

Section 8 Technical Reports

8.e Drainage and Erosion Control Report and Plan

This section addresses *Larimer County Procedural Guide for 1041 Permits*, Item 8.e, and the criteria and standards described in LUC Sections 8.1, 8.12, 14.10.D.3, 14.10.D.4, 14.10.D.6, 14.10.D.8, and 14.10.D.11.

As discussed during the Pre-Application Conference with Larimer County Planning staff on May 26, 2016, submission of a simplified drainage narrative would be sufficient with the application because the majority of the TWP site will be restored to pre-construction conditions and the TWP does not include many impervious areas.

Corridor and Existing Site Drainage

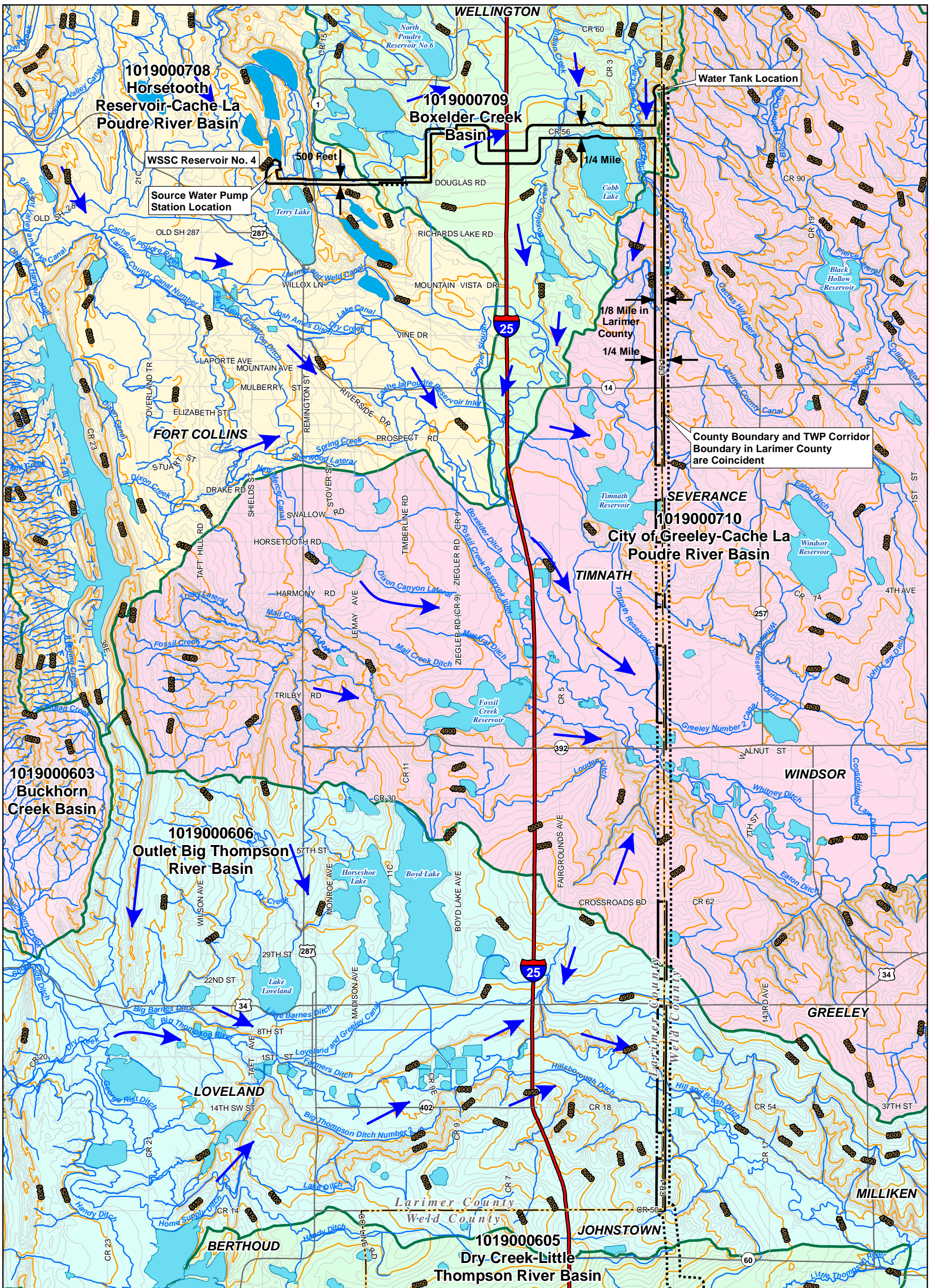
The TWP corridor is 500-feet to ¼-mile wide to accommodate the water pipeline and appurtenances. The final water pipeline alignment will be developed during final design. Typically a 50-foot permanent easement for the water pipeline and a 40-foot temporary construction easement will be purchased from property owners. The TWP corridor width varies to allow for flexibility when developing the final water pipeline alignment and location of appurtenances as described in Section 2: Project Description. The TWP corridor within unincorporated Larimer County spans four 10-digit hydrologic unit code (HUC) watersheds, as shown in **Figure 8.e-1**, HUC Watersheds. A Site Plan Review that will include the required drainage and erosion control plan will be submitted to Larimer County after design has progressed for the source water pump station. This narrative focuses on the TWP corridor for the water pipeline and appurtenances, including the water tank.


The western-most portion of the TWP corridor near the connection to WSSC Reservoir No. 4 is located in the HUC 1019000708 watershed, the Horsetooth Reservoir-Cache la Poudre River Basin. Land in this portion of the TWP corridor generally drains from north to south with the exception of the land immediately west and east of the relatively low-lying Black Lake, which generally drains from the east and west toward the lake. On average, topography slopes in this reach generally range from approximately 1 percent to approximately 8 percent. This portion of the TWP corridor crosses Jackson Ditch, Larimer County Canal, and potentially other ditches, tributaries, and drainageways.

The majority of the east-west portion of the corridor east of North County Road 13 is located in the HUC 1019000709 watershed, the Boxelder Creek Basin. This portion of the TWP corridor is generally south of Windsor Reservoir No. 8 and north of Cobb Lake, as shown in **Figure 8.e-1**. Topography in this portion of the TWP corridor generally drains from north to south with the exception of a north-south ridge that drains to the west and east. On average, topography slopes in this portion of the TWP corridor range from less than 1 percent to approximately 8 percent. This portion of the TWP corridor crosses Larimer County Canal, No. 8 Outlet Ditch, Larimer County Ditch, Boxelder Creek, Indian Creek, Cowan Lateral, Windsor Ditch, and potentially other ditches, tributaries, and drainageways.

The water tank appurtenance on the northern end of the TWP corridor is located near the border between the HUC 1019000709, Boxelder Creek Basin and 1019000710, City of Greeley-Cache la Poudre River Basin, as shown in **Figure 8.e-1**. The water tank site sits at a relatively higher elevation than other reaches of the TWP corridor. This portion of the TWP corridor generally drains from east to west at slopes ranging from approximately 4 to 8 percent.

Thornton Water Project






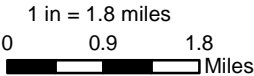
**CITY OF THORNTON
COLORADO**

12450 WASHINGTON ST
THORNTON, CO 80241-2405

11/10/2017



1 in = 1.8 miles



0 0.9 1.8 Miles

- TWP Corridor in Unincorporated Larimer County
- TWP Corridor outside Unincorporated Larimer County
- County Boundary
- Stream/River/Canal/Ditch
- HUC 10 Boundary
- Flow Direction

- 100ft Contour
- 20ft Contour

**Figure 8.e-1
Drainage and
Erosion Control**

Sources: NHD, USGS, CDWR, Larimer and Weld Counties, CDOT

The majority of the north-south portion of the TWP corridor is in the HUC 1019000710 watershed, the City of Greeley-Cache la Poudre River basin. The direction of runoff varies in this portion of the corridor, as shown on **Figure 8.e-1**. Several local ridges and draws are interspersed with flatter areas. Average slopes vary from less than 1 percent to approximately 5 percent. This portion of the TWP corridor crosses Larimer County Canal, Cactus Hill Lateral, Larimer and Weld Irrigation Canal, Cache la Poudre Reservoir Inlet Canal, Lake Canal, Lake Canal Ditch, Windsor Reservoir Outlet, Timnath Reservoir, Timnath Reservoir Outlet, Greeley Number 2 Canal, Whitney Ditch, the Cache la Poudre River and tributaries, and potentially other ditches, tributaries, and drainageways.

The southern-most 4 miles of the TWP corridor within Larimer County, shown on **Figure 8.e-1**, are within the HUC 1019000606 watershed, the Outlet Big Thompson River Basin. Direction of runoff varies in this reach. Portions of the TWP corridor drain from north to south, other areas drain from south to north, and others from west to east across the corridor. Average slopes range from less than 1 percent to approximately 5 percent. This portion of the TWP corridor crosses the Loveland and Greeley Canal, Farmers Ditch, Hill and Brush Ditch, Hillsborough Ditch, the Big Thompson River and tributaries, and potentially other ditches, tributaries, and drainageways.

Construction Water Quality Management

Development of the final alignment will consider water pipeline construction locations that minimize impacts to historical surface and subsurface water flows in the TWP area. Water pipeline crossings of jurisdictional waters, including wetlands, will be constructed utilizing trenchless construction methods.

Prior to construction, Thornton and/or the TWP contractors will obtain a Stormwater Discharge Associated with Construction Activity - General Permits from the Colorado Department of Public Health and Environment (CDPHE). Construction Stormwater Management Plan(s) (SWMPs) will be developed under the general permit to protect the quality of stormwater runoff during construction in accordance with the Construction Stormwater Discharge Permit requirements. The SWMP(s) will detail the potential pollutants to stormwater anticipated to be associated with construction, and the associated construction stormwater best management practices (BMPs) to be implemented to protect the quality of stormwater runoff from TWP areas during construction. The SWMP will describe the inspection and maintenance procedures implemented on the site to maintain erosion and sediment control practices. Site inspections will be conducted to meet the requirements and schedules stipulated under the permit.

Construction wastewater associated with the potential dewatering of trenches will be handled in accordance with CDPHE permit discharge requirements. Prior to construction, Thornton and/or the TWP contractors will obtain a General Permit for Construction Dewatering Activities from CDPHE and specify the management measures to capture and manage any generated discharge.

The TWP will be hydrostatically tested prior to operation start up. Before discharge of hydrostatic test water from the water pipeline, Thornton and/or the TWP contractor will obtain a General Permit for Discharges from Hydrostatic Testing of Pipelines, Tanks, and Similar Vessels from CDPHE. Sampling and effluent limits will be in accordance with permit requirements.

Construction BMPs

Appropriate criteria manuals and standards will be used for the development of the SWMPs and selection of BMPs. Manuals may include the *Urban Storm Drainage Criteria Manual (USDCM) Volume 3, the City of Greeley's BMPs for Utility Planning and Construction Through Rural, Wetland, and Riparian Lands*, and/or other state and local guidance documents. Example descriptions of common construction BMPs that could be used on the project are provided for reference in **Appendix D**.

BMPs will also be deployed for construction dewatering activities, pursuant to the Construction Stormwater Discharge Permit and/or the Construction Dewatering Discharge Permit as appropriate for the site conditions and soil erodibility, to protect the quality of stormwater, surface water, and groundwater in the TWP corridor. See Section 8.g for descriptions of groundwater protection practices that could be used during construction.

BMPs will be implemented under the SWMP to minimize or mitigate soil erosion and revegetate disturbed areas. Soil erodibility along the TWP corridor is shown in **Figure 8.e-2**. The soil erodibility figure shows the Natural Resources Conservation Service (NRCS) K factor values. K factor values represent the susceptibility of soil erosion, transportability of the sediment, and the amount and rate of runoff given a particular rainfall event. The majority of the TWP corridor is located within the low-to-medium soil erodibility range. A low-to-medium soil erodibility factor indicates that slight to moderate erosion is likely and that erosion-control measures may be needed. A limited portion of the TWP corridor is located within the high soil erodibility range. High soil erodibility indicates that erosion is very likely and that erosion-control measures are advised, including revegetation of bare areas. Disturbed areas will be restored to pre-construction grades and revegetated at the conclusion of construction. Certified weed-free seed mix consisting of drought-tolerant native grasses will be specified in the SWMP for the revegetation of disturbed areas to meet property owner and regulatory requirements. Disturbed mature vegetation will be replaced, per a property owner's reasonable request, with a like species.

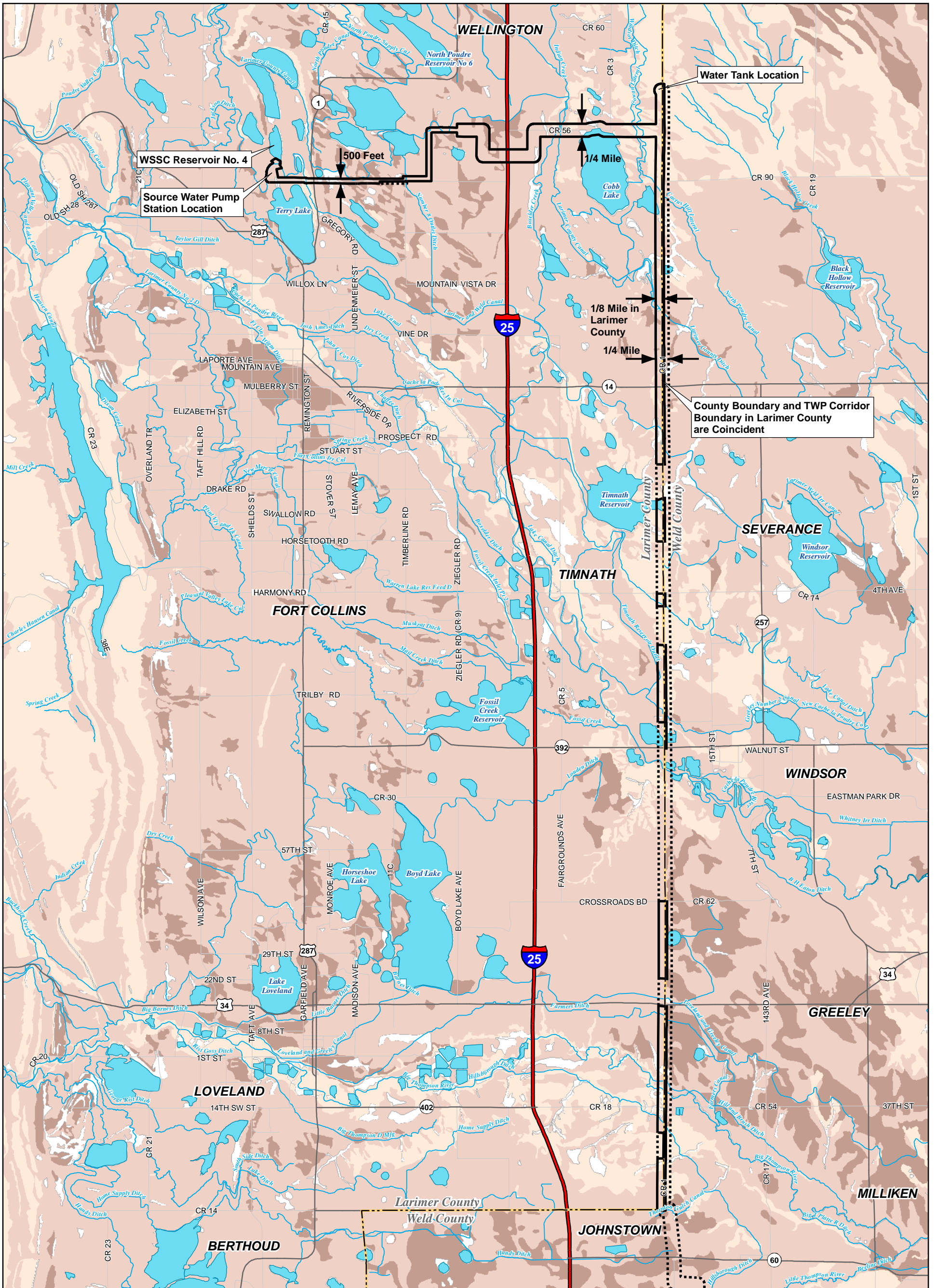
BMPs will be maintained and inspected. Failed BMPs will be replaced as required. After work is complete and final stabilization has been achieved, temporary BMPs will be removed. Final stabilization will be reached as defined in the Stormwater Discharge Associated with Construction Activity - General Permit.

Post-Construction Stormwater Runoff

The TWP corridor will be restored following construction to pre-construction grades and vegetation conditions with few exceptions. An example of an exception would be minor grading necessary following construction to restore a stable slope. In general, following TWP construction, the restored TWP corridor will drain in the same manner and at generally the same rate as it did prior to construction.

To mitigate impacts caused by erosion, landscaping for the TWP will consist of vegetation restoration and maintenance of areas disturbed by the TWP. Effects to vegetation along the easement areas will be temporary and mostly associated with construction. Potential future repairs and maintenance could affect discrete areas of vegetation so that the water pipeline and appurtenances may be accessed in a particular location. Any vegetated areas disturbed during maintenance or any required repairs will be restored by the methods used during construction.

Thornton Water Project



**CITY OF THORNTON
COLORADO**

12450 WASHINGTON ST
THORNTON, CO 80241-2405

12/29/2017



- TWP Corridor in Unincorporated Larimer County
- TWP Corridor outside Unincorporated Larimer County
- County Boundary
- Lake/Reservoir
- River/Stream/Canal/Ditch

- Soil Erodibility (K Factor)**
- No Value
 - Low (<0.20)
 - Medium (0.20 - 0.40)
 - High (>0.40)

**Figure 8.e-2
Soil Erodibility**

Water pipeline crossings of jurisdictional waters, including wetlands, will be constructed using trenchless construction methods. Irrigation ditches will be crossed using trenchless construction methods as required by ditch owner. Existing ditches, streams, and natural drainages will be preserved and no permanent effects on area drainage are anticipated.

Within urbanized areas subject to National Pollutant Discharge Elimination System (NPDES) and Colorado Discharge Permit System (CDPS) municipal separate storm sewer system (MS4) regulations, project components will be designed to address post-construction stormwater in a manner that complies with applicable requirements of the local MS4, including *Larimer County Stormwater Design Standards*. Portions of the TWP corridor are located within the boundaries of MS4 permitted areas in Larimer County.