The Havana Alternative will have no direct impact to the Zone "B" flood plain located to the northeast of the intersection at Francis Avenue and Havana Street. The area has no wetland characteristics. Indirect impacts of project construction to the south of the Little Spokane River will be avoided by use of water quality/ quantity BMPs (see Figure 4-13).

Operation of any of the proposed alignments will not promote incompatible flood plain development and attendant increases in water flows or flood dangers. Impacts will be avoided through the use of water quality/quantity BMPs within their design parameters. The proposed bridge crossing the Spokane River and roadway approaches to the bridge will neither create flooding nor be adversely affected by flooding, since the entire 100-year flood plain will be spanned.

North Option (Preferred Alternative) and South Option

The project will not encroach on the regulated flood plain or floodway of the Little Spokane River. The NSF ends before reaching the Little Spokane River. Indirect impacts from project operation, south of the Little Spokane River, will be avoided by use of water quality/quantity BMPs.

Mitigation

No mitigation is proposed.

Water Quality

Studies and Coordination

The following references were consulted:

1. *The Spokane Aquifer, Washington: Its Geologic Origin and Water-Bearing and Walter-Quality Characteristics*, by Dee Molenaar
2. Spokane County Water Quality Management Program, Ground Water Data Base 1992-93
3. Spokane Aquifer, Cause and Effect Report, Dec. 1978, by Larry Esvelt P.E. Ph.D.
4. U.S. Geological Service (USGS) Bulletin No. 27
5. USGS quadrangle maps

The EPA is a cooperating agency, but has directed WSDOT to confer with Spokane County on matters concerning the Spokane Sole Source Aquifer. Water quality parameters and present water quality data were obtained from the Spokane County Aquifer Protection Office and Washington State Department of Ecology (Ecology).

Public and private wells near and within the proposed right of way were identified with assistance from the Spokane County Aquifer Protection Office and the city of Spokane (see Figures 4-15 through 4-18).

All proposed NSF alignments were field investigated to obtain a thorough overview of the project area.

The infiltration capacity versus the runoff rate of the various soil types within the project area were analyzed. A rainstorm with a 10-year recurrence interval was used in the analysis. Results are shown in Table 4-20; areas of poor infiltration

contributing to higher runoff are footnoted. For further information refer to the Geology and Soils, and Waterways and Hydrological Systems sections of this chapter.

Affected Environment

Water bodies within or in the vicinity of the project area include: the Spokane Sole Source Aquifer, Spokane River, Little Spokane River (north of the project terminus), an unnamed creek, three seasonal (sinking) streams, and three wetlands. See Figures 4-8 through 4-11 in the Waterways and Hydrological Systems section of this chapter for maps showing affected surface water bodies.

Parameter	Observed Values[1] 1977-78	Observed Values[2] 1992-93	Allowable[3]
Dissolved Solids	201 mg/L (avg.)	171 mg/L (avg.)	500 mg/L
Dissolved Solids	283 mg/L (high)	253 mg/L (high)	
Chloride	6.9 mg/L (avg.)	5.1 mg/L (avg.)	250 mg/L
Chloride	20 mg/L (high)	15.8 mg/L (high)	
Nitrates &	2.33 mg/L (avg.)	2.13 mg/L (avg.)	10 mg/L
Nitrites (as N, mg/L)	9.8 mg/L (high)	5.0 mg/L (high)	

NOTES:
1. Spokane Aquifer Cause and Effect Report, Dec. 1978, by Larry Esvelt P.E., Ph. D.
2. Spokane County Water Quality Management Program, Ground Water Data Base 92-93.
3. Federal Drinking Water Standards (EPA 1988).
   Mg/L= milligram per liter.

Spokane Aquifer Water Quality Parameters
Table 4-21

Parameter	Observed Values[1] 1977-78	Observed Values[2] 1992-93	Allowable[3]
Temperature	11o C (avg.)	11o C (avg.)	N/A2
Zinc	<0.01 to 0.06 mg/L	<0.01 to 0.08 mg/L	5.0 mg/L
Copper	<0.01 to 0.08 mg/L	<0.01 to 0.02 mg/L	1.0 mg/L
Phosphorus	<0.01 mg/L	<0.01 to 0.02 mg/L	N/A3

NOTES:
1. Federal Drinking Water Standards, unless otherwise noted.
2. Temperature not to rise above background due to human activity.
3. No standard for ground water.
4. Spokane Aquifer Cause and Effect Report, Dec. 1978, by Larry Esvelt P.E., Ph. D
5. Spokane County Water Quality Management Program, Ground Water Data Base 92-93.
   Mg/L= milligram per liter.

Aquifer Water Quality Parameters of Concern
Table 4-22

Spokane Sole Source Aquifer

The Spokane Aquifer is the source of domestic, industrial, and agricultural water in the Spokane area. Tables 4-21 and 4-22 show the water quality parameters of concern for the aquifer.

The Spokane Aquifer has uniformly low concentrations of pollutants. These - concentrations are generally better than water quality standards. Coordination

with the county has included updating water quality data to ensure the accuracy of this report.

The city of Spokane is developing a Wellhead Protection Plan. This plan will define wellhead protection areas as sensitive sites. WSDOT has coordinated with the city and county on public well location and will comply with the city/county Wellhead Protection Plan, once it is ~~developed~~ completed and approved.

The Spokane River and the Spokane Aquifer share water through exfiltration from the river to the aquifer and infiltration to the river from the aquifer. Consequently, water quality in one influences water quality in the other. Water quality parameters of interest for the river are not the same as those for the aquifer, since surface water is subject to excess sediment loading and biological contaminants (see Table 4-23).

The Spokane River is subject to seasonal high turbidity that may exceed the allowable level. The river generally meets Class A standards.

Parameter	Observed Values[1] Post Falls	Riverside	Date	Allowables
Turbidity (NTU)	1.42	7.92	1988-92 avg	5 NTU2
TSS3 (mg/L)	2.55	29.15	1988-92 avg	N/A
Dissolved O2 (mg/L)	10.70	11.93	1988 avg	>=9.5 mg/L
Temperature (high, C)	22.10	16.30	1988	20.0 C (natural)
Temperature (low, C)	1.70	3.70	1988	N/A
COD_4 (mg/L)	N/A	12.00	1988-91 avg	N/A
Zinc (mg/L)	117.00	96.10	1984 avg	5000 mg/L
Copper (mg/L)	18.00	18.40	1984 avg	1000 mg/L
Lead, TOTAL (mg/L)	15.37	9.50	1984 avg	650 mg/L
NO3 & NO2 (mg/L)	0.0264	0.5055	1988 avg	10 mg/L
Phosphorus (mg/L)	0.02	0.05	1988-92 avg	N/A

NOTES:

1. ECOLOGY provided [Post Falls Idaho (east of Spokane), Riverside State Park (northwest of Spokane)]
2. Allowable turbidity is 5 NTU over background turbidity, WAC 173-201A-030(2)(c)(vi).
3. TSS = Total Suspended Solids.
4. COD = Chemical Oxygen Demand.
5. Class A water quality parameters in WAC 173-201A (Nov. 1992); mg/L = Micrograms per liter; mg/L = milligram per liter; and C = degrees Celsius

Spokane River Water Quality Parameters
Table 4-23

Impacts

(For discussion of construction activity impacts, see the Construction Activity Impacts section of this EIS.)

Stormwater runoff can transport pollutants to both surface and sub-surface receiving water bodies. The parameters of concern are those shown in Tables 4-22 and 4-23. They include dissolved solids, chloride, temperature, zinc, copper, nitrates and nitrites, phosphorus, turbidity, suspended solids, dissolved oxygen, chemical oxygen demand, and lead. Of these, dissolved and suspended solids from roadway sanding, chlorides from deicing salts, and lead from vehicle fuels are the pollutants most likely to originate from operation of the roadway. Residual

hydrocarbons from unburned fuel and spilled lubricants are also pollutants of potential concern.

The runoff rates resulting from a storm of 12.7 millimeters (1/2 inch) per hour exceed the estimated infiltration capacities for the available infiltration areas in several locations (refer to footnoted entries in Table 4-20). When runoff exceeds infiltration capacity, surface transport of stormwater off the highway right of way will result if there is no detention structure or stormwater system.

~~No impacts due to stormwater runoff are projected on any of the proposed NSF alternatives. This is possible through the use of water quality/quantity treatment and infiltration Best Management Practices (BMPs) within their established design parameters.~~ Stormwater runoff will be treated and addressed on any of the proposed alternatives. Water quality/quantity treatment and infiltration Best Management Practices (BMPs), within their established design parameters, will minimize the need for this treatment. A Stormwater Site Plan will be developed for each NSF phase, covering both temporary and permanent measures. The site plan will also meet the requirements of the National Pollution Discharge Elimination System (NPDES). Stormwater BMPs are detailed in the WSDOT Highway Runoff Manual and the Water Quality Study for Waters of the State of Washington, WAC 173-201A.

Sanding and Deicing

In Spokane County, WSDOT uses sanding as the primary method of winter traction aid. Salt deicing chemicals (in solid form) are used only minimally. However, WSDOT has assessed several other substances for winter traction improvement, rust inhibition, dust control, and reductions in other impacts. Some of the substances that were evaluated include "quick salt," calcium lignosulfonate (PCI), magnesium chloride, sodium citrate, and calcium-magnesium acetate (CMA). All of these substances are organic and have not caused damage to roadside vegetation in the amounts used for traction improvement.

The approved liquid traction aid/deicer, adopted during the winter of 1993-94, will be available for use on all sections of roadway including the proposed NSF. The approved product is a solution of magnesium chloride (27.5 to 28.5 percent, for deicing), calcium lignosulfonate (4.5 to 5 percent, a rust inhibitor [a patented wood-by-product, PCI, of Georgia Pacific Corporation]) magnesium sulfate (1.2 to 1.6 percent processing by product), and water (65 to 68 percent). This product has been used to melt ice and snow without contributing particulates to the air or to stormwater runoff.

Almost all western states have accepted or are in the process of accepting magnesium chloride plus calcium lignosulfonate for traction aid/deicing purposes. Due to its water solubility, this deicer becomes part of the stormwater runoff. The natural organic materials that make up the deicer are biodegradable and environmentally safe in the amounts used for traction improvement. This is especially true when considering the large dilution factor from melting snow and ice. The characteristics of each natural constituent of this liquid deicer are well known and documented.

Water Wells

The city of Spokane and Spokane County are developing a Wellhead Protection Plan. The plan will define wellhead protection areas and establish these areas as sensitive sites. WSDOT has coordinated with the city and county on public well location and will comply with the city/county Wellhead Protection Plan once it is ~~developed~~ completed and approved.

Most of each proposed NSF alternative is within the Spokane County Aquifer protection area. The project will not impact aquifer protection zones; for example, stormwater runoff will be diverted away from sensitive areas and channeled through combined water quality/quantity BMPs.

Landscaping

Grass swales and other landscaping may require fertilization and application of pesticides. The amounts of these materials used will not exceed the application levels set by the manufacturer/WSDOT for approved safe use. Use of pesticides directly adjacent to any surface water body is prohibited.

There will be no impacts to water quality from the maintenance of landscaped areas. Since grass swales provide stormwater detention, organic fertilizer and pesticides will break down as they perform their intended purpose in the grass, etc. Any remaining material will break down in the topsoil and lower soil layers well before entering any natural water course.

Accidental Spills of Hazardous Materials

The statistical likelihood of a hazardous materials spill on the completed NSF is very low, based on a conservative estimate gained from past accident records and risk analysis. Heavy trucks over 454 kilograms (10,000 pounds) gross vehicle weight are the primary carriers of hazardous materials. Information collected by the Washington State Patrol (WSP) and the Washington Utilities and Transportation Commission were used in the analysis and are listed below.

- Statewide

  From 1989 through 1991, there were approximately 135 billion vehicle miles driven, with 382,542 traffic accidents reported statewide.

  Approximately 9.49 billion of these miles driven were by heavy trucks; 14,722 accidents were reported involving heavy trucks. Of these, 206 involved trucks hauling hazardous materials, and 24 created hazardous spills.

- Spokane County

  From 1989 through 1991, there were approximately 7.5 billion vehicle miles driven, with 26,603 traffic accidents reported, in Spokane County (includes the city of Spokane).

  Approximately 530 million of these miles driven were by heavy trucks, and 684 accidents were reported involving heavy trucks. Thirteen of these heavy truck accidents involved trucks hauling hazardous materials; of these, two created hazardous spills.

Spokane County averages approximately one accident involving a truck hauling hazardous material for every 41 million heavy truck miles driven, and one hazardous material spill for every 265 million heavy truck miles driven in Spokane County.

I-90 accounted for 144 million of the heavy truck miles driven in Spokane County (includes that portion of I-90 within the city of Spokane), 101 of the heavy truck accidents (two of which were hauling hazardous material), and no hazardous material spills. (I-90 averaged one accident involving a heavy truck hauling hazardous materials every 72 million heavy truck miles traveled and no hazardous spills in 144 million truck miles.)

The total vehicle miles predicted to be driven on the completed NSF in the year 2020 is 271 million. Of these, 24 million will be heavy truck miles.

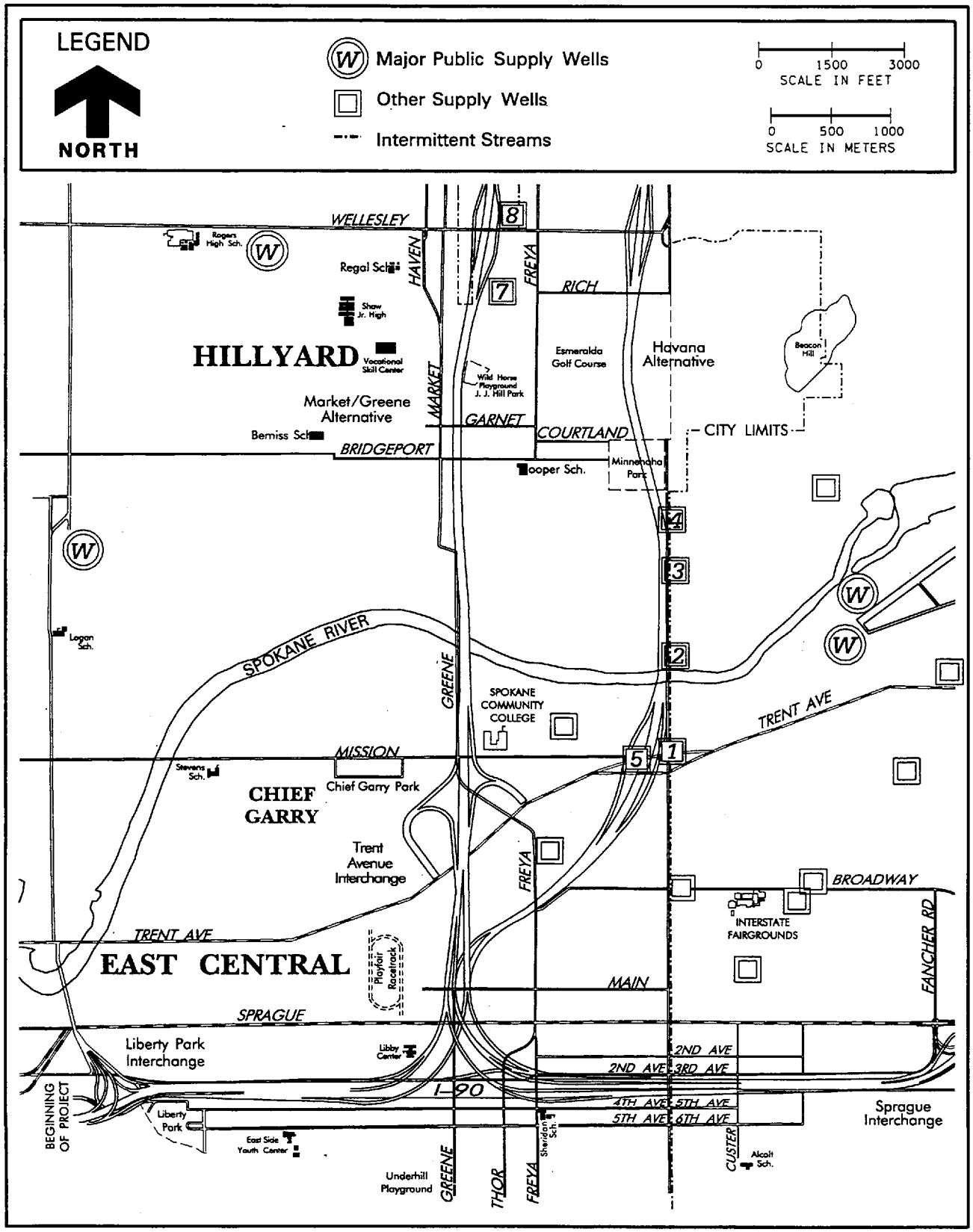
Using the above Spokane County statistics, approximately one accident every year and eight months could involve a heavy truck hauling hazardous materials. One every 11 years could involve a hazardous material spill on the completed project roadway (starting in 2020).

These projections are supported by review of actual accident data on a similar facility (I-90) with the same geometric features (such as a viaduct, interchange, and a bridge over a water body) that are proposed for the NSF. However, I-90 within Spokane County is eight times the length of the NSF.

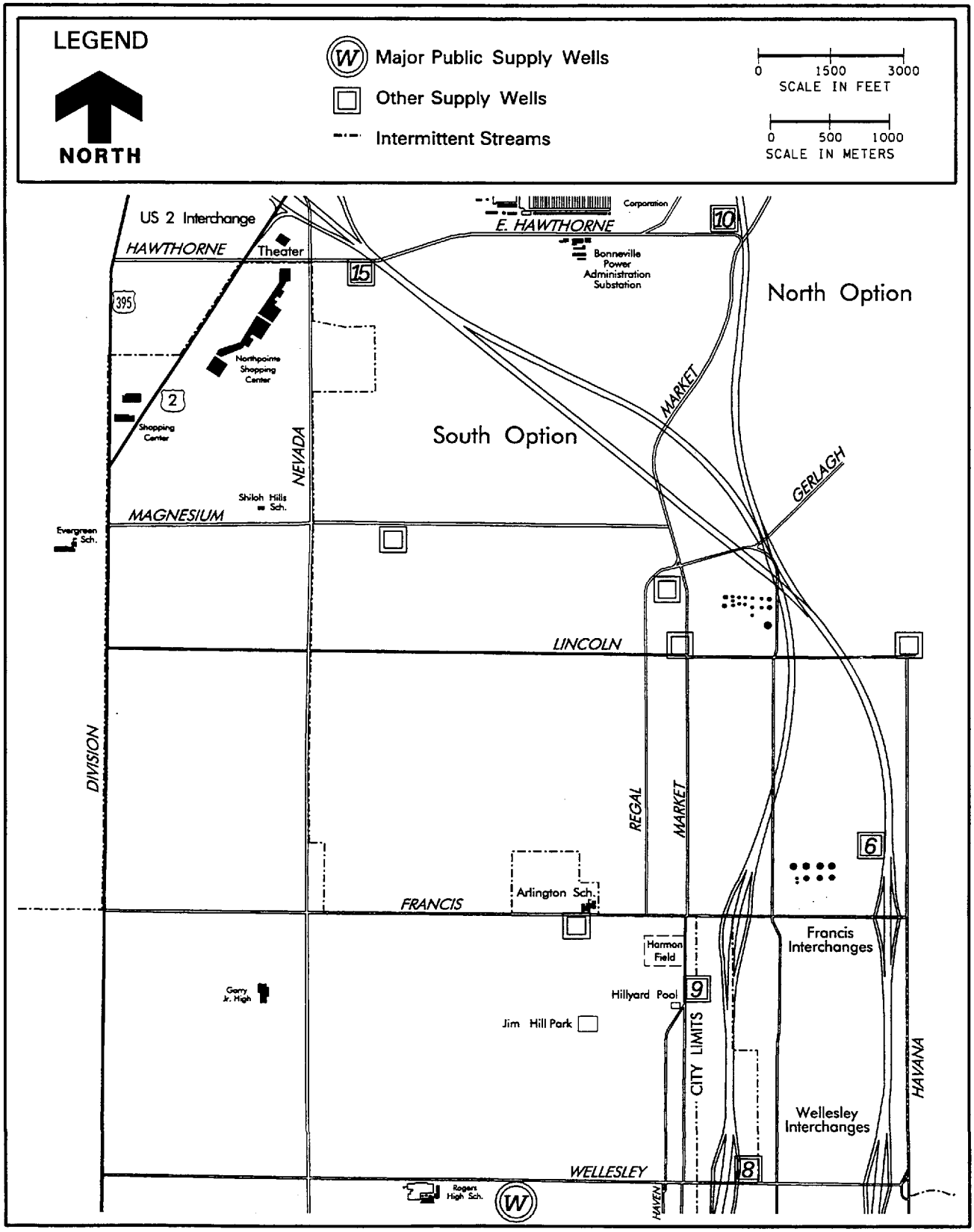
Generalized accident data also indicates that the accident rate on urban arterials with geometric characteristics similar to the arterials running north/south in the city of Spokane is three and a half times greater than the accident rate on urban freeways of geometric characteristics similar to the proposed NSF. Use of the proposed NSF will provide a reduced risk of hazardous spills in Spokane County for the north/south traffic flow.

Hazardous Materials Impacts on Ground Water

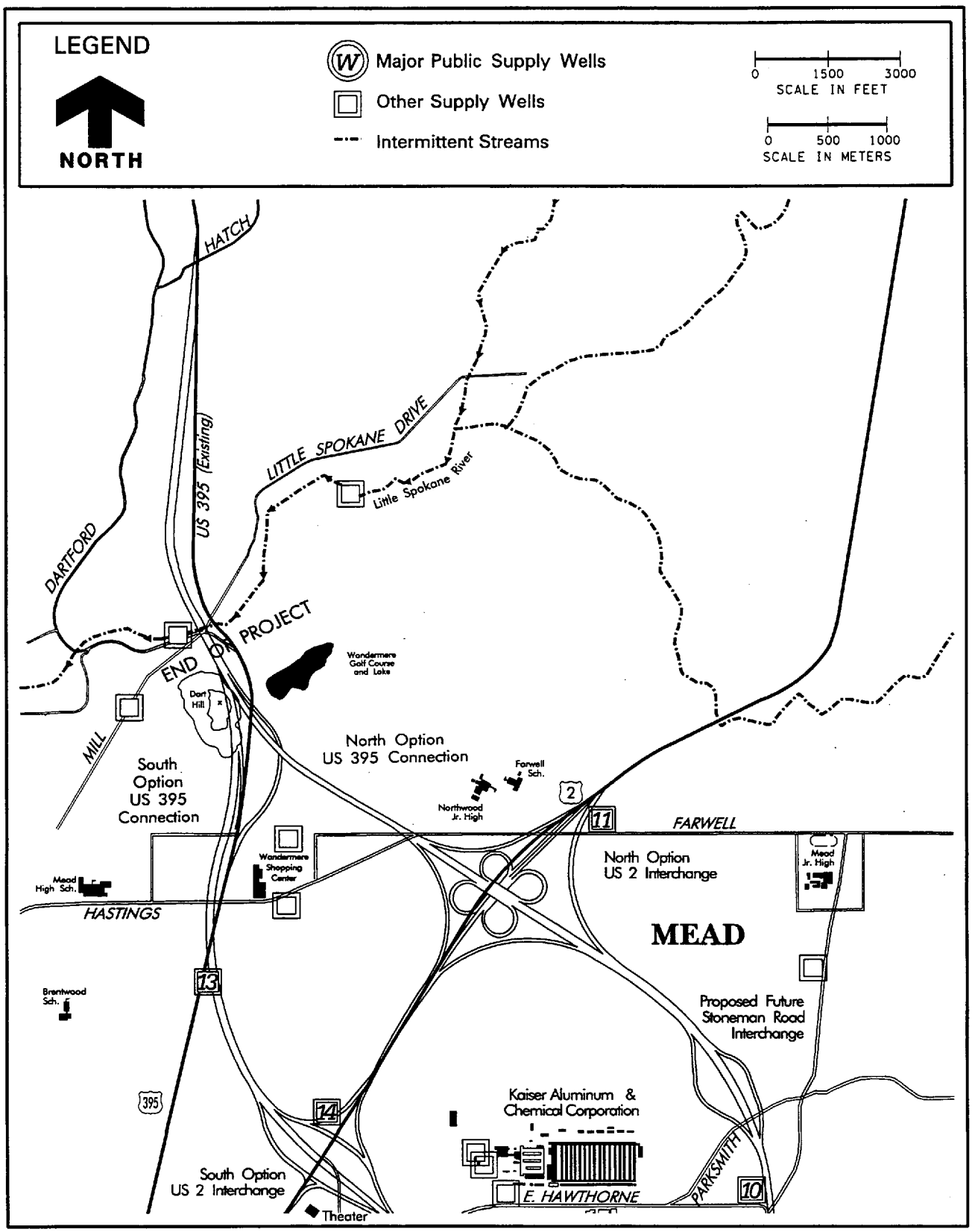
There are three sites in the area that are on the National Priority List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These are also known as "Superfund" sites (see Figures 4-49 through 4-53). The first of these is the General Electric transformer repair center, which has shown above acceptable levels of PCB; the site is near the Havana Alternative on Mission Avenue, east of the project limits. The second is the North Market Street Superfund Site near both the Market/Greene and the Havana Alternatives, on the west side of project limits. The North Market site has a history of hydrocarbon product processing and storage, oil refining, and petroleum products storage. The third Superfund site is the spent potliner landfill on Kaiser Aluminum and Chemical Company (KACC) property north of Hawthorne Road (off the project between both the North and South Options). All three sites are considered sensitive and will be avoided by each of the proposed NSF alternatives. Project stormwater runoff will also be diverted away from these sensitive sites. No impacts to the ground water from operation of the NSF is expected.



Market/Greene (Preferred Alternative) and Havana Alternative Major Public Supply Wells Area 1
Figure 4-15



Market/Greene (Preferred Alternative) and Havana Alternative Major Public Supply Wells Area 2
Figure 4-16



Market/Greene (Preferred Alternative) and Havana Alternative Major Public Supply Wells Area 3
Figure 4-17

The operational impacts and mitigation of existing hazardous waste sites adjacent to or within the project area are discussed further in the Hazardous Waste Section of this chapter.

Mitigation

~~Stormwater runoff will be directed away from rivers, creeks, and wetlands. Discharge to surface water bodies will be avoided.~~

Stormwater runoff will be directed to water quality and quantity treatment structures prior to discharge to rivers, creeks, and wetlands. Discharge to surface water bodies will be avoided when possible through the use of infiltration best management practices.

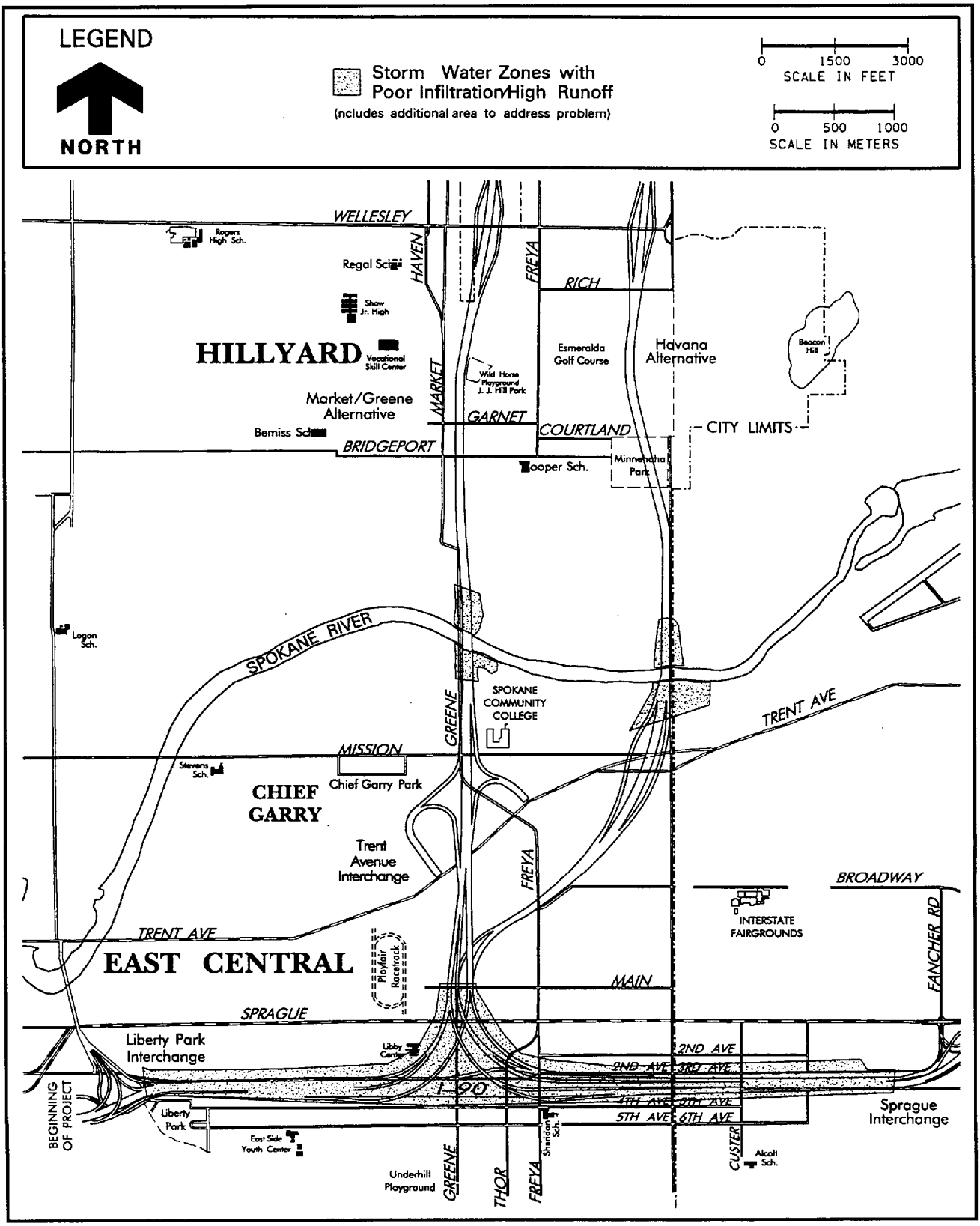
Special pollutant reduction strategies (combined BMPs) such as, but not limited to, retention tanks/ponds, lined ponds, will be combined with infiltration BMPs to provide additional protection at the crossing of the Spokane River, as well as at other sensitive sites (in the case of the Spokane River crossing, the BMPs will be in the vicinity of the bridge approaches). Due to structural considerations, the viaduct section between the I-90 Interchange and the Spokane River will also require special or combined BMPs for stormwater treatment.

The city of Spokane is not accepting additional stormwater runoff into city waste water or stormwater collection systems. This is due to downstream capacity restrictions in the interceptor and treatment plant. The existing runoff levels for the proposed I-90 C/D originate from I-90, 2nd, 3rd, and 4th Avenues. Consequently, additional runoff above existing levels from the I-90 C/D, due to increased impermeable area, will require the use of a separate stormwater management system. This would likely be in the form of a storm water detention, pre-treatment, and infiltration ponds.

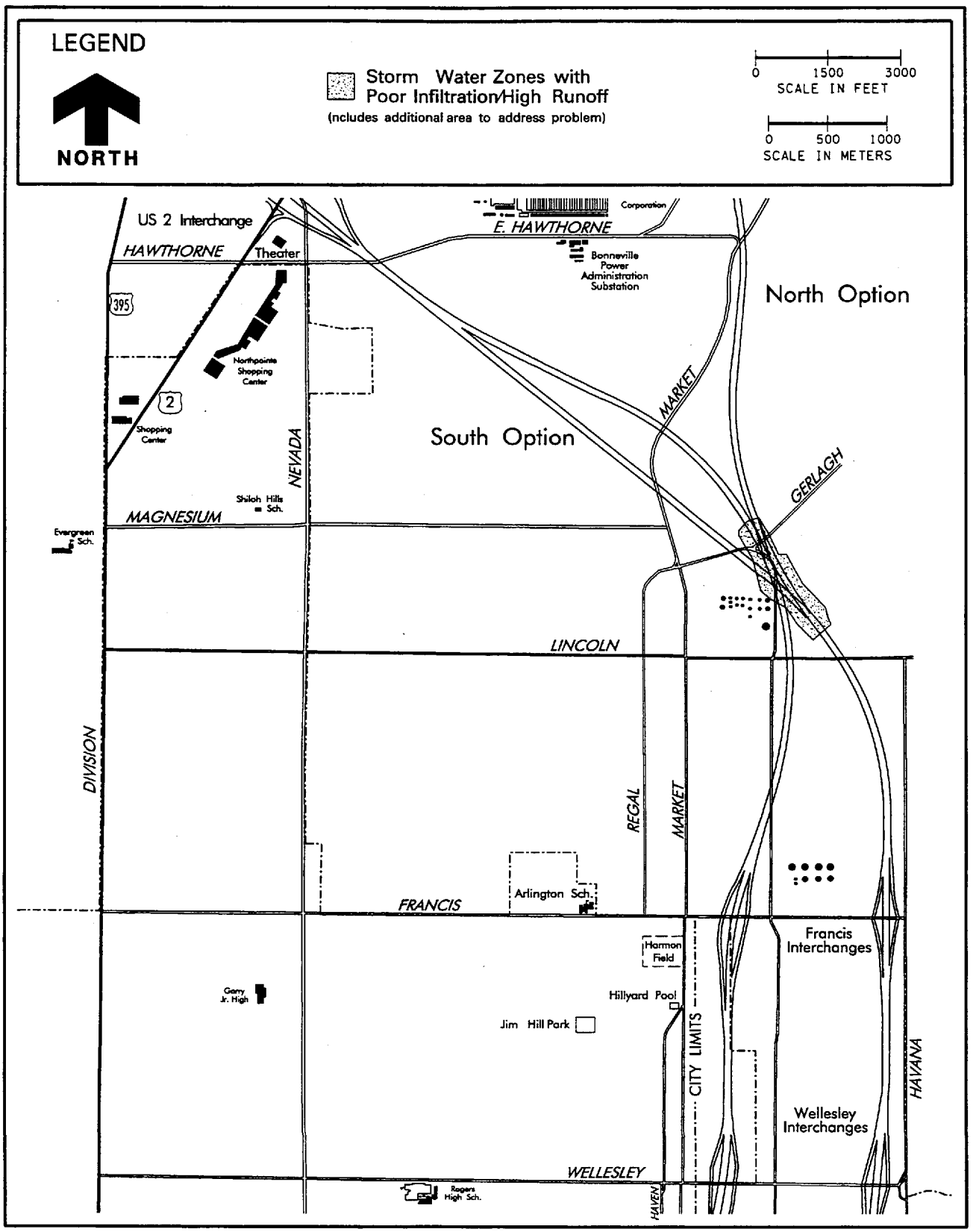
Locations where special stormwater treatment measures are required due to poor infiltration rates, high runoff rates, or structures, are shown in Figures 4-18 and 4-19. These locations also include additional area for potential stormwater transfer systems, and additional quantity/quality (BMP) measures.

The need for deicing/traction aids on state highways will not change, but the method of application, the quantity, and the type of material used have been extensively reviewed. WSDOT has a state-wide winter strategy for deicing/traction aids. The strategy entails monitoring pavement temperature and incoming weather to optimize the use of traction aids on the roadways (Novoteny, 1993). This optimization helps reduce the quantities of all types of deicing/traction aid substances used and also serves to minimize any potential impact. Continued review of new materials, methods of application, and expanding pavement temperature/weather monitoring capability will help WSDOT continue to improve this strategy.

Combined water quality/quantity BMPs will be used at each bridge/sensitive site. These will help prevent impacts to water bodies from hazardous materials spills on structures and at other sensitive sites.



Market/Greene (Preferred Alternative) and Havana Storm Water Zones — Area 1
Figure 4-18



Market/Greene (Preferred Alternative) and Havana Storm Water Zones — Area 2
Figure 4-19