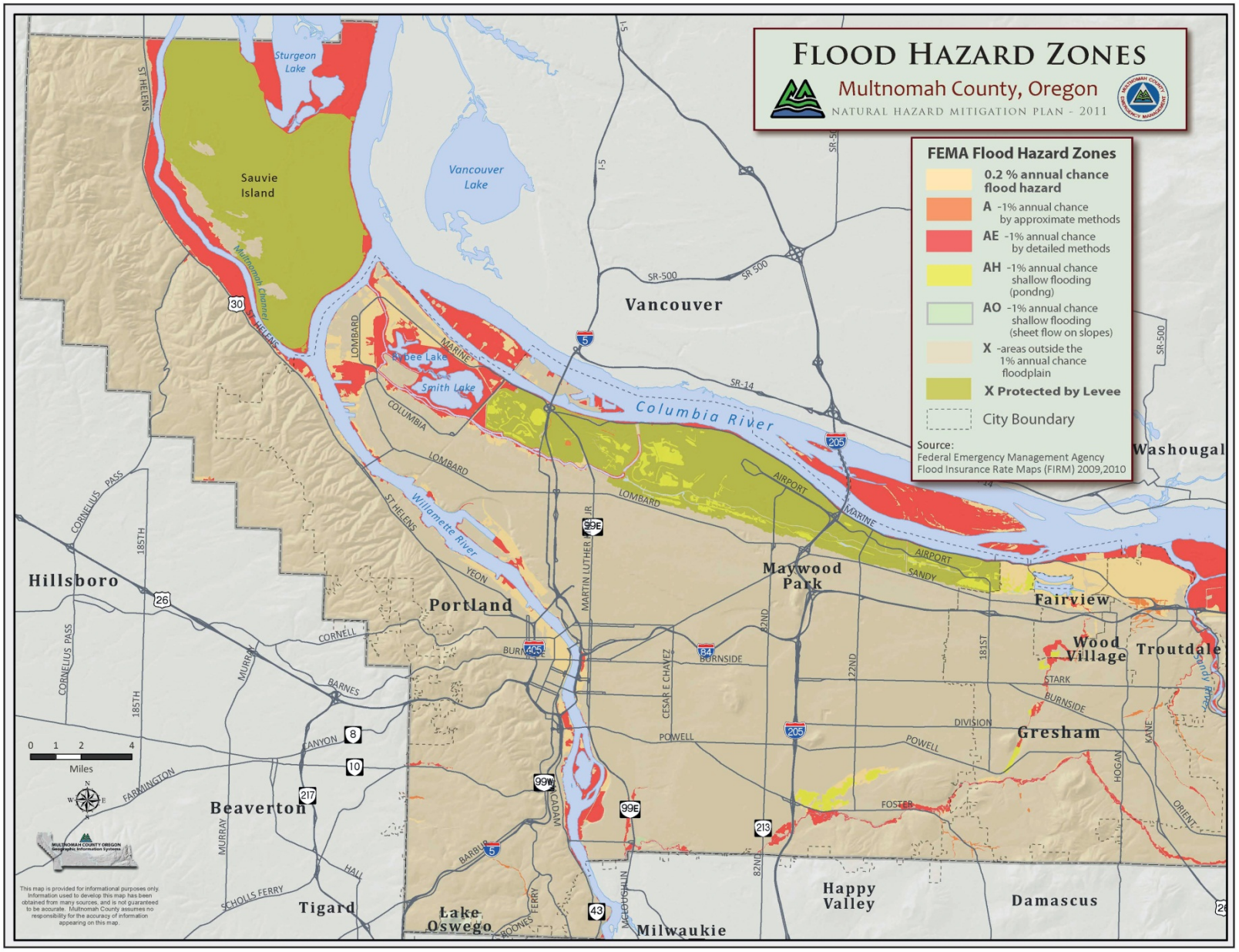


Figure 9.3
FEMA-Mapped Floodplains within Multnomah County - East

As shown in the preceding figures, there are many areas within Multnomah County within the FEMA-mapped floodplains or protected by levees. The majority of these at-risk areas are located along the Columbia River, with significant at-risk areas along the Willamette River and the Multnomah Channel, which separates Sauvie Island from the western part of Multnomah County. There are also smaller FEMA-mapped floodplains along the Sandy River and numerous smaller streams.

However, an important caveat on the interpretation of the FEMA Maps shown in Figures 9.2 and 9.3, is that some of the large areas, including a large area that includes Portland International Airport and much of Sauvie Island are classified as Zone X. These areas are protected by levees and thus subject to flooding only in extreme flood events or unanticipated levee failures.

9.2.2 Flood Hazard Data

For mapped 100-year floodplain areas (AE Zones), the flood hazard data included in the Flood Insurance Study (FIS) allow quantitative calculation of the frequency and severity of flooding for any property within the floodplain.

Table 9.1
Flood Hazard Data
Sandy River: At Columbia River Highway

Flood Frequency (years)	Discharge (cfs)	Elevation (feet)
10	48,000	35.8
50	72,000	39.2
100	82,800	40.6
500	129,200	45.0

The stream discharge data shown above for the Sandy River is from Table 6 on page 22 of the December 18, 2009 Flood Insurance Study for Multnomah County. Stream discharge means the volume of water flowing down the river and is typically measured in cubic feet of water per second (cfs).

The flood elevation data are from the Flood Profile Graph 52P in the Flood Insurance Study. Flood elevation data vary with location along the reach of the river and thus separate flood elevation data points must be read from the graph at each location along the river. The data shown above are for Cross Section H, at the East Columbia Highway Bridge.

Quantitative flood hazard data such as shown above, are important for mitigation planning purposes because they allow quantitative determination of the frequency and severity (i.e., depth) of flooding for any building or other facility (e.g., road or water treatment plant) for which elevation data exist. Such quantitative flood hazard data are also necessary for benefit-cost analysis of mitigation projects to reduce the level of flood risk for a particular building or other facility.

For a given location, the level of flood risk varies dramatically depending on the first floor elevation of each building or other facility. For example, in the area near the Columbia River Highway Bridge, a building with a first floor elevation of 33 feet is expected to experience flooding above the first floor more frequently than every 10 years on average. However, a nearby building, with a first floor elevation of 41 feet would be expected to experience flooding above the first floor only about once every 100 years on average.

9.6.3 Caveats for the Multnomah County Flood Insurance Study

The Flood Insurance Study (FIS) for Multnomah County and vicinity was current as of 2009. Over time, flood hazards may gradually change because of increasing development upstream, changes in stream channels, improvements (or degradation) of flood protection measures over time and other changes, including climate change. Therefore, Flood Insurance Studies which are 10 or 20 years old are more likely to be inaccurate than more recent studies. The older a study is, the more likely it is that channel or watershed conditions have changed over time.

Another caveat is that flood studies are inevitably less than perfect, due to incomplete data and modeling uncertainties. Thus, in some cases, mapped floodplain boundaries may underestimate or overestimate the actual level of flood risk at a given location.

9.2.4 Interpreting Flood Hazard Data for Mapped Floodplains

The level of flood hazard (frequency and severity of flooding) is not determined simply by whether the footprint of a given structure is or is not within the 100-year floodplain. A common error is to assume that structures within the 100-year floodplain are at risk of flooding while structures outside of the 100-year floodplain are not. This simplistic view is simply not true. Some important guidance for interpreting flood hazards is given below.

A. Being in the 100-year floodplain does not mean that floods happen once every 100 years. Rather, a 100-year flood simply means that the probability of a flood to the 100-year level or greater has a 1% chance of happening every year.

B. Within or near the 100-year floodplain, the key determinant of flood hazard for a building or other facility is the relationship of the elevation of the structure or facility to the flood elevations for various flood events. Thus, for example, homes with first floor elevations below or near the 10-year flood elevation have drastically higher levels of flood hazard than other homes with first floor elevations near the 50-year or 100-year flood elevations or at higher elevations.

C. Much flooding happens outside of the mapped 100-year floodplain.

   a. The 100-year flood is not the worst possible flood. Floods greater than the 100-year event will flood many areas outside of the mapped 100-year floodplain.

   b. Areas protected by levees may flood if the levees fail.

   c. Some flood prone areas flood because of local storm water drainage conditions which are unrelated to the 100-year floodplain boundaries (see Section 9.5 below).

9.3 Levee Systems Protecting Multnomah County

9.3.1 Eastern Multnomah County

The low portions of Multnomah County south of the Columbia River are protected from Columbia River flooding by a substantial system of levees. The Columbia River levees were first built between 1915 and 1920, with extensions eastwards to the Sandy River completed in 1939. Over the ensuing years, the levees have been raised and strengthened several times.

There are four drainage districts which own the levees extending from west of Interstate 5 to the Sandy River on the east as shown in Figure 9.4 on the following page.

The four drainage districts shown above in Figure 9.4 from west to east are:

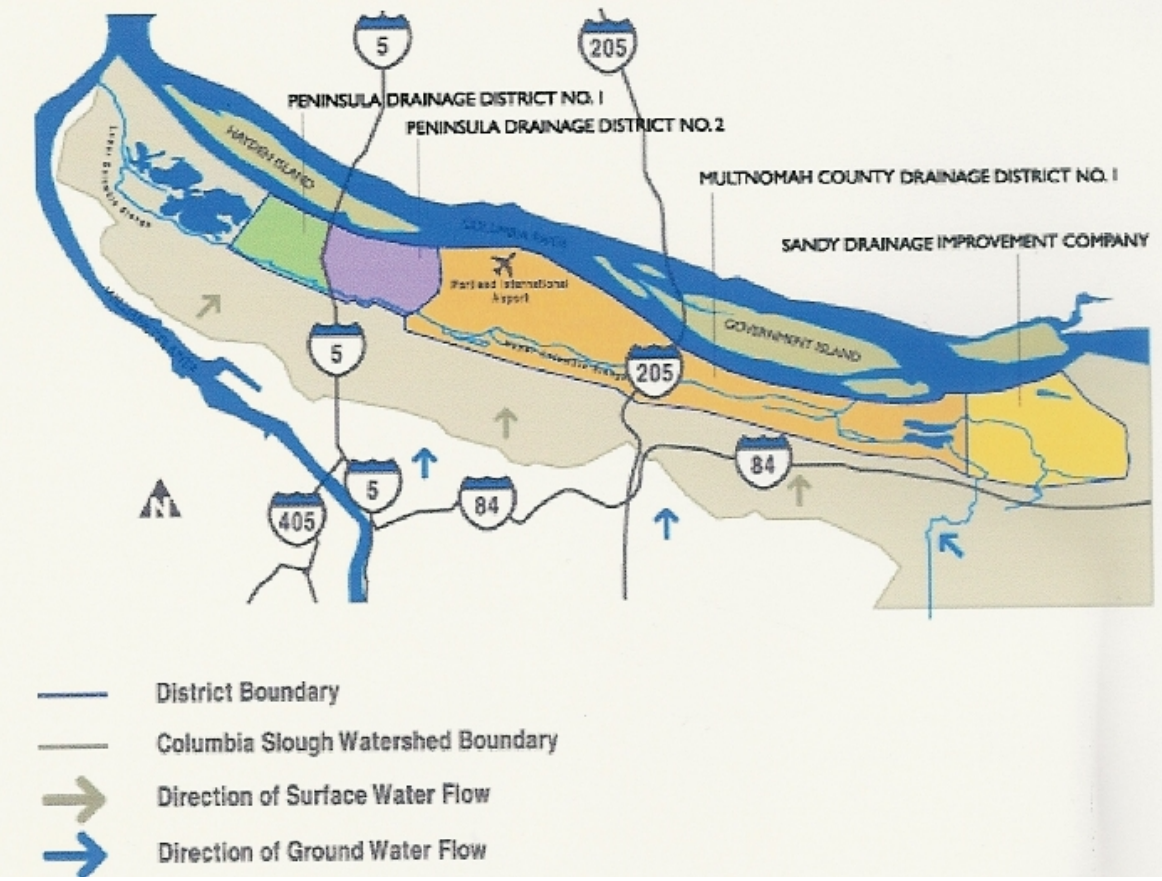
- Peninsula Drainage District No. 1, formed in 1917.
- Peninsula Drainage District No. 2, formed in 1917.
- Multnomah County Drainage District No. 1, formed in 1917.
- Sandy Drainage Improvement Company, formed in 1915.

Although there are four separate drainage districts, the Multnomah County Drainage District No.1 manages and operates all four systems, with contracts from the other three drainage districts.

The main components of this levee system include:

- Approximately 28 miles of levees along the Columbia River,
- Six cross levees between the Columbia River levees and high ground on the south side of the districts,
- An extensive drainage and pumping system behind the Columbia River levees.

Figure 9.4
Columbia River Drainage Districts



The main levees along the Columbia River provide the primary flood protection. Elevations of the levee tops range from about 41 to 44 feet. These levees have substantial overbuild beyond the minimum required elevations to provide 100-year flood protection. In the vicinity of Multnomah County, the 100-year and 500-year flood elevations are approximately 30.5 to 31 feet and 33.8 to 34.5 feet, respectively.

The cross levees provide important flood protection by limiting the extent of flooding if the main levees are breached.

The drainage and pumping system removes water from levee toe drains, rainfall, and streamflow into the protected area behind the levees.

9.3.2 Western Multnomah County

Sauvie Island, which is bordered by the Columbia River, Willamette River and the Multnomah Channel, is located partly in Multnomah County and

partly in Columbia County. Sauvie Island is protected by levees owned and operated by the Sauvie Island Drainage Improvement Company.

The Sauvie Island Drainage Improvement Company manages the levee and canal system on the southern half of Sauvie Island. The levee protects 11,200 acres from flooding and is surrounded by the Columbia and Willamette Rivers as well as the Multnomah Channel and Sturgeon Lake. The levee is approximate 18 miles in length and divided into four segments. The elevation of the levee ranges from 33 to 36 feet. Levee construction began in the late 1930's and is constructed of material dredged from the Colombia River and pits and canals dug on the island. The main Pump House was constructed in 1941 and houses four pumps capable of evacuating 125,000 gallons-per-minute of water at varying river levels. The interior of the drainage system consists of over 30 miles of canals and ditches to convey rain, seepage and spring water from the interior of the levee to the Multnomah Channel.

9.4 Flood Hazards and Flood Risk: Outside of Mapped Floodplains

Sections 9.2, 9.3 and 9.4 above apply only to the areas of Multnomah County that are within the FEMA-mapped floodplains and/or within areas of potential flooding due to levee or dam failures. In addition, other areas of Multnomah County may also be at relatively high risk from over bank flooding along streams too small to be mapped by FEMA or in localized stormwater drainage problem areas.

Many areas of the United States outside of mapped floodplains are subject to repetitive, damaging floods from local stormwater drainage. Nationwide, more than 25% of flood damage occurs outside of FEMA-mapped floodplains.

In most locations, stormwater drainage systems are designed to handle only small to moderate size rainfall events. Stormwater systems are sometimes designed to handle only 2-year or 5-year flood events, and are rarely designed to handle rainfall events greater than 10-year or 15-year events.

For local rainfall events that exceed the collection and conveyance capacities of the stormwater drainage system, some level of flooding inevitably occurs. In many cases, local storm water drainage systems are designed to allow minor street flooding to carry off stormwater that exceeds the capacity of the stormwater drainage system. In larger rainfall events, flooding may extend beyond streets to include yards. In major rainfall events, local stormwater drainage flooding can also flood buildings. In extreme cases, local stormwater drainage flooding can sometimes result in several feet of water in buildings, with correspondingly high damage levels.

For Multnomah County, stormwater drainage problems have been minor, with no locations known to have significant flooding problems within the unincorporated areas. Storm water drainage problems within the incorporated cities are

addressed in their mitigation plans and are not included here. The County's current regulations for new storm water drainage systems require control of the 10-year 24-hour storm; however, many older drainage systems are built to lower standards.

9.5 Dam Failures

9.5.1 Columbia River Watershed

There are about 75 large dams and numerous smaller dams on the Columbia River and its tributaries which provide hydroelectric power, water for many purposes and flood control. A full analysis of the design and safety levels vis-à-vis floods, earthquakes and other hazards for all of these dams is beyond the scope of this mitigation planning effort. For reference, Figure 9.5 below shows some of the major dams.

The dams within the Columbia River drainage area are operated by federal agencies, state, provincial or local governments, public utilities and private owners. The four large dams on the Columbia River within Oregon are: Bonneville Dam, The Dalles Dam, John Day Dam and McNary Dam. These dams are maintained and operated by the US Army Corps of Engineers.

Figure 9.5
Dams in the Columbia River Watershed

In the very unlikely, but not impossible, failure of one or more of these dams, severe flooding could occur along the Columbia River. Worst case scenario flood events are shown by dam failure inundation maps with dam failure at the spillway design flood. These inundation maps are worst case scenarios, designed for emergency planning purposes only, and do not indicate that any of these dams are unsafe.

An excerpt from the maximum inundation map for Multnomah County in the event of failures of the McNary, John Day, The Dalles or Bonneville Dam is shown below in Figure 9.6 (USACE, Guidelines for Flood Emergency Plans with Inundation Maps, Bonneville Dam, Columbia River, Oregon and Washington, December 1989).

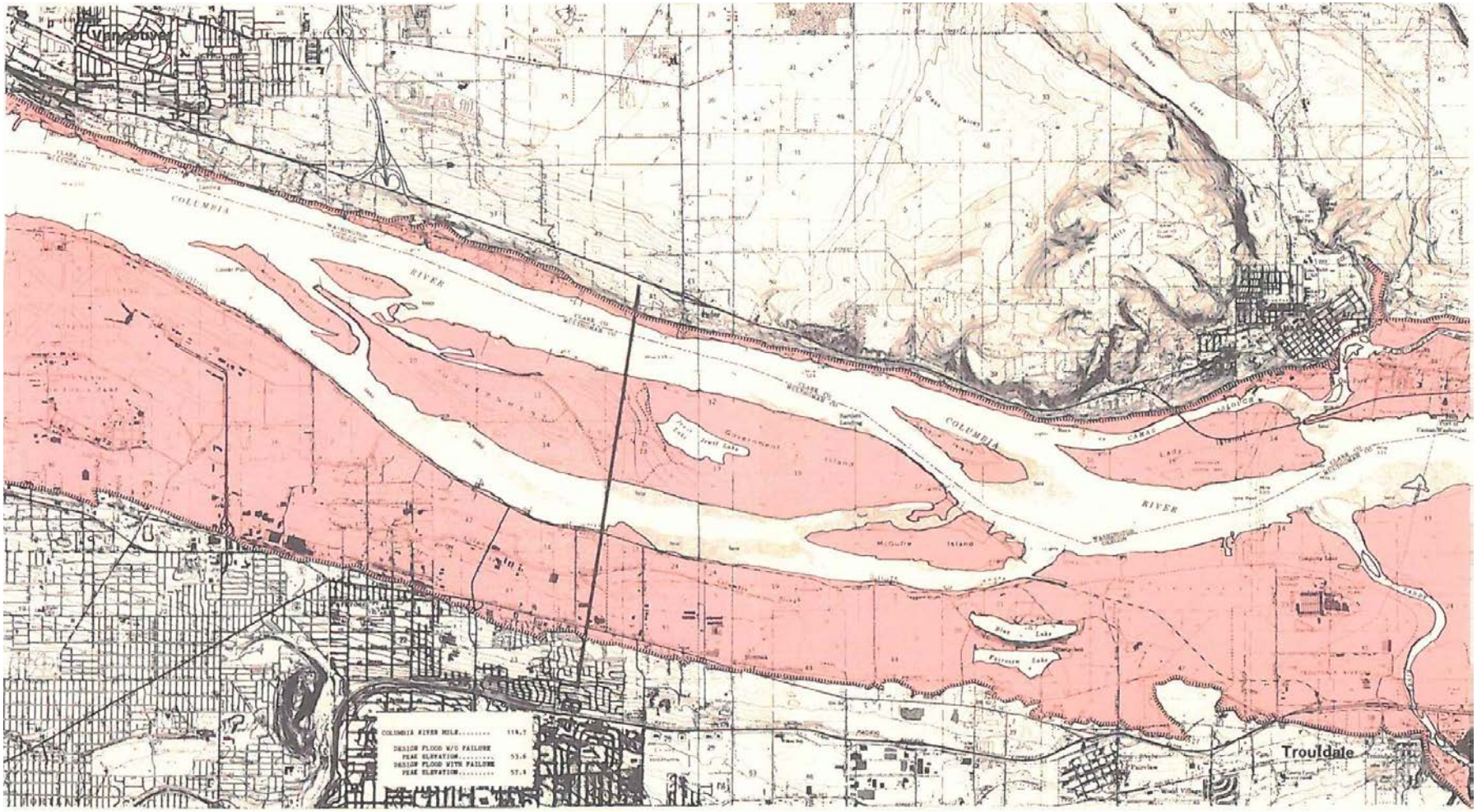
The pink-shaded area shows the inundation area for the spillway design flood without dam failure. The narrow hatched border shows the additional inundation area for the spillway design flood with dam failure. These are worst-case scenarios with a full reservoir pool coincident with dam failures and a spillway design flood.

As shown in Figure 9.6, substantial portions of Multnomah County along the Columbia River would be inundated in the worst case scenario of a spillway design flood event with or without dam failure. For the spillway design flood, the increase in inundated areas is minor.

It is important to recognize that dam failures at normal full pool would result in markedly smaller flood events. For example, for the John Day Dam, the flood elevation would be about 24 feet lower than the worst case scenario summarized above, resulting in no inundation behind the existing levees.

Thus, dam failures pose relatively little risk except for the truly worst case scenario of dam failures coincident with a spillway design flood.

Figure 9.6
Maximum Dam Failure Inundation Map for
McNary, John Day, The Dalles and Bonneville Dams



9.5.2 Multnomah County Watersheds and Willamette River Watershed

Figure 9.7 and 9.8 show dams within Multnomah County and dams in the Willamette watershed upstream of the County.

Failures of any of the dams within Multnomah County would result in localized flooding within watersheds downstream of the dam. Two example inundation maps are shown in Figure 9.9 and 9.10 for the Bull Run Dam and Mt. Tabor Reservoirs, respectively.

Failure of the Bull Run Dam would result in major flooding along Bull Run and the Sandy River downstream of the confluence with Bull Run. The possible inundation area includes large portions of Troutdale and the large area behind the Columbia River levees, including the Portland International Airport.

Failure of the Mt. Tabor Reservoirs would result in localized flooding within the City of Portland between Mt. Tabor and the Willamette River.

Failure of any one or more of the major dams upstream on the Willamette River could result in substantial flooding along the lower Willamette River. However, the extent of flooding would depend strongly on river levels at the time of dam failure, the amount of available storage in dams downstream of a dam which failed and whether or not progressive failure of downstream dams were to occur.

Figure 9.7
Dams Within Multnomah County

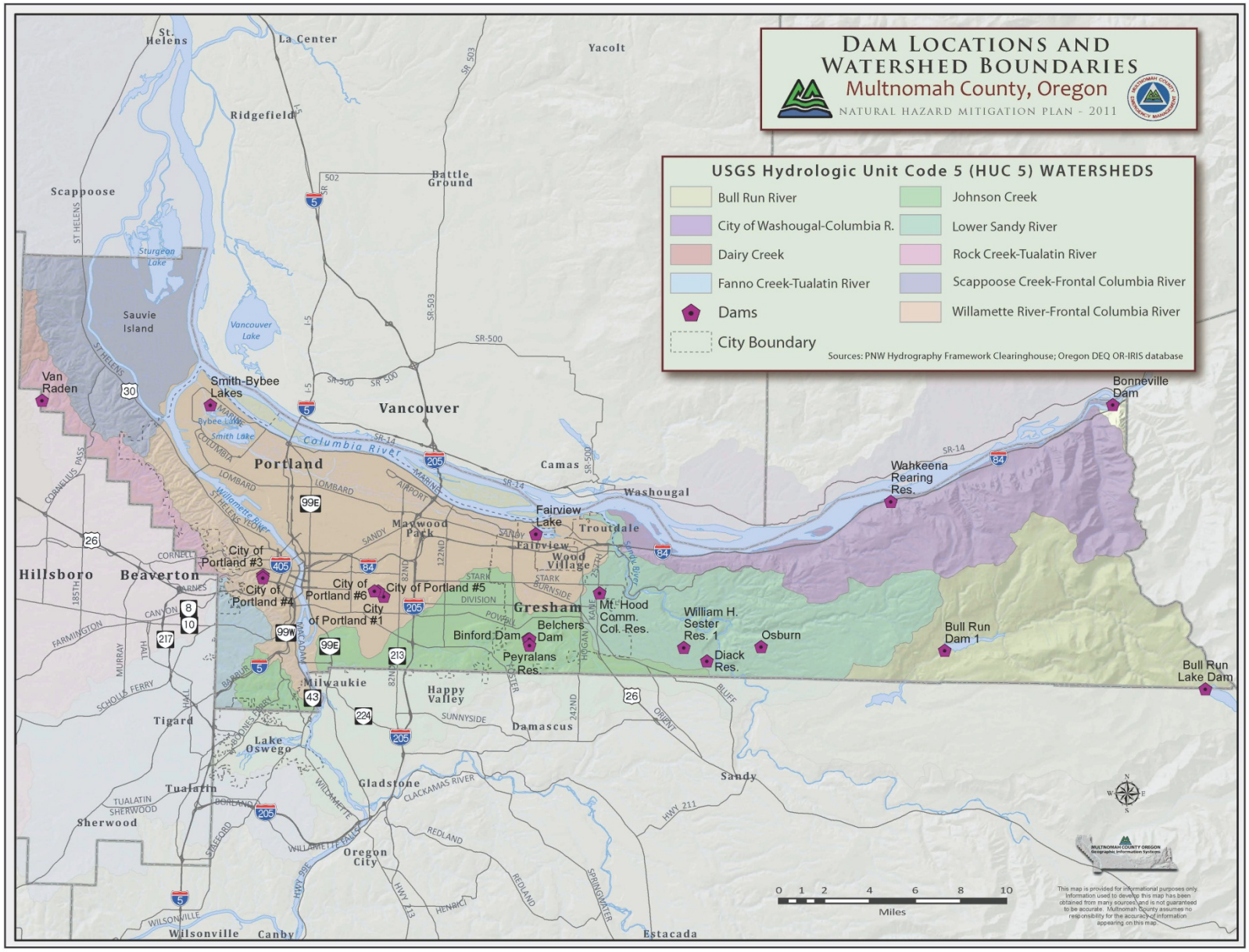


Figure 9.8
Willamette River Watershed: Major Dams Upstream of Multnomah County

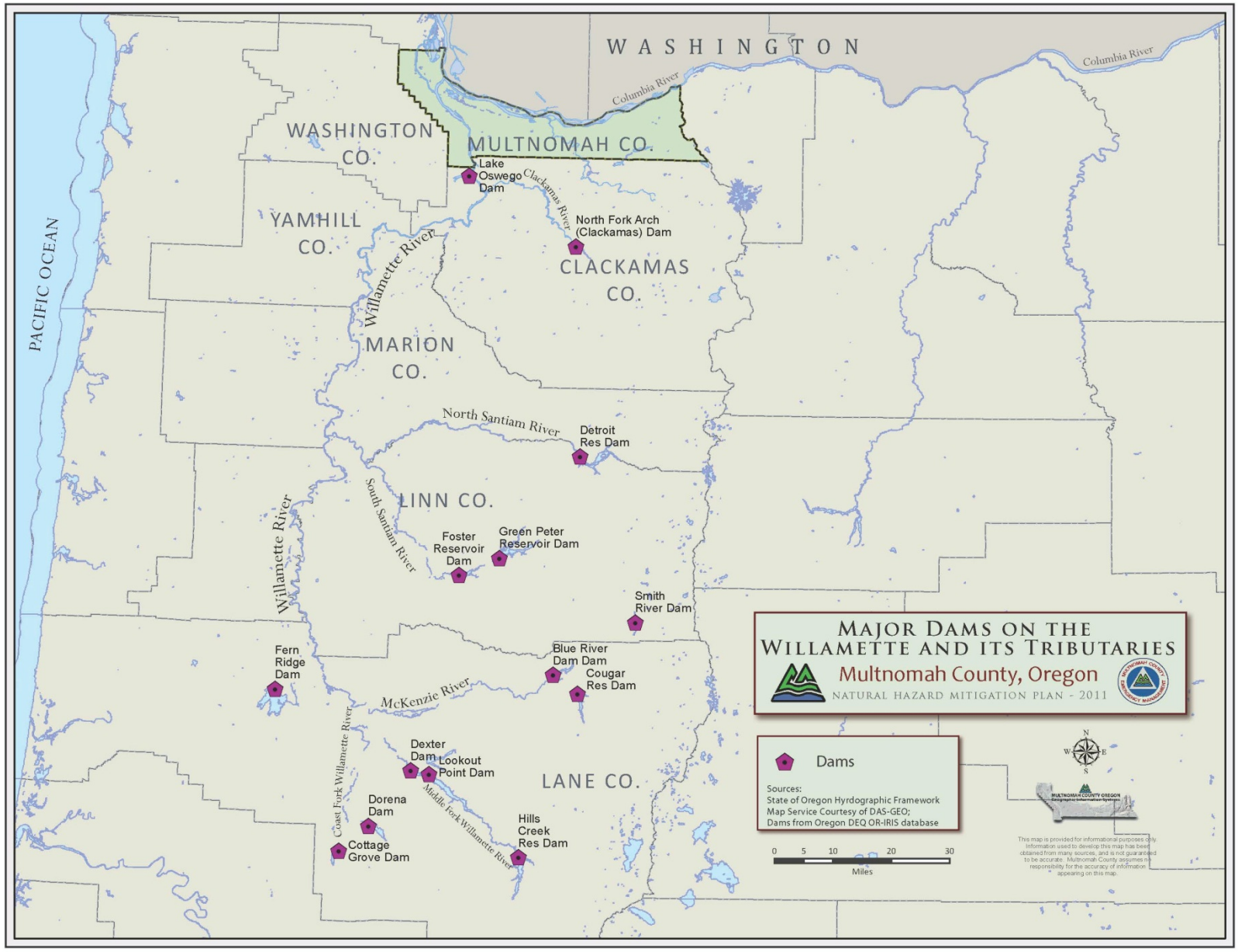


Figure 9.9
Inundation Map: Bull Run Reservoir

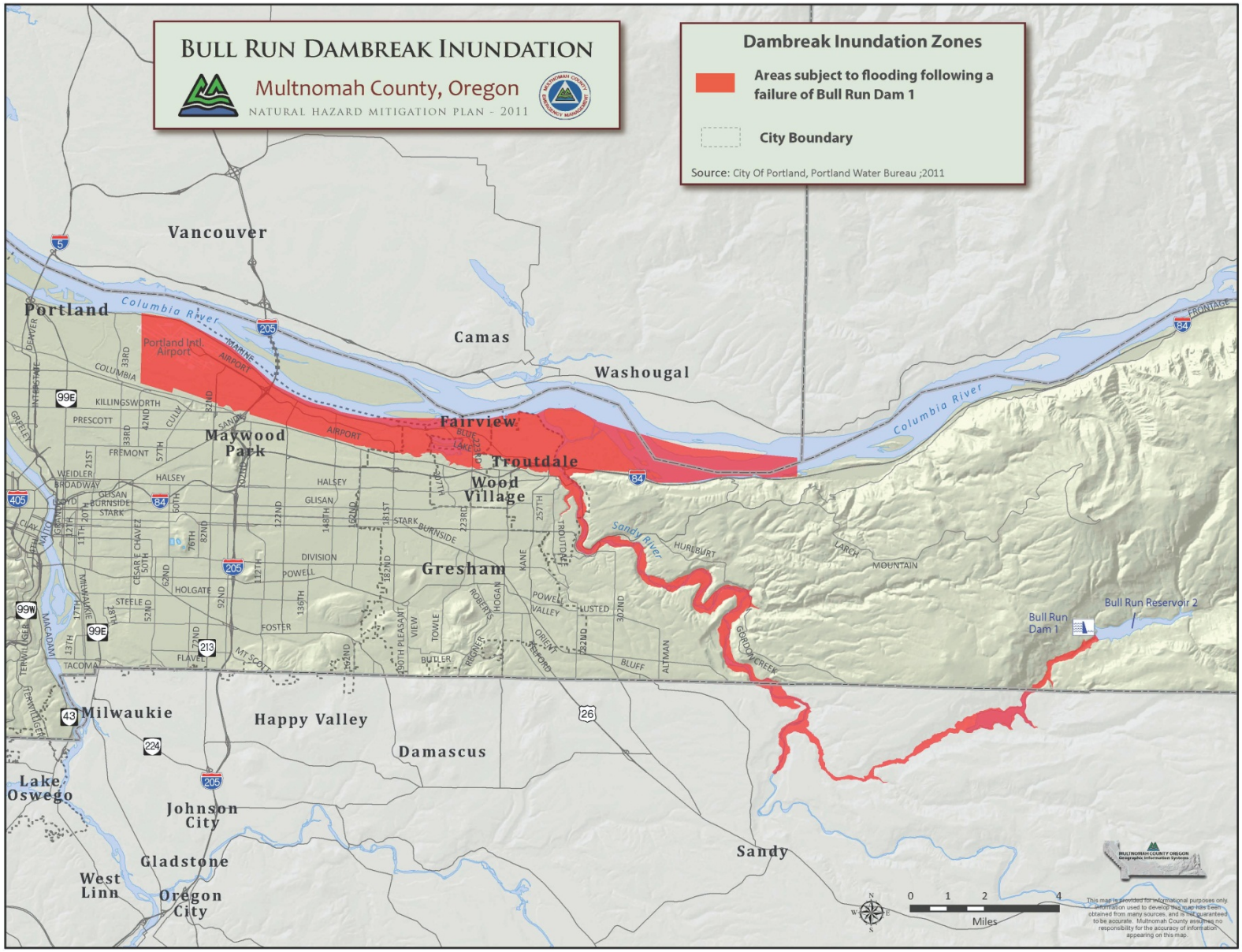
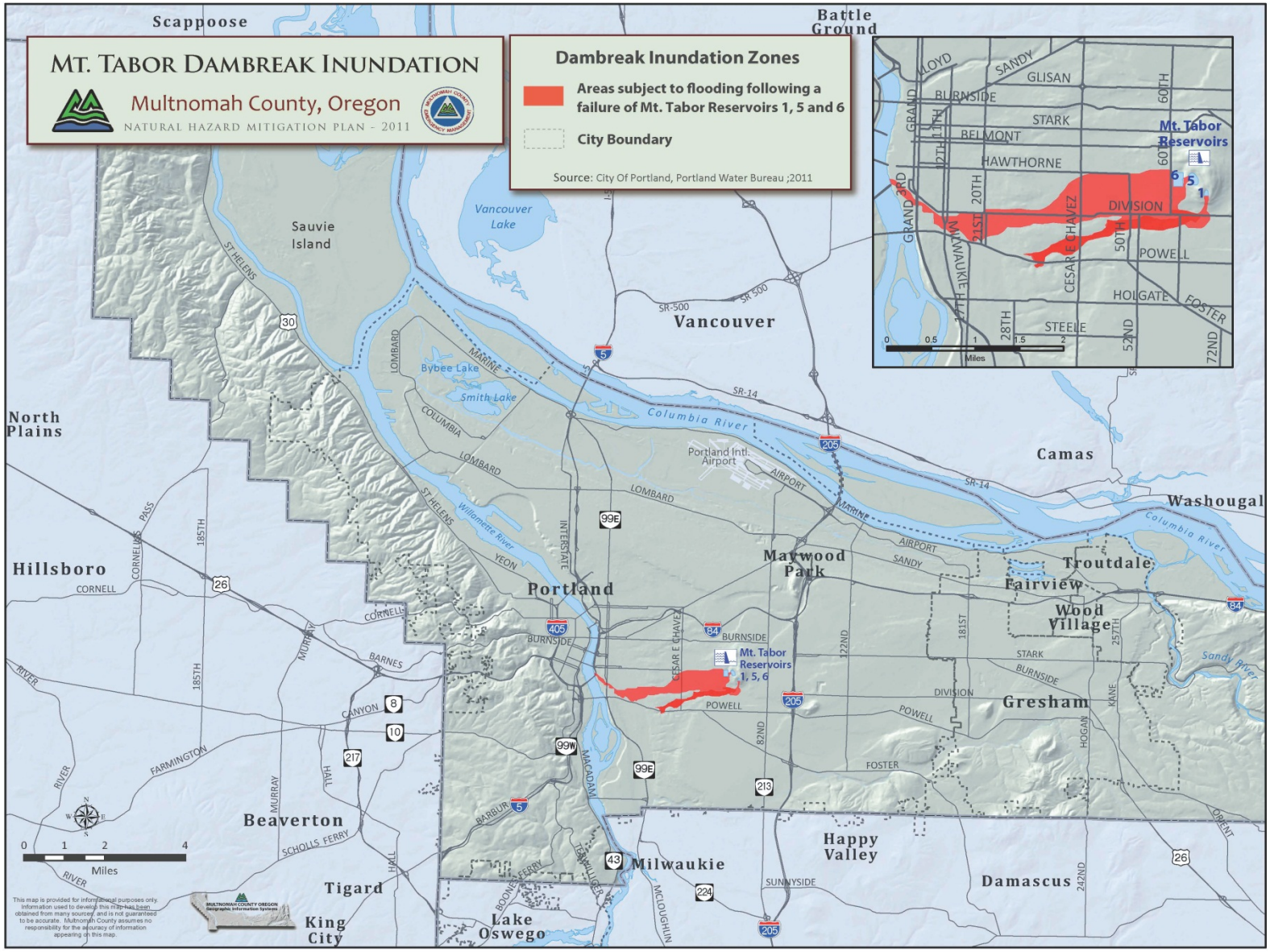


Figure 9.10
Inundation Map: Mt. Tabor Reservoirs



9.6 Inventory Exposed to Flood Hazards in Multnomah County

The inventory of buildings within Multnomah County's FEMA mapped floodplains has been evaluated by overlaying the mapped floodplains Data are drawn from assesor's records and the 2009 Flood Insurance Rate Maps for Multnomah County.

Table 9.2
Multnomah County: All Buildings
Incorporated and Unincorporated Areas (Entire County)

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
Buildings	7,233	93	39,300	761	23,935	210,160	1,104	9,478	**292,064**
County Bldgs	32	0	5	9	68	16	2	7	**139**
Population	9,420	851	141,226	19,497	105,535	441,325	4,476	13,004	**735,334**

Table 9.3
Multnomah County: All Buildings
Unincorporated Areas Only

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
Buildings	30	0	15	0	0	2,061	4	8,731	**10,841**
County Bldgs	0	0	0	0	0	0	0	7	**7**
Population	2	0	272	0	0	4,144	0	11,781	**16,199**

Table 9.4
FEMA-Mapped Floodplains: All Buildings
Unincorporated Areas

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
0.2 %annual chance	4	0	0	0	0	177	0	48	**229**
A 1% annual chance	0		0	0	0	0	0	3	**3**
AE 1% annual chance	13	0	0	0	0	18	0	293	**324**
AH 1% annual chance	0	0	0	0	0	4	0	0	**4**
AO 1% annual chance	0	0	0	0	0	0	0	0	**0**
X outside 1% annual chance	13	0	15	0	0	1,860	4	8,039	**9,931**
X protected by levee	0	0	0	0	0	0	0	347	**347**
Total									**10,838**

Table 9.5
FEMA Mapped Floodplains: County Buildings Only
Unincorporated Areas

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
0.2 %annual chance	0	0	0	0	0	0	0	0	**0**
A 1% annual chance	0	0	0	0	0	0	0	0	**0**
AE 1% annual chance	0	0	0	0	0	0	0	0	**0**
AH 1% annual chance	0	0	0	0	0	0	0	0	**0**
AO 1% annual chance	0	0	0	0	0	0	0	0	**0**
X outside 1% annual chance	0	0	0	0	0	0	0	7	**7**
X protected by levee	0	0	0	0	0	0	0	0	**0**
Total									**7**

Table 9.6
FEMA Mapped Floodplains: All Buildings
Incorporated Areas

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
0.2 %annual chance	799	1	335	59	1,247	1,046	18	3	**3,508**
A 1% annual chance	27	0	0	0	7	17	0	0	**51**
AE 1% annual chance	682	0	241	39	840	419	21	161	**2,403**
AH 1% annual chance	79	0	150	2	8	583	9	2	**833**
AO 1% annual chance	6	0	0	1	0	0	0	0	**7**
X outside 1% annual chance	4,318	86	38,658	534	21,555	205,366	704	494	**271,715**
X protected by levee	1,354	0	0	51	284	536	355	79	**2,659**
Total									**281,176**

Table 9.7
FEMA Mapped Floodplains: County Buildings Only
Incorporated Areas

Data Set	Industrial	Commercial	Multi-Family Residential	Parks - Open Space	Mixed Use Residential	Single-Family Residential	Mixed Use Employment	Rural	**Total**
0.2 %annual chance	4	0	0	0	7	0	0	0	**11**
A 1% annual chance	0	0	0	0	0	0	0	0	**0**
AE 1% annual chance	0	0	0	7	1	0	0	0	**8**
AH 1% annual chance	0	0	0	0	0	0	0	0	**0**
AO 1% annual chance	0	0	0	0	0	0	0	0	**0**
X outside 1% annual chance	21	0	5	2	57	15	1	0	**101**
X protected by levee	3	0	0	0	0	0	0	0	**3**
Total									**123**

As shown in Table 9.4, there are 331 buildings within the 100-year floodplains in the unincorporated parts of Multnomah County, along with an additional 229 buildings within the 500-year floodplains.

Tables 9.6 and 9.7 contain buildings within the mapped floodplains in the incorporated areas of Multnomah County. The incorporated cities have primary responsibility for these areas. The data are shown above for reference and because the Multnomah County has primary responsibility for county-owned buildings in the incorporated areas. As shown in Table 9.7, there are a total of 123 county-owned buildings in the incorporated areas. Of these 11 are in the 0.2 % annual chance areas (500-year floodplain), 11 are within the 1% annual chance areas (100-year floodplain) and 104 are in Zone X. The definitions of these flood zones were given previously on Page 9-4.

9.7 National Flood Insurance Program Compliance

This section and the data presented below is only for the unincorporated areas of Multnomah County. The incorporated cities have responsibility for NFIP compliance within their jurisdictions.

FEMA's National Flood Insurance Program (NFIP) maintains nationwide databases of flood insurance policies and repetitive loss properties.

9.7.1 Insurance Summary

NFIP's 2011 data shows the following policy information for unincorporated Multnomah County:

- Number of polices: 252 of which 103 are in the A-Zones,
- Insurance in force: $65,823,800
- NFIP claims paid:850,
- Total claims amount: $1,148,575 which is an average of about $13,500 per claim, and
- Number of repetitive loss buildings: 0.
- Number of structures within mapped floodplains were shown previously in Tables 9.4 to 9.7.

Previous NFIP data indicated 2 homes on the repetitive loss list; both homes have been mitigated and both are now within an area annexed by the City of Gresham.

NFIP insured properties are often given high priority for flood mitigation actions such as elevation or acquisitions (which always voluntary at the discretion of the owner).

9.7.2 Staff Resources

- At present, Multnomah County does not have a certified floodplain manager on staff.
- Multnomah County Land Use Planning staff provides floodplain review for building permits and our contract building departments carry out inspections. Our staff provide information to the public and work with the public to identify structures on digital FIRM maps.
- There are no known barriers to effective floodplain management. Mulnomah County has an effective floodplain management program, with a low density of development within the limited areas of mapped floodplains in the unincorporated parts of the County.

9.7.3 Compliance History

- Multnomah County is in good standing with the NFIP.
- Current violations: NONE
- Last Community Assistance Visit: August 3, 2006.
- A follow up Community Assistance Visit does not appear necessary at this time.

9.7.4 Regulation

- Multnomah County entered the NFIP in 1982. The Community Number is 410179.
- The effective date of the first FIS and FIRMs was June 15, 1982..
- The latest revised FIS and FIRMs were adopted by the County and became effective on November 30, 2009.
- The 2009 FIRMs are digital.
- Multnomah County's floodplain ordinance, which is included in Multnomah County's Building Regulations Chapter 29, exceeds FEMA's minimum requirements. This ordinance was amended in response to the 2006 Community Assistance Visit and became effective in October of 2008. Flood Management Area which met NFIP standards when adopted. It exceeds NFIP standards in at least two areas: balanced cut and fill is required in the floodplain and dwellings must have at least one foot of freeboard.
- The County issues floodplain development permits for structural and non-structural development in the floodplain. Notices of watercourse alterations are provided to DLCD as the state coordinating agency. County works with permit applicants to ensure complete application information, and issues a floodplain

development permit including any conditions necessary for compliance. Applicant is then required to obtain a building permit for projects that include structures. The county provides a zoning stamp of compliance on building plans, which the applicant then takes to the appropriate city for issuance of building permits. The county has formal written agreements with the cities that provide building permit and inspection services.

9.7.5 Community Rating System (CRS)

- Multnomah County does not yet participate in the Community Rating System, because of the low number of buildings in the unincorporated areas that are within the FEMA-mapped 100-year floodplain.
- The decision to not participate in the CRS will be reviewed periodically.

9.7.6 NFIP Continued Compliance Actions

Staff Resources

- Staffing levels and training are adequate for the program at this time.

Compliance

- A Community Assistance Visit is not needed at this point..

Regulation

- The County's flood hazard program has been updated by several efforts in recent years that together meet the county's flood plain management needs. These updates include the levee certification process in 2007, revisions of the Flood Hazard ordinance in 2008 and completion of the FEMA map modernization process in 2009.

Flood Risk Maps

- The County FIRMs were recently updated in 2009 and included new Lidar data for areas along the Columbia River.
- We are not aware of any areas that need new flood studies. However, as additional Lidar data become available it may be desirable to update the flood studies.

Community Outreach Activities

- The Multnomah County Land Use Planning website contains a link to the FIRMs for our jurisdiction along with a description of the map coverage and purposes. Addition additional web resources include::
    - FEMA Floodplain Elevation Certificate,
    - FEMA Floodproofing Certificate,
    - County Flood Plain Development Permit**,** and
    - Link to Multnomah County Code Chapter 29 Flood Hazard regulations.
- The planning division provides applications and individualized service an information at the planning counter.

9.8 Flood Mitigation Projects

Potential mitigation projects to reduce the potential for future flood losses cover a wide range of possibilities, which include:

- Levee improvements,
- Interior drainage and pumping improvements,
- Channel improvements
- Storm water drainage improvements
- Elevation or acquisition/demolition of high risk structures, deep within mapped floodplains or with a history of repetitive losses,
- Floodproofing measures, and
- Others.

The following table includes flood mitigation action items from the master Action Items table in Chapter 4.

Table 9.8
Flood Mitigation Action Items

Hazard	Action Item	Coordinating Organizations	Timeline	Plan Goals Addressed				
				Life Safety	Protect Property and Infrastructure	Emergency Management Capabilities	Public Awareness and Education	Environmental Stewardship
Flood Mitigation Action Items: Within FEMA-Mapped Floodplains								
Short-Term #1	Complete an inventory and GIS mapping of structures, critical facilities and important transportation or utility system components within mapped floodplains and/or within areas subject to flood in the event of levee or dam failures, including elevation data.	GIS	1-2 Years			X	X	
Short-Term #2	Facilitate an identification and prioritization process for the purpose of defining a candidate list of localized inundation scenarios related to levee failures that result from different hazard events.	Multnomah County Emergency Management	1-2 Years	X	X	X		
Short-Term #3	Conduct a targeted risk assessment for all areas within the county containing public facilities, private industry and/or residential facilities which were previously flooded or flood prone.	Multnomah County Emergency Management	3 Years	X	X	X	X	
Short-Term #4	Use targeted flood risk assessments to educate stakeholders on need to take mitigation and/or preparedness actions in order to reduce flood hazard impacts.	Multnomah County Emergency Management	5 Years	X	X	X	X	
Short-Term #5	Encourage local jurisdictions to post high water marks around the county to aid citizens and first responders in visually assessing flood hazards.	Multnomah County Emergency Management	1-2 Years	X		X	X	
Long-Term #1	Implement mitigation actions for identified high risk buildings or infrastructure as funding becomes available.	Multnomah County Emergency Management	Ongoing	X	X	X	X	
Flood Mitigation Action Items: Outside of FEMA-Mapped Floodplains								
Short-Term #1	Complete an inventory and GIS Mapping of structures, critical facilities and important transportation or utility system components in locations with a history of severe or repetitive flooding.	GIS	1-2 Years	X	X	X	X	X
Long-Term #1	For locations with repetitive flooding and significant damages or road closures, determine and implement mitigation measures such as upsizing culverts or storm water drainage capacity.	Transportation	Ongoing	X	X	X		X