

TECHNICAL APPENDIX



**BB. CONCEPT DRAINAGE
MEMORANDUM**

MEMORANDUM

DATE: May 8, 2017
TO: Andy Daleiden, PE
Project Manager
FROM: Cody Janson
SUBJECT: Concept Drainage Memo
PROJECT NO. Key No. 20049
PROJECT NAME: Int. Glenwood & State St Study

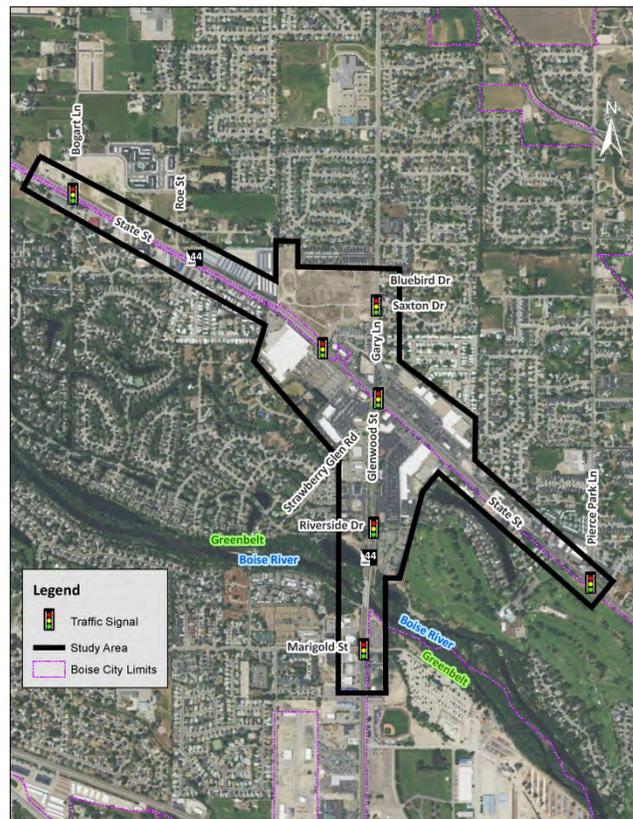
PROJECT DESCRIPTION

The Glenwood Street and State Street intersection is a critical junction for moving people and goods through the State Street corridor and connecting the cities of Boise and Garden City. This signalized, high-volume intersection carries approximately 45,000 daily vehicles and two of the highest transit ridership routes (#9 and #9X) in the Treasure Valley. The adjacent land uses serve as a regional commercial hub and evolving transit-oriented development (TOD) node. The intersection has a diverse set of challenges, which have led to the Idaho Transportation Department (ITD) and Ada County Highway District (ACHD) partnering to lead the Glenwood Street and State Street Intersection Study.

This 12-month Study will engage partnering agencies, property owners, businesses, and the community at-large to assess and identify a preferred intersection solution at the Glenwood Street and State Street intersection that:

- Improves intersection functionality for all users, including those with disabilities,
- Provides enhanced opportunities for pedestrian and bicycle connectivity,
- Accommodates the surrounding current and planned land uses, including the proposed redevelopment of State Street as a transit-oriented corridor, and
- Complies with ACHD and ITD standards and supports the State Street Transit & Traffic Operational Plan.

The study area is shown above.



CONCEPT DRAINAGE REVIEW

This Drainage Review Memo was prepared to summarize and memorialize the concept design study pre-project storm drainage systems and outline possible locations and treatments for post-project drainage facilities for the Int Glenwood Street & State Study. The field analysis was completed on 4/24/2017 (Parametrix – Brad Burkett) after a storm event dropped approximately 0.15 inches over 12 hours. The photos below depict the drainage accumulation occurring in the referenced facilities after this event.

The drainage review can be utilized to better understand drainage alternatives, which can be assessed with the preferred intersection alternative from this Study. This memo will document existing drainage and irrigation facilities, as well as provide conceptual stormwater treatment options for use in developing design alternatives.

Pre-Project Conditions

In the pre-project condition most of State Street and Glenwood Street are urban road sections developed with curb, gutter, and separate sidewalk. General exceptions are the south side of State Street east of Vista Pawn, as well as the north and south sides of State Street west of Glenwood Street/Gary Lane. A field survey was not completed but a visual indication was used to approximate the following existing drainage patterns:

- Project Area East of the Intersection: State Street generally slopes west within the project limits.
 - There is a swale area with no curb serving the south side of State Street east of Vista Pawn to the eastern project limit. Runoff collects and flows west along continuous curb and gutter for both sides of State Street for the remainder of State east of Glenwood Street. Stormwater collected along the curb and gutter portion from this leg eventually enters inlets near the Glenwood and State intersection, and is conveyed to the swale system adjacent to the parking lots serving Walmart, Washington Trust Bank, etc.
- Project Area West of the Intersection: State Street generally slopes west within the project limits.
 - An open swale system runs along the north side of State Street west of the intersection. After the recent rainstorm, several areas had standing pools of water. This swale system is very shallow, and does not seem to provide adequate storage for the runoff produced (see Photos 1 and 2 on page 3).
 - The south side of State Street is served by several swales adjacent and within the commercial development (Walmart). The south side of State Street has curb and gutter from the intersection to the west until just beyond the Walmart building. Runoff for this side of State flows into swales via catch basins and is piped directly into swales to the west of the Walmart building.
- Project Area North of the Intersection: Gary Lane drains south from a high point near the intersection with Bunch Lane, eventually draining into a roadside swale system on the west side of Glenwood Street and the south side of State Street (see Photo 3 on page 4). North of Bunch Lane, the drainage from Gary Lane enters a system which flows north to a facility outside of the project area.
- Project Area South of the Intersection: There appears to be a low point on Glenwood Street approximately 1,000' south of the intersection (near Burger King) that collects runoff from a portion of the east leg of the intersection (State Street) as well as the runoff from the east side of Glenwood Street for much of the south leg of the project limits. The drainage is collected via a catch basin / sediment grease trap and is then conveyed west to a swale system on the west side of Glenwood Street (see Photo 4 on page 4).



Photo 1 – North Side of State Street Swales West of Gary Lane

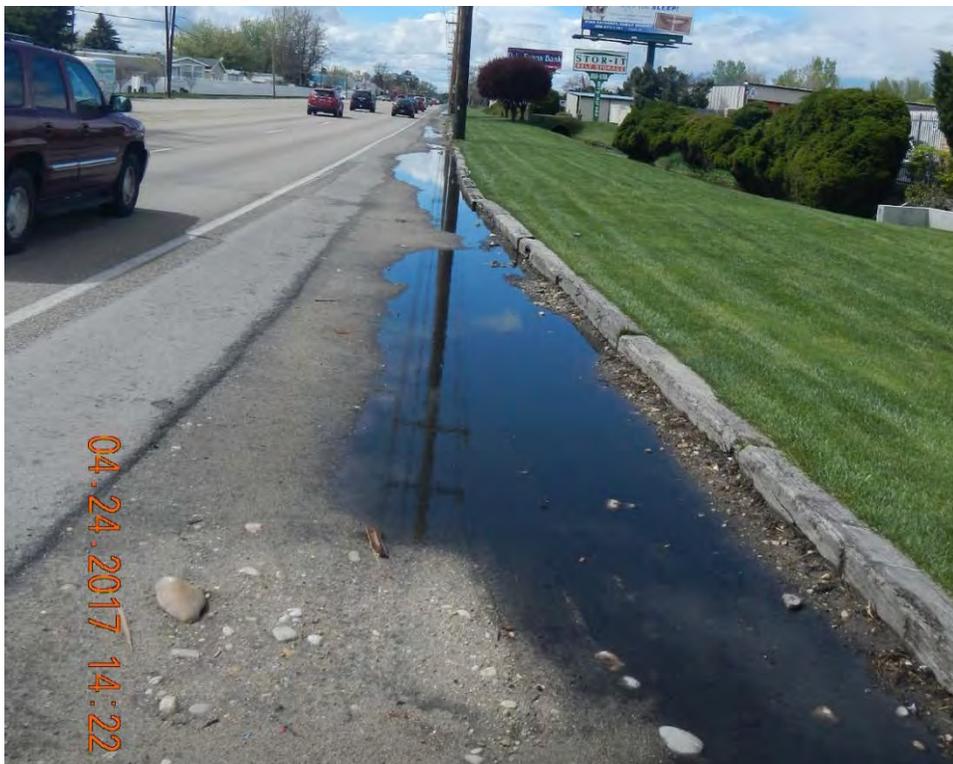


Photo 2 - North Side of State Street Swales West of Saxton Drive



Photo 3 - Southwest State/Glenwood Intersection Swales



Photo 4 - N Glenwood Street Swales

Soil Conditions

According to National Resources Conservation Service soil data, infiltration rates vary for soils in the area and typically from 2 to 6 inches/hour. No project-related soils analysis has been performed at this time. Concept level drainage treatments should assume an infiltration rate within this range for native soils.

High groundwater is an important consideration given the projects proximity to the Boise River. Stormwater facilities must be designed to ensure minimum groundwater clearances.

Design Criteria / Hydrology Method

Storage requirements for the study area have been developed according to ACHD Drainage Policy at the time this Draft Drainage Memorandum was prepared. Sizing for runoff volumes utilized the 100-year, 1-hour design storm. The Rational Method was used to determine the storage requirements for proposed stormwater facilities. ITD's Roadway Design Manual indicates the Rational Method may be utilized for watersheds less than 200 acres. ACHD has adopted the Rational Method as their preferred methodology in calculating stormwater runoff.

The peak stormwater runoff rate is estimated from the following equation:

$$Q = C \times I \times A$$

where: Q = Peak Runoff (cubic feet per second (cfs))

C = Surface Runoff Coefficient (unit less)

I = Rainfall Intensity (inches/hour)

A = Drainage Area (acres (ac))

The rainfall intensity is taken from an Intensity Duration Frequency (IDF) graph or table which is unique to the Boise Area. The Rational Method assumes constant rainfall intensity over a given duration; which is equal to the time of concentration. For shorter durations, the rainfall intensity is higher than longer durations. ACHD's IDF table was used for all the Rational Method equations.

The Rational Method can be used to estimate the total runoff volume for a given duration and rainfall frequency. This is done by assuming the rainfall runoff starts at zero and increases in a straight line to the peak runoff rate (at the corresponding time of concentration or rainfall duration) and then decreases back to zero at double the rainfall duration. ACHD's standard to determine runoff volume is the 100-year frequency, 1-hour rainfall duration. The runoff volume can be calculated with the following equation:

$$V = D \times Q_D \times 60 \text{ (minutes/hour)} \times 60 \text{ (seconds/minute)}$$

where: V = Total Runoff Volume (cubic feet (cf))

D = Rainfall Duration (hours)

Q_D = Peak Runoff Rate at the given Duration (cfs)

A land area coverage of 10% permeable and 90% impermeable surfaces was taken to represent the right of way drainage area to gain a conceptual estimate of runoff volumes. A weighted average of the C values for these two surface areas produced the overall Surface Runoff Coefficient listed below:

0.95	Impervious areas including roadway, curb, gutter, and sidewalks
0.20	Pervious landscaped and undeveloped areas
0.88	Overall adjusted C value

Post-Project Conditions

Feasible stormwater treatments for the Int Glenwood Street & State Study may include treatment and conveyance swales, grass buffer strips, seepage bed with sand and grease traps, and tree systems (taking high groundwater into consideration). Utilizing the above total runoff volume formula, the volume of storage needed to accommodate a 1-hour, 100-year storm for three typical right of way sections within the study area are as follows:

- State Street – An assumed 160 feet of right of way yields approximately 2150 CF of runoff per 100 feet of length
- N Glenwood Street – An assumed 110 feet of right of way yields approximately 900 CF of runoff per 100 feet of length
- N Gary Lane – An assumed 85 feet of right of way yields approximately 850 CF of runoff per 100 feet of length

The significant widening of State Street in the project area, with expansion occurring mainly on the north side, may impact facilities currently serving the Northgate Shopping Center parking lot. While the shopping center facilities do not serve runoff from State Street right of way, facilities may need to be moved or replaced as a result of roadway widening. Drainage for the east leg of State Street in the study area is currently treated in facilities between curb and sidewalk along the west side of Glenwood Street. This area has potential for placement of proposed facilities to accommodate future east State Street and Glenwood Street runoff as well.

For the west leg of State Street, adequate room exists in the right of way along the south side west of Glenwood Street to utilize and improve upon the existing swale system to accommodate future runoff. The facilities serving the north side of State Street west of Gary Lane may need to be changed or improved to adequately treat a wider drainage section, and fix current drainage issues.

The N Gary Lane leg of the study area may only see slight modifications. This drainage is currently treated via the swale system running along a large parking area (serving Walmart, Applebee's, etc.), which should be a practical location for future treatment as well.

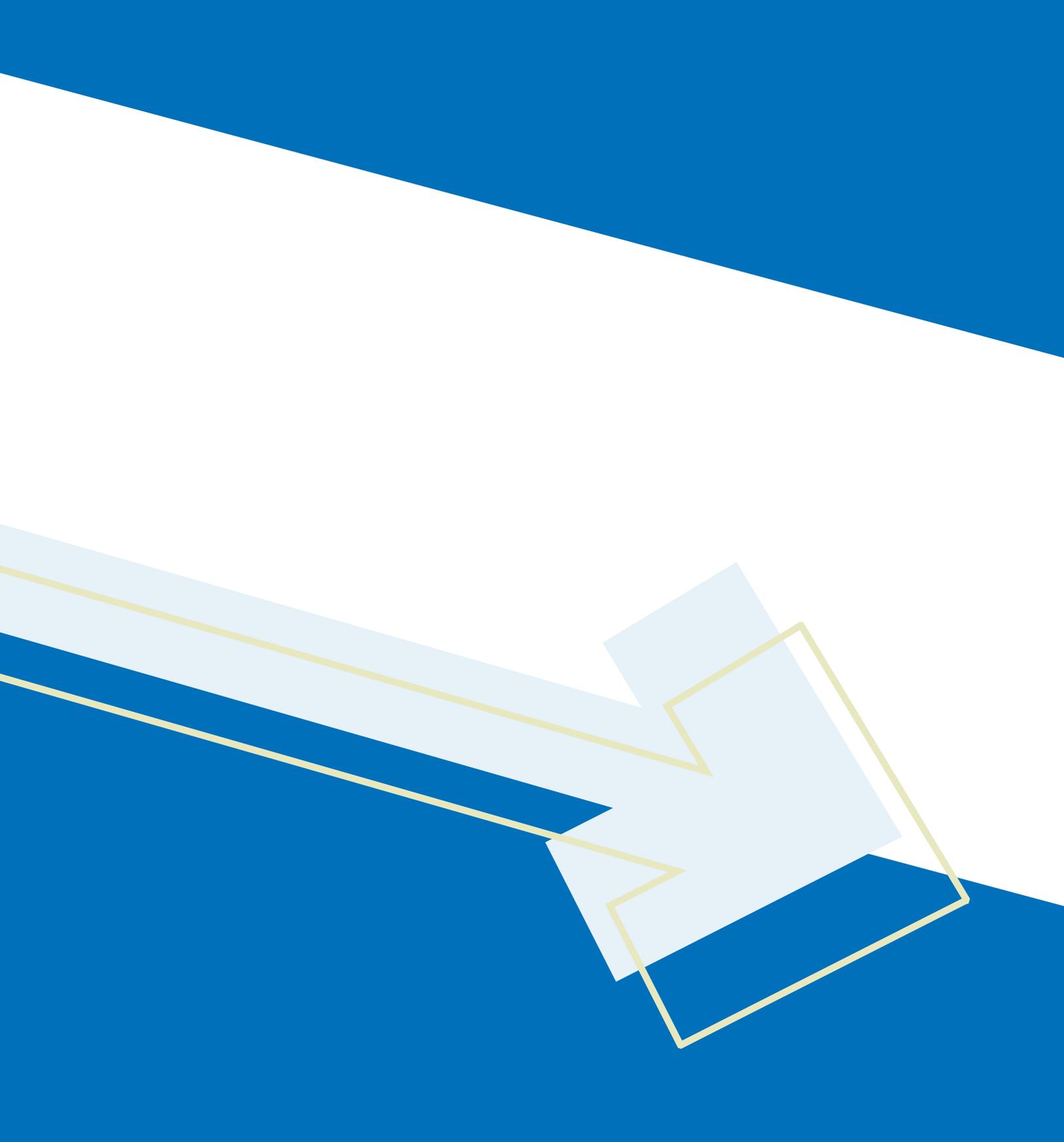
Existing Irrigation Facilities

On April 20, 2017, Parametrix met with the Boise Valley Irrigation Ditch Company (BVIDC) to obtain information regarding existing irrigation systems in the project area with the goal of retaining existing facilities related to the Boise Valley Canal. Collaboration with BVIDC will continue after further project development to address potential impacts to the canal.

The Boise Valley Canal is managed by BVIDC and runs behind the businesses fronting State Street (along the north side of the street) from the eastern study limit, flowing west to Gary Lane through underground facilities. West of Gary Lane, the canal becomes an open channel. Just west of Saxton Rd, it veers to the southwest, where it then parallels the north side of State Street to the western study limit. An underground lateral from the canal crosses State Street between Money Tree and Radio Shack, connecting to a lateral that runs along the south side of State Street from about Applebee's to just past the RV & Mini Storage facility to the west where it then turns south. Another underground irrigation line connects to this lateral running parallel to the parking lot entrance west of Washington Trust Bank. This lateral then crosses the large parking lots serving the Walmart and other businesses there, heading southwesterly towards a residential area fronting Apache Way. The Boise Valley Irrigation Ditch Company claimed ownership of no other irrigation facilities in the study area. However, several irrigation structures were identified at various points along the west side of Glenwood Street. These structures are not indicated on the BVIDC facility map for the study area, and were not discussed in the meeting. Ownership of these facilities is unknown.

CONCLUSION

The post-project drainage facilities for the study area must be designed for the 100-yr, 1-hr storm event. This memorandum provides estimated runoff quantities for typical right of way sections within the study area, and identifies concept level treatments and locations for proposed BMP's. Utilizing the suggested treatments and locations will minimize changes to the existing drainage system, and limit impacts on surrounding stormwater and irrigation facilities. Further analysis to determine specific treatment types and drainage system improvements will continue into preliminary design as design alternatives are refined.



INTERSECTION GLENWOOD ST & STATE ST STUDY, BOISE
ITD PN A020(049), KEY NO. 20049 / ACHD PN 317045

Ada County Highway District and Idaho Transportation Department