This section of the Draft Environmental Impact Report (Draft EIR or DEIR) identifies the hydrological resources, the existing drainage conditions, and the surface water and groundwater quality in Chico and the surrounding area. This section also evaluates the potential impacts of the proposed General Plan Update with respect to flooding, drainage, erosion, and water quality, and identifies the appropriate General Plan policies and actions that would lessen the identified impacts. The reader is referred to Section 4.12, Public Services and Utilities, regarding further analysis of groundwater/water supply impacts of the proposed General Plan Update.

4.9.1 EXISTING SETTING

REGIONAL HYDROLOGY

The City of Chico is located in the Sacramento River Valley and is approximately 10 miles east of the Sacramento River itself. The Sacramento River flows in a south/southeasterly direction through the Sacramento River Valley.

According to the 2005 California Department of Water Resources California Water Plan Update, the state has been subdivided into ten hydrologic regions. The City of Chico is located in the north-central portion of the Sacramento River Hydrologic Region, which covers approximately 17.4 million acres (27,200 square miles) (DWR, 2005) and includes all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Plumas, Butte, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake, and Napa counties. Geographically, the Sacramento River Hydrologic Region extends south from the Modoc Plateau near the Oregon border to the Sacramento-San Joaquin River Delta. The northernmost area, mainly high desert plateau, is characterized by hot, dry summers and cold, snowy winters with only moderate rainfall. The Sacramento Valley, which forms the core of the region, is bounded to the east by the crest of the Sierra Nevada and southern Cascades and to the west by the crest of the Coast Range and Klamath Mountains. Another significant feature is the Sacramento River, which is the longest river system in the State of California with major tributaries the Pit, Feather, Yuba, Bear, and American rivers. Overall, annual precipitation in the Sacramento River Hydrologic Region generally increases as one moves from south to north and west to east. The heavy snow and rain that falls in this region contributes to the overall water supply for the entire state.

The Sacramento River Hydrologic Region is the main water supply for much of California's urban and agricultural areas. Annual runoff in the Sacramento River Hydrologic Region averages about 22.4 million acre-feet, which is nearly one-third of the state's total natural runoff. Major water supplies in the region are provided through surface storage reservoirs. Shasta Lake is one of the two largest surface water projects in the region. In total, the region has 43 reservoirs with a combined capacity of almost 16 million acre-feet (DWR, 2005). Major reservoirs in the region not only provide water supply but are also the source of recreation, power generation, and other environmental and flood control benefits. In addition, the region has a network of creeks and rivers that convey water for use throughout the region and provide nesting and rearing ground for major fish and wildlife species. Approximately eight million acre-feet of water go to municipal, industrial, and agricultural uses, while approximately 2.5 million acre-feet are stored as groundwater. Much of the remainder of the runoff goes to dedicated natural flows, which support various environmental requirements, including in-stream fishery flows and flushing flows in the Sacramento River Delta.

SURFACE WATER

Distinctive geographic features in the Planning Area include the perennial waterways of Big Chico Creek, Mud Creek, and Butte Creek. Other significant streams in the city include Little Chico Creek, Dead Horse Slough, Sycamore Creek, Comanche Creek, and Lindo Channel. These stream systems provide drainage to the Planning Area. A drainage basin is an extent of land where water from rain or snow melt drains downhill into a body of water, such as a river, lake, reservoir, estuary, wetland, sea, or ocean. The drainage basin includes the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels. Several ephemeral streams exist within the City of Chico during the rainy season, and seasonal wetlands occur within grassland habitats.

The City of Chico is made up of the Big Chico Creek watershed and the Little Chico Creek/Butte Creek watershed.[1]

Big Chico Creek Watershed

The Big Chico Creek watershed originates from a series of springs, at an elevation of about 5,400 feet, northeast of the City of Chico on the southwest flanks of Colby Mountain, to form a main channel at Chico Meadows. From Chico Meadows, below the human-made lake at Camp Lassen at about 4,400 feet elevation, Big Chico Creek is a free-flowing stream down to Five-Mile Dam in Bidwell Park. After leaving Chico Meadows, the creek turns and flows in a westerly direction for a short stretch before its confluence with Cascade Creek, the first main tributary, at Soda Springs Campground. From here the creek turns to the southwest and begins to follow the valley to the north of State Route 32.

The creek continues to flow freely before reaching Bear Lake, a large plunge pool formed by a waterfall. In this area, Musty Buck Ridge becomes the watershed divide to the northwest, splitting flows between Big Chico Creek and Mud Creek. About a third of a mile above the Ponderosa Way bridge, the creek has another significant waterfall which forms Higgins Hole, the generally agreed-upon uppermost barrier to anadromous fish migration. The creek continues toward the valley, passing just north of Forest Ranch in a deep, wide-topped canyon before reaching Upper Bidwell Park. As Big Chico Creek enters Upper Bidwell Park, it assumes a pool and drop morphology, due to a steeper gradient. This area, referred to as Iron Canyon, is characterized by classic wildland swimming holes, such as Browns Hole, Salmon Hole, Bear Hole, and other unnamed holes. These holes may also serve as over-summering grounds for adult spring-run Chinook salmon, especially during drought years. The Iron Canyon fish ladder sits just below Browns Hole, above Salmon Hole. The ladder was built in the 1950s to assist the salmon over a significant barrier on their journey upstream (BCCWA, 2000). The only other fish ladder on the creek is located at One-Mile Dam to assist the fish in passing over the dam.

At the Five-Mile Dam, Big Chico Creek's flow is partially diverted into Lindo Channel, or Sandy Gulch as it was historically known. Big Chico Creek enters the City of Chico flowing through Upper and Lower Bidwell Park and reaching One-Mile Dam just east of the Vallombrosa and Mangrove/Pine intersection. One-Mile Dam creates the Sycamore Swimming Pool, a public recreational area commonly referred to as One-Mile Pool. The creek then flows directly through

[1] Little Chico Creek watershed and Butte Creek watershed represent two distinct watersheds, yet are connected by the Little Chico Creek-Butte Creek Diversion Channel and therefore are referred to as the Little Chico Creek/Butte Creek watershed for the purposes of this document.

the California State University, Chico, campus, providing a living laboratory for research at the university. The banks of the creek as it runs through the City of Chico remain in a relatively natural state with few cemented or rocked sections. After leaving Chico, the creek continues to the west, passing through agricultural lands on its way toward the Sacramento River. Big Chico Creek flows a distance of 45 miles from its origin, crossing portions of Butte and Tehama counties, to its confluence with the Sacramento River, at an elevation of 120 feet, west of the City of Chico (BCCWA, 2000).

The Big Chico Creek watershed also encompasses three smaller drainages to the north: Mud, Rock, and Sycamore creeks. Closest to Big Chico Creek is Sycamore Creek, which originates at around 1,600 feet in elevation and is a tributary to Mud Creek. Mud and Rock creeks, farther north, originate between 3,600 and 3,800 feet in elevation. Mud Creek drains off Cohasset Ridge to the south, flowing 26 miles to its confluence with Big Chico Creek. Rock Creek drains the north side of Cohasset Ridge and flows 28.5 miles before it joins Mud Creek.

Mud Creek

Mud Creek is a spring-fed stream originating around 3,600 feet in elevation, draining off the south side of Cohasset Ridge and confined to the south by Musty Buck Ridge. The creek is perennial in most years down to where it meets Cohasset Highway. Mud Creek has two main tributaries, Maple and Cave creeks, which originate at about 2,400 and 2,000 feet in elevation, respectively, and both join Mud Creek near Richardson Springs. There are also many other springs in the area, some perennial and others intermittent, that contribute water to Mud Creek (BCCWA, 2000).

Moving downstream from its headwaters, Mud Creek has a series of small waterfalls located about 1 mile upstream of Richardson Springs. At Richardson Springs, at an elevation of about 600 feet, there is a 69-foot waterfall, which is the uppermost barrier to any fish migration. In the vicinity of Richardson Springs is a group of mineral springs, which have a combined flow of approximately 15 gallons per minute (City of Chico, 2008b). These springs are what brought development to Mud Creek Canyon in the late 1800s. The springs are saline springs, and since the time the Indians occupied the area they have been known for their healing qualities. Above Richardson Springs is a small diversion dam, which was used to divert water for domestic use as well as generate electricity. The diversion is no longer in use but the dam is still in place, holding back water in a small reservoir (BCCWA, 2000).

Rock Creek

Rock Creek flows off the north side of Cohasset Ridge, originating around 3,800 feet in elevation. The creek flows just north of Cohasset Ridge for about 6 miles to where Keefer Ridge spurs off Cohasset and forms the headwaters of the Anderson Fork to the east, at around 2,400 feet in elevation, and drains the bottom portion of Cohasset Ridge.

Anderson Fork, the main tributary, flows along Cohasset Road down to the edge of the foothills and joins Rock Creek at approximately 425 feet elevation. Rock Creek forms the Tehama/Butte county line from near its headwaters downstream approximately 6 to 7 miles. There is one small diversion dam in the valley section of the creek, just upstream of the Anderson Fork confluence, which is in use from April to November. The lower valley section of the creek is heavily channelized to protect urban and agricultural lands (BCCWA, 2000). Recent development in the Rock Creek floodplain has led to significant flooding problems. These problems are currently under investigation by the U.S. Army Corps of Engineers (USACE) and Butte County.

Rock Creek formerly flowed out onto the valley floor and into a large marsh, somewhere near Nord, which most likely drained into Pine Creek (BCCWA, 2000). Presently Rock Creek drains into the human-made Kusal Slough, which delivers the water to Mud Creek, about 1 mile upstream of the confluence with Big Chico Creek. Currently there is no stream flow gauging station located on Rock Creek (BCCWA, 2000).

Sycamore Creek

Sycamore Creek flows just to the south of the airport and joins Mud Creek approximately one-fifth of a mile before it passes under State Route (SR) 99. Sycamore Creek is also restricted by levees from the confluence with Mud Creek upstream to just above Cohasset Highway. The Sycamore Creek diversion channel, which receives water from Big Chico Creek, has eroded away a great deal of material within its channel. This material has been transported down the system and formed depositional areas near Cohasset Highway and Meridian Road (BCCWA, 2000).

Lindo Channel (Sandy Gulch)

Big Chico Creek is a free-flowing stream down to Five-Mile Dam in Bidwell Park. At Five-Mile Dam, Big Chico Creek's flow is partially diverted into Lindo Channel (historically known as Sandy Gulch). Lindo Channel is an ephemeral stream that formed as a natural channel on the Chico alluvial fan, but was historically modified for flood control purposes in the early 1960s. Lindo Channel runs parallel to Big Chico Creek for almost 8 miles before rejoining the creek about 2.5 miles from Big Chico Creek's confluence with the Sacramento River. Lindo Channel is still used today as a diversion channel to relieve flood flows in Big Chico Creek. In addition to flood control, Lindo Channel is important for groundwater recharge as well as aquatic and riparian habitat.

Another flood control channel, the Sycamore Diversion, was constructed off of Lindo Channel. It can be seen running to the northwest at the entrance to Upper Bidwell Park, diverting flood flows from Lindo Channel to Sycamore Creek, which drains into Mud Creek. These channels divert potentially damaging flood flows around the City of Chico (BCCWA, 2000).

Little Chico Creek/Butte Creek Watershed

Little Chico Creek

Little Chico Creek originates in the foothills of the northern Sierra Nevada (Platte Mountain is located at the northern terminus of the watershed) and travels nearly 16 miles in a southwesterly direction through steep canyons before flattening out along the floor of the Sacramento Valley. The topography of Little Chico Creek is diverse, including the relatively flat valley floor, the low-angle slope of the creek's alluvial fan, lower canyons, and steep-sloped headwaters. Before Little Chico Creek enters the City of Chico urban area, it passes a diversion structure constructed in the 1960s, which is intended to divert high flow from Little Chico Creek into Butte Creek. The creek flows another 9 miles, west through the City of Chico and then southwest, before intermingling with the numerous braided channels that make up the eastern floodplain of the Sacramento River (Butte County, 2006).

Butte Creek

Butte Creek originates in the Lassen National Forest at over 7,000 feet. Butte Creek travels through canyons through the northwestern region of Butte County and through the valley, entering the floor near Chico. The northern Sierra Nevada and southern Cascade mountain ranges generally divide the valley section from the mountainous section of the Butte Creek watershed in Butte County. Once Butte Creek enters the valley section of the watershed near Chico, it travels approximately 45 miles before it enters the Sacramento River (BCWC, 1998). Levees were constructed along Butte Creek in the 1950s by the USACE. These levees extend for over 14 miles along the Butte Creek channel.

Comanche Creek

Comanche Creek parallels Little Chico Creek to the south and extends approximately 6 miles upstream into the Sierra Nevada foothills. The creek flows year-round due to the diversion of waters from Butte Creek (approximately 4 miles east of the Skyway) into the creek for conveyance to agricultural users to the west of the city. Comanche Creek, which is also known as Edgar Slough and Crouch Ditch, flows along the southern fringe of the City of Chico before intersecting Little Chico Creek on the Sacramento River floodplain (Butte County, 2006).

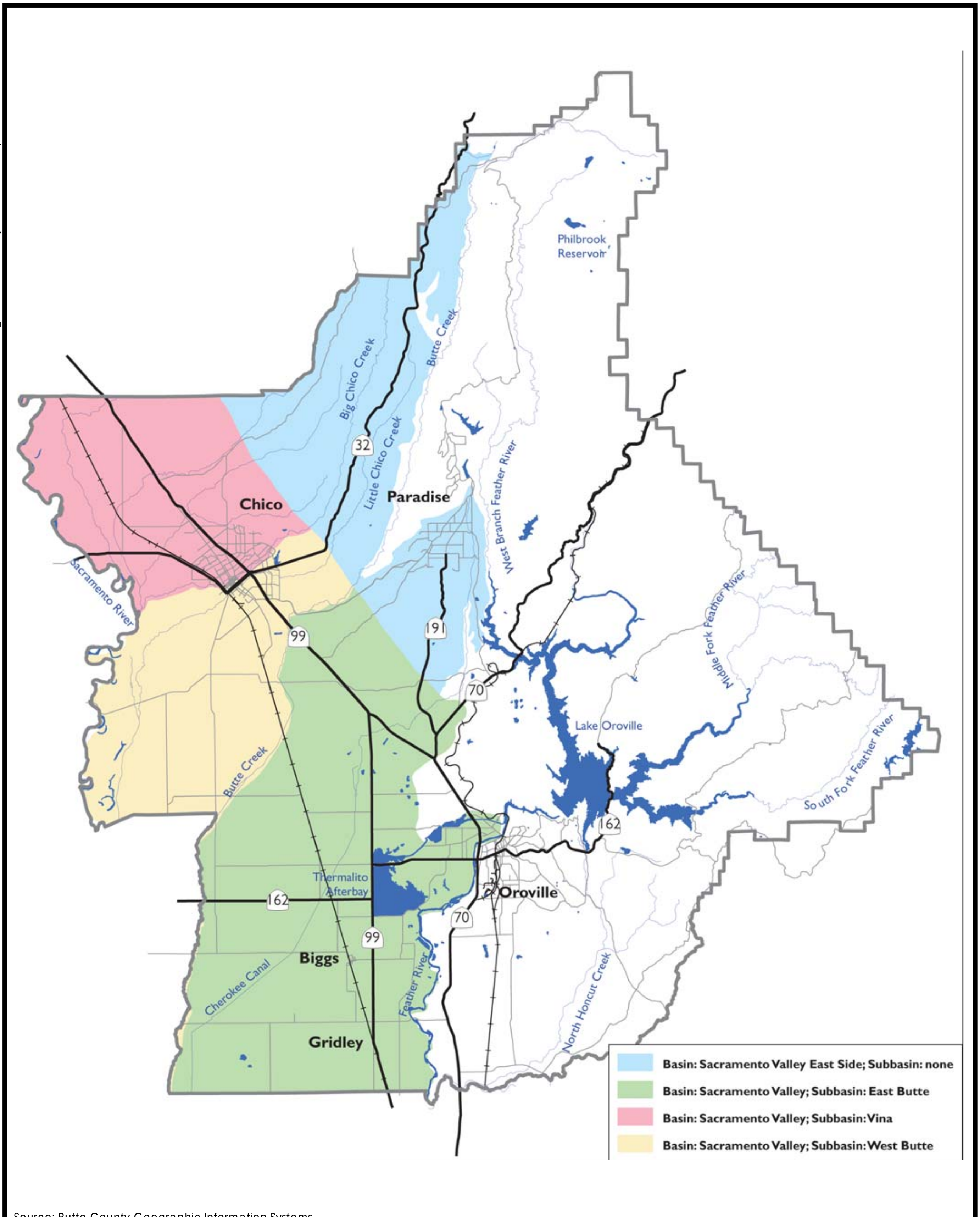
GROUNDWATER

The City of Chico lies above the Sacramento Valley Groundwater Basin and the West Butte and Vina subbasins (DWR, 2004a, 2004b). The West Butte Subbasin is bounded on the west and south by the Sacramento River, on the north by Big Chico Creek, on the northeast by the Chico Monocline, and on the east by Butte Creek (DWR, 2004a) (**Figure 4.9-1**). Big Chico and Butte creeks serve as subbasin boundaries in the near surface. The West Butte Subbasin is hydrologically contiguous with the Vina Subbasin at depth (DWR, 2004a). The Vina Subbasin is bounded on the west by the Sacramento River, on the north by Deer Creek, on the east by the Chico Monocline, and on the south by Big Chico Creek (DWR, 2004b) (**Figure 4.9-1**). The aquifer system underlying Chico comprises continental deposits of Tertiary to late Quaternary age. The Quaternary deposits include the Holocene stream channel deposits and basin deposits and the Pleistocene Modesto Formation, Riverbank Formation, and Sutter Buttes alluvium (DWR, 2004a, 2004b). The Tertiary deposits consist of the Pliocene Tehama Formation and the Tuscan Formation (DWR, 2004a, 2004b).

The aquifer system underlying Chico supplies the municipal and agricultural water demands of the city. Approximately 60 percent of the groundwater pumped for the city and most of the stormwater runoff from impervious development returns to either the groundwater system as recharge or the surface water system as discharge. Another 16 percent returns through septic systems (Butte LAFCo, 2006). The portion of water that does not return to the aquifer is consumed by landscape plants, lost through evapotranspiration, or discharged as treated wastewater to the Sacramento River. In addition, the groundwater system is largely sustained by recharge in the foothills located east of Chico, streamflow infiltration from Big Chico and Little Chico creeks and Lindo Channel, and to a lesser degree by direct infiltration of precipitation. The Lower Tuscan Formation is the primary groundwater-producing aquifer in the region. Most of the recharge areas of the Tuscan Formation are located along the base of the Sierra Nevada foothills in Butte County. Groundwater quality is generally good, but there are some areas of concern (see below).

The Chico region's geology plays a major role in the water resources, as some geological formations (aquifers) can transport and hold considerable amounts of water, while others do not. Also, some geological formations are permeable, allowing rapid infiltration of surface water, while other are relatively impermeable and greatly restrict recharge of groundwater. The Tuscan Formation extends from just west of the Sacramento River into the Sierra Nevada. It averages 1,700 feet in depth in the eastern portions of this swath to approximately 300 feet near the

Sacramento River. The formation is of Pliocene age and comprises volcanic mudflows, tuff, breccia, sandstone, and ash deposits. Groundwater in the Sacramento Valley Groundwater Basin Region, which underlies Chico, is contained primarily within the pore spaces of the reworked sand and gravel layers of this formation. Much of the groundwater is confined under pressure by layers of impermeable clays, mudflows, or tuff breccia. Volcanic sands of this formation can yield high amounts of water to wells in many areas in the eastern portions of the Sacramento Valley.



Source: Butte County Geographic Information Systems

Figure 4.9-1
Groundwater Basins

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Groundwater-Bearing Zones

The general groundwater geology of the Chico area comprises the primary water-bearing Tuscan Formation of the Plio-Pleistocene Age. Beneath the Sacramento Valley floor, it is in part underlain by marine tertiary formations and the Miocene basalt overlying the Cretaceous and crystalline basement rock. The Tuscan Formation is overlain westerly by the Older Alluvium, which dips gently westward. Recent Alluvium also occurs along Big Chico Creek as channel fill and recent terraces.

Three water-bearing zones occur beneath the Chico area: shallow, intermediate, and deep. Groundwater is available in the Chico area from these water-bearing zones.

The shallow zone, consisting of Recent Alluvium, occurs between sea level and approximately 150 feet above sea level. This zone consists of recent alluvial material deposited by Big Chico and Little Chico creeks. Most of the material is coarse sand and gravel with extremely variable permeability, generally producing 100 or less gallons per minute per well (City of Chico, 2008a). The shallow zone is 30 feet thick and consists of silt from 0 to 22 feet and coarse sand and gravel to 30 feet. Groundwater in this zone is unconfined. Very little groundwater is pumped from this zone in the eastern portion of Chico due to its limited storage capabilities. This zone receives its recharge directly from infiltration of precipitation, stream flow, domestic wastewater from leach fields, and urban runoff from drainage wells.

The intermediate zone, consisting of Older Alluvium, occurs from sea level to approximately 300 to 400 feet below sea level and lies above the top of the Tuscan Formation. It ranges in depth from 1,500 feet thick in the foothills east of Chico to 6,400 feet thick west of Chico (City of Chico, 2008a). This zone is composed of mainly thick, clayey layers and cemented sand and gravel, generally producing 100 to 1,000 gallons per minute per well (depending on the well location). Groundwater occurs mainly in thin uncemented sand and gravel aquifers under semi-confined conditions. This aquifer is the source for most of the individual wells in the Chico area (City of Chico, 2008a). This zone receives recharge from faults and streams incised in the Older Alluvium through vertical leakage from the overlying saturated alluvium, and possibly subsurface inflow from the Tuscan Formation. The older alluvium appears to have limited vertical permeability due to cementation of the rock matrix.

The deep zone occurs below the Tuscan Formation, generally producing from 1,500 to 2,000 gallons per minute per well. The deep zone aquifers are thick beds of black sand and/or coarse-grained gravel of the Tuscan Formation confined by less permeable clay, tuff, and mudflow layers. The highly permeable volcanic sediments yield large amounts of water to deep irrigation and municipal wells. This zone is recharged mainly by faults and streams that drain the foothill area east of Chico, including Big Chico Creek, and is the source for the California Water Service Company wells, which serve incorporated and urbanized unincorporated areas within the City of Chico. This zone lies approximately 3,400 feet below ground surface east of Chico and gradually deepens to about 6,000 feet below ground surface west of the city.

Groundwater Supply

In 2001, available water supplies during normal and drought years were estimated, and regional impacts on groundwater were estimated by comparing groundwater extraction estimates with groundwater hydrology data (Butte County Department of Water and Resource Conservation, 2001). Groundwater conditions and supply as concluded by the subsequent report, the Butte County Water Inventory and Analysis, March 2001, are summarized below (Butte County Department of Water and Resource Conservation, 2001).

- The portion of the Sacramento Valley aquifer system under Butte County has recovered from the 1988–1994 drought. Long-term trends in groundwater storage indicate the basin groundwater aquifer is not in a state of decline. During normal to wet years, the aquifer system recharges to its maximum storage capacity by the following spring.

- Butte County, which includes the city, has been divided into water inventory units and sub-units; Big Chico Creek flows through the Foothill and West Butte Inventory Units. Within the Foothill Inventory Unit and Mountain Inventory Unit, overall groundwater supply is limited because the groundwater occurs primarily in fractures and joints of volcanic bedrock. Shallow, domestic wells could be susceptible to dewatering during periods of drought.

- Under the normal hydrologic conditions evaluated in the Butte County Water Inventory and Analysis, Butte County has an adequate surface water and groundwater supply to meet current demands.

- Under drought conditions evaluated in the Butte County Water Inventory and Analysis, current demand can generally be met through increased groundwater extraction provided groundwater extractions are increased to offset reduced surface supplies.

- Under the drought conditions evaluated, additional groundwater wells and conveyance and distribution systems may be required to fully utilize the groundwater resource.

- Under the drought conditions evaluated, the Foothill Inventory Unit experiences water shortages.

- Future increases in demand will be associated with population growth and environmental regulatory requirements, both within and outside of Butte County.

- A significant amount of water supplied to meet demand remains available for use through deep percolation to groundwater and outflow to other areas.

- Environmental water use (uses including artificial lakes intended to create wildlife habitat, fish ladders around dams, and water releases from reservoirs timed to help fish spawn) constitutes a substantial amount of water demand in Butte County, extending water demand past the typical irrigation season. The trend in environmental water use has increased in the recent past due to regulatory requirements.

- Water quality is generally adequate to meet current demands; however groundwater nitrate contamination could threaten supply in areas with a high density of septic systems. Regulation of non-point source agricultural return water may become an issue in the near future.

The reader is referred to Section 4.12, Public Services and Utilities, regarding further analysis of groundwater/water supply impacts of the proposed General Plan Update.

WATER QUALITY

The Sacramento River Hydrologic Region is part of the California Regional Water Quality Control Board's Central Valley Region (CVRWQCB).

Surface Water Quality

Water quality for all surface and ground waters for the Sacramento Valley is regulated under the jurisdiction of the CVRWQCB. Water quality standards for all waters in the region are discussed in the region's Basin Plan, which covers the entire area included in the Sacramento and San Joaquin river drainage basins. As stated above, the Sacramento River drainage basin covers approximately 27,000 square miles and includes the entire area drained by the Sacramento River including the Planning Area.

Section 303(d) of the federal Clean Water Act (CWA) requires states to identify the waters of the state that do not meet the CWA's national goal of "fishable, swimmable" and to develop total maximum daily loads (TMDLs) for such waters, with oversight of the United States Environmental Protection Agency (USEPA). These waters are commonly referred to as "impaired." A TMDL is a quantifiable assessment of potential water quality issues, contributing sources, and load reductions or control actions needed to restore or protect bodies of water. Streams within the Planning Area, which include the Big Chico Creek watershed, Little Chico Creek, Comanche Creek (Edgar Slough), Lindo Channel (Sandy Gulch), and Butte Creek, are not listed on the 303(d) list (RWQCB, 2006). Waters within the Planning Area generally flow to the Sacramento River, which is on the 303(d) list.

Groundwater Quality

Groundwater in the Planning Area is considered most vulnerable to the following activities associated with contaminants detected in the water supply: sewer collection systems, septic systems, parks, RV parks, agricultural drainage, fertilizer and pesticide application, automobile body and repair shops, utility stations (maintenance areas), railroad yards (maintenance/fueling areas), electrical/electronic manufacturing, chemical/petroleum processing/storage, machine shops, grazing, lumber processing/manufacturing, wood preserving/treating, fleet/truck/bus terminals, known contaminant plumes, and drinking water treatment plants (California Water Service Company, 2008). The low foothill area east of the city is the primary aquifer recharge area for Chico's domestic groundwater (Butte LAFCo, 2006). The groundwater in this area is vulnerable to contamination from urban activity in this area, including construction, grading, use of equipment and automobiles, sewer leakage, and other potential contaminants. Special precautions may be necessary to prevent groundwater contamination resulting from development in the foothills.

Water delivered to Chico customers is treated to meet all federal and state drinking water regulations. However, as described below, there are issues that affect the quality of the water supply. These include plumes of contaminated groundwater, areas with high nitrate concentration levels, and locations with high arsenic levels.

Contaminated Groundwater Plumes

Eight areas of contaminated groundwater (plumes) have been identified in the City of Chico. There are six areas of known groundwater contamination associated with volatile organic compounds (VOCs). Four of these areas are associated with perchloroethylene (PCE) contamination from dry-cleaning establishments. Dry-cleaning operations often disposed of PCE by pouring it down the drain. Being highly soluble and heavier than water, leaky sewer pipes allowed the PCE to contaminate the shallow, unconfined groundwater aquifer (Butte LAFCo, 2006). A fifth plume is a result of trichloroethylene (TCE) contamination from a former metal tube can manufacturer. Wells in these areas that have been tested and were shown to exceed the maximum contaminant level (MCL) for TCE and PCE have either been taken out of service or had treatment facilities installed to remove the contaminant. However, the California Water Service Company (Cal Water) is concerned with the future availability of other wells not currently impacted. Contaminant migration of these solvents with groundwater movement could force the closure or treatment of other wells. There is also a large TCE/petroleum plume for which a responsible party has not yet been identified. The contaminants in each of the identified plumes are shown in **Table 4.9-1.**

TABLE 4.9-1
CONTAMINATED PLUMES IN CHICO

Plume Name	General Location	Contaminant
Central Plume	Area south of Chico State University roughly spanning from Mangrove Avenue to State Route 32	Tetrachloroethylene/ Perchloroethylene (PCE)
Chico Municipal Airport/Victor Industries	Area south of the Chico Municipal Airport and north of Eaton Road	Trichloroethylene (TCE)
Louisiana Pacific Plume	South Chico spanning from Park Avenue to Dayton Road	Pentachlorophenol (PCP)
North Central Plume	Area just south of the Lindo Channel spanning between Mangrove Avenue and State Route 99	Perchloroethylene (PCE) and 1,2-DCE (a breakdown product of PCE)
North Valley Plaza Cleaners Plume	Area bounded by East Avenue, State Route 99, and Cohasset Road	Perchloroethylene (PCE) and 1,2-DCE
Skyway Homes Subdivision Plume	Area spanning Hegan Lane from Midway to Dayton Road in south Chico	Trichloroethylene (TCE) and Perchloroethylene (PCE)
Southwest Plume	Area in south Chico roughly spanning from State Route 32 to Lone Pine Road	Perchloroethylene (PCE)
Victor 20th Street Plume	Stretches 1.5 miles from Mulberry Street in a southwesterly direction to the intersection of Berrington Road and Dayton Road	Trichloroethylene (TCE)

Source: DTSC, 2004

The California Department of Toxic Substances Control (DTSC) oversees investigation and remediation of each of these plumes. Remediation measures can consist of extraction and treatment of contaminated water, soil excavation, soil vapor extraction, and bottled water dispensing programs.

DTSC has installed a two-well pump and treatment system as an interim remedial measure to provide source control within the aquifer immediately down gradient from Flair Custom Cleaners. The system continues to remove a significant amount of PCE from the aquifer and appears to have been a significant factor in stabilizing the plume. DTSC also installed a carbon unit for cleaning water on one Cal Water well. During this time, DTSC also developed a draft Remedial Action Plan, completed in late 1995. The plan was not finalized, as the "possible responsible parties" named in that plan wished to develop their own remediation plan. These parties cited the high expense of proposed remediation activities (14 million dollars for treatment of the entire plume) as a main reason for developing their own plan. In 2005, DTSC approved the proposed Remedial Action Plan, which includes continued remediation of the plumes with installation and maintenance of a well monitoring program, remediation system design and construction, system testing and startup, final remedial system reporting, system operations and maintenance, and system decommissioning.

Arsenic

The arsenic levels in some of the wells have also recently become an issue for Cal Water. Based on the MCL that went into effect on January 23, 2006 [10 parts per billion (ppb)], four of the existing wells could be taken out of service.

Groundwater Nitrate Concerns

Use of septic tanks have contributed to the creation of areas of high nitrate concentrations found throughout the aquifer underlying the city. Groundwater nitrate concentrations within the city range from 0.7 milligrams per liter (mgl) to 168 mgl (Butte LAFCo, 2006). Some locations exceed the state's MCL for nitrate (45 mgl).

Elevated nitrate concentrations are found throughout the aquifer underlying Chico. In 1979, the California Department of Water Resources (DWR) found elevated nitrate levels in 21 of the 69 private wells it tested in the community. Additional studies in 1983 identified four nitrate plumes, each having concentrations over 60 mgl, 15 mgl over USEPA and state regulatory levels. Nitrate contamination was attributed to on-site septic systems for wastewater disposal.

Eventual transition of residences from septic systems to sewer service and limitation on issuance of new septic system permits may gradually assist in the elimination of nitrates. Conversion of septic systems may have an impact on groundwater supply and recharge, as 16 percent of the groundwater recharge returns through septic systems. The bulk of on-site septic systems are located in three areas: neighborhoods in north Chico (the Lassen Avenue corridor), central Chico (the Avenues), and south Chico (Chapman-Mulberry area). These three zones represent areas with large amounts of unincorporated parcels or parcels just recently incorporated into the city and include numerous single-family dwellings, apartment complexes, and mobile home parks relying on on-site septic rather than the City sanitary sewer system. The City of Chico and Butte County have entered into an agreement to speed up the process of connecting existing developed properties to the sanitary sewer and that process is currently underway.

Nitrate concentrations in predominantly agricultural areas range from 50.3 to 80.5 mgl as a result of livestock feedlots, agricultural fertilizers, and natural soil nitrogen. These concentrations suggest that nitrate concentrations in groundwater may not be solely due to on-site disposal of domestic wastewater with septic tanks, but also may be attributed to agricultural uses and collection of urban stormwater runoff in drainages and drywells. A Nitrate Action Plan was adopted by the City of Chico and Butte County in 1985, and further studies are under way to confirm and update technical data on sources and locations of nitrate contamination.

Butte County prepared the Nitrate Action Plan in 1985 to address the nitrate problem in response to Prohibition Orders issued by the CVRWBCB (Resolution 84-074). Yet significant portions of the shallow aquifer under the city were being contaminated and continued to be contaminated. In 1990, the CVRWQCB issued a Prohibition Order (Order No. 90-126) establishing a prohibition on individual disposal systems in the city. This order prohibited the installation of new individual disposal systems in the Chico area and mandated the elimination of existing systems on lots of less than 1 acre. Currently, both the County and City are working together to implement the improvements.

In addition, the Chico Urban Area Nitrate Compliance Plan has been prepared to update the Nitrate Action Plan, which was adopted by the Board of Supervisors on September 25, 2001. The Chico Urban Area Nitrate Compliance Plan (Plan) provides for case-by-case evaluation of non-residential septic systems and recognizes that sewer connection may not be practical or feasible in all cases. According to the Plan, Approximately 65 percent of the estimated systems are to be sewered. The Plan addresses potential nitrate-reducing technologies that can be retrofitted to existing septic systems, the sewering of non-residential (commercial) systems, and introduces an on-site program for monitoring those parcels that are not required to be sewered and would retain their onsite septic systems. It is determined in the Plan that nitrate-reducing technologies retrofitted to existing septic systems do not represent a viable solution due to low reliability, high maintenance requirements, and cost. The sewering of non-residential (commercial) systems are extremely varied in their type and volume of discharge and the most viable method for dealing with commercial systems will be performed on a case-by-case basis and review of each nitrate loading situation. According to the Plan, the on-site monitoring program solution will protect groundwater quality and is consistent with the State Water Code and other adopted State and Regional Board policies for meeting the nitrate maximum contaminant level of 45 mg/l.

CLIMATE AND PRECIPITATION

The climate in the Planning Area is considered Mediterranean, which is characterized by hot, dry summers and cool, wet winters. In the Chico area, temperatures range from an average January low of approximately 36° Fahrenheit (F) to an average July high of approximately 96°F. Between mid-April and mid-October, significant precipitation is unlikely and high temperatures often peak at over 100° Fahrenheit with lows in the high 50s and low 60s. Winters are fairly mild, with the most rainfall coming in January. Rainfall in the Planning Area averages approximately 26 inches annually and occurs predominantly from October to May. During the winter, highs are typically in the 60s with lows in the 30s. "Tule fog" (thick ground fog) is often present during the autumn and winter months. The typical seasonal pattern is for North Pacific cyclonic storms to periodically sweep into the area from October through April and for high pressure to dominate over the area and to deflect storms from May to October.

FLOODING

High Sacramento River flood stage creates a backwater in the creeks and tributaries which pass through the Planning Area and may delay runoff from entering the river. The Flood Insurance Rate Map (FIRM) for unincorporated Butte County shows Sacramento River overflow inundating an area about 2 miles east of the river boundaries (**Figure 4.9-2**).

Capacities of channels in the western portion of the Planning Area are also limited, and potential flood flows are believed to be higher than recorded historical occurrences. The FIRM shows floodwater flowing out of the Big Chico Creek Channel near the western edge of the Planning Area. Inadequate channel capacity exacerbates the flooding potential near the Sacramento River. Flood control projects on Little Chico Creek, Big Chico Creek, and Lindo Channel have helped reduce the amount of runoff that flows through the city, reducing potential flooding problems. Identified flood concerns within the city are discussed below. Further discussion of local flood issues are described below.

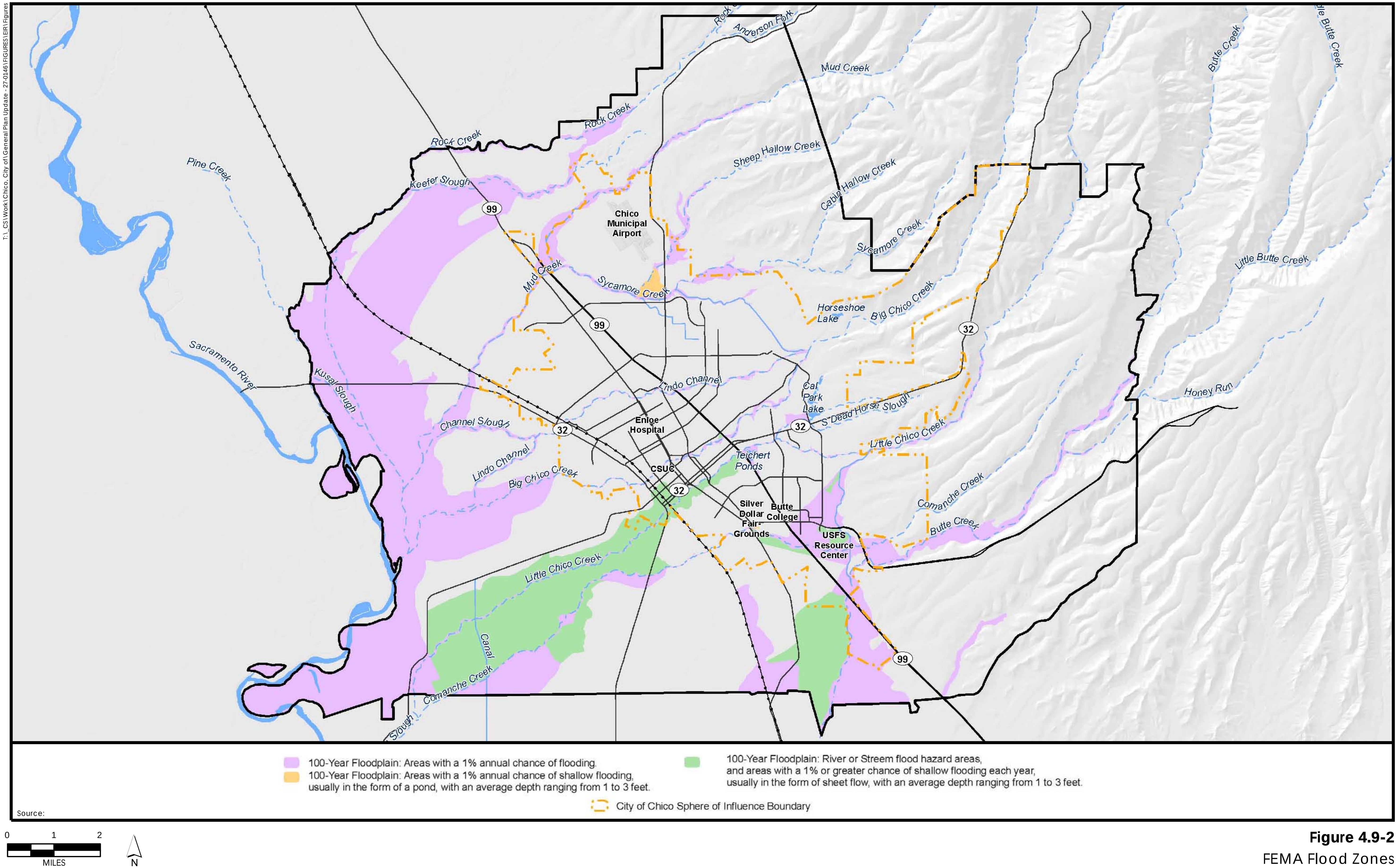

Figure 4.9-2

FEMA Flood Zones

PMC®

Big Chico Creek Watershed

Flooding hazards within the Big Chico Creek watershed are attributed to potential high flows from Lindo Channel, Sycamore Creek, Rock Creek, Keefer Slough, and Big Chico Creek. The flooding hazards in the Big Chico Creek watershed are summarized from the Butte County Flood Mitigation Plan (Butte County, 2006) as well as the Big Chico Creek Watershed Alliance's Existing Conditions Report (BCCWA, 2000).

Big Chico Creek

Flood control of Big Chico Creek for the City of Chico is provided by a flood control structure at the Five-Mile Recreation Area. The structure was installed by the U.S. Army Corps of Engineers in the mid-1960s and is designed for a maximum allowable flow down Big Chico Creek above the Big Chico Culvert of 14,500 cubic feet per second (cfs) (BCCWA, 2000). The primary purpose of the structure is to divert potentially damaging peak flows around the central portion of the City of Chico. The flood control structure is maintained by Butte County in conjunction with the California Department of Water Resources (DWR).

The Five-Mile flood control system is designed to create a pool in the stilling basin, thereby allowing controlled flows through Big Chico Creek, the Lindo Channel flow control structures, and the Sycamore Bypass Channel. The Sycamore Bypass Channel, or Sycamore Diversion, was constructed off of Lindo Channel. It can be seen running to the northwest at the entrance to Upper Bidwell Park. This diversion brings flood flows off of Lindo Channel to Sycamore Creek, which drains into Mud Creek. Where Lindo Channel splits off at Five-Mile, the flow capacity is 14,500 (cfs) until the Sycamore Diversion split, which is capable of receiving 8,500 cfs, leaving the rest of Lindo Channel with the design capacity of 6,000 cfs (BCCWA, 2000). These channels divert potentially damaging flood flows around the City of Chico.

During high flow periods, Big Chico Creek exits the narrow foothill canyon at very high velocities, carrying a large bedload, larger particles that are carried along the bottom of a stream, until it encounters the Five-Mile Area stilling basin. At this location, velocity and bedload mobilizing capacity is significantly reduced, allowing for the larger, entrained sediment to quickly fall out of the water column, depositing the large gravel just upstream of the Five-Mile Area Flow Control Structures. During the following high flow period, the previously deposited gravels flow in the direction of least resistance, sometimes bypassing Big Chico Creek proper and flowing down Lindo Channel or Sycamore Bypass instead.

Sycamore Creek

At the Sycamore Creek diversion near Marigold Avenue, the channel and its banks show signs of severe erosion, which provides the sediment source for deposition in the downstream reaches that have milder slopes and slower velocities, such as the Cohasset Road Bridge. In addition to sediment deposits, large woody debris that plugs the bridge and the levees in this area has resulted in overtopping during very high flow events.

Lindo Channel Diversion

At the Lindo Channel diversion located at the Five-Mile Recreation Area levee, erosion, lack of freeboard (distance from the waterline to the top of the banks), and the accumulation of large, woody debris has historically resulted in flooding in the area during high flow events.

Confluence of Big Chico Creek and Lindo Channel

At the confluence of Big Chico Creek and Lindo Channel, a private levee near Meridian Road and Grape Way broke during a recent high flow event, leaving the residents vulnerable to flooding.

Little Chico Creek/Butte Creek Watershed

Chico Planning Area flooding hazards within the Little Chico Creek/Butte Creek watersheds are attributed to potential high flows from Butte Creek, Comanche Creek, Little Chico Creek, and Dead Horse Slough. The flooding hazards in the Little Chico Creek/Butte Creek watershed are summarized from the Butte Creek Watershed Floodplain Management Plan (Butte Creek Watershed Conservancy/Butte County, 2005).

Little Chico Creek

Heavy vegetation in the Little Chico Creek channel in the reach that flows through the City of Chico urban area has reduced channel capacity, increasing the probability of flooding during a storm event. According to the Federal Emergency Management Agency (FEMA), the 100-year flow in Little Chico Creek was estimated at 3,300 cfs upstream of Dead Horse Slough and 3,700 cfs downstream of Dead Horse Slough (Dead Horse Slough meets Little Chico Creek in the vicinity of Forest Avenue and Humboldt Road). A hydraulic analysis for the Little Chico Creek channel showed that its existing capacity is as low as 1,800 cfs due to heavy vegetation. In the lower reaches of Little Chico Creek, the Little Chico Creek crossing at Alberton Avenue and at Taffee Avenue have experienced levee overtopping, sheet flow flooding, and levee seepage.

Little Chico Creek-Butte Creek Diversion Channel

Northwest of the Little Chico Creek-Butte Creek diversion channel crossing at Warfield Lane, residential development such as the Doe Mill Lane subdivision has occurred in the FEMA-designated 100-year floodplain. The development is approximately 300 feet west of the Little Chico Creek-Butte Creek diversion channel west bank, and the area is at risk of flooding. Additional development in the floodplain is planned for the near future.

Dead Horse Slough

The Dead Horse Slough crossing at El Monte Avenue experiences periodic inundation. Nearby structures have been inundated as recently as 1997.

Comanche Creek

The FEMA 100-year floodplain near Comanche Creek downstream of Skyway Road contains some industrial buildings and a golf park. According to FEMA Flood Insurance Rating Maps, flooding is likely to occur in this area. The floodplain was determined by FEMA to be caused by a levee failure at the west side of the Little Chico Creek-Butte Creek diversion channel. Flooding at the golf park would cause minimal damage; however the industrial buildings could be at risk (FEMA is referenced in the Butte Creek Watershed Floodplain Management Plan).

Butte Creek

The levees along both banks of Butte Creek near Midway Road and extending west are just south of Chico city limits yet within the Planning Area. These levees were constructed in the 1950s by the USACE and lack adequate freeboard for a 100-year event as determined by FEMA. Although a recent 500-year event did not overtop the levees, the levee system still does not meet the FEMA requirements for freeboard in many locations and is not certified.

Similarly, the levees along both banks of Butte Creek between Midway Road and SR 99, which were also constructed in the 1950s by the USACE, lack adequate freeboard for a 100-year event as determined by FEMA. Although a recent 500-year event did not overtop the levees, they also do not meet the FEMA requirements for freeboard in many locations and are not certified.

Local Drainage Flooding

Several issues cause drainage problems that lead to flooding in the watershed. Ditches and storm sewers are needed to convey stormwater away from developed areas; however in some areas the topography prevents surface water from draining quickly to a ditch, stream, or storm drain. Typically, storm drainage systems are designed to handle storm runoff for events smaller than the 100-year event, such as a 10-year event (Butte Creek Watershed Conservancy/Butte County, 2005). Runoff increases as a watershed is developed; as a result older storm sewers designed to convey a 10-year storm or less may become inadequate as additional development takes place. Storm sewers, ditches, and other waterways can be blocked by debris, resulting in the ponding of stormwater prior to the sewer clearing. Ponding is defined as a pool of artificially created still water. Many roads not in the FEMA-designated floodplain have undergone damage in the past due to flooding caused by such blockages (Butte Creek Watershed Conservancy/Butte County, 2005).

Chico Flood Control Projects

In the 1960s the City of Chico, the County of Butte, the State of California, and the federal government collaborated on a series of flood control projects in the city. The two projects that are most important are:

- The Little Chico Creek to Butte Creek Diversion
    - Designed for a 2 percent chance event (commonly called a 50-year event)
    - Conveys high water flows from the mouth of Stillson Canyon, south past the Skyway, and into Butte Creek
- The Big Chico Creek, Lindo Channel, Sycamore Creek, and Mud Creek Diversion
    - Designed for a 1 percent chance event (commonly called a 100-year event)
    - Conveys high water flows from the mouth of Big Chico Creek Canyon (at Five-Mile) to Lindo Channel, and at higher flows to Sycamore and Mud creeks

In the 1970s FEMA began to produce Flood Insurance Rate Maps (FIRM) for the country in order to determine flood risks (and insurance rates) for individual communities. Because of the flood control projects completed in the 1960s, the City of Chico was exempt from the FEMA mapping requirements.

In the 1990s FEMA revised the FIRMs, resulting in a reversal of protocol regarding the City of Chico's exemption from FEMA mapping requirements. During the FEMA mapping that ensued, the potential for flooding was analyzed based on the existence of the levee system. Due to the fact that the system levees of Little Chico Creek were not designed to FEMA standards, portions of the city along Little Chico Creek were determined to be in a floodplain and homeowners were required to purchase flood insurance. It was determined that the Big Chico Creek system's levees were designed to FEMA standards and that they would protect the northern portions of the city.

Currently, FEMA is revising the FIRMs again. For the purposes of this round of FIRM revisions, if levees are to be considered as providing flood protection, the levees are required to be certified. Certification involves demonstrating that the levees were built and are maintained to FEMA standards. If levees are not certified, FEMA will produce maps that assume the levees do not exist. This would mean that a significant number of parcels in Chico would be determined to be in a flood zone and homeowners with federally insured loans in the flood zone will be required to purchase flood insurance.

In November 2008, FEMA sent letters to communities, like Chico, affected by this round of FIRM revisions and its requirement that the owners of levees certify the levees. These letters offered to allow the owners of levees to enter into Provisionally Accredited Levee (PAL) agreements, which allow the signing party two years to certify levees before FEMA produces maps that assume that the levees do not exist.

Although the City is not the owner of the levees in the Big Chico Creek system, FEMA allowed the City of Chico to enter into a PAL agreement for the certification of those levees and that process is now underway. The certification process will not apply to the Little Chico or Butte Creek systems as they were not originally designed to FEMA standards and areas they serve are already identified as floodplain.

DAM FAILURE

Flooding of the area below a dam may occur as a result of structural failure of the dam, overtopping, or a seiche (earthquake-generated waves that can overtop the dam). The collapse and structural failure of a dam may be caused by a severe storm, earthquakes, or internal erosion of piping caused by embankment and foundation leakage. Larger dams that would inundate significant portions of Chico, or watersheds within the Chico area, include the Shasta Dam (in Shasta County), Oroville Dam on the Feather River, and Black Butte Dam on Stony Creek (Butte County, 2006, Appendix D).

Paradise and Magalia reservoirs, owned and operated by the Paradise Irrigation District (PID), are located on Butte Creek, above Paradise. Paradise Dam is an earth-filled structure, and Magalia Dam is a hydraulic fill structure. Failure of Paradise Dam would overtop Magalia Dam and result in temporary flooding in the Planning Area along Butte Creek. According to the Butte Creek Watershed Floodplain Management Plan (Butte Creek Watershed Conservancy/Butte County, 2005), the Magalia Reservoir has restricted water surface levels to ensure safety following a seismic event as a precaution to the higher liquefaction potential at this location. No earthquake measures are performed at Paradise Reservoir; the system integrity is considered adequate for an earthquake of significant magnitude.

Oroville Dam is a large earthen dam located on the Feather River, near the City of Oroville. The dam was constructed as a major component of the State Water Project to provide water for the growing population of California, irrigation in central and southern California, flood control, and hydroelectricity. The dam is over 700 feet high and is almost 7,000 feet long at the top. The inundation area projected for failure of Oroville Dam is located south of the Planning Area and does not include the City of Chico or the Planning Area.

Black Butte Dam was constructed on Stony Creek by the USACE and is operated by the U.S. Bureau of Reclamation (USBR). Black Butte Dam is an earth-filled structure located approximately 24 miles west of the Sacramento River. The dam is located below the Stony Creek, Stony Gorge, and East Park reservoirs. The combined storage capacities of these reservoirs are estimated to be 160,000 acre-feet. Should the dams upstream of Black Butte fail, Black Butte Dam could not withstand the volume of water and would also fail and flood the area approximately 8 miles east of the Sacramento River into the City of Chico (Butte County, 2006, Appendix D).

Whiskeytown Dam was constructed as a feature of the federal Central Valley Project and is operated by the USBR. It is located along Clear Creek approximately 65 miles northwest of the City of Chico. In the event of a dam failure, flow would travel along Clear Creek and into the Sacramento River, inundating almost 20 miles east of the Sacramento River into the Planning Area (Butte County, 2006, Appendix D).

Shasta Dam was constructed as a feature of the federal Central Valley Project and is operated by the USBR. It is located approximately 70 miles north of the City of Chico, with an estimated capacity of 4.5 million acre-feet. In the event of a failure, water would flow into the Sacramento River and inundate roughly 30 miles east of the Sacramento River into the City of Chico (Butte County, 2006, Appendix D).

4.9.2 REGULATORY FRAMEWORK

FEDERAL

Clean Water Act

The Clean Water Act (CWA) regulates the water quality of all discharges into waters of the United States including wetlands and perennial and intermittent stream channels. Section 401, Title 33, Section 1341 of the CWA sets forth water quality certification requirements for "any applicant applying for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters." Section 404, Title 33, Section 1344 of the CWA in part authorizes the U.S. Army Corps of Engineers to:

- Set requirements and standards pertaining to such discharges: subparagraph (e);
- Issue permits "for the discharge of dredged or fill material into the navigable waters at specified disposal sites": subparagraph (a);
- Specify the disposal sites for such permits: subparagraph (b);
- Deny or restrict the use of specified disposal sites if "the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies and fishery areas": subparagraph (c);
- Specify type of and conditions for non-prohibited discharges: subparagraph (f);
- Provide for individual state or interstate compact administration of general permit programs: subparagraphs (g), (h), and (j);
- Withdraw approval of such state or interstate permit programs: subparagraph (i);

- Ensure public availability of permits and permit applications: subparagraph (o);
- Exempt certain federal or state projects from regulation under this Section: subparagraph (r); and
- Determine conditions and penalties for violation of permit conditions or limitations: subparagraph (s).

Section 401 certification is required prior to final issuance of Section 404 permits from the U.S. Army Corps of Engineers.

Section 303(d) of the federal Clean Water Act requires that all states in the U.S. identify waterbodies that do not meet specified water quality standards and that do not support intended beneficial uses. Identified waters are placed on the Section 303(d) List of Impaired Waterbodies. Once placed on this list, states are required to develop a water quality control plan — called a Total Maximum Daily Load (TMDL) — for each waterbody and each associated pollutant/stressor. TMDLs are discussed in more detail below.

National Pollutant Discharge Elimination System

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Permit Program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. It is the responsibility of the water boards, such as the Central Valley RWQCB, to preserve and enhance the quality of the state's waters through the development of water quality control plans and the issuance of waste discharge requirements (WDRs). WDRs for discharges to surface waters also serve as NPDES permits.

Under Phase I, which started in 1990, the Regional Water Quality Control Boards have adopted NPDES stormwater permits for medium (serving between 100,000 and 250,000 people) and large (serving more than 250,000 people) municipalities. The State Water Resources Control Board (SWRCB) adopted a General Permit for the Discharge of Storm Water from Small MS4s (WQ Order No. 2003-0005-DWQ) to provide permit coverage for smaller municipalities, including nontraditional Small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes. The MS4 permits require the discharger to develop and implement a stormwater management plan/program with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Section 402(p) of the Clean Water Act. The management programs specify what best management practices (BMPs) will be used to address certain program areas. The program areas include public education and outreach, illicit discharge detection and elimination, construction and post-construction, and good housekeeping for municipal operations.

Under Phase II requirements, dischargers in any location whose projects disturb 1 or more acres of soil, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the statewide General Permit for Discharges of Storm Water Associated with Construction Activity. Construction activity subject to this permit generally include clearing, grading, and disturbances to the ground such as stockpiling or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit (CGP) requires the development and implementation of a stormwater pollution prevention plan (SWPPP). The SWPPP should contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list best management practices the discharger will use to protect stormwater runoff and the placement of those BMPs. On September 2, 2009, the SWRCB adopted a new CGP (Order No. 2009-0009DWQ) that will supersede the existing CGP on July 1, 2010. A summary of the differences between the existing CGP and the new CGP follows (SWRCB, 2009):

> ***Rainfall Erosivity Waiver:*** *This General Permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.*
>
> ***Technology-Based Numeric Action Levels:*** *This General Permit includes NALs [numeric action levels] for pH and turbidity.*
>
> ***Technology-Based Numeric Effluent Limitations:*** *This General Permit contains daily average NELs [numeric effluent limitations] for pH during any construction phase where there is a high risk of pH discharge and daily average NELs turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU [turbidity] to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/Best Conventional Pollutant Control Technology (BCT) standard) and the traditional, numeric receiving water limitations for turbidity.*
>
> ***Risk-Based Permitting Approach:*** *This General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: (1) Project Sediment Risk, and (2) Receiving Water Risk.*
>
> ***Minimum Requirements Specified:*** *This General Permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.*
>
> ***Project Site Soil Characteristics Monitoring and Reporting:*** *This General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.*
>
> ***Effluent Monitoring and Reporting:*** *This General Permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to determine compliance with the NELs and evaluate whether NALs included in this General Permit are exceeded.*
>
> ***Receiving Water Monitoring and Reporting:*** *This General Permit requires some Risk Level 3 dischargers to monitor receiving waters and conduct bioassessments.*
>
> ***Post-Construction Storm Water Performance Standards:*** *This General Permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts.*

Rain Event Action Plan: *This General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.*

Annual Reporting: *This General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.*

Certification/Training Requirements for Key Project Personnel: *This General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.*

Linear Underground/Overhead Projects: *This General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).*

Certain actions during construction may also need to conform to a General Permit (Water Quality Order No. 5-00-175) that requires that a permit be acquired for dewatering and other low threat discharges to surface waters, provided that they do not contain significant quantities of pollutants and either (1) are four months or less in duration, or (2) the average dry weather discharge does not exceed 0.25 million gallons per day (mgd). Examples of activities that may require the acquisition of such a permit include well development water, construction dewatering, pump/well testing, pipeline/tank pressure testing, pipeline/tank flushing or dewatering, condensate discharges, water supply system discharges, and other miscellaneous dewatering/low threat discharges. However, the actions applicable to site development may already be covered under the CGP, and therefore a separate permit may not be required.

Total Maximum Daily Loads

Under CWA Section 303(d) and California's Porter-Cologne Water Quality Control Act of 1969, the State of California is required to establish beneficial uses of state waters and to adopt water quality standards to protect those beneficial uses. Section 303(d) establishes the total maximum daily load process to assist in guiding the application of state water quality standards, requiring the states to identify waters whose water quality is impaired (affected by the presence of pollutants or contaminants) and to establish a TMDL or the maximum quantity of a particular contaminant that a waterbody can assimilate without experiencing adverse effects on the beneficial use identified. TMDLs serve as a regulatory mechanism to identify and implement additional controls on both point and non-point source discharges in waterbodies that are impaired from one or more pollutants and are not expected to be restored through normal point source controls. Within California, the Regional Water Quality Control Boards generally prepare TMDLs for the impaired waterbodies under their jurisdiction. Implementation of the TMDL is accomplished through amendments to the RWQCB Basin Plans, which are reviewed and if necessary, modified or amended triennially.

Federal Emergency Management Agency

National Flood Insurance Program

The City of Chico is a participant in the National Flood Insurance Program (NFIP), a federal program administered by the Federal Emergency Management Agency. Participants in the NFIP must satisfy certain mandated floodplain management criteria. The National Flood Insurance Act of 1968 has adopted, as a desired level of protection, an expectation that developments should be protected from floodwater damage of the Intermediate Regional Flood (IRF). The IRF is defined as a flood that has an average frequency of occurrence on the order of once in 100 years although such a flood may occur in any given year. The City of Chico is occasionally audited by the Department of Water Resources to ensure the proper implementation of FEMA floodplain management regulations.

Executive Order 11988

Executive Order 11988 (Floodplain Management) is an order given by President Carter in 1977 to avoid the adverse impacts associated with the occupancy and modification of floodplains. The order addresses floodplain issues related to public safety, conservation, and economics. It generally requires federal agencies constructing, permitting, or funding a project in a floodplain to:

- Avoid incompatible floodplain development;
- Be consistent with the standards and criteria of the NFIP; and
- Restore and preserve natural and beneficial floodplain values.

STATE

Porter-Cologne Water Quality Act

The Porter-Cologne Water Quality Act governs the coordination and control of water quality in the state and includes provisions relating to non-point source pollution. The California Coastal Commission, pursuant to the Coastal Act, specifies duties regarding the federally approved California Coastal Management Program. This law requires that the State Water Resources Control Board, along with the California Coastal Commission, regional boards, and other appropriate state agencies and advisory groups, prepare a detailed program to implement the state's non-point source management plan on or before February 1, 2001. The law also requires that the state board, in consultation with the California Coastal Commission and other agencies, submit copies of prescribed state and regional board reports containing information related to non-point source pollution, on or before August 1 of each year.

Senate Bill 5

Senate Bill (SB) 5 was signed into law in October 2007 and requires the State to develop a plan for flood protection by 2012. Once this state plan takes effect, the bill will prohibit counties and cities located in the Sacramento-San Joaquin Valley watershed from entering into development agreements or approving permits, entitlements, or subdivision maps in a flood zone unless there is an appropriate level of flood protection or the local flood management agency has determined that adequate progress toward that flood protection has been made. Also once the plan takes effect, the bill will require 200-year flood protection for proposed projects in urban and urbanizing areas (defined as 10,000 residents or more). The bill also authorizes cities and counties to develop and adopt local plans of flood protection that include a strategy to meet the 200-year level of flood protection, an emergency response plan, and a long-term funding strategy for improvement, maintenance, and operation of flood protection facilities.

In order to implement this bill, the Department of Water Resources was required to provide cities and counties within the Central Valley watershed with preliminary 100- and 200-year floodplain maps by July 1, 2008. DWR has prepared only preliminary 100- and 200-year flood maps for 32 counties and 91 cities within the watershed, including the City of Chico. These maps are based on the best information currently available. DWR has initiated several projects that will provide updated information about flood hazards in the watershed over the next two to four years (DWR, 2008). Based on review of this mapping, there are land areas in the western portion of the Planning Area outside of the Chico Sphere of Influence within the 200-year floodplain.

Assembly Bill 162

Assembly Bill (AB) 162 was signed into law in October 2007 and requires cities and counties in California to incorporate flood hazards in their general plans in order to minimize risk in flood-prone areas. The bill further requires that each city and county submit their draft safety element, or draft amendment to the safety element of its general plan, to the Central Valley Flood Protection Board (formerly the State Reclamation Board) for review and comment at least 90 days prior to adoption.

Department of Water Resources

The Department of Water Resources' major responsibilities include preparing and updating the California Water Plan to guide development and management of the state's water resources, planning, designing, constructing, operating, and maintaining the State Water Resources Development System, protecting and restoring the Sacramento-San Joaquin Delta, regulating dams, providing flood protection, assisting in emergency management to safeguard life and property, educating the public, and serving local water needs by providing technical assistance. In addition, DWR cooperates with local agencies on water resources investigations, supports watershed and river restoration programs, encourages water conservation, explores conjunctive use of groundwater and surface water, facilitates voluntary water transfers, and, when needed, operates a state drought water bank.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) is composed of nine Regional Water Quality Control Boards that are responsible for preserving California's water quality. The Regional Water Quality Control Boards (RWQCB) issue waste discharge permits, take enforcement action against violators, and monitor water quality. SWRCB and the Regional Water Quality Control Boards jointly administer most of the federal clean water laws. However, SWRCB retains oversight responsibility and, like the USEPA, may intervene if it determines the proposed project is not in compliance with SWRCB regulations.

On December 8, 1999, the USEPA promulgated the Phase II Regulations covering small MS4s. The State Water Resources Control Board administers the Phase II Regulations issued by the USEPA within California. The federal regulations allow two permitting options for stormwater discharge: individual permits and general permits. SWRCB has elected to adopt a statewide General Permit for small MS4s. This option allows the small MS4 to sign onto the General Permit in lieu of developing a fully individualized program and allows the State to efficiently regulate numerous stormwater dischargers under a single permit.

The City of Chico has opted to comply with the NPDES Phase II Regulations through coverage under the State's General Permit and has prepared the City of Chico Storm Water Management Program, which is described further below.

Central Valley Regional Water Quality Control Board

The Central Valley Regional Water Quality Control Board (CVRWQCB) is responsible for establishing water quality standards and objectives that protect the beneficial uses of various waters. In the Chico area, CVRWQCB is responsible for protecting surface and ground waters from both point and non-point sources of pollution.

The Central Valley Regional Water Quality Control Plan (Basin Plan) covers all the drainage basin areas for the Sacramento and San Joaquin rivers. This plan describes the beneficial uses to be protected in these waterways, water quality objectives to protect those uses, and implementation measures to make sure those objectives are achieved.

LOCAL

Chico Storm Water Management Program (2004)

The Chico Storm Water Management Program is a comprehensive program developed and administered by the Engineering Division as a requirement of Phase II of the National Pollutant Discharge Elimination System (NPDES) Program. The program comprises various elements and activities designed to reduce stormwater pollution to the maximum extent practicable (MEP) and eliminate prohibited non-stormwater discharges in accordance with federal and state laws and regulations.

Chico Storm Drainage Master Plan (2000)

The Chico Storm Drainage Master Plan provides a conceptual blueprint for development of the City's storm runoff management infrastructure as Chico grows and expands and areas within the Sphere of Influence become more urbanized. The document includes storm drain facility design standards and descriptions of mitigation measures to convey runoff, attenuate peak flows, and stabilize stream channels, as well as best management practices for water quality enhancement at construction sites and new developments.

Chico Municipal Code

The Chico Municipal Code prohibits discharges of storm runoff to sanitary sewers (Title 15: Water and Sewers), regulates development in floodplains and alteration of watercourses (Title 16: Buildings and Construction), provides for preservation and enhancement of riparian habitat (Title 18: Subdivisions), and establishes design criteria and improvement standards for storm drain management and facilities (Title 18R: Design Criteria and Improvements Standards), development standards in floodplains (Title 16R.37: Floodplain Standards), and development and use standards for creek-side areas (Title 19: Land Use and Development).

It should also be noted that there are approved development projects in the city that have adopted mitigation measures that provide mitigation for soil erosion, flooding, and water quality impacts (preparation of a SWPPP and provision of erosion control features). These projects include large-scale developments in the city such as the Meriam Park project and the Northwest Chico Specific Plan.

4.9.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

Pursuant to State CEQA Guidelines Appendix G, a hydrologic or water quality impact of the proposed General Plan Update would be considered significant if it would result in any of the following actions:

1) Violate any water quality standards or waste discharge requirements.

2) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted.

3) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.

4) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

5) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

6) Otherwise substantially degrade water quality.

7) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

8) Place within a 100-year flood hazard area structures that would impede or redirect flood flows.

9) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of a failure of a levee or dam.

10) Inundation by seiche, tsunami, or mudflow.

Based on the analysis provided in the Notice of Preparation, the Planning Area is not located in an area that would be affected by a seiche, tsunami, or mudflow. Therefore, the project would result in no impact regarding inundation and will not be discussed further in this Draft EIR. The reader is referred to Section 4.12, Public Services and Utilities, regarding analysis of potential groundwater/water supply impacts (depletion of groundwater resources, recharge impacts and interference with groundwater) of the proposed General Plan Update.

METHODOLOGY

The hydrology and flood potential analysis is based on a review of published information, reports, and plans regarding regional hydrology, climate, geology, water quality, and regulations. Relevant documents include the Chico Stormwater Master Plan, FEMA FIRM Maps, Big Chico Creek Watershed Alliance Existing Conditions Report (BCCWA, 2000), Butte County Flood Mitigation Plan (Butte County, 2006), the Butte Creek Watershed Project Existing Conditions Report (BCWC, 1998), and the California Water Plan Update (DWR, 2009). Numerous other technical studies and reports were reviewed to aid in the analysis of the hydrology and water quality setting and impacts as a result of the proposed General Plan Update. A list of these documents is located under the References heading of this section.

The following proposed General Plan Update policies and actions address impacts to hydrology and water quality related issues:

Policy PPFS-6.1 *(Storm Drainage Master Plan) – Address current and future storm drainage needs in a Storm Drainage Master Plan.*

Action PPFS-6.1.1 *(Update the Storm Drainage Master Plan) – Update, adopt and implement an updated Storm Drainage Master Plan that identifies areas with infrastructure deficiencies and establishes a program to address the deficiencies. Address drainage issues on a basin or sub-basin scale. Identify opportunities to increase infiltration, based on such factors as existing infrastructure, geology, the hydrology and hydraulics of the receiving waters, and planned land uses.*

Action PPFS-6.1.2 *(Development Fees) – Update the development fee program as needed to ensure that storm water drainage development fees are equitable and adequate to pay for the storm water drainage infrastructure needed for future development.*

Action PPFS-6.2.1 *(Storm Water Drainage Standards) – Regularly update storm water drainage standards to include all current best management practices and water quality and quantity standards governing the discharge of storm water drainage to downstream receiving water to conform with State and Federal regulations.*

Action PPFS-6.2.2 *(Expand Storm Water Drainage Infrastructure) – As funding allows, continue installation of storm water drainage infrastructure in areas not served.*

Policy PPFS-6.4 *(Water Runoff) – Protect the quality and quantity of water runoff that enters surface waters and recharges the aquifer.*

Policy PPFS-6.5 *(Flood Control) – Manage the operation of the City's flood control and storm drainage facilities and consult with local and state agencies that have facilities providing flood protection for the City.*

Action PPFS-6.5.1	*(Flood Management) – Consult with Butte County and other flood control agencies to ensure that all possible actions are taken to prevent floodwaters from entering the City.*
Action PPFS-6.5.2	*(Natural Watercourses) – Utilize the natural watercourses and existing developed flood control channels as the City's primary flood control channels when and where feasible.*
Action PPFS-6.5.3	*(Flood Impacts) – Require that new development not increase flood impacts on adjacent properties in either the upstream or downstream direction.*
Action PPFS-6.5.4	*(Flood Zones) – Require new development to fully comply with State and Federal regulations regarding development in flood zones.*
Policy OS-3.1	*(Surface Water Resources) – Protect and improve the quality of surface water.*
Action OS-3.1.1	*(Comply with State Standards) – Comply with the California Regional Water Quality Control Board's regulations and standards to maintain and protect water quality.*
Action OS-3.1.2	*(Runoff from New Development) – Require the use of pollution management practices and National Pollutant Discharge Elimination System permits to control and treat runoff from development.*
Action OS-3.1.3	*(Clean Creeks Project) – Continue implementation of the Chico USA Clean Creeks Project which provides community-wide education regarding storm water runoff, pollution management practices, and the importance of clean creeks.*
Policy OS-3.2	*(Protect Groundwater Recharge Areas) – Protect aquifer recharge areas to maintain groundwater supply and quality.*
Action OS-3.2.1	*(Protect Recharge Areas) – Avoid impacts to groundwater recharge areas through stream setbacks and clustering development.*
Action OS-3.2.2	*(Nitrate Compliance Plan) – Continue to implement the Nitrate Compliance Plan and provide regular updates to the City Council.*
Action OS-3.2.3	*(Monitor Contaminated Sites) – Maintain an inventory of known sources of groundwater and soil contamination within the Planning Area and support the California Department of Toxic Substances Control and the Regional Water Quality Control Board in their efforts to monitor and remediate sites.*
Policy S-2.1	*(Potential Flood Hazards) – When considering areas for development analyze potential impacts of flooding.*

Action S-2.1.1 *(Flood Hazard Analysis) – As part of project review, analyze potential impacts from flooding and require compliance with appropriate building standards and codes for structures subject to 200-year flood hazards.*

Action S-2.1.2 *(FEMA Flood Hazard Designations) – Continue efforts to work with the Federal Emergency Management Agency and state and local agencies to evaluate the potential for flooding, identify areas susceptible to flooding, accredit the flood control levees in the City, and require appropriate measures to mitigate flood related hazards.*

The impact analysis provided below utilizes these proposed policies and actions to determine whether implementation of the proposed General Plan Update would result in significant impacts. The analyses identify and describe how specific policies and actions as well as other City regulations and standards provide enforceable requirements and/or performance standards that address hydrology and water quality and avoid or minimize significant impacts.

PROJECT IMPACTS AND MITIGATION MEASURES

Surface Water Quality Impacts (Standards of Significance 1, 3, 5, and 6)

Impact 4.9.1 Implementation of the proposed General Plan Update could result in a violation of water quality standards; substantial alteration of the existing drainage pattern, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion, siltation, and/or environmental harm; polluted stormwater runoff; or otherwise degrade water quality. However, implementation of proposed General Plan Update policy provisions and continued implementation of City standards would ensure that water quality impacts are addressed. This impact is considered **less than significant**.

Direct and indirect surface water quality impacts could occur from general land use activities resulting from urban development:

- **Construction:** Grading and vegetation removal activities would result in the exposure of raw soil materials to the natural elements (wind, rain, etc.). During precipitation events, soil erosion can impact the surface runoff by increasing the amount of silt and debris carried by runoff. In addition, refueling and parking of construction equipment and other vehicles on-site during construction may result in spills of oil, grease, or related pollutants that may discharge into city drainages. Improper handling, storage, or disposal of fuels and hazardous materials or improper cleaning of machinery close to area waterways could cause water quality degradation.

- **Urban Development:** Urban development often involves the conventional maintenance of yards, for example, using fertilizers, herbicides, pesticides, fungicides, and other chemicals in and around the home that can enter stormwater runoff. In addition, motor vehicle operation and maintenance introduces oil, antifreeze, and other petroleum-based products, heavy metals such as copper from brake linings, and surfactants from cleaners and waxes into residential runoff. Pet and animal waste from yards, trails, and stream corridors can enter stormwater runoff or flow directly into stream channels.

- **Recreation:** Parks and golf courses often practice conventional landscaping methods and maintain recreation areas using fertilizers, herbicides, pesticides, and algaecides, which can enter stormwater runoff or flow directly into stream channels.

Construction Surface Water Quality Impacts

Construction associated with subsequent development under the proposed General Plan Update would consist of grading and vegetation removal activities that could increase soil erosion rates on the areas proposed for development. Construction activities would result in the exposure of raw soil materials to the natural elements (wind, rain, etc.). In rainy periods during the summer season, grading operations may impact the surface runoff by increasing the amount of silt and debris carried by runoff. Areas with uncontrolled concentrated flow would experience loss of material within the graded areas and could potentially impact downstream water quality.

Refueling and parking of construction equipment and other vehicles on-site during construction may result in spills of oil, grease, or related pollutants that may discharge into Planning Area drainages. Improper handling, storage, or disposal of fuels and materials or improper cleaning of machinery close to area waterways could cause water quality degradation.

The State Water Resources Control Board is responsible for implementing elements of the Clean Water Act and has issued a statewide General Permit (Water Quality Order 99-08-DWQ) for construction activities within the state. The State General Construction Activity Storm Water Permit is implemented and enforced by Regional Water Quality Control Boards and applies to construction activities that disturb 1 acre or more. This permit also requires the preparation and implementation of a stormwater pollution prevention plan that identifies best management practices (BMPs) to minimize pollutants from discharging from construction sites to the maximum extent practicable. BMPs are effective, practical, structural or nonstructural methods which prevent or reduce the movement of sediment, nutrients, pesticides, and other pollutants from the land to surface water or groundwater, or which otherwise protect water quality from potential adverse effects of development activities. The adoption and use of BMPs provide the mechanism for reducing the volume of surface runoff originating from an area of development disturbance and running directly into surface water. Standard BMPs are available in the California Stormwater Quality Association handbooks (California Stormwater Quality Association, 2003).

The Chico Municipal Code prohibits discharges of storm runoff to sanitary sewers (Title 15: Water and Sewers) and establishes design criteria and improvement standards for storm drain management and facilities (Title 18R: Design Criteria and Improvements Standards) and development and use standards for creek-side areas (Title 19: Land Use and Development). Sections 16.22 through 16.32 of the Municipal Code, Grading Regulations and General Provisions, was enacted by the City for the purpose of regulating grading on all property within the city to avoid pollution of watercourses with nutrients, sediments, or other earthen materials generated or caused by surface runoff on or across the permit area. Sections 16.22 through 16.32 of the City Municipal Code set forth rules and regulations to control grading and erosion control activities, including fills and embankments. These ordinances also establish the administrative procedure for issuance of permits and provide for approval of plans and inspection of grading construction and erosion control plans for all graded sites.

Operational Surface Water Quality Impacts

Runoff from urban land use typically contains oils, grease, fuel, antifreeze, and byproducts of combustion (such as lead, cadmium, nickel, and other metals), as well as nutrients from fertilizers and animal waste, sediment, pesticides, herbicides, and other pollutants. Also, sizable quantities of animal waste from pets contribute bacterial pollutants into surface and source waters. Precipitation during the early portion of the wet season displaces these pollutants into the stormwater runoff, resulting in high pollutant concentrations in the initial wet weather runoff. This initial runoff, containing peak pollutant levels, is referred to as the "first flush" of storm events. It is estimated that during the rainy season, the first flush of heavy metals and hydrocarbons would occur during the first inches of seasonal rainfall.

The amount and type of runoff generated by land uses within the city may be greater than that under existing conditions due to increases in impervious surfaces. There would likely be a corresponding increase in urban runoff pollutants and first flush roadway contaminants such as heavy metals, oil, grease, nutrients (i.e., nitrates and phosphates), pesticides, and herbicides from landscaped areas. These constituents may result in water quality impacts to on- and off-site drainage flows and to downstream area waterways, including the waterways of the Big Chico Creek watershed and the Little Chico Creek/Butte Creek watershed.

As identified above, as part of the City's coverage under the General Permit for the NPDES Phase II Regulations, the City has developed and is implementing its Storm Water Management Program to protect water quality. BMPs under this program include public participation and involvement, public education and outreach, construction site runoff control, illicit discharge detection and elimination, pollution prevention and good housekeeping, and post-construction runoff control.

An example of City BMPs implemented to minimize water quality impact throughout the city includes storm drainage inlet stenciling. Storm drain stenciling is important practice, as many people are not aware that storm drains flow directly to creeks. Storm drain stenciling is appropriate in that it helps educate Chico's population on the final destination of storm drain flow. Chico's storm drain system has been mapped on its Geographic Information System (GIS). The mapping shows storm drain inlets and manholes. An estimated 4,000 inlets are located throughout the city (City of Chico, 2007). As inlets are marked and maintenance activities take place, manholes and inlets are distinguished from one another on the maps. In August 2002, the City (in conjunction with the California Conservation Corps) installed 1,058 markers, which equates to roughly 26 percent inlets being marked. In the second year, 2004–05, the City worked with the Chico High School Rotary Club and a local group called Kids and Creeks to install storm drain markers. These two groups were only able to place 147 markers. The City has also contracted with a local environmental group, Big Chico Creek Watershed Alliance. In 2005–2006, Big Chico Creek Watershed Alliance marked 1,226 inlets with help from citizens, Chico State student groups, and private citizen groups.

The City of Chico 2006–2007 General Permit for the Discharge of Storm Water from Small Municipal Separate Storm Sewer Systems Annual Report presents the accomplishments of the first, second, third, and fourth years of a five-year program for the implementation of the City's BMPs. The purpose of this annual report is to keep the California Regional Water Quality Control Board, City officials, and the public up to date on the City's progress, failures, and proposed modifications to the BMPs. The BMP requirements implemented in years one, two, three, and four have been and will continue to be implemented through year five.

The City also works to identify priority areas of illicit discharge by visually inspecting and pH testing all priority outfalls for illicit discharges and conducting further investigation and enforcement as necessary. Further investigations could involve reviewing storm drain maps and identifying specific industrial and manufacturing facilities within the tributary area of the outfall with illicit discharges. Manufacturing and industrial sites have a higher likelihood of having illicit discharges. The City has identified those outfalls having manufacturing and industrial uses within their tributary areas as being priority outfalls.

The proposed General Plan Update contains policies and actions with restrictions and corresponding performance standards that address surface water quality impacts. For instance, Action OS-3.1.1 requires compliance with the California Regional Water Quality Control Board's regulations and standards to maintain and protect water quality, which includes the State General Construction Activity Storm Water Permit implemented and enforced by Regional Water Quality Control Boards as described above. Action OS-3.1.2 requires the use of pollution management practices and National Pollutant Discharge Elimination System permits to control and treat runoff from development. Action OS-3.1.3 aims to provide community-wide education regarding storm water runoff, pollution management practices, and the importance of clean creeks.

Compliance with the proposed General Plan policy and actions described above, the State General Construction Activity Storm Water Permit requirements (where applicable), the City's Grading Regulations and General Provisions (Sections 16.22 through 16.32 of the Municipal Code), and the City's Storm Water Management Program would reduce surface water quality impacts associated with implementation of the proposed General Plan Update to a **less than significant** level and no mitigation measures are required. This impact is avoided through the use of effective construction-phase, source control, and treatment control BMPs that include site preparation, runoff control, sediment retention, and other similar features. The effectiveness of BMPs has been recognized in the California Stormwater Quality Association, Stormwater Best Management Practice Handbooks.

Groundwater Quality Impacts (Standard of Significance 1 and 6)

Impact 4.9.2 Implementation of the proposed General Plan Update could result in the degradation of groundwater quality and may violate water quality standards and/or degrade water quality resulting from future land uses. However, implementation of proposed General Plan Update policy provisions and continued implementation of City standards would ensure that groundwater quality is protected. This impact is considered **less than significant**.

As discussed above in Impact 4.9.1, development of the Planning Area under the proposed General Plan Update could generate runoff containing oils, grease, fuel, antifreeze, byproducts of combustion (such as lead, cadmium, nickel, and other metals), household pollutants, nutrients (i.e., fertilizers), and other chemicals from landscaped areas. Groundwater in the Planning Area is considered most vulnerable to the following activities associated with contaminants detected in the water supply: sewer collection systems, septic systems, improperly abandoned wells, parks, RV parks, agricultural drainage, fertilizer and pesticide application, automobile body and repair shops, utility stations (maintenance areas), railroad yards (maintenance/fueling areas), electrical/electronic manufacturing, chemical/petroleum processing/storage, machine shops, grazing, lumber processing/manufacturing, wood preserving/treating, fleet/truck/bus terminals, known contaminant plumes, and drinking water treatment plants (Cal Water, 2008). The low foothill area east of the city is the primary aquifer recharge area for Chico's domestic groundwater (Butte LAFCo, 2006) within City jurisdiction. The groundwater in this area is vulnerable to contamination from urban activity in this area, including construction, grading, use of equipment and automobiles, sewer leakage, and other potential contaminants. These pollutants could potentially contaminate groundwater conditions (if not properly treated with water quality controls). However, as mentioned above under Regulatory Framework, the National Pollutant Discharge Elimination System Permit Program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. In addition, Action OS-3.2.1 seeks to avoid impacts to groundwater through stream setbacks and clustering development away from groundwater recharge areas. Actions OS-3.2.2 and OS-3.2.3 seek to address current impacts to groundwater resources by continuing to implement the Nitrate Compliance Plan described above and by maintaining an inventory of known sources of groundwater and soil contamination within the Planning Area in order to support the California Department of Toxic Substances Control and the Regional Water Quality Control Board in their efforts to monitor and remediate sites.

As part of the NPDES, the State Water Resources Control Board has adopted a General Permit for the Discharge of Storm Water from Small MS4s to provide permit coverage for smaller municipalities, with which the City complies through implementation of its Storm Water Management Program, described under Impact 4.9.1 above, that provides water quality protections for surface water and groundwater. In addition, Chico Municipal Code Section 18R.08.050 states that development shall provide storm drainage facilities that will convey stormwater runoff to an existing drainage channel or drainage system. Adequate access for maintenance of the system is to be provided and the capacity of an existing drainage system must be large enough to accommodate the additional runoff generated by the development. The California Stormwater Quality Association has prepared technical studies regarding water quality control feature impacts on groundwater in the Stormwater Best Management Practice Handbooks. These studies have identified that water quality control features (when inspected and monitored properly) such as infiltration basins have been successful in controlling water quality and avoiding groundwater quality impacts. (Metals and organic compounds associated with stormwater are typically captured or trapped within the first few feet of the soil of the basins).

Compliance with the proposed General Plan update policies and actions described above, as well as compliance with Section 18R.08.050 of the Chico Municipal Code and the City's Storm Water Management Program, would reduce groundwater quality impacts to a **less than significant** level.

Drainage Impacts (Standard of Significance 4)

Impact 4.9.3 Implementation of the proposed General Plan Update could result in a substantial alteration of an existing drainage pattern, including through the alteration of the course of a stream or river, which may substantially increase the rate of amount of surface runoff in a manner which would result in flooding on- or off-site or could result in the creation or contribution of runoff water which would exceed the capacity of existing or planned stormwater drainage system. However, implementation of proposed General Plan Update policy provisions and continued implementation of City standards would ensure that drainage is adequately addressed. This impact is considered **less than significant**.

Stormwater runoff has, at times, created localized flooding problems in the City of Chico and the agricultural area west of the city. High Sacramento River flood stage creates a backwater in the creeks and tributaries which pass through the Planning Area and may delay runoff in the lower parts of the planning area from entering the river. The Flood Insurance Rate Map (FIRM) for unincorporated Butte County shows Sacramento River overflow inundating an area about 2 miles east of the river boundaries (**Figure 4.9-2**). The volume of water within this 2-mile backwater area may increase over time with additional urban runoff associated with growth under the proposed General Plan Update.

Capacities of channels in the western portion of the Planning Area are also limited, and potential flood flows are believed to be higher than recorded historical occurrences. The FIRM shows floodwater flowing out of the Big Chico Creek Channel near the western edge of the Planning Area. Inadequate channel capacity exacerbates the flooding potential near the Sacramento River. Flood control projects on Little Chico Creek, Big Chico Creek, and Lindo Channel have helped reduce the amount of runoff that flows through the city, reducing potential flooding problems. General Plan Update Action PPFS-6.2.2 states that as funding allows, the City shall continue installation of storm water drainage infrastructure in areas not served. In addition, Action PPFS-6.5.2 seeks to utilize the natural watercourses and existing developed flood control channels as the City's primary flood control channels when and where feasible.

The City of Chico adopted a Storm Drainage Master Plan (SDMP) in September 2000 that identifies the public storm drain improvements necessary to serve a major portion of the city at build-out under the 1994 General Plan. The projected build--out under the proposed General Plan Update is similar to the current 1994 General Plan build-out and therefore the recommendations of the 2000 SDMP are still relevant. The specific objectives of the SDMP are to:

- Develop a consistent set of planning criteria;
- Update and modify existing storm drainage studies;
- Prepare a preliminary storm drain master plan for all pipes larger than 18 inches in diameter;
- Develop planning level cost estimates for required improvements;
- Identify topographic or other data requirements needed for future drainage planning;
- Collect more precise definition of appropriate design high water elevations in the creeks;
- Implement a computer model of the system;
- Provide peak flow attenuation in Comanche and Little Chico creeks; and
- Provide channel stabilization in all waterways in the urban area.

The SDMP identifies specific projects to improve existing storm drainage and to provide drainage facilities for future development. The drainage facilities would include replacement of existing pipes, placement of new pipes, installation of pump stations, construction of peak flow attenuation facilities (detention basins), bank stabilization facilities, stormwater quality facilities, and design and data collection programs. In particular, peak attenuation facilities would be constructed in the Comanche Creek and Little Chico Creek urban drainage basins. Policy PPFS-6.1 aims to address current and future storm drainage needs in the SDMP. The specific size and design of individual facilities would vary. Each project would adhere to standards, performance criteria, and design criteria consistent with the SDMP and the General Plan, as adopted by the

City Council and as amended to reflect advances in policy, technology, or engineering practice.

The City's maintenance crew maintains Chico's storm drain system. Throughout 2007, City crews cleaned 108 stormwater hydrodynamic separators, 123 manholes/catch basins/drywells, 350 drop inlets, and 18,281 lineal feet of storm drain line, and removed 395.75 cubic yards of debris (City of Chico, 2007). Such activities assist to maintain channel storm drainage capacity, thus reducing flooding potential.

In addition, the City has adopted Section 18R.08.050, Design Criteria and Improvements Standards: Storm Drainage, into the Municipal Code which establishes design criteria and improvement standards for storm drain management and facilities. While Action PPFS-6.5.3 requires that new development not increase flood impacts on adjacent properties in either the upstream or downstream direction, which may require the employment of storm water drainage infrastructure, Action PPFS-6.1.2 will update the development fee program as needed to ensure that storm water drainage development fees are equitable and adequate to pay for the storm water drainage infrastructure needed for future development.

Implementation of proposed General Plan Update policies and actions as well as continued adherence to the objectives of the Storm Drainage Master Plan and Section 18R.08.050 of the Chico Municipal Code would reduce this impact to **less than significant** by ensuring that adequate drainage facilities are provided and no mitigation measures are necessary. Actions PPFS-6.5.3 and PPFS-6.1.2 require new development to address impacts to drainage facilities while Section 18R.08.050 of the Municipal Code establishes the design criteria for new drainage facilities, which new development much adhere. The adopted SDMP identifies public storm drain improvements necessary to serve a major portion of the city. Action PPFS-6.1.1 mandates the update, adoption and implementation of an updated Storm Drainage Master Plan that identifies areas with infrastructure deficiencies and establishes a program to address the deficiencies. The updated Storm Drainage Master Plan will identify opportunities to increase infiltration, based on such factors as existing infrastructure, geology, the hydrology and hydraulics of the receiving waters, and planned land uses.

Flooding Impacts (Standards of Significance 7, 8, and 9)

Impact 4.9.4 Implementation of the proposed General Plan Update may result in the placement of housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or other flood hazard delineation map; and as a result impede or redirect flood flows exposing people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of a failure of a levee or dam. However, implementation of proposed General Plan Update policy provisions and continued implementation of City standards would ensure that flooding is adequately addressed. This impact is considered **less than significant**.

Major floods affecting the Chico region have typically resulted from extended periods of winter rainfall produced by winter storms. Generally, these storms affect the region from early November until the end of April. In general, the waterway which is the most susceptible to flooding in the City of Chico is Little Chico Creek. This perennial stream can overflow during storm events, but flooding is typically of a local nature. Because the City of Chico participates in the National Flood Insurance Program administered by the Federal Emergency Management Agency, FEMA has mapped known floodplains in Chico and surrounding areas. The identified floodplains appear on Flood Insurance Rate Maps (FIRMs) numbered 06007C0310D, 06007C0320D, 06007C0340C, 06007C0345C, 06007C0505C, and 06007C0510D. According to FEMA maps, most of the proposed Planning Area is located in Zone X, which designates areas subject to flooding during a 500-year storm event or areas that are protected by levees from flooding during a 100-year storm event. The maps show 100-year and 500-year floodplains and floodways located along the channels of the creeks of the Planning Area, including Rock, Mud, Sycamore, Big Chico, Little Chico, Comanche, and Butte creeks. A 100-year floodplain is an area that experiences a 1-in-100 chance of flooding each year; a 500-year floodplain experiences a 1-in-500 chance of flooding each year. Refer to **Figure 4.9-2** for 100-year floodplain areas within the City of Chico.

As previously mentioned, in the 1970s FEMA began to produce Flood Insurance Rate Maps (FIRM) for the country in order to determine flood risks (and insurance rates) for individual communities. Because of the flood control projects completed in the 1960s, the City of Chico was exempt from the FEMA mapping requirements. In the 1990s FEMA revised the FIRMs, resulting in a reversal of protocol regarding the City of Chico's exemption from FEMA mapping requirements. During the FEMA mapping that ensued, the potential for flooding was analyzed based on the existence of the levee system. Due to the fact that the system levees of Little Chico Creek were not designed to FEMA standards, portions of the city along Little Chico Creek were determined to be in a floodplain and homeowners were required to purchase flood insurance. It was determined that the Big Chico Creek system's levees were designed to FEMA standards and that they would protect the northern portions of the city.

Currently, FEMA is revising the FIRMs again. For the purposes of this round of FIRM revisions, if levees are to be considered as providing flood protection, the levees are required to be certified. Certification involves demonstrating that the levees were built and are maintained to FEMA standards. If levees are not certified, FEMA will produce maps that assume the levees do not exist. This would mean that a significant number of parcels in Chico would be determined to be in a flood zone and homeowners with federally insured loans in the flood zone will be required to purchase flood insurance. In November 2008, FEMA sent letters to communities, like Chico, affected by this round of FIRM revisions and its requirement that the owners of levees certify the levees. These letters offered to allow the owners of levees to enter into Provisionally Accredited Levee (PAL) agreements, which allow the signing party two years to certify levees before FEMA produces maps that assume that the levees do not exist. Although the City is not the owner of the levees in the Big Chico Creek system, FEMA allowed the City of Chico to enter into a PAL agreement for the certification of those levees and that process is now underway. The certification process will not apply to the Little Chico or Butte Creek systems as they were not originally designed to FEMA standards and areas they serve are already identified as floodplain.

Chapter 16R.37 of the City Municipal Code constitutes the floodplain standards of the City to apply to all development occurring within floodplains in Chico. The floodplain standards set forth in Chapter 16R.37 are necessary in order to ensure that development is properly elevated, flood-proofed, and otherwise protected from flood damage and in order to prevent such development from creating obstructions which cause or contribute to an increase in flood heights and velocities.

Dam failure, another potential flooding risk, is the collapse or failure of an impoundment that causes significant downstream flooding. Large dams that could inundate significant portions of Chico, or watersheds in the Chico area, include Shasta Dam (in Shasta County), Oroville Dam on the Feather River, and Black Butte Dam on Stony Creek (Butte County, 2006, Appendix D). Prior to the terrorist attacks of September 11, 2001, public information was available that provided structural ratings for dams throughout the country. Since that time, this information has been classified and is not readily available. Dams are regulated by the Division of Safety of Dams of the California Department of Water Resources and are routinely inspected during their impoundment life, which includes monitoring for compliance with seismic stability standards. Thus, dam failure is not is considered a reasonably foreseeable event.

The proposed General Plan Update contains policies and actions that include requirements and performance standards that address flood-related impacts. Action PPFS-6.5.3 requires that new development not increase flood impacts on adjacent properties in either the upstream or downstream direction while Action PPFS-6.5.4 requires new development to fully comply with State and Federal regulations regarding development in flood zones. Similarly, Action S-2.1.1 states that as part of project review, an analysis of potential impacts from flooding is required along with compliance with appropriate building standards and codes for structures subject to 200-year flood hazards. Implementation of the General Plan policies and actions described above as well as Chapter 16R.37 of the Chico Municipal Code would reduce this impact to **less than significant**.

4.9.2 CUMULATIVE SETTING, IMPACTS, AND MITIGATION MEASURES

CUMULATIVE SETTING

The cumulative setting consists of the Big Chico Creek watershed, the Little Chico Creek/Butte Creek watershed, and the Sacramento River. Additionally, the cumulative setting includes anticipated development described in **Table 4.0-4** that could contribute to cumulative water resource impacts.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Water Quality Impacts (Standards of Significance 1, 3, 5, and 6)

Impact 4.9.5 Land uses and growth under the proposed General Plan Update, in combination with current land uses in the surrounding region, could introduce substantial grading, site preparation, and an increase in urbanized development. Increased development would contribute to cumulative water quality impacts that are considered **less than cumulatively considerable**.

As described under Impacts 4.9.1 and 4.9.2, development under the proposed General Plan Update could contribute to water quality degradation from construction, operation, and alteration of drainage patterns. This could add to other potential development activities in the region.

As part of NPDES, the State Water Resources Control Board has adopted a General Permit for the Discharge of Storm Water from Small MS4s to provide permit coverage for smaller municipalities, with which the City complies through implementation of its Storm Water Management Program described above that provides water quality protections for surface water and groundwater.

Sections 16.22 through 16.32 of the Municipal Code, Grading Regulations and General Provisions, was enacted by the City for the purpose of regulation grading on all property in Chico to avoid pollution of watercourses with nutrients, sediments, or other earthen materials generated or caused by surface runoff on or across the permit area. Sections 16.22 through 16.32 of the City Municipal Code set forth rules and regulations to control grading and erosion control activities, including fills and embankments. These ordinances also establish the administrative procedure for issuance of permits and provides for approval of plans and inspection of grading construction and erosion control plans for all graded sites.

In addition, Chico Municipal Code Section 18R.08.050 states that development shall provide storm drainage facilities that will convey stormwater runoff to an existing drainage channel or drainage system. Adequate access for maintenance of the system shall be provided and the capacity of an existing drainage system must be large enough to accommodate the additional runoff generated by the development. The California Stormwater Quality Association has prepared technical studies regarding water quality control feature impacts on groundwater. These studies have identified that water quality control features (when inspected and monitored properly), such as infiltration basins, have been successful in controlling water quality and avoiding groundwater quality impacts.

The proposed General Plan Update includes several policies and actions that address water quality. These policies and actions are described under Impacts 4.9.1 and 4.9.2.

Implementation of the proposed General Plan Update policies and actions, as well as compliance with provisions of the City's Municipal Code and Storm Water Management Program, would ensure that the proposed General Plan's contribution to cumulative water quality impacts would be mitigated. Thus this impact would be **less than cumulatively considerable**.

Cumulative Drainage and Flood Hazards (Standards of Significance 4, 7, 8, and 9)

Impact 4.9.6 Implementation of the proposed General Plan Update could increase impervious surfaces and alter drainage conditions and rates in the Planning Area, which could contribute to cumulative flood conditions downstream. This is considered a **less than cumulatively considerable** impact.

As described under Impacts 4.9.4 and 4.9.5, urban development under the proposed General Plan Update would result in an increase in impervious surfaces in the Planning Area that would contribute (in combination with cumulative development in the watershed) to increases in flood conditions for area waterways. Additionally, development associated with the proposed General Plan Update, in combination with future development in the region, could expose future residences and structures to flood hazards. However, the proposed General Plan Update contains policies and actions that adequately address drainage and flooding issues at the Planning Area level.

The City of Chico adopted a Storm Drainage Master Plan in September 2000 that identifies the public storm drain improvements necessary to serve a major portion of the city. The Storm Drainage Master Plan identifies specific projects to improve existing storm drainage and to provide drainage facilities for future development. Proposed Parks, Public Facilities, and Services Element Action PPFS-6.1.1 ensures periodic updates of the Storm Drainage Master Plan in order to identify areas with infrastructure deficiencies and to establish a program to install, upgrade, and enhance stormwater management infrastructure necessary to meet City standards. In addition, the City has adopted Section 18R.08.050, Design Criteria and Improvements Standards: Storm Drainage, into the Municipal Code which establishes design criteria and improvement standards for storm drain management and facilities.

Chapter 16R.37 of the City Municipal Code constitutes the floodplain standards of the City to apply to all development occurring within floodplains in Chico. The floodplain standards set forth in Chapter 16R.37 are necessary in order to ensure that development is properly elevated, flood-proofed, and otherwise protected from flood damage and in order to prevent such development from creating obstructions which cause or contribute to an increase in flood heights and velocities.

The proposed General Plan Update includes several policies and actions that address flooding. The policies and actions are described under Impacts 4.9.3 and 4.9.4.

The proposed General Plan's contribution to the cumulative condition of drainage and flood-related impacts in the area, as well as its potential incremental contribution to cumulative impacts, would be reduced to **less than cumulatively considerable**.

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