3.4 HYDROLOGY AND WATER QUALITY

3.4.1 Affected Environment

The following sections provide an overview of the hydrologic setting, climate and hydrology, water rights and uses, and water quality in the general project area. The project area for the purposes of this discussion includes a one-mile buffer or corridor around each of the proposed routes with the exception of the towns of Twisp and Okanogan, which were excluded from the project area. A slightly larger area is included along the southern portions of the Valley Floor and Pateros/Twisp routes to include potential access issues associated with the Pateros/Twisp route (Figure 3.1-1). Larger-scale maps are available for each alternative in Appendix C. This project area represents the extent to which direct effects on hydrology and water quality are expected to occur.

Comments made during public scoping for this project identified the following issue with respect to hydrology and water quality:

- Use of herbicides to treat noxious weeds would cause chemical pollution of water.
- Construction activities associated with the proposed alternatives have the potential to increase sedimentation and affect water quality.
- Disturbance associated with the Loup Loup transmission line reconstruction may cause additional sedimentation in Frazer Creek.

The following affected environment discussion is divided into four general sections: hydrologic setting, climate and hydrology, water rights and uses, and water quality.

3.4.1.1 Hydrologic Setting

The project area occurs within the southern portions of the Methow and Okanogan watersheds (Water Resource Inventory Areas [WRIAs] 48 and 49). The Methow and Okanogan Rivers, the major perennial streams, are the principal hydrologic features of the project area, with approximately 40 miles of the Methow River and 5 miles of the Okanogan River flowing through the project area. The Methow River, a clear, fast-flowing river, bisects the U-shaped Methow River Valley from the headwaters near the crest of the Cascade Range to Winthrop, and drains the project area, ultimately flowing south into the Columbia River. A much smaller portion of the Okanogan River (less than 5 miles) and its drainage occur in the northeastern extent of the project area. The headwaters of the Okanogan River are in British Columbia, Canada. Like the Methow River, the Okanogan River also eventually drains into the Columbia River.

Within the project area, the major tributaries of the Methow River (from upstream to downstream) include: Twisp River at the northern edge of the project area, Frazer Creek, Alder Creek, Benson Creek, Texas Creek, Libby Creek, Gold Creek, McFarland Creek, French Creek, Squaw Creek, and Black Canyon Creek. The Loup Loup portion of the project area follows Frazer Creek to the east of the Methow River Valley up to the watershed divide between the Methow and Okanogan Rivers. Across the watershed divide, the project area continues along Summit, Loup Loup, and Tallant Creeks toward the Okanogan River.

3.4.1.2 Climate and Hydrology

The project area falls within the rain shadow east of the Cascade Mountains. At 10 inches, annual precipitation near the town of Pateros is among the lowest in the Methow River Valley (Richardson, 1976). Approximately two-thirds of the precipitation in the project area falls between October and March, mostly as snow from December to February (Washington State Conservation Commission, 2000). Summers are generally hot and dry with brief and intense thunderstorms.

The variability in precipitation, elevation, aspect, geology, soils, and vegetation affects the natural runoff patterns and water storage in the Methow and Okanogan River watersheds. Most runoff occurs during snowmelt in the spring. The maximum volumes of streamflow and the highest peak flows occur during spring and early summer (Washington State Conservation Commission, 2000). Rain-on-snow events also occur in the lower-elevation slopes of the Methow and Okanogan Basins within the project area between November and December (personal communication, M. Bennett, USDA Forest Service, December 15, 2004). These events occur when rain saturates and melts the existing snowpack, causing large quantities of overland flow over a short period of time. However, rain-on-snow events tend to be localized in the project area and do not cause peak flows on the Methow or Okanogan Rivers. Air temperatures tend to be too cold on National Forest System (NFS) lands for rain-on-snow events to occur, except infrequently.

In general, streamflows remain relatively high through early June but quickly recede from July to September in response to reduced snowmelt, low summer precipitation, and higher air temperatures. Many tributaries of the Methow and Okanogan Rivers go dry during summer months. The extent and duration of dry stream conditions depends largely on the amount of precipitation and winter snowpack from the previous year. Portions of both the Methow and Okanogan Rivers are located within the Special Flood Hazard Areas (Federal Emergency Management Agency, 2004). However, flooding rarely occurs beyond the inner floodplain of the Methow or Okanogan Rivers.

Water management also affects the hydrology of the project area. Surface and groundwater withdrawals, irrigation return flow, and diversions reduce low flows, periodically causing streams to dry during summers (Washington State Conservation Commission, 2000). Timber harvests and livestock grazing can also affect hydrology by removing vegetative cover and compacting surface soils. Past and current timber harvest and grazing have caused soil compaction from road construction and heavy livestock concentrations. Roads in managed forests can impact watershed runoff and sedimentation processes (Amaranthus et al., 1985; Bilby et al., 1989; Donald et al., 1996; Kochenderfer et al., 1997; Megahan and Kidd, 1972; Reid and Dunne, 1984; Rice and Lewis, 1986; Rothacher, 1971; Sullivan and Duncan, 1981; Swanson et al., 1981; Swift, 1985, 1988). During field visits, soil compaction related to roads was observed in the project area.

Roads in the project area are chronic sources of sediment delivery from cutslopes, ditchlines, and running surfaces, and as potential sites for accelerated mass movements. Roads intercept subsurface flows, concentrate flows in ditchlines and through culverts and bridges, and act as direct conduits for sediment delivery to stream channels (Beschta, 1998). Hydrologically connected roads have a moderate effect on flow quantity and a direct effect on the timing of flows, especially during unusual runoff events. Roads can change hydrologic conditions, degrade water quality, and introduce chemical contamination (USDA Forest Service, 2001a). Existing water quality conditions are discussed in Section 3.1.4.1. These conditions result, in part, from roads throughout the project area.

Approximately 590 miles of road exist within the project area, for an average total road density of 3.98 miles per square mile. Most roads occur on relatively flat areas. Less than one percent of the roads in the project area cross slope gradients greater than 20 percent. Roads influence watershed hydrology and sedimentation processes most strongly at stream crossings. Stream crossings (including line crossings and road crossings) in the right-of-way (ROW) areas proposed under each alternative were evaluated in the field. The results of these surveys are summarized in Section 3.6 (Wetlands and Riparian Vegetation). In total, 151 stream crossings occur within the project area (Table 3.7-3).

Within Washington State Department of Natural Resources (WDNR) and private forested lands in the project area, Washington State Forest Practices rules require road construction and maintenance to prevent sediment delivery and runoff that would impair fish habitat or water quality (WDNR, 2004). Road Maintenance and Abandonment Plans (RMAPs) are required for road construction on WDNR, other state, local government, or private forested lands. These plans address construction measures to mitigate potential damage to fish habitat or water quality. They also specify the frequency and type of maintenance required.

Road construction on NFS lands within Riparian Habitat Conservation Areas (RHCAs) is managed under PACFISH (1995). Existing and planned roads must meet Riparian Management Objectives and avoid adverse effects on listed anadromous fish. In addition, any construction or reconstruction of road crossings must accommodate fish passage and 100-year floods.

3.4.1.3 Past and Present Human Activities

A range of past and present human activities influences the hydrology and water quality in the project area. Development has resulted in additional paved surfaces, leading to slightly increased runoff rates. Ground disturbance and road networks contribute to higher sedimentation rates. Development often involves removing riparian vegetation, which may increase stream temperatures. The confluence of the Twisp River with the Methow River is listed under Section 303(d) of the Clean Water Act (CWA) for elevated stream temperature, and if approved by the U.S. Environmental Protection Agency (EPA), an additional segment of the Methow River near the town of Pateros would be added to that listing, also for elevated stream temperatures (Ecology, 2004c).

Timber harvest has occurred throughout the forested portions of the project area, which are generally limited to the Loup Loup corridor. Minor logging has also occurred in a few areas along the northern portion of the Pateros/Twisp corridor. Clearcut harvests may result in localized increases in runoff and streamflow, but these changes are not measurable until a large percentage of a drainage is clear cut. Current National Forest Practices often intentionally avoid clearcut harvests to minimize impacts to hydrology and water quality. Given the existing good water quality conditions of the project area (see Water Quality section below), logging access roads and skid trails have likely not caused watershed degradation.

Agriculture has affected water quality in the project area by contributing herbicides and pesticides. Agriculture is particularly dominant in the Valley Floor corridor, and to a lesser extent in the Pateros/Twisp corridor and lower elevation portions of the Loup Loup corridor. Much of the lower-elevation land has been converted to cultivation, both for orchards and for crops, particularly alfalfa. Tributaries and the mainstem of the lower Okanogan River have been listed on the CWA 303(d) list because of elevated levels of dichlordiphenyltrichloroethane (DDT) and its derivatives, likely from agricultural uses.

The project area has historically been nearly all or entirely grazed by cattle and, presumably beginning around the end of the nineteenth century, sheep. Grazing levels have been high in the area of analysis, on private, state, and Federal land. Areas where water is available are most impacted by grazing because of the concentration of cattle. Reports on riparian conditions in the area often note impacts to streambank stability, and elevated levels of fecal coliform have been noted in stream segments. Segments of the Okanogan River have been listed in the CWA 303(d) list for fecal coliform from livestock and wildlife, but comments within the listing details indicated that recent improvements in livestock management have reduced levels of fecal coliform in Okanogan River samples.

Roads contribute to increases in sediment delivery and streamflows. The existing transmission and distribution facilities in the Loup Loup and Valley Floor corridors already have well-developed access road systems and are near the major roads of State Highway 20 and State Highway 253. The proposed Pateros/Twisp corridor includes areas with few developed roads, though almost all areas have primitive track roads established.

3.4.1.4 Instream Flows

Instream flow water rights may be established under the Water Resources Act of 1971 (Ch. 173-500 WAC). Typically, instream flows are established to maintain and/or protect fish, although other values (e.g., water quality, recreational uses) may also be considered. Water may also be reserved for future use.

Minimum instream flow requirements have been established for seven points in the Methow Basin, including the Lower Methow, Middle Methow, and Upper Methow, and the Twisp River (Golder, 2002). Streams in the project area that are closed to further consumptive use (except exempt wells) include Alder Creek, Benson Creek, Texas Creek, Libby Creek, Gold Creek, McFarland Creek, Squaw Creek, Black Canyon Creek, and French Creek (Golder, 2002). Instream flows were set by rule in 1976 on the lower and middle Okanogan River (Montgomery Water Group et al., 1995). Portions of the Methow River have been listed under 303(d) of the CWA as impaired for stream flows (see section below on Water Quality).

3.4.1.5 Water Quality

In general, water in the Methow Basin appears to be of high quality (Golder, 2002). The Methow River is classified as Class A from its mouth to the Chewuch River (at river mile 50.1) and as Class AA from the Chewuch River to its headwaters. Class A and AA waters generally exceed the requirements for most or all uses; Class AA waters exceed requirements markedly and uniformly. Since 1985, the Okanogan River has had occasional problems with acidity, temperature, dissolved oxygen, fecal coliform, lead and mercury, and sedimentation, particularly in summer months (Montgomery Water Group et al., 1995).

Baseline water quality conditions in the project area are generally good (Golder, 2002; Montgomery Water Group et al., 1995). Data from U.S. Geological Survey (USGS) water quality stations on the Methow and Okanogan Rivers near the project area show that suspended sediment levels range from 10 to almost 7,000 tons per day, with average turbidities of 0.3 nephelometric turbidity unit (NTU) in the Methow River and 5 NTU in the Okanogan River. The percentage of fine materials (the silt and clay fraction, less than 0.063 millimeters) ranges from 34 to 97 percent. Stream temperatures range from 0 to 27ºC, with averages of almost 10ºC in the Methow River and 12ºC in the Okanogan River.

When water quality impairment affects the beneficial uses designated for a water body, that water body is identified on the 303(d) list. Several stream segments within the project area are identified as water quality impaired on Washington's 1998 303(d) list (Ecology, 2004c). A segment of the Methow River between Benson and Texas Creeks and the confluence of Beaver Creek with the Methow River are both listed for failing to provide adequate water flow (instream flow) for fish. In addition, several other segments near the project area are identified on the 1998 303(d) list. The confluence of the Twisp River with the Methow River, just upstream of the project area, is listed for elevated stream temperature. The confluence of Tallant Creek with the Okanogan River is listed for DDT pesticide. Although this segment is outside the project area, upstream portions of Tallant Creek and its watershed do fall within the boundary of the project area. Segments of the Okanogan River in the town of Okanogan are listed for fecal coliform. Segments of the Okanogan River are also listed for total polychlorinated biphenyls (PCBs) several miles downstream of the project area. A Total Maximum Daily Load (TMDL) has been drafted for DDT and PCBs in the lower Okanogan River, including portions of the project area (Peterschmidt, 2004).

The 303(d) lists are generally updated every 2 years; however, the U.S. Environmental Protection Agency (EPA) did not require states to submit a 2000 303(d) list. Ecology released a preliminary 2002/2004 update to the 303(d) list on January 15, 2004, based on the results of a statewide water quality assessment. Comments and new data were solicited through March 15, 2004. The list was also made available for public review from November 3 to December 17, 2004. If approved by the

EPA, an additional segment of the Methow River near the town of Pateros would be added to the 2002/2004 303(d) list for elevated stream temperatures (Ecology, 2004c).

One issue identified during scoping was the potential sedimentation to Frazer Creek that might result from the Loup Loup transmission line reconstruction. The existing Loup Loup transmission line ROW includes access roads and an area where vegetation has been cleared. These disturbances have resulted in degradation of the fish habitat in Frazer Creek. In addition, the condition of Frazer Creek has been described as fair, with bank damage ranging from 35 percent to 100 percent of sampled reaches because of livestock impacts (USDA Forest Service, 1997). Substantial new siltation has occurred in the low-gradient reaches of the creek. Pools observed during a 1993 survey were filling with sediment. More than half of the Frazer Creek drainage has road densities between 2.1 and 5 miles of road per square mile of land. Observations during an October 2003 field visit indicated that roads appear to be affecting the function of Frazer Creek where they parallel the streambed, but no unstable roads were noted.

3.4.2 Environmental Effects

This section assesses the potential hydrology and water quality effects associated with the Methow Transmission Project. The following discussion is divided into three sections. The first section discusses the evaluation criteria used to assess the potential effects of no action, the proposed action, and the five action alternatives. The second section assesses the direct and indirect effects of the proposed alternatives on sedimentation. The potential for construction activities to increase sedimentation and affect water quality was identified as an issue during public scoping. The final section discusses the cumulative hydrology and water quality impacts associated with the proposed project.

3.4.2.1 Evaluation Criteria

The hydrology and water quality issue identified during public scoping is whether construction activities would have the potential to increase sedimentation, thus affecting water quality. The alternatives are evaluated with respect to this issue using several evaluation criteria. In addition, water quality parameters currently included on the CWA 303(d) list are also analyzed in the Effects section.

Sediments can consist of several sizes of transported materials. Coarse-grained sediments (e.g., gravels, cobbles, boulders) that reach streams are often transported as bedload. In contrast, fine-grained sediments (e.g., silt, clay) often form the dissolved or suspended load in streams. Different sizes of sediments can affect fish habitat differently. Finer sediments are generally more detrimental to fish habitat than coarse sediment loads. Fine suspended and dissolved sediments are evaluated by looking at the turbidity (or cloudiness) of a stream. Most soils in the project area are sandy loams (Section 3.3), which contain 45 to 85 percent sand. The remaining fraction in sandy loams consists of clay and/or silt, which generally result in turbidity when eroded.

In general, stream sedimentation requires two components, a source of sediment and a means for the sediment to be transported to a stream. Under the proposed action alternatives, sediment would come from soil erosion associated with the proposed construction activities. Wind, water, gravity, or other forces can transport eroded materials. In the project area, gravity-driven mass wasting and wind erosion are not common (Section 3.3, Soils). Water most commonly carries eroded materials to streams. Water often carries sediment directly to streams across roadbeds that reach road-stream crossings, or in flow that erodes road prisms and side-cast materials as it travels downhill near streams.

The following sections evaluate the potential effects of the proposed alternatives on water quality based on four evaluation criteria:

- Soil erosion potential,
- Predicted soil erosion,

- Number of road-stream crossings, and
- Lengths of road within 300 feet and 900 feet of streams.

The first evaluation criterion, soil erosion potential, is discussed in Section 3.3 (Soils). That section describes that soils are rated in terms of their potential for erosion based on soil characteristics, proximity to streams, and potential for disturbance under each alternative. Areas of soils with severe erosion potential that are located within 300 feet of streams are presented in Table 3.3-4 for each alternative. RHCAs of 300 feet are recommended under PACFISH (1995) to protect water quality and aquatic habitats on fish-bearing streams. RHCAs on non-fish bearing streams are 150 feet, and on other water bodies they are 100 feet. The most conservative distance is used to evaluate potential adverse impacts to water quality throughout the project area, even though 300-foot RHCAs are only required on fish-bearing streams on NFS and BLM lands. Soils with a severe risk of erosion and located within the 300-foot RHCA are relatively likely to affect water quality by contributing to stream sedimentation. This measure is used to compare the risk of sedimentation between the alternatives. In addition, the results of soil erosion modeling of the conditions that would exist within 300 feet of streams under each alternative are shown in Table 3.3-6. This second evaluation criterion, the relative amount of soil erosion predicted by the WEPP model, also offers a measure of the likely potential for sediment to reach streams, resulting in water quality degradation.

Sediment created by soil erosion may be transported to streams along roads. Road-stream crossings provide direct conduits for eroded sediment to reach streams. To evaluate this risk, a third evaluation criterion, the number of road-stream crossings related to new construction activities, is considered for each alternative. Roads near streams also contribute to sedimentation. Increased sediment delivery to streams after road building is well documented in the Pacific Northwest and Idaho (Bilby et al., 1989; Donald et al., 1996; Megahan and Kidd, 1972; Reid and Dunne, 1984; Rothacher, 1971; Sullivan and Duncan, 1981). To measure the potential impacts of constructing temporary roads, the lengths of road within 300 feet of streams are considered as the fourth criteria. According to Ketcheson and Megahan (1996), the farthest that sediment travels from roads to reach streams is approximately 900 feet. Based on that result, roads within 900 feet of streams are also compared for each alternative (personal communication, M. Bennett, USDA Forest Service, December 15, 2004).

The level of each of these evaluation criteria that would be considered significant depends on many factors. At best, any predicted runoff or erosion value, by any model, will be within only plus or minus 50 percent of the true value. Erosion rates are highly variable, and most models can predict only a single value. Replicated research has shown that observed values vary widely for identical plots, or the same plot from year to year (Elliot et al., 2000). Also, spatial variability and variability of soil properties add to the complexity of erosion prediction (Elliot et al., 2000). Road conditions vary greatly, and some hillslopes separating roads and streams have sufficient roughness to trap sediment before it reaches streams. In addition, the duration and spatial extent of a disturbance greatly affects whether that disturbance will significantly impact water quality. In general, localized, short-term soil disturbance is not likely to result in significant sedimentation. Given these complexities, the overall combination of soil erosion potential and presence of roads near streams are evaluated to determine whether impacts are likely to be significant. Long-term soil erosion and sedimentation or extensive channelization of hillslopes would result in significant adverse impacts to water quality. Localized or short-term effects would not result in significant changes to hydrology and water quality on a watershed-scale.

3.4.2.2 Sedimentation to Streams

Soil Erosion Potential

The extent of soils within riparian areas that are both inherently susceptible to erosion and likely to be disturbed under each alternative is discussed in Section 3.3 (Soils). Alternative 5 would involve the greatest area of soil erosion potential (39 acres), followed by Alternative 2 (37.7 acres) (Table 3.3-2).

If eroded, this fine material may be transported to nearby streams, resulting in water quality degradation from sedimentation, as discussed below. Alternatives 4, 6, and 7 involve the next highest areas of severe soil erosion potential (31.9, 31.7, and 31.3 acres, respectively), followed by Alternative 3 (17.6 acres) (Table 3.3-2). Alternative 1–No Action, would involve no construction activity and therefore no soil erosion potential from construction-related soil disturbances.

In general, the WEPP model predicts that a very small proportion of potentially eroded surface material would become sediment even without mitigation in place due to buffering vegetation near streams. With mitigation in place, erosion rates would drop to less than half of the unmitigated values. With mitigation, the average annual erosion rate from sloped construction areas is estimated to be less than 0.5 ton per acre of disturbance for slopes up to 70 percent. For slopes of 30 percent or less, the annual rate is less than 0.06 ton per acre (Table 3.3-6). Without mitigation, slopes up to 70 percent could have annual surface erosion rates of 1.5 tons per acre or greater. The probabilities that this eroded material would reach streams under each alternative are discussed below.

The results of the WEPP modeling (presented in Section 3.3) indicate that Alternatives 2 and 3 would have the greatest likelihood of surface soils erosion from riparian areas (10 percent probability) (Table 3.3-6). The model predicts approximately 0.05 ton per acre annually based on a 10-year average for both alternatives. The probability of erosion from disturbance adjacent to streams is 0 to 10 percent for the other alternatives. The amount of erosion generated in riparian areas predicted by the model is 0.03 tons per acre for Alternatives 4 through 7. These numbers should be used to compare the relative impacts of alternatives and not as predictions of actual erosion that would occur under each alternative.

Sediment Transport Potential

Results of the WEPP model predict no sedimentation for any of the alternatives as a result of the proposed activities (Table 3.3-6). Surface roughness in the riparian area and implementation of mitigation measures would prevent the small amount of soil eroded from reaching streams.

The likelihood that eroded sediment would reach streams and impact water quality increases with the number of road-stream crossings under each alternative. Road crossings through shorelines of state significance (Type 1) or waters with influence on downstream water quality (Type 4), as classified by the WDNR, are particularly sensitive to sedimentation. The number of road and track road crossings through those sensitive stream reaches and through all other stream reaches are shown in Table 3.4-1. These are only the crossings that would require roadwork (such as heavy or deferred maintenance). Additional road-stream crossings exist throughout the project area, but these would not contribute to different levels of sediment between alternatives. As explained in Section 2.4.3 (Access Roads), track roads are unimproved dirt roads without surfacing or regular maintenance, generally 8 to 12 feet in width. Many track roads have already formed over the countryside after periodic use by four-wheel-drive vehicles. Others would be built using minimal construction.

The greatest number of total road-stream crossings requiring bladework would occur under Alternative 5, with 23 total crossings. Alternatives 4, 6, and 7 would follow, with 19 total crossings, followed by Alternative 2 (7 crossings) and Alternative 3 (2 crossings). Alternative 1—No Action, would involve no new construction activity and therefore no construction-related road-stream crossings. In general, the majority of road-stream crossings would occur across track roads. Wherever feasible, gates will be maintained to limit vehicular access to NFS, BLM, WDFW, and WDNR lands, and to private land where permission is granted by the landowner (see Section 2.4.3.3). The greatest potential for adverse impacts would occur at road crossings requiring bladework on Type 1 and 4 streams. Four of these would occur under Alternatives 4 through 7, and one would occur under Alternatives 2 and 3 (Table 3.4-1).

Table 3.4-1. Number of Road-Stream Crossings Related to Maintenance and Construction Activities by Type and Alternative

Road-Stream Crossing Type[1/] (number)	Alternatives						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Road Crossing with Type 1 or 4 Stream	0	1	1	4	4	4	4
Track Road Crossing with Type 1 or 4 Stream	0	1	0	0	1	0	0
Road Crossing with Type 3, 5, or 9 Stream	0	0	0	15	15	15	15
Track Crossing with Type 3, 5, or 9 Stream	0	5	1	0	3	0	0
Total	**0**	**7**	**2**	**19**	**23**	**19**	**19**

Notes:
[1/] Stream Types are from WDNR GIS metadata. Type 1 = shorelines of state significance, Type 3 = waters with medium influence and importance, Type 4 = waters with influence on downstream water quality, Type 5 = Other streams not classified as Types 1 through 4, and Type 9 = unclassified streams.
Source: GIS data. Only road-stream crossings requiring heavy maintenance are shown. Other road-stream crossings exist throughout the project area.

Bladework would be required on existing roads and/or new track roads under each of the proposed action alternatives. As described in Section 2.4.3 (Access Roads), roadwork techniques would vary depending on the level of improvement needed. In general, most roads or tracks would only require use of a bulldozer or grader to level the travel surface in spots. A portion of the road-related ground disturbance would occur within the 300-foot RHCAs, (Table 3.3-4), or within 900 feet, the maximum distance documented for road-related sediment to reach roads (Table 3.3-5).

In general, a relatively small amount of disturbance from structure areas and road blading is proposed under each action alternative. The largest area disturbed within 300 feet of streams would occur under Alternatives 4 and 7 (with 9.3 acres), followed by Alternative 6 (with 8.9 acres). Alternative 3 (with 5.7 acres), Alternative 5 (with 4.7 acres), and Alternative 2 (with 2.8 acres) would involve relatively small amounts of disturbance near streams (Table 3.3-3). The largest area of road disturbance within 900 feet of streams would occur under Alternative 5 (with 6.1 acres), followed by Alternative 2 (with 5.3 acres), and Alternatives 4, 6, and 7 (with 4.9 acres). Alternative 3 would involve only 0.2 acre of disturbance caused by roadwork (Table 3.3-5). Less than one percent of the project area would be disturbed under any of the proposed alternatives.

Discussion of Effects

Sedimentation and Turbidity

An overall estimate of potential impacts to water quality from each alternative is determined by considering both the likelihood of soil erosion and the likelihood that any eroded sediments would reach streams. Soil disturbance potential would range from 17.6 acres under Alternative 3 to 39 acres under Alternative 5. Alternative 2 would affect 37.7 acres, while Alternatives 4, 6, and 7 would affect 31.9, 31.7, and 31.3 acres, respectively (Table 3.3-2).

All alternatives have a very small (10 percent or lower) probability of producing measurable soil erosion (Table 3.3-6). If any occurred, soil erosion would be most likely to occur immediately following ground-disturbing activities. However, modeling of site conditions shows no potential for sedimentation because mulching and revegetation mitigation measures are effective at controlling transport of eroded materials (see Section 4.3 and 4.4 for descriptions of mitigation measures). Eroded materials would be redeposited before reaching streams. None of the alternatives is expected to result in substantial (measurable) soil erosion or delivery of sediment to streams. Without sediment delivery, no increases in turbidity are predicted with any of the alternatives.

If implemented, Alternatives 4 through 7 would have the greatest number of sensitive road-stream crossings (Table 3.4-1). Localized, short-term increases in sediment would be likely results of ground-disturbing activities at these crossings. The majority of these, however, would involve bladework at existing road-stream crossings. With Best Management Practices (BMPs) implemented, this roadwork would offer the opportunity to reduce sedimentation from the roads over the long term.

Use of mulching and revegetation mitigation measures would also prevent increases in sediment delivery to Frazer Creek under Alternatives 4 through 7. Furthermore, the USDA Forest Service has determined that there are no unstable roads that deliver sediment to Frazer Creek. Disturbance in the Frazer Creek area would be limited to the establishment of pads to complete work on the Loup Loup transmission lines as part of Alternatives 4 through 7, minimal vegetation clearing, and use of stable roads that would not contribute to sedimentation.

Other Parameters on the CWA 303(d) List

As described below, the implementation of mitigation measures, including BMPs, would prevent the alternatives from affecting stream flows; stream water quality from fuel spills, pesticides, herbicides, or fecal coliform; or stream temperatures.

Less than one percent of the project area would be disturbed under any of the alternatives. Furthermore, as discussed in Section 3.3.2.3, soil compaction would be minimal (also less than one percent of the project area) because organic soils would be avoided and disturbances would be limited to access roads and construction areas. No new roads would be constructed along the Loup Loup alignment, and roadwork would be limited under the other action alternatives. In addition, vegetation removal in riparian areas would be minimal (see Sections 3.5 and 3.6). The combination of minimal soil compaction (less than one percent of the project area) and minimal vegetation removal in riparian areas would result in no measurable increases in streamflow. No new water rights would be necessary to accomplish the proposed construction activities.

The proposed alternatives would not result in water quality degradation from fuel or other chemical spills at construction pads and along roads because fueling would occur outside RHCAs. Secondary containment at fueling sites would prevent spills from reaching streams. New structures installed under all alternatives would include pentachlorophenol-treated wood structures. Pentachlorophenol may leach in small amounts from the structure into the soil, but is broken down by sunlight and microorganisms to non-toxic chemicals within several days to months (Agency for Toxic Substances and Disease Registry, 2001). Herbicide applications used for noxious weed treatments would not affect water quality because they would not be sprayed near RHCAs or open water. Fecal coliform is most commonly introduced to streams in the project area by livestock and wildlife, which are not affected as part of any project alternatives.

The confluence of the Twisp River with the Methow River is on the CWA 303(d) list for elevated stream temperature. If approved by the EPA, an additional segment of the Methow River near the town of Pateros would be added. The proposed alternatives do not include paving and would involve very little riparian vegetation removal (see Sections 3.5 and 3.6). As a result, the alternatives would not contribute to increased stream temperatures.

3.4.2.3 Cumulative Effects

This section considers the incremental effects of the proposed alternatives when added to other past, present, and reasonably foreseeable future actions. Past and present actions affecting resources are included in the affected environment portion of this section. In the case of Alternatives 2 and 3, other past, present, and reasonably foreseeable actions include the operation and maintenance of the existing Loup Loup transmission line and the valley floor distribution circuits. As a result, all of the cumulative effects sections assess the effects of Alternative 2 and 3 in conjunction with the existing Loup Loup transmission line and the valley floor distribution circuits. Reasonably foreseeable future actions are defined for the purposes of this analysis as future actions that are planned within the 5th level hydrologic units (identified by the Hydrologic Unit Code, or HUC) that contain the project area (Figure 3.7-1).

The reasonably foreseeable actions included in this analysis are discussed in Section 3.1. These activities include grazing allotment actions on NFS lands, grazing management on WDNR land, fuels management and timber salvage projects on NFS lands, Forest Practices on local government, state, and private forestlands, and residential and commercial development.

Grazing has increased surface erosion, and concentrated grazing in streams or along streambanks has caused bank failures and sedimentation in isolated locations throughout the project area (USDA Forest Service, 2004c). Livestock that take water in or near streams can contribute fecal coliform directly to surface water. One segment of the Okanogan River is on the 303(d) list for fecal coliform near the town of Okanogan. The three reasonably foreseeable grazing allotment actions on NFS lands are all intended to reduce grazing impacts to riparian areas and would meet all applicable Forest Plan standards and guidelines intended to protect wetlands, riparian areas, and other resources. As discussed in Section 3.3, elimination of grazing within riparian areas on NFS lands in the Loup Loup corridor would reduce soil erosion and sediment delivery to streams over time.

Although timber harvest and management activities can affect hydrology and sediment delivery, the extent of harvests in the project area has been small enough so that increases in peak streamflows have not been observed. No stream segments in the project area are on the CWA 303(d) list for sediment. Similarly, logging roads and skid trails have not notably altered water flow through increases in impervious surfaces or changes to the water holding capacity of soils. Activities that may remove vegetation in riparian areas, including road construction or timber harvest, may affect temperature levels. The Methow River is under consideration for water quality impairment for temperature in the 2002/2004 303(d) list. The proposed alternatives contribute very little to the cumulative amount of riparian vegetation removal in the affected watersheds.

Prescribed burns generally maintain sufficiently low soil temperatures to avoid volatilizing organic materials and creating hydrophobic (water-repellent) soils. The four reasonably foreseeable fuels management and timber salvage projects on NFS lands would meet all applicable Forest Plan standards and guidelines intended to protect wetlands, riparian areas, and other resources and are not expected to have significant effects on hydrology or water quality because RHCA or riparian resource requirements would be applied. The 15 reasonably foreseeable Forest Practices authorized by the WDNR within or in the immediate vicinity of the project area are assumed to meet all Forest Practices rules, which are, among other things, designed to specifically address cumulative effects (WAC 222-12-046). None of the alternatives would increase stream flow or significantly affect sediment delivery. Combined with these planned activities, they would not contribute to cumulative effects to hydrology and water quality.

Land development in previously undeveloped areas typically results in an increase in impervious surface area and may lead to increases in erosion and sedimentation, which can affect water quality. The two reasonably foreseeable residential development projects in the area will increase the amount of impervious surface area within and in the immediate vicinity of the project area. These developments are assumed to meet all local, county, and state planning regulations and ordinances, including those designed to protect water quality and streams. Localized increases in runoff may contribute to increased stream flow, but large percentages of watersheds would need to be developed before adverse cumulative impacts would be notable. The largest development would likely involve 780 acres with full build-out. Unless these were concentrated in a single watershed, the percentages affected by proposed developments would be too small to produce notable effects on hydrology. In addition, there are 13 other smaller short plats within the project area that have been approved or are pending approval with Okanogan County. Together with the proposed alternatives, these land developments will not result in sufficient impervious surfaces or soil compaction to affect hydrology or water quality.

Fuel spills and other machinery-related chemical spills may occur near existing roads, agricultural lands, timber harvest landing areas, and industrial areas within the affected watersheds. Most of these activities require adequate preventative measures, including a Spill Prevention, Control, and Countermeasure (SPCC) Plan to reduce introduction of chemical contaminants into streams and rivers. SPCC Plans are required for operators of facilities that use or consume oil and oil products (EPA, 2004) and would be required for alternatives calling for a new substation (Alternatives 2, 3, and 5) or for temporary diesel generation (Alternative 6). Stream segments in the Okanogan watersheds are also listed for water impairment caused by pesticides (DDT and its derivatives) from past or ongoing activities in the Okanogan watershed (Montgomery Water Group et al., 1995). Agricultural uses in the area likely contribute most of this chemical to streams. The proposed alternatives would not contribute or accelerate additional DDT into the streams.

The existing road network developed by past actions but not being used by the proposed alternatives also contributes sediment and transport eroded materials to streams. None of the streams in the project area is currently listed for sedimentation. Four road projects in and near the project area will be implemented between 2006 and 2008. The Twisp River Road will be widened, graded, and realigned, and ditches will be installed as needed. A fish passage will also be added to the State Highway 20, which will require removing the existing culvert and replacing it with barrier-free fish passage. Minor bridge repair is also planned on this highway, but no earth moving will be required, and resealing will be completed on approximately 13 miles of the highway. With required mitigation measures and BMPs, these planned road activities will not significantly impact the hydrology or water quality of the affected watersheds. Short-term increases in sediment are likely during the instream fish passage project, but these will not result in significant (long-term) impacts to water quality. Together with the track roads included in the action alternatives, these foreseeable activities will not cumulatively impact the hydrologic regime or water quality of the affected watersheds.

The impacts on hydrology from past, present, future, and the Methow Transmission Project would not be significant. Reductions in riparian grazing, reconstruction of the road-stream crossing for fish passage, and implementation of required mitigation and BMPs would likely result in positive impacts to hydrology and water quality.