APPENDIX P

MEMORANDUM: PROPOSED CONDITION HYDRAULIC CAPACITY

Reata Wash
Flood Control Improvement Study

Contract No. 2014-168-COS

Memorandum: Proposed Condition Hydraulic Capacity

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EXPIRES 12-31-16

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1. EXECUTIVE SUMMARY

This *Proposed Condition Hydraulic Capacity Memorandum* documents the results of HEC-RAS modeling of the recommended solution's proposed improvements for the Reata Wash drainage corridor. The study has been divided into five distinct hydraulic reaches as shown *on Exhibit 1 – Study Location Reach Map and Proposed Condition Floodplain*. Proposed condition hydraulic modeling has been performed for all reaches. The 100-year peak discharge used in this analysis is based upon the results of this study's hydrology task for identifying a Federal Emergency Management Agency (FEMA) compliant peak discharge as documented in the *Hydrologic Memorandum* (Reference 1).

Potential existing condition deficiencies within the corridor were identified on a per reach basis and are documented in the *Existing Condition Hydraulic Capacity Memorandum (Reference 2)*. Based on that analysis and input from study stakeholders and the public, potential solutions were identified, analyzed and refined to develop recommended solutions which address the identified deficiencies and are believed to be capable of being FEMA compliant.

The recommended solution addresses the potential technical deficiencies within the corridor, minimizes the drainage system footprint and disturbance area, and takes into consideration the stakeholders, public, economic and aesthetic concerns. A summary of the analysis performed and the recommended solutions are provided on a per reach basis below:

- **Reach 1 – Pinnacle Peak Road to 1,000 feet north:** This reach was analyzed with a 100-year peak discharge of 13,015 cubic feet per second (cfs). Three potential conveyance options were initially developed for this reach including: an earthen trapezoidal channel, a concrete 'U' channel with grouted rock invert and a grouted rock trapezoidal channel. Rough surfaced hard lined open channel solutions are recommended within Reach 1 due to the anticipated high velocities, limited available drainage easement width and the need to collect overland side flows. Therefore, earthen trapezoidal channel option was eliminated from consideration and the options considered include a 'U' channel with grouted rock invert and a grouted rock trapezoidal channel.

  The recommended solution includes a floodwall at the upstream end of this study reach to prevent an existing condition flow breakout, an incised concrete 'U' channel with a grouted rock invert and 85 foot bottom width from the floodwall to approximately 100' north of the bridge, a concrete channel transition from this point to the existing bridge section. A grouted rock trapezoidal channel could

also be implemented for a portion of this reach. The recommended solution cross sections are shown on *Figure 1- Reach 1 Typical Sections.*

The Pinnacle Peak Road Bridge has the hydraulic capacity to convey the 100-year peak discharge, but floodwaters breakout before arriving at the bridge. Thus the bridge inlet area will need to be altered in the final design to prevent the breakout occurring to allow the bridge to pass the 100-year peak discharge.

The benefits of this recommended solution include reduction of additional land acquisition requirements; it costs less than a covered concrete box culvert, requires reasonable maintenance, is easily inspected and is more efficient at collecting side flows and conveying flows at an acceptable velocity of 15 feet per second (fps). The recommended solution is considered only moderately context sensitive, is not favorable to wildlife movement and will require safety railing.

Any improvements within this reach will require City acquisition of land rights for construct of improvements and maintenance within the existing drainage easement owned by the Pinnacle Peak Heights Homeowners Association. Additional land rights are needed to accommodate permanent improvements on Lots 7 and 9 of Pinnacle Peak Heights subdivision in order to accommodate the proposed floodwall.

- **Reach 2 – Pinnacle Peak Road to Cross Canyon Way:** This reach was analyzed with a 100-year peak discharge of 13,015 cfs from the Pinnacle Peak Road Bridge immediately downstream of Reach 1. There would be a flow release of 2,000 cfs to the southwest to provide flows to Dobson Wash. The 100-year peak discharge in Reata Wash is reduced to 11,015 cfs downstream of this release.

  Five potential conveyance options were originally developed for this reach including:

  - an incised earthen trapezoidal channel,
  - a perched earthen trapezoidal channel with levee banks,
  - a concrete 'U' channel,
  - a grouted rock trapezoidal channel,
  - a covered concrete box culvert.

  The land requirements for both of the earthen channel options were prohibitive which eliminated them from further consideration.

The recommended solution consists of a combined system consisting of a concrete 'U' channel from the Pinnacle Peak Road Bridge area to approximately 1,300 feet south and a grouted rock trapezoidal channel from that point downstream to Cross Canyon Way. Concrete box culverts with inlet and outlet headwalls will be required at Foothills Drive and Cross Canyon Way, and will be sized to convey the study's 100-year discharge. The Foothills Drive crossing will also require the vertical relocation of a 12 inch waterline. The concrete 'U' channel will have a bottom width of 60 feet and a depth of approximately 13.5 feet with safety rails on top of the walls. Forms will be used to create a rough undulating surface on both the walls and channel invert to emulate a rock surface increasing the Manning's "n" value and reducing flow velocities. A concrete channel transition structure is required immediately downstream of the Pinnacle Peak Road Bridge that will allow the flow to transition from the bridge outlet geometry to the concrete 'U' channel inlet geometry. At a point approximately 1,300 feet downstream of Pinnacle Peak Road Bridge, a divider wall is proposed within the channel to create a separation between the main flow in Reata Wash (11,015 cfs) and the Dobson Wash flow release (2,000 cfs). The final design will account for this location to divert the initial low frequency flows into Dobson Wash. This concept is illustrated on *Figure 6 – Dobson Wash Release.*

Approximately 400 feet south of the Dobson Wash release, the conveyance system will transition from a concrete 'U' channel to an incised grouted rock trapezoidal channel with an 80 foot bottom width and 2:1 side slopes. There are several locations along this reach where offsite flows will need to be collected and conveyed into the proposed drainage system.

The benefits of the concrete 'U' channel segment of the recommended solution are that City land rights and existing drainage easement were utilized to minimize additional land acquisition. The recommended solution is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also more efficient at collecting and conveying flows at an acceptable velocity and costs less than a covered concrete box culvert.

The potential drawbacks of the recommended solution within this reach are that it is considered moderately context sensitive, is not favorable to wildlife movement and will require safety railing.

The benefits of the grouted rock trapezoidal channel segment shown on *Figure 2 - Reach 2 Typical Sections* are that it is moderately sensitive to land currently available for drainage improvements and has a moderate footprint to reduce additional land requirements. The recommended solution is anticipated to have

reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also more efficient at collecting and conveying flows at an acceptable velocity and costs less than a covered concrete box culvert.

The recommended solution within this reach is considered only moderately context sensitive, is somewhat favorable to wildlife movement and will require safety railing. In addition, the recommended solution has a larger footprint than either the covered concrete box culvert or concrete 'U' channel. The recommended solution cross sections are shown on *Figure 2 - Reach 2 Typical Sections.*

Approximately 50% or 3,150 lineal feet of the recommended solution improvements, for Reach 2, can be constructed within the limits of property over which the City has land rights. The City would need to acquire land rights for the remainder of the property required for the proposed improvements within the Pinnacle Peak Heights Units 5 and 6 subdivisions as shown on *Exhibit 1 – Study Location Reach Map and Proposed Condition Floodplain.*

- **Reach 3 – Cross Canyon Way to Thompson Peak Parkway:** This reach was analyzed with a 100-year peak discharge of 11,254 cfs at Cross Canyon Way and 11,901 cfs at Thompson Peak Parkway. The northern segment of this reach does not have the capacity to contain and convey the 100-year peak discharge within the property where the City has land rights. Flow breaks out both west and southwesterly along this segment and encroaches into several privately owned parcels near Cross Canyon Way. Three potential conveyance options were initially developed for the northern segments of this reach including: a grouted rock trapezoidal channel, a concrete 'U' channel, and a covered concrete box culvert.

  The existing buried bank protection along the east bank north of Thompson Peak Parkway may require improvements to achieve sufficient scour protection. The recommended solution for improving the buried bank protection is to construct a narrow width trench at the toe of the existing bank protection to a depth sufficient to meet the calculated potential scour depth and to fill the trench with pneumatically placed mortar.

  The recommended conveyance system in the northern segment of Reach 3 is an incised grouted rock trapezoidal channel with an 80 foot bottom width and 2:1 side slopes. In the southern segment of the reach, the existing condition floodplain does encroach into some residential lots along the west bank north of Thompson Peak Parkway. Buried bank protection measures are recommended

for this segment to address existing and future floodplain encroachments into private property. The proposed buried bank protection would be high enough to provide containment based on the proposed condition water surface elevation and deep enough to address the calculated potential scour depth. The recommended solution cross sections are shown on *Figure 3 - Reach 3 Typical Sections.*

The benefits of the recommended solution for this segment of the reach is that it can be constructed within the limits where the City has land rights, is considered context sensitive, favorable to wildlife, has a reasonable maintenance cost and costs less than the other two options considered.

- **Reach 4 – Thompson Peak Parkway to Bell Road:** This reach was analyzed with a peak flow of 11,901 cfs at Thompson Peak Parkway, 12,338 cfs at the confluence with North Beardsley Wash, 11,870 cfs at Legacy Boulevard and 15,842 cfs at the confluence with South Beardsley Wash and Thompson Peak Wash immediately upstream of Bell Road. The peak discharge is contained within City land rights along this entire reach with the exception of a narrow encroachment along the DC Ranch Park on the east side of Reata Wash south of Thompson Peak Parkway. Development has occurred along a majority of this reach which includes existing drainage control infrastructure (buried bank protection, grade control structures and embankments). Improvements to the existing buried bank protection may be required to achieve sufficient scour protection.

  The recommended approach for addressing deficiencies the existing buried bank protection due to insufficient depth is to construct a narrow width trench at the toe of the existing bank protection to a depth sufficient to meet the calculated potential scour depth and install pneumatically placed mortar.

  The benefits of the recommended solution for this segment of the reach are that it can be constructed within the limits where the City has land rights, it is considered context sensitive, favorable to wildlife and has a reasonable maintenance cost.

  Several existing embankment (potential levees) along the west bank within this reach have been identified as slightly freeboard deficient. Increased bank heights and localized channel grading are recommended improvements at these locations to meet potential levee or embankment freeboard requirements. The cross sections for the recommended buried bank protection and levee/embankment improvements are shown on *Figure 4 - Reach 4 Typical Sections.*

There are three locations within this reach where existing culverts convey low flows from Reata Wash to the southwest; however, no reduction in peak discharges have been applied to the Reata Wash study corridor downstream of these culverts. The 100-year peak discharge is contained within the limits where the City has land rights along this entire reach. The proposed improvements will require the relocation of an existing 8 inch waterline crossing Reata Wash within a utility easement located just north of Bell Road.

- **Reach 5 – Bell Road to East McDowell Mountain Ranch Road:** This reach was analyzed with a peak flow of 15,842 cfs. Downstream of the Bell Road Bridge, the peak discharge exceeds the conveyance capacity of the existing limited in size channel and the floodplain spreads out over a large unconfined path well beyond the limits where the City has land rights.

  Three potential conveyance options were initially developed for this reach including:

  - a concrete trapezoidal channel,
  - a grouted rock trapezoidal channel,
  - an incised earthen trapezoidal channel with buried bank protection.

  An incised earthen channel section was identified as the most desired option based on its cost effectiveness, as well as aesthetics.

  The recommended solution to contain and convey the 100-year peak discharge within this reach is an incised earthen trapezoidal channel with buried bank protection, a 200-foot bottom width and 3:1 side slopes from the Bell Road Bridge to the McDowell Mountain Ranch Road Bridge.

  A concrete drop structure is proposed as part of the recommended solution approximately 900 feet north of the McDowell Mountain Ranch Road Bridge. A 4 foot high concrete sill will be constructed immediately upstream of the McDowell Mountain Ranch Road Bridge to provide a sediment basin with approximately 9.1 acre-feet of storage capacity. The proposed improvements will require the relocation of an existing 8 inch non-potable waterline and 24 inch sanitary sewer line to immediately upstream of the proposed drop structure.

  The benefits of the recommended solution are that it is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution also costs less than a concrete or grouted rock trapezoidal channel and is considered context sensitive. The recommended solution cross section is shown on *Figure 5 - Reach 5 Typical Sections.*

2. INTRODUCTION

This memorandum summarizes the assumptions, supporting analysis and conclusions for the proposed condition hydraulic capacity of the drainage corridor for the Reata Wash Food Control Improvement Study (Reata Wash Study). The proposed drainage system was evaluated for the proposed hydraulic conditions include: drainage system conveyance capacity and containment, free board, scour protection and sediment transport.

Based on this evaluation, portions of the drainage corridor will fall into one of the following categories:

- existing drainage infrastructure is sufficient,
- improvements to existing drainage infrastructure will be required including improved buried bank protection and/or improved levees or embankments,
- or new drainage infrastructure will be required including conveyance channels/conduits, buried bank protection, floodwalls and sediment basin.

3. ANALYSIS, CONSTRAINTS AND HYDRAULIC PARAMETERS

Hydraulic modeling has been performed based on the proposed condition for the entire study corridor. The 100-year peak discharges used in this analysis are based upon the results of the hydrology task identifying FEMA compliant peak discharges developed for this study and as documented in the *Hydrologic Memorandum* (Reference 1) and shown on *Exhibit 2 – HEC-RAS Cross Section Locations and Proposed Condition Peak Discharges*. The most notable revision to the hydrology in the proposed condition is a 100-year peak release of 2,000 cfs into Dobson Wash about 1,300 feet south of Pinnacle Peak Road, and the associated reduction in downstream flows based on this release.

The proposed condition hydraulic capacity analysis is based upon FEMA compliant 100-year peak discharge and addresses the impact of additional hydraulic parameters such as velocity, anticipated scour, required freeboard and sediment transport. Existing embankments (potential levees) along the project reach were evaluated and embankment/levee improvements are proposed in any areas found to be inadequate to meet FEMA levee freeboard requirements. Flow containment was analyzed for all other non-levee areas.

The proposed condition hydraulic modeling is based on Manning's Roughness Factor, "n" value, as found in the Flood Control District of Maricopa County (FCDMC) Hydraulics Manual. The "n" value used in this study for proposed conveyance systems is derived from the intermediate diameter of the proposed material that equals or exceeds that of 84 percent (D_{84}) of the proposed materials particles. A physical model study may be required to verify the "n" value to be used in the final design. For natural earthen channel corridor with vegetation, the "n" values chosen range from 0.035 to 0.04 which is consistent with the previously approved Letter of Map Revision (LOMR) applications within the corridor. The "n" values for new channel improvements include 0.035 for new earthen channel, 0.048 for grouted rock channels, 0.016 for concrete channel transitions channel; 0.040 to 0.0493 for concrete 'U' channel with special rock surface treatment, 0.020 to 0.055 (at drops in the box culvert option) for concrete with roughened concrete surface.

4. RESULTS AND RECOMMENDATIONS

The results of the proposed condition hydraulic analysis including potential deficiencies and recommended solutions have been identified based on a per reach basis as described below:

- **Reach 1:** Reach 1 extends from Pinnacle Peak Road to approximately 1,000 feet north. This reach was analyzed with a 100-year peak discharge of 13,015 cfs as identified in this study's *Hydrologic Memorandum* (Reference 1). The proposed improvements within this reach include channelization from the bridge to approximately 1,000 feet upstream to collect and convey the 100-year peak discharge to the existing bridge at Pinnacle Peak Road.

  The results of the existing condition hydraulic analysis indicate that the 100-year peak design flow is not contained within the existing drainage easement, but breaks out into the west overbank upstream of the Pinnacle Peak Road Bridge. In order to prevent this flow from breaking out to the southwest, a floodwall is proposed at the upstream end of this study reach that will intercept and direct the 100-year peak discharge into the proposed downstream channel system.

  Three potential conveyance options were initially developed for this reach including:

  - an earthen trapezoidal channel,
  - a concrete 'U' channel with grouted rock invert,
  - a grouted rock trapezoidal channel.

  Initial analysis indicated that rough surfaced hard lined open channel solutions would be required within Reach 1 due to the high velocities associated with the steep slopes in the reach, limited available drainage easement width and the need to collect overland side flows along a long portion of the reach. Therefore, the earthen trapezoidal channel option was eliminated from further consideration. The remaining options also meet the important considerations of minimizing the drainage system footprint and disturbance area as well as achieving an aesthetic acceptable solution capable of conveying the FEMA compliant peak discharge through the reach to the Pinnacle Peak Road Bridge.

  To collect, contain and convey the 100-year peak discharge in this reach, an incised concrete 'U' channel with an 85 foot wide grouted rock invert and a depth of approximately 12 feet with safety rails on top of the walls is recommended from the proposed floodwall at the upstream end of the proposed improvements to approximately 100' north of the bridge. A grouted

rock trapezoidal channel could also be implemented for a portion of this reach. An incised concrete channel transition is recommended from this point to the existing bridge section. The average proposed condition slope within this reach is approximately 3.3% and the average proposed condition velocity is approximately 15 feet per second. The recommended solution cross sections are shown on *Figure 1- Reach 1 Typical Sections.*

The Pinnacle Peak Road Bridge is located near the apex of FEMA Alluvial Fan #2B and has the capacity to convey the 100-year peak discharge based on the proposed condition hydraulic analysis. It is recommended that for the final design the bridge inlet capacity will need to be altered so that the entire 100-year peak discharge and potential sediments can be effectively handled by the bridge. At the 15% level of design, no detailed analysis was performed to account for sediment load at this location.

The benefits of this recommended solution are that it is sensitive to land currently available for drainage improvements and minimizes the improvement's footprint to reduce, as much as possible, additional land requirements. It is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also more efficient at collecting side flows and conveying flows at an acceptable velocity and costs less than a covered box culvert.

The recommended solution is considered only moderately context sensitive, is not favorable to wildlife movement and will require safety railing.

Any improvements within this reach will require City acquisition of land rights for construct of improvements and maintenance within the existing drainage easement owned by the Pinnacle Peak Heights Homeowners Association. Additional land rights are needed to accommodate permanent improvements on Lots 7 and 9 of Pinnacle Peak Heights subdivision in order to accommodate the proposed floodwall, as shown on *Exhibit 1 – Study Location Reach Map and Proposed Condition Floodplain*.

A proposed condition HEC-RAS model, 4264-CHNL.prj, has been developed and includes all five reaches of the project (Appendices A through C).

- **Reach 2:** Reach 2 extends from Pinnacle Peak Road to Cross Canyon Way and is approximately 6,100 feet in length. In the existing condition analysis, the middle and southern segments of Reach 2 were not analyzed because the reach does not have the defined physical drainage corridor capacity to contain and convey the peak discharge. In the proposed condition, this reach was analyzed with a

100-year peak discharge of 13,015 cfs from the Pinnacle Peak Road Bridge immediately downstream of Reach 1. There is a flow release within this reach of 2,000 cfs to the southwest in the proposed condition modeling. This release provides flows to Dobson Wash which is about 1,300 feet south of Pinnacle Peak Road. Due to this release, the 100-year peak discharge in Reata Wash is reduced to 11,015 cfs downstream of the release as identified in the *Hydrologic Memorandum* (Reference 1).

Five potential conveyance options were originally developed for this reach including:

- an incised earthen trapezoidal channel,
- a perched earthen trapezoidal channel with levee banks,
- a concrete 'U' channel,
- a grouted rock trapezoidal channel,
- a covered concrete box culvert.

Minimizing the drainage system footprint and disturbance area as well as achieving an aesthetic acceptable solution are important considerations, all of the solutions mentioned above can be implemented to convey the FEMA compliant peak discharge through the reach.

It was determined that the land requirements for both of the earthen channel options were prohibitive which eliminated them from further consideration. The remaining three conveyance options, alone or in combination, have been further developed and analyzed for this reach. One of the options considered incorporates either the concrete 'U' channel or the covered concrete box culvert for the entire reach. Other options consist of systems that incorporate a combination of conveyance solutions. A combined system would consist of a covered concrete box culvert or concrete 'U' channel from the Pinnacle Peak Road Bridge to approximately 1,300 feet south and a grouted rock trapezoidal channel from that point downstream to Cross Canyon Way at the south end of the reach. This combined system would require concrete box culverts with inlet and outlet headwalls at two roadways crossings within this reach, Foothills Drive and Cross Canyon Way. The Foothills Drive crossing will also require the vertical relocation of a 12 inch waterline.

The covered concrete box culvert and concrete 'U' channel have very similar footprints and are both are respectful of and capable of being constructed within the limits of an existing 100' wide drainage easement in the upper portion of the reach. Since the 'U' channel is less expensive than the covered box

culvert, it was selected as the recommended solution for the upper portion of a combination system. The grouted rock trapezoidal channel will be used for the lower portion of the reach. The concrete 'U' channel will have a bottom width of 60 feet and a depth of approximately 13.5 feet with safety rails on top of the walls. Forms will be used to create a rough undulating surface on both the walls and channel invert to emulate a rock surface increasing the Manning's "n" value and reducing velocities. A concrete channel transition structure is required immediately downstream of the Pinnacle Peak Road Bridge that will allow the flow to transition from the bridge outlet geometry to the concrete 'U' channel inlet geometry. At a point approximately 1,300 feet downstream of Pinnacle Peak Road Bridge, a divider wall is proposed within the channel to create a separation between the main flow in Reata Wash (11,015 cfs) and the Dobson Wash environmental flow release (2,000 cfs) as quantified in the *Hydrologic Memorandum* (Reference 1). Provisions will also be made at this location to divert the initial low flow in the channel into Dobson Wash. Dobson Wash is analyzed for the entire 2,000 cfs, but a conservative approach was used for analyzing Reata Wash downstream of the split assuming that not all of the 2,000 cfs is released. There are four culvert locations that release floodwaters from the main Reata Wash channel, the peak flow was not reduced in the main channel, as presented in Reach 4.

Approximately 400 feet south of the Dobson Wash release, the conveyance system will transition from a concrete 'U' channel to an incised grouted rock trapezoidal channel with an 80 foot bottom width and 2:1 side slopes. In order to achieve acceptable velocities within this reach, several drops have been implemented to allow for a proposed condition slope between drops of 2.5 to 3.0% and maximum velocities below 30 feet/second. The recommended solution cross sections are shown on *Figure 2 - Reach 2 Typical Sections.*

Although the City owns a number of the parcels and has drainage easement rights over others parcels along the lower end of this reach, additional land rights will need to be obtained from private property owners in order to form a contiguous drainage corridor through the reach as shown on *Exhibit 1 – Study Location Reach Map and Proposed Condition Floodplain.*

The concrete 'U' channel is not favorable to wildlife movement. A small bridge type structure crossing could be incorporated into the final design to maintain wildlife connectivity across the wash since there is wildlife habitat on both sides of the wash in this area.

There are several locations along this reach where offsite flows will need to be collected and conveyed into the proposed drainage system. A small local wash from the west downstream of Pinnacle Peak Road will be collected at a headwall and connector pipe into the channel. A significant offsite flow (2,057 cfs) from the east (FEMA alluvial fan #2A) near the south end of Via Ventosa Drive will require grading an inlet channel, within City land rights, to the conveyance system and modifying/notching the east wall of the concrete 'U' channel at the to allow flow to drop into the system.

The benefits of the concrete 'U' channel segment of the recommended solution are that it is sensitive to land currently available for drainage improvements and minimizes the improvement's footprint to reduce, as much as possible, additional land requirements. It is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also more efficient at collecting and conveying flows at an acceptable velocity and costs less than a covered concrete box culvert.

The recommended "U" channel solution within this reach is considered moderately context sensitive, is not favorable to wildlife movement and will require safety railing.

The benefits of the grouted rock trapezoidal channel segment of the recommended solution are that it is moderately sensitive to land currently available for drainage improvements and has a moderate footprint to reduce additional land requirements. It is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also more efficient at collecting and conveying flows at an acceptable velocity and costs less than a covered concrete box culvert.

The recommended grouted rock trapezoidal channel solution within this reach is considered moderately context sensitive, is somewhat favorable to wildlife movement and will require safety railing. In addition, it has a larger footprint than either the covered concrete box culvert or concrete 'U' channel.

Approximately 50% or 3,150 lineal feet of the recommended solution improvements, for Reach 2, can be constructed within the limits of property over which the City has land rights. The City would need to acquire land rights for the remainder of the property required for the proposed improvements within the Pinnacle Peak Heights Units 5 and 6 subdivisions as shown on Exhibit 1 – Study Location Reach Map and Proposed Condition Floodplain.

- **Reach 3:** Reach 3 extends from Cross Canyon Way to Thompson Peak Parkway and is approximately 4,700 feet in length. This reach was analyzed with a 100-year peak discharge of 11,254 cfs at Cross Canyon Way and 11,901 cfs at Thompson Peak Parkway as identified in the *Hydrologic Memorandum* (Reference 1).

  The northern segment of this reach is approximately 2,000 feet in length and does not have the capacity to contain and convey the 100-year peak discharge within the property where the City has land rights. Flow breaks out both west and southwesterly along this segment and encroaches into several privately owned parcels near Cross Canyon Way.

  Three potential conveyance options were initially developed for the northern segments of this reach including: a concrete 'U' channel, a grouted rock trapezoidal channel and a covered concrete box culvert. Although minimizing the drainage system footprint and disturbance area as well as achieving an aesthetic acceptable solution are important considerations, all of the solutions mentioned above can be implemented to convey the FEMA compliant peak discharge through this segment of the reach.

  As with the downstream segment of Reach 2, the recommended conveyance system in the northern segment of Reach 3 is an incised grouted rock trapezoidal channel with an 80 foot bottom width and 2:1 side slopes. This segment of the system has milder slopes than the upstream reaches and drops were not required to achieve acceptable velocities. The proposed condition slopes are between 2.5 and 4.0 % and the maximum velocities are 20 feet/second.

  The southern segment of the reach has containment for the most part, but the existing condition floodplain does encroach into some residential lots along the west bank north of Thompson Peak Parkway. Buried bank protection measures are recommended for this segment to address existing and future floodplain encroachments into private property. Since the velocities within this reach are high, up to 18 feet/second, these bank protection measures would mitigate the potential for lateral migration of the wash onto private property. The proposed buried bank protection would be high enough to provide containment based on the proposed condition water surface elevation and deep enough to address the calculated potential scour depth.

  There is existing buried bank protection along the east bank north of Thompson Peak Parkway. Since as-built plans were not available for these improvements, design plans were used for estimating the existing bank protection depth. Based

on the design plans, it appears that some portions of the existing bank protection may not have sufficient depth to address the calculated potential scour depths as identified in the *Sediment Transport and Local Scour Assessment* (Reference 9). Improvements to the existing buried bank protection may be required to achieve sufficient scour protection. However, it is recommended that additional field investigation should be performed prior to project final design to determine if the actual depth of existing bank protection is sufficient.

The recommended solution for improving the buried bank protection, where it is found to be of insufficient depth, is to construct a narrow width trench at the toe of the existing bank protection to a depth sufficient to meet the calculated potential scour depth and to fill the trench with pneumatically placed mortar. The recommended solution cross sections are shown on *Figure 3 - Reach 3 Typical Sections.*

The benefits of the recommended solution for this segment of the reach is that it can be constructed within the limits where the City has land rights, is considered context sensitive, favorable to wildlife, has a reasonable maintenance cost and costs less than the other two options considered.

- **Reach 4:** Reach 4 extends from Thompson Peak Parkway to Bell Road and is approximately 12,300 feet in length. This reach was analyzed with a peak flow of 11,901 cfs at Thompson Peak Parkway, 12,338 cfs at the confluence with North Beardsley Wash, 11,870 cfs at Legacy Boulevard and 15,842 cfs at the confluence with South Beardsley Wash and Thompson Peak Wash immediately upstream of Bell Road as identified in the *Hydrologic Memorandum* (Reference 1).

  The peak discharge is contained within City land rights along this entire reach with the exception of a narrow encroachment along the DC Ranch Park on the east side of Reata Wash south of Thompson Peak Parkway. The floodplain shown on *Exhibit 1* for the reach between Thompson Peak Parkway and Bell Road is based on the effective floodplains as delineated in the recent Letters of Map Revision for DC Ranch (Reference 5) and Windgate Ranch (Reference 6). For the remainder of the reach, the floodplain shown is based on the proposed condition modeling.

  Development has occurred along a majority of this reach which has resulted in significant existing drainage control infrastructure including buried bank protection, grade control structures and levees along the majority of the reach. The two segments along this reach where bank protection does not exist include the segment immediately south of Thompson Peak Parkway on both the east and west banks and along the west bank adjacent to DC Ranch Park. New bank

protection is not recommended in this study at either of these locations. Potential future channel migration at these locations would not jeopardize any structures and the cost to repair damage due to channel migration would be minimal and, at the park site, incidental to ongoing park maintenance. If the parcels immediately south of Thompson Peak Parkway are developed in the future, the need for bank protection can be revisited by the parcel developer.

Since as-built plans were only available for the existing buried bank protection for one parcel within the project limits, design plans were used for estimating the bank protection depth. Based on the design plans, the existing bank protection along several segments of the west bank (DC Ranch Parcels 2.17, 2.18, 2.19, 1.11 and La Reggia) and east bank (DC Ranch Parcel T7 and Windgate Ranch Phase 2) appears to indicate that some portions of the existing bank protection may not have sufficient depth to address the calculated potential scour depths as identified in the *Sediment Transport and Local Scour Assessment* (Reference 9). Improvements to the existing buried bank protection may be required to achieve sufficient scour protection. However, it is recommended that additional field investigation should be performed prior to project final design to determine if the actual depth of existing bank protection is sufficient. It should be noted that the apparent scour depth protection deficiency is nominal (less than 1 foot) for significant lengths of the segments thought to be deficient. Since the calculated potential scour depth includes a factor of safety of 1.3, the length of the required improvements/amendments may be significantly reduced during final design if a slightly lower safety factor is found to be acceptable to the design team.

The recommended approach for addressing deficiencies the existing buried bank protection due to insufficient depth is to construct a narrow width trench at the toe of the existing bank protection to a depth sufficient to meet the calculated potential scour depth and install pneumatically placed mortar.

The benefits of the recommended solution for this segment of the reach is that it can be constructed within City land rights, it is considered context sensitive, favorable to wildlife and has a reasonable maintenance cost.

Several existing embankments (potential levees) along the west bank within this reach (La Reggia, Sera Brisa, DC Ranch Parcel 1.11 and the Bell Road Bridge levee) have been identified as slightly freeboard deficient based on FEMA levee accreditation requirements (44CFR65.10) as documented in the *Levee Identification and Assessment Memorandum* (Reference 7). Increased levee heights and localized channel grading are recommended improvements at these locations to meet levee freeboard requirements. The cross sections for the

recommended buried bank protection and levee/embankment improvements are shown on *Figure 4 - Reach 4 Typical Sections.*

There are three locations within this reach where existing culverts convey low flows from Reata Wash to the southwest into washes that may meet the requirements of being designated as Clean Waters Act (CWA) Section 404 washes; however, no reduction in peak discharges have been applied to the Reata Wash study corridor downstream of these culverts.

The proposed improvements will require the relocation of an existing 8 inch waterline crossing Reata Wash within a utility easement located just north of Bell Road.

- **Reach 5:** Reach 5 extends from Bell Road to just south of McDowell Mountain Ranch Road within the Bureau of Reclamation (BOR) land and is approximately 3,800 feet in length. This reach was analyzed with a peak flow of 15,842 cfs as identified in the *Hydrologic Memorandum (Reference 1).*

  Downstream of the Bell Road Bridge, the peak discharge exceeds the conveyance capacity of the existing limited in size channel and the floodplain spreads out over a large unconfined path well beyond the limits of City land rights.

  Three potential conveyance options were initially developed for this reach including: a concrete trapezoidal channel, a grouted rock trapezoidal channel and an earthen trapezoidal channel with buried bank protection. All of the solutions mentioned above can be implemented to convey the FEMA compliant peak discharge through this segment of the reach.

  The recommended solution to contain and convey the 100-year peak discharge within this reach is an incised earthen trapezoidal channel with buried bank protection, a 200 foot bottom width and 3:1 side slopes from the Bell Road Bridge to the McDowell Mountain Ranch Road Bridge. The average proposed condition slope within this reach is approximately 1.4% and the average proposed condition velocity is approximately 14 feet/second. The recommended solution cross section is shown on *Figure 5 - Reach 5 Typical Sections.*

  An incised earthen channel was constructed with the McDowell Mountain Ranch Road Bridge improvements to allow flows to be collected and conveyed under the bridge and into the downstream BOR, Reach11, Basin 4. A concrete drop structure is proposed as part of the recommended solution near the upstream end of the existing earthen channel approximately 900 feet north of the

McDowell Mountain Ranch Road Bridge. The proposed improvements will require the relocation of an existing 8 inch non-potable waterline and 24 inch sanitary sewer line to immediately upstream of the proposed drop structure.

A 4 foot high concrete sill will be constructed immediately upstream of the McDowell Mountain Ranch Road Bridge to provide a sediment basin between the concrete drop structure and the bridge. It should be noted that providing a sediment basin to accommodate a less frequent (25, 50 or 100-year) storm events is not feasible at this location. The anticipated sediment yield from the watershed is 4.7 acre-feet/year based on a 0.24 acre-feet/square mile/year as documented in the *Sediment Yield Memorandum (Reference 8)*. Therefore, a sediment basin with approximately 9.1 acre-feet of storage capacity is proposed to handle more frequent storm events.

At the final design stage, a site specific sediment maintenance and basin operations plan should be developed that requires a basin inspection annually and after significant runoff events. A requirement should also be included that requires excess sediment to be removed as needed based on guidelines developed in the plan.

The benefits of the recommended solution are that it is anticipated to have reasonable maintenance costs and is easily inspected for maintenance requirements. This solution is also costs less than a concrete or grouted rock trapezoidal channel. The recommended solution is considered only moderately context sensitive, it is only moderately favorable to wildlife movement and it has a larger footprint than a concrete or grouted rock trapezoidal channel.

5. REFERENCES

1. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix H: JE Fuller Hydrology and Geomorphology, Inc., *Reata Wash Flood Control Improvement Study, Hydrologic Memorandum,* August 31, 2016.

2. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix O: Wood, Patel & Associates, Inc., *Reata Wash Flood Control Improvement Study, Existing Condition Hydraulic Memorandum,* August 31, 2016.

3. Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona, Hydraulics, August 2013.

4. U.S. Army Corps of Engineers, HEC-RAS Computer Program, Version 4.1.0, Hydrologic Engineering Center, January 2010.

5. Federal Emergency Management Agency, Letter of Map Revision, Reata Pass Wash, Case No. 13-09-2520P, Issue Date: January 2, 2014.

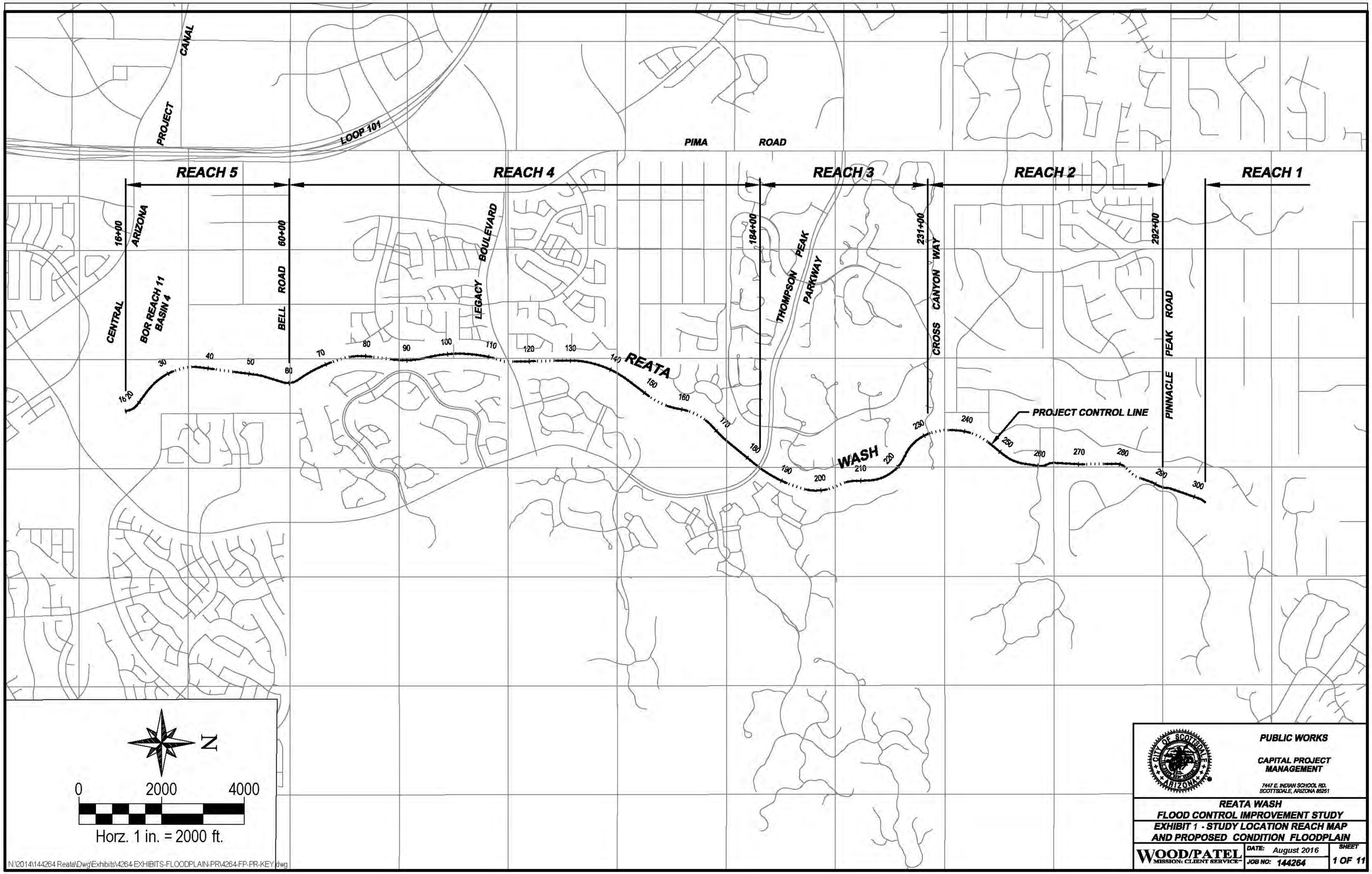
6. Federal Emergency Management Agency, Letter of Map Revision, Reata Pass Wash, Case No. 13-09-2519P, Issue Date: December 26, 2013.

7. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix N: JE Fuller Hydrology and Geomorphology, Inc., *Reata Wash Flood Control Improvement Study, Levee Identification and Assessment,* August 31, 2016.

8. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix K: JE Fuller Hydrology and Geomorphology, Inc., *Reata Wash Flood Control Improvement Study, Sediment Yield,* August 31, 2016.

9. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix M: JE Fuller Hydrology and Geomorphology, Inc., *Reata Wash Flood Control Improvement Study, Sediment and Stable Channel Assessment: Sediment Transport and Local Scour Assessment,* August 31, 2016.

EXHIBIT 1
Study Location and Reach Map and Proposed Condition Floodplain



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CITY OF SCOTTSDALE ARIZONA

PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

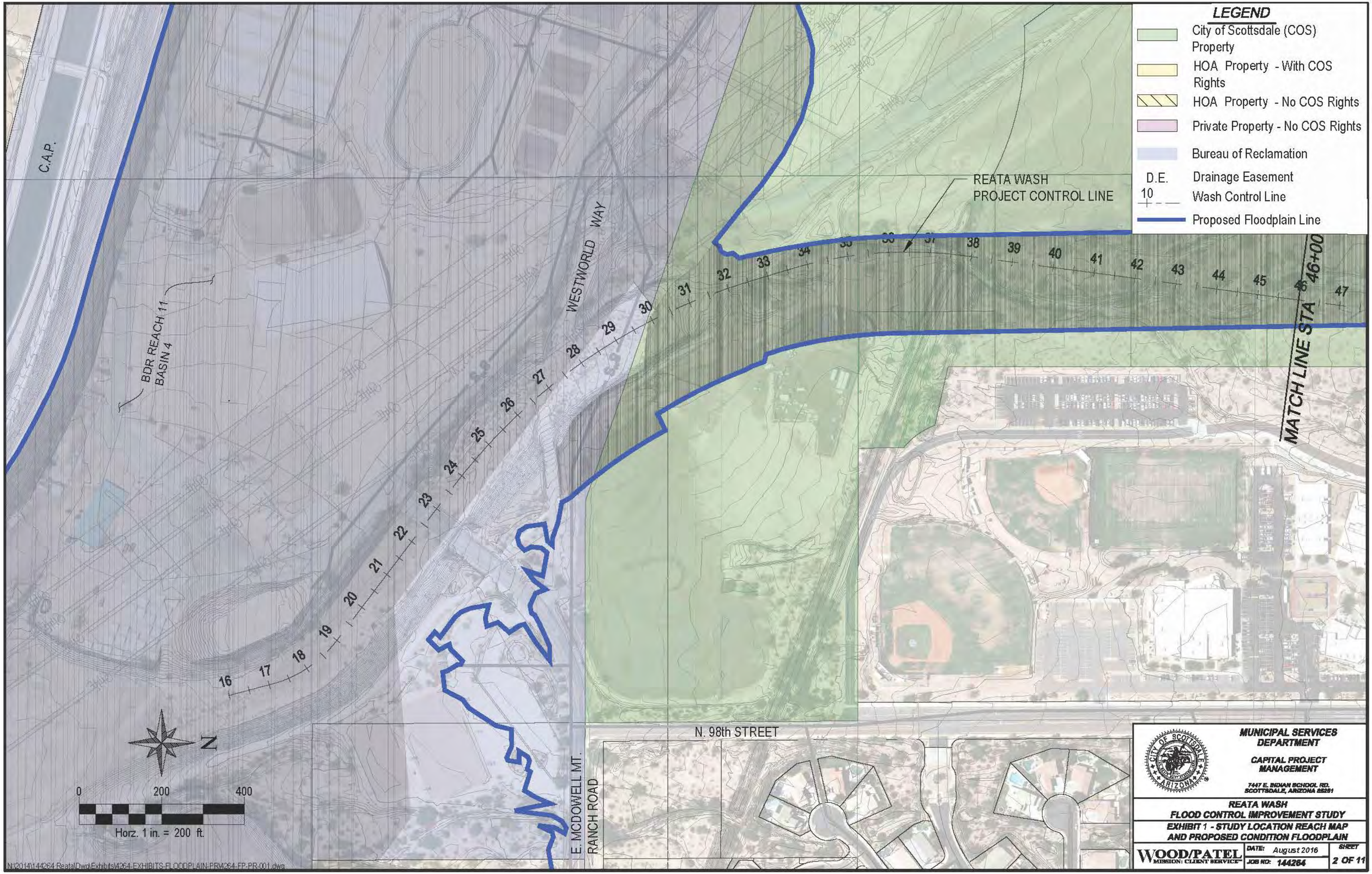
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN

WOOD/PATEL
MISSION: CLIENT SERVICE™

DATE: August 2016

JOB NO: 144264

SHEET 1 OF 11



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CITY OF SCOTTSDALE ARIZONA

MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN

WOOD/PATEL
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DATE: August 2016
JOB NO: 144264
SHEET 2 OF 11

LEGEND

- City of Scottsdale (COS) Property
- HOA Property - With COS Rights
- HOA Property - No COS Rights
- Private Property - No COS Rights
- Bureau of Reclamation
- D.E. Drainage Easement
- 10 Wash Control Line
- Proposed Floodplain Line

MATCH LINE STA 46+ 00

MATCH LINE STA 75+ 00

REATA WASH
PROJECT CONTROL LINE

BELL ROAD

BELL ROAD
BRIDGE

COS
DE

COS
DE
30' EASEMENT

COS
DE

WINDGATE
RANCH

WINDGATE
RANCH
PH1

WINDGATE
RANCH
PH2

WINDGATE
RANCH
PH1

N

0 200 400

Horz. 1 in. = 200 ft.

N:\2014\144264 Reata\Dwg\Exhibits\4264-EXHIBITS-FLOODPLAIN-PR\4264-FP-PR-002.dwg

CITY OF SCOTTSDALE ARIZONA

MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016
JOB NO: 144264

SHEET
3 OF 11

LEGEND

- City of Scottsdale (COS) Property
- HOA Property - With COS Rights
- HOA Property - No COS Rights
- Private Property - No COS Rights
- Bureau of Reclamation
- D.E. Drainage Easement
- 10 Wash Control Line
- Proposed Floodplain Line

DC RANCH PARCEL 1.11

N. 95TH STEET

N. 96TH STREET

SERA BRISA

COS DE

PRIVATE DE

COS DE

REATA WASH PROJECT CONTROL LINE

MATCH LINE

STA 75+00

STA 102+00

MATCH LINE

COS DE

N. 96TH WAY

N. 96TH WAY

E. PUERTA DEL YIENTO RD.

WINDGATE RANCH PH2

N

0 200 400

Horz. 1 in. = 200 ft.

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REATA WASH
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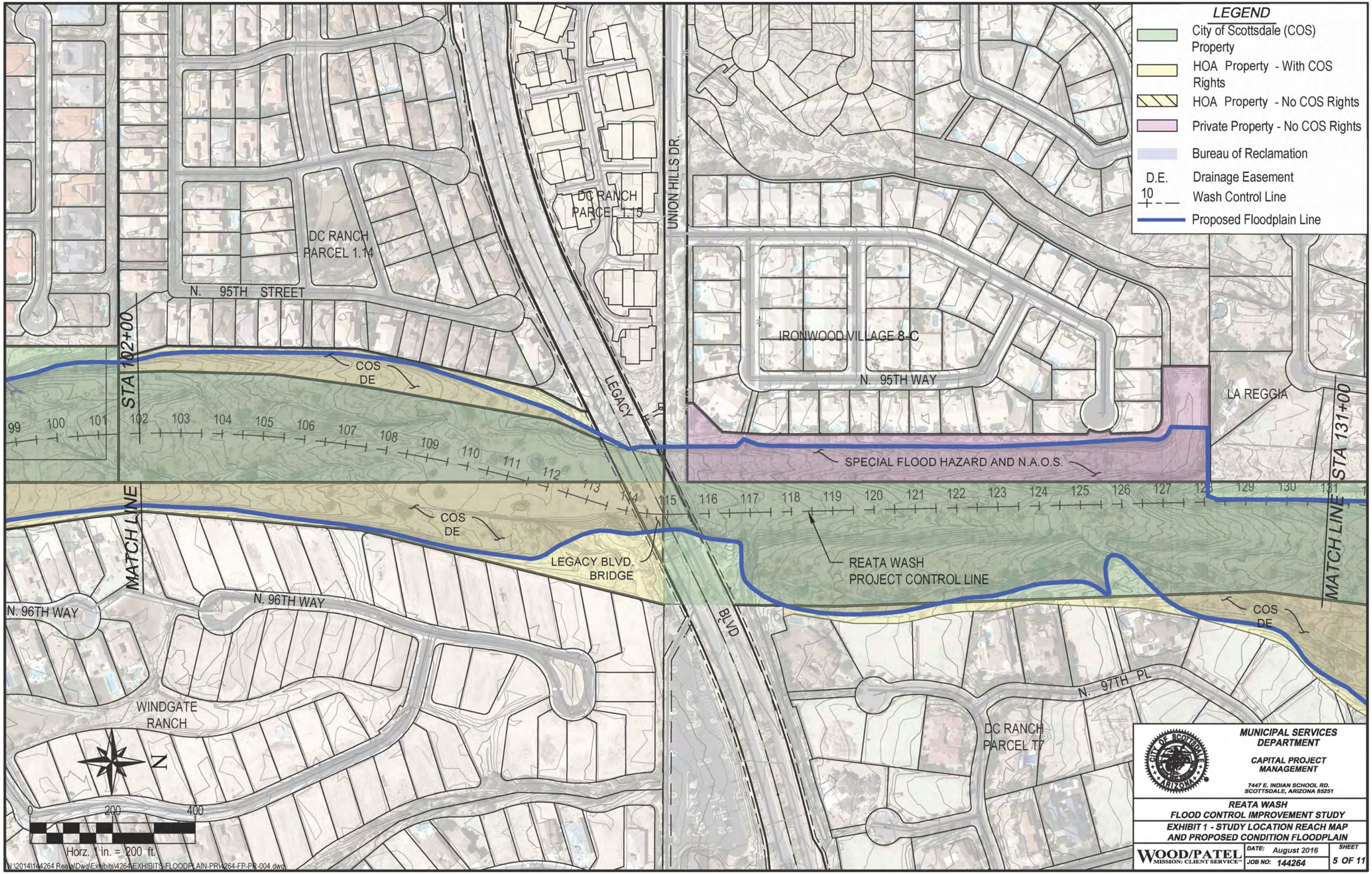
JOB NO: 144264
SHEET 4 OF 11


LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
Proposed Floodplain Line
DC RANCH PARCEL 1.14
DC RANCH PARCEL 1.15
UNION HILLS DR.
N. 95TH STREET
IRONWOOD VILLAGE 8-C
N. 95TH WAY
LA REGGIA
STA 102+00
STA 131+00
COS DE
LEGACY BLVD.
SPECIAL FLOOD HAZARD AND N.A.O.S.
99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
MATCH LINE
COS DE
LEGACY BLVD. BRIDGE
REATA WASH PROJECT CONTROL LINE
MATCH LINE
N. 96TH WAY
N. 96TH WAY
WINDGATE RANCH
BLVD
N. 97TH PL
DC RANCH PARCEL T7
N
0 200 400
Horz. 1 in. = 200 ft.
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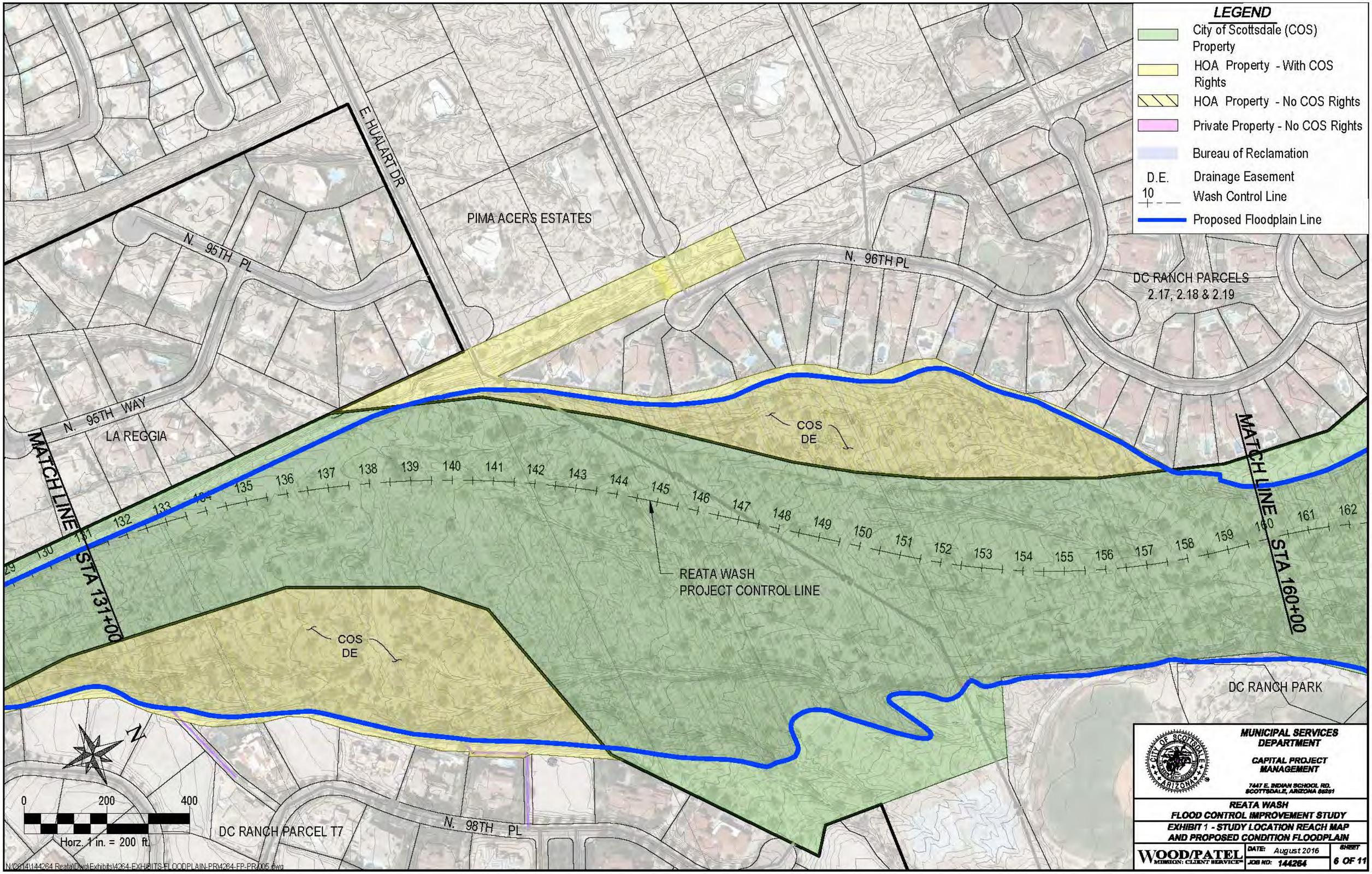
CITY OF SCOTTSDALE ARIZONA
MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN
WOOD/PATEL MISSION: CLIENT SERVICE™
DATE: August 2016
JOB NO: 144264
SHEET 5 OF 11


LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
Proposed Floodplain Line
E. HUALAR DR
PIMA ACERS ESTATES
N. 95TH PL
N. 95TH WAY
LA REGGIA
N. 96TH PL
DC RANCH PARCELS 2.17, 2.18 & 2.19
COS DE
MATCH LINE STA 131+00
MATCH LINE STA 160+00
REATA WASH PROJECT CONTROL LINE
COS DE
DC RANCH PARK
DC RANCH PARCEL T7
N. 98TH PL
N
0 200 400
Horz. 1 in. = 200 ft.
MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
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WOOD/PATEL
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DATE: August 2016
JOB NO: 144264
SHEET 6 OF 11
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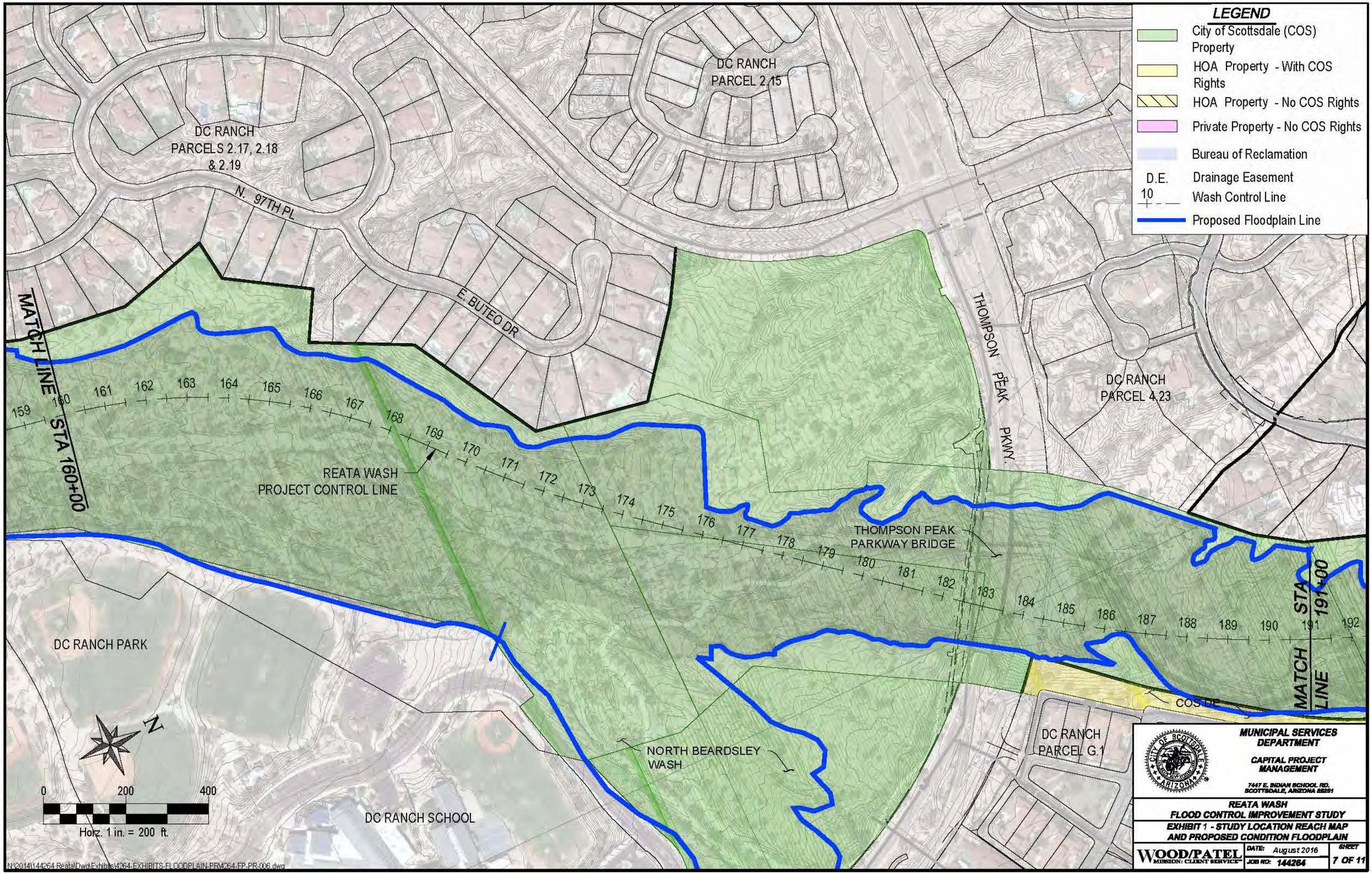
LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
Proposed Floodplain Line
DC RANCH PARCELS 2.17, 2.18 & 2.19
DC RANCH PARCEL 2.15
N. 97TH PL
E. BUTEO DR
MATCH LINE STA 160+00
159
160
161
162
163
164
165
166
167
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176
177
178
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189
190
191
192
REATA WASH PROJECT CONTROL LINE
THOMPSON PEAK PKWY.
DC RANCH PARCEL 4.23
THOMPSON PEAK PARKWAY BRIDGE
MATCH LINE STA 191+00
COS DE
DC RANCH PARK
DC RANCH SCHOOL
NORTH BEARDSLEY WASH
DC RANCH PARCEL G.1
N
0
200
400
Horz. 1 in. = 200 ft.
MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN
WOOD/PATEL
MISSION: CLIENT SERVICE
DATE: August 2016
JOB NO: 144264
SHEET 7 OF 11
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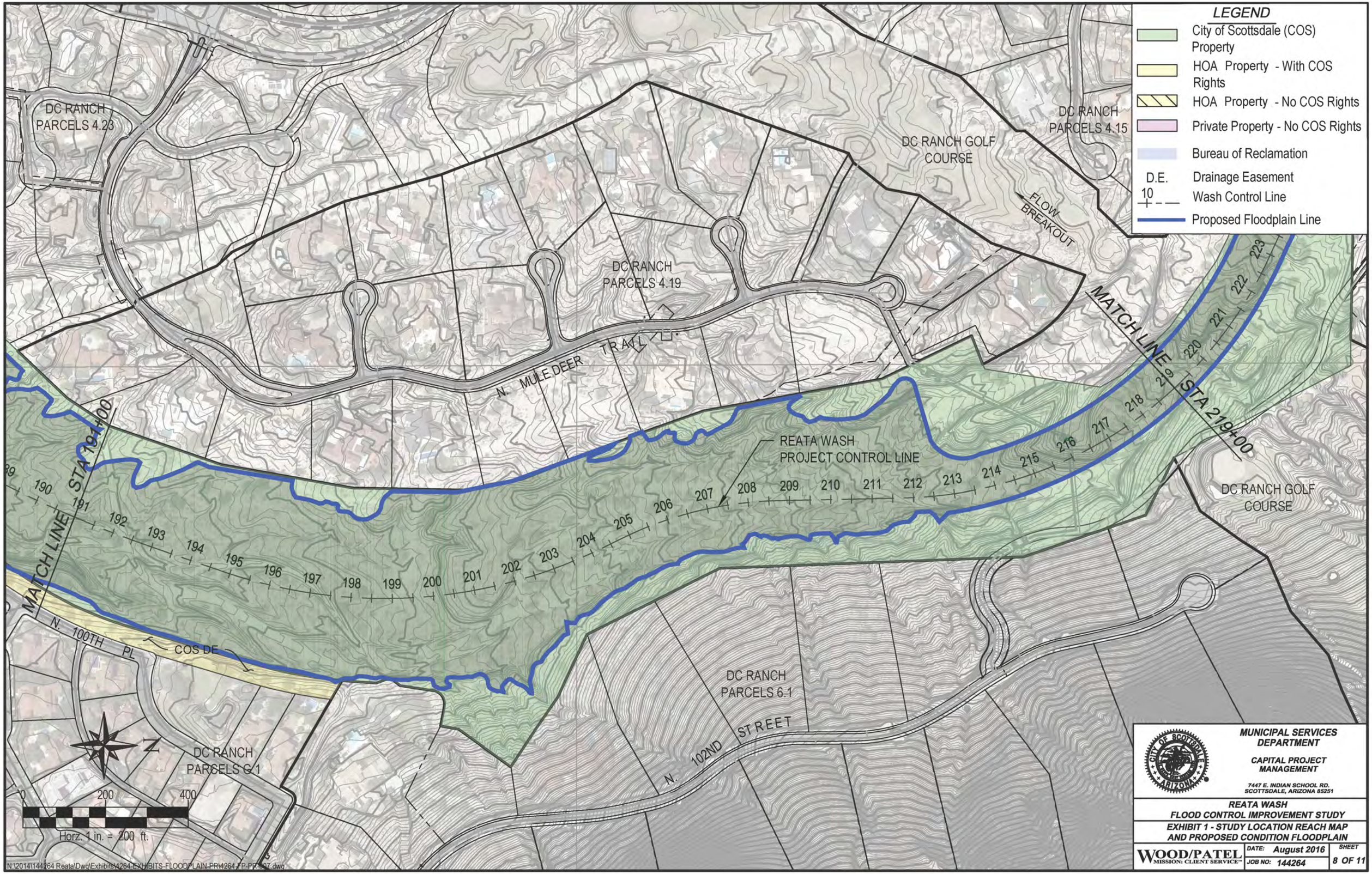

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CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN

WOOD/PATEL
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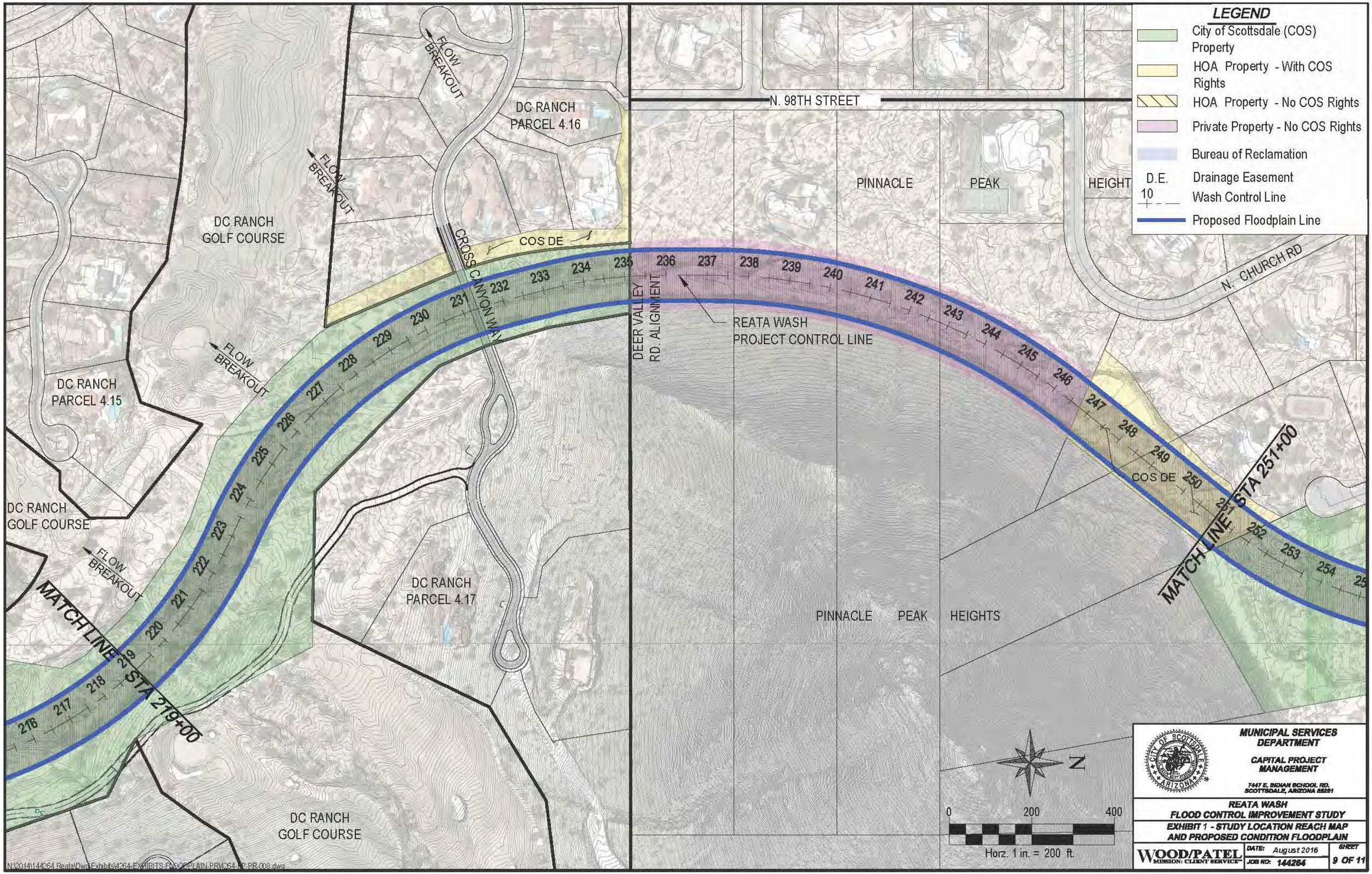
DATE: August 2016
JOB NO: 144264


LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
Proposed Floodplain Line
N. 98TH STREET
N. CHURCH RD
DC RANCH PARCEL 4.16
DC RANCH GOLF COURSE
DC RANCH PARCEL 4.15
DC RANCH PARCEL 4.17
DC RANCH GOLF COURSE
DC RANCH GOLF COURSE
FLOW BREAKOUT
FLOW BREAKOUT
FLOW BREAKOUT
FLOW BREAKOUT
CROSS CANYON WAY
DEER VALLEY RD. ALIGNMENT
COS DE
COS DE
REATA WASH PROJECT CONTROL LINE
MATCH LINE STA 219+00
MATCH LINE STA 251+00
PINNACLE PEAK HEIGHTS
PINNACLE PEAK
N
0 200 400
Horz. 1 in. = 200 ft.
MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN
WOOD/PATEL
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DATE: August 2016
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SHEET 9 OF 11
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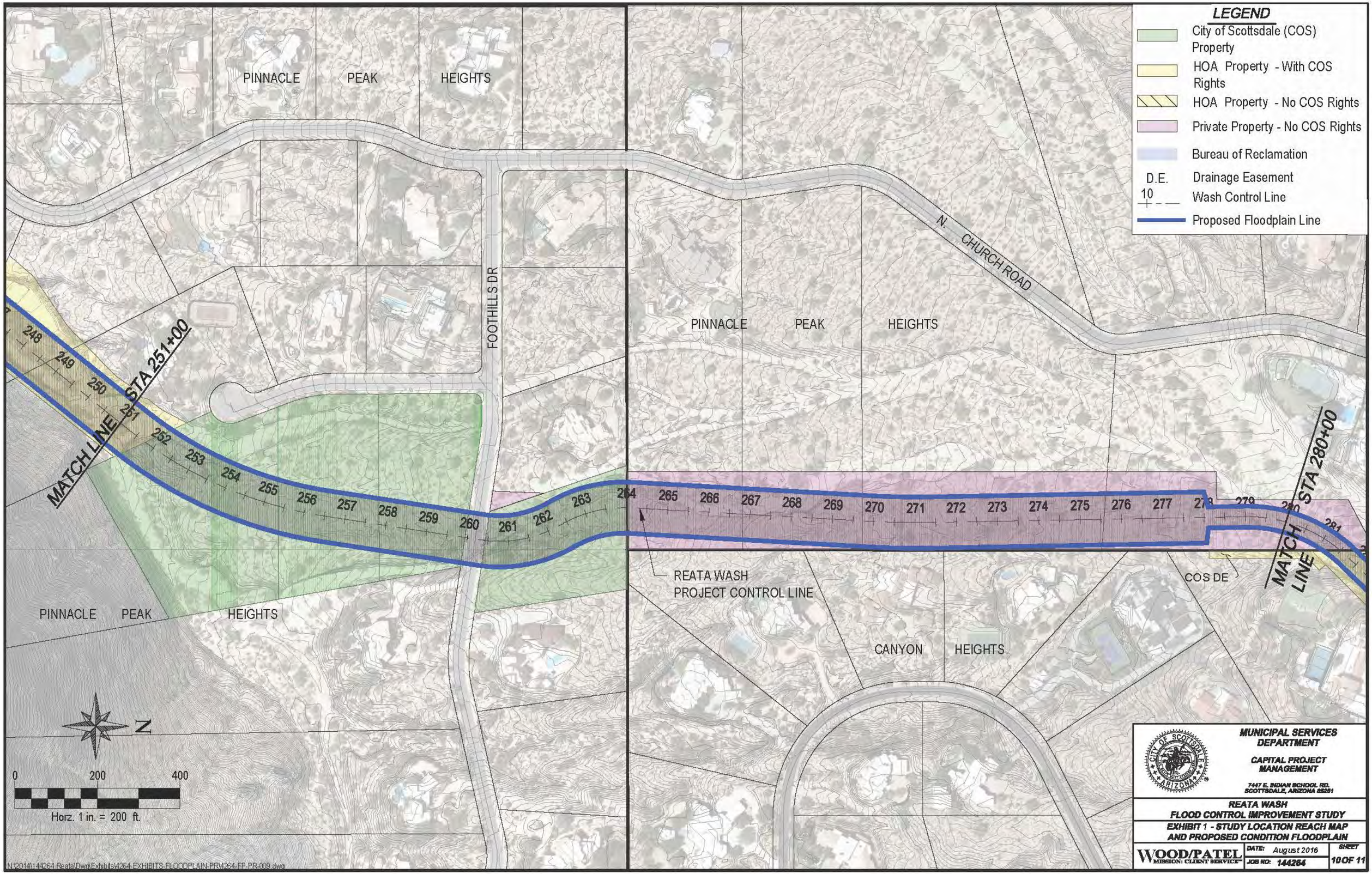
LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
Proposed Floodplain Line
PINNACLE PEAK HEIGHTS
FOOTHILLS DR
N. CHURCH ROAD
STA 251+00
MATCH LINE
STA 280+00
MATCH LINE
REATA WASH
PROJECT CONTROL LINE
COS DE
CANYON HEIGHTS
248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 279 280 281
N
0 200 400
Horz. 1 in. = 200 ft.
MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1 - STUDY LOCATION REACH MAP
AND PROPOSED CONDITION FLOODPLAIN
WOOD/PATEL
MISSION: CLIENT SERVICE
DATE: August 2016
JOB NO: 144264
SHEET
10 OF 11
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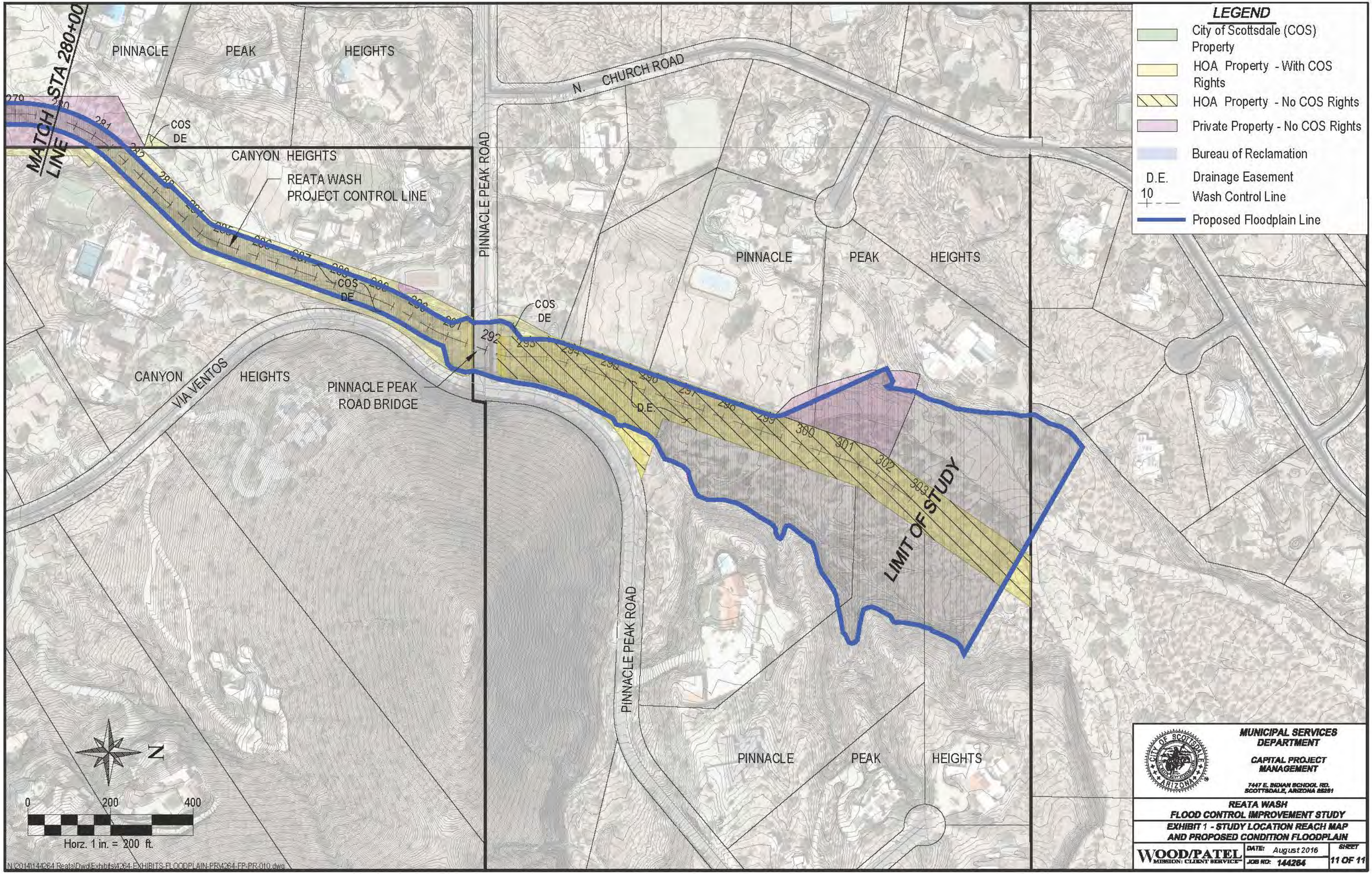

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CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1 - STUDY LOCATION REACH MAP AND PROPOSED CONDITION FLOODPLAIN

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016

JOB NO: 144264

SHEET 11 OF 11

EXHIBIT 2
HEC-RAS Hydraulic Cross Sections and Proposed Condition Peak Discharges

REACH 5

REACH 4

REACH 3

REACH 2

REACH 1

PROJECT

CANAL

LOOP 101

PIMA ROAD

CENTRAL ARIZONA

BOR REACH 11 BASIN 4

BELL ROAD

LEGACY BOULEVARD

THOMPSON PEAK PARKWAY

CROSS CANYON WAY

PEAK PARKWAY

PINNACLE PEAK ROAD

16+00

60+00

184+00

231+00

292+00

BELL ROAD BRIDGE
Q_{100} = 15,842 cfs

LEGACY BLVD. BRIDGE
Q_{100} = 11,870 cfs

Q_{100} = 12,026 cfs

Q_{100} = 12,182 cfs

Q_{100} = 12,338 cfs

THOMPSON PEAK PARKWAY BRIDGE
Q_{100} = 11,254 cfs

Q_{100} = 11,901 cfs

Q_{100} = 11,340 cfs

Q_{100} = 10,880 cfs

Q_{100} = 2,000 cfs
DOBSON WASH

PROJECT CONTROL LINE

PINNACLE PEAK PARKWAY BRIDGE
Q_{100} = 13,015 cfs

REATA WASH

STA. 20+00
STA. 30+00
STA. 40+00
STA. 50+00
STA. 60+00
STA. 70+00
STA. 80+00
STA. 90+00
STA. 100+00
STA. 110+00
STA. 120+00
STA. 130+00
STA. 140+00
STA. 150+00
STA. 160+00
STA. 170+00
STA. 180+00
STA. 190+00
STA. 200+00
STA. 210+00
STA. 220+00
STA. 230+00
STA. 240+00
STA. 250+00
STA. 260+00
STA. 270+00
STA. 280+00
STA. 290+00
STA. 300+00
STA. 305+00

NORTH BEARDSLEY WASH

STREAM 2A

STREAM 2B

SOUTH BEARDSLEY WASH

SOUTH BEARDSLEY WASH BREAKOUT

N

0 2000 4000

Horz. 1 in. = 2000 ft.

N:\2014\144264 Reata\Dwg\Exhibits\4264-Exhibit 3-HEC-RAS Proposed Cross Sections-Peak Discharges1.dwg

PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 2 - HEC-RAS CROSS SECTION LOCATIONS & PROPOSED CONDITION PEAK DISCHARGES

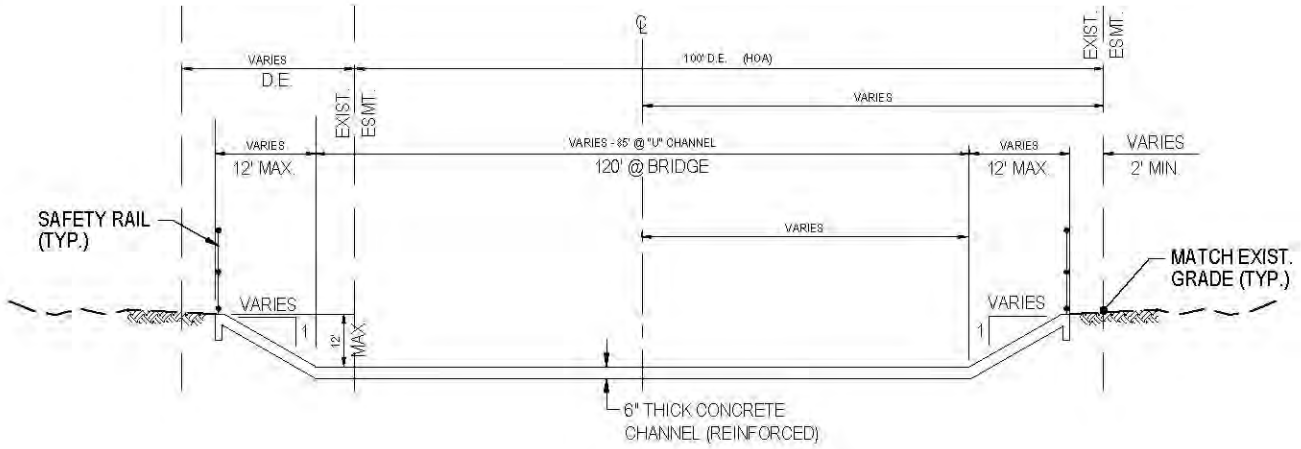
WOOD/PATEL
MISSION: CLIENT SERVICE™

DATE: August 2016

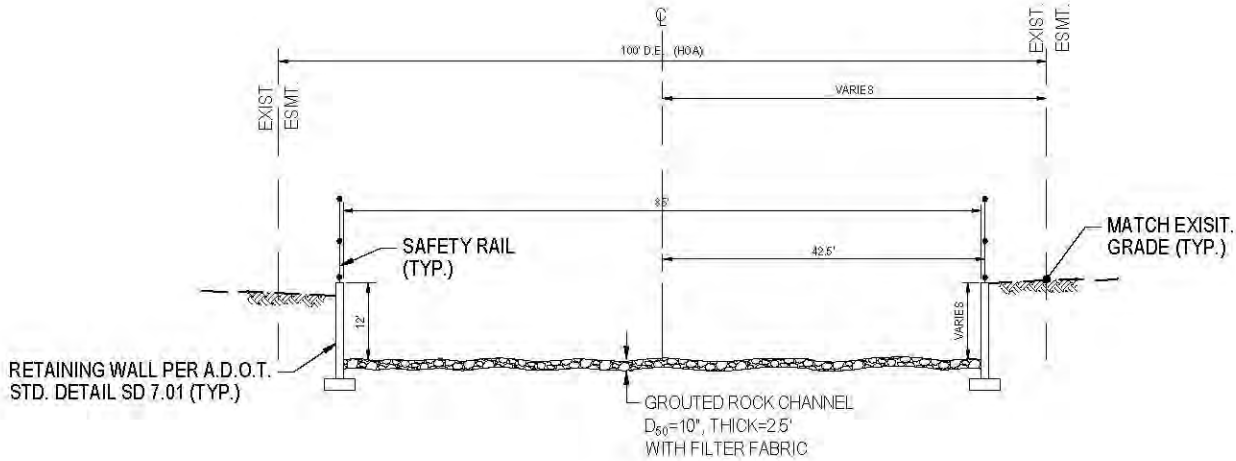
JOB NO: 144264

SHEET 1 OF 1

FIGURE 1
Reach 1 Typical Sections



CONCRETE CHANNEL TRANSITION
STA 292+10 TO STA 293+00
(NOT TO SCALE)



"U" CHANNEL CONCRETE WALL & GROUTED ROCK INVERT
STA 293+00 TO STA 299+00
(NOT TO SCALE)

FIGURE 1
REATA WASH – REACH 1
TYPICAL SECTIONS

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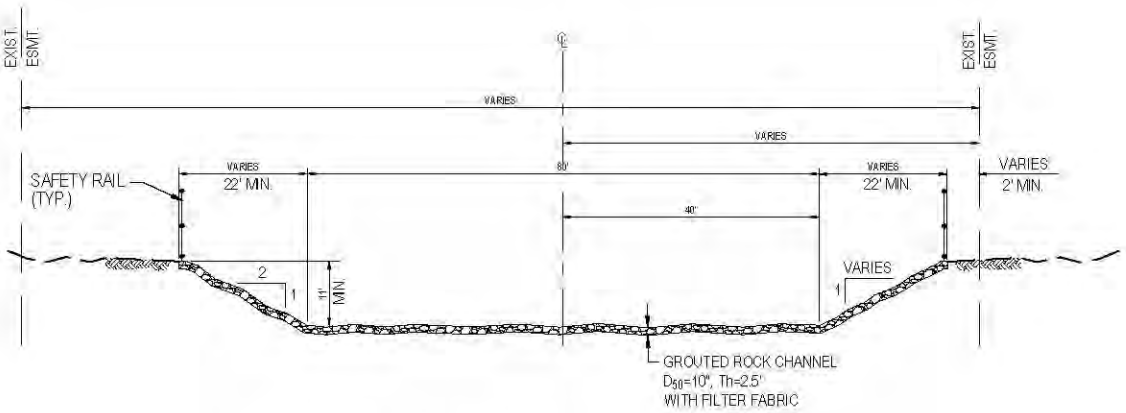
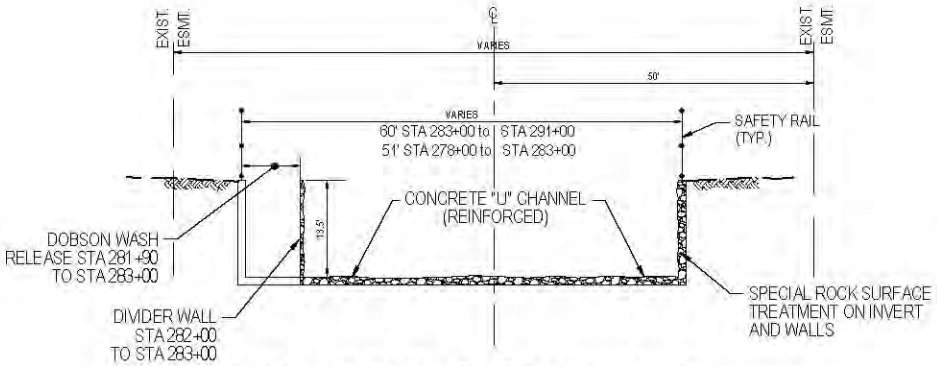
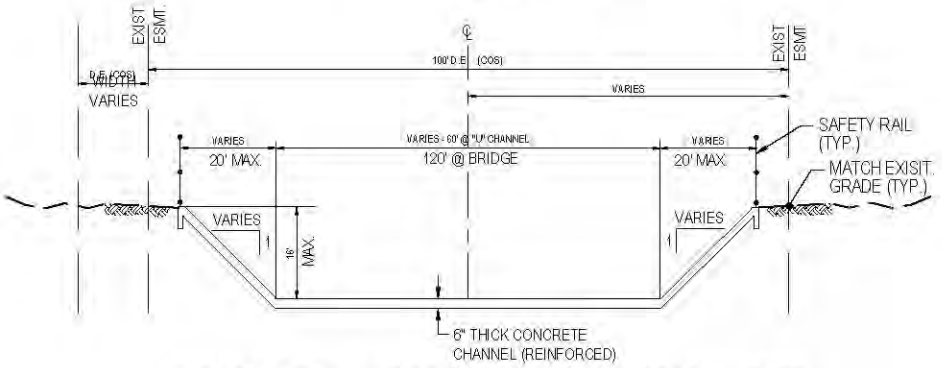
FIGURE 2
Reach 2 Typical Sections



GROUTED ROCK CHANNEL
STA 231+00 TO STA 278+00
(NOT TO SCALE)



CONCRETE "U" CHANNEL
STA 278+00 TO STA 291+00
(NOT TO SCALE)



CONCRETE CHANNEL TRANSITION
STA 291+00 TO STA 291+65
(NOT TO SCALE)

FIGURE 2
REATA WASH – REACH 2
TYPICAL SECTIONS

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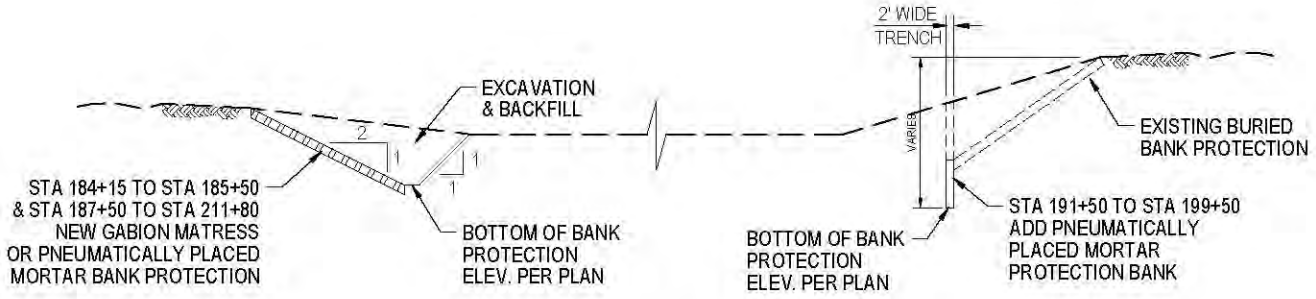
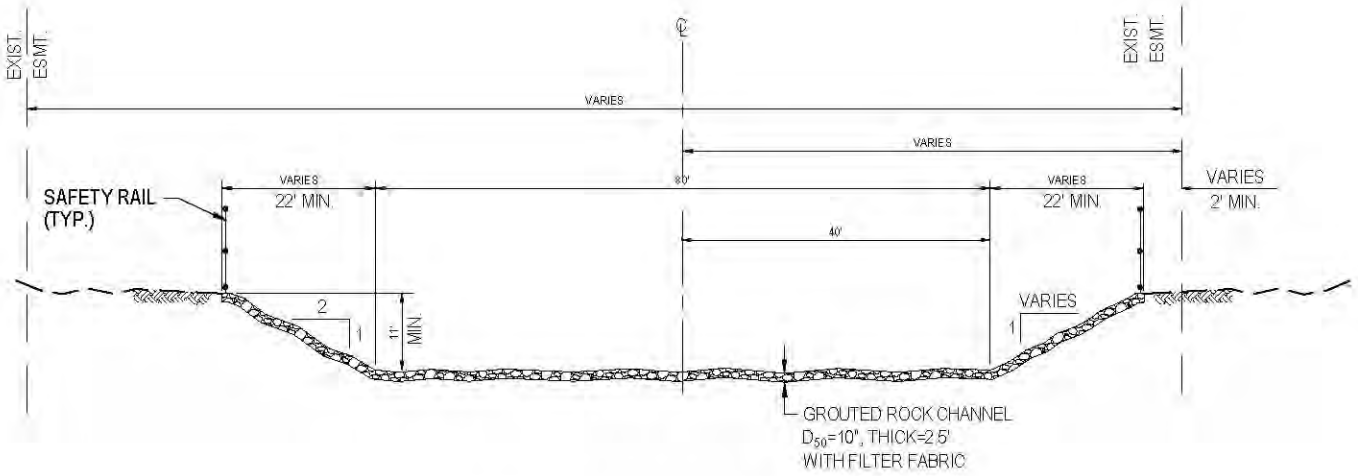
FIGURE 3
Reach 3 Typical Sections



NATURAL CHANNEL WITH BURIED BANK PROTECTION STA 184+15 TO STA 211+80

(NOT TO SCALE)



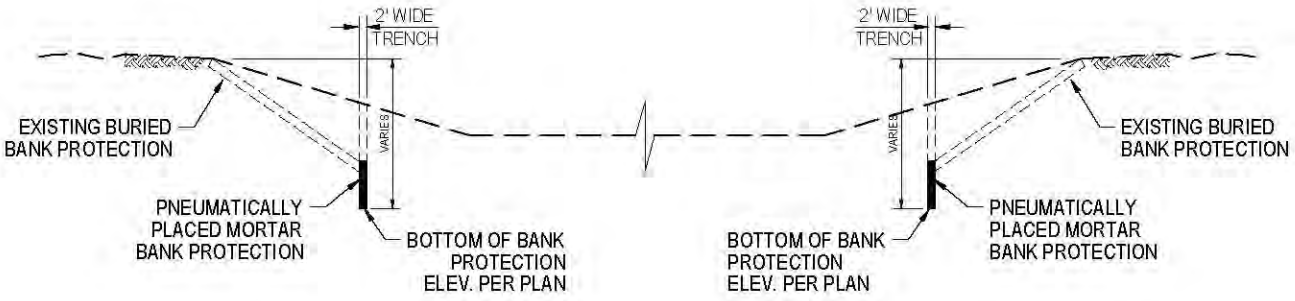
GROUTED ROCK CHANNEL STA 213+00 TO STA 231+00

(NOT TO SCALE)

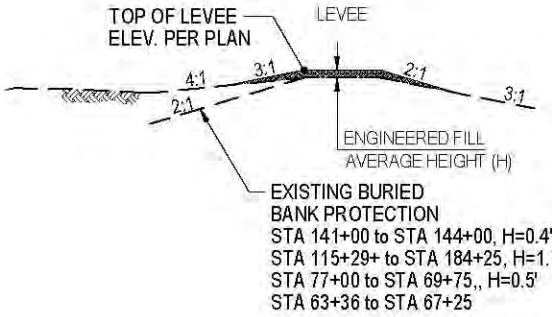
FIGURE 3
REATA WASH – REACH 3
TYPICAL SECTIONS

N:\2014\144264 Reata\Dwg\mp\4264-004-TS.dwg

FIGURE 4
Reach 4 Typical Sections



NATURAL CHANNEL
WITH BURIED BANK PROTECTION
STA 60+70 TO STA 184+15

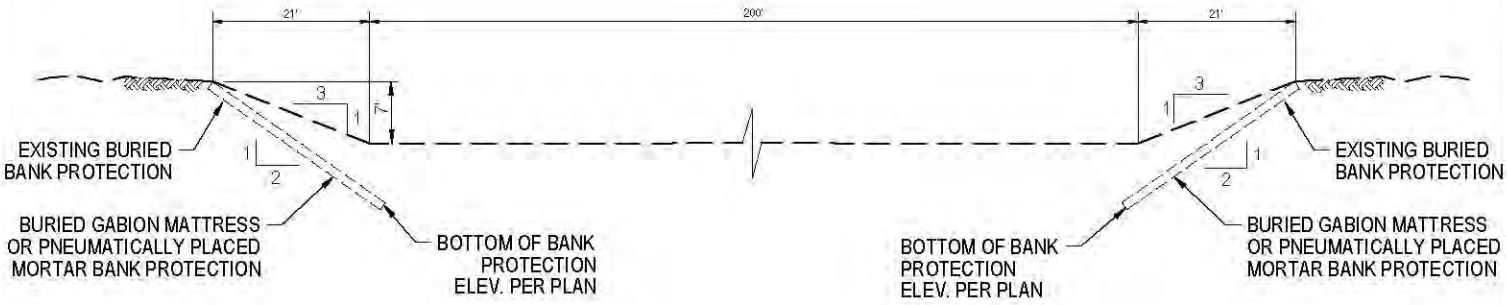


NATURAL CHANNEL
LEVEE/ EMBANKMENT IMPROVEMENTS
(WESTBANK)
STA 63+36 TO STA 144+00

FIGURE 4
REATA WASH – REACH 4
TYPICAL SECTIONS

N:\2014\144264 Reata\Dwg\mp\4264-005-TS.dwg

FIGURE 5
Reach 5 Typical Sections



REATA WASH – REACH 1
TYPICAL SECTIONS

FIGURE 5
REATA WASH – REACH 5
TYPICAL SECTIONS

N:\2014\144264 Reata\Dwg\mp\4264-005-TS.dwg

FIGURE 6
Dobson Wash Release

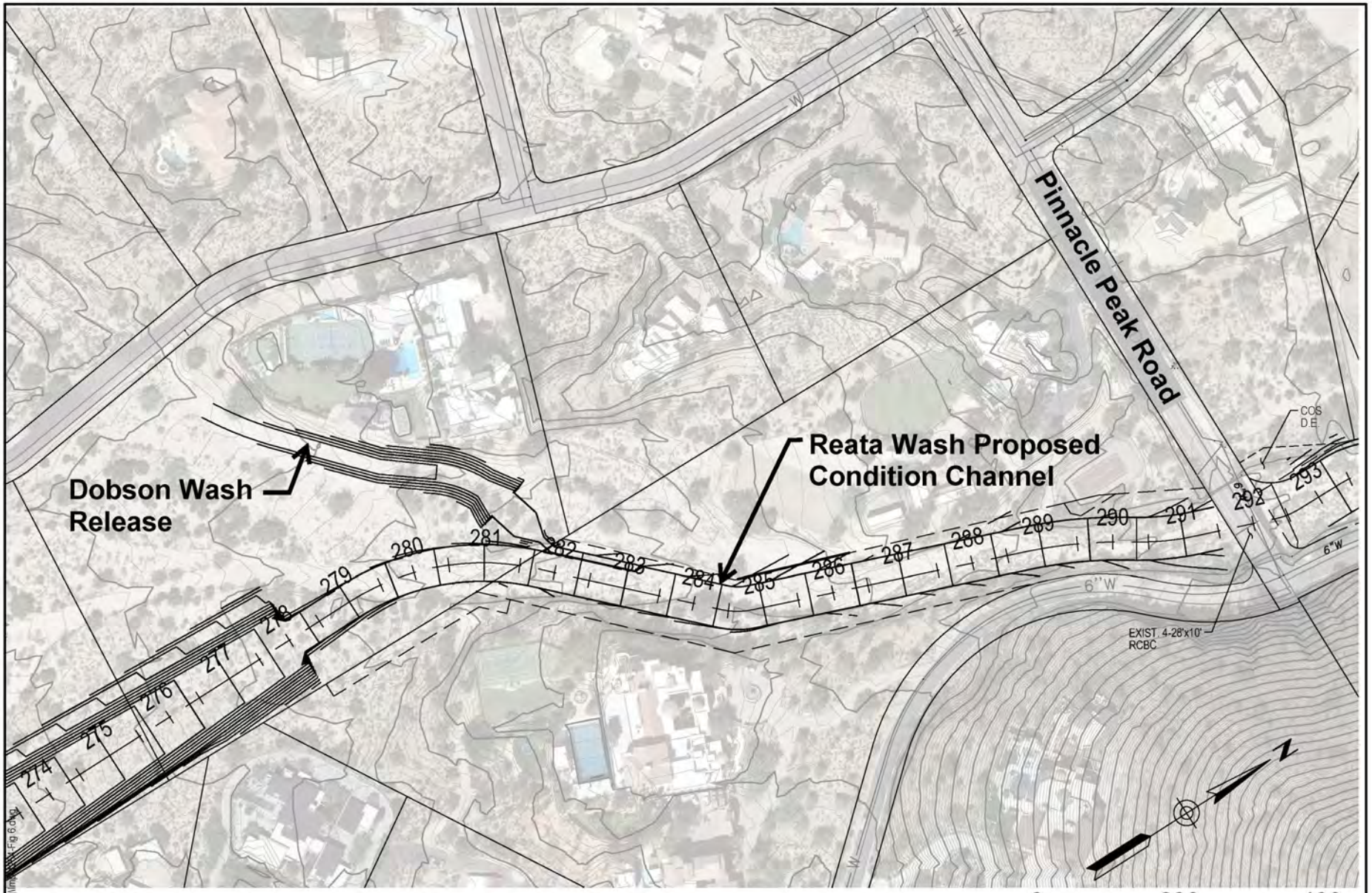


FIGURE 6
DOBSON WASH RELEASE

APPENDIX A
HEC-RAS Output Tables

HEC-RAS Plan: 4264-U CHNL River: REATA WASH Reach: 4264-010-CL Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
4264-010-CL	30600	PF 1	13015.00	2220.11	2225.66	2225.66	2226.96	0.013183	9.16	1420.84	548.43	1.00
4264-010-CL	30500	PF 1	13015.00	2215.87	2222.62	2222.62	2223.94	0.013344	9.21	1414.95	552.91	1.01
4264-010-CL	30400	PF 1	13015.00	2213.08	2219.27	2219.27	2220.57	0.013590	9.13	1425.74	566.90	1.01
4264-010-CL	30300	PF 1	13015.00	2210.78	2215.64	2215.64	2216.86	0.013590	8.88	1465.79	607.54	1.01
4264-010-CL	30200	PF 1	13015.00	2207.14	2212.91	2212.91	2214.29	0.013146	9.43	1380.31	507.69	1.01
4264-010-CL	30100	PF 1	13015.00	2203.42	2210.13	2210.13	2211.60	0.012998	9.73	1337.86	470.16	1.01
4264-010-CL	30000	PF 1	13015.00	2200.91	2206.16	2206.16	2208.13	0.010198	12.42	1292.88	319.40	0.96
4264-010-CL	29900	PF 1	13015.00	2190.99	2201.29	2201.29	2204.16	0.008303	14.00	1090.42	227.16	0.77
4264-010-CL	29800	PF 1	13015.00	2187.99	2198.04	2198.04	2201.39	0.009740	14.88	970.71	217.52	0.83
4264-010-CL	29750	PF 1	13015.00	2186.50	2195.77	2195.77	2199.97	0.013086	16.46	805.80	127.80	0.95
4264-010-CL	29700	PF 1	13015.00	2184.99	2194.30	2194.30	2198.47	0.012968	16.41	808.94	127.63	0.95
4264-010-CL	29600	PF 1	13015.00	2181.99	2190.63	2190.63	2194.00	0.011777	15.49	942.60	138.79	0.93
4264-010-CL	29500	PF 1	13015.00	2178.99	2187.81	2187.81	2191.40	0.011849	15.76	904.93	125.77	0.94
4264-010-CL	29400	PF 1	13015.00	2177.24	2186.04	2186.04	2189.83	0.012203	16.10	871.12	118.17	0.96
4264-010-CL	29310	PF 1	13015.00	2175.68	2184.55	2184.55	2188.58	0.012476	16.42	837.14	107.24	0.97
4264-010-CL	29250	PF 1	13015.00	2174.74	2183.80		2185.85	0.001037	11.47	1134.32	147.11	0.73
4264-010-CL	29210.84	PF 1	13015.00	2174.00	2183.97	2181.21	2185.73	0.000741	10.66	1223.34	134.53	0.61
4264-010-CL	29180		Culvert									
4264-010-CL	29168.47	PF 1	13015.00	2173.00	2180.29	2180.29	2183.92	0.002217	15.30	850.83	118.44	1.01
4264-010-CL	29150	PF 1	13015.00	2165.50	2180.30	2174.38	2181.50	0.000317	8.79	1508.24	131.51	0.43
4264-010-CL	29100	PF 1	13015.00	2163.99	2175.34	2175.34	2181.00	0.024094	19.09	681.65	60.23	1.00
4264-010-CL	29000	PF 1	13015.00	2160.88	2172.24	2172.24	2177.90	0.024244	19.10	681.24	60.68	1.00
4264-010-CL	28900	PF 1	13015.00	2158.00	2169.31	2169.31	2175.00	0.024304	19.15	679.67	60.23	1.00
4264-010-CL	28800	PF 1	13015.00	2155.00	2166.31	2166.31	2172.00	0.024280	19.14	679.89	60.23	1.00
4264-010-CL	28700	PF 1	13015.00	2152.00	2163.31	2163.31	2169.00	0.024294	19.15	679.76	60.23	1.00
4264-010-CL	28600	PF 1	13015.00	2149.00	2160.35	2160.35	2166.00	0.024046	19.08	682.78	64.08	1.00
4264-010-CL	28500	PF 1	13015.00	2146.00	2157.32	2157.32	2163.00	0.024220	19.13	680.46	60.23	1.00
4264-010-CL	28400	PF 1	13015.00	2142.98	2154.31	2154.31	2160.00	0.024301	19.15	679.75	60.23	1.00
4264-010-CL	28300	PF 1	11015.00	2139.99	2151.27	2151.27	2156.95	0.025854	19.12	576.22	51.23	1.00
4264-010-CL	28200	PF 1	11015.00	2136.99	2148.27	2148.27	2153.95	0.025841	19.11	576.32	51.23	1.00
4264-010-CL	28100	PF 1	11015.00	2134.00	2145.28	2145.28	2150.95	0.025834	19.11	576.35	51.22	1.00
4264-010-CL	28000	PF 1	11015.00	2130.93	2142.24	2142.24	2147.90	0.025816	19.09	576.88	51.41	1.00
4264-010-CL	27900	PF 1	11015.00	2128.00	2139.27	2139.27	2144.95	0.025862	19.12	576.13	51.23	1.00
4264-010-CL	27800	PF 1	11015.00	2124.98	2132.82	2132.82	2136.19	0.018601	14.72	748.45	111.31	1.00
4264-010-CL	27700	PF 1	11015.00	2122.00	2129.80	2129.80	2133.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27600	PF 1	11015.00	2119.00	2126.80	2126.80	2130.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27500	PF 1	11015.00	2116.00	2123.80	2123.80	2127.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27400	PF 1	11015.00	2113.00	2120.80	2120.80	2124.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27300	PF 1	11015.00	2110.00	2117.80	2117.80	2121.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27200	PF 1	11015.00	2107.00	2114.80	2114.80	2118.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27100	PF 1	11015.00	2104.00	2111.80	2111.80	2115.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	27000	PF 1	11015.00	2101.00	2108.80	2108.80	2112.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26900	PF 1	11015.00	2098.00	2105.80	2105.80	2109.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26885	PF 1	11015.00	2093.00	2100.80	2100.80	2104.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26800	PF 1	11015.00	2090.00	2097.80	2097.80	2101.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26700	PF 1	11015.00	2087.00	2094.80	2094.80	2098.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26600	PF 1	11015.00	2084.00	2091.80	2091.80	2095.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26500	PF 1	11015.00	2081.00	2088.80	2088.80	2092.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26400	PF 1	11015.00	2078.00	2085.80	2085.80	2089.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26300	PF 1	11015.00	2075.00	2082.80	2082.80	2086.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26200	PF 1	11015.00	2072.00	2079.80	2079.80	2083.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26100	PF 1	11015.00	2069.00	2076.80	2076.80	2080.19	0.018795	14.77	745.82	111.21	1.01
4264-010-CL	26000	PF 1	11340.00	2066.00	2073.94	2073.94	2077.39	0.018712	14.89	761.64	111.77	1.01
4264-010-CL	25900	PF 1	11340.00	2063.00	2070.95	2070.95	2074.39	0.018696	14.88	761.85	111.78	1.00
4264-010-CL	25800	PF 1	11340.00	2060.00	2067.94	2067.94	2071.39	0.018718	14.89	761.55	111.77	1.01
4264-010-CL	25700	PF 1	11340.00	2057.00	2064.94	2064.94	2068.39	0.018716	14.89	761.58	111.77	1.01
4264-010-CL	25600	PF 1	11340.00	2054.00	2061.94	2061.94	2065.39	0.018714	14.89	761.61	111.77	1.01
4264-010-CL	25578	PF 1	11340.00	2047.00	2054.94	2054.94	2058.39	0.018712	14.89	761.64	111.77	1.01
4264-010-CL	25500	PF 1	11340.00	2044.00	2051.95	2051.95	2055.39	0.018696	14.88	761.85	111.78	1.00
4264-010-CL	25400	PF 1	11340.00	2041.00	2048.94	2048.94	2052.39	0.018718	14.89	761.55	111.77	1.01
4264-010-CL	25300	PF 1	11340.00	2038.00	2045.94	2045.94	2049.39	0.018716	14.89	761.58	111.77	1.01
4264-010-CL	25200	PF 1	11340.00	2035.00	2042.95	2042.95	2046.39	0.018700	14.89	761.80	111.78	1.00
4264-010-CL	25100	PF 1	11340.00	2032.00	2039.94	2039.94	2043.39	0.018718	14.89	761.55	111.77	1.01
4264-010-CL	25000	PF 1	11340.00	2029.00	2036.94	2036.94	2040.39	0.018713	14.89	761.62	111.77	1.01
4264-010-CL	24900	PF 1	11340.00	2026.00	2033.94	2033.94	2037.39	0.018712	14.89	761.64	111.77	1.01
4264-010-CL	24800	PF 1	11340.00	2023.00	2030.94	2030.94	2034.39	0.018703	14.89	761.76	111.78	1.00
4264-010-CL	24700	PF 1	11340.00	2020.00	2027.94	2027.94	2031.39	0.018714	14.89	761.61	111.77	1.01
4264-010-CL	24600	PF 1	11340.00	2017.00	2024.94	2024.94	2028.39	0.018705	14.89	761.73	111.78	1.00
4264-010-CL	24500	PF 1	11340.00	2014.00	2021.95	2021.95	2025.39	0.018700	14.89	761.80	111.78	1.00
4264-010-CL	24400	PF 1	11340.00	2011.50	2019.44	2019.44	2022.89	0.018718	14.89	761.55	111.77	1.01
4264-010-CL	24300	PF 1	11340.00	2009.00	2016.94	2016.94	2020.39	0.018713	14.89	761.62	111.77	1.01
4264-010-CL	24200	PF 1	11340.00	2006.50	2014.44	2014.44	2017.89	0.018712	14.89	761.64	111.77	1.01
4264-010-CL	24100	PF 1	11340.00	2004.00	2011.94	2011.94	2015.39	0.018703	14.89	761.76	111.78	1.00
4264-010-CL	24000	PF 1	11340.00	2001.50	2009.44	2009.44	2012.89	0.018714	14.89	761.61	111.77	1.01
4264-010-CL	23900	PF 1	11340.00	1999.00	2006.94	2006.94	2010.39	0.018705	14.89	761.73	111.78	1.00
4264-010-CL	23800	PF 1	11340.00	1996.50	2004.45	2004.45	2007.89	0.018700	14.89	761.80	111.78	1.00
4264-010-CL	23700	PF 1	11340.00	1994.00	2001.94	2001.94	2005.39	0.018718	14.89	761.55	111.77	1.01
4264-010-CL	23600	PF 1	11340.00	1991.50	2000.65	1999.44	2003.12	0.011441	12.61	898.99	116.58	0.80
4264-010-CL	23500	PF 1	11340.00	1990.00	1997.94	1997.94	2001.39	0.018704	14.89	761.74	111.78	1.00

HEC-RAS Plan: 4264-U CHNL River: REATA WASH Reach: 4264-010-CL Profile: PF 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
4264-010-CL	23400	PF 1	11340.00	1988.00	1995.94	1995.94	1999.39	0.018715	14.89	761.59	111.77	1.01
4264-010-CL	23300	PF 1	11340.00	1986.00	1993.94	1993.94	1997.39	0.018706	14.89	761.72	111.78	1.01
4264-010-CL	23200	PF 1	11340.00	1984.00	1991.94	1991.94	1995.39	0.018701	14.89	761.79	111.78	1.00
4264-010-CL	23100	PF 1	11254.00	1981.00	1988.91	1988.91	1992.33	0.018728	14.86	757.54	111.63	1.00
4264-010-CL	23000	PF 1	11254.00	1978.00	1985.91	1985.91	1989.33	0.018738	14.86	757.41	111.62	1.01
4264-010-CL	22900	PF 1	11254.00	1974.00	1981.91	1981.91	1985.33	0.018698	14.85	757.94	111.64	1.00
4264-010-CL	22800	PF 1	11254.00	1971.00	1978.88	1978.88	1982.28	0.018704	14.78	761.30	113.11	1.00
4264-010-CL	22700	PF 1	11254.00	1967.00	1974.92	1974.92	1978.33	0.018586	14.82	759.48	111.70	1.00
4264-010-CL	22600	PF 1	11254.00	1963.50	1971.42	1971.42	1974.83	0.018591	14.82	759.40	111.69	1.00
4264-010-CL	22500	PF 1	11254.00	1960.00	1967.92	1967.92	1971.33	0.018603	14.82	759.24	111.69	1.00
4264-010-CL	22400	PF 1	11254.00	1956.00	1963.92	1963.92	1967.33	0.018588	14.82	759.45	111.69	1.00
4264-010-CL	22300	PF 1	11254.00	1952.00	1959.92	1959.92	1963.33	0.018601	14.82	759.26	111.69	1.00
4264-010-CL	22200	PF 1	11254.00	1948.00	1955.92	1955.92	1959.33	0.018621	14.83	758.99	111.68	1.00
4264-010-CL	22100	PF 1	11901.00	1944.00	1952.20	1952.20	1955.72	0.018417	15.05	790.94	112.82	1.00
4264-010-CL	22000	PF 1	11901.00	1940.00	1948.20	1948.20	1951.72	0.018423	15.05	790.86	112.81	1.00
4264-010-CL	21900	PF 1	11901.00	1937.00	1945.20	1945.20	1948.72	0.018430	15.05	790.75	112.81	1.00
4264-010-CL	21800	PF 1	11901.00	1934.00	1942.20	1942.20	1945.72	0.018442	15.05	790.58	112.80	1.00
4264-010-CL	21700	PF 1	11901.00	1931.00	1939.21	1939.21	1942.72	0.018411	15.05	791.03	112.82	1.00
4264-010-CL	21600	PF 1	11901.00	1928.00	1936.20	1936.20	1939.72	0.018415	15.05	790.97	112.82	1.00
4264-010-CL	21500	PF 1	11901.00	1925.00	1933.20	1933.20	1936.72	0.018421	15.05	790.89	112.81	1.00
4264-010-CL	21400	PF 1	11901.00	1923.00	1931.20	1931.20	1934.72	0.018429	15.05	790.76	112.81	1.00
4264-010-CL	21300	PF 1	11901.00	1921.00	1929.20	1929.20	1932.72	0.018442	15.05	790.58	112.80	1.00
4264-010-CL	21200	PF 1	11901.00	1917.08	1925.64	1925.64	1928.43	0.009124	13.55	915.70	335.52	0.96
4264-010-CL	21100	PF 1	11901.00	1915.11	1921.59	1921.59	1923.94	0.009929	12.53	1002.13	278.17	0.98
4264-010-CL	21000	PF 1	11901.00	1912.39	1918.71	1918.71	1920.95	0.009897	12.50	1059.68	276.43	0.97
4264-010-CL	20900	PF 1	11901.00	1908.90	1915.34	1915.34	1917.56	0.009876	12.79	1086.21	353.08	0.97
4264-010-CL	20800	PF 1	11901.00	1905.55	1910.69	1910.69	1912.63	0.010223	11.27	1107.97	299.45	0.96
4264-010-CL	20700	PF 1	11901.00	1902.02	1907.58	1907.58	1909.65	0.011012	11.59	1045.57	263.53	1.00
4264-010-CL	20600	PF 1	11901.00	1899.35	1904.46	1904.46	1906.22	0.010613	11.14	1196.76	345.58	0.97
4264-010-CL	20500	PF 1	11901.00	1895.74	1900.95	1900.95	1902.82	0.011285	11.00	1093.86	302.79	0.99
4264-010-CL	20400	PF 1	11901.00	1891.92	1898.10	1898.10	1899.77	0.009362	10.49	1226.16	439.95	0.91
4264-010-CL	20300	PF 1	11901.00	1889.65	1895.14	1895.14	1897.04	0.010587	11.49	1146.78	310.56	0.98
4264-010-CL	20200	PF 1	11901.00	1886.81	1893.15	1893.15	1894.97	0.007339	11.22	1265.44	395.28	0.85
4264-010-CL	20100	PF 1	11901.00	1883.38	1890.78	1890.78	1892.19	0.006225	10.47	1569.21	531.43	0.78
4264-010-CL	20000	PF 1	11901.00	1881.30	1885.61	1885.61	1886.99	0.013322	10.86	1393.28	497.92	1.05
4264-010-CL	19900	PF 1	11901.00	1877.74	1882.57	1882.57	1884.19	0.012475	11.18	1257.29	392.91	1.03
4264-010-CL	19800	PF 1	11901.00	1874.11	1879.95	1879.95	1881.65	0.010496	11.17	1242.17	407.59	0.97
4264-010-CL	19700	PF 1	11901.00	1871.10	1878.15	1878.15	1879.97	0.010549	11.60	1199.34	409.76	0.98
4264-010-CL	19600	PF 1	11901.00	1869.56	1876.47	1876.47	1878.18	0.008906	11.60	1305.72	436.20	0.92
4264-010-CL	19500	PF 1	11901.00	1868.18	1875.00	1875.00	1876.64	0.007876	11.07	1358.87	435.64	0.87
4264-010-CL	19400	PF 1	11901.00	1866.03	1872.57	1872.57	1874.12	0.009490	11.79	1428.75	438.77	0.94
4264-010-CL	19300	PF 1	11901.00	1863.64	1870.21	1870.21	1871.97	0.011015	11.84	1249.53	353.56	1.00
4264-010-CL	19200	PF 1	11901.00	1861.06	1867.67	1867.67	1869.66	0.009267	11.44	1105.64	340.44	0.93
4264-010-CL	19100	PF 1	11901.00	1857.52	1866.45	1866.45	1868.65	0.008351	12.08	1085.12	294.15	0.90
4264-010-CL	19000	PF 1	11901.00	1855.58	1865.13	1865.13	1866.89	0.007089	12.88	1454.67	389.70	0.86
4264-010-CL	18900	PF 1	11901.00	1852.15	1862.94	1862.94	1864.82	0.008551	12.73	1532.74	417.82	0.93
4264-010-CL	18800	PF 1	11901.00	1850.34	1860.12	1860.12	1862.18	0.008491	14.14	1286.13	305.83	0.94
4264-010-CL	18700	PF 1	11901.00	1848.20	1855.95	1855.95	1857.70	0.009011	13.19	1374.12	364.63	0.95
4264-010-CL	18600	PF 1	11901.00	1844.48	1853.55	1853.55	1855.46	0.007938	11.52	1221.17	349.24	0.88
4264-010-CL	18500	PF 1	11901.00	1842.56	1850.12	1850.12	1852.48	0.011867	12.69	1047.38	296.44	1.05
4264-010-CL	18400	PF 1	11901.00	1840.18	1848.68	1848.61	1850.39	0.008710	11.25	1234.34	351.77	0.90
4264-010-CL	18345	PF 1	11901.00	1838.78	1848.74	1847.30	1849.62	0.003486	8.33	1686.06	355.87	0.59
4264-010-CL	18322		Bridge									
4264-010-CL	18300	PF 1	11901.00	1837.67	1846.31	1846.31	1848.09	0.012362	11.72	1192.79	326.04	0.94
4264-010-CL	18200	PF 1	11901.00	1834.23	1842.74	1842.74	1844.41	0.016180	10.38	1146.49	349.42	1.01
4264-010-CL	18100	PF 1	11901.00	1832.60	1839.88	1839.88	1841.66	0.015103	10.74	1119.51	321.79	0.99
4264-010-CL	18000	PF 1	11901.00	1830.72	1837.25	1837.25	1839.26	0.015087	11.39	1045.12	262.46	1.01
4264-010-CL	17900	PF 1	11901.00	1828.18	1834.85	1834.85	1836.67	0.015611	10.82	1099.70	307.22	1.01
4264-010-CL	17800	PF 1	11901.00	1826.34	1832.60	1832.60	1834.37	0.015295	10.66	1118.86	322.88	1.00
4264-010-CL	17700	PF 1	11901.00	1824.08	1830.05	1830.05	1831.85	0.014940	10.78	1112.25	349.15	0.99
4264-010-CL	17600	PF 1	11901.00	1821.57	1828.13	1828.13	1829.94	0.013629	10.97	1135.66	364.90	0.96
4264-010-CL	17500	PF 1	11901.00	1819.18	1826.23	1826.23	1827.68	0.010560	10.44	1389.74	492.20	0.86
4264-010-CL	17400	PF 1	11901.00	1817.31	1823.51	1823.51	1824.98	0.012676	10.23	1301.98	457.73	0.92
4264-010-CL	17300	PF 1	11901.00	1814.84	1820.92	1820.92	1822.28	0.010112	10.20	1427.63	547.98	0.84
4264-010-CL	17200	PF 1	12338.00	1812.56	1817.51	1817.51	1818.91	0.014372	10.38	1371.22	471.45	0.97
4264-010-CL	17100	PF 1	12338.00	1810.08	1814.97	1814.97	1816.46	0.014080	10.96	1349.62	446.17	0.97
4264-010-CL	17000	PF 1	12338.00	1806.97	1811.59	1811.59	1812.91	0.015554	10.40	1406.42	518.35	1.00
4264-010-CL	16900	PF 1	12338.00	1802.94	1808.69	1808.69	1809.99	0.018122	9.51	1361.91	532.71	1.03
4264-010-CL	16800	PF 1	12338.00	1799.46	1805.93	1805.93	1807.26	0.017782	9.67	1357.74	523.72	1.03
4264-010-CL	16700	PF 1	12338.00	1798.06	1803.20	1803.20	1804.47	0.018776	9.76	1411.00	556.01	1.01
4264-010-CL	16600	PF 1	12338.00	1795.14	1800.10	1800.10	1801.43	0.014437	9.55	1387.36	533.70	0.95
4264-010-CL	16500	PF 1	12338.00	1792.83	1797.87	1797.87	1799.15	0.013278	9.63	1452.97	556.19	0.92
4264-010-CL	16400	PF 1	12338.00	1790.16	1795.40	1795.40	1796.81	0.013999	9.45	1477.68	587.37	0.94
4264-010-CL	16300	PF 1	12338.00	1787.76	1792.88	1792.88	1794.14	0.015382	10.11	1439.70	547.42	0.99
4264-010-CL	16200	PF 1	12338.00	1785.16	1790.16	1790.16	1791.62	0.014319	10.10	1322.45	484.62	0.96
4264-010-CL	16100	PF 1	12338.00	1782.55	1787.94	1787.94	1789.39	0.013422	10.59	1362.00	450.99	0.95
4264-010-CL	16000	PF 1	12338.00	1780.21	1785.46	1785.46	1786.96	0.016018	9.84	1263.60	427.23	0.99
4264-010-CL	15900	PF 1	12338.00	1778.54	1783.00	1783.00	1784.57	0.015849	10.12	1240.29	416.94	1.00
4264-010-CL	15800	PF 1	12338.00	1775.69	1780.63	1780.63	1782.13	0.015316	9.86	1274.15	453.14	0.98

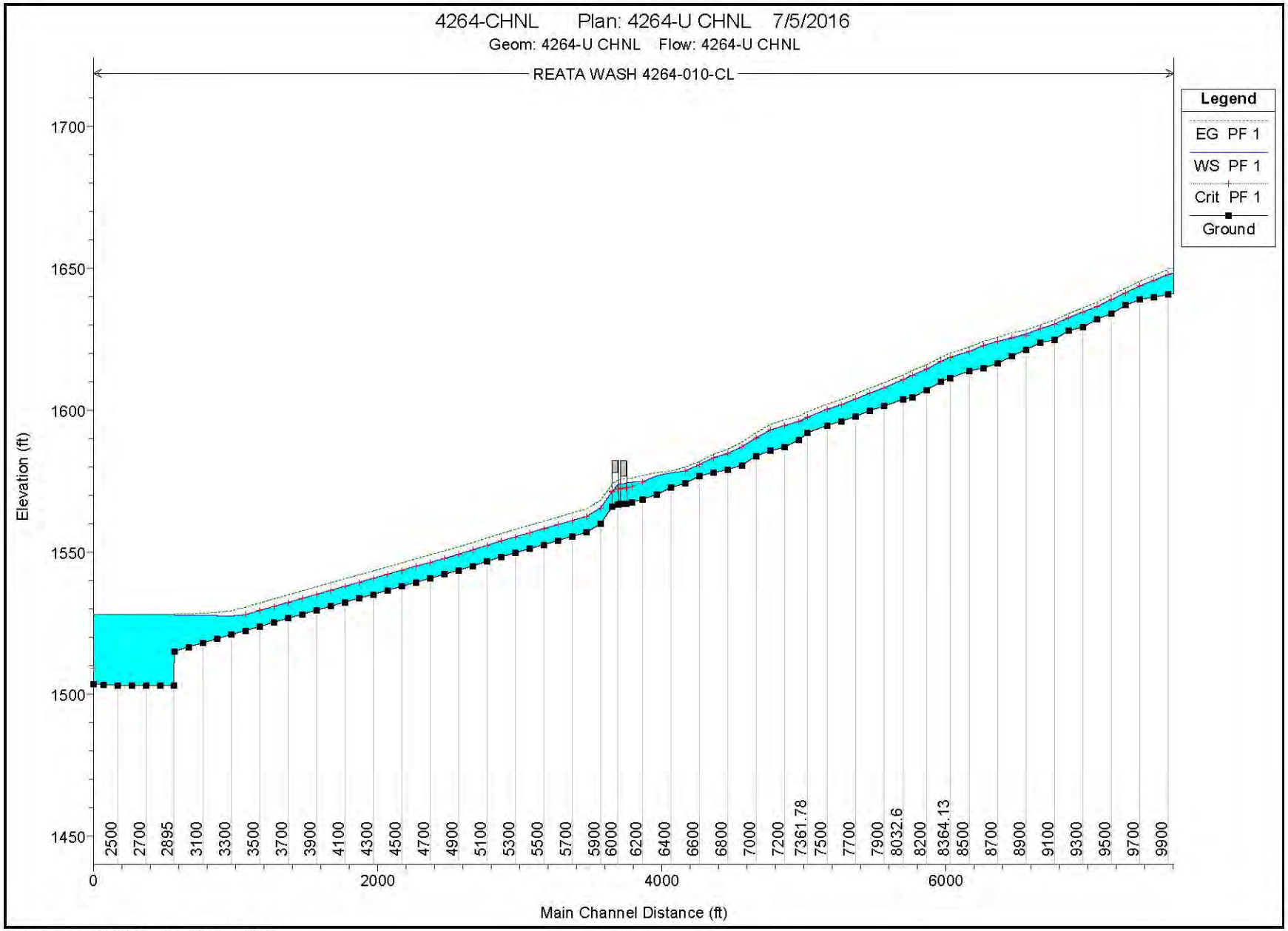
HEC-RAS Plan: 4264-U CHNL River: REATA WASH Reach: 4264-010-CL Profile: PF 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
4264-010-CL	15700	PF 1	12338.00	1773.65	1778.00	1778.00	1779.31	0.017081	9.19	1343.02	517.78	1.00
4264-010-CL	15600	PF 1	12338.00	1770.37	1775.17	1775.17	1776.44	0.017784	9.23	1381.86	563.66	1.02
4264-010-CL	15500	PF 1	12338.00	1768.18	1772.51	1772.51	1773.70	0.017862	8.79	1418.19	611.05	1.01
4264-010-CL	15400	PF 1	12338.00	1764.45	1770.54	1770.54	1771.88	0.018646	8.64	1445.61	663.54	1.02
4264-010-CL	15300	PF 1	12338.00	1762.83	1768.08	1768.08	1769.15	0.018308	8.30	1490.18	708.39	1.00
4264-010-CL	15200	PF 1	12338.00	1760.15	1765.59	1765.59	1766.81	0.018833	8.14	1517.43	758.11	1.01
4264-010-CL	15100	PF 1	12338.00	1758.33	1763.10	1763.10	1764.10	0.018510	8.09	1538.07	767.93	1.00
4264-010-CL	14965.19	PF 1	12182.00	1755.32	1760.26	1760.26	1761.26	0.020631	8.02	1517.49	790.71	1.04
4264-010-CL	14900	PF 1	12182.00	1753.81	1758.65	1758.65	1759.67	0.019650	8.10	1502.90	747.74	1.02
4264-010-CL	14800	PF 1	12182.00	1751.69	1756.37	1756.37	1757.43	0.018089	8.28	1488.88	771.13	1.00
4264-010-CL	14700	PF 1	12182.00	1749.33	1753.93	1753.93	1755.04	0.017738	8.48	1446.05	750.13	1.00
4264-010-CL	14600	PF 1	12182.00	1746.37	1751.31	1751.31	1752.48	0.015732	9.26	1480.11	720.83	0.97
4264-010-CL	14500	PF 1	12182.00	1744.85	1749.03	1749.03	1750.09	0.014388	8.79	1585.97	751.85	0.93
4264-010-CL	14400	PF 1	12182.00	1741.82	1746.85	1746.85	1747.95	0.013181	9.15	1567.22	735.11	0.91
4264-010-CL	14300	PF 1	12182.00	1739.41	1744.59	1744.59	1745.56	0.012598	9.01	1728.08	831.44	0.89
4264-010-CL	14200	PF 1	12182.00	1737.16	1742.16	1742.16	1743.11	0.014703	8.97	1695.78	840.03	0.94
4264-010-CL	14100	PF 1	12182.00	1735.08	1739.31	1739.31	1740.31	0.019059	8.82	1570.39	818.05	1.03
4264-010-CL	14000	PF 1	12182.00	1733.04	1736.98	1736.98	1737.93	0.020439	8.47	1580.31	834.70	1.05
4264-010-CL	13900	PF 1	12182.00	1730.73	1734.53	1734.53	1735.51	0.019733	8.61	1564.70	800.67	1.04
4264-010-CL	13835.07	PF 1	12182.00	1728.47	1732.95	1732.95	1733.96	0.018778	8.11	1517.62	765.12	1.01
4264-010-CL	13700	PF 1	12182.00	1725.25	1730.00	1730.00	1731.10	0.018619	8.46	1447.84	678.93	1.01
4264-010-CL	13600	PF 1	12182.00	1723.39	1727.71	1727.71	1728.88	0.017144	8.74	1419.02	611.60	0.99
4264-010-CL	13500	PF 1	12182.00	1719.92	1725.30	1725.30	1726.52	0.016662	8.94	1384.05	568.14	0.99
4264-010-CL	13400	PF 1	12182.00	1717.68	1723.28	1723.28	1724.58	0.017365	9.23	1345.27	538.47	1.01
4264-010-CL	13300	PF 1	12026.00	1715.78	1721.33	1721.33	1722.67	0.016365	9.36	1309.10	497.37	0.99
4264-010-CL	13200	PF 1	12026.00	1713.53	1719.14	1719.14	1720.59	0.016417	9.69	1254.04	442.79	1.00
4264-010-CL	13100	PF 1	12026.00	1710.53	1716.58	1716.58	1718.25	0.014417	10.64	1193.84	383.58	0.97
4264-010-CL	13000	PF 1	12026.00	1707.62	1714.70	1714.70	1716.54	0.014196	11.23	1136.56	313.40	0.98
4264-010-CL	12900	PF 1	12026.00	1705.97	1712.68	1712.68	1714.64	0.013911	11.88	1107.49	288.94	0.98
4264-010-CL	12800	PF 1	12026.00	1702.17	1710.81	1710.81	1712.88	0.012865	11.78	1088.62	275.72	0.96
4264-010-CL	12700	PF 1	12026.00	1699.71	1708.05	1708.05	1710.23	0.012018	11.99	1053.89	249.11	0.93
4264-010-CL	12600	PF 1	12026.00	1697.60	1703.22	1703.22	1705.30	0.014476	12.89	1092.10	276.76	1.03
4264-010-CL	12545.24	PF 1	12026.00	1696.40	1702.03	1702.03	1704.07	0.015873	11.93	1060.50	273.06	1.04
4264-010-CL	12400	PF 1	12026.00	1693.12	1698.83	1698.83	1701.01	0.013809	11.94	1036.03	252.88	0.99
4264-010-CL	12289.17	PF 1	12026.00	1690.57	1696.57	1696.57	1698.76	0.013722	12.06	1036.54	253.10	0.99
4264-010-CL	12200	PF 1	12026.00	1687.43	1694.16	1694.16	1696.38	0.013470	12.11	1027.18	238.39	0.98
4264-010-CL	12100	PF 1	12026.00	1685.62	1691.63	1691.63	1693.84	0.013671	12.10	1028.01	239.22	0.99
4264-010-CL	12033.11	PF 1	12026.00	1683.38	1689.90	1689.90	1692.10	0.013384	12.11	1034.21	239.30	0.98
4264-010-CL	11900	PF 1	12026.00	1680.42	1686.81	1686.81	1689.06	0.013246	12.26	1025.60	233.39	0.98
4264-010-CL	11777	PF 1	12026.00	1677.50	1683.93	1683.93	1686.20	0.013208	12.37	1024.74	232.21	0.98
4264-010-CL	11685.28	PF 1	11870.00	1674.76	1680.85	1680.85	1683.09	0.013733	12.07	1003.19	231.12	0.99
4264-010-CL	11614.66	PF 1	11870.00	1672.74	1679.59	1679.59	1681.89	0.013925	12.19	984.36	218.26	0.99
4264-010-CL	11600.41	PF 1	11870.00	1672.29	1679.14	1679.14	1681.43	0.013842	12.22	990.21	219.88	0.99
4264-010-CL	11582.03	PF 1	11870.00	1671.63	1678.20	1678.20	1680.47	0.013869	12.19	988.50	224.04	0.98
4264-010-CL	11567.48	PF 1	11870.00	1672.33	1677.21	1677.20	1679.53	0.010315	12.40	991.65	218.49	0.89
4264-010-CL	11561.97	PF 1	11870.00	1672.33	1677.19	1677.19	1679.50	0.001901	12.39	986.98	218.36	0.99
4264-010-CL	11545.46	PF 1	11870.00	1668.58	1677.20		1677.92	0.000277	6.93	1778.42	224.82	0.42
4264-010-CL	11539.95	PF 1	11870.00	1668.57	1677.02	1673.58	1677.90	0.000338	7.55	1586.93	190.22	0.46
4264-010-CL	11516.11		Culvert									
4264-010-CL	11492.27	PF 1	11870.00	1668.34	1674.29		1676.08	0.005808	10.72	1114.58	188.76	0.77
4264-010-CL	11378.89	PF 1	11870.00	1668.90	1673.80	1673.12	1675.70	0.006121	11.52	1131.19	211.11	0.80
4264-010-CL	11316.85	PF 1	11870.00	1668.71	1672.73	1672.73	1675.21	0.009248	13.15	992.20	210.55	0.96
4264-010-CL	11271.2	PF 1	11870.00	1668.35	1672.63	1672.11	1674.54	0.006996	11.85	1138.99	236.51	0.85
4264-010-CL	11130.61	PF 1	11870.00	1668.98	1671.98		1673.36	0.007807	9.59	1301.27	361.59	0.83
4264-010-CL	11000	PF 1	11870.00	1668.85	1670.56	1670.56	1672.05	0.012978	10.24	1223.45	410.83	1.03
4264-010-CL	10900	PF 1	11870.00	1668.18	1668.16	1668.16	1669.69	0.016269	10.06	1205.56	402.63	1.01
4264-010-CL	10800	PF 1	11870.00	1658.90	1665.69	1665.69	1667.20	0.015963	9.97	1216.86	407.36	0.99
4264-010-CL	10700	PF 1	11870.00	1657.70	1663.50	1663.50	1665.04	0.016424	10.05	1203.98	406.18	1.01
4264-010-CL	10600	PF 1	11870.00	1655.47	1661.17	1661.17	1662.73	0.016495	10.15	1193.94	396.23	1.01
4264-010-CL	10500	PF 1	11870.00	1653.85	1658.99	1658.99	1660.53	0.015761	10.06	1204.44	396.12	0.99
4264-010-CL	10400	PF 1	11870.00	1651.44	1656.46	1656.46	1658.07	0.015949	10.26	1179.20	377.40	1.00
4264-010-CL	10300	PF 1	11870.00	1647.53	1654.16	1654.16	1655.78	0.016230	10.36	1171.51	372.79	1.01
4264-010-CL	10200	PF 1	11870.00	1645.71	1651.95	1651.95	1653.62	0.015342	10.53	1158.62	350.30	1.00
4264-010-CL	10100	PF 1	11870.00	1644.68	1650.29	1650.16	1651.94	0.011151	10.87	1214.20	331.97	0.89
4264-010-CL	10000	PF 1	11870.00	1641.70	1649.07	1649.07	1650.84	0.010624	11.33	1218.03	338.89	0.88
4264-010-CL	9900	PF 1	11870.00	1640.80	1647.89	1647.89	1649.70	0.010984	12.14	1213.36	318.19	0.91
4264-010-CL	9800	PF 1	11870.00	1639.81	1645.70	1645.70	1647.49	0.014181	11.63	1159.47	324.61	0.99
4264-010-CL	9700	PF 1	11870.00	1639.00	1643.80	1643.80	1645.50	0.016287	11.24	1161.85	348.14	1.04
4264-010-CL	9600	PF 1	11870.00	1636.96	1641.41	1641.41	1643.02	0.015867	10.30	1175.36	372.69	1.00
4264-010-CL	9500	PF 1	11870.00	1634.00	1639.00	1639.00	1640.56	0.016327	10.21	1199.33	395.87	1.01
4264-010-CL	9400	PF 1	11870.00	1632.04	1636.57	1636.57	1638.04	0.016443	9.79	1231.76	430.99	1.00
4264-010-CL	9300	PF 1	11870.00	1629.23	1634.65	1634.65	1636.04	0.016424	9.49	1257.59	454.89	1.00
4264-010-CL	9200	PF 1	11870.00	1628.06	1632.67	1632.67	1634.04	0.015117	9.50	1290.50	477.07	0.97
4264-010-CL	9100	PF 1	11870.00	1624.94	1630.35	1630.35	1631.71	0.015880	9.41	1293.19	482.35	0.98
4264-010-CL	9000	PF 1	11870.00	1623.73	1628.74	1628.74	1630.10	0.014218	9.50	1307.89	492.03	0.94
4264-010-CL	8900	PF 1	11870.00	1621.37	1626.87	1626.44	1628.23	0.009884	9.56	1323.96	397.82	0.82
4264-010-CL	8800	PF 1	11870.00	1619.06	1625.47	1625.47	1627.30	0.007882	11.25	1204.70	365.52	0.87
4264-010-CL	8700	PF 1	11870.00	1616.49	1624.25	1624.25	1625.68	0.005727	10.63	1498.10	497.23	0.76
4264-010-CL	8600	PF 1	11870.00	1614.87	1622.82	1622.82	1624.20	0.006767	10.86	1496.41	495.09	0.81

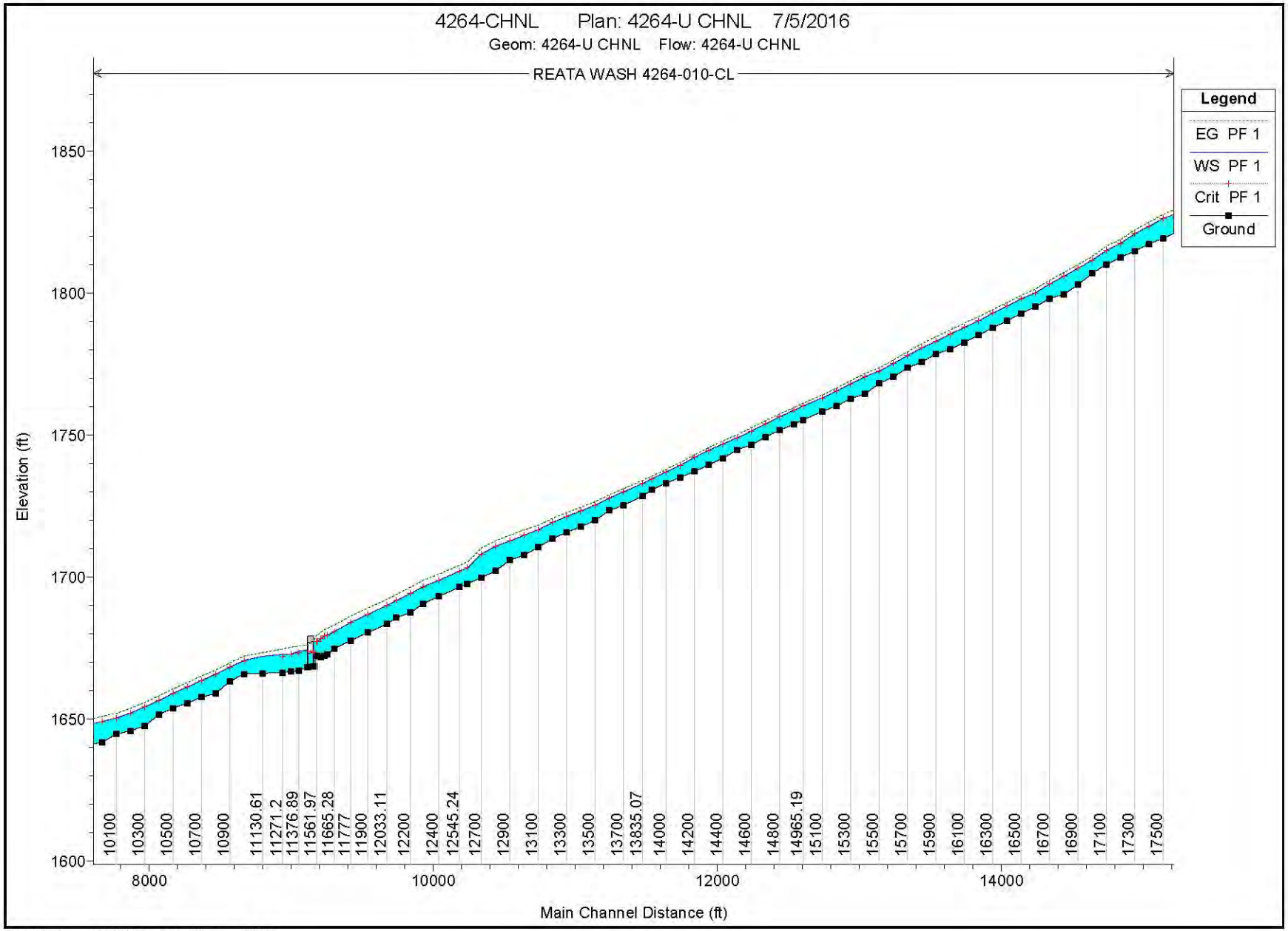
HEC-RAS Plan: 4264-U CHNL River: REATA WASH Reach: 4264-010-CL Profile: PF 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
4264-010-CL	8500	PF 1	11870.00	1613.79	1620.74	1620.74	1622.25	0.008363	10.97	1371.67	455.77	0.89
4264-010-CL	8364.13	PF 1	11870.00	1611.45	1618.63	1618.63	1620.04	0.007169	11.20	1461.72	466.11	0.84
4264-010-CL	8300	PF 1	11870.00	1609.97	1617.23	1617.23	1618.67	0.007689	11.73	1437.06	445.59	0.87
4264-010-CL	8200	PF 1	11870.00	1607.14	1614.50	1614.50	1616.02	0.008795	11.43	1342.95	413.18	0.91
4264-010-CL	8100	PF 1	11870.00	1604.59	1612.41	1612.41	1614.04	0.008379	11.88	1308.04	387.69	0.90
4264-010-CL	8032.6	PF 1	11870.00	1603.79	1610.83	1610.83	1612.45	0.008483	11.54	1301.54	382.78	0.90
4264-010-CL	7900	PF 1	11870.00	1601.53	1607.92	1607.92	1609.64	0.012707	10.70	1178.79	363.55	0.93
4264-010-CL	7800	PF 1	11870.00	1599.88	1606.10	1606.10	1607.81	0.012856	11.04	1195.03	346.14	0.94
4264-010-CL	7700	PF 1	11870.00	1597.86	1603.97	1603.97	1605.81	0.013127	11.15	1138.69	320.40	0.95
4264-010-CL	7600	PF 1	11870.00	1596.17	1602.01	1602.01	1603.81	0.015128	10.80	1113.69	319.53	1.00
4264-010-CL	7500	PF 1	11870.00	1594.68	1600.33	1600.33	1602.16	0.014316	11.05	1117.16	309.55	0.98
4264-010-CL	7361.78	PF 1	11870.00	1592.05	1597.60	1597.60	1599.46	0.014475	11.13	1103.58	299.85	0.99
4264-010-CL	7300	PF 1	11870.00	1589.54	1596.11	1596.11	1598.00	0.013804	11.52	1112.62	294.08	0.98
4264-010-CL	7200	PF 1	11870.00	1586.99	1594.69	1594.69	1596.68	0.010412	11.80	1139.46	294.44	0.89
4264-010-CL	7100	PF 1	11870.00	1585.73	1593.05	1593.05	1594.95	0.011385	11.67	1152.57	301.76	0.91
4264-010-CL	7000	PF 1	11870.00	1583.87	1590.30	1590.30	1592.15	0.014810	11.11	1120.62	328.37	1.00
4264-010-CL	6900	PF 1	11870.00	1580.67	1587.19	1587.19	1588.81	0.016155	10.56	1184.90	386.63	1.02
4264-010-CL	6800	PF 1	11870.00	1579.16	1584.83	1584.76	1586.25	0.015670	9.96	1254.79	415.18	0.99
4264-010-CL	6700	PF 1	11870.00	1577.99	1583.29	1583.29	1584.55	0.017378	9.71	1351.64	533.33	1.02
4264-010-CL	6600	PF 1	11870.00	1576.81	1580.94	1580.94	1581.95	0.015024	9.09	1513.47	739.84	1.05
4264-010-CL	6500	PF 1	15842.00	1574.28	1578.62	1578.62	1579.98	0.014324	9.98	1726.99	646.64	1.06
4264-010-CL	6400	PF 1	15842.00	1572.84	1577.97		1578.61	0.004010	6.72	2501.28	841.61	0.59
4264-010-CL	6300	PF 1	15842.00	1570.36	1576.89		1578.05	0.006416	9.01	1853.73	445.25	0.76
4264-010-CL	6200	PF 1	15842.00	1568.63	1574.79	1574.79	1577.11	0.010991	12.22	1295.91	284.10	1.01
4264-010-CL	6126.11	PF 1	15842.00	1567.70	1574.68	1573.19	1576.15	0.004476	9.71	1631.85	258.78	0.68
4264-010-CL	6084.06	PF 1	15842.00	1567.00	1574.62	1572.68	1575.95	0.003687	9.24	1715.31	249.80	0.62
4264-010-CL	6060		Bridge									
4264-010-CL	6041.11	PF 1	15842.00	1566.96	1574.18	1572.43	1575.59	0.004117	9.54	1661.38	248.86	0.65
4264-010-CL	6024.98	PF 1	15842.00	1566.80	1574.14	1572.29	1575.51	0.003849	9.39	1688.82	248.83	0.63
4264-010-CL	6000		Bridge									
4264-010-CL	5981.62	PF 1	15842.00	1565.98	1571.42	1571.42	1573.99	0.010453	12.87	1231.29	238.31	1.00
4264-010-CL	5900	PF 1	15842.00	1560.00	1565.61	1565.61	1568.24	0.010514	13.01	1217.30	233.68	1.00
4264-010-CL	5800	PF 1	15842.00	1557.00	1562.61	1562.61	1565.24	0.010514	13.01	1217.30	233.68	1.00
4264-010-CL	5700	PF 1	15842.00	1555.56	1561.17	1561.17	1563.80	0.010516	13.02	1217.21	233.66	1.00
4264-010-CL	5600	PF 1	15842.00	1554.12	1559.74	1559.74	1562.36	0.010502	13.01	1217.75	233.69	1.00
4264-010-CL	5500	PF 1	15842.00	1552.69	1558.30	1558.30	1560.93	0.010513	13.01	1217.36	233.68	1.00
4264-010-CL	5400	PF 1	15842.00	1551.25	1556.86	1556.86	1559.49	0.010515	13.01	1217.27	233.68	1.00
4264-010-CL	5300	PF 1	15842.00	1549.79	1555.40	1555.40	1558.03	0.010518	13.02	1217.14	233.66	1.01
4264-010-CL	5200	PF 1	15842.00	1548.35	1553.97	1553.97	1556.59	0.010508	13.01	1217.53	233.69	1.00
4264-010-CL	5100	PF 1	15842.00	1546.79	1552.40	1552.40	1555.03	0.010524	13.02	1216.93	233.68	1.01
4264-010-CL	5000	PF 1	15842.00	1545.19	1550.81	1550.81	1553.44	0.010510	13.01	1217.48	233.70	1.00
4264-010-CL	4900	PF 1	15842.00	1543.65	1549.27	1549.27	1551.89	0.010504	13.01	1217.67	233.69	1.00
4264-010-CL	4800	PF 1	15842.00	1542.24	1547.85	1547.85	1550.48	0.010510	13.01	1217.44	233.68	1.00
4264-010-CL	4700	PF 1	15842.00	1540.83	1546.45	1546.45	1549.07	0.010509	13.01	1217.46	233.68	1.00
4264-010-CL	4600	PF 1	15842.00	1539.43	1545.04	1545.04	1547.67	0.010515	13.01	1217.29	233.70	1.00
4264-010-CL	4500	PF 1	15842.00	1538.02	1543.63	1543.63	1546.26	0.010509	13.01	1217.52	233.71	1.00
4264-010-CL	4400	PF 1	15842.00	1536.61	1542.22	1542.22	1544.85	0.010515	13.01	1217.23	233.67	1.00
4264-010-CL	4300	PF 1	15842.00	1535.20	1540.82	1540.82	1543.44	0.010509	13.01	1217.46	233.68	1.00
4264-010-CL	4200	PF 1	15842.00	1533.80	1539.41	1539.41	1542.04	0.010514	13.01	1217.31	233.69	1.00
4264-010-CL	4100	PF 1	15842.00	1532.39	1538.00	1538.00	1540.63	0.010514	13.01	1217.31	233.69	1.00
4264-010-CL	4000	PF 1	15842.00	1530.98	1536.59	1536.59	1539.22	0.010517	13.02	1217.21	233.68	1.00
4264-010-CL	3900	PF 1	15842.00	1529.57	1535.18	1535.18	1537.81	0.010511	13.01	1217.43	233.69	1.00
4264-010-CL	3800	PF 1	15842.00	1528.16	1533.78	1533.78	1536.40	0.010509	13.01	1217.47	233.67	1.00
4264-010-CL	3700	PF 1	15842.00	1526.73	1532.34	1532.34	1534.97	0.010517	13.02	1217.20	233.69	1.00
4264-010-CL	3600	PF 1	15842.00	1525.29	1530.90	1530.90	1533.53	0.010510	13.01	1217.45	233.68	1.00
4264-010-CL	3500	PF 1	15842.00	1523.85	1529.46	1529.46	1532.09	0.010524	13.02	1216.93	233.68	1.01
4264-010-CL	3400	PF 1	15842.00	1522.41	1528.03	1528.03	1530.65	0.010497	13.01	1217.86	233.71	1.00
4264-010-CL	3300	PF 1	15842.00	1520.96	1527.58		1529.42	0.006023	10.90	1454.00	239.66	0.78
4264-010-CL	3200	PF 1	15842.00	1519.52	1527.66		1528.82	0.002840	8.64	1878.59	322.22	0.55
4264-010-CL	3100	PF 1	15842.00	1518.08	1527.72		1528.50	0.001523	7.14	2285.50	288.84	0.42
4264-010-CL	3000	PF 1	15842.00	1516.64	1527.75		1528.32	0.000907	6.10	2725.62	336.09	0.33
4264-010-CL	2900	PF 1	15842.00	1515.20	1527.83		1528.19	0.000510	5.00	3542.53	404.34	0.25
4264-010-CL	2895	PF 1	15842.00	1503.00	1528.03		1528.11	0.000049	2.26	7445.07	441.40	0.09
4264-010-CL	2800	PF 1	15842.00	1503.00	1528.03		1528.10	0.000045	2.25	7679.64	438.33	0.08
4264-010-CL	2700	PF 1	15842.00	1503.00	1528.02		1528.10	0.000044	2.29	7730.89	434.91	0.08
4264-010-CL	2600	PF 1	15842.00	1503.00	1528.02		1528.09	0.000042	2.31	7889.11	431.26	0.08
4264-010-CL	2500	PF 1	15842.00	1503.19	1528.01		1528.09	0.000044	2.34	7852.28	450.35	0.08
4264-010-CL	2400	PF 1	15842.00	1503.37	1528.00		1528.08	0.000045	2.36	7757.70	450.39	0.09
4264-010-CL	2330	PF 1	15842.00	1503.50	1528.00	1509.13	1528.08	0.000046	2.37	7749.47	450.17	0.09

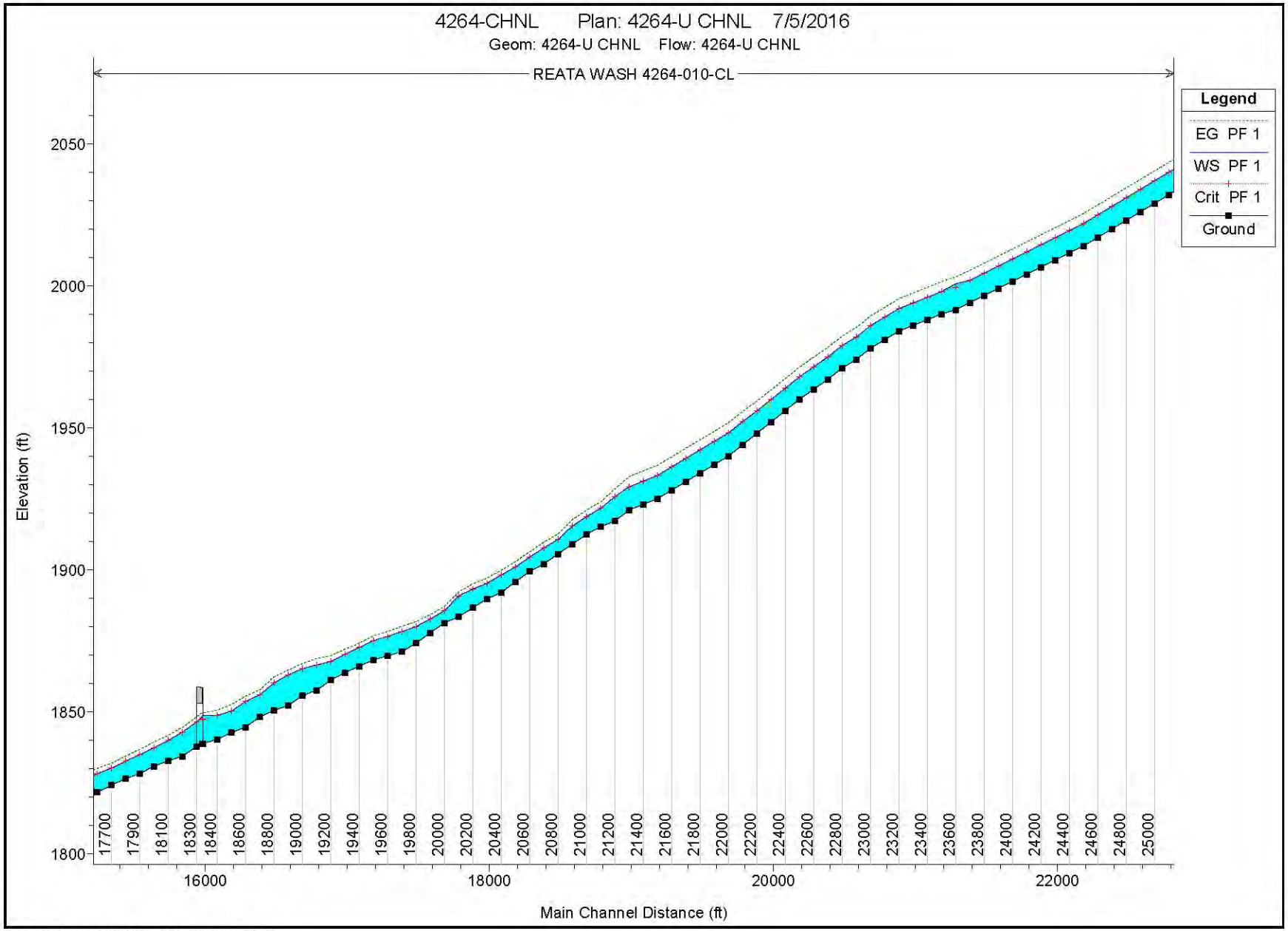
APPENDIX B
HEC-RAS Profile and Cross Sections



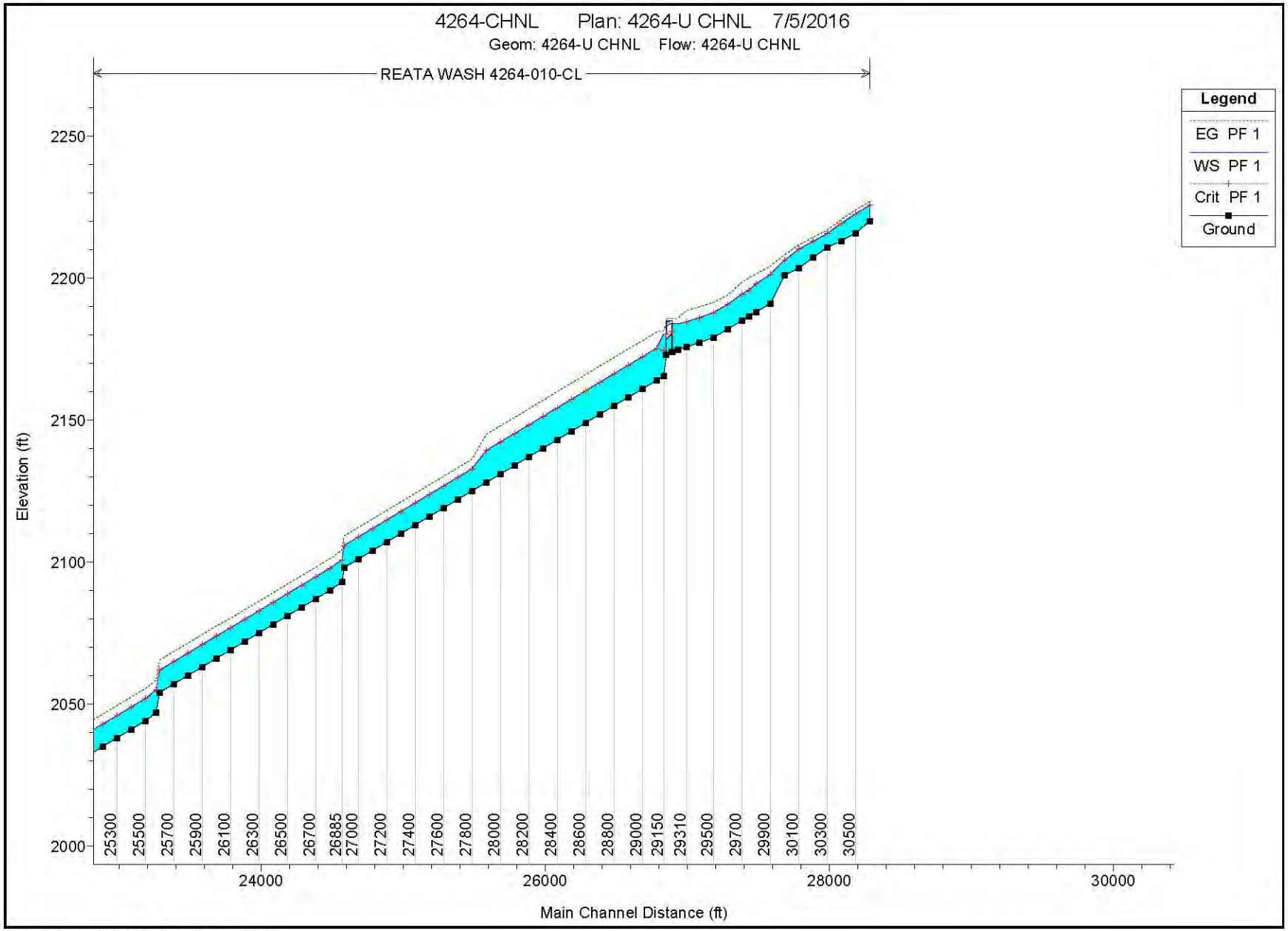
1 in Horiz. = 1000 ft 1 in Vert. = 50 ft



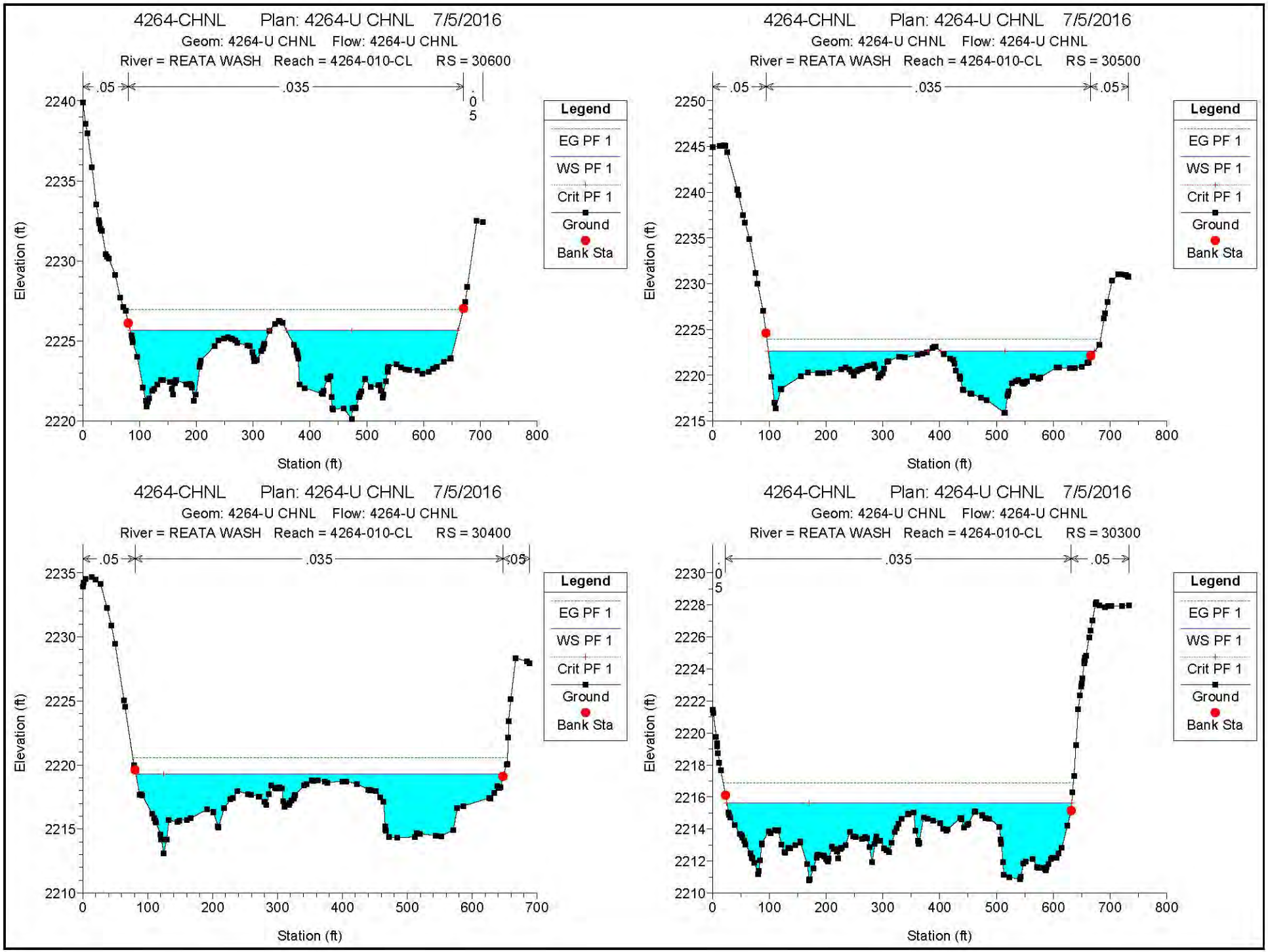
1 in Horiz. = 1000 ft 1 in Vert. = 50 ft



1 in Horiz. = 1000 ft 1 in Vert. = 50 ft



1 in Horiz. = 1000 ft 1 in Vert. = 50 ft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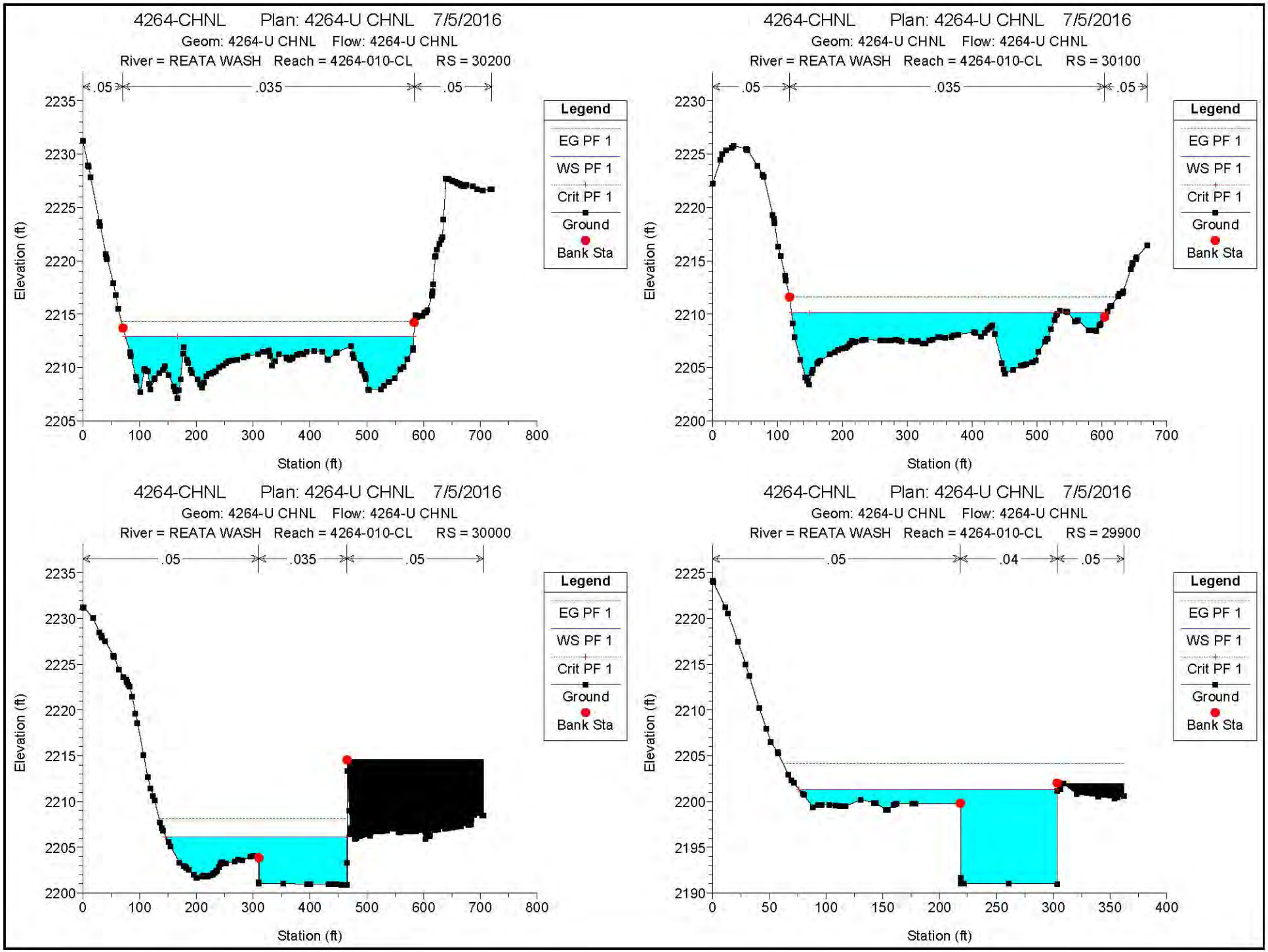
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30600
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30500
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30400
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30300
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30100
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 30000
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29900
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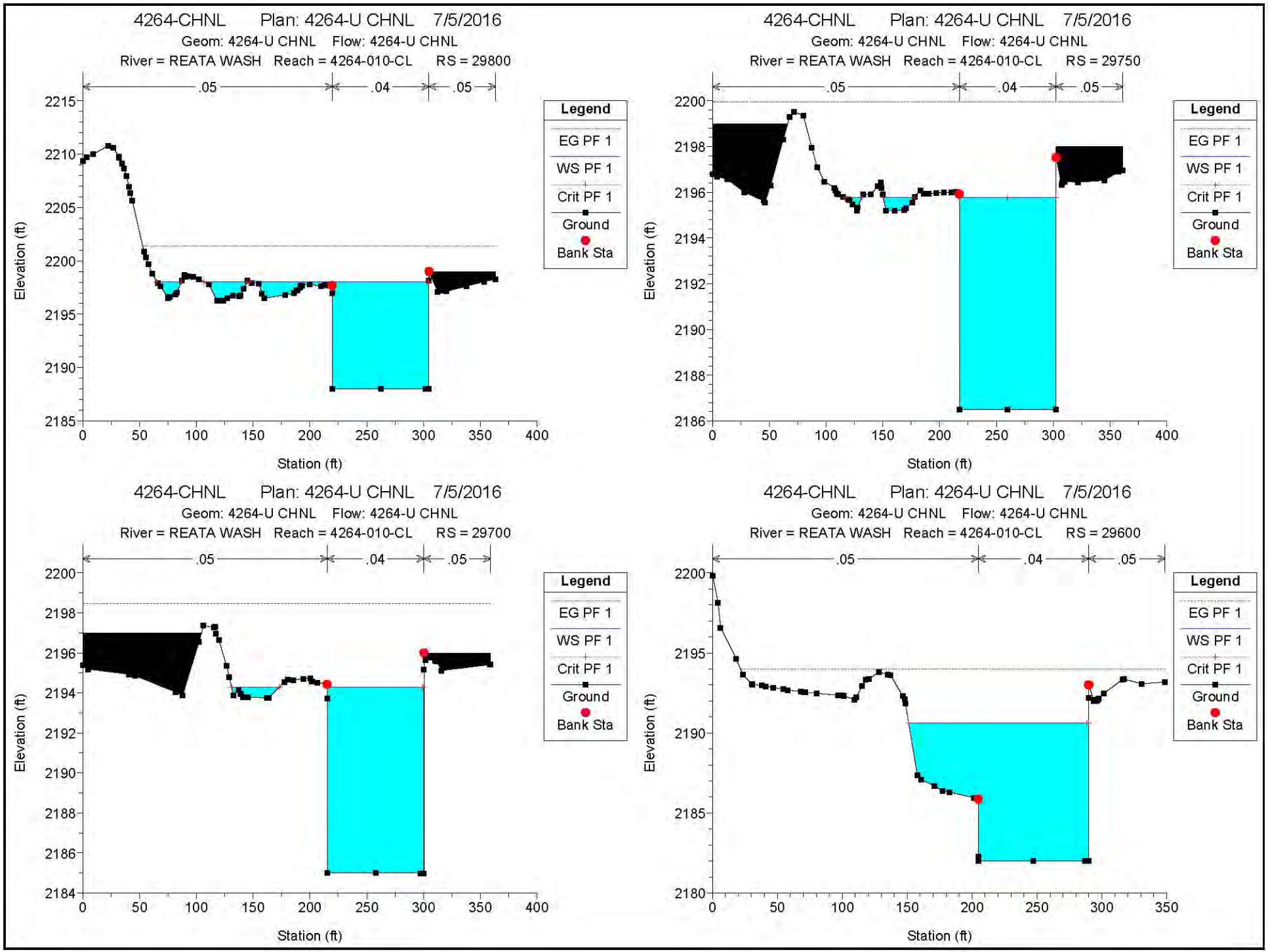
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29750
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29700
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29600
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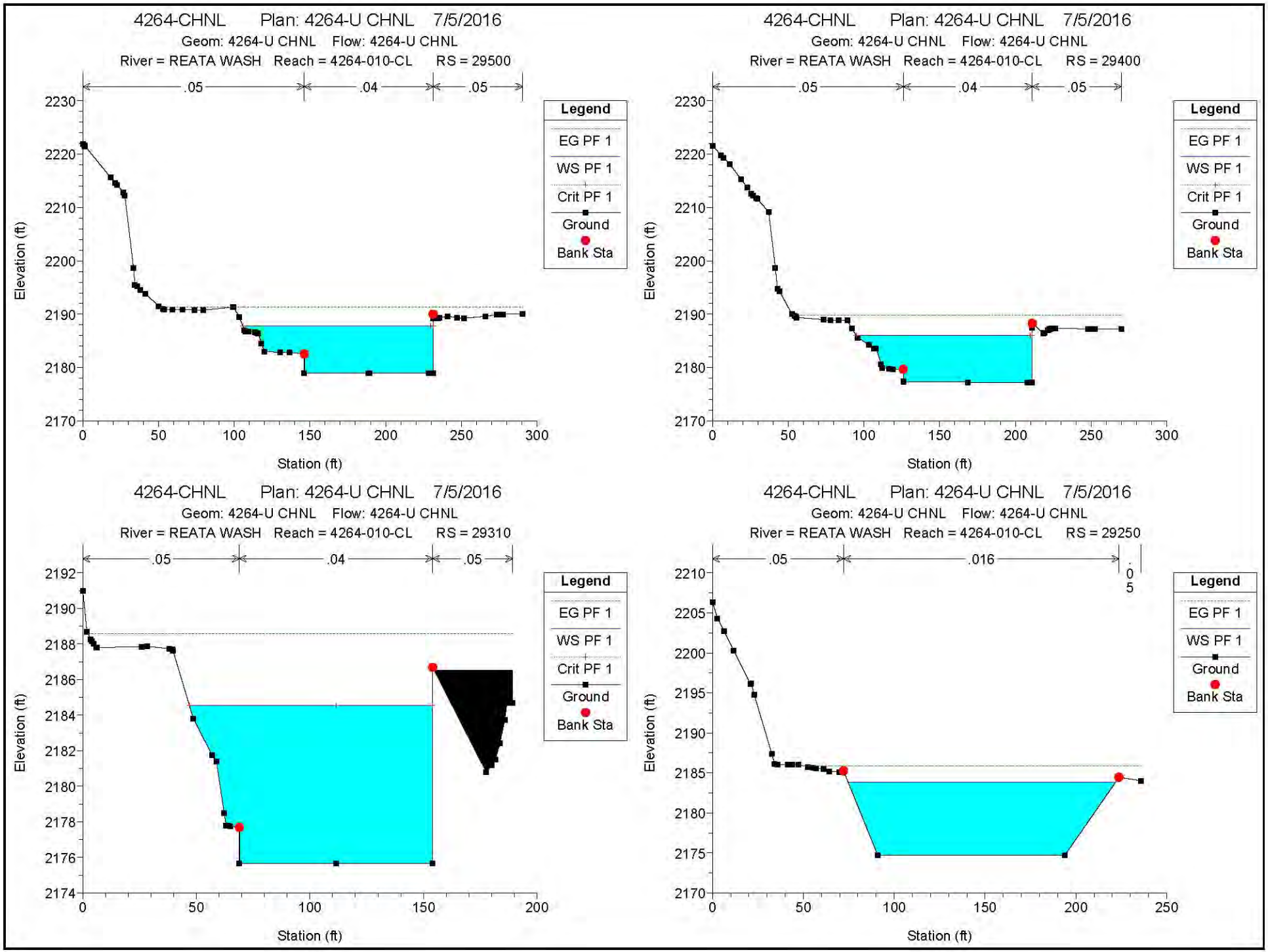
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29400
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29310
.05
.04
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29250
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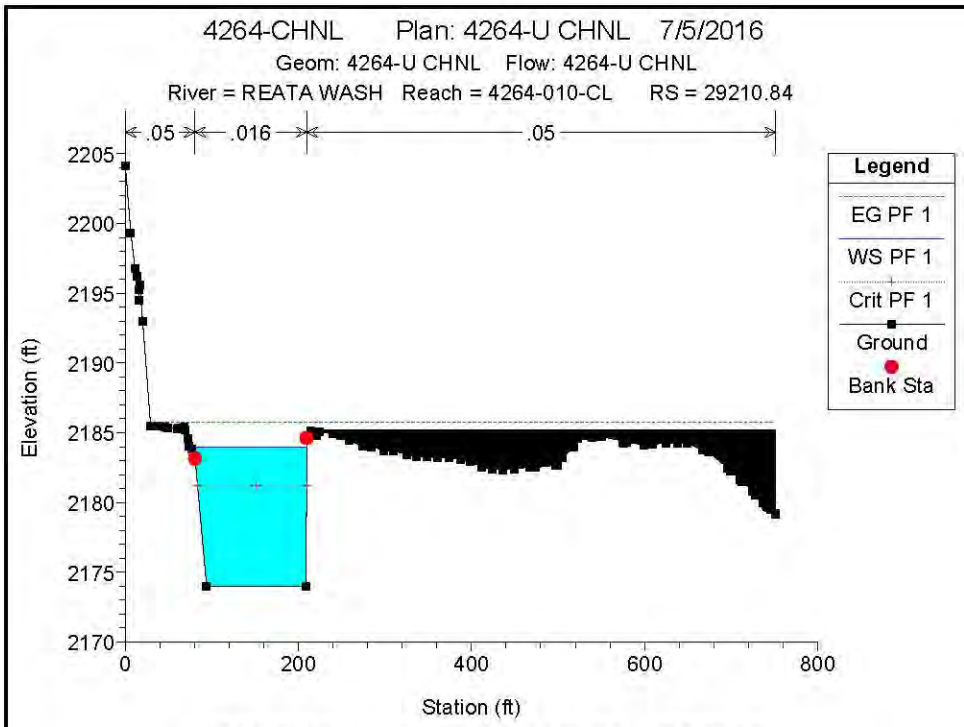
.016
.05
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29210.84
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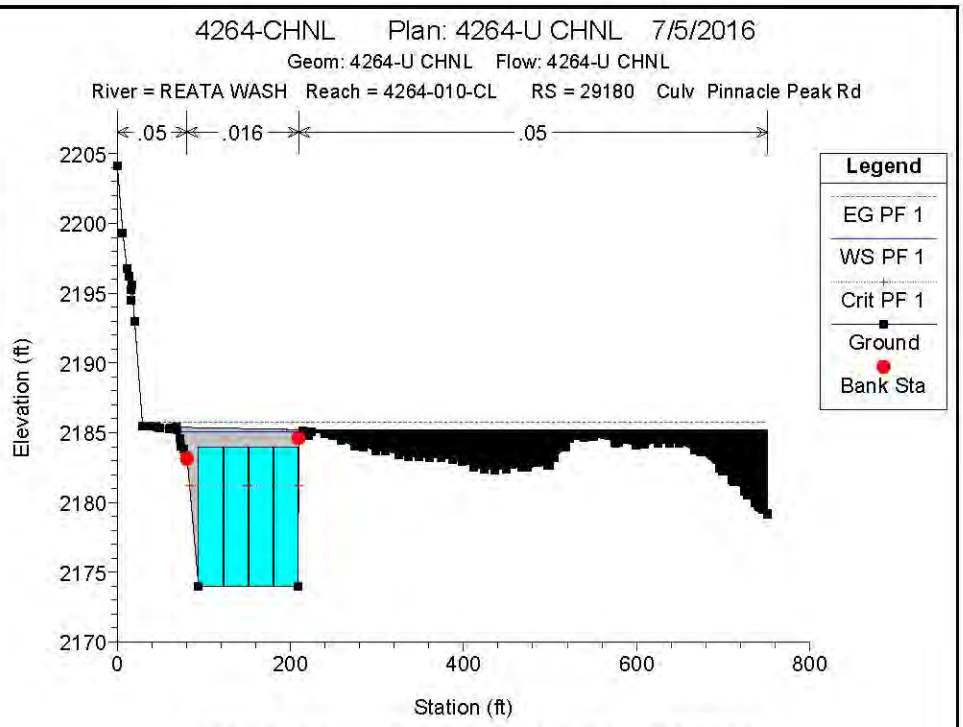
.016
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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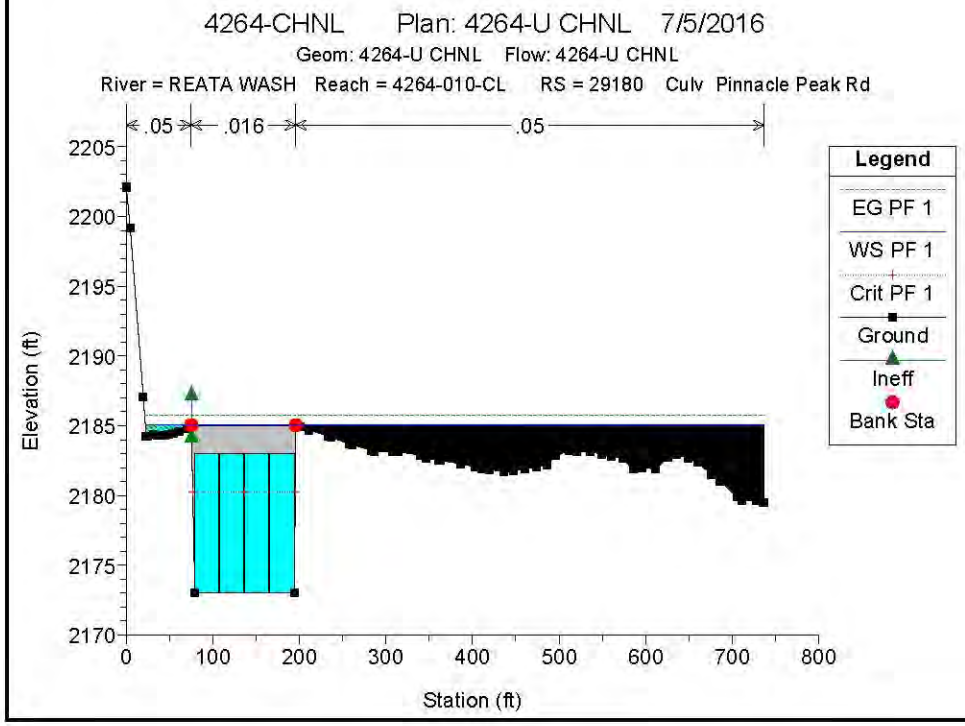
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29180 Culv Pinnacle Peak Rd
.05
.016
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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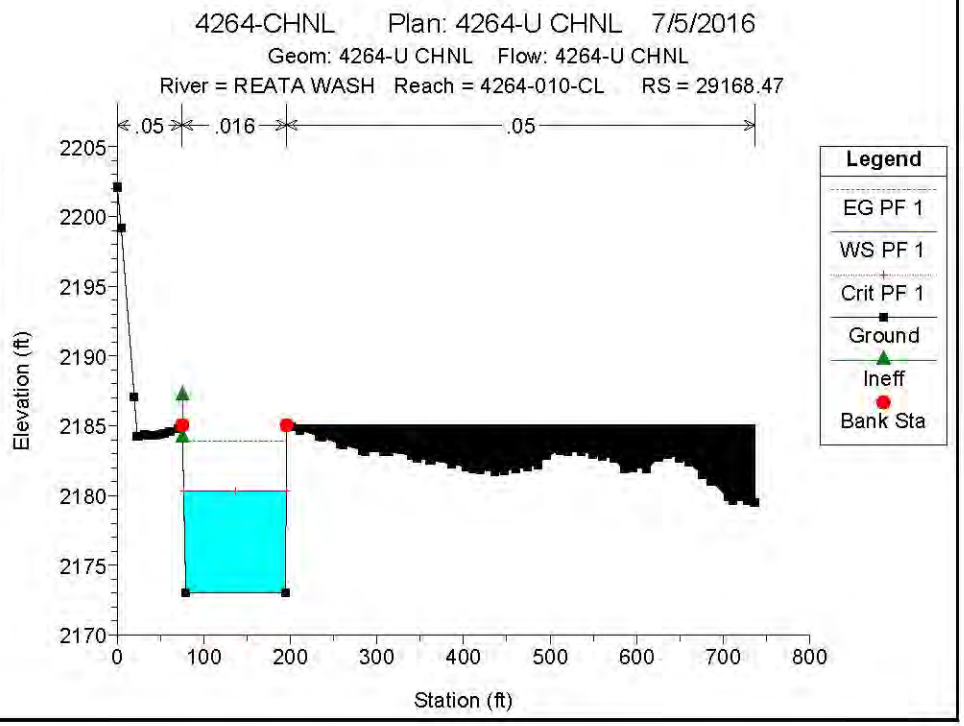
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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.05
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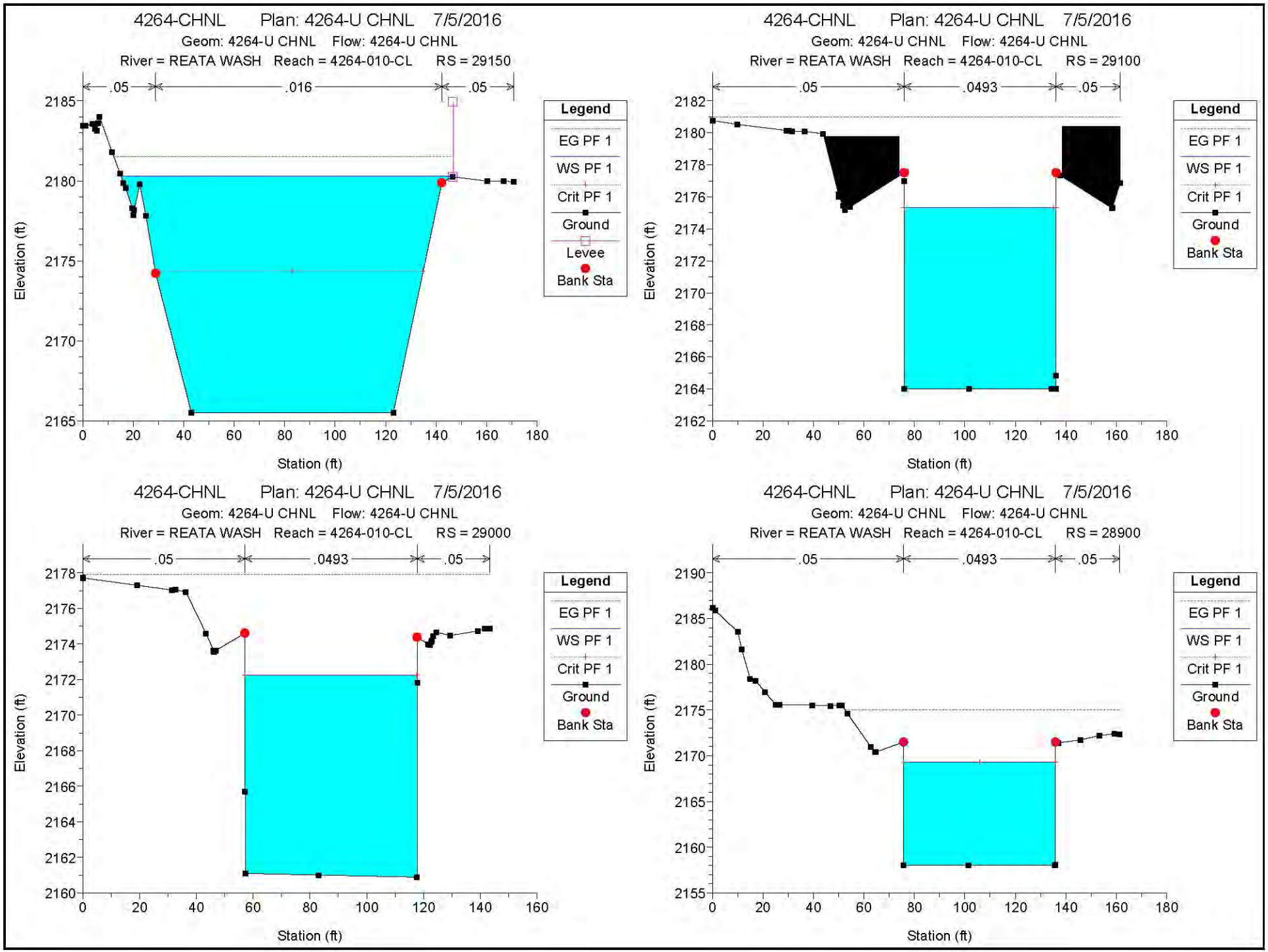
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29150
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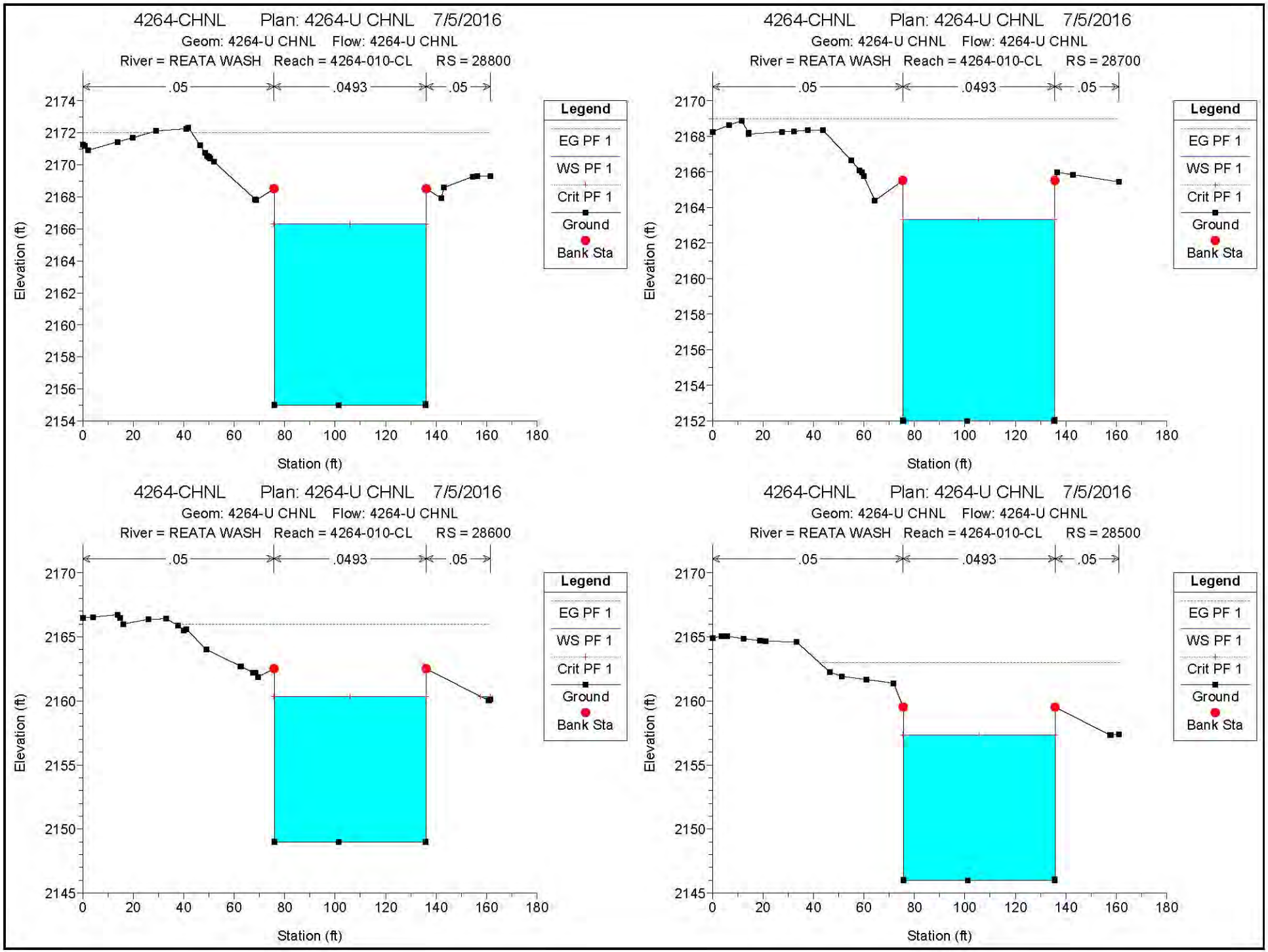
.016
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29100
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 29000
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28900
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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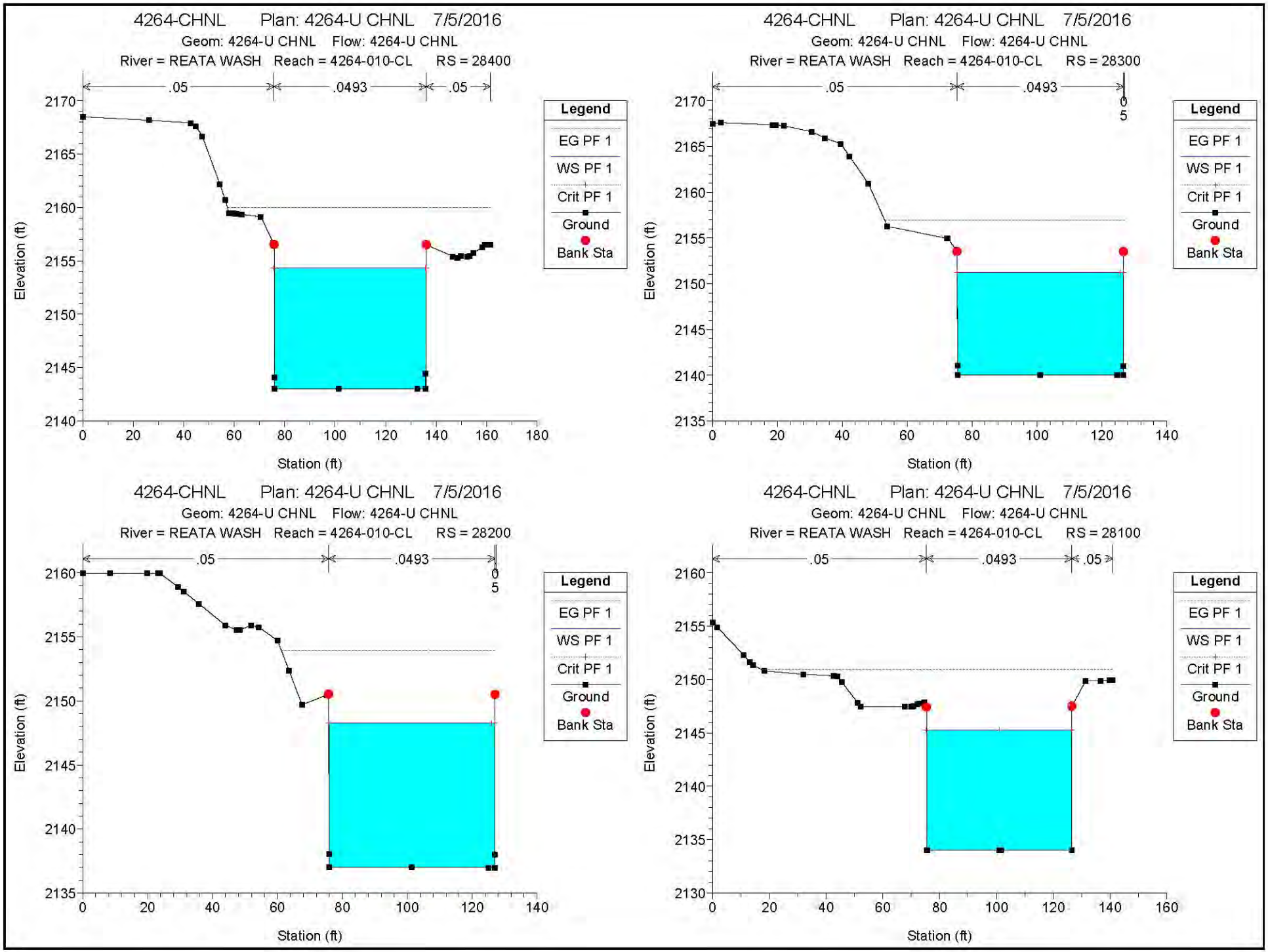
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28800
.05
.0493
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28700
.05
.0493
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28600
.05
.0493
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28500
.05
.0493
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28400
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28300
.05
.0493
0
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28200
.05
.0493
0
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28100
.05
.0493
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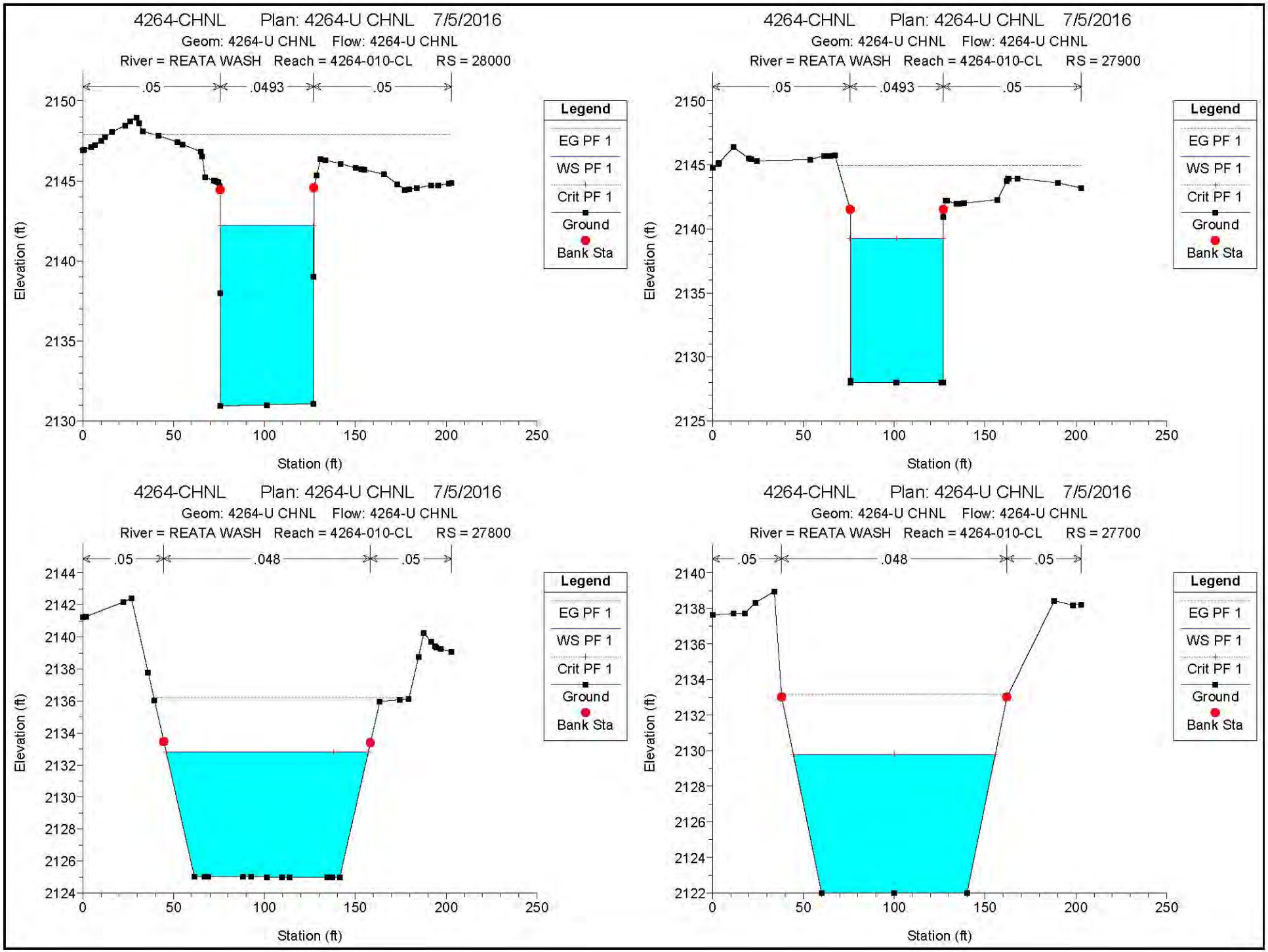
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 28000
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27900
.05
.0493
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27800
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27700
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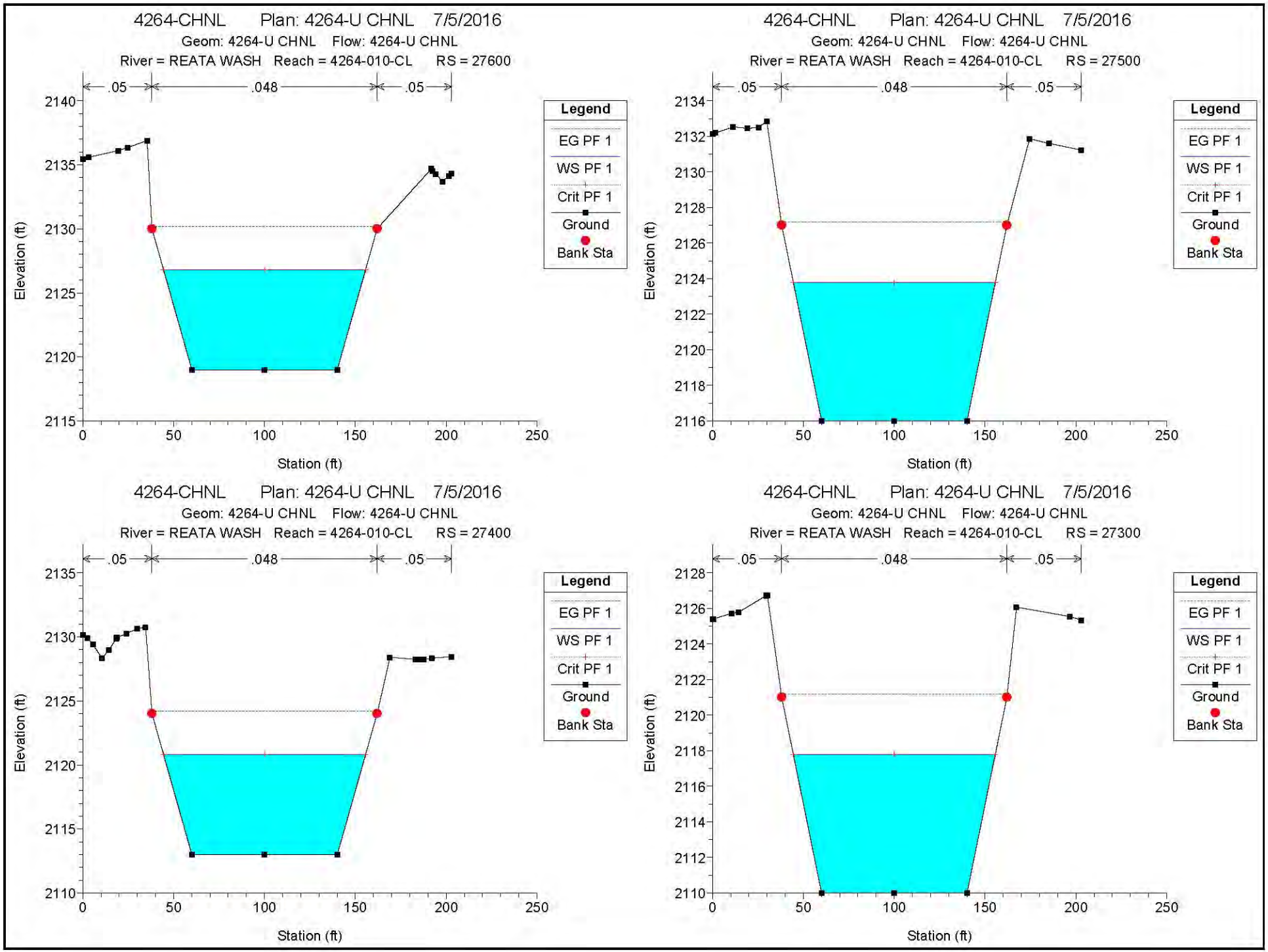
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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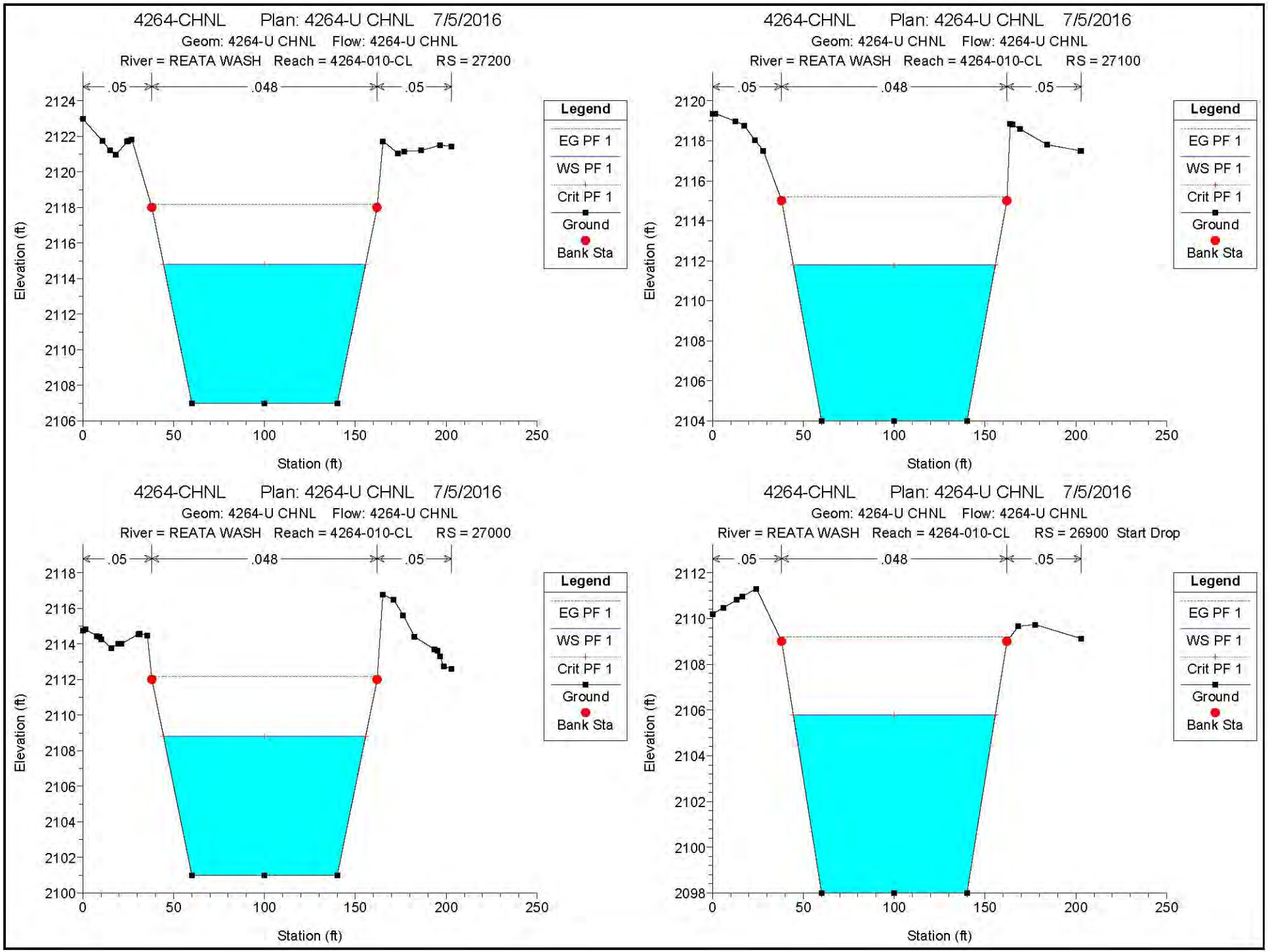
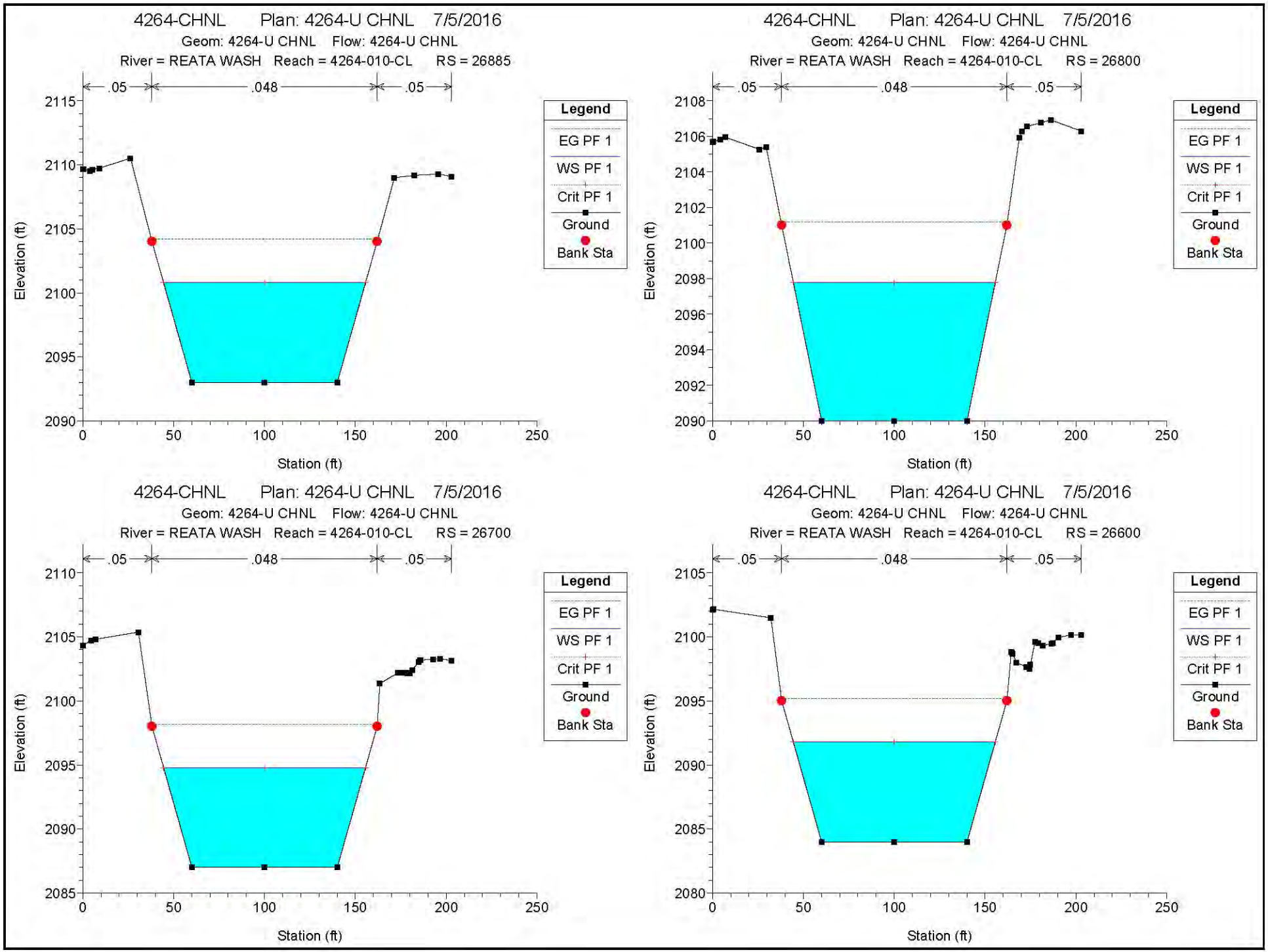
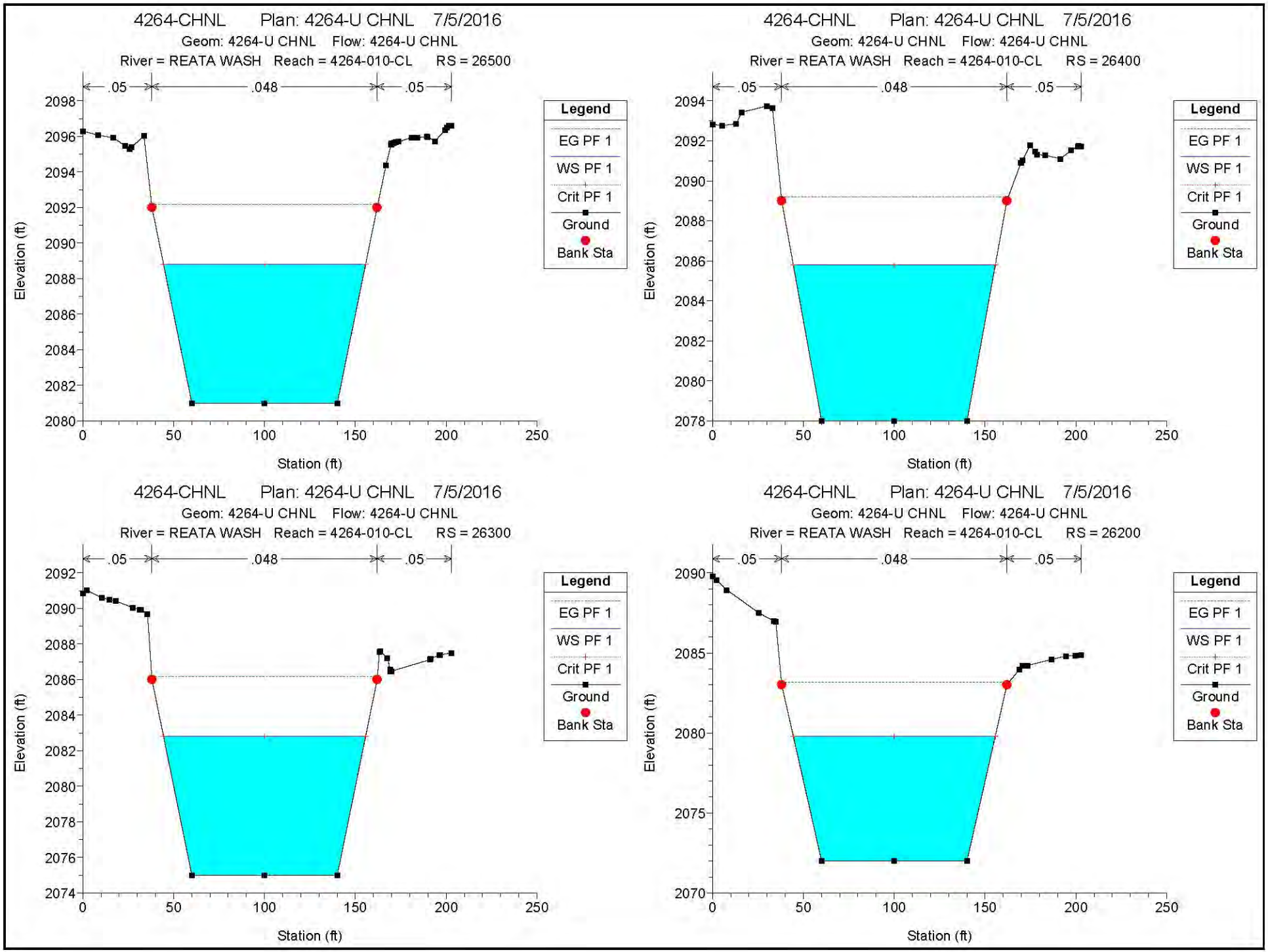
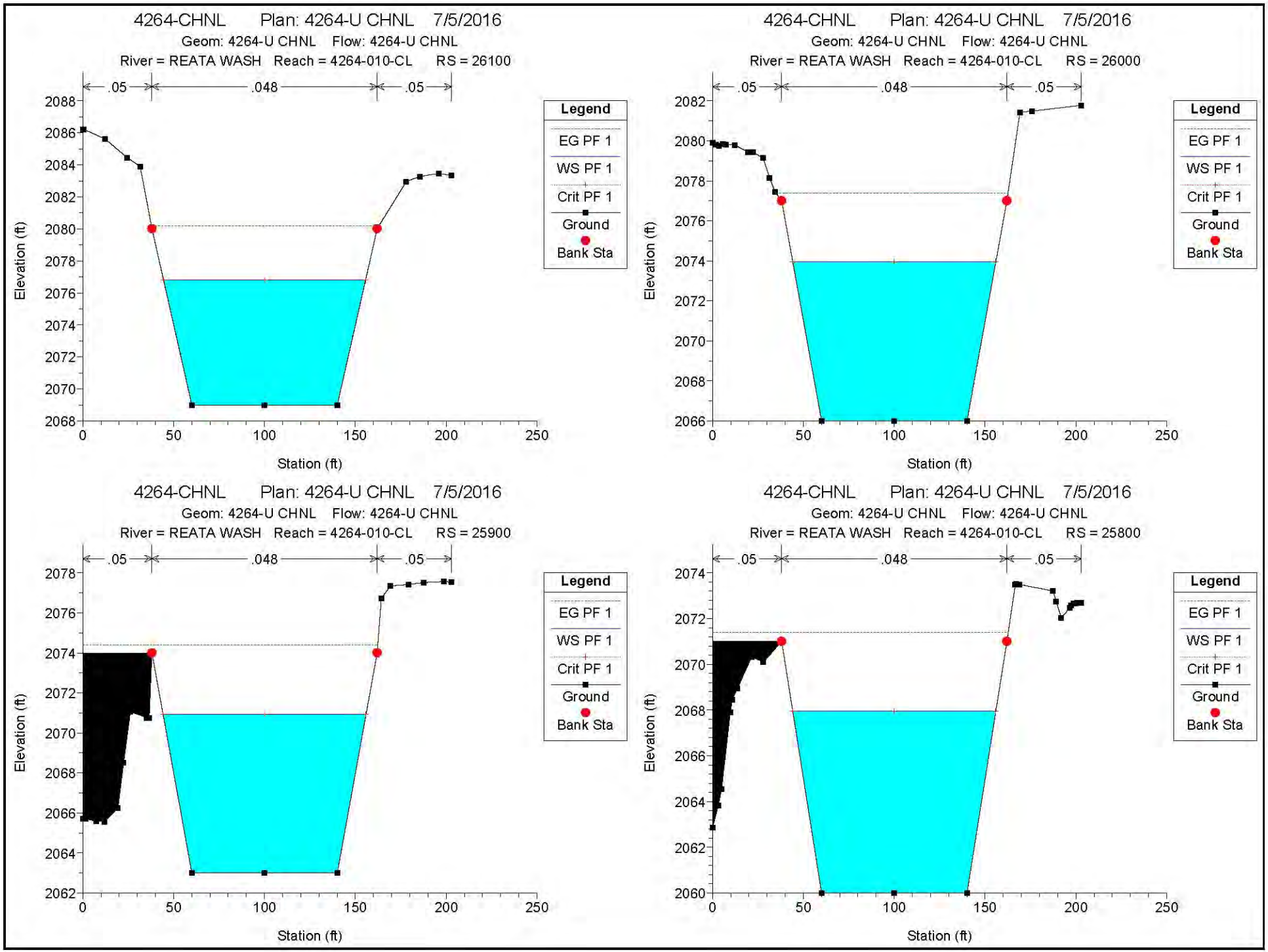
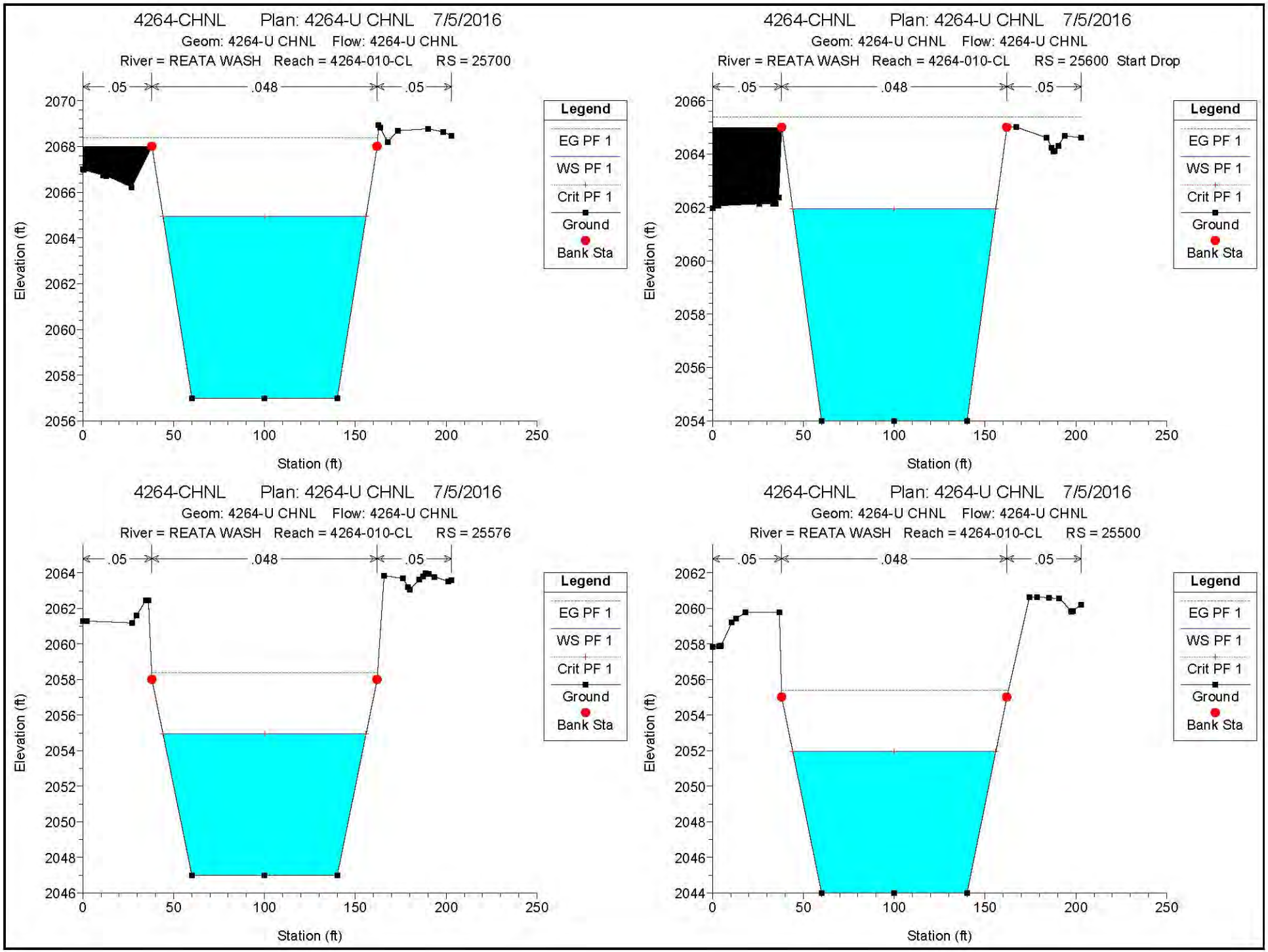
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27600
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27500
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27400
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27300
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

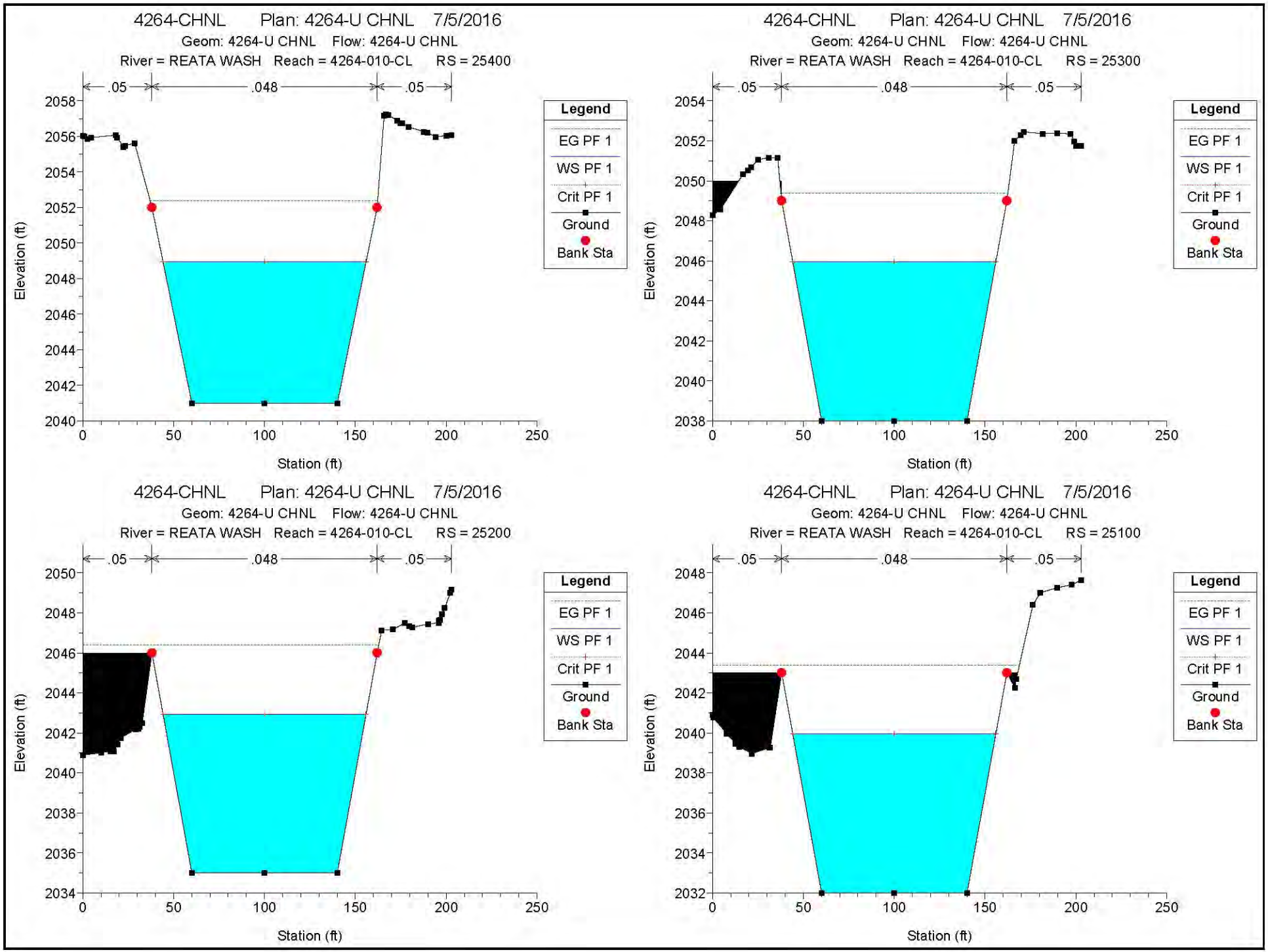

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27200
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27100
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 27000
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26900 Start Drop
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

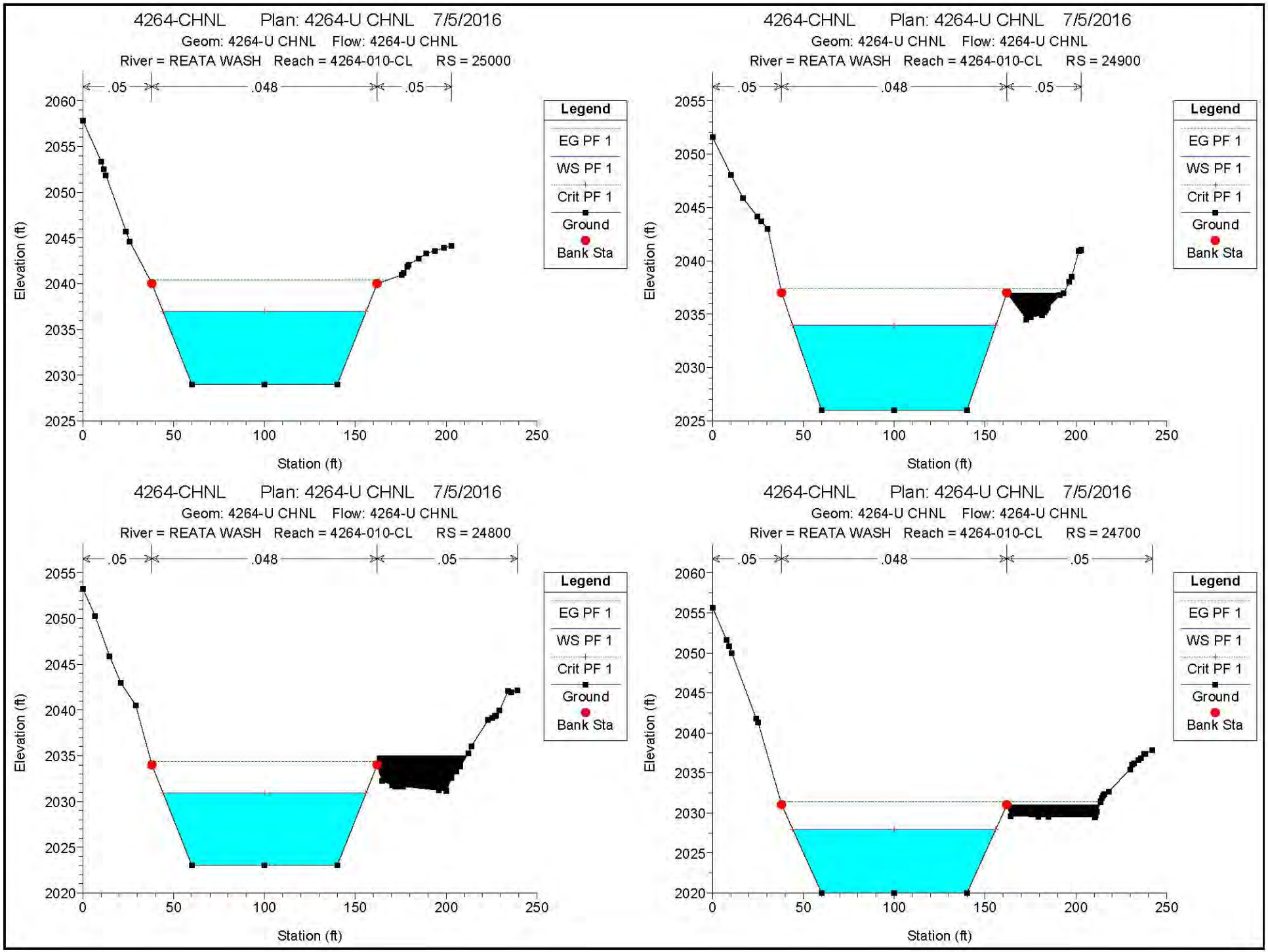

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26885
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26800
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26700
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26600
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26500
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26400
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26300
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26200
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26100
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 26000
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25900
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25800
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25700
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25600 Start Drop
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25576
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25500
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25400
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25300
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25200
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 25100
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
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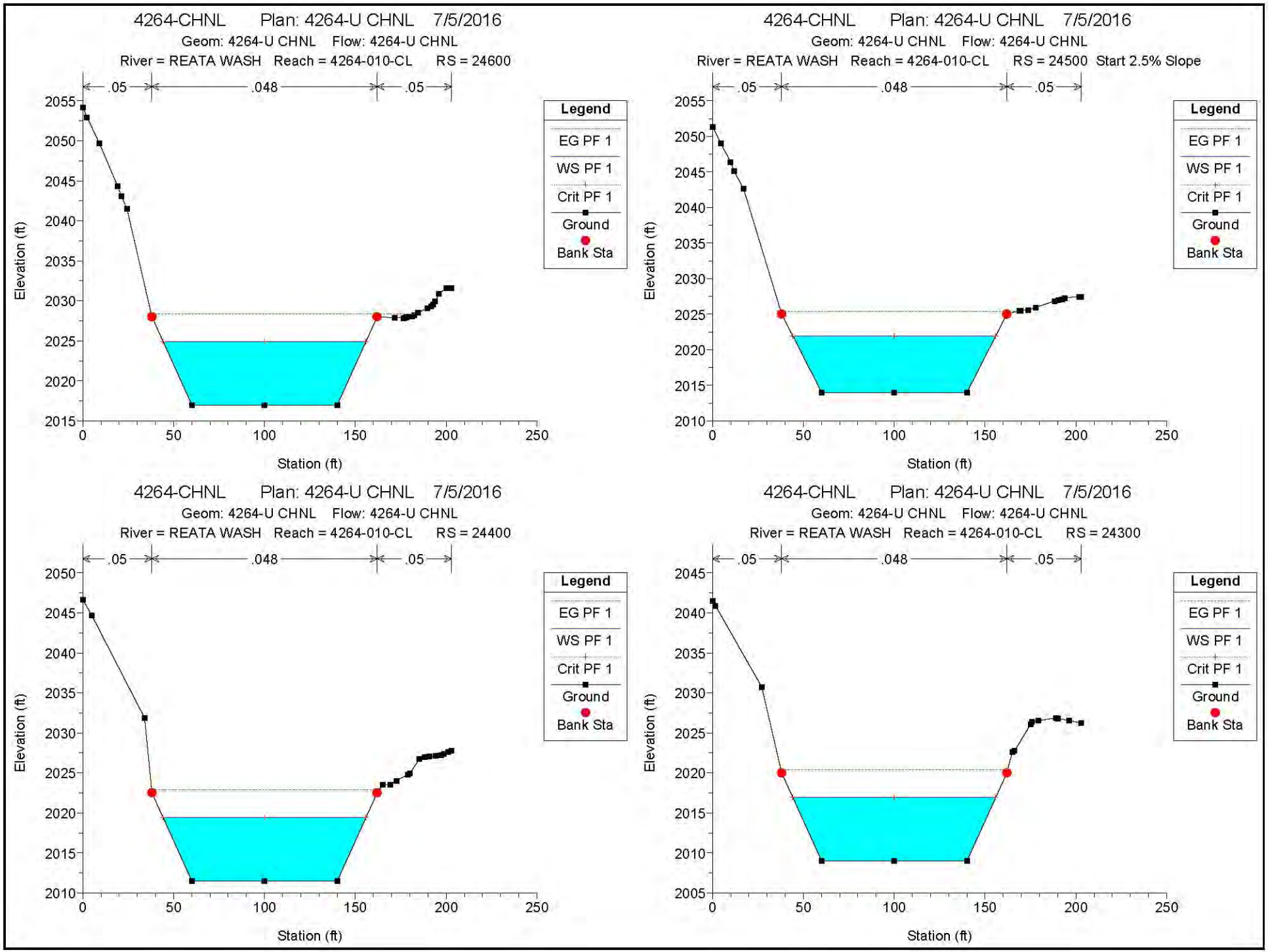
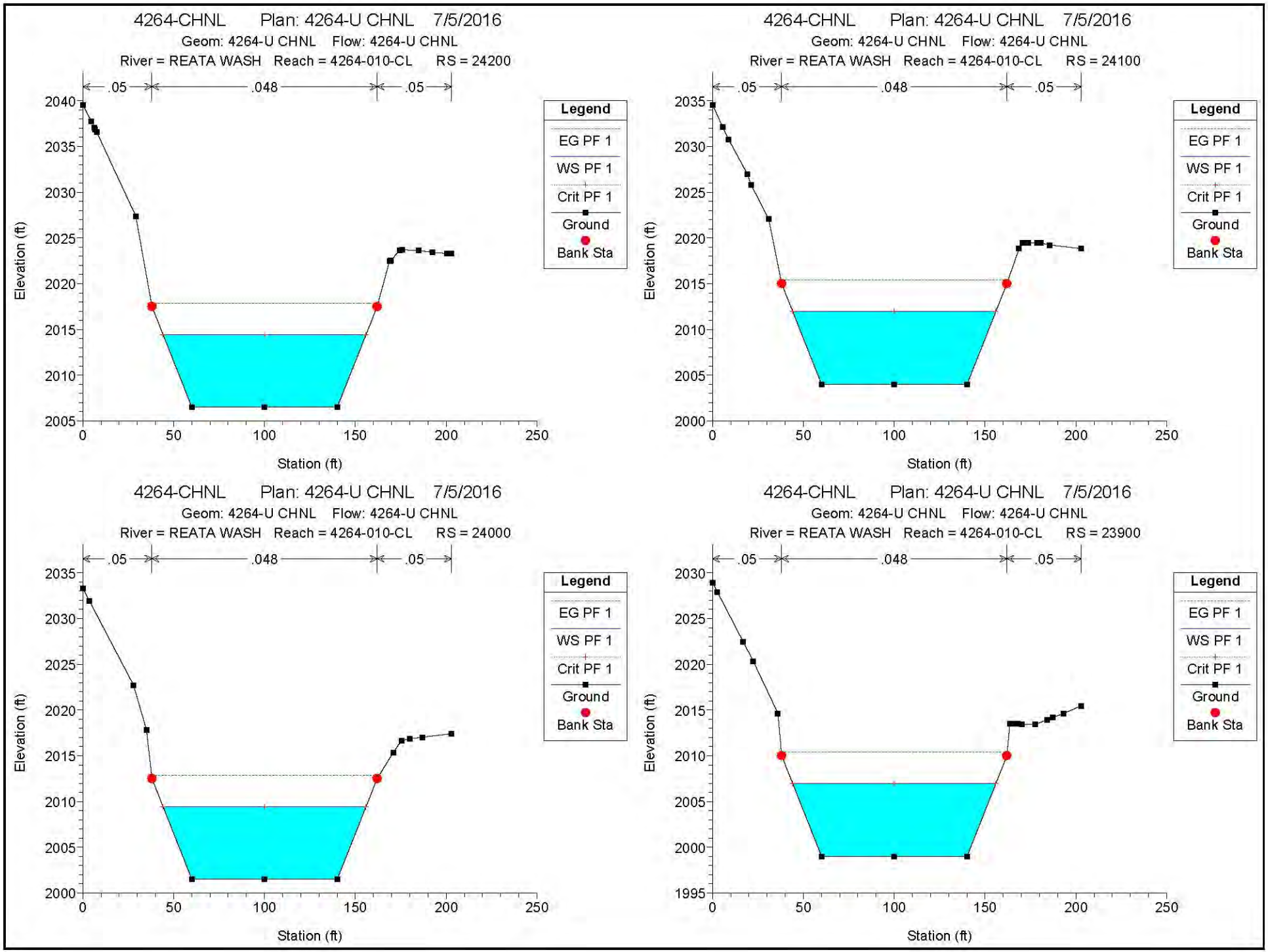
River = REATA WASH Reach = 4264-010-CL RS = 25000
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24900
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24800
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24700
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24600
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24500 Start 2.5% Slope
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24400
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24300
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24200
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24100
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 24000
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23900
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
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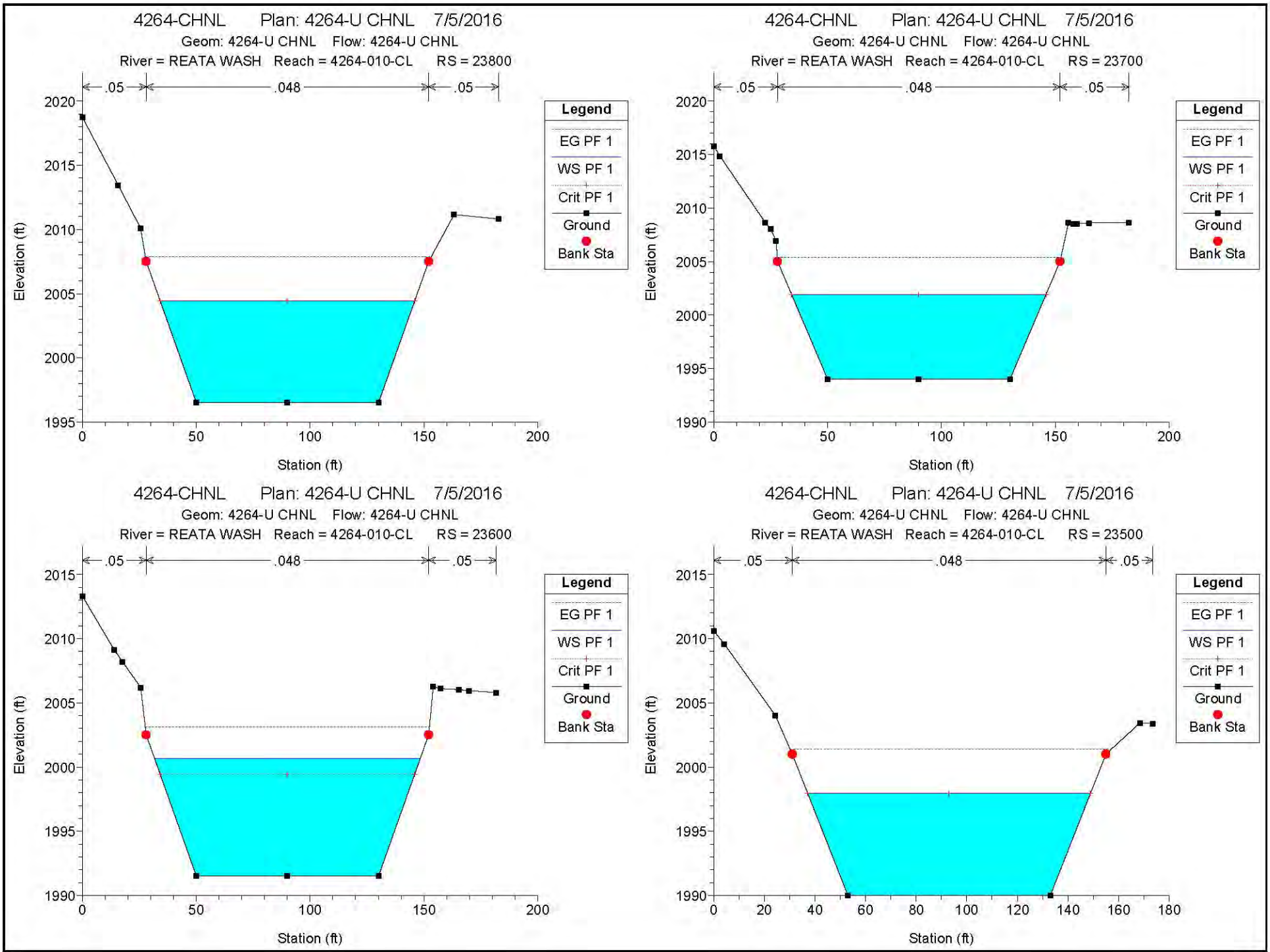
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23800
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23700
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23600
.05
.048
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23500
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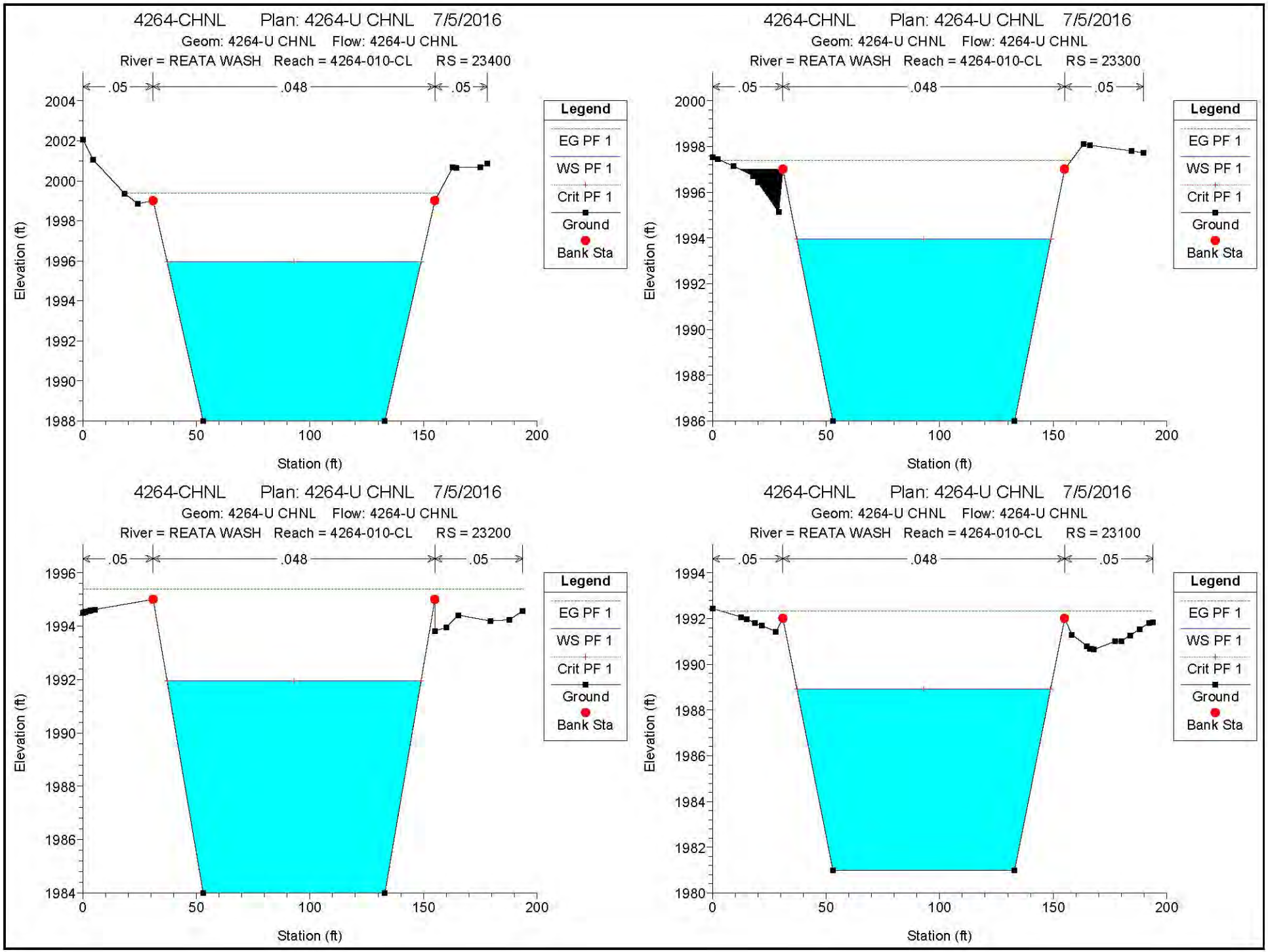
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23300
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23200
.05
.048
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Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 23100
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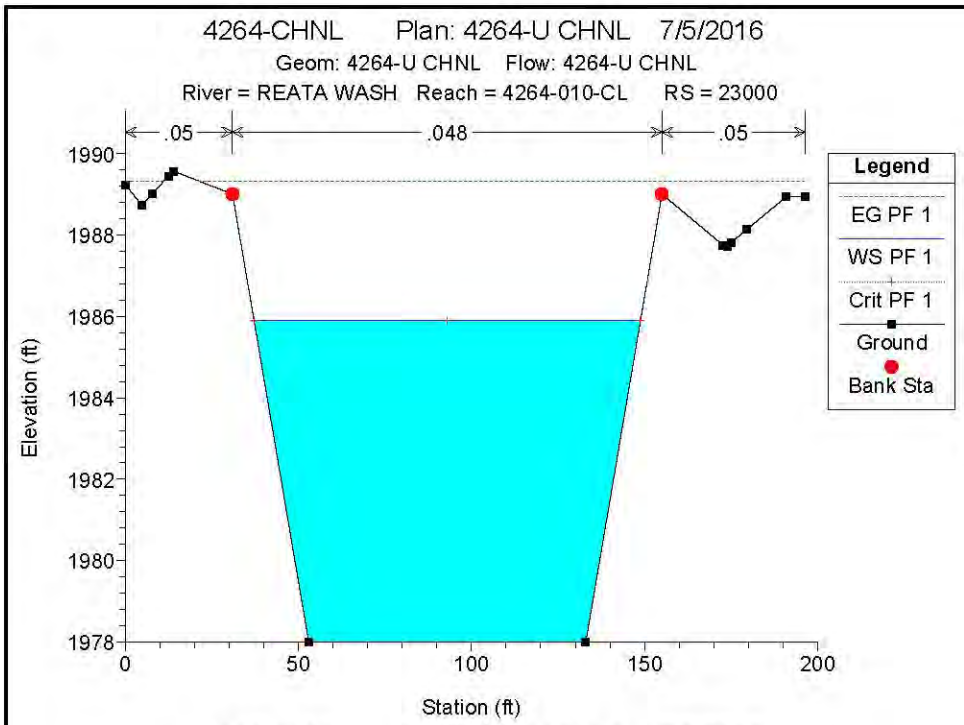
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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Geom: 4264-U CHNL Flow: 4264-U CHNL
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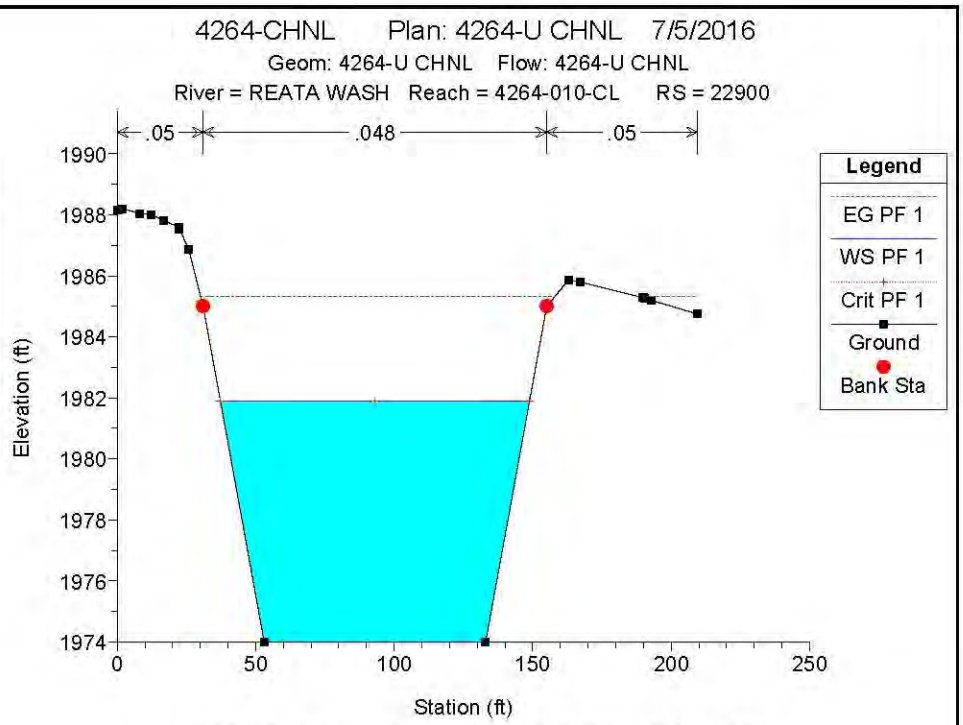
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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Legend
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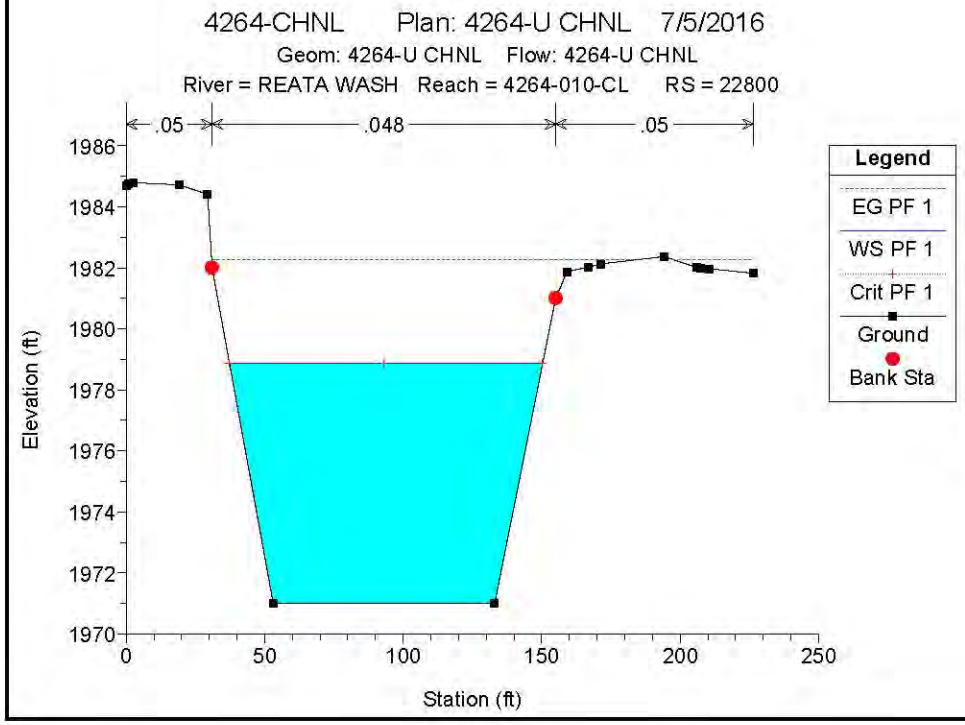
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22800
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Legend
EG PF 1
WS PF 1
Crit PF 1
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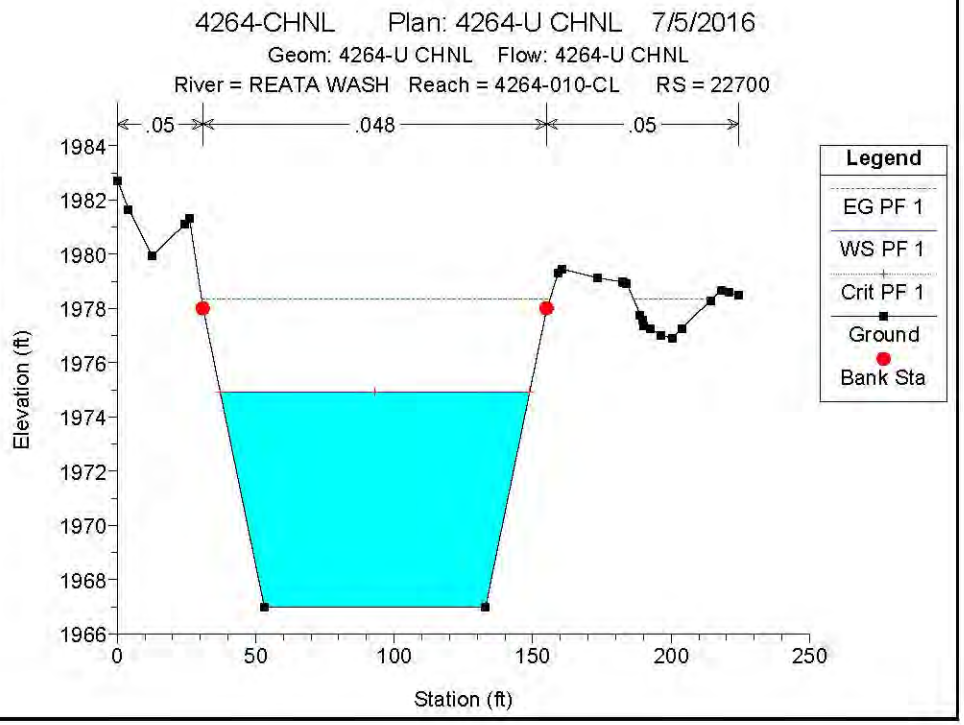
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
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Legend
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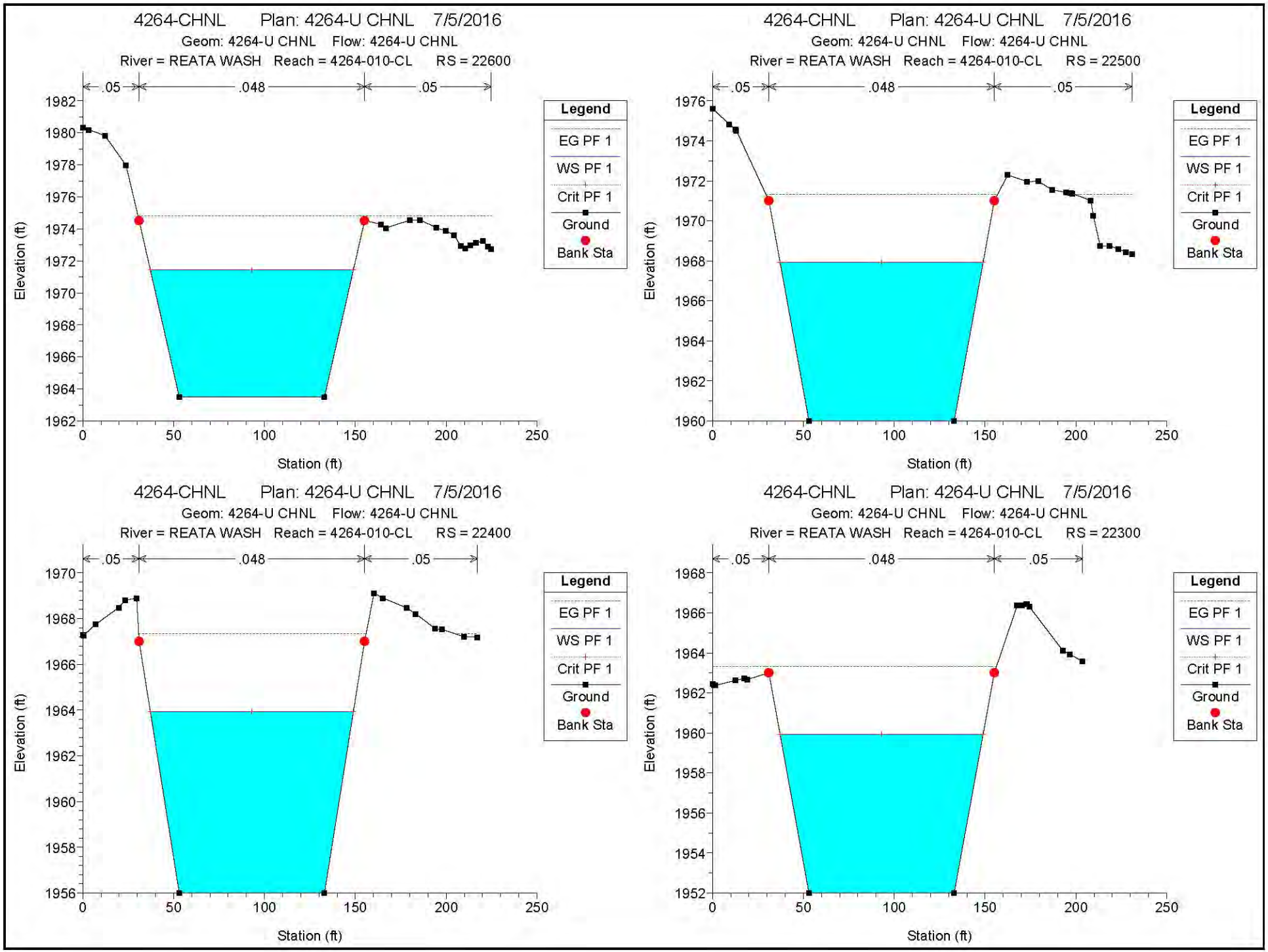
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22600
.05
.048
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Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22500
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22400
.05
.048
.05
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22300
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.048
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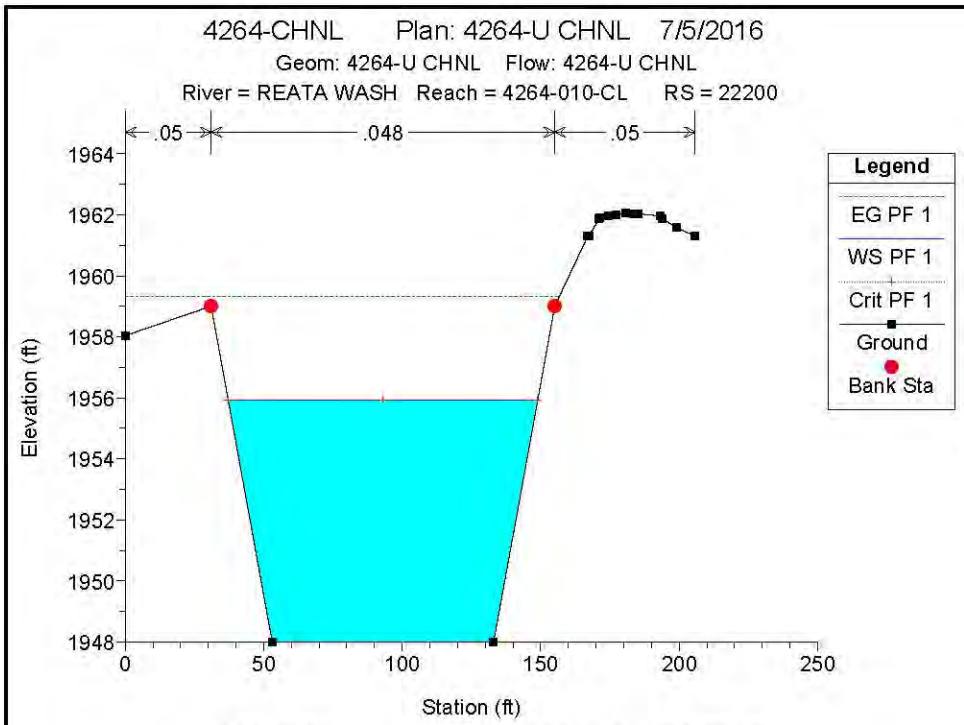
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22200
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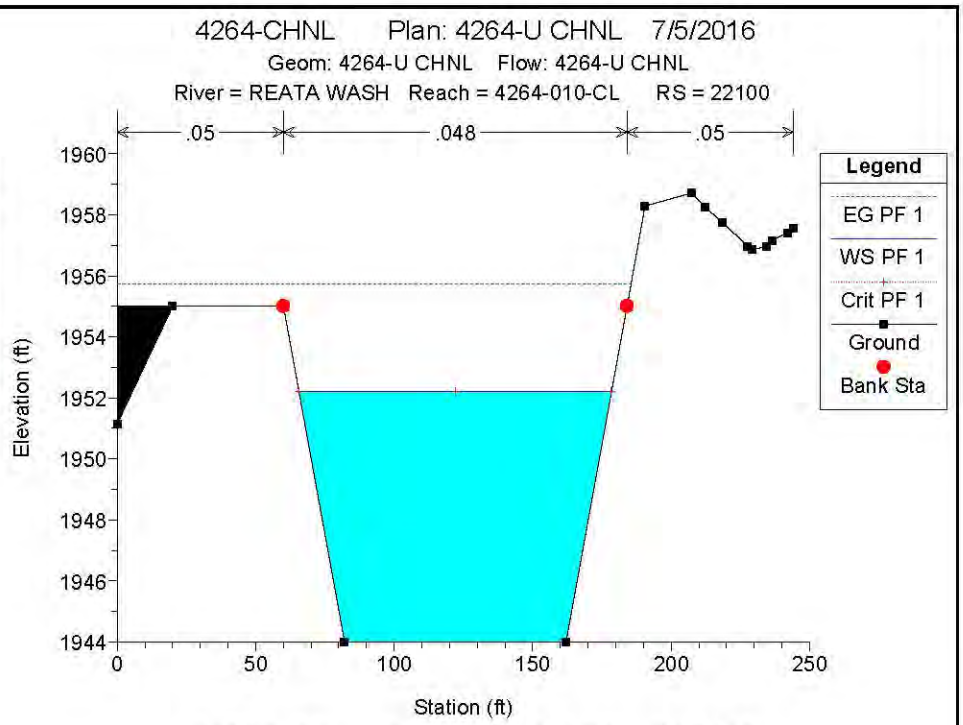
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22100
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Legend
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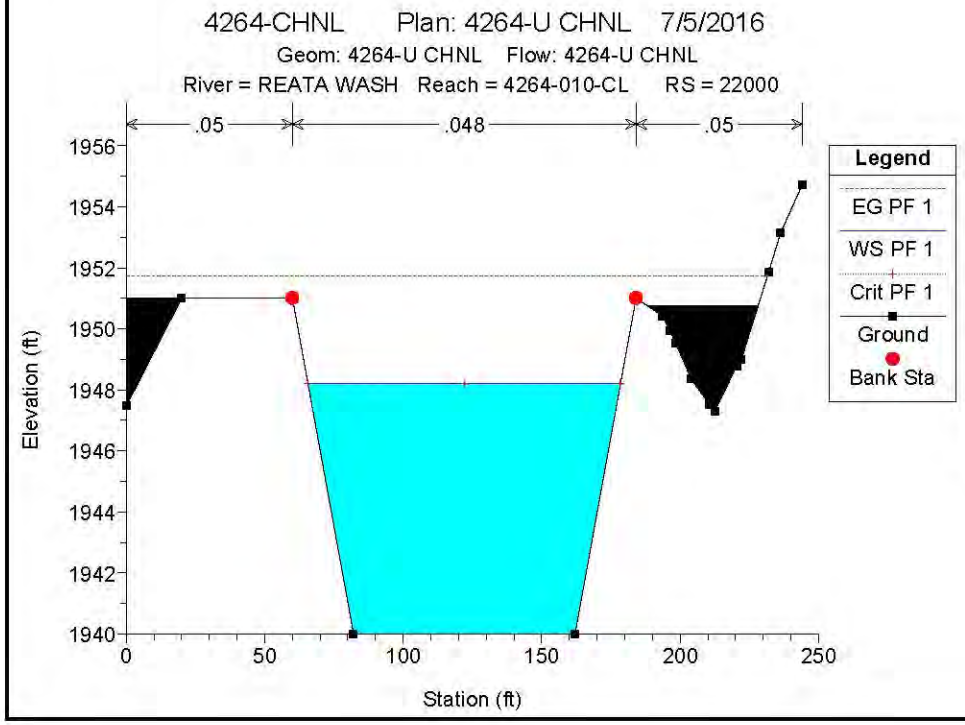
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 22000
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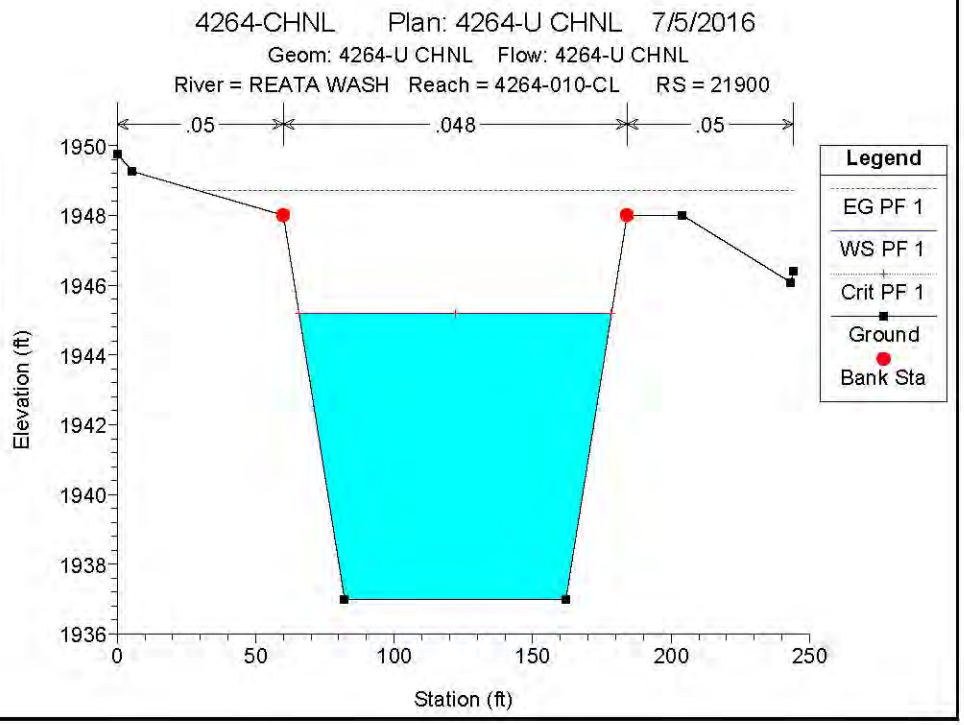
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21900
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Crit PF 1
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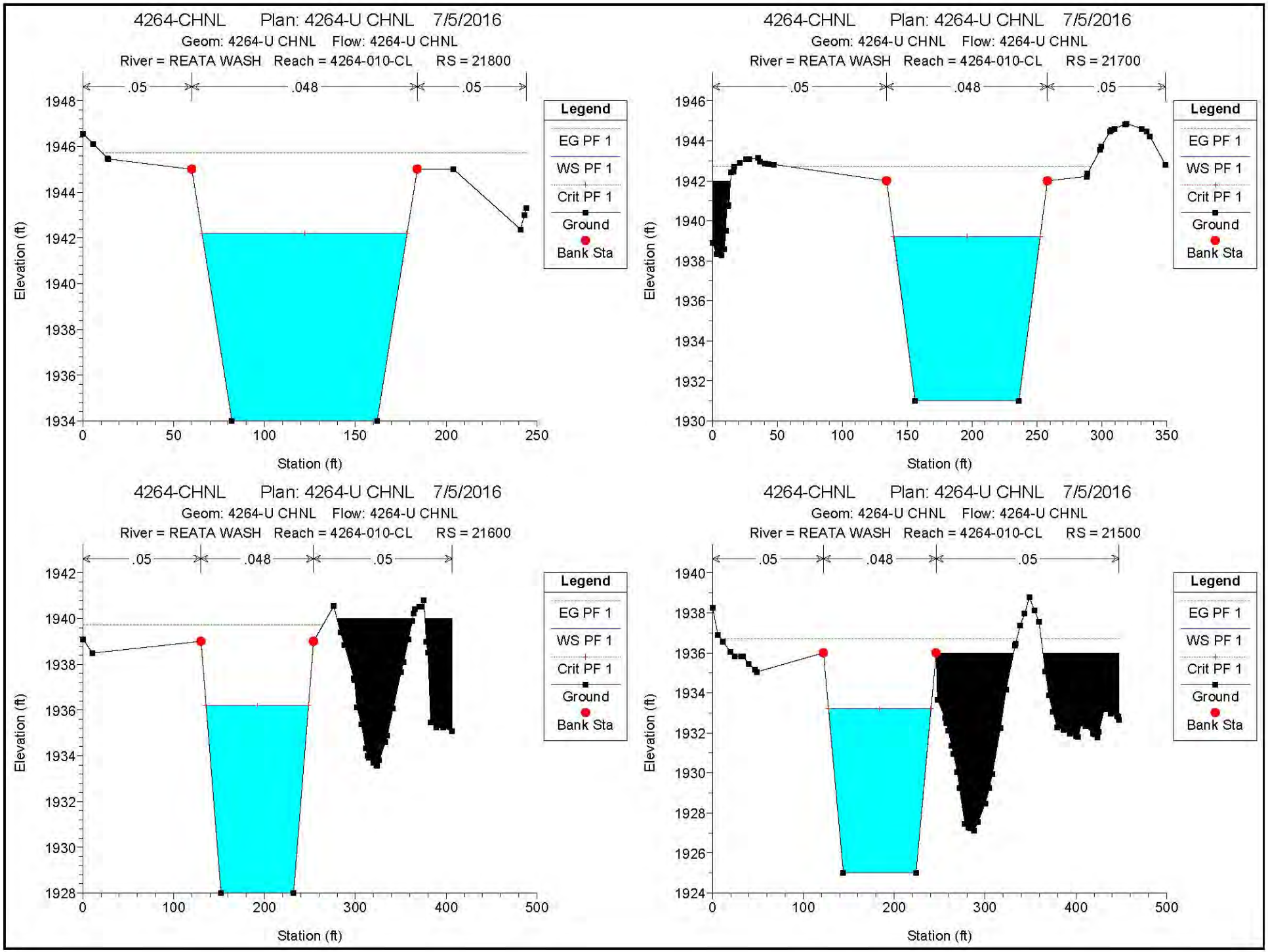
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21800
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.048
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21700
.05
.048
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21600
.05
.048
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21500
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Legend
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WS PF 1
Crit PF 1
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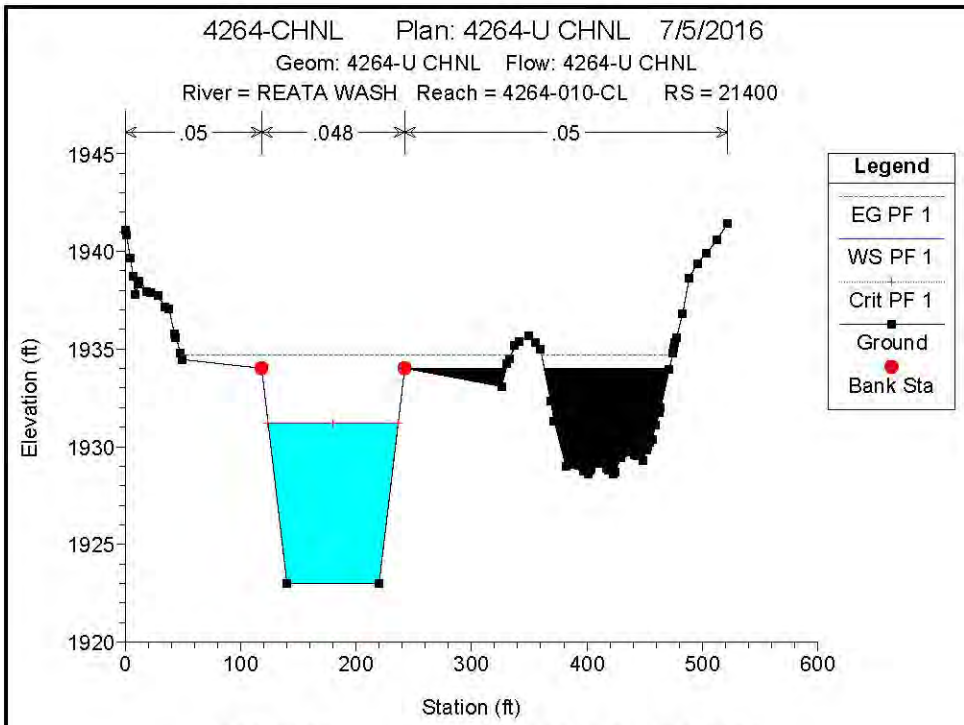
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21400
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Legend
EG PF 1
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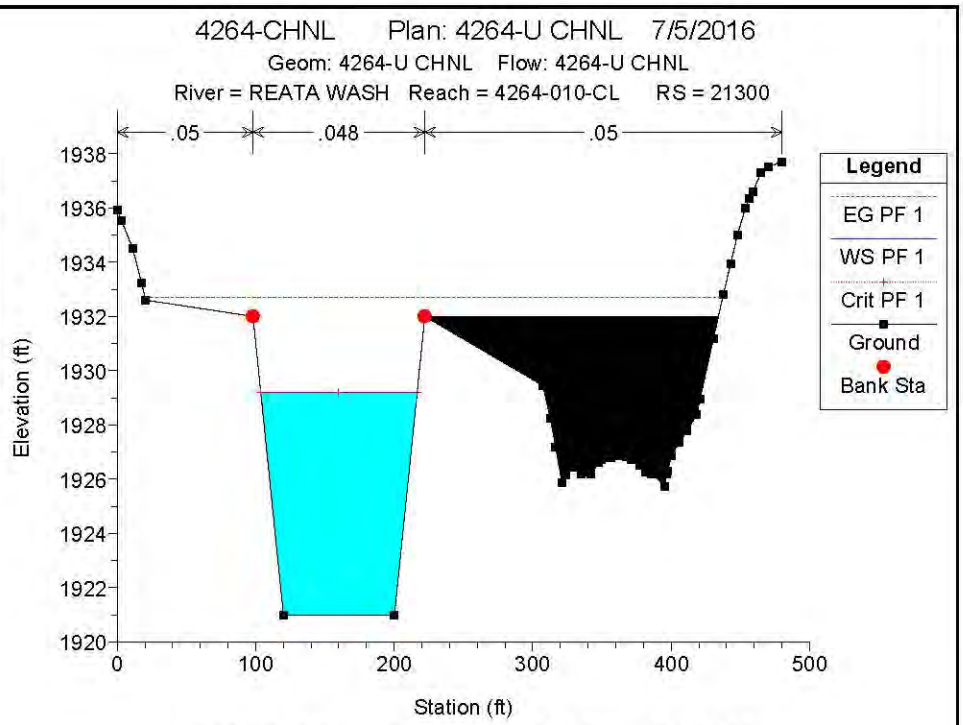
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21300
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Crit PF 1
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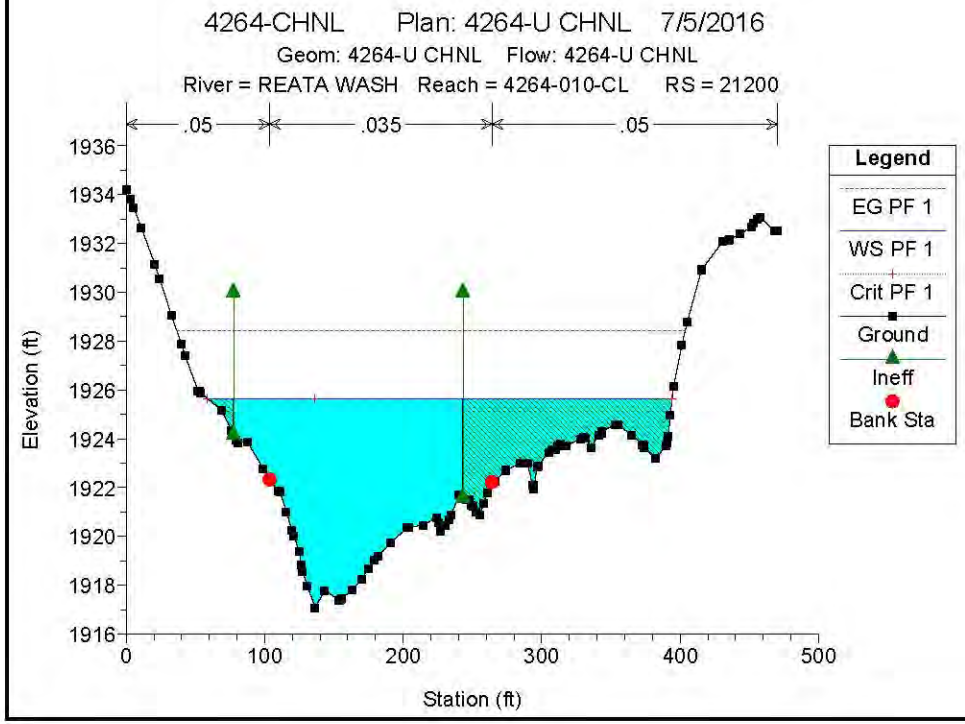
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21200
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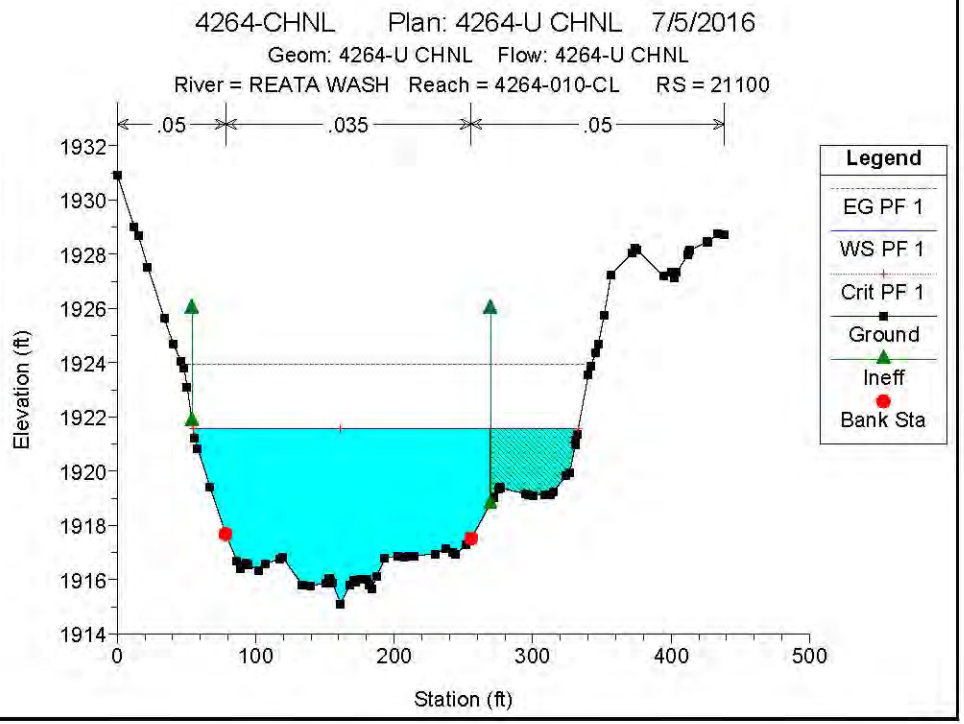
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21100
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Legend
EG PF 1
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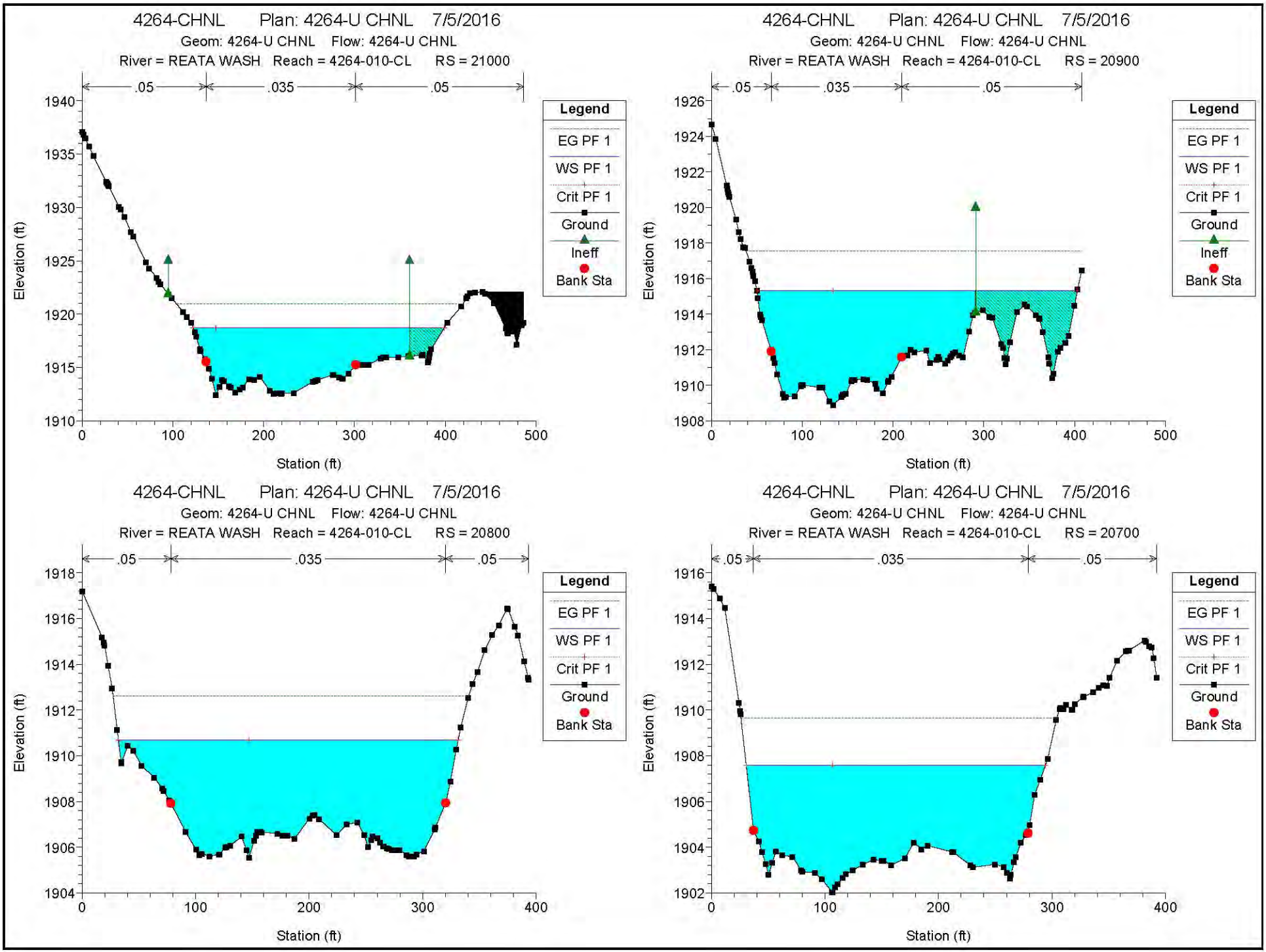
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 21000
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20900
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20800
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20700
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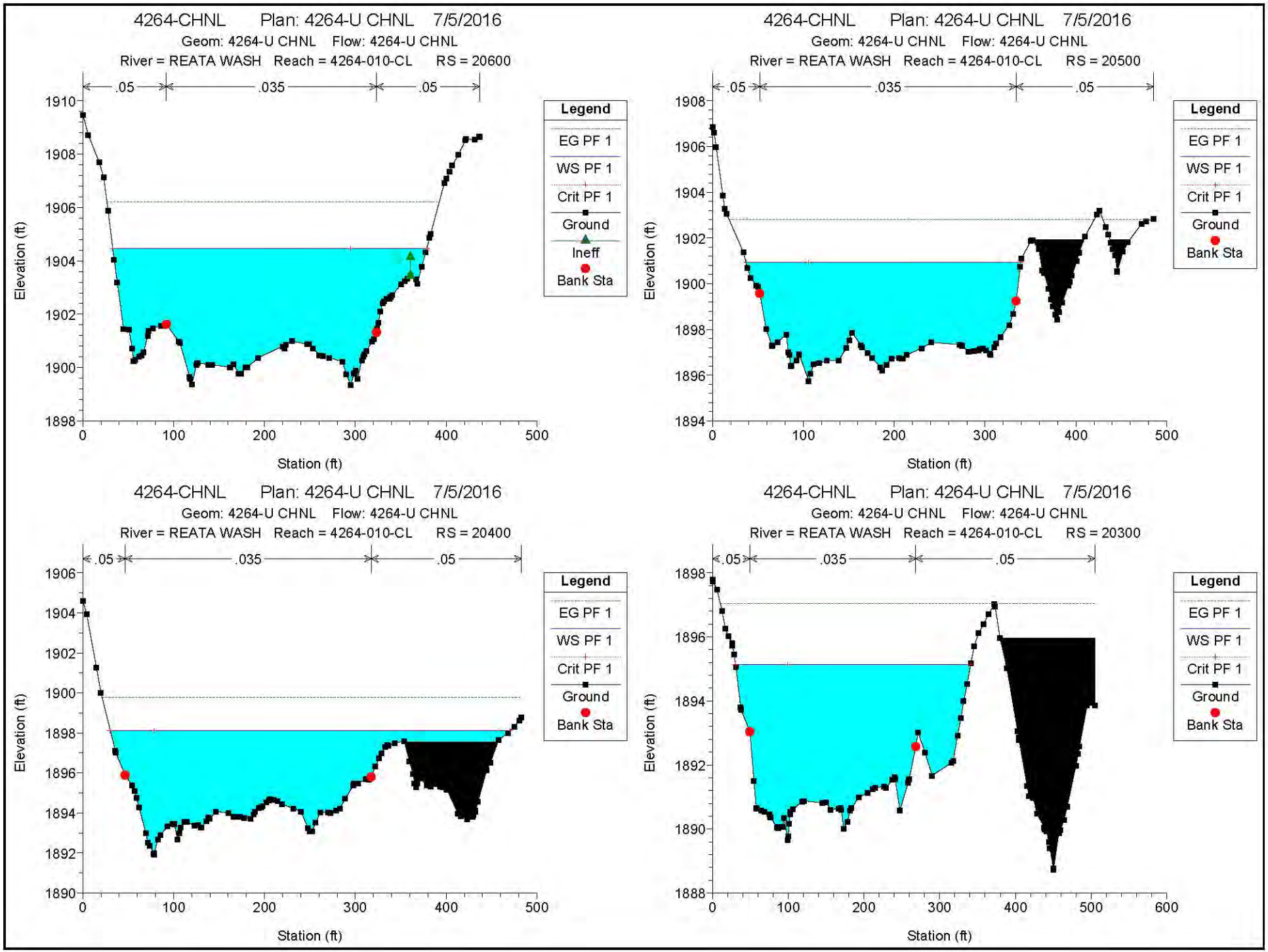
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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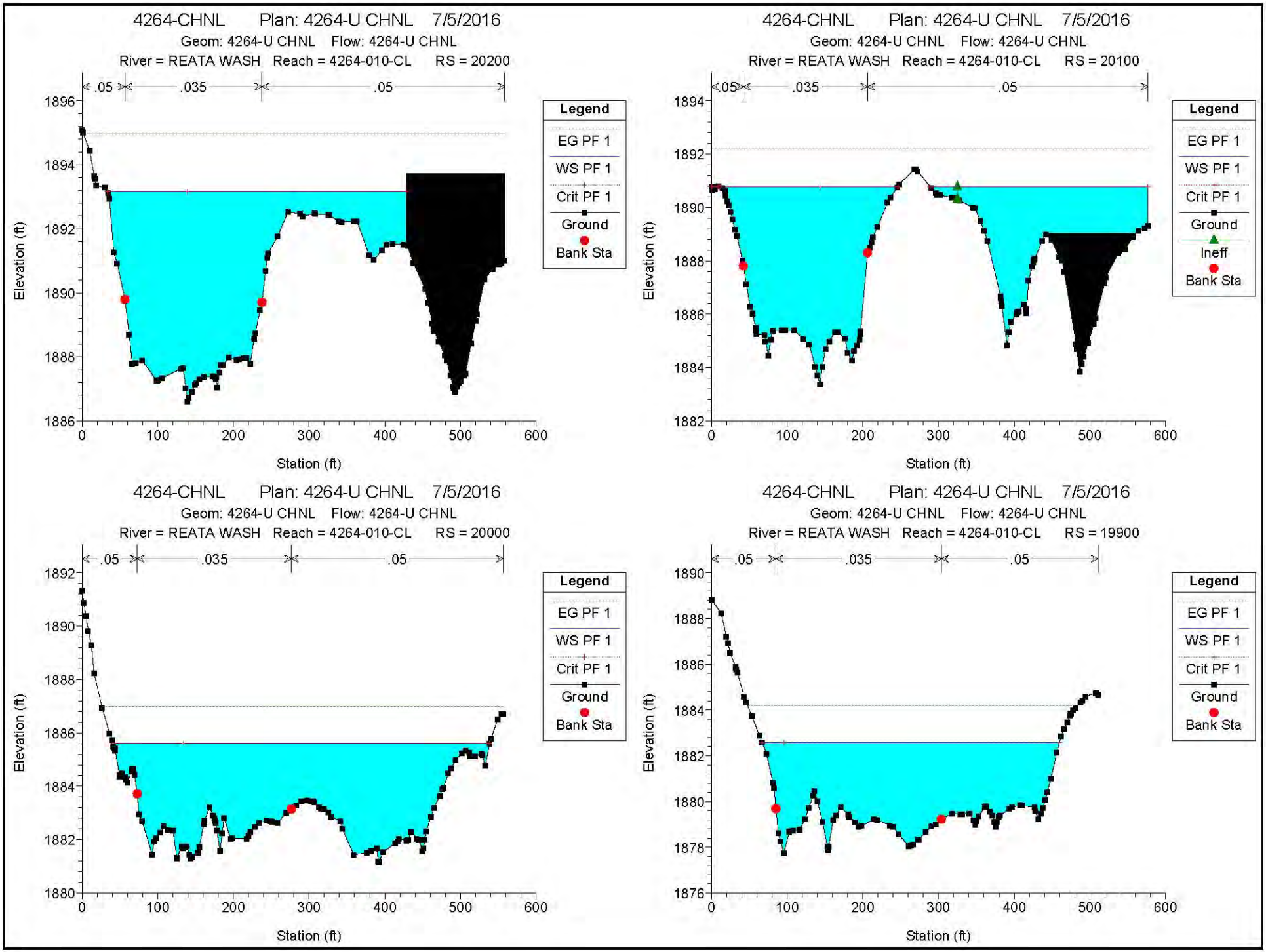
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20600
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20500
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20400
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20300
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20200
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20100
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 20000
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19900
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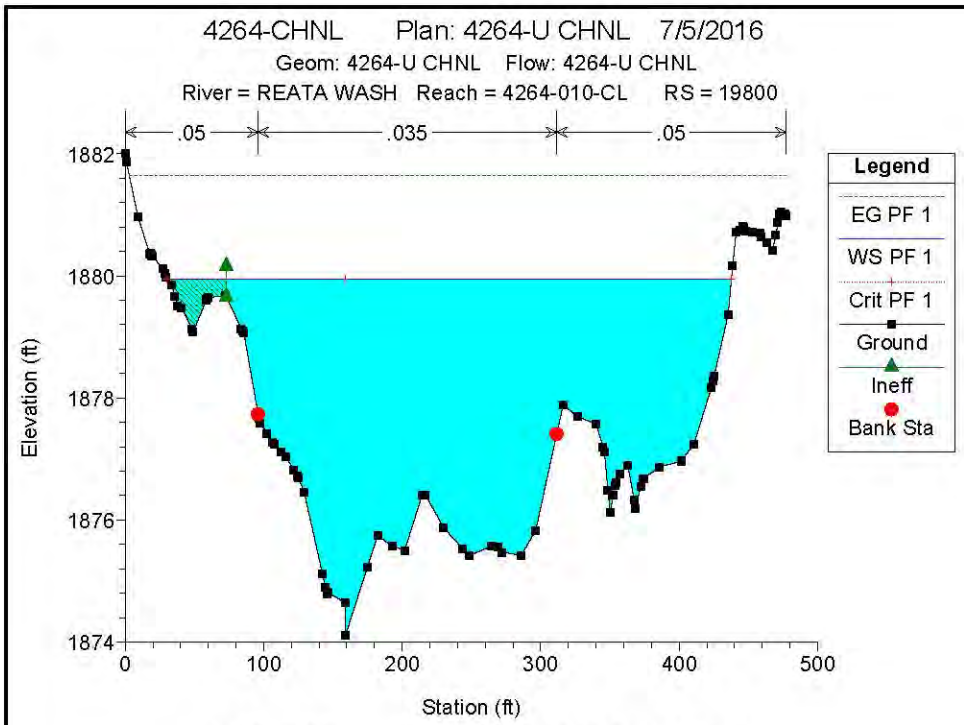
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19800
.05
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.05
Legend
EG PF 1
WS PF 1
Crit PF 1
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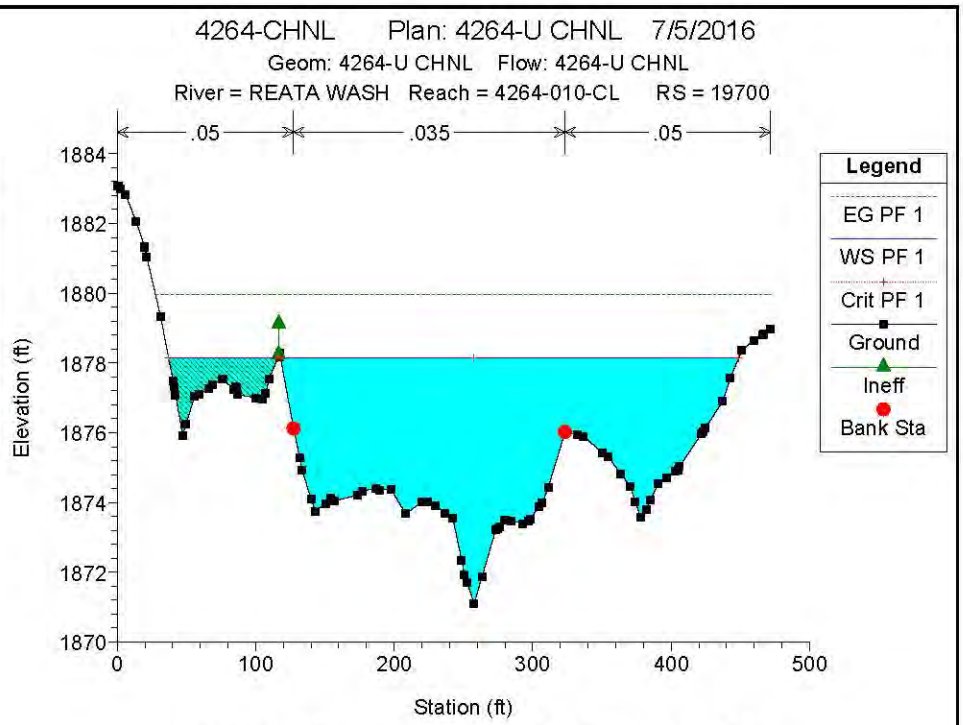
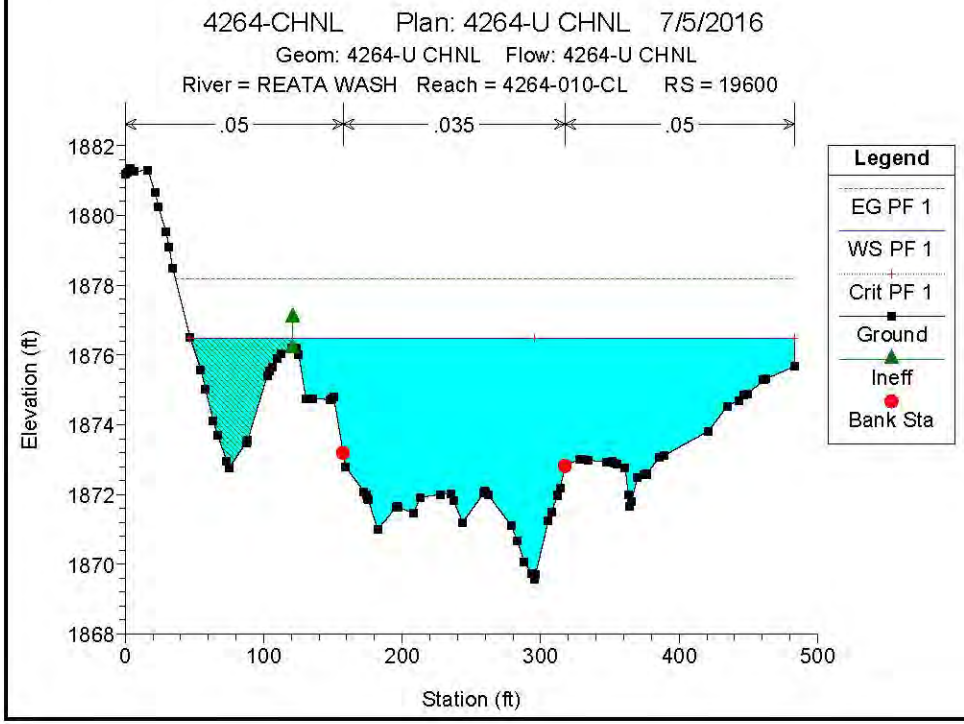
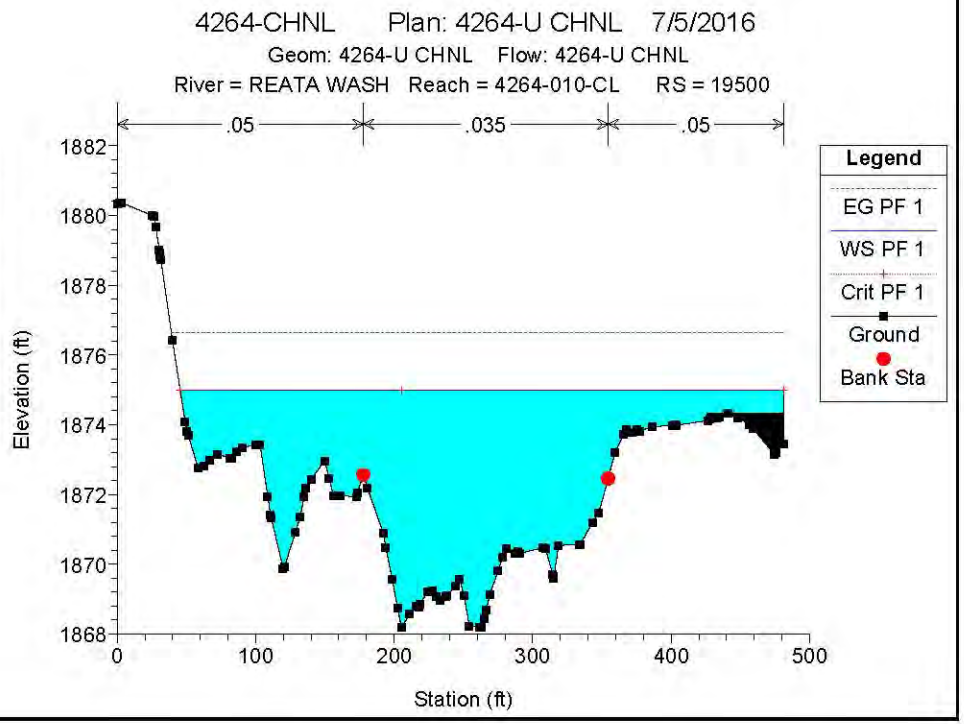
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19700
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19600
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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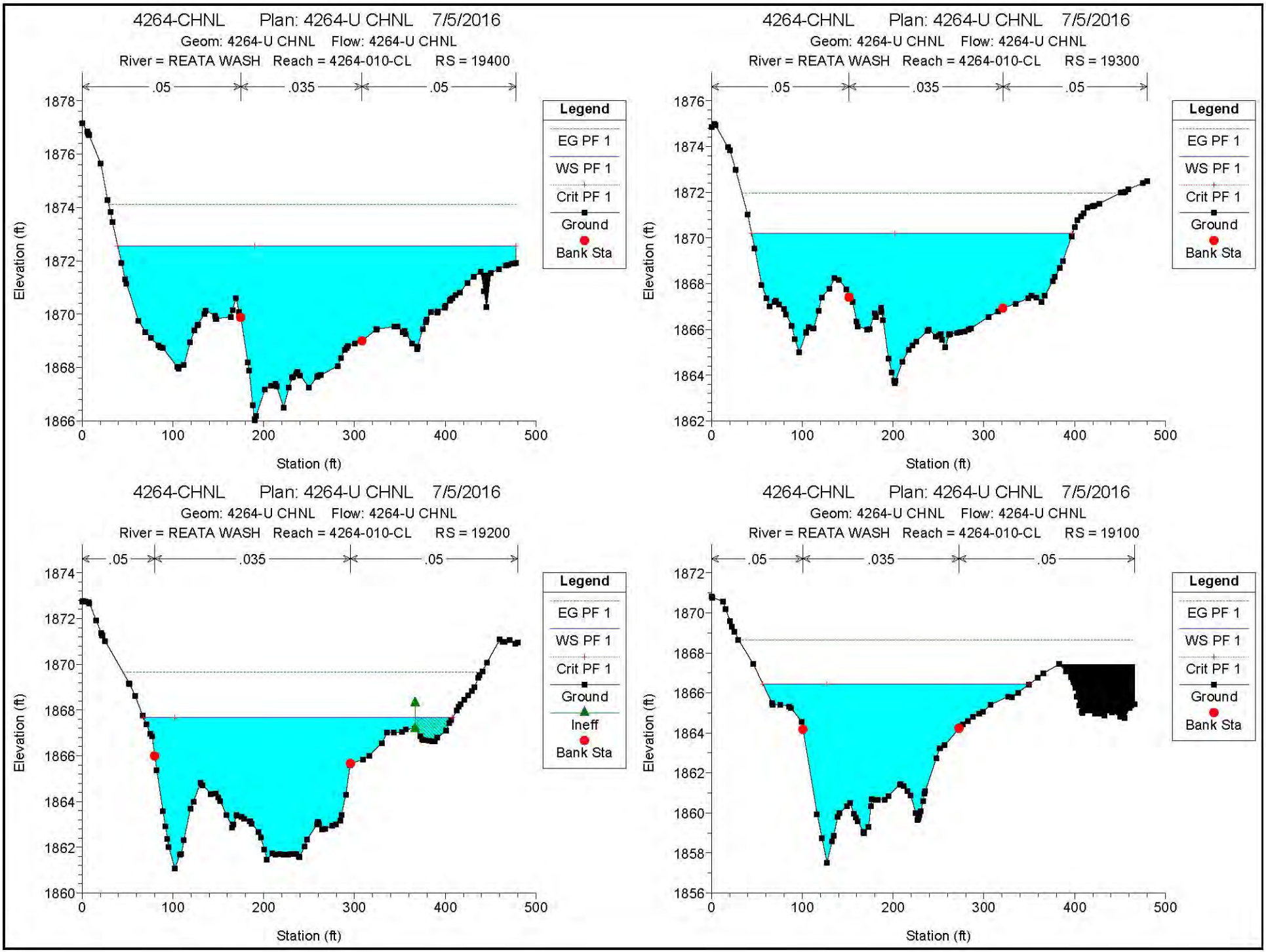
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19500
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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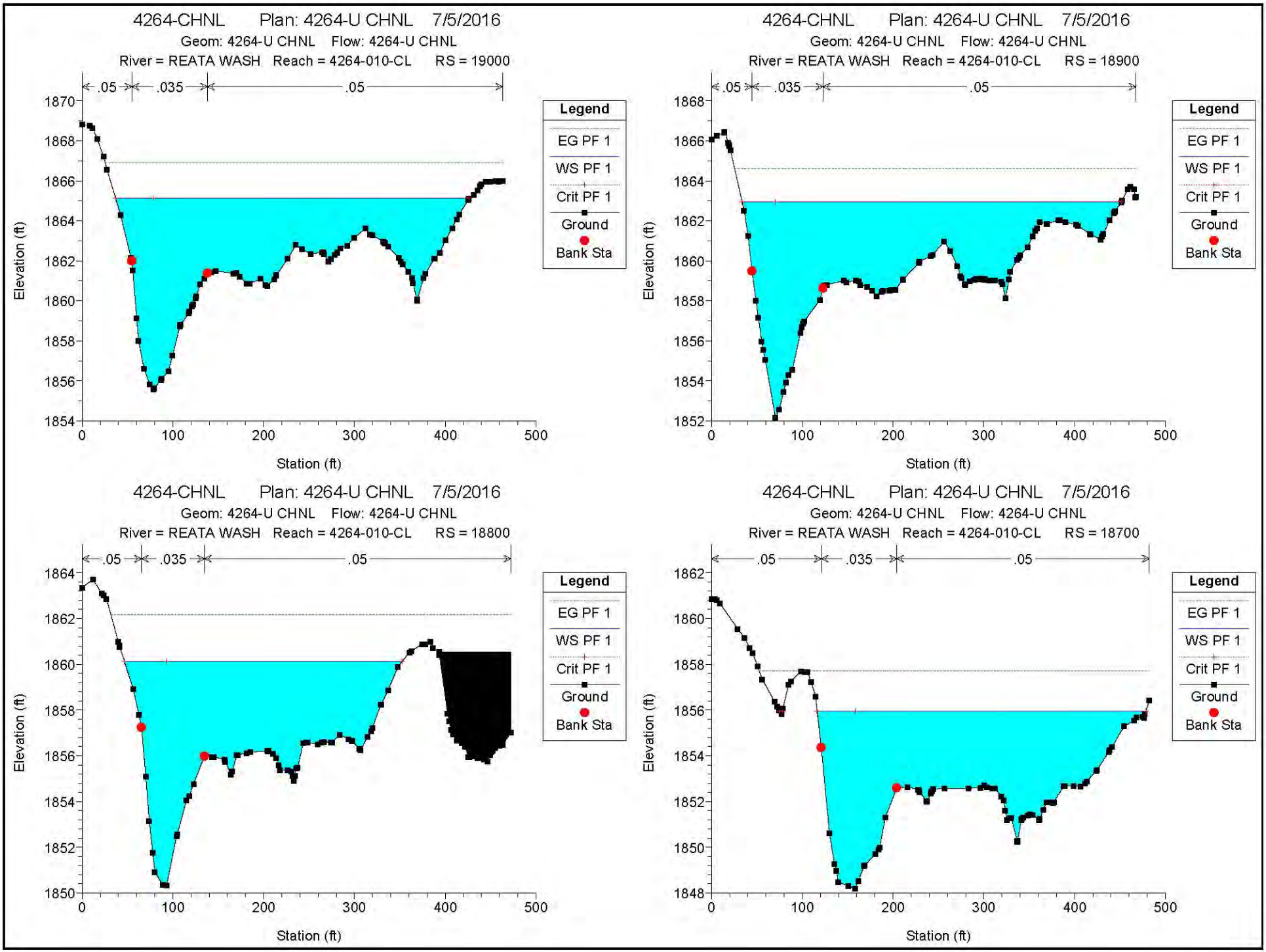
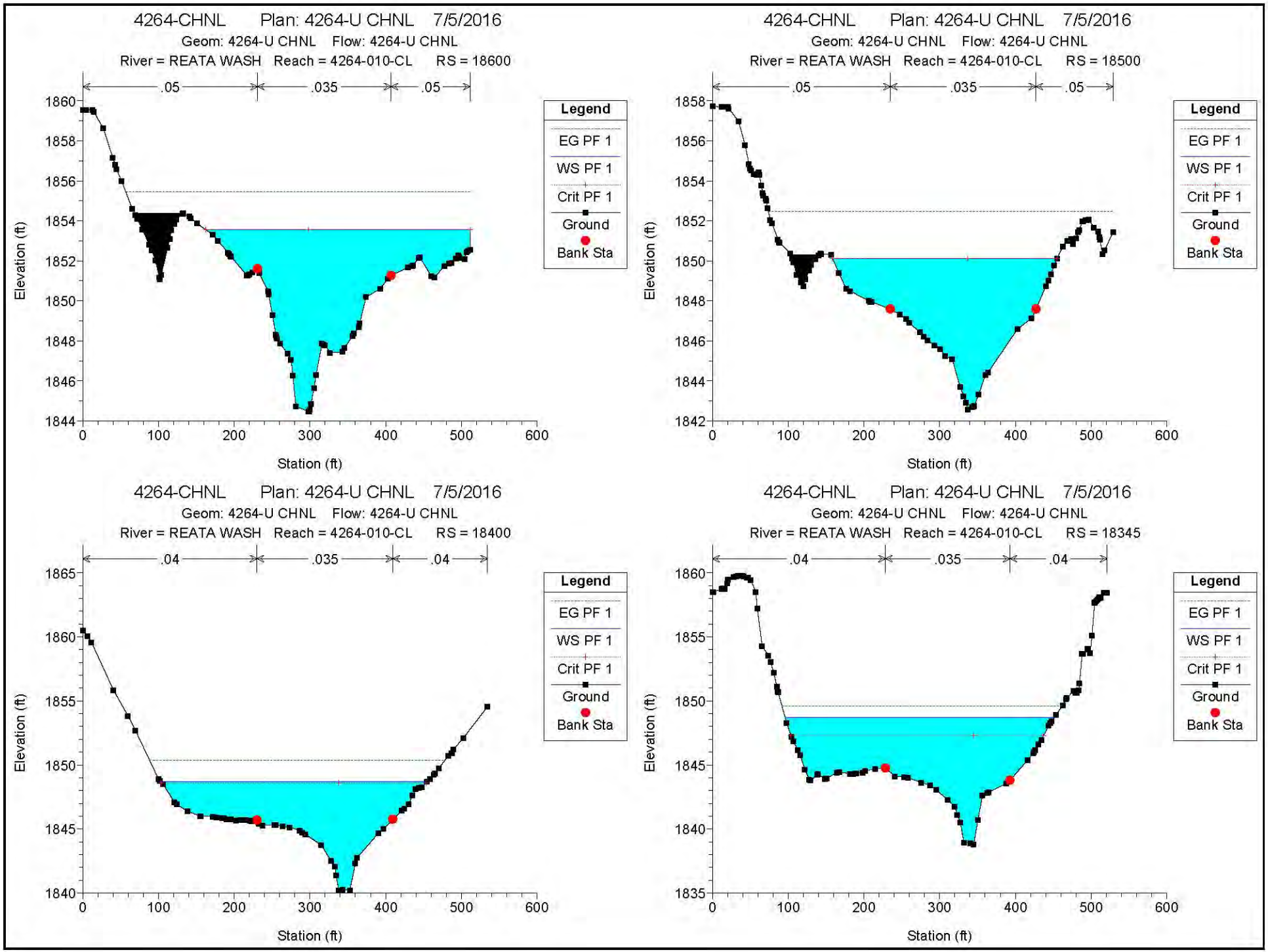
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19400
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19300
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19200
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19100
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 19000
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18900
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18800
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18700
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18600
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18500
.05
.035
.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18400
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18345
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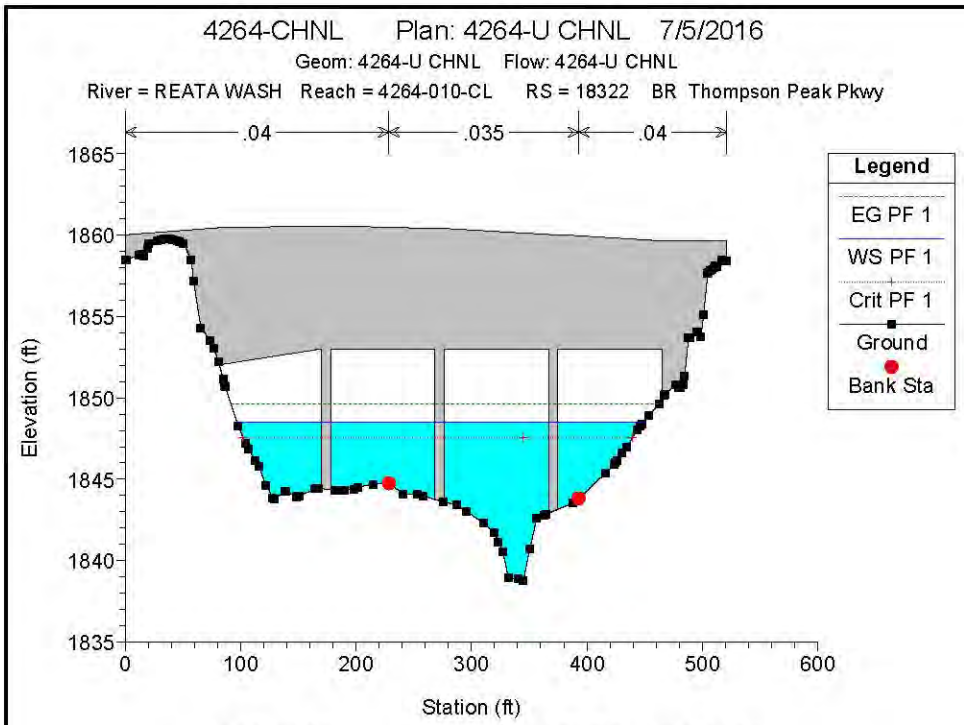
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18322 BR Thompson Peak Pkwy
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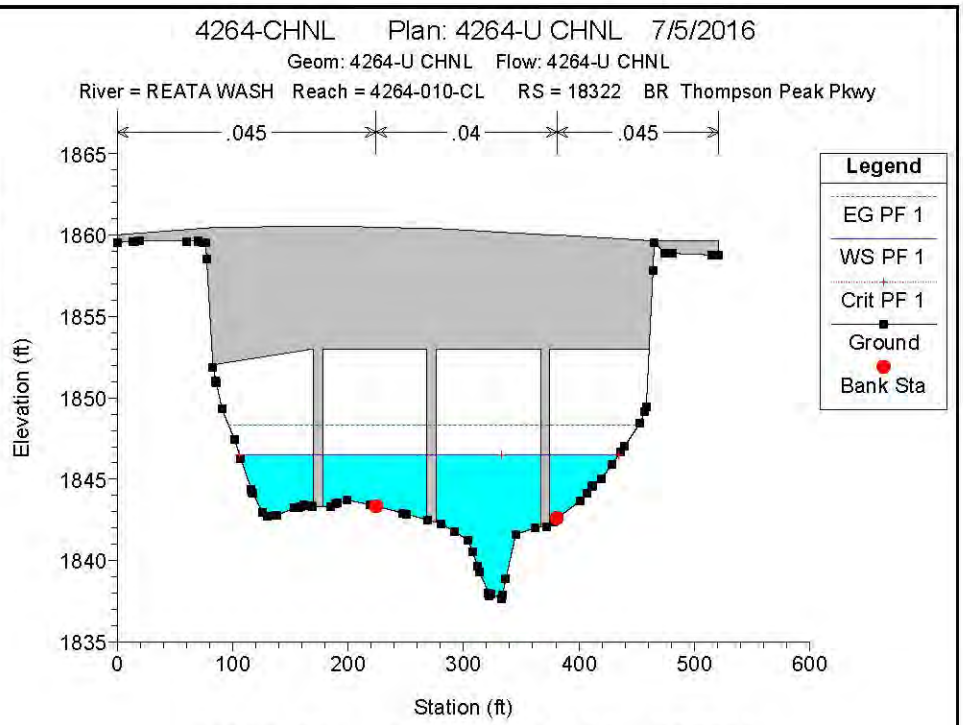
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18322 BR Thompson Peak Pkwy
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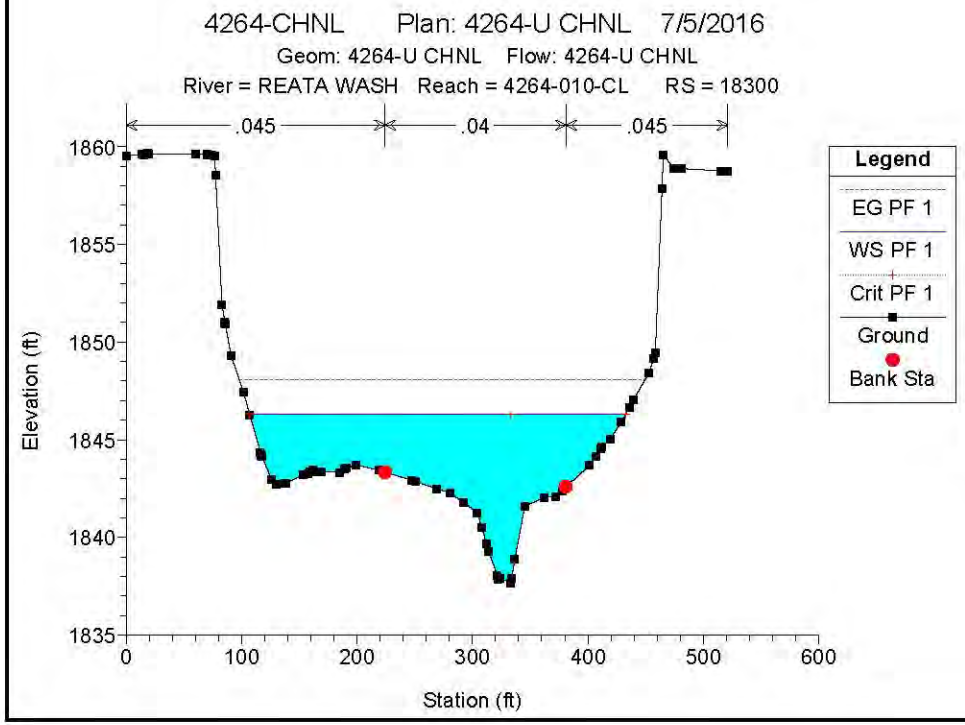
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18300
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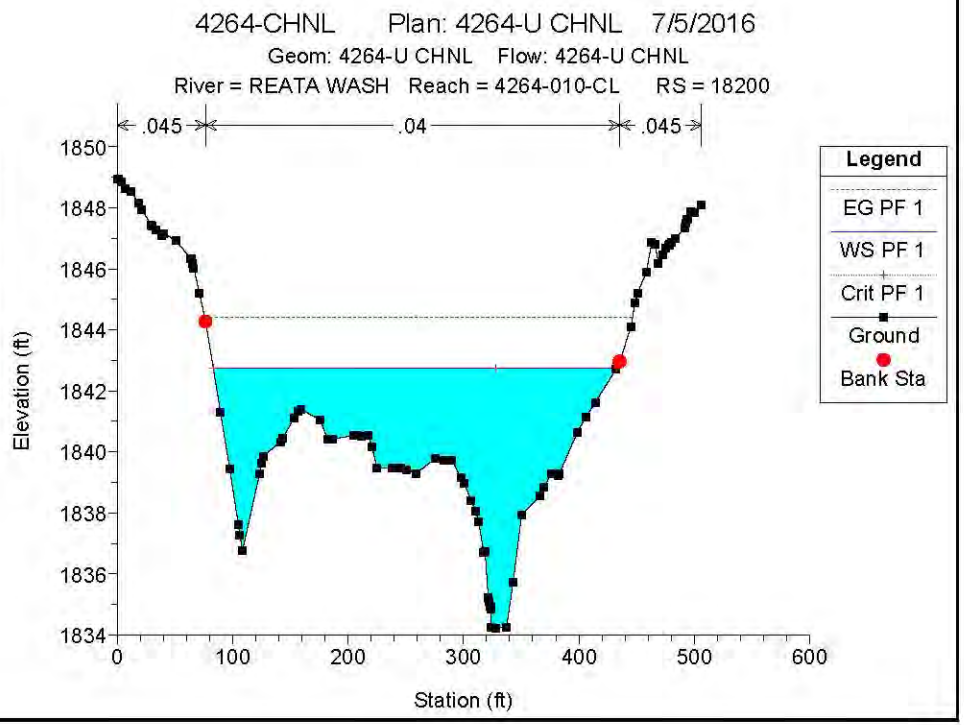
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18200
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.04
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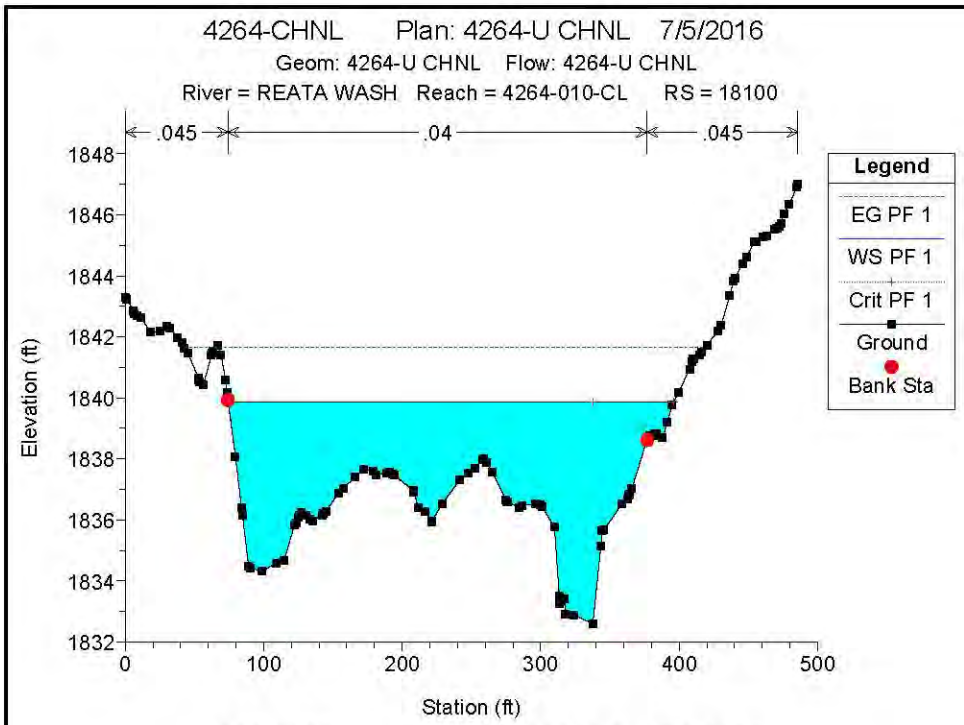
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18100
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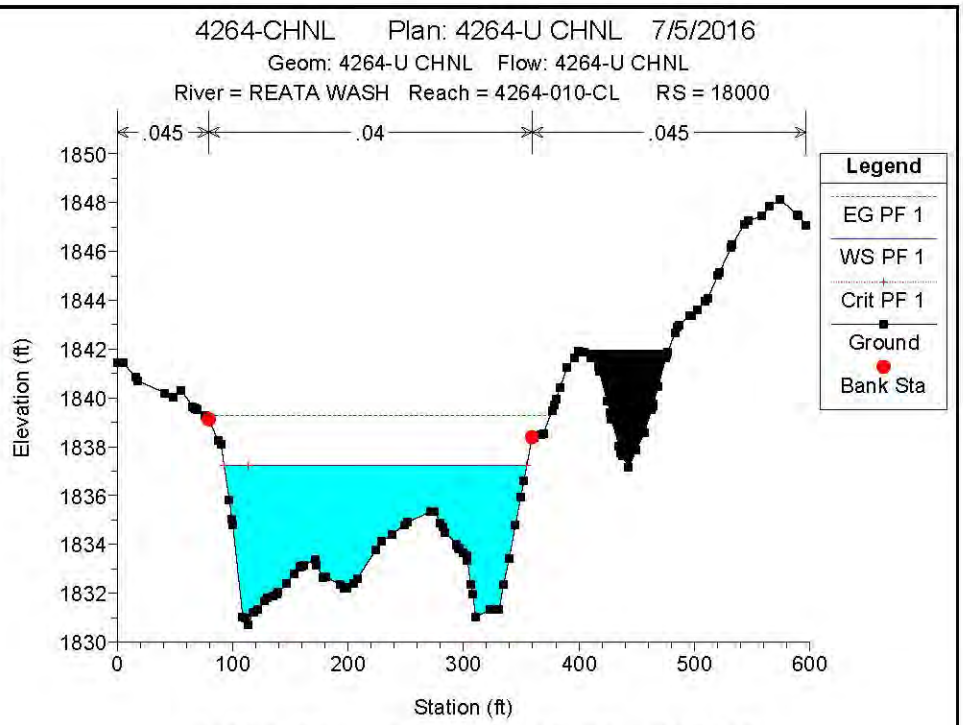
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 18000
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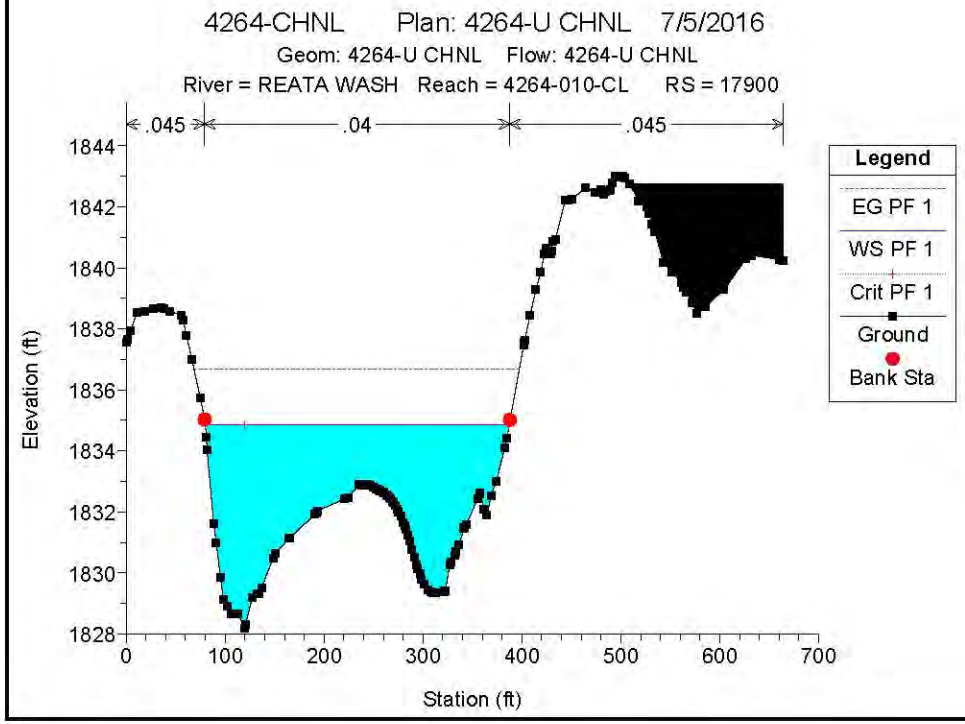
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17900
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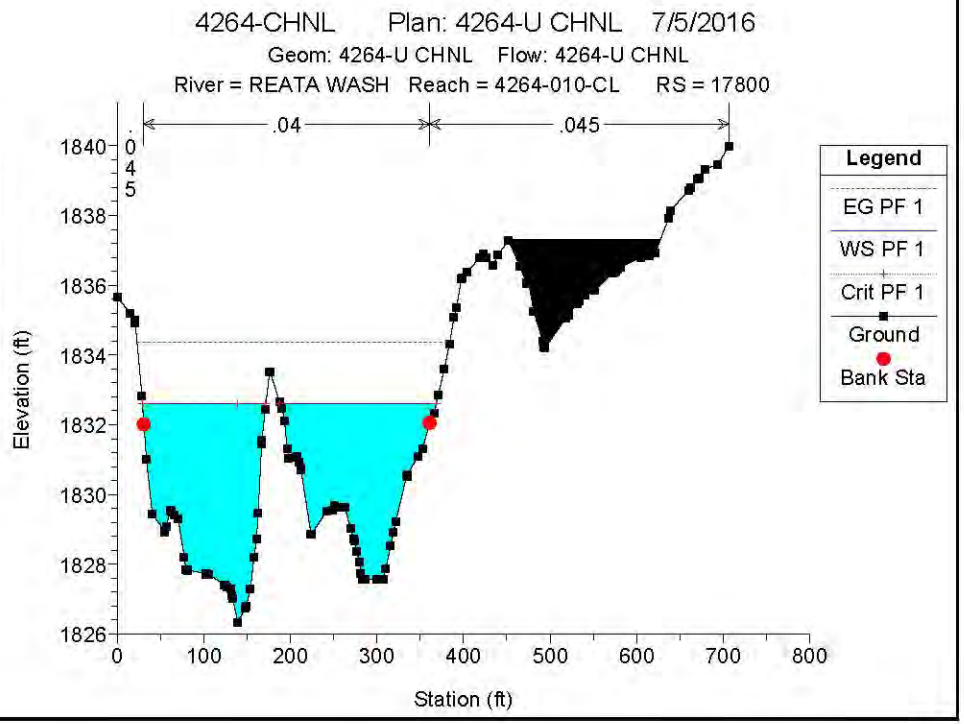
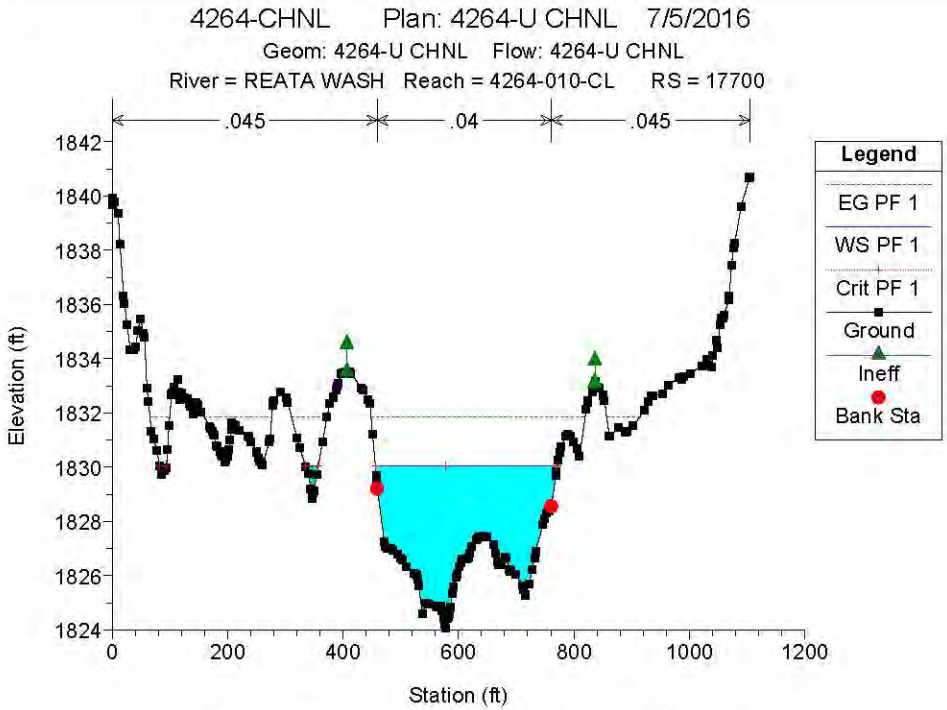
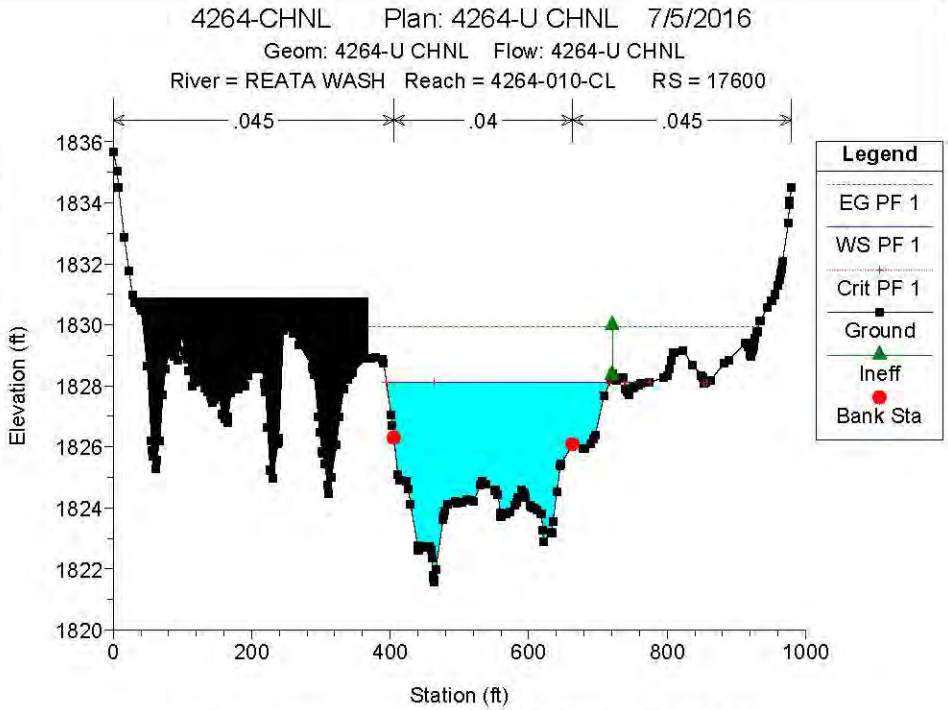
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17800
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17600
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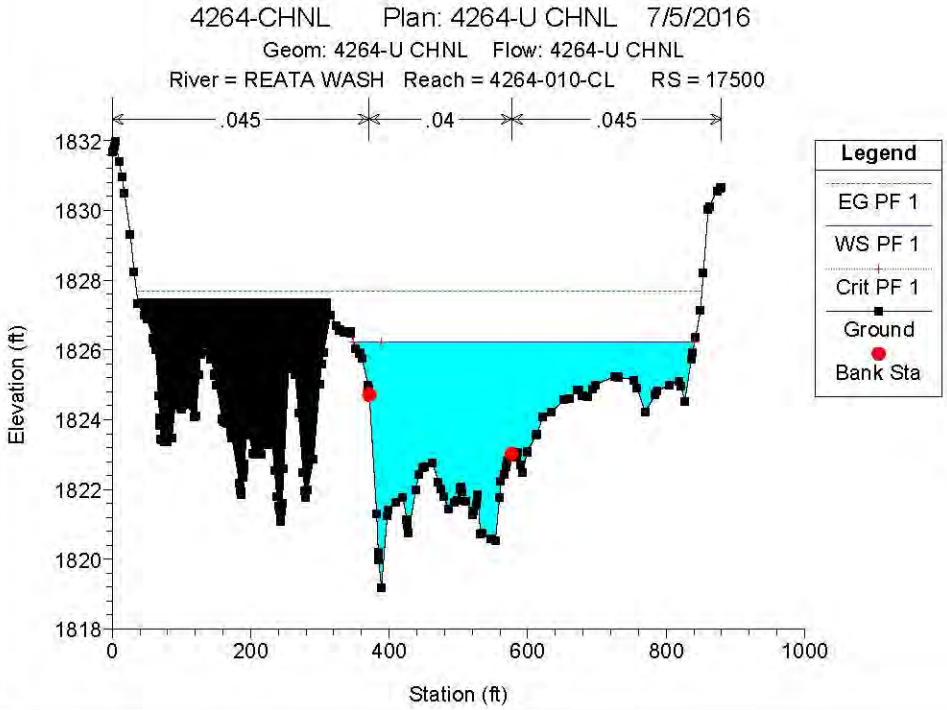
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17500
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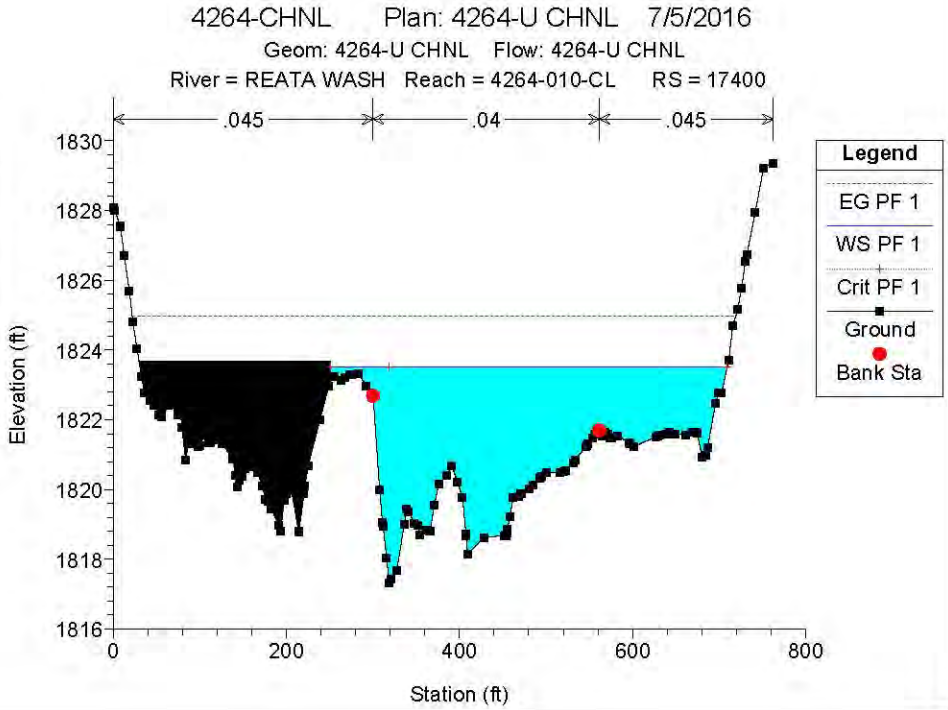
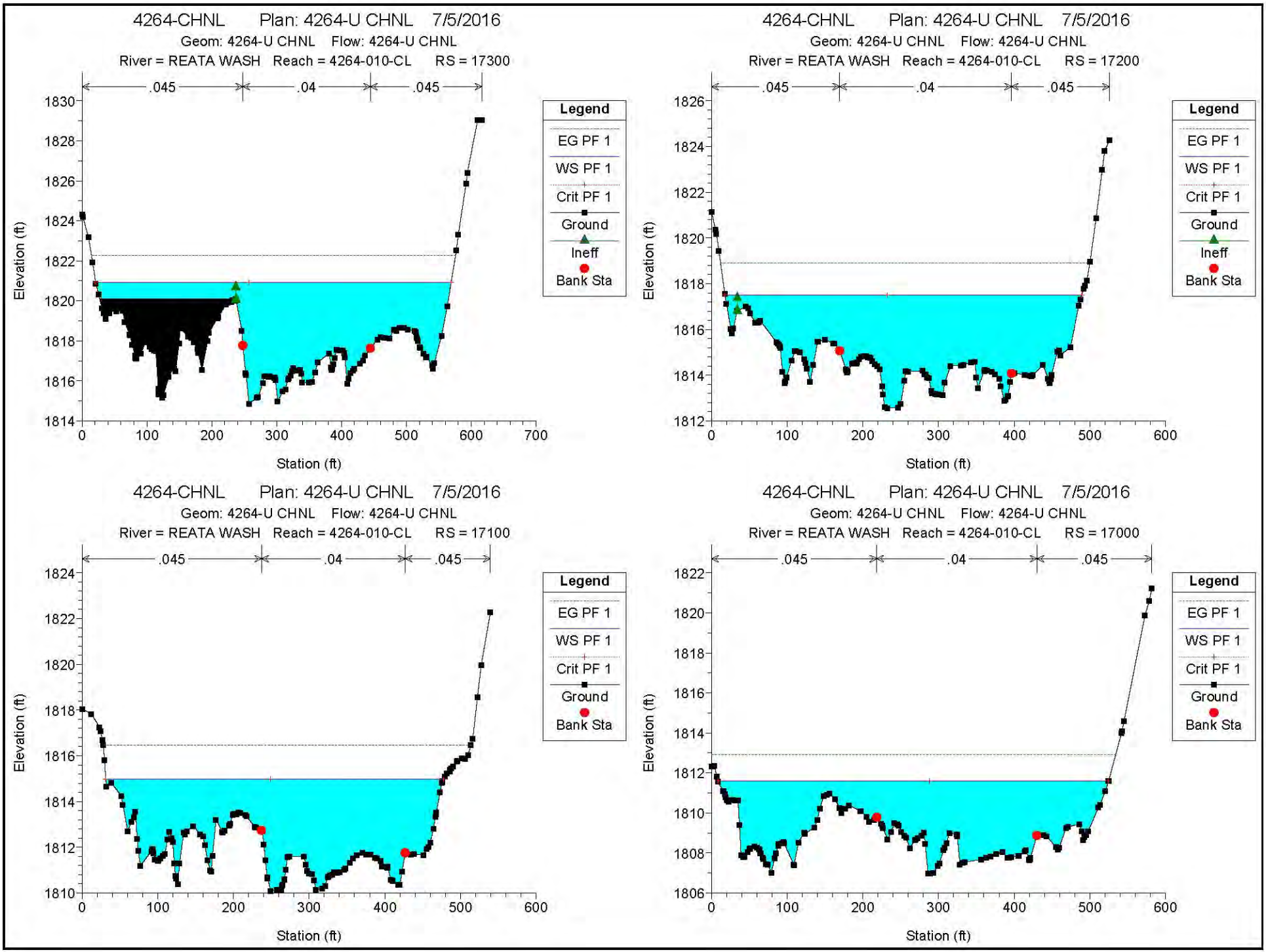
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 17000
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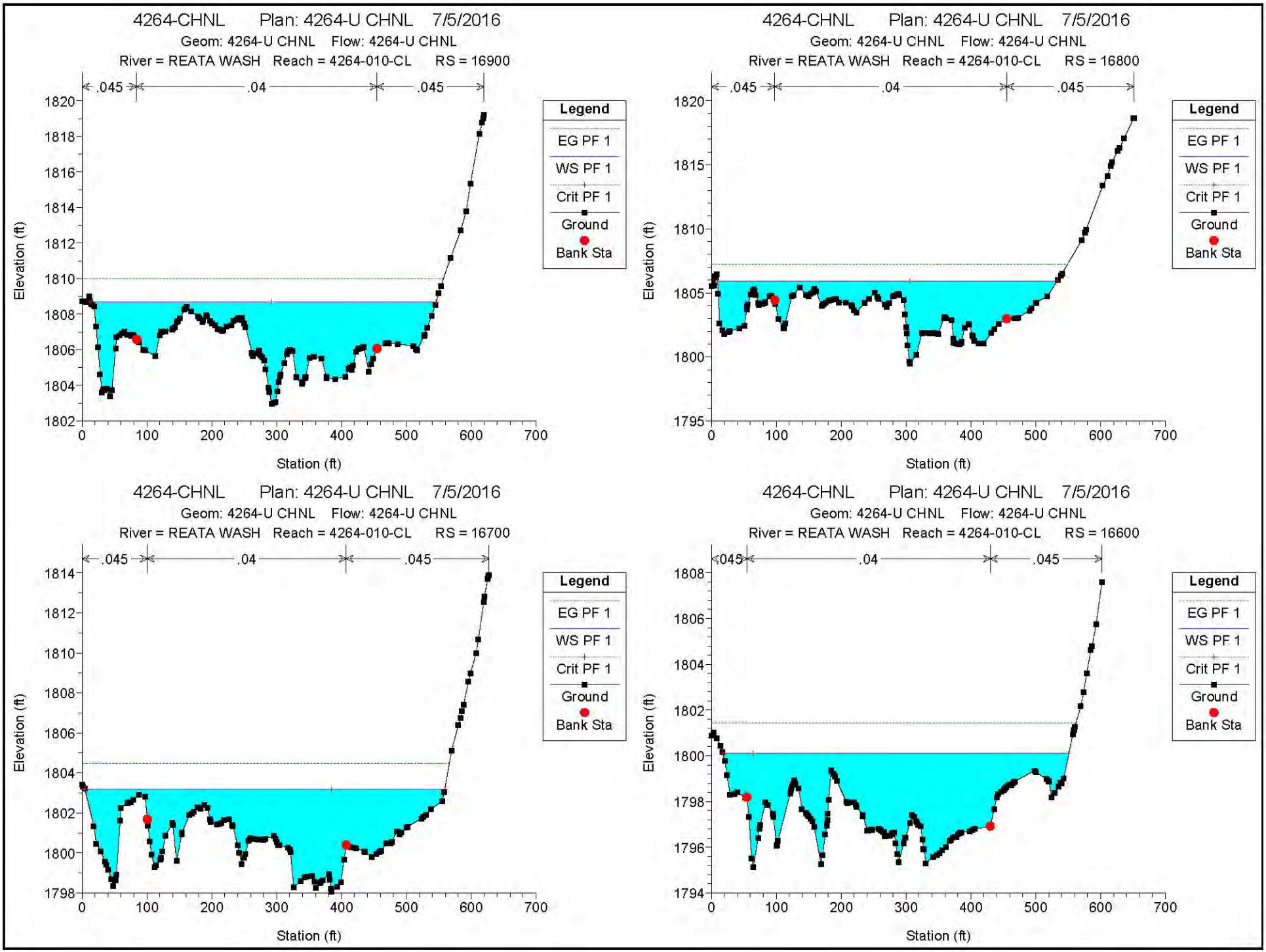
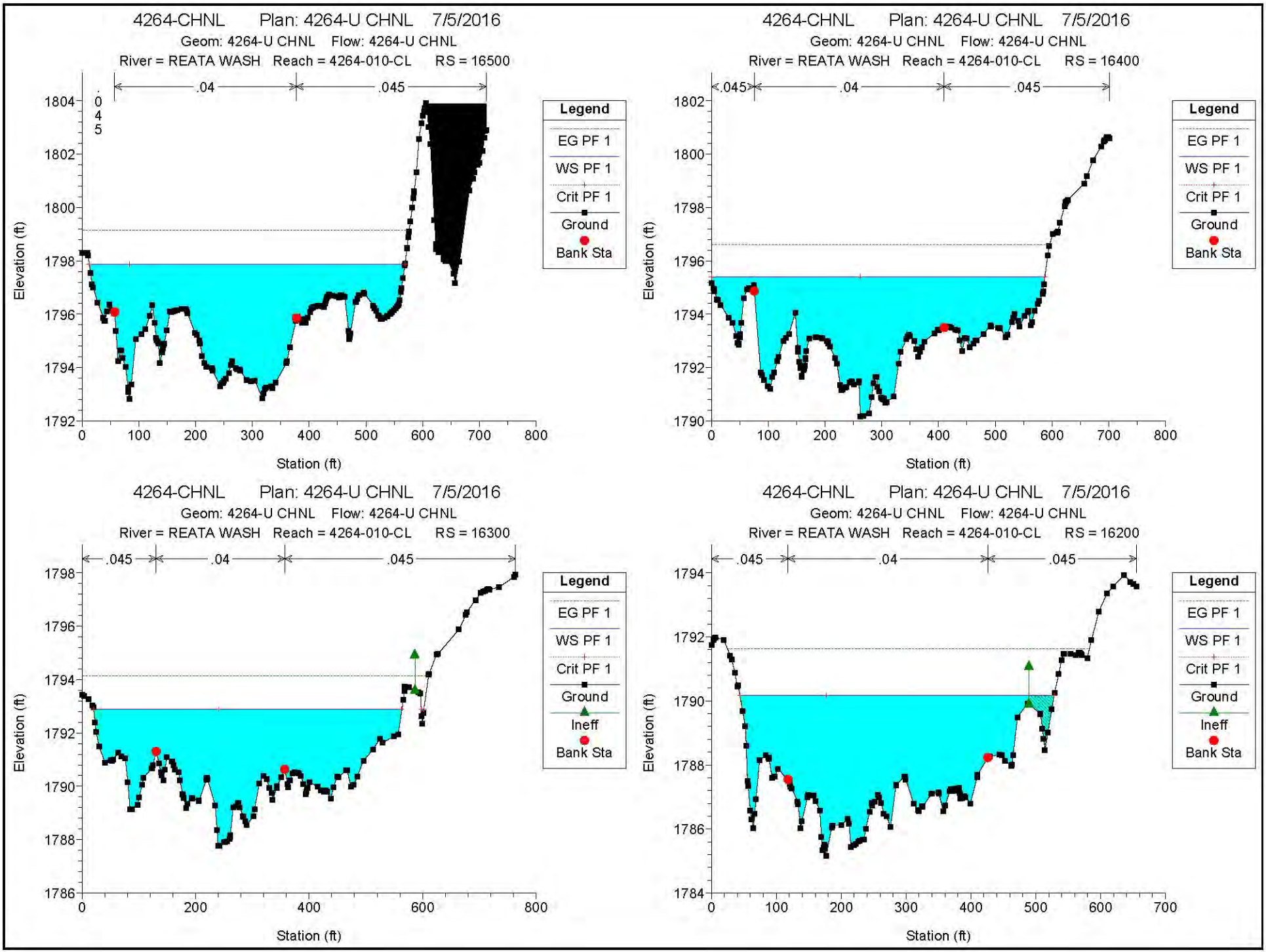
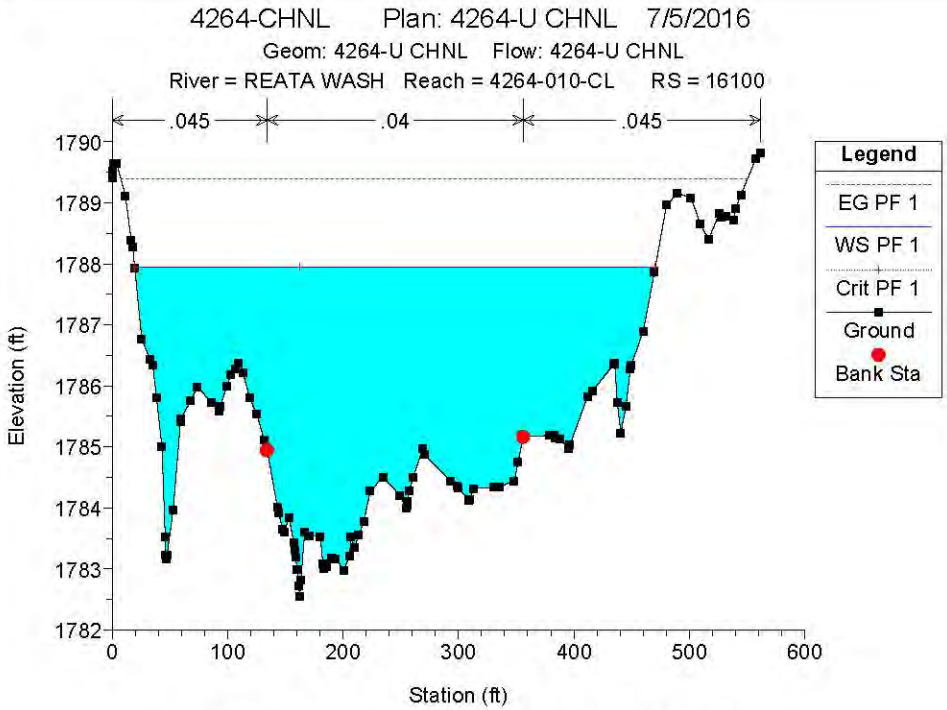
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16900
.045
.04
.045
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16800
.045
.04
.045
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16700
.045
.04
.045
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16600
.045
.04
.045
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16100
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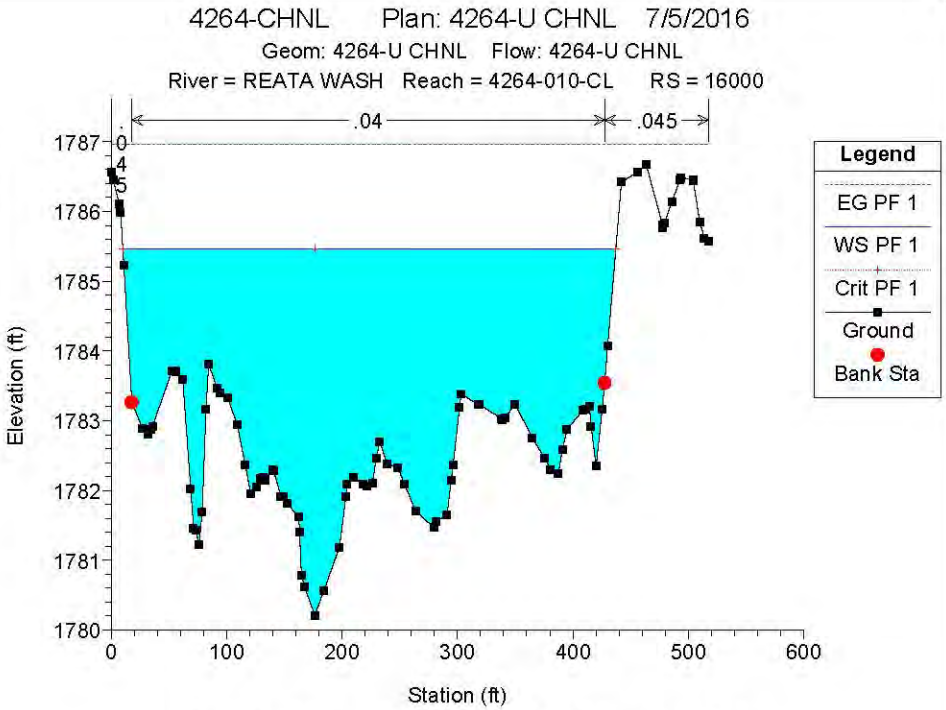
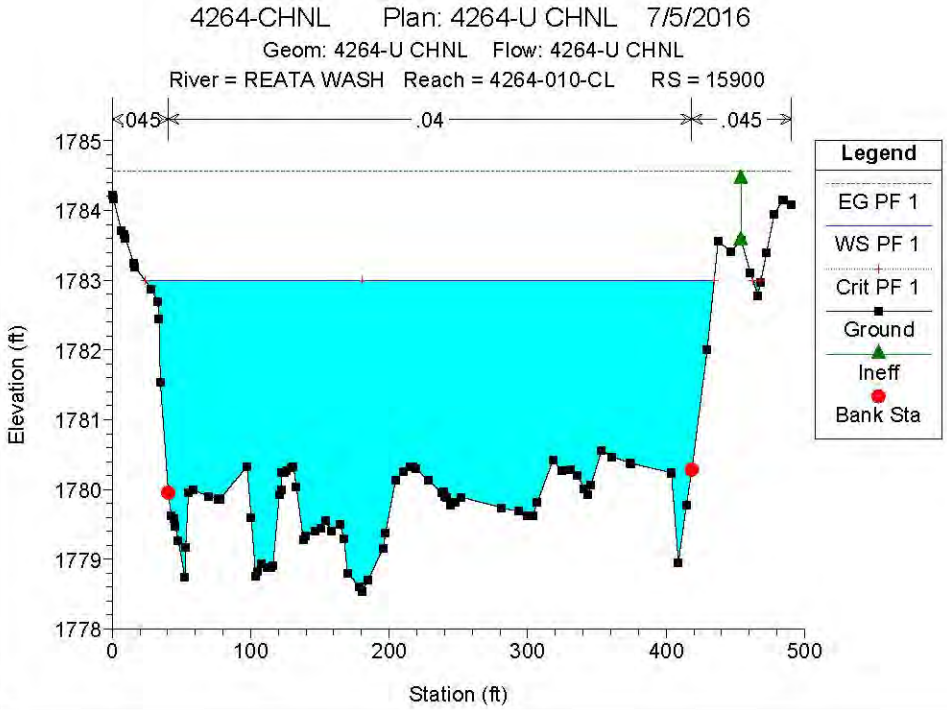
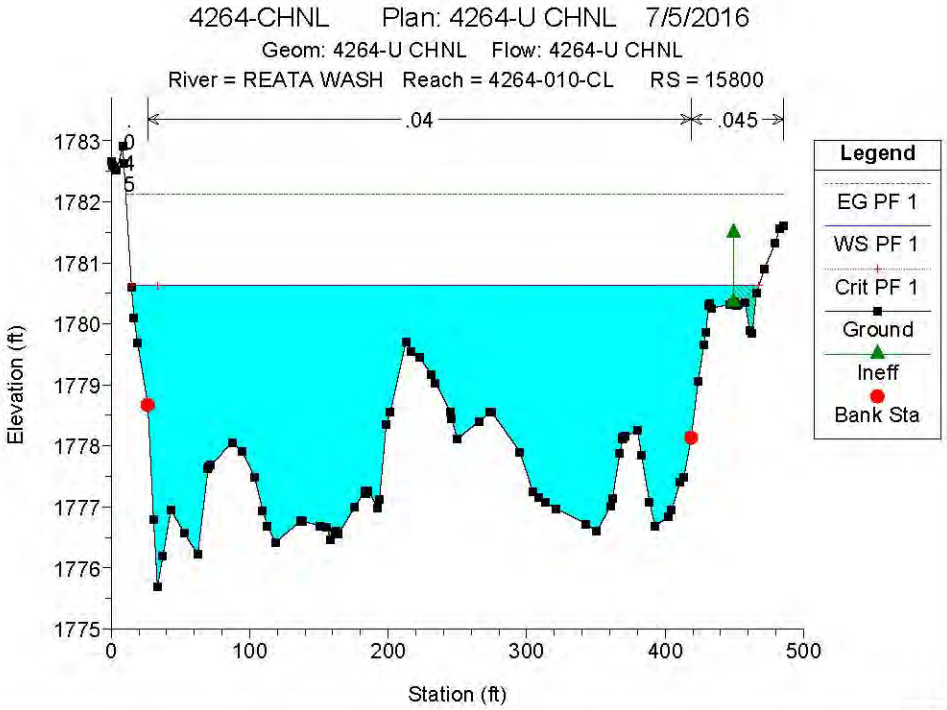
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 16000
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15800
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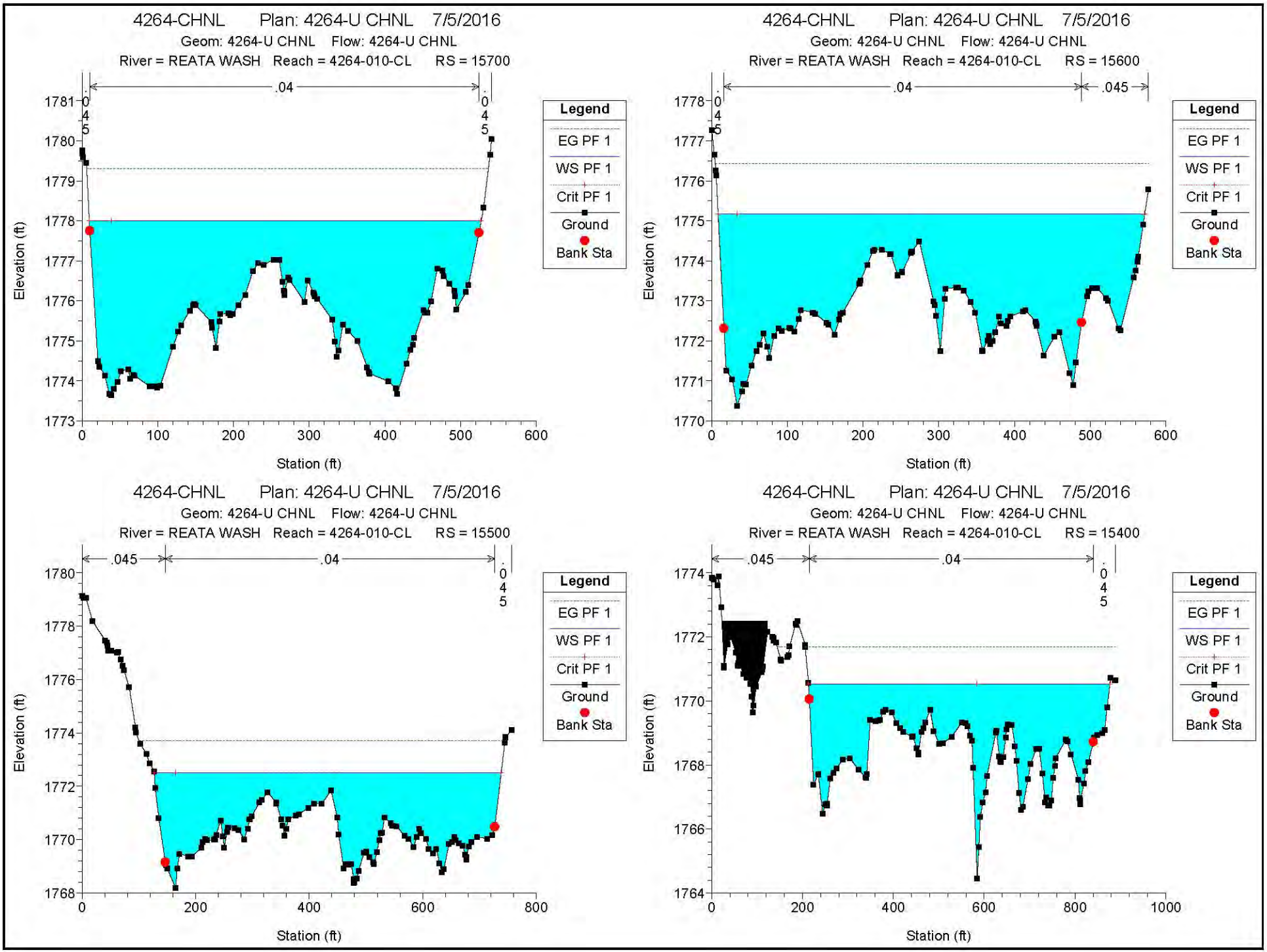
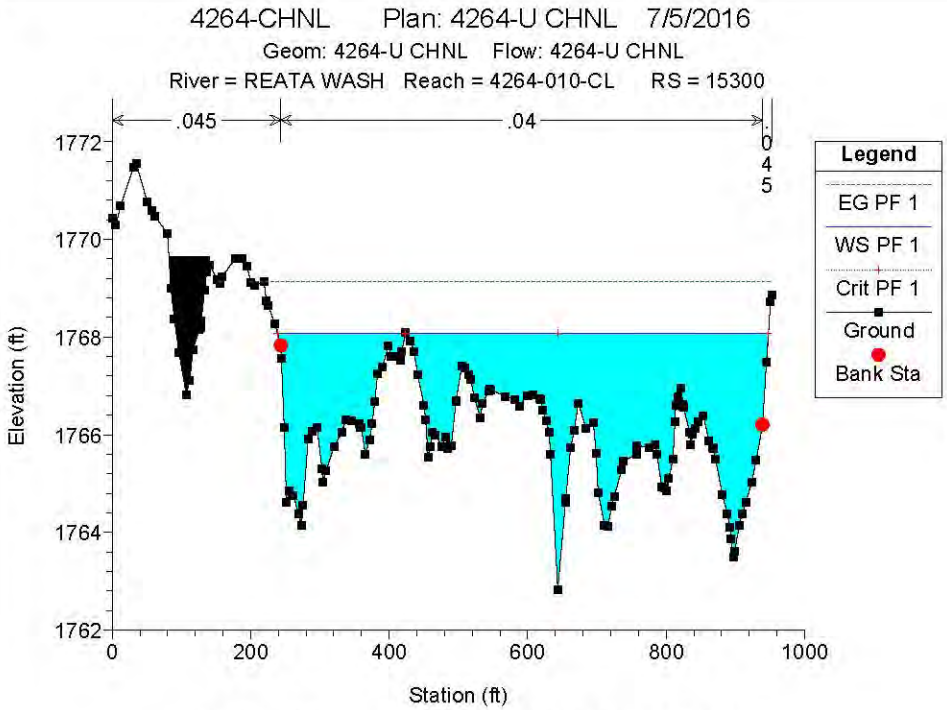
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15300
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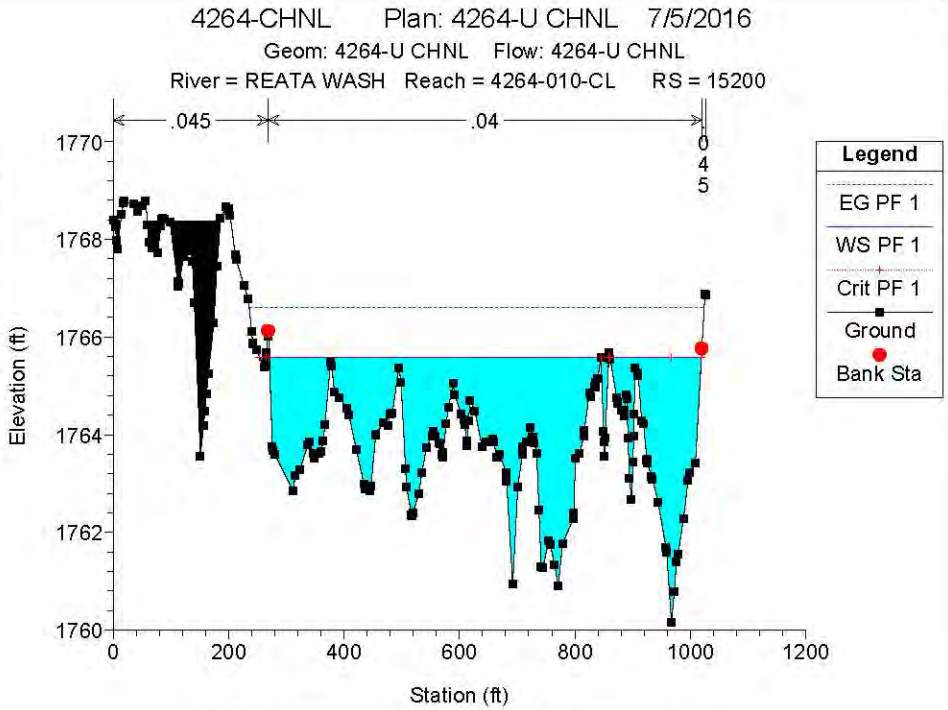
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15200
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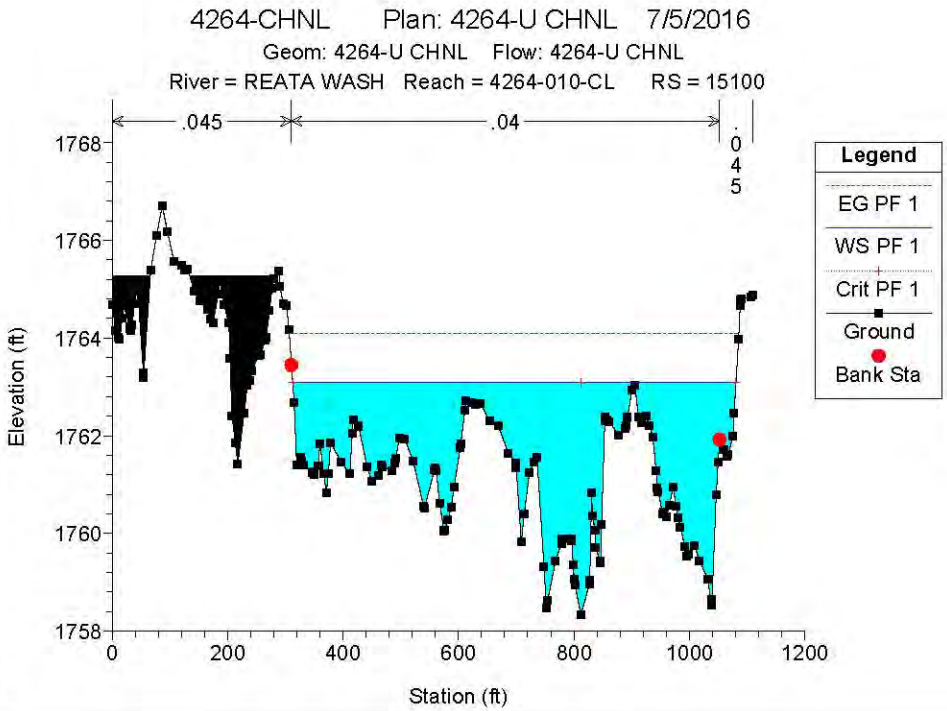
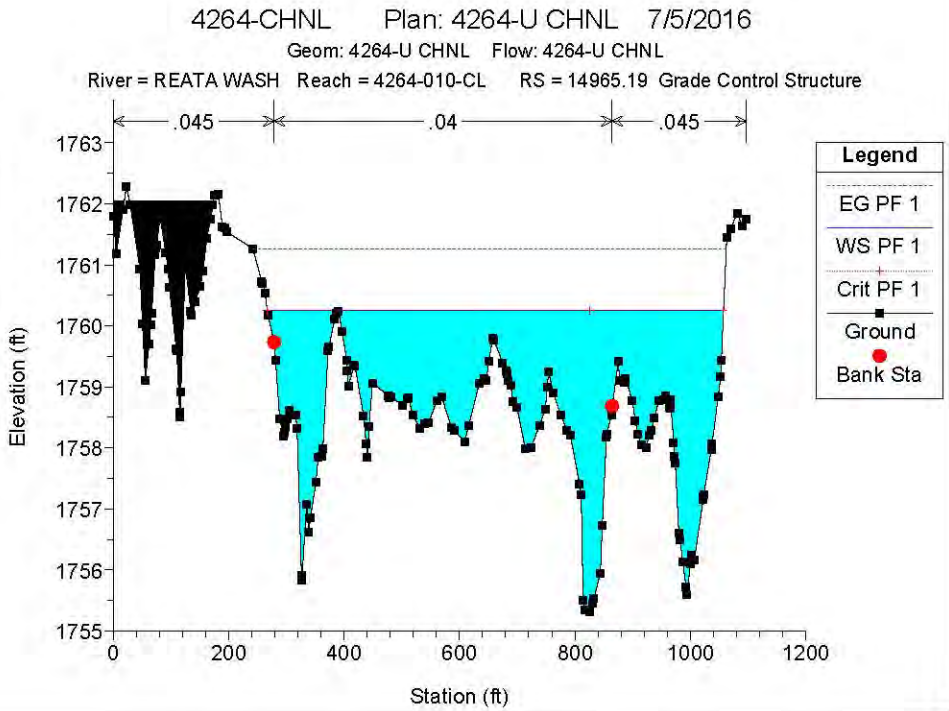
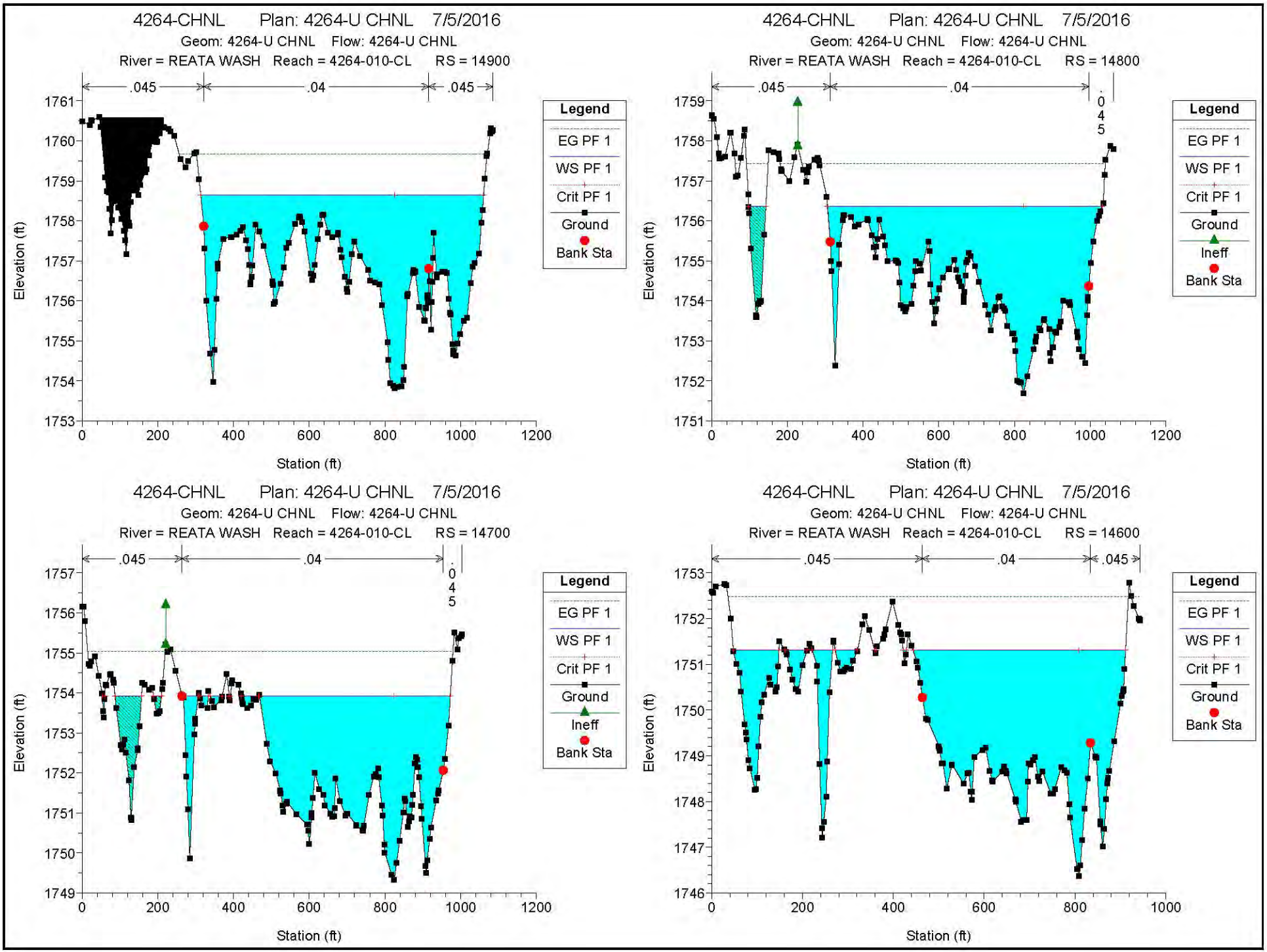
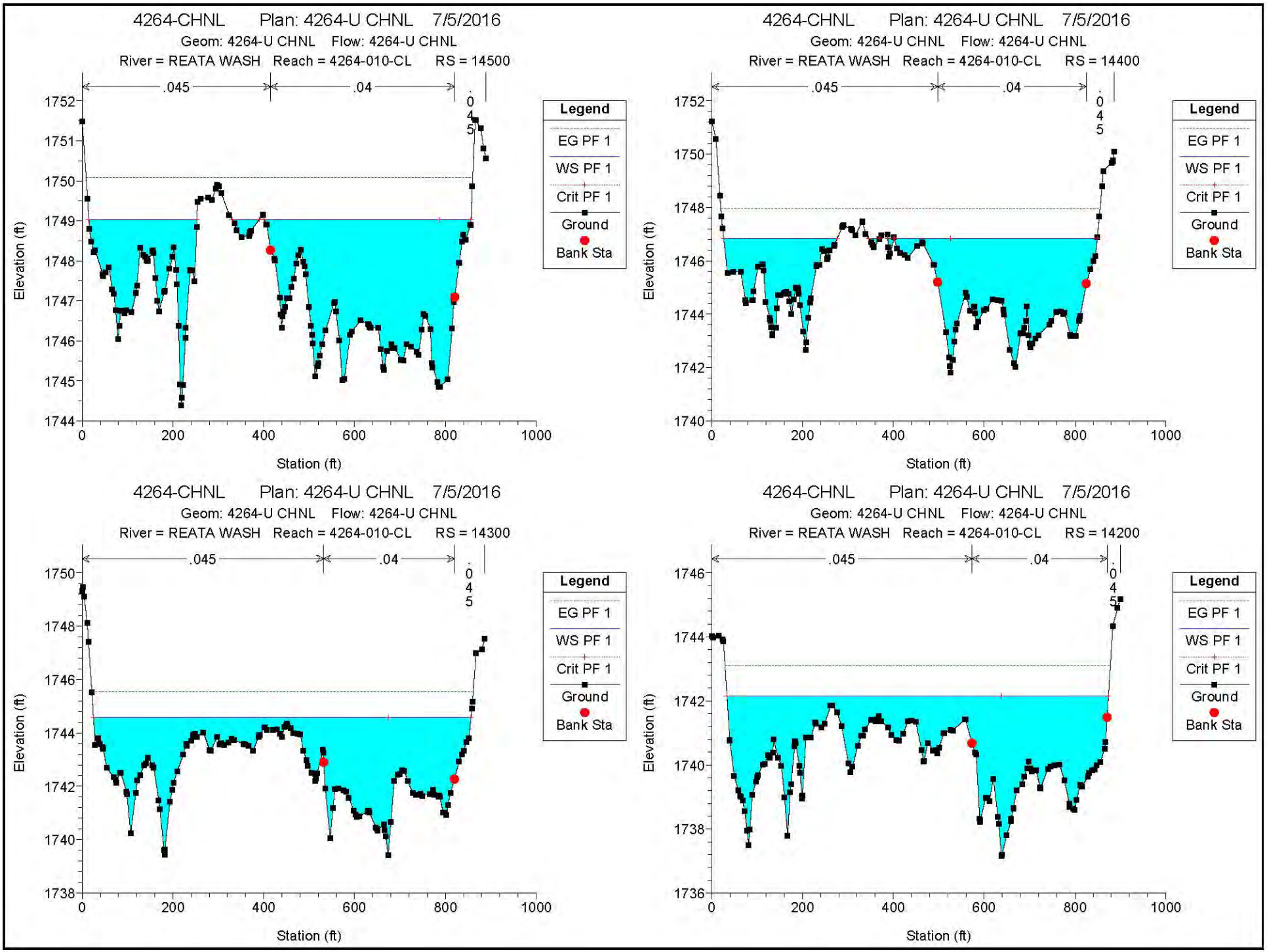
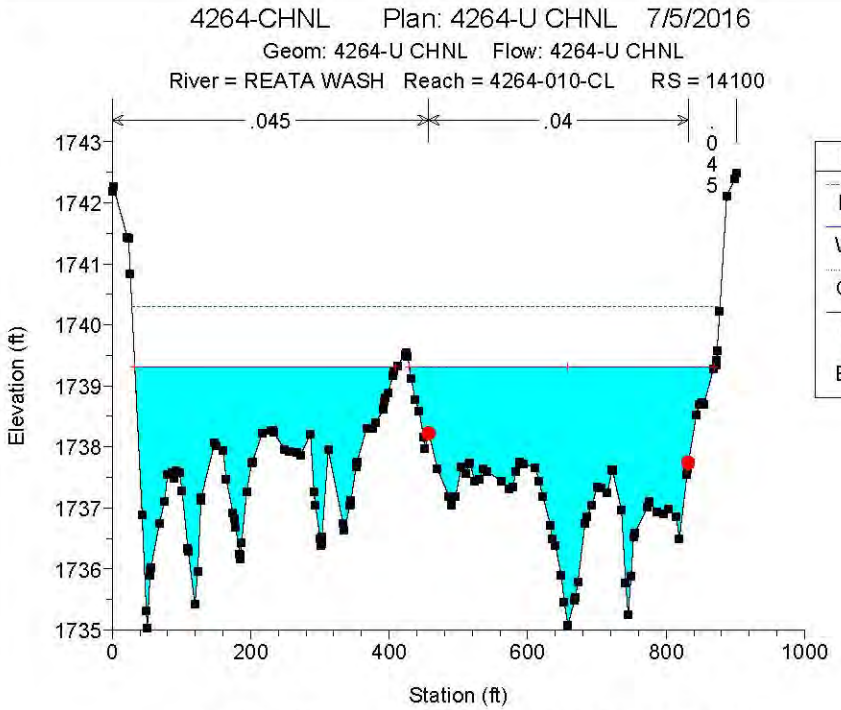
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

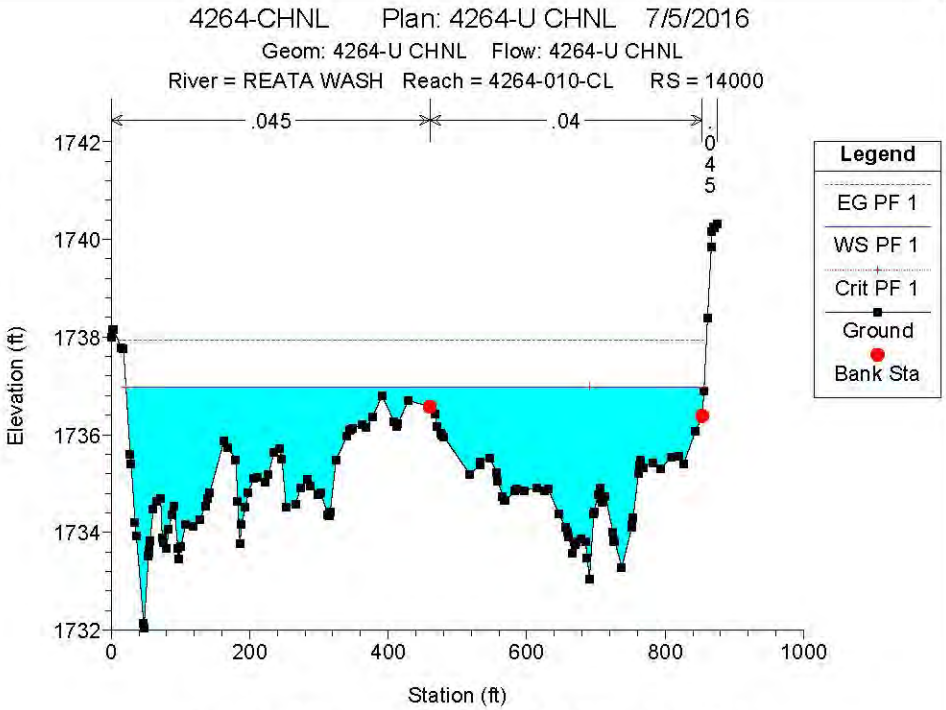

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 15100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

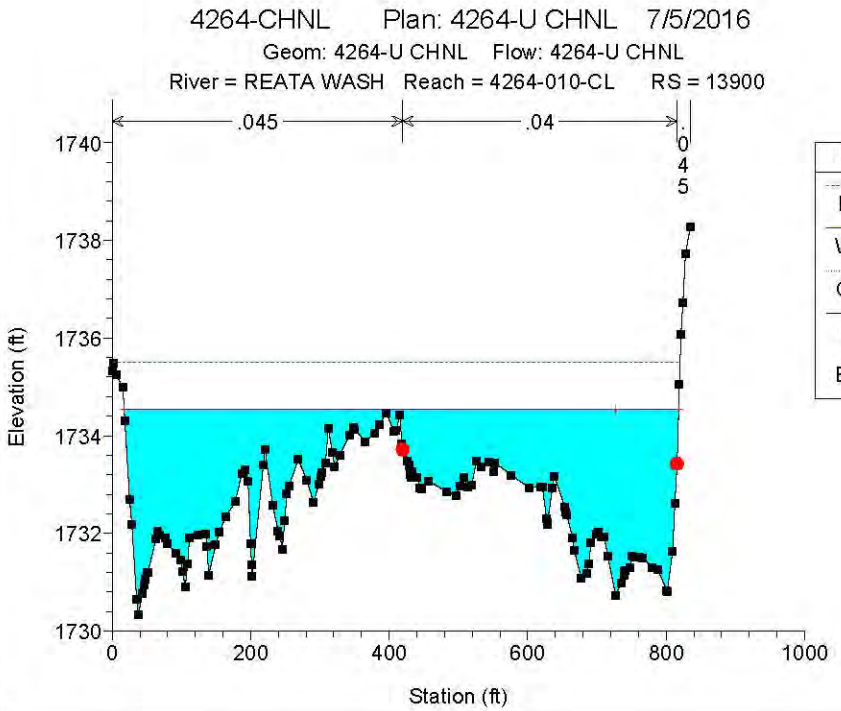

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14965.19 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

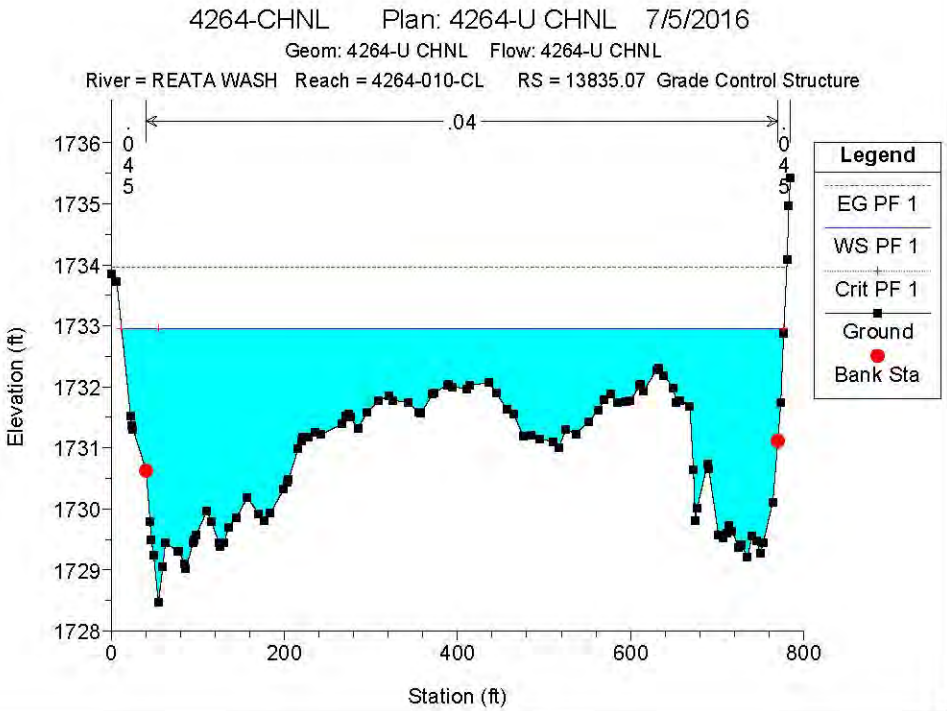

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14800
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

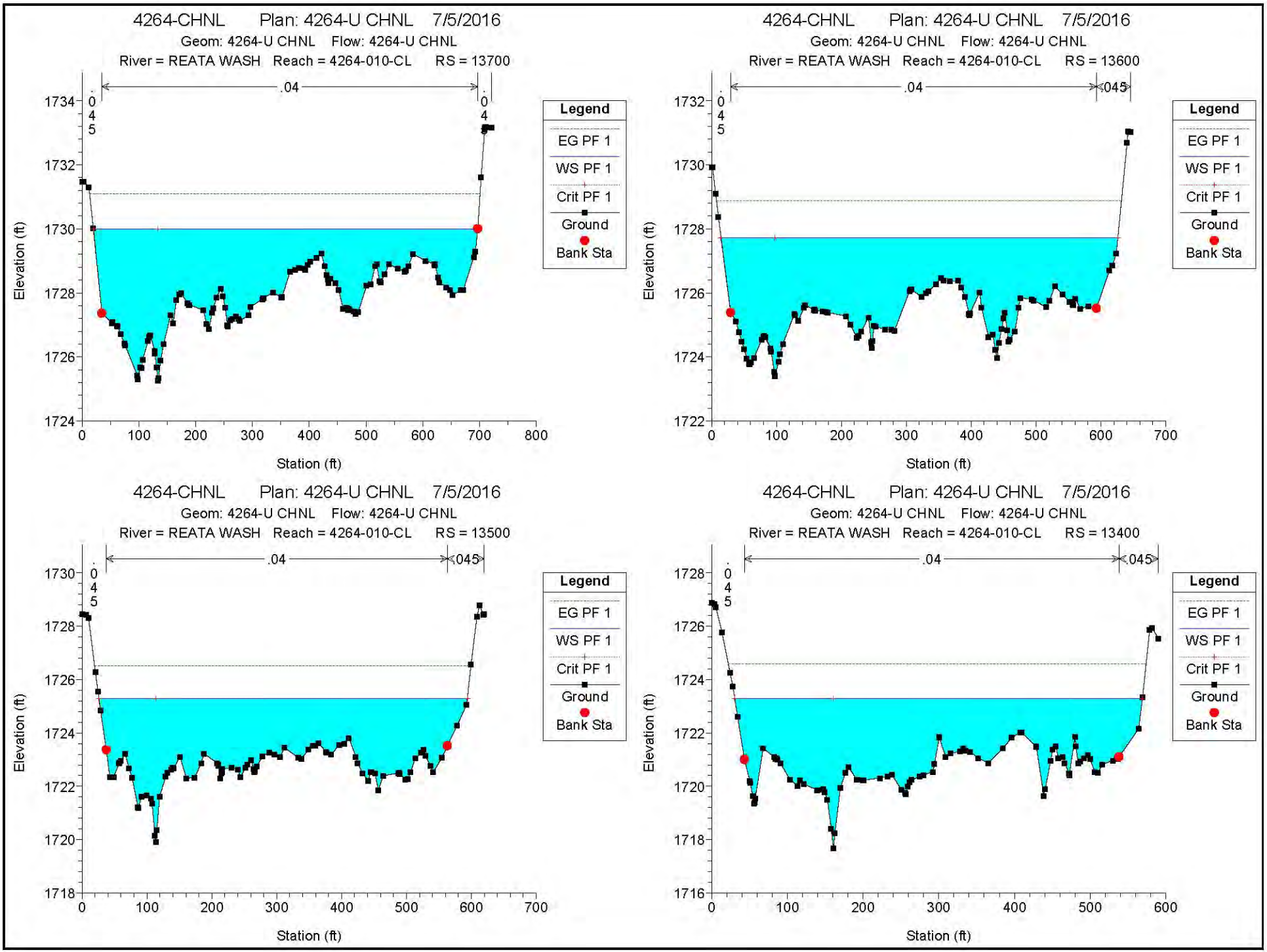

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

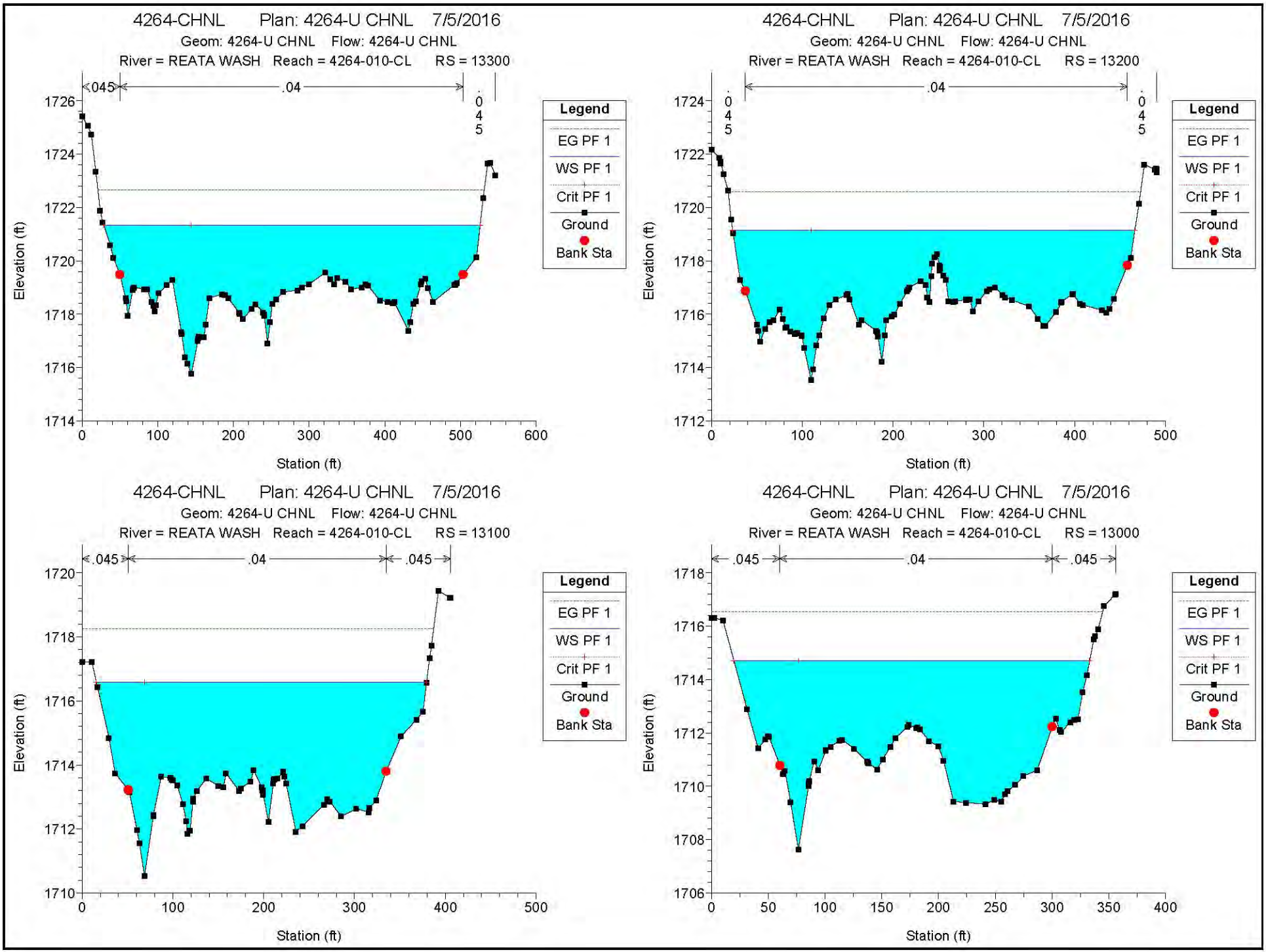

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

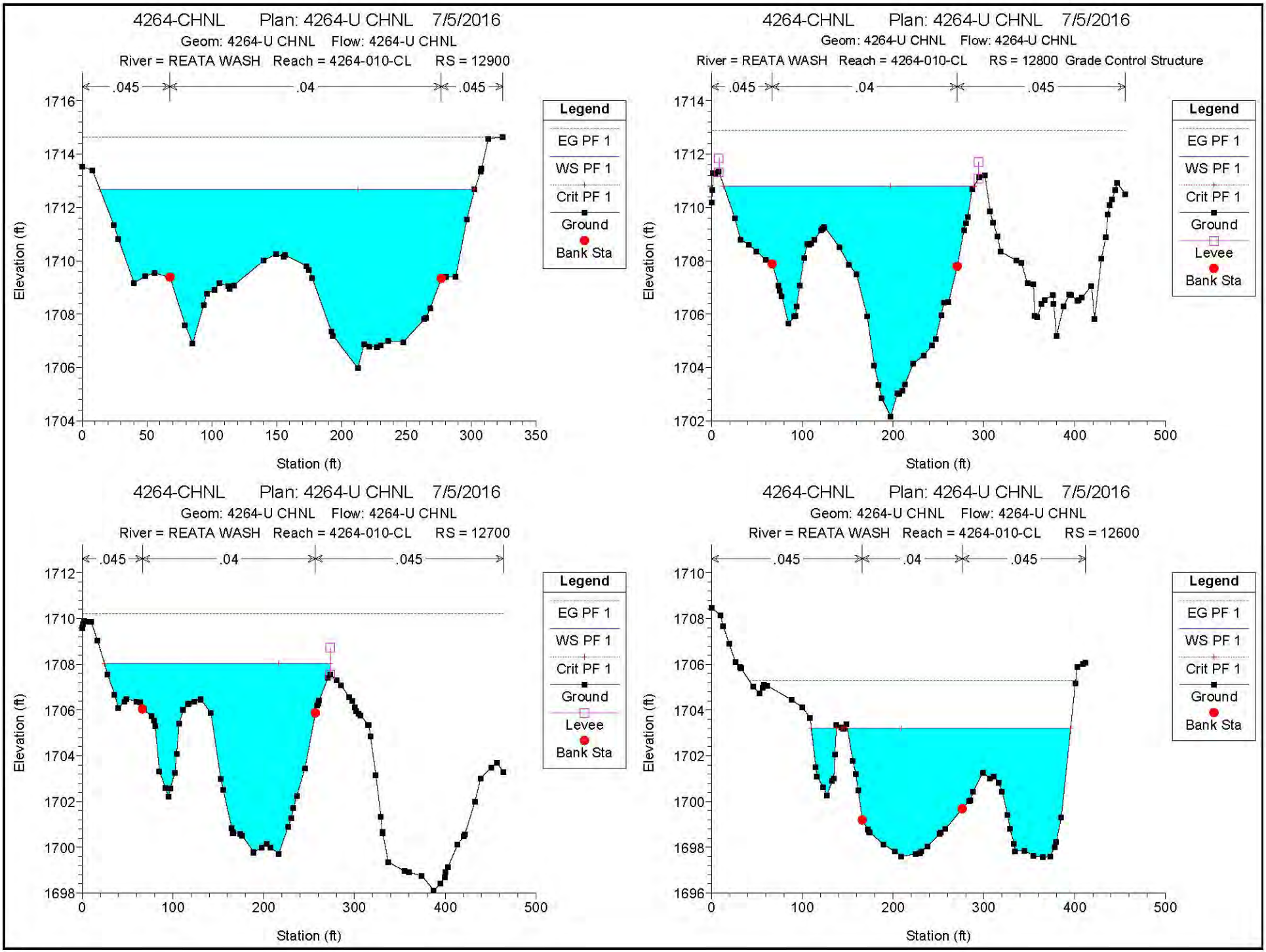

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 14000
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

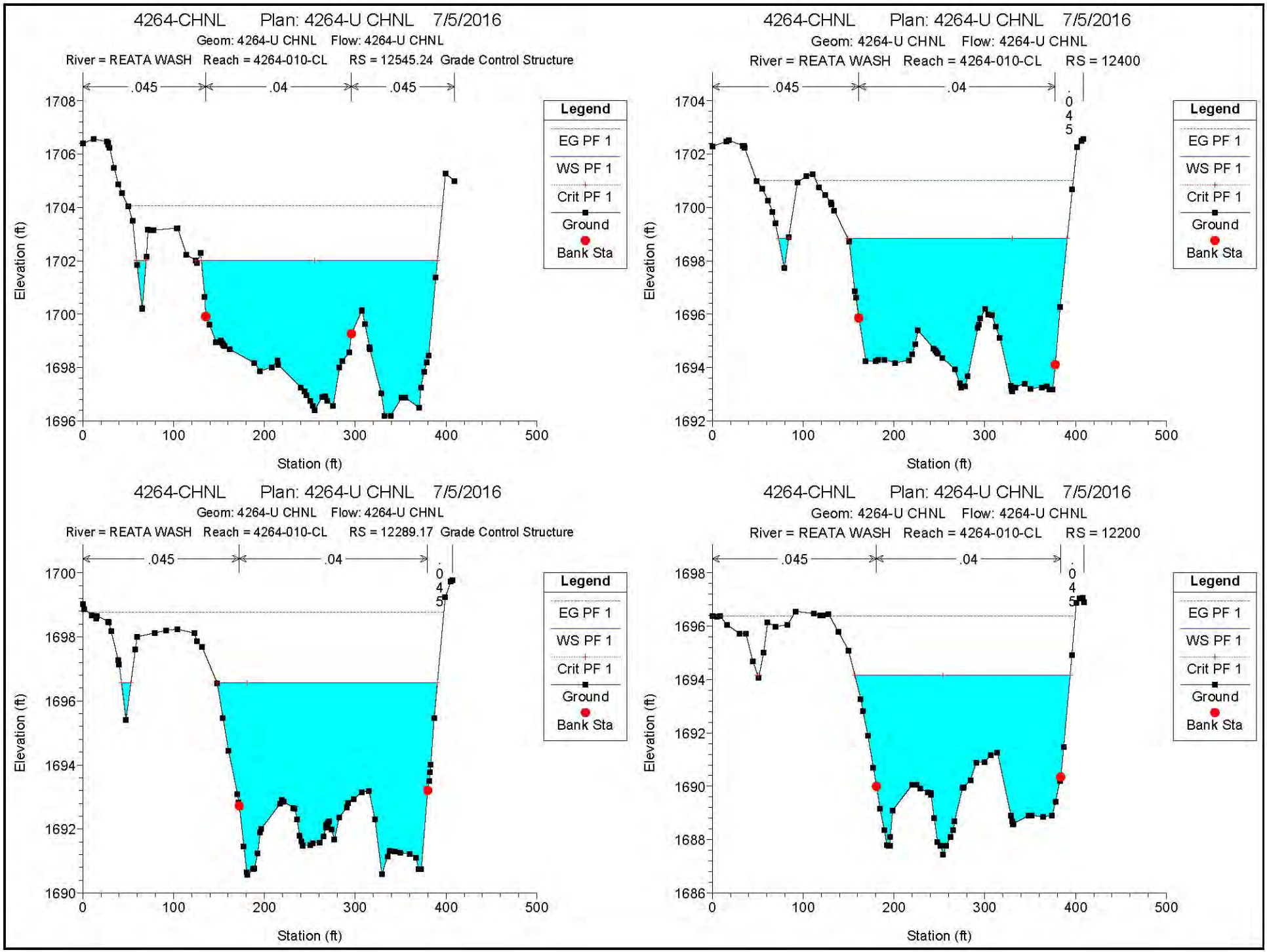

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

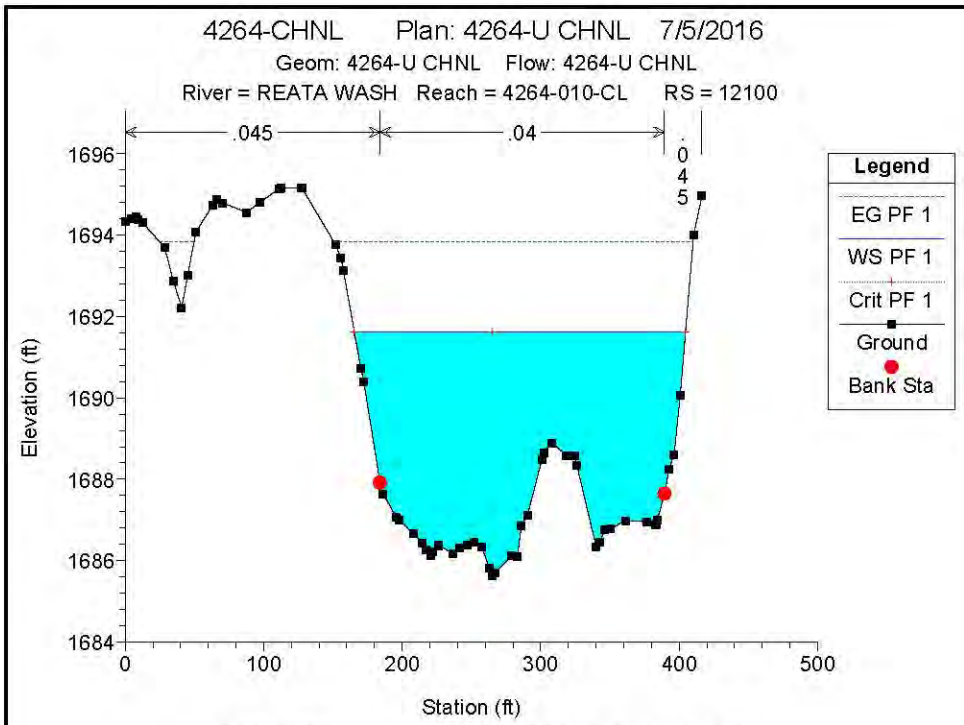

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13835.07 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

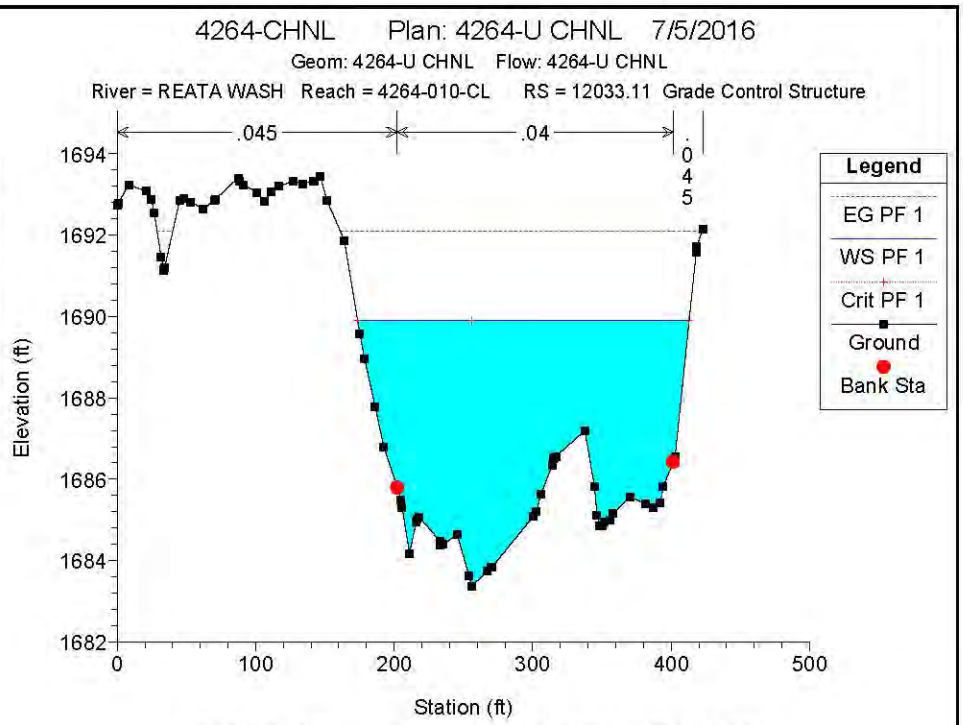

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

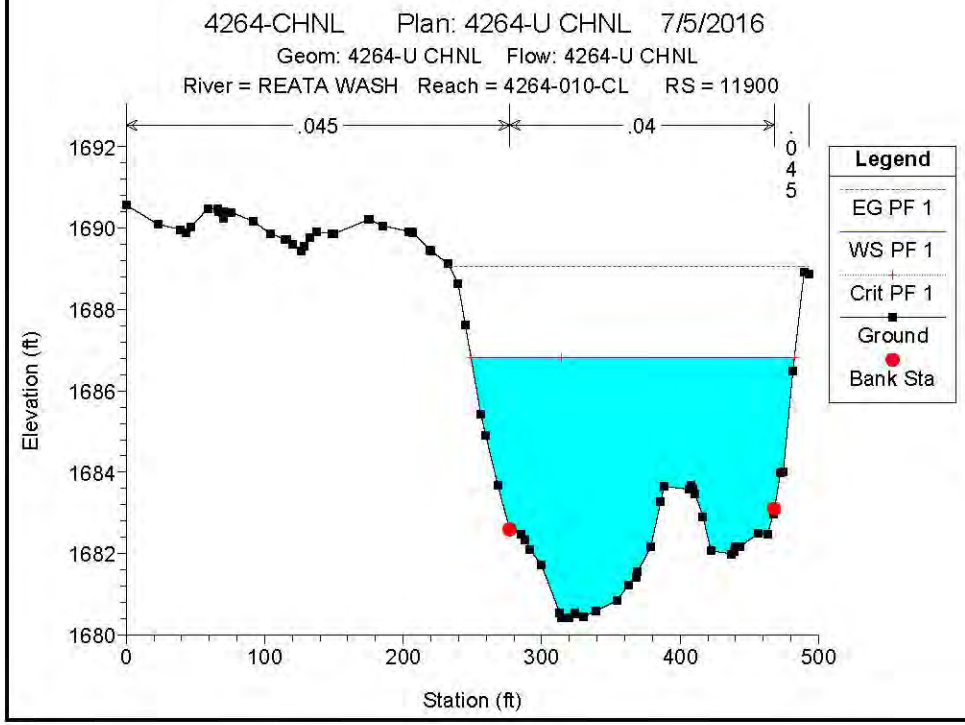

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 13000
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

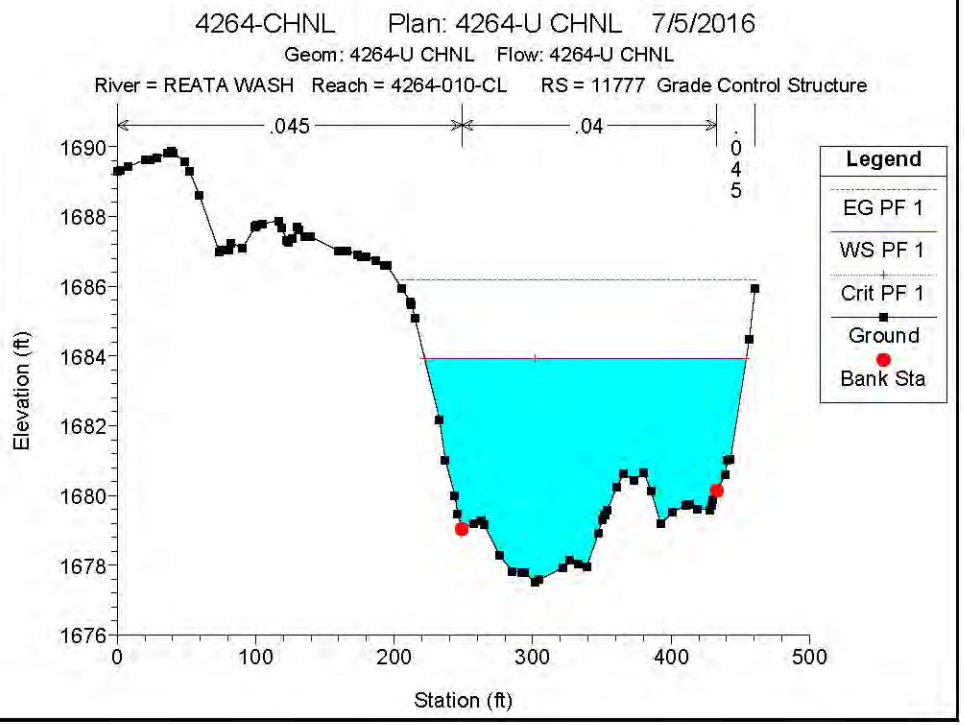

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12800 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

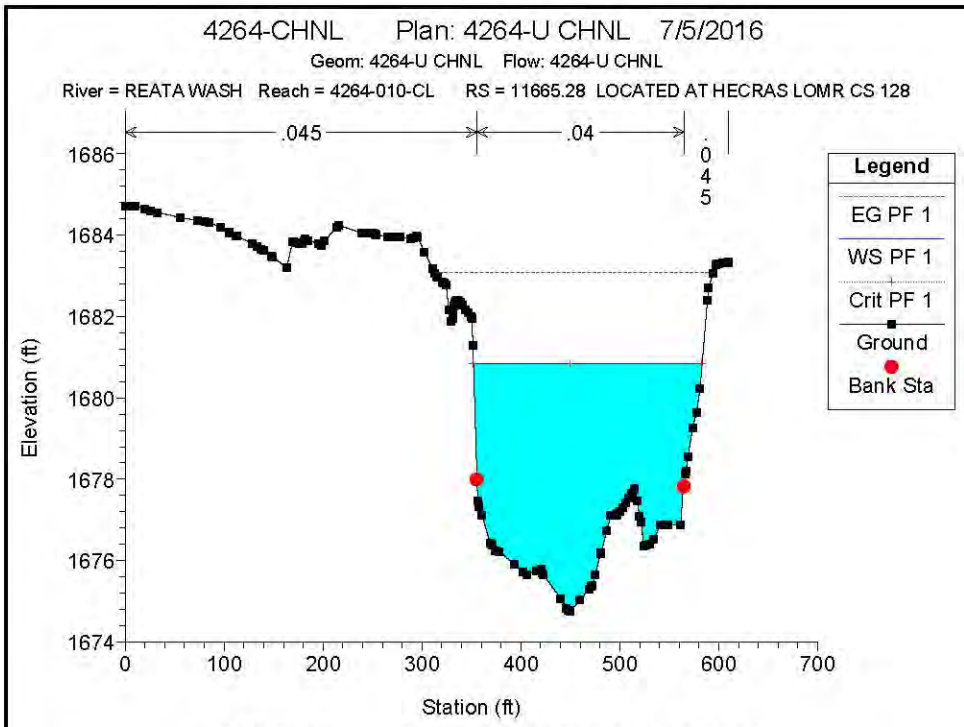

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12545.24 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12289.17 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

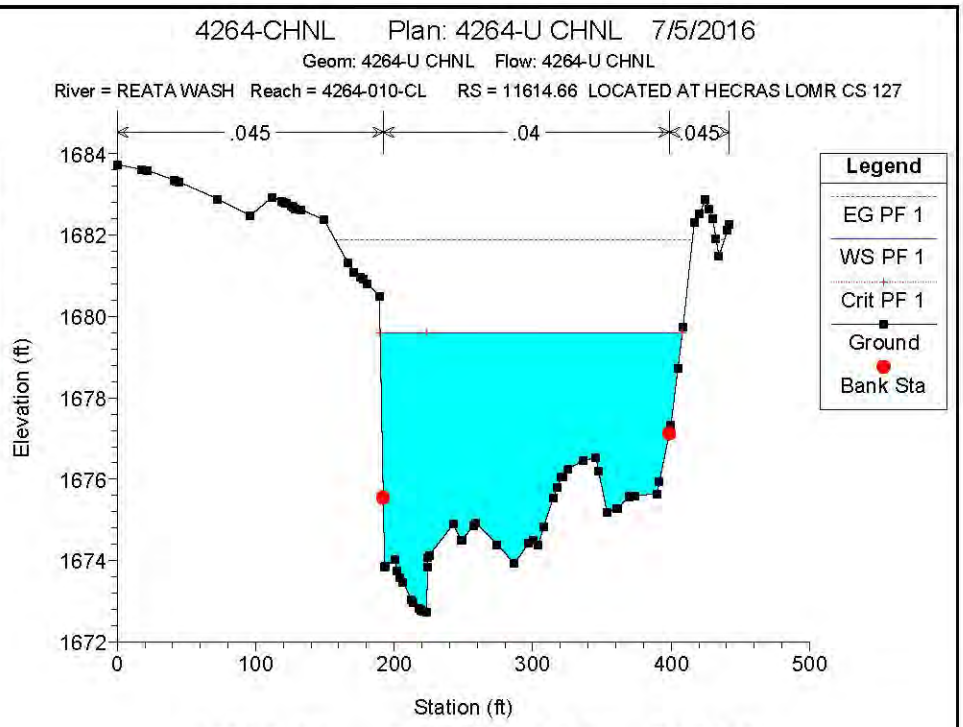

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

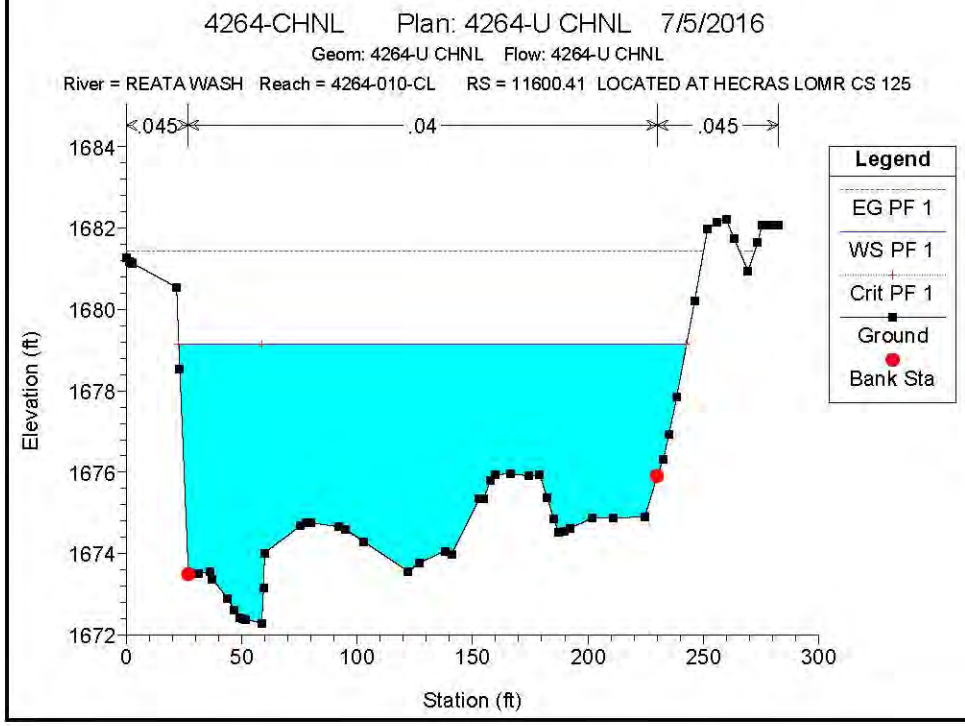

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 12033.11 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

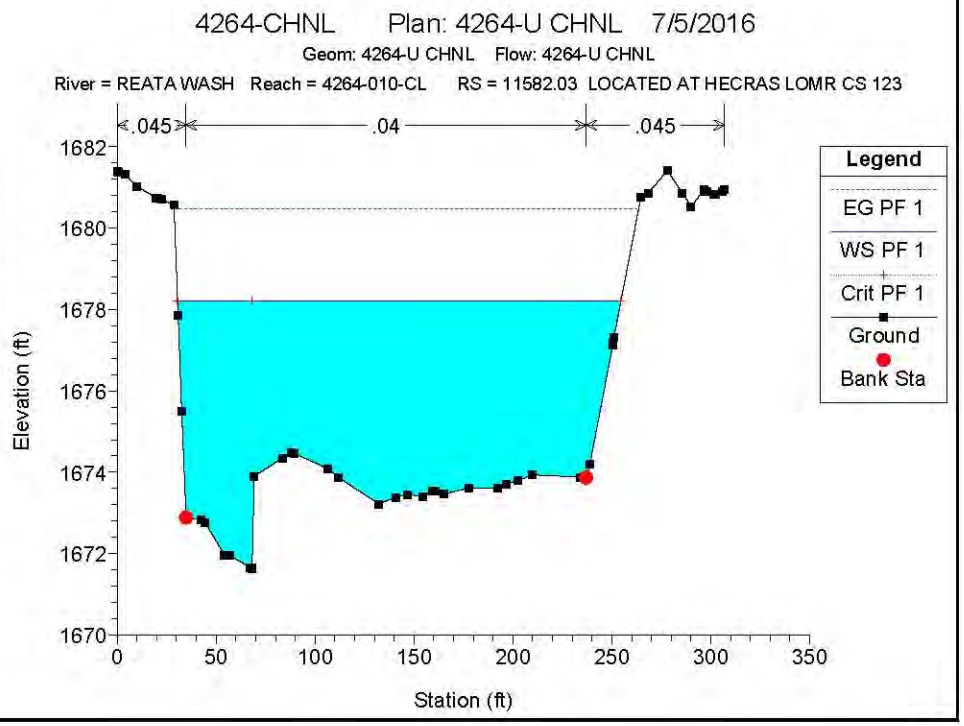

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

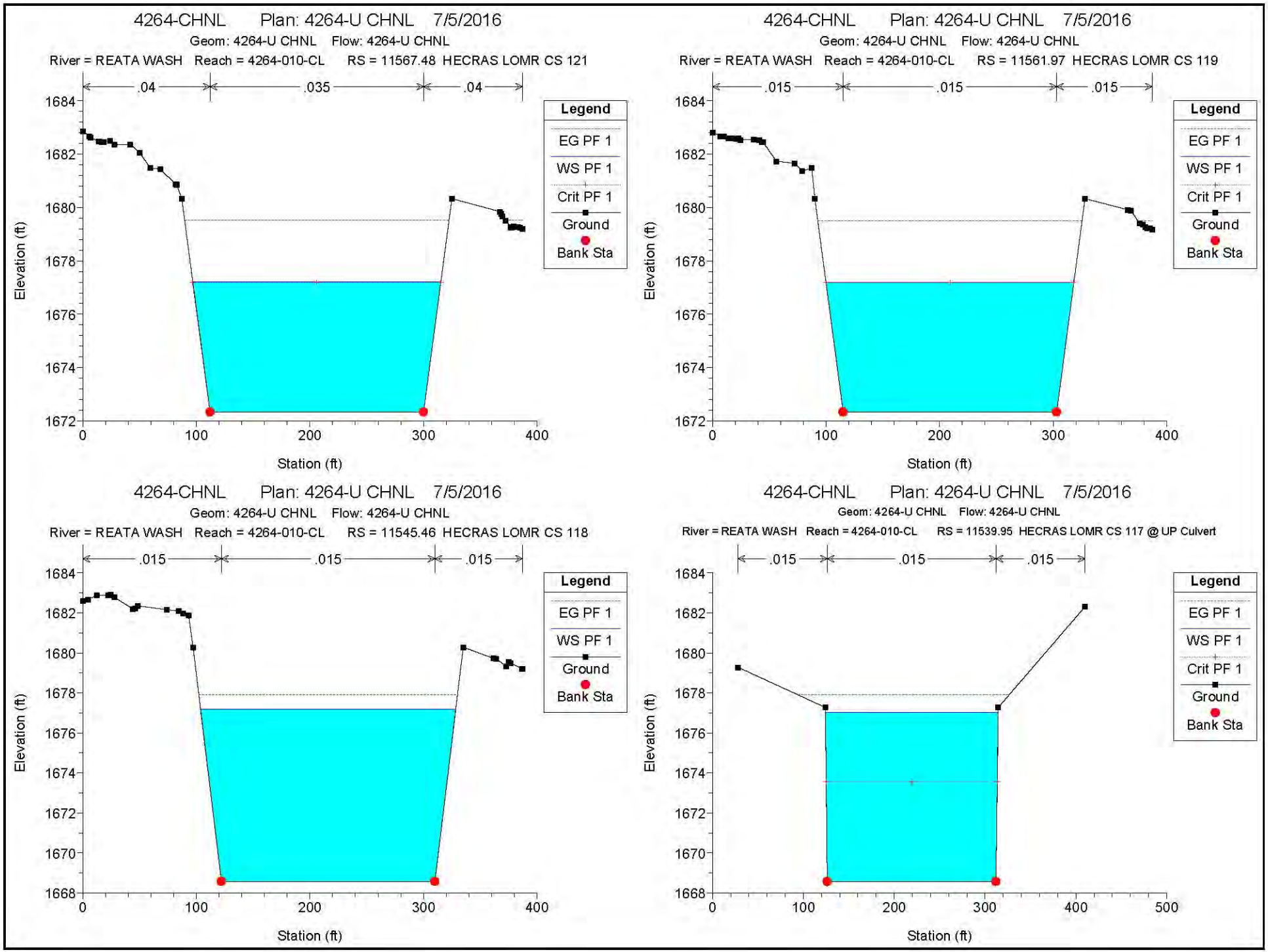

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11777 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

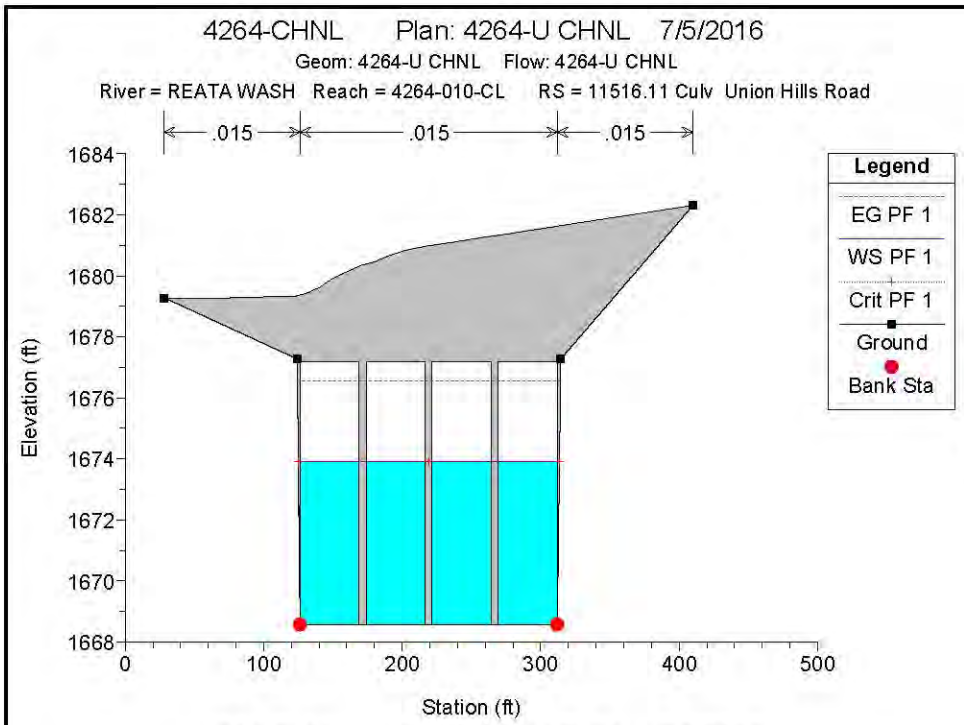

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11665.28 LOCATED AT HECRAS LOMR CS 128
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

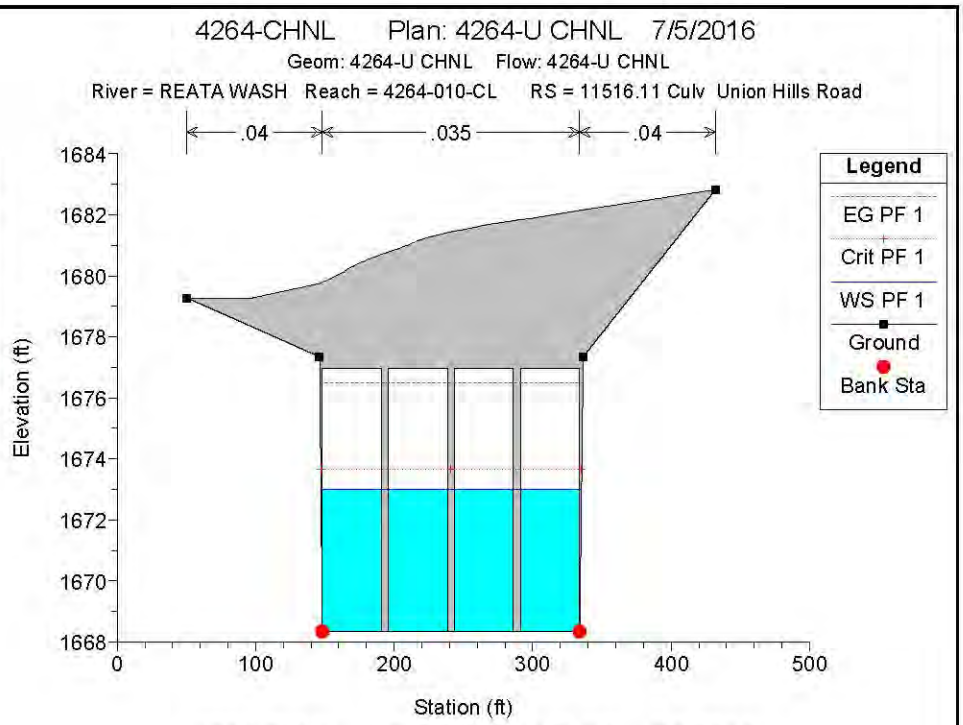

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11614.66 LOCATED AT HECRAS LOMR CS 127
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

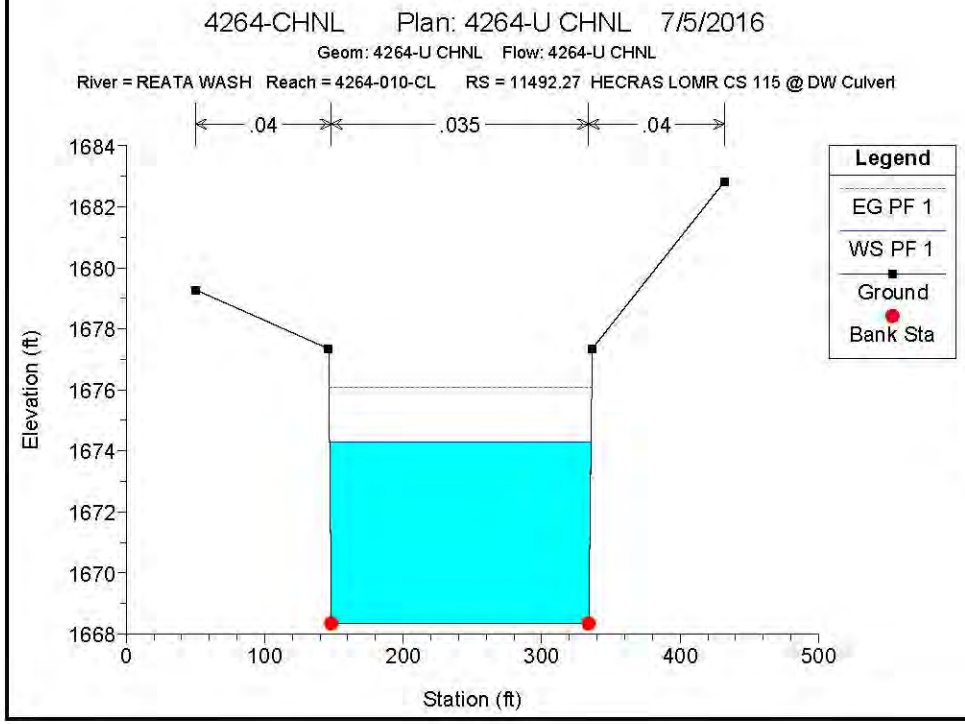

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11600.41 LOCATED AT HECRAS LOMR CS 125
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

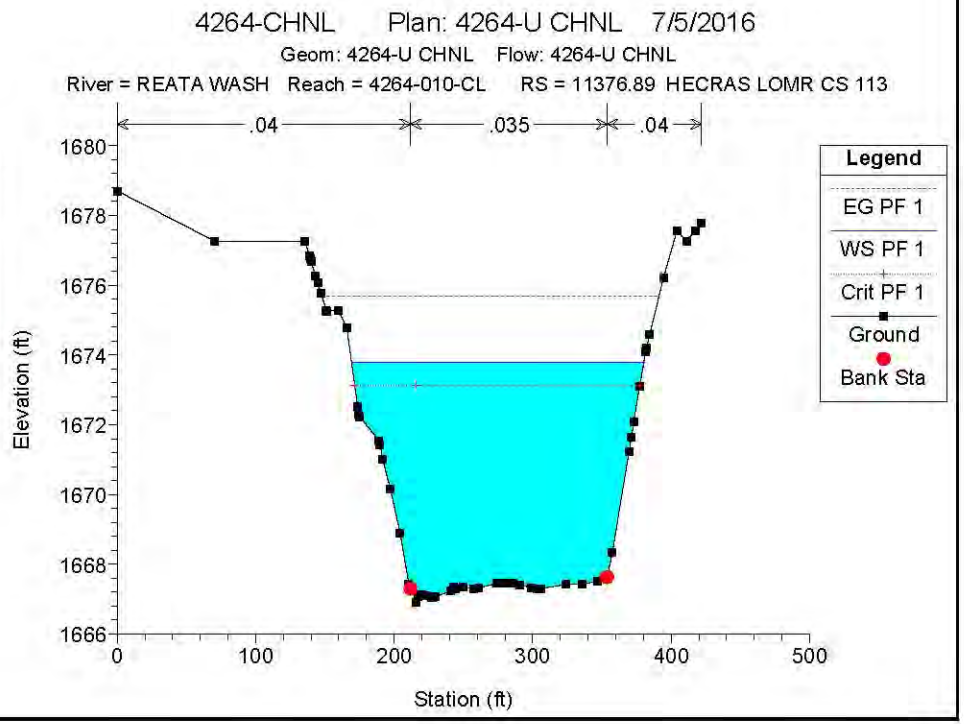

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11582.03 LOCATED AT HECRAS LOMR CS 123
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

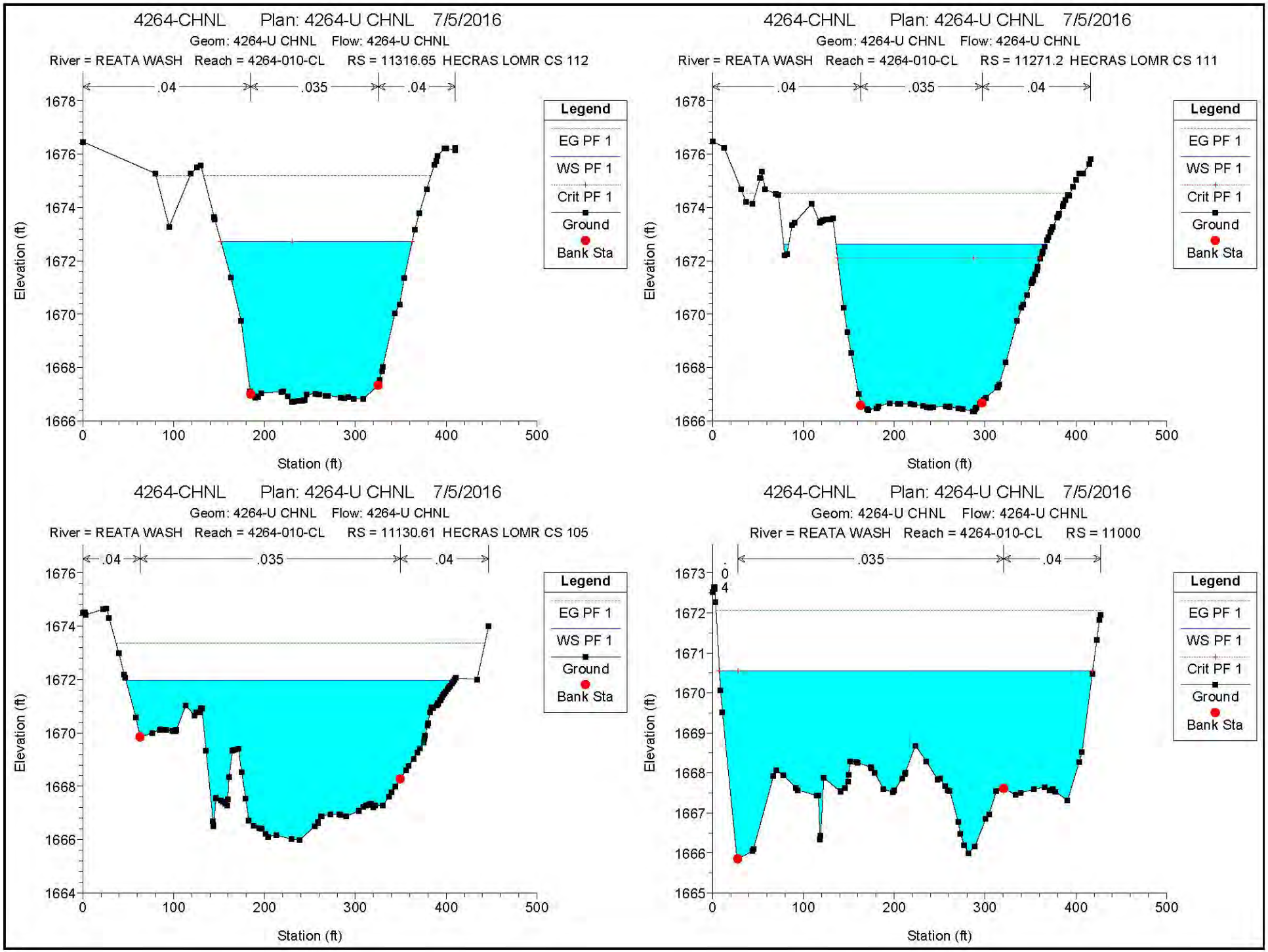

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11567.48 HECRAS LOMR CS 121
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11561.97 HECRAS LOMR CS 119
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11545.46 HECRAS LOMR CS 118
.015
.015
.015
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11539.95 HECRAS LOMR CS 117 @ UP Culvert
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

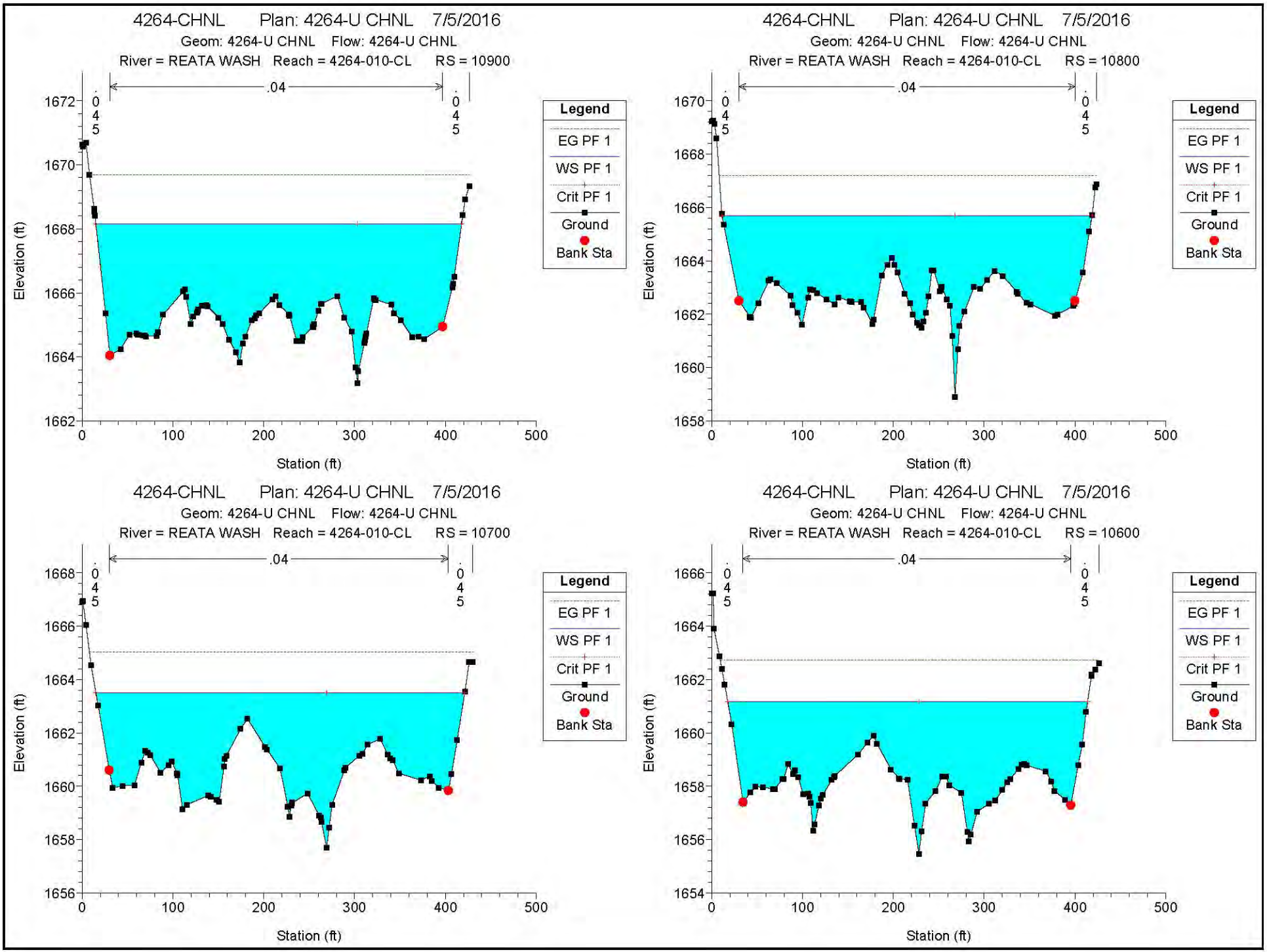

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11516.11 Culv Union Hills Road
.015
.015
.015
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

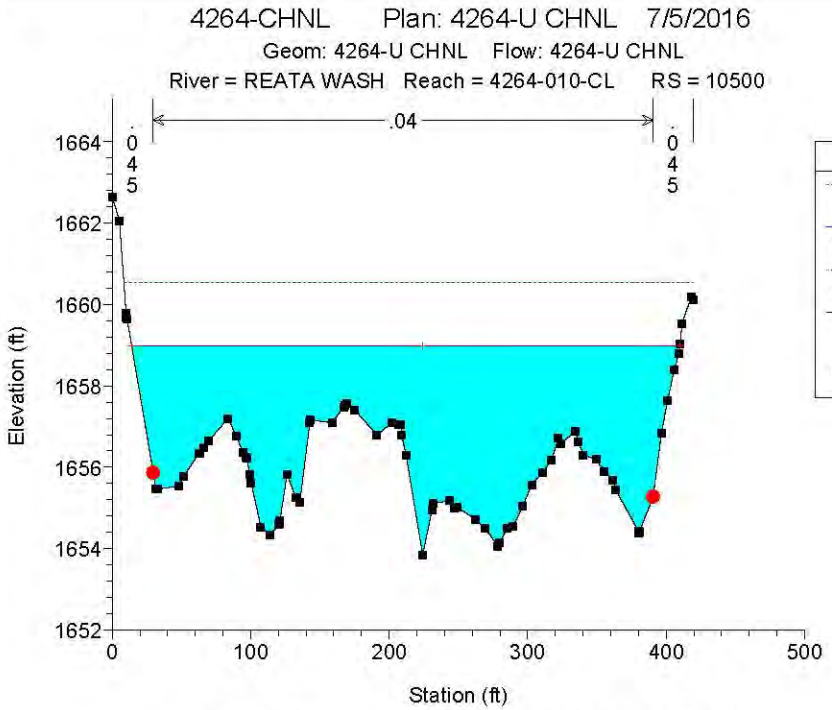

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11516.11 Culv Union Hills Road
.04
.035
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

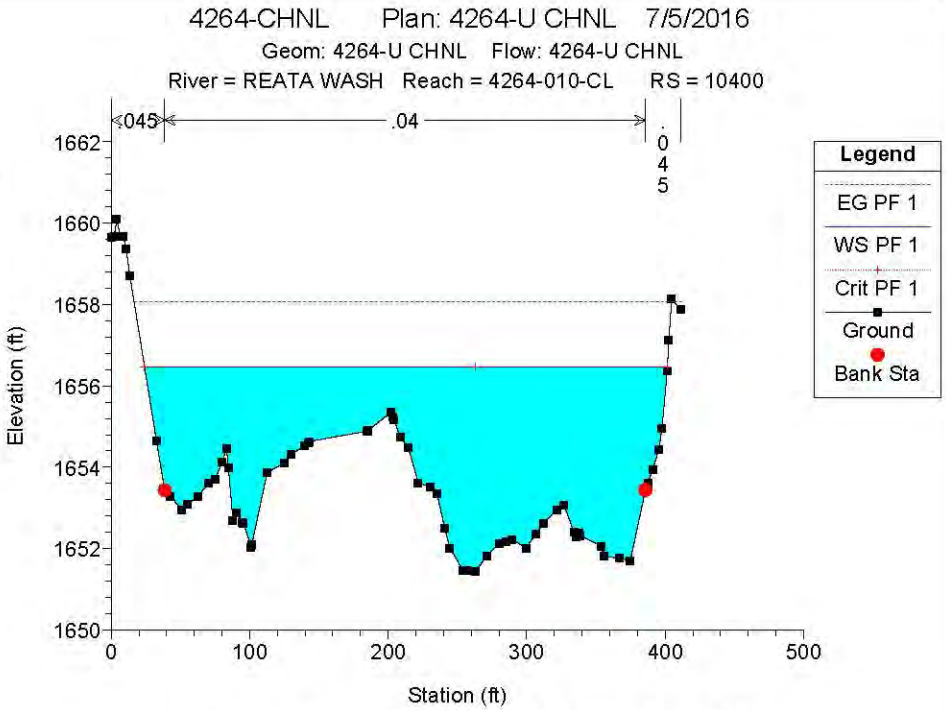

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11492.27 HECRAS LOMR CS 115 @ DW Culvert
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

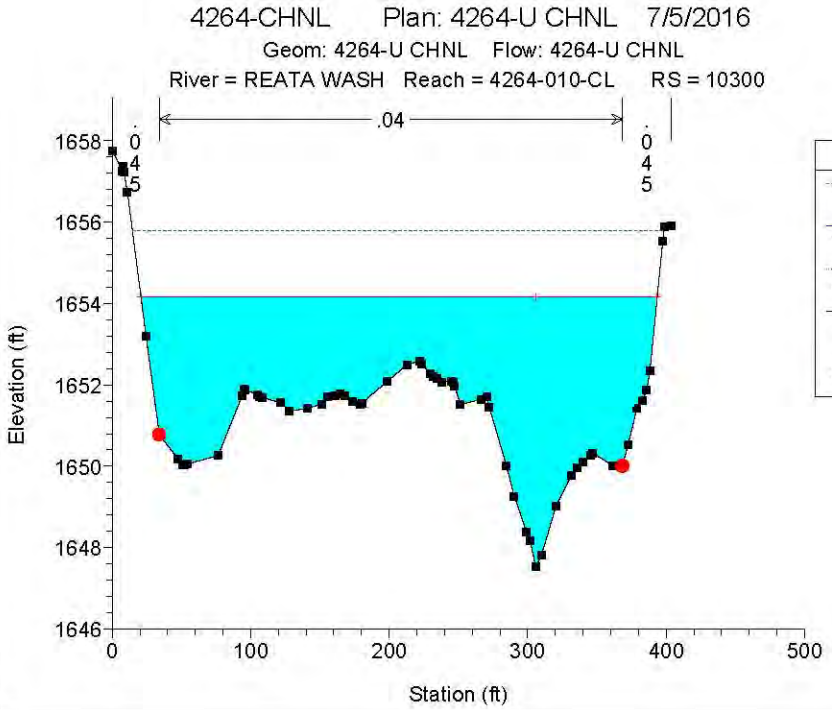

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11376.89 HECRAS LOMR CS 113
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

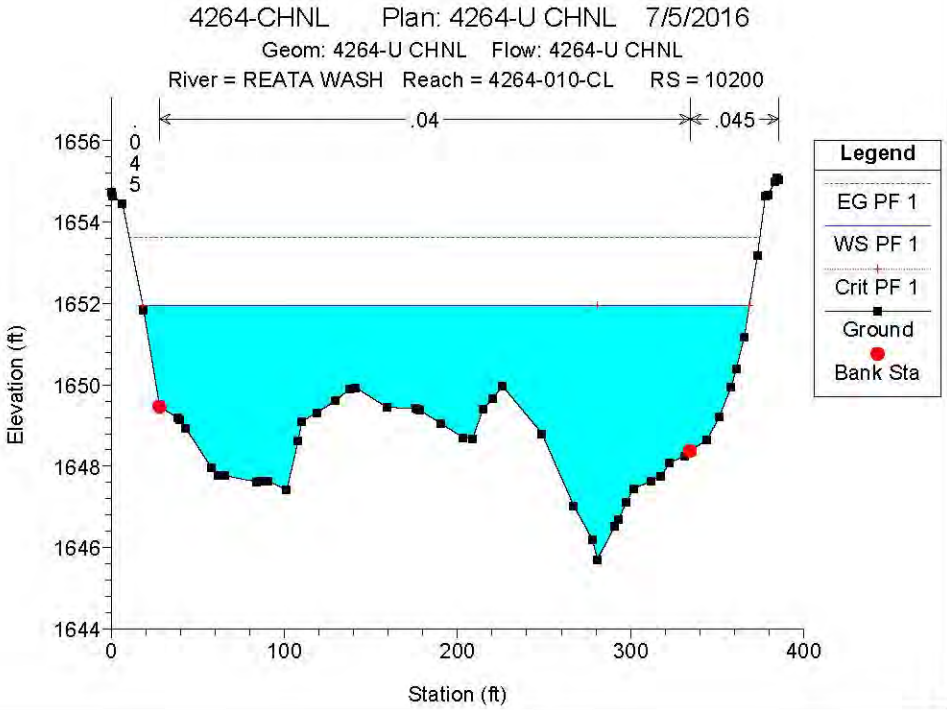

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11316.65 HECRAS LOMR CS 112
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11271.2 HECRAS LOMR CS 111
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11130.61 HECRAS LOMR CS 105
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 11000
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

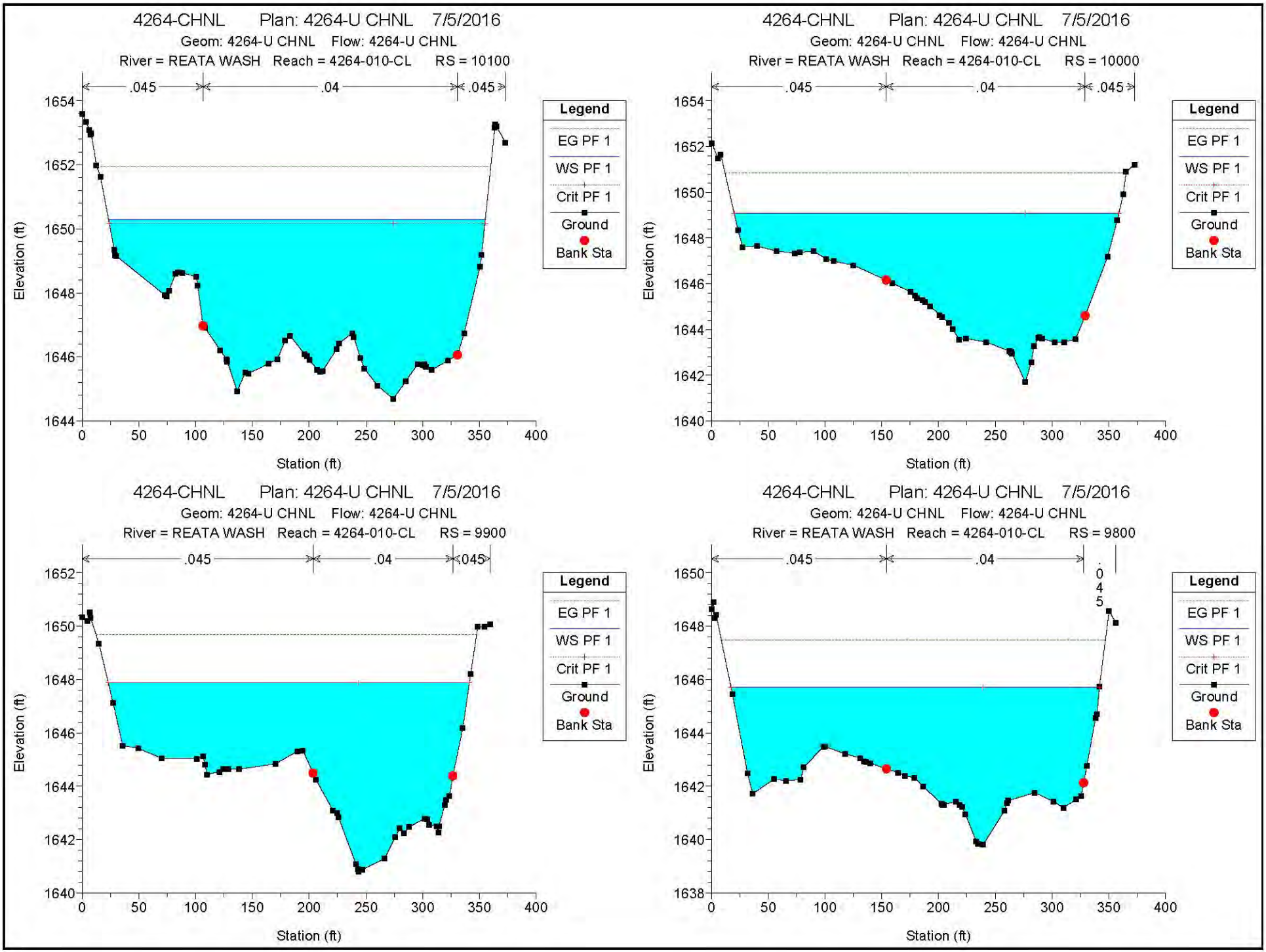

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10800
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

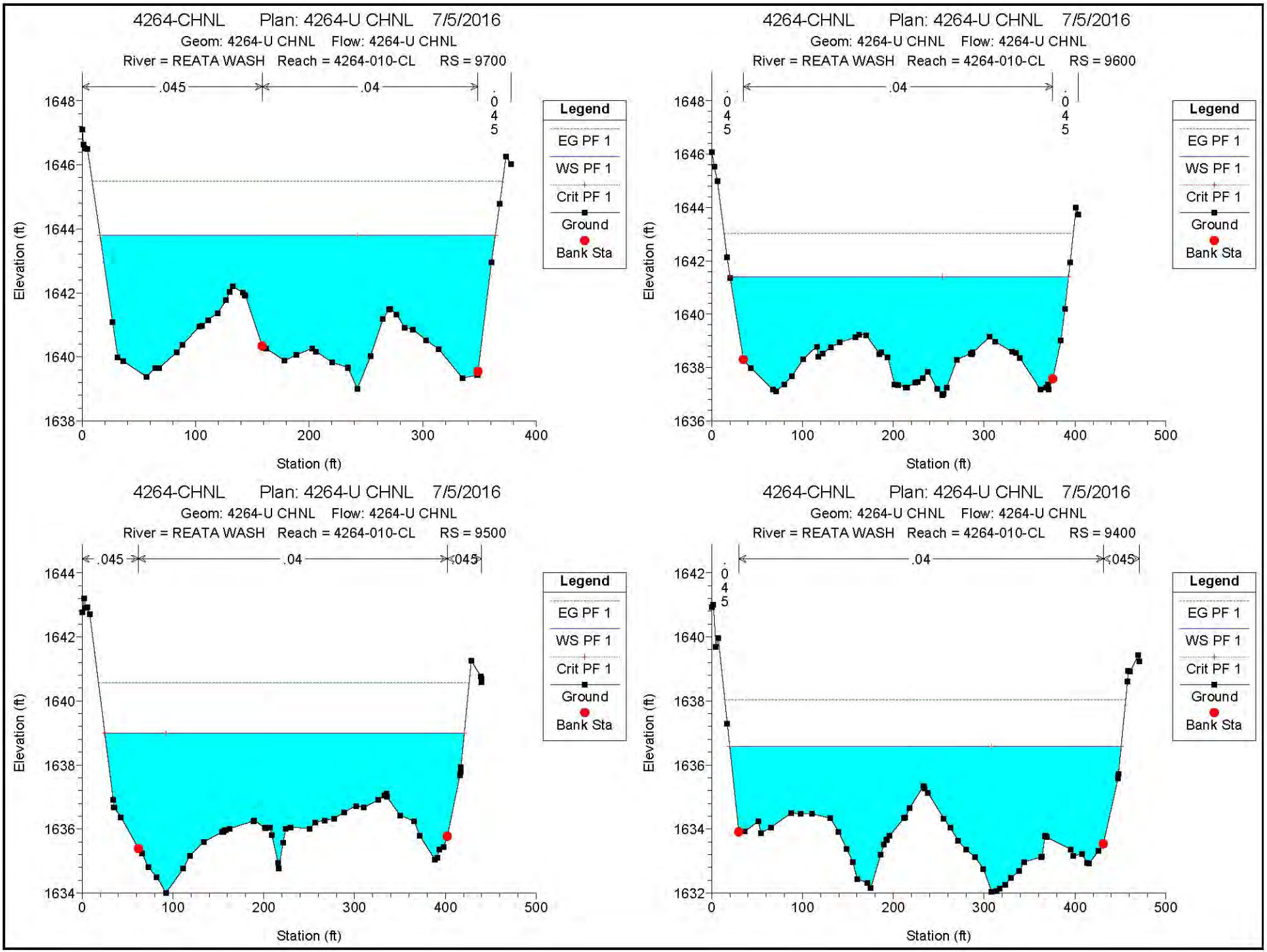

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

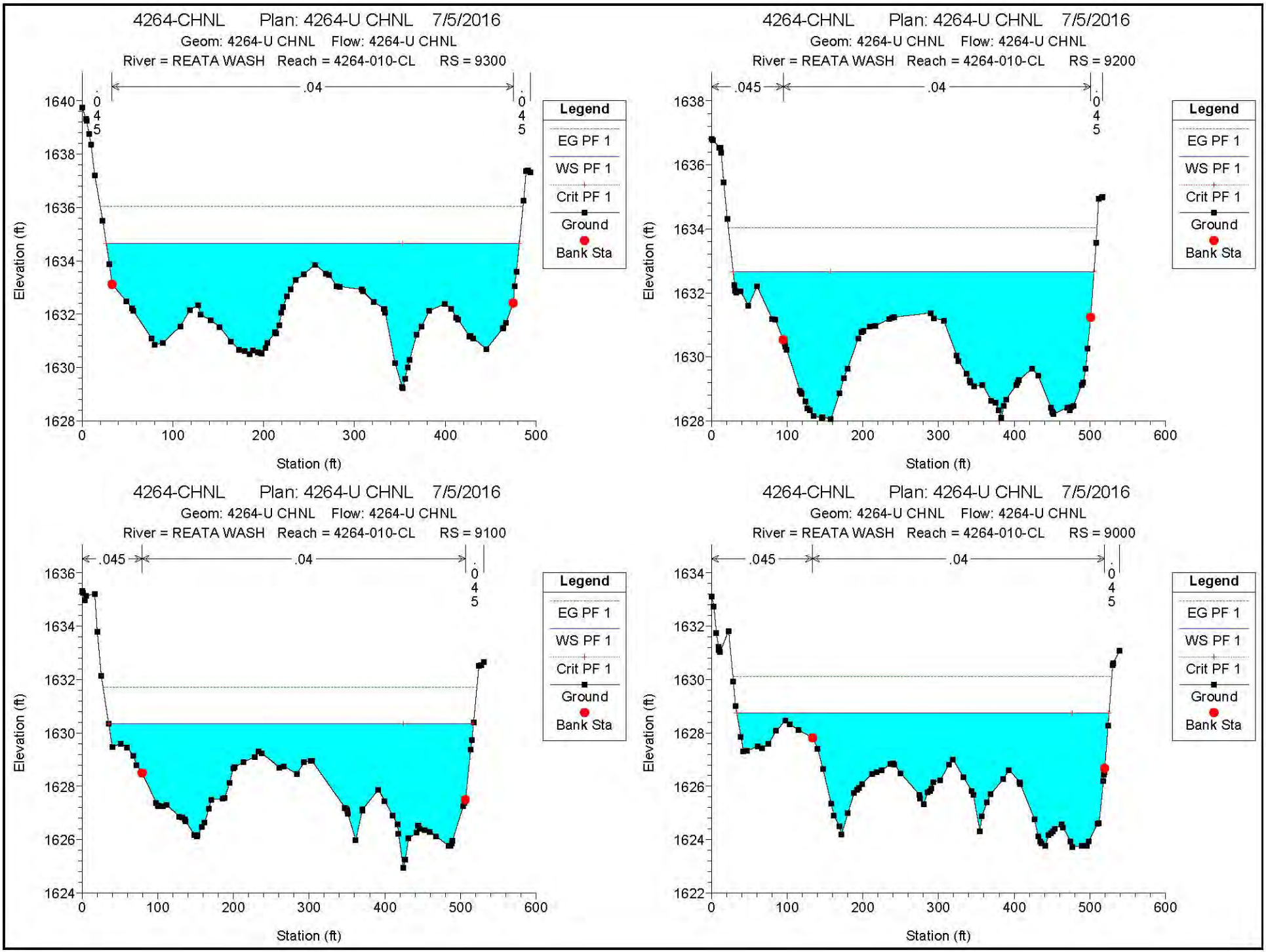

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

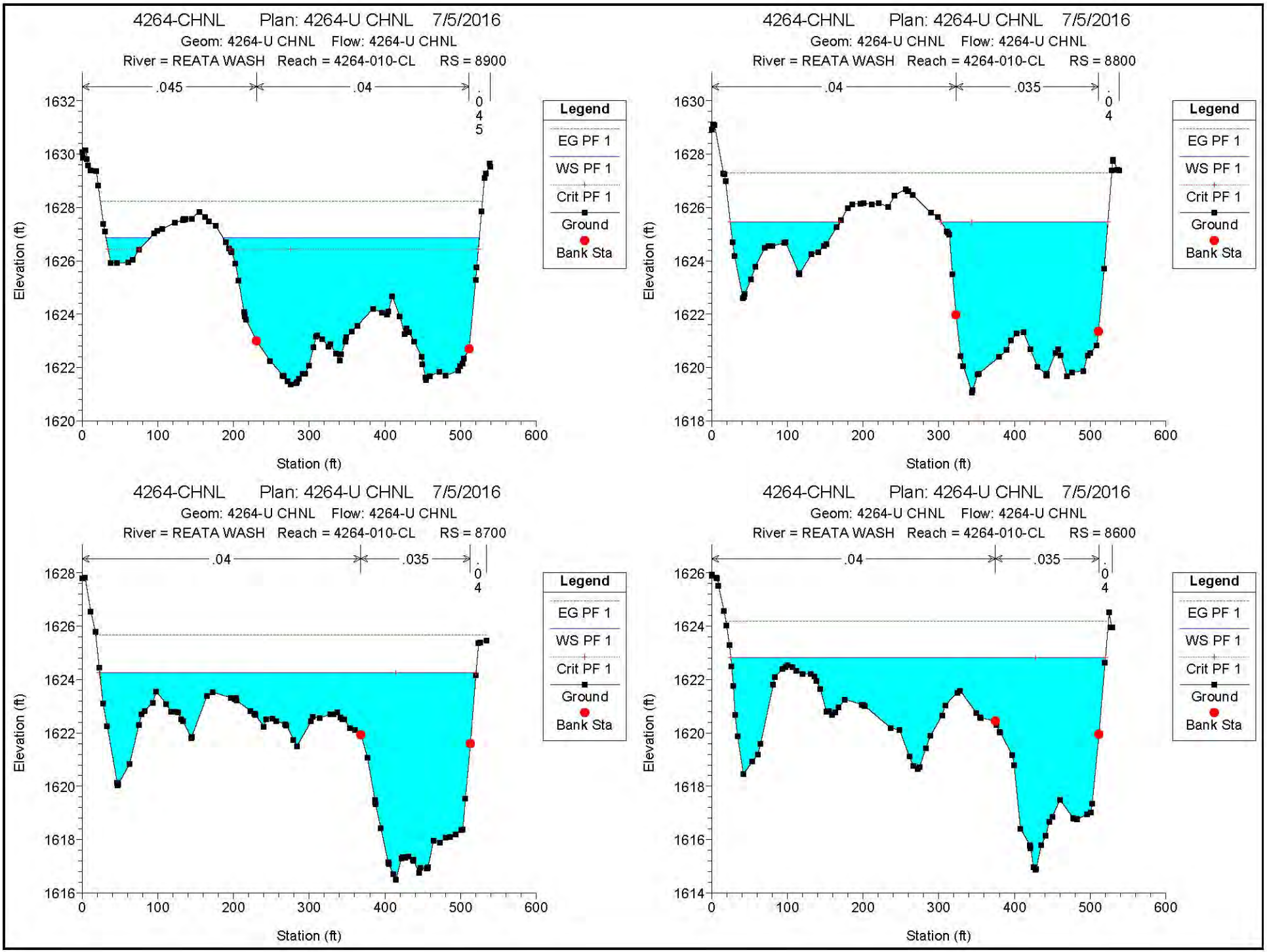

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

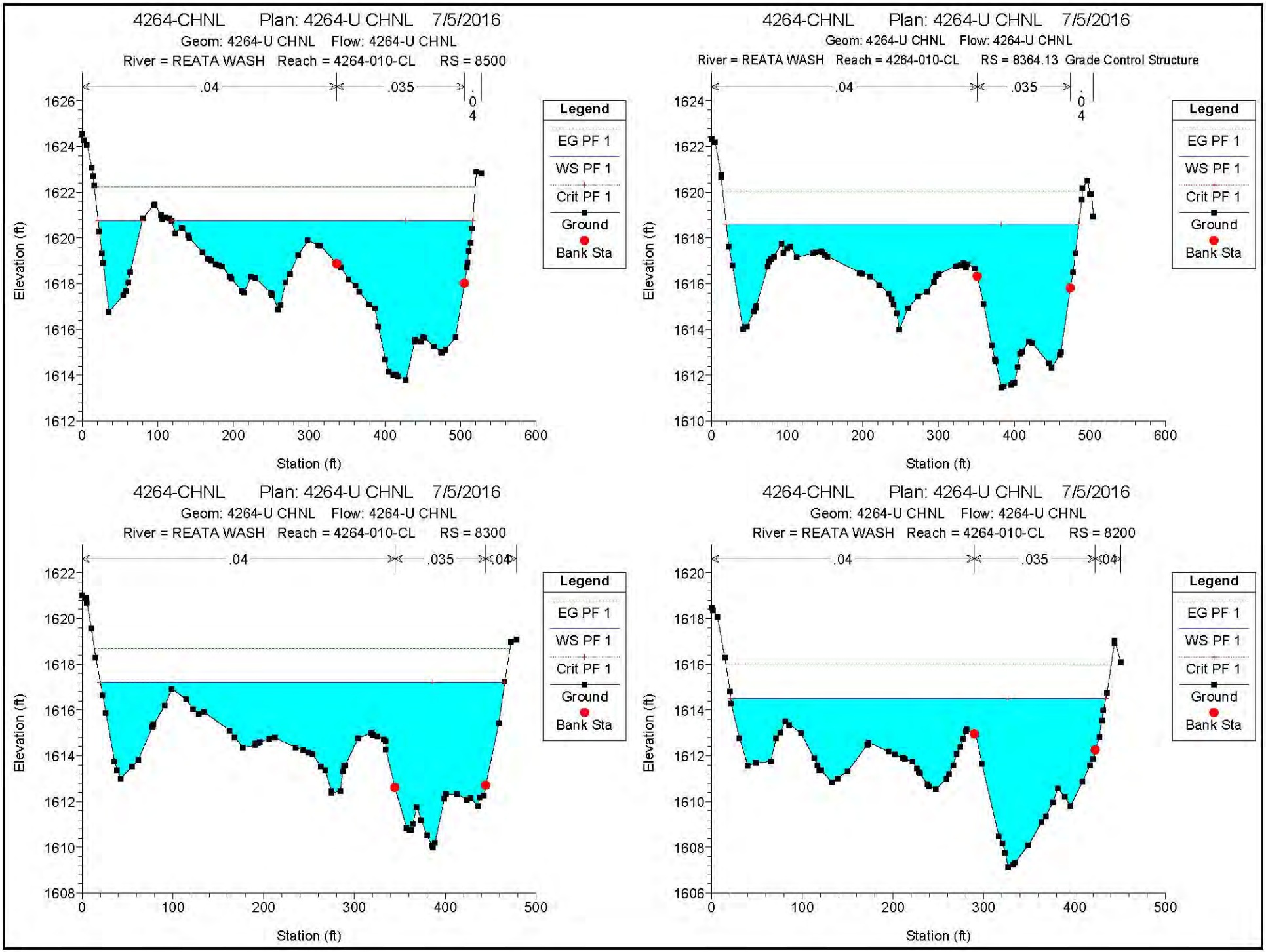

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

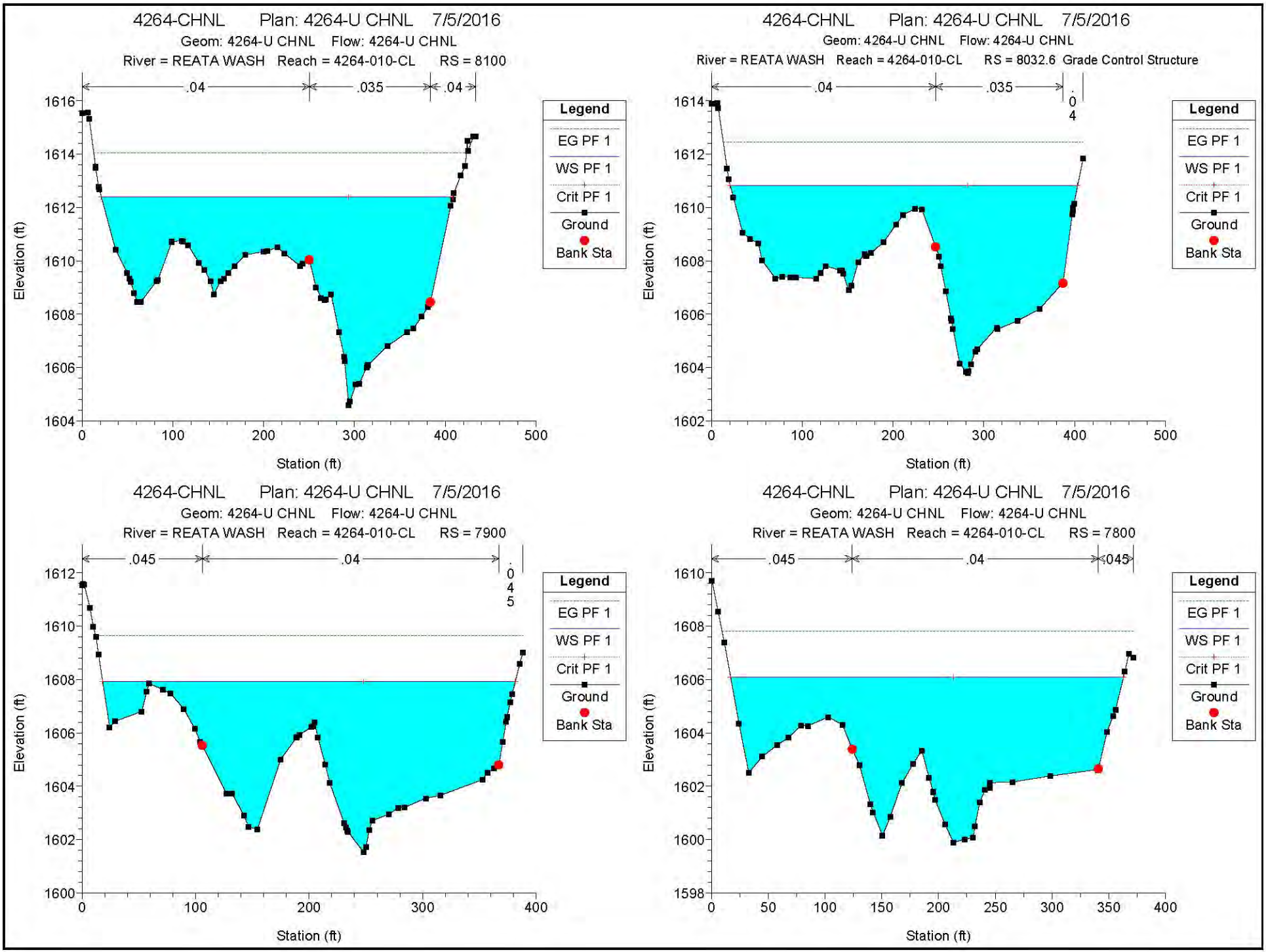

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 10000
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9800
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

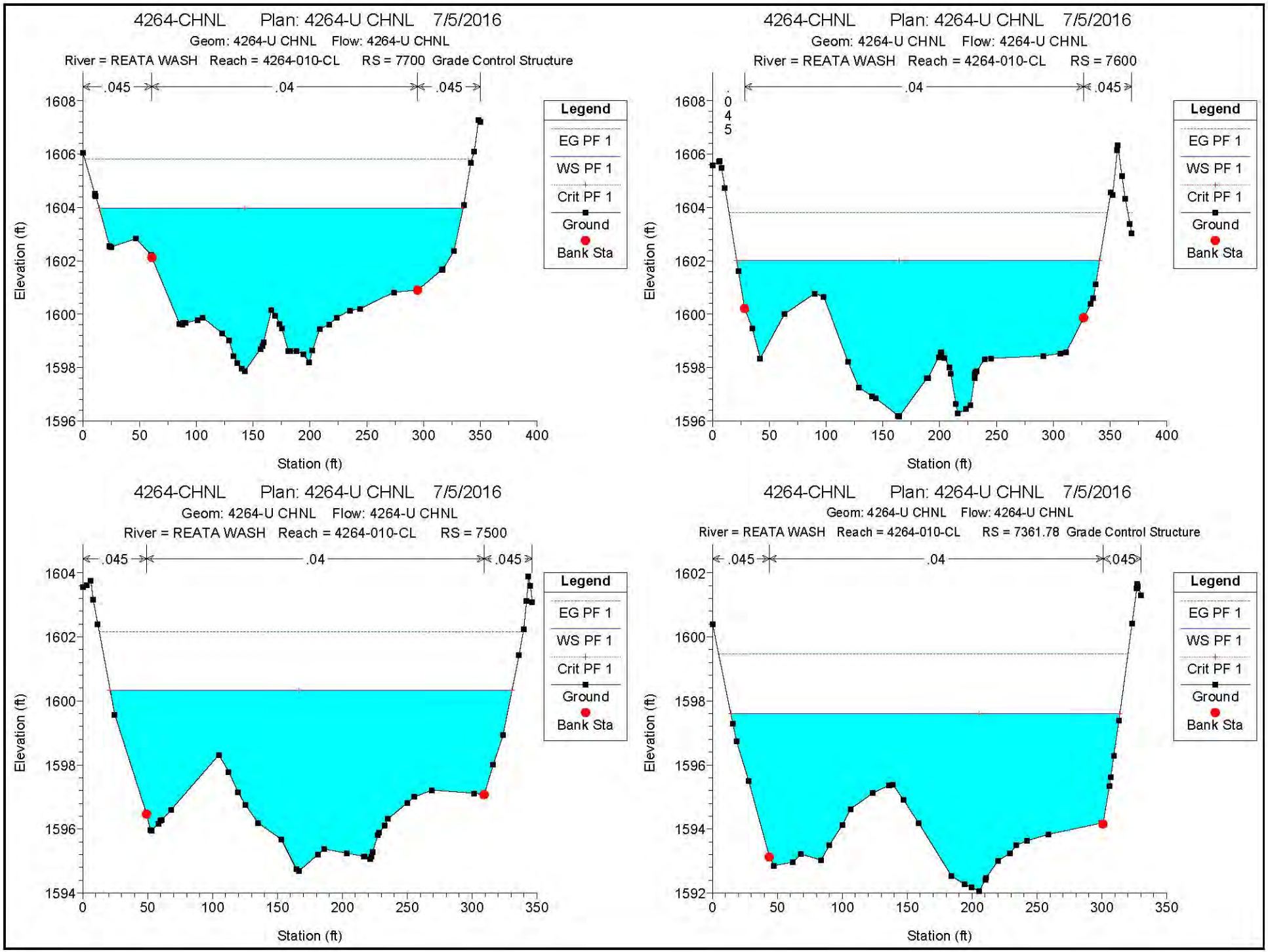

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9700
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9400
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

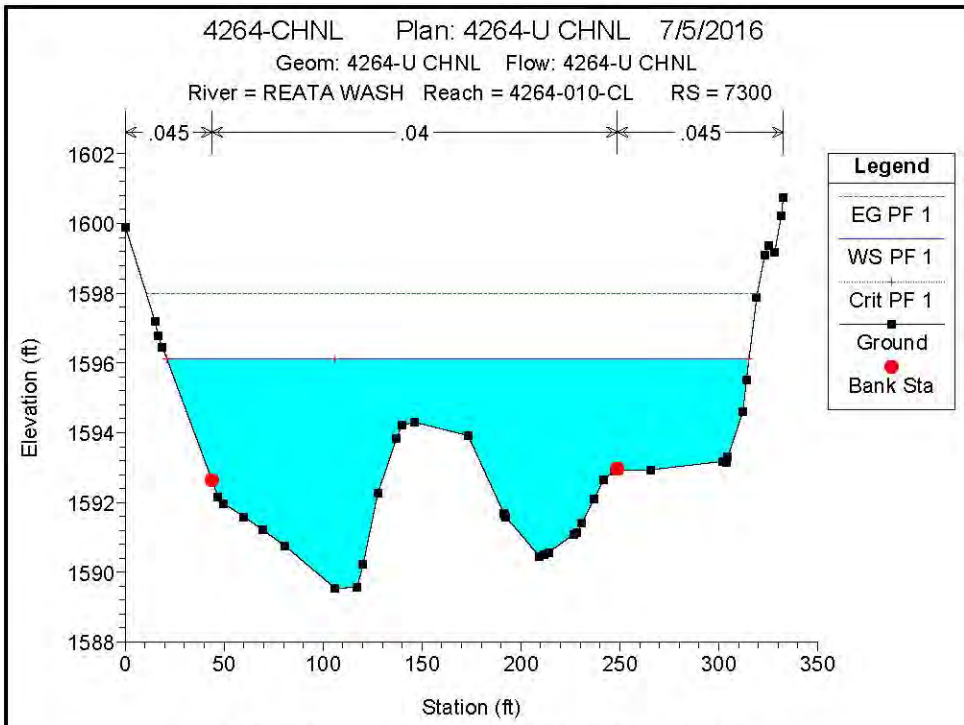

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9200
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9100
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 9000
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

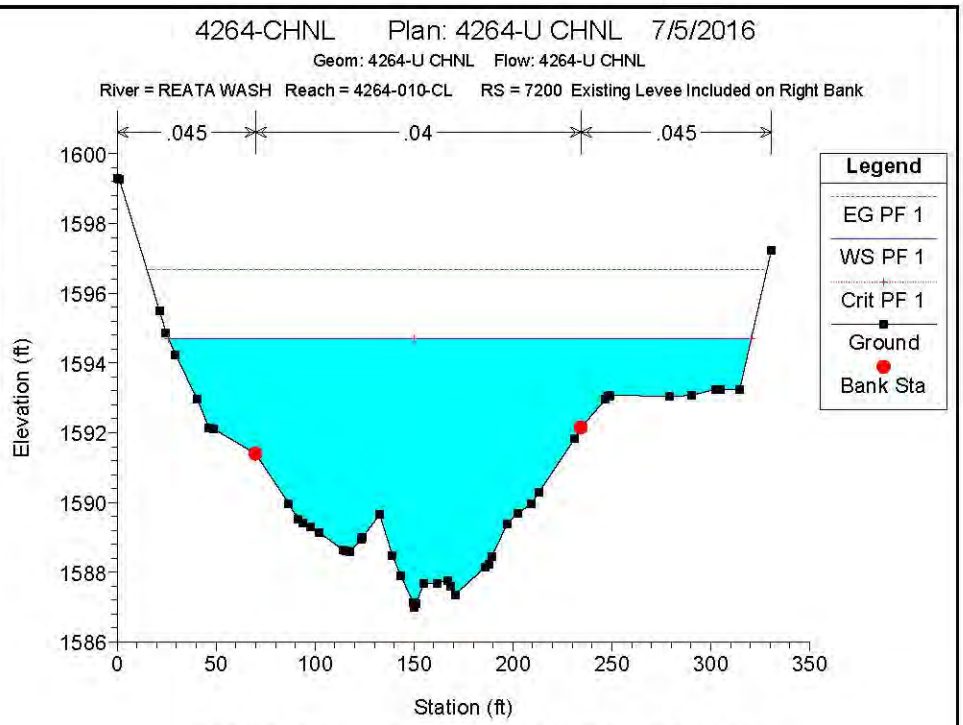

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8800
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8700
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8600
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

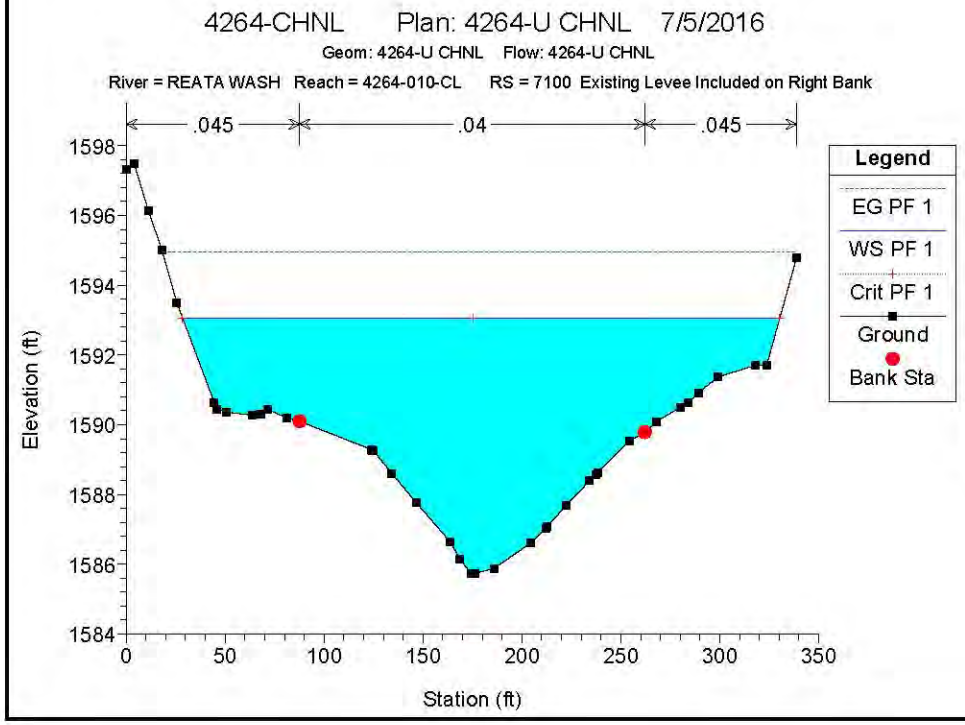

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8500
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8364.13 Grade Control Structure
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8300
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8200
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

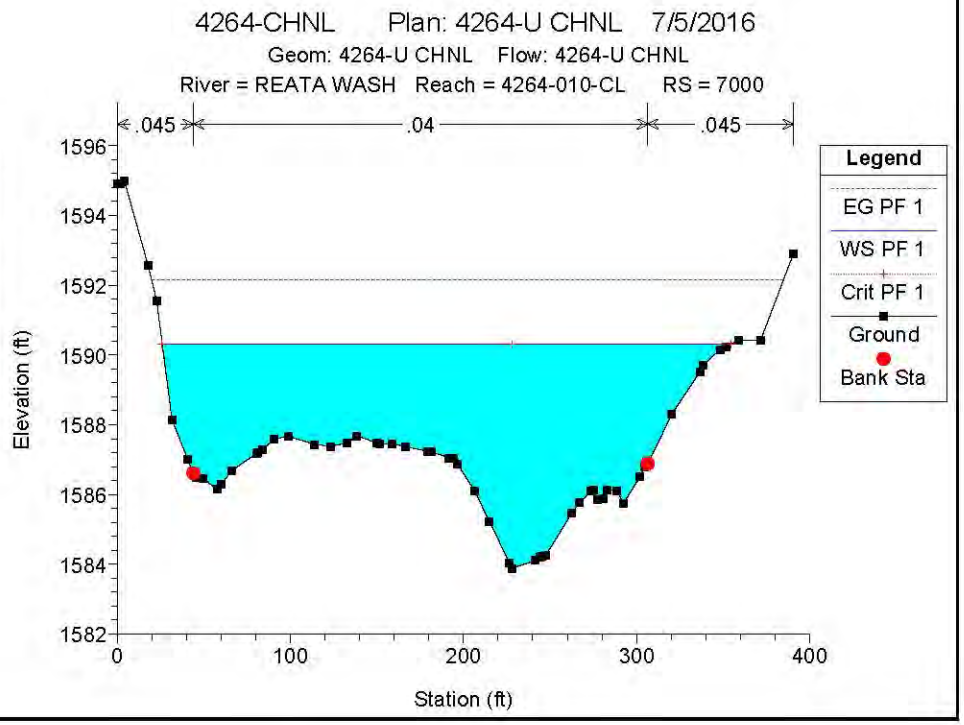

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8100
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 8032.6 Grade Control Structure
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7800
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

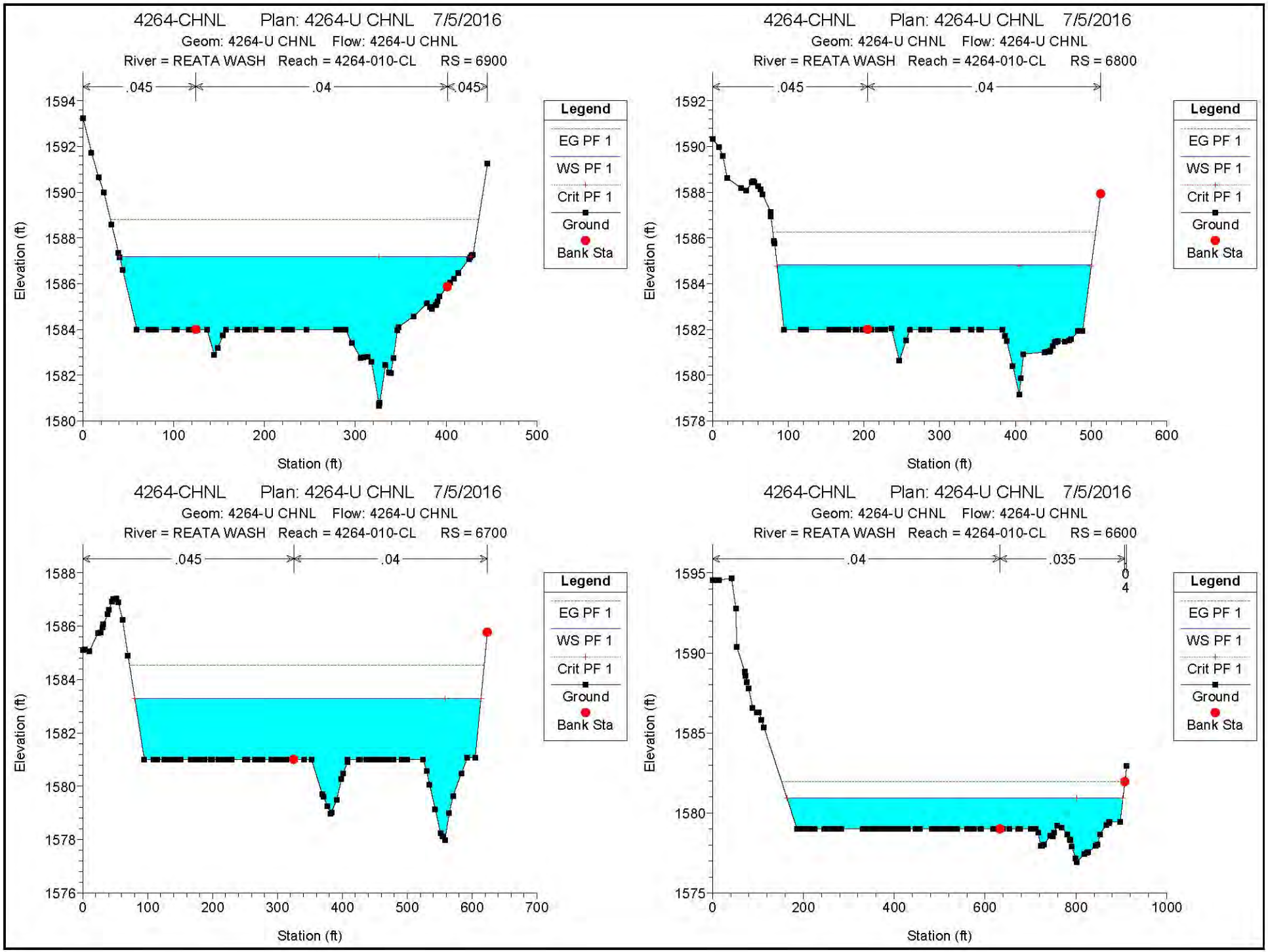

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7700 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7600
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7500
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7361.78 Grade Control Structure
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

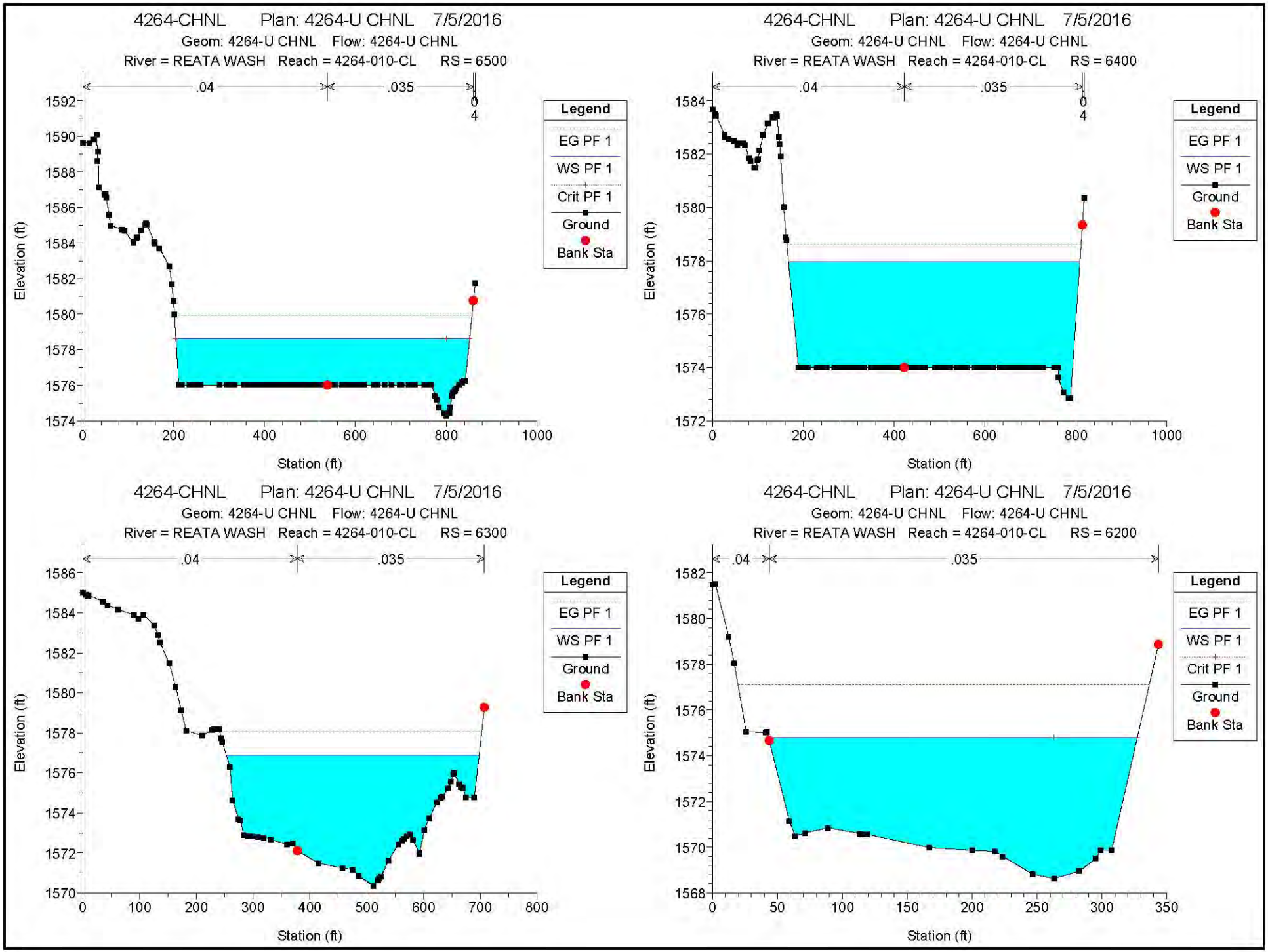

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7300
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

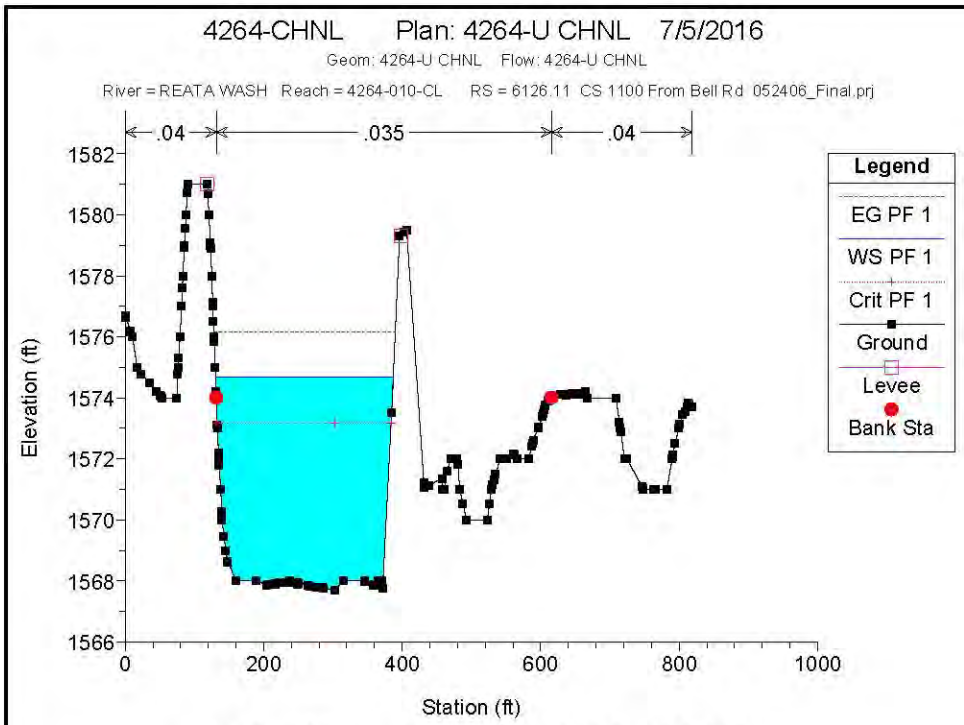

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7200 Existing Levee Included on Right Bank
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

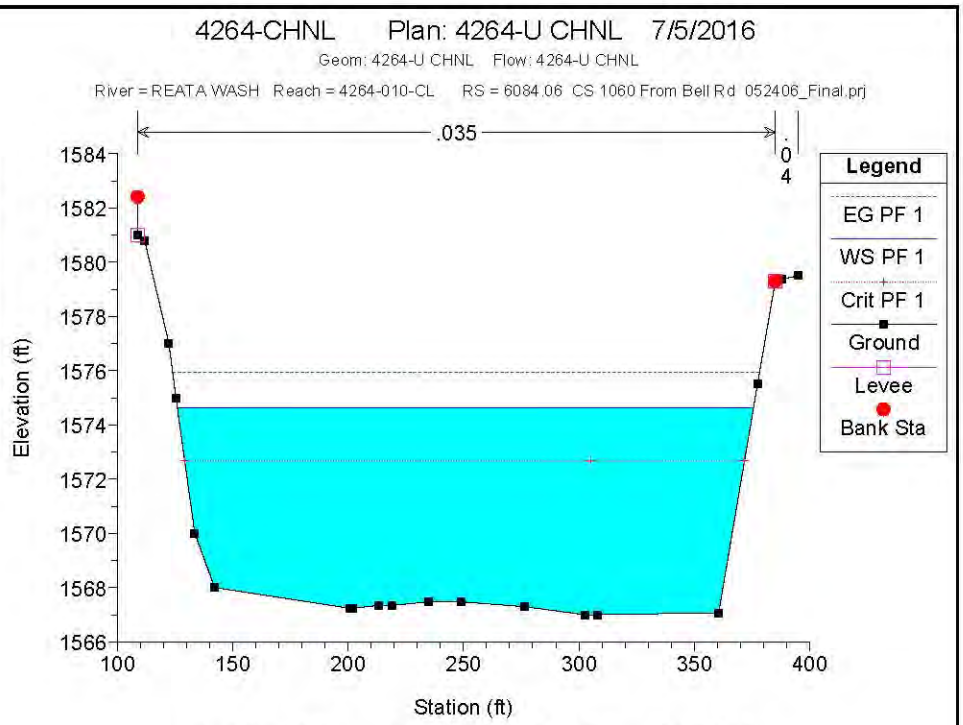

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7100 Existing Levee Included on Right Bank
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

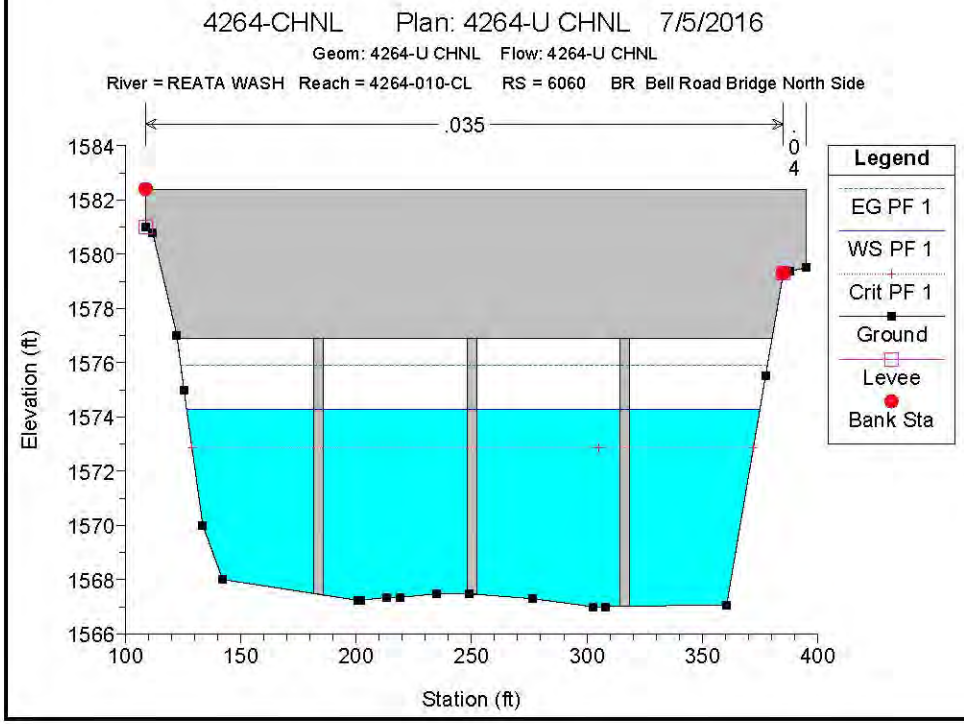

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 7000
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

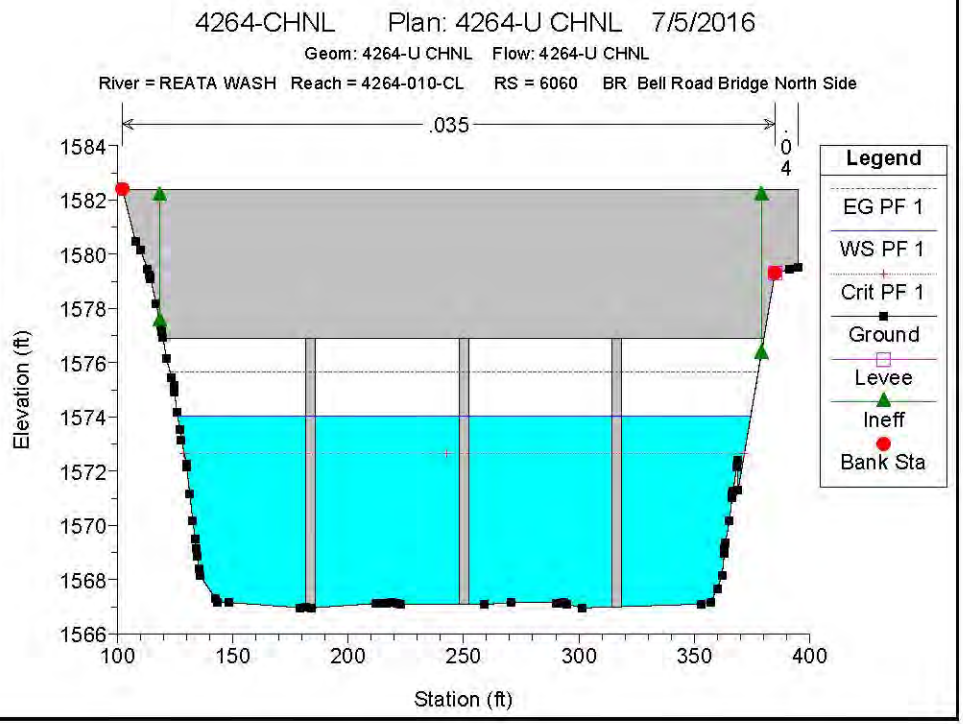

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6900
.045
.04
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6800
.045
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6700
.045
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6600
.04
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

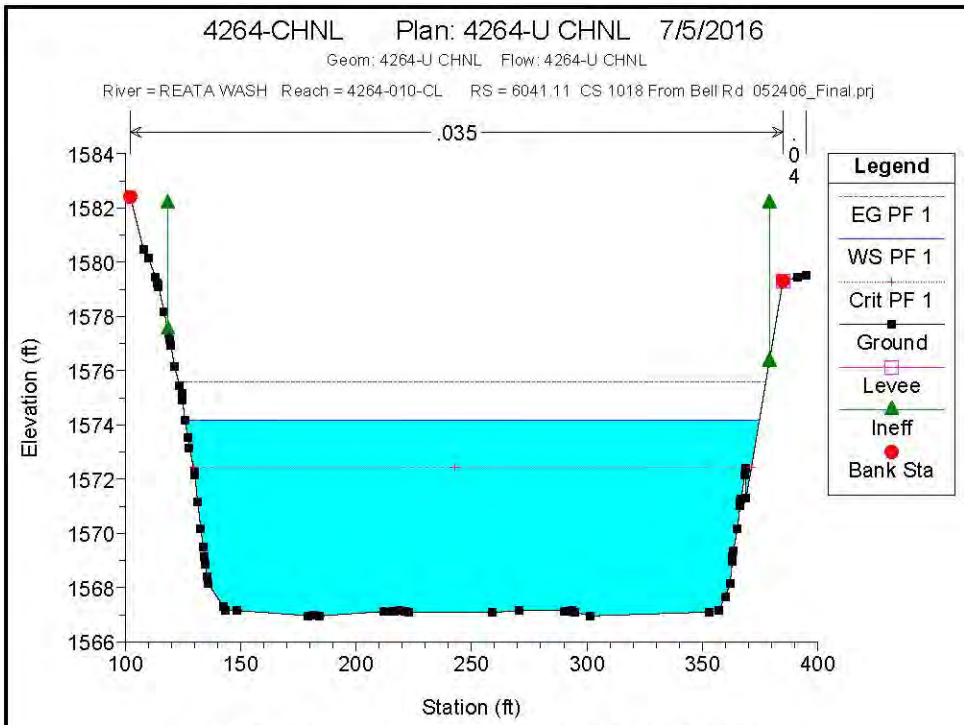

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6500
.04
.035
0
4
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6400
.04
.035
0
4
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6300
.04
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6200
.04
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

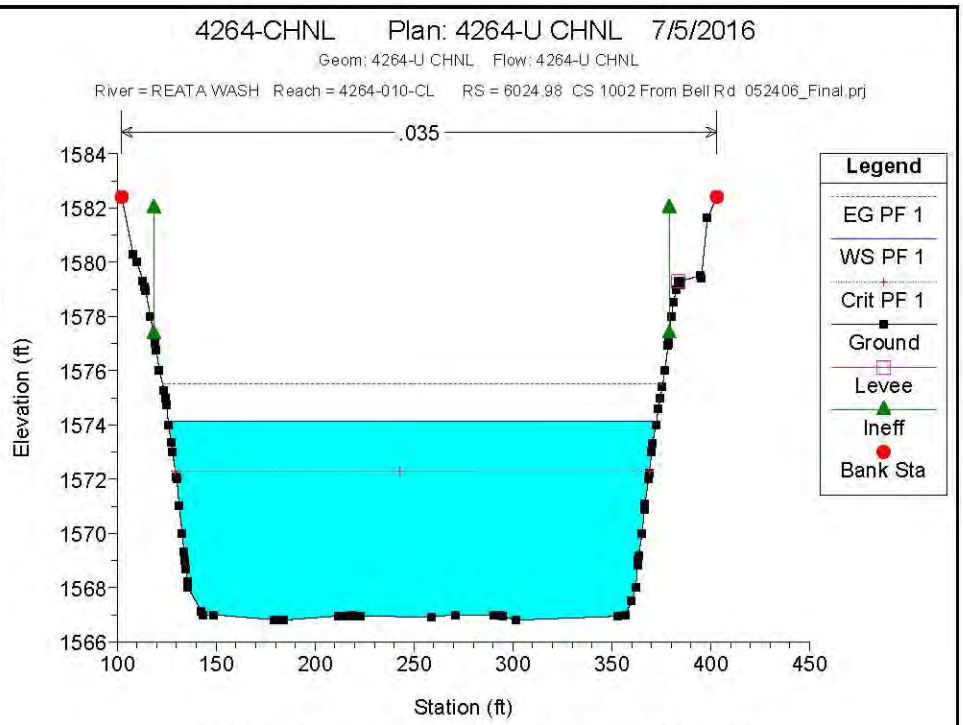

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6126.11 CS 1100 From Bell Rd 052406_Final.prj
.04
.035
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

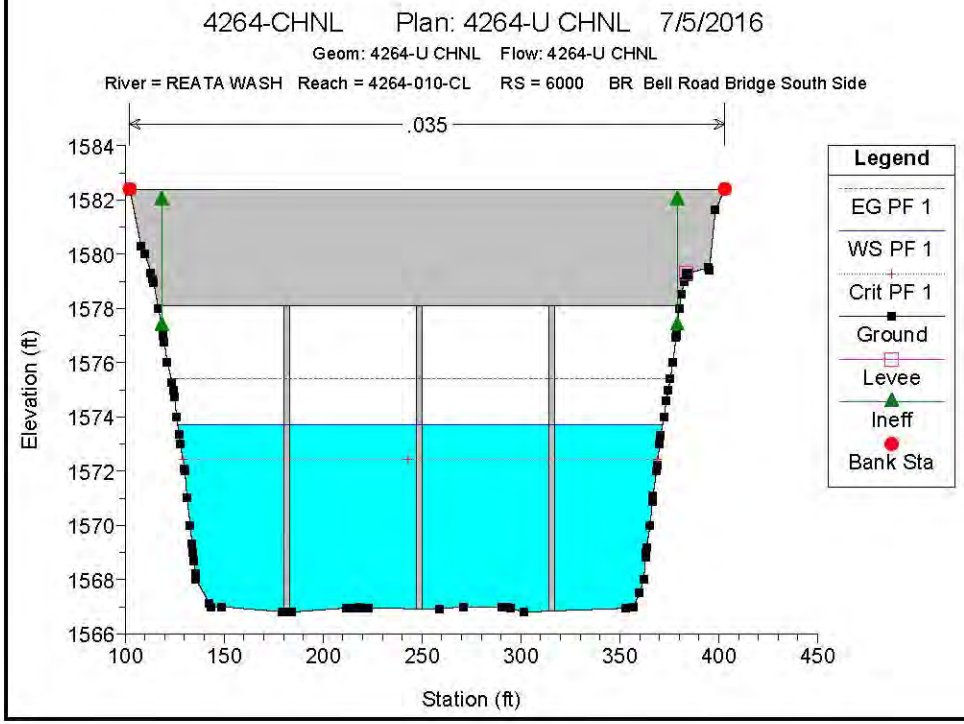

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6084.06 CS 1060 From Bell Rd 052406_Final.prj
.035
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

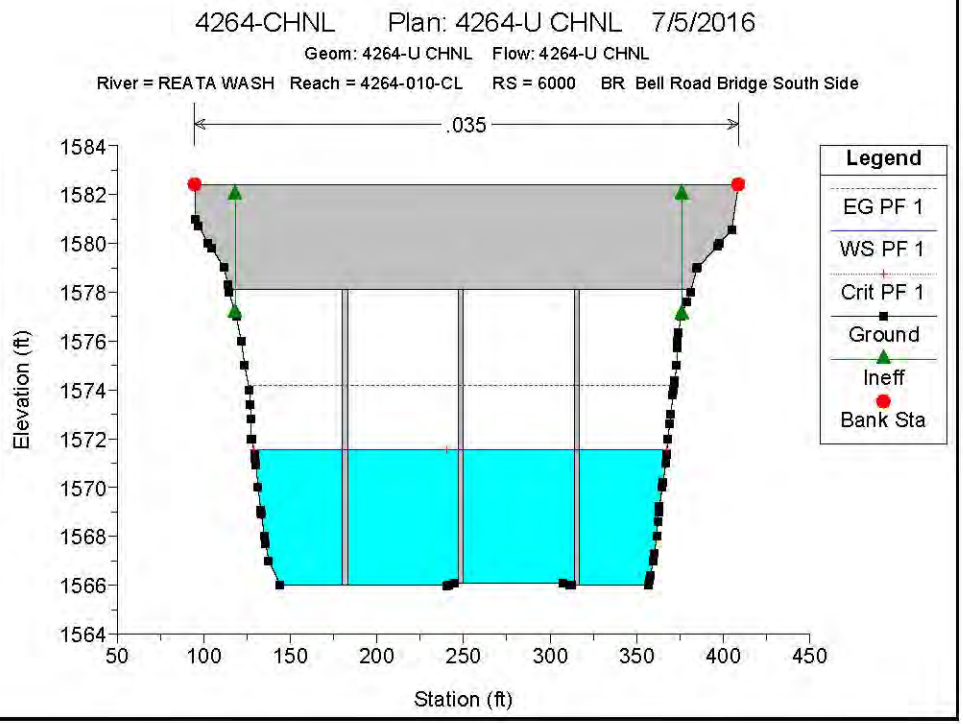

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6060 BR Bell Road Bridge North Side
.035
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

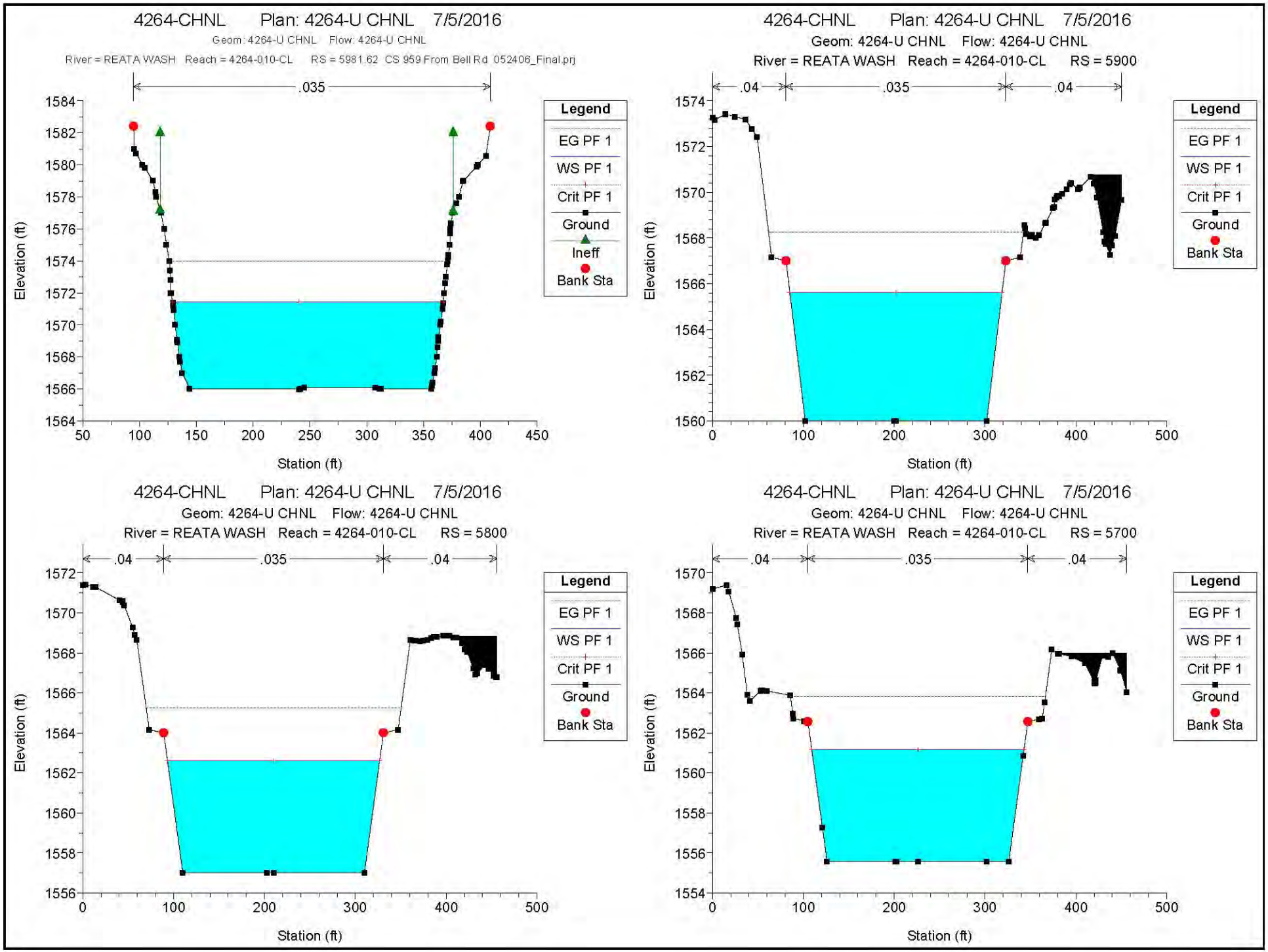

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6060 BR Bell Road Bridge North Side
.035
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta

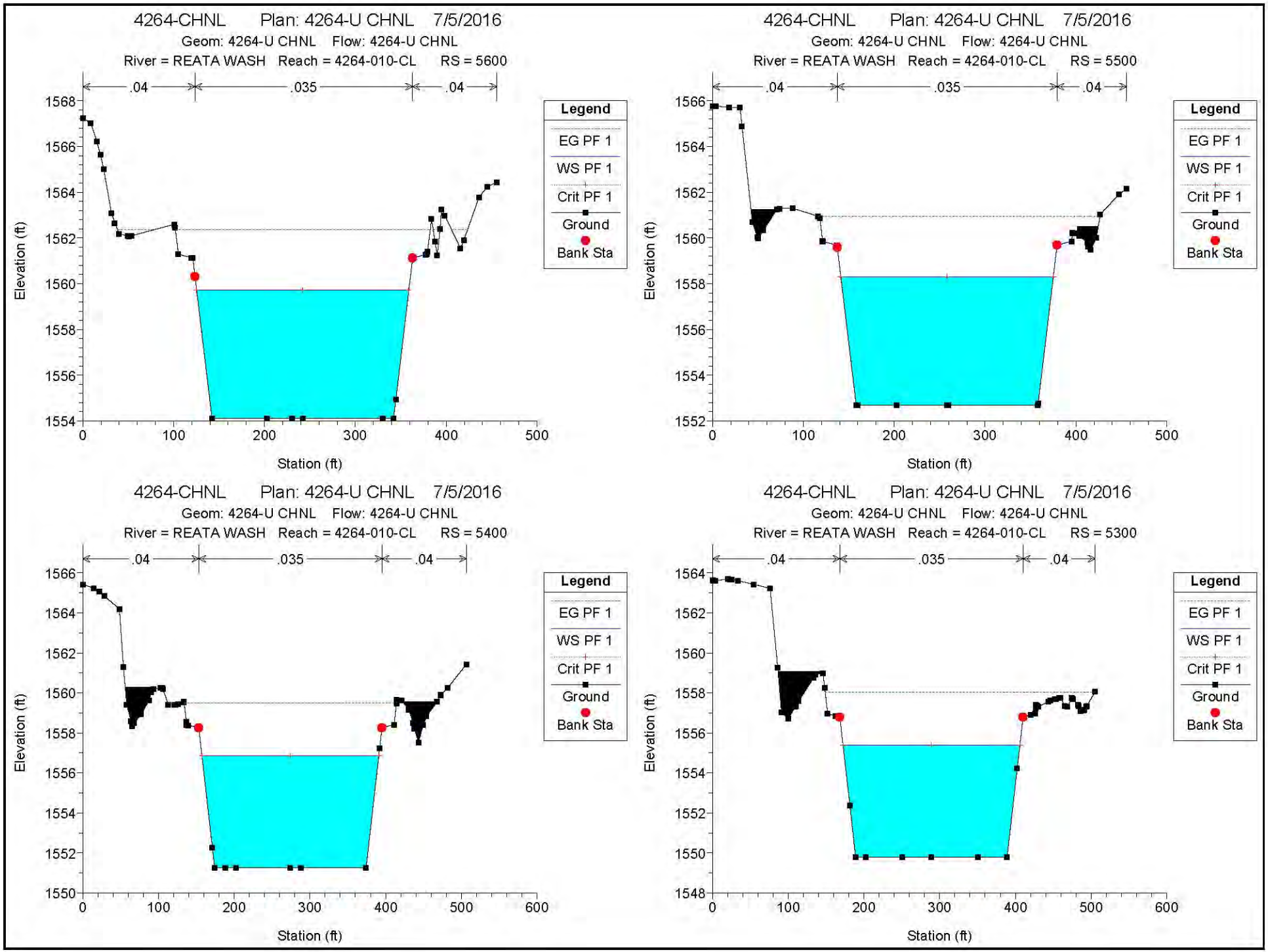

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6041.11 CS 1018 From Bell Rd 052406_Final.prj
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

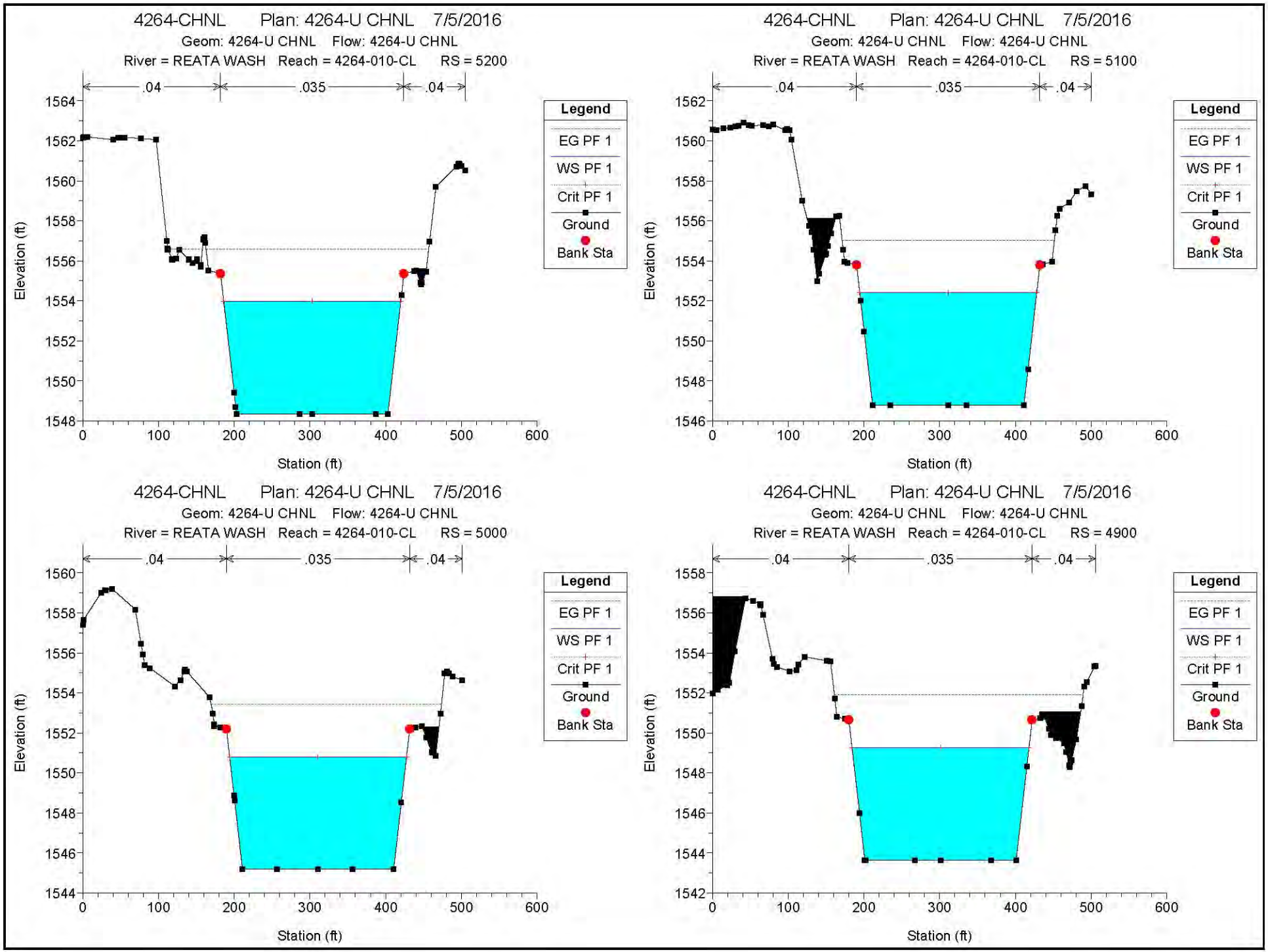

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6024.98 CS 1002 From Bell Rd 052406_Final.prj
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

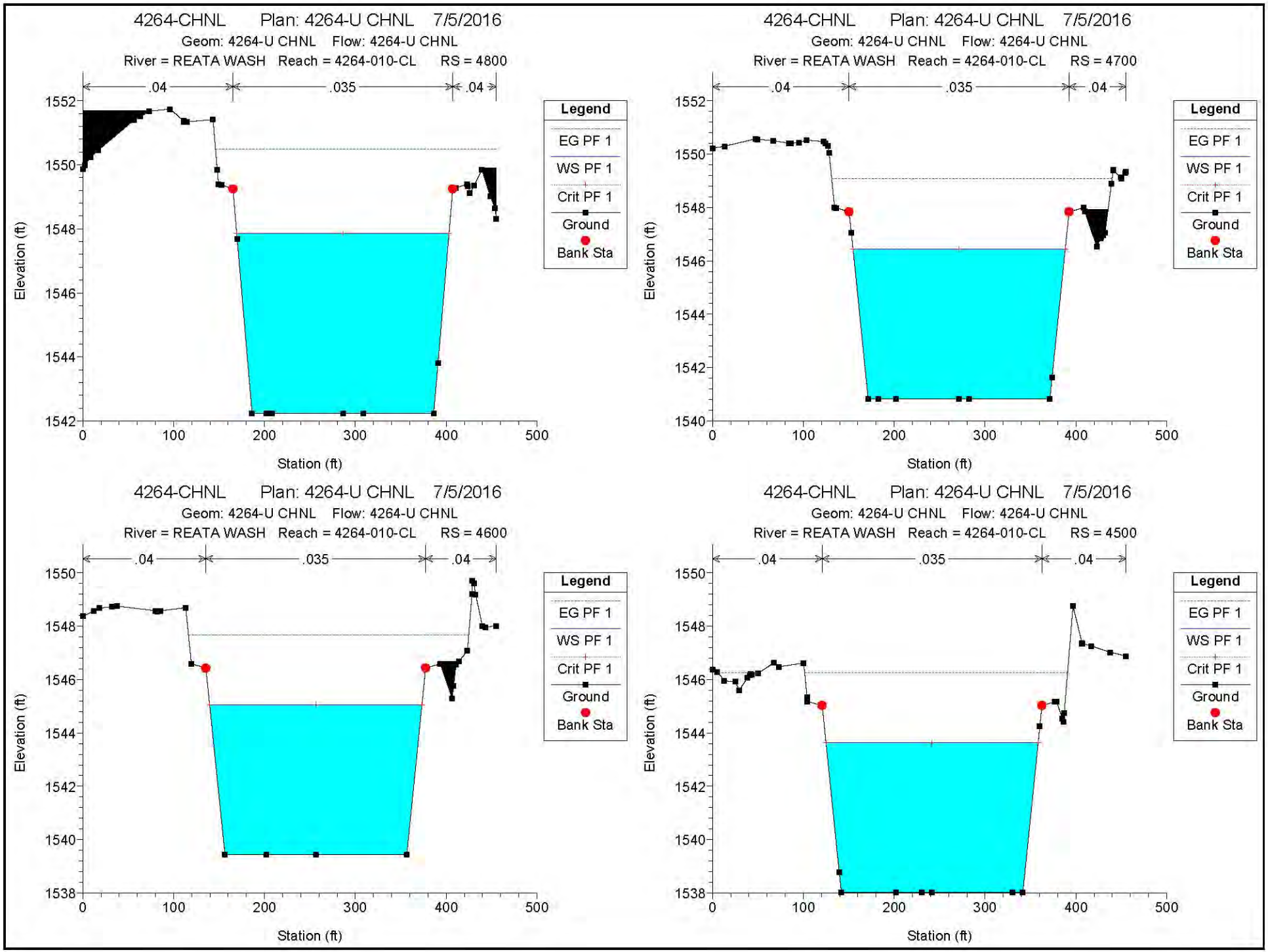

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6000 BR Bell Road Bridge South Side
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

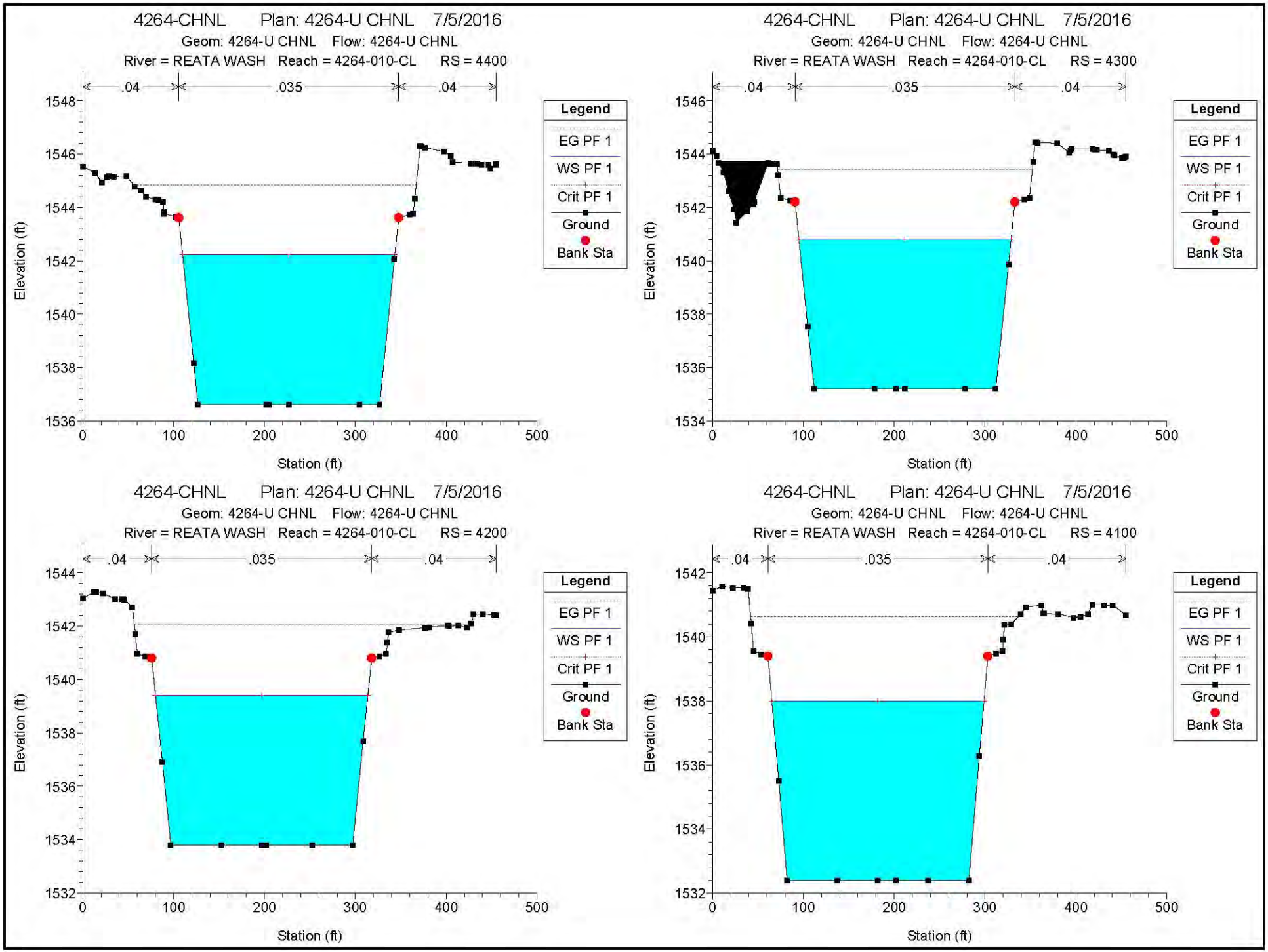

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 6000 BR Bell Road Bridge South Side
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

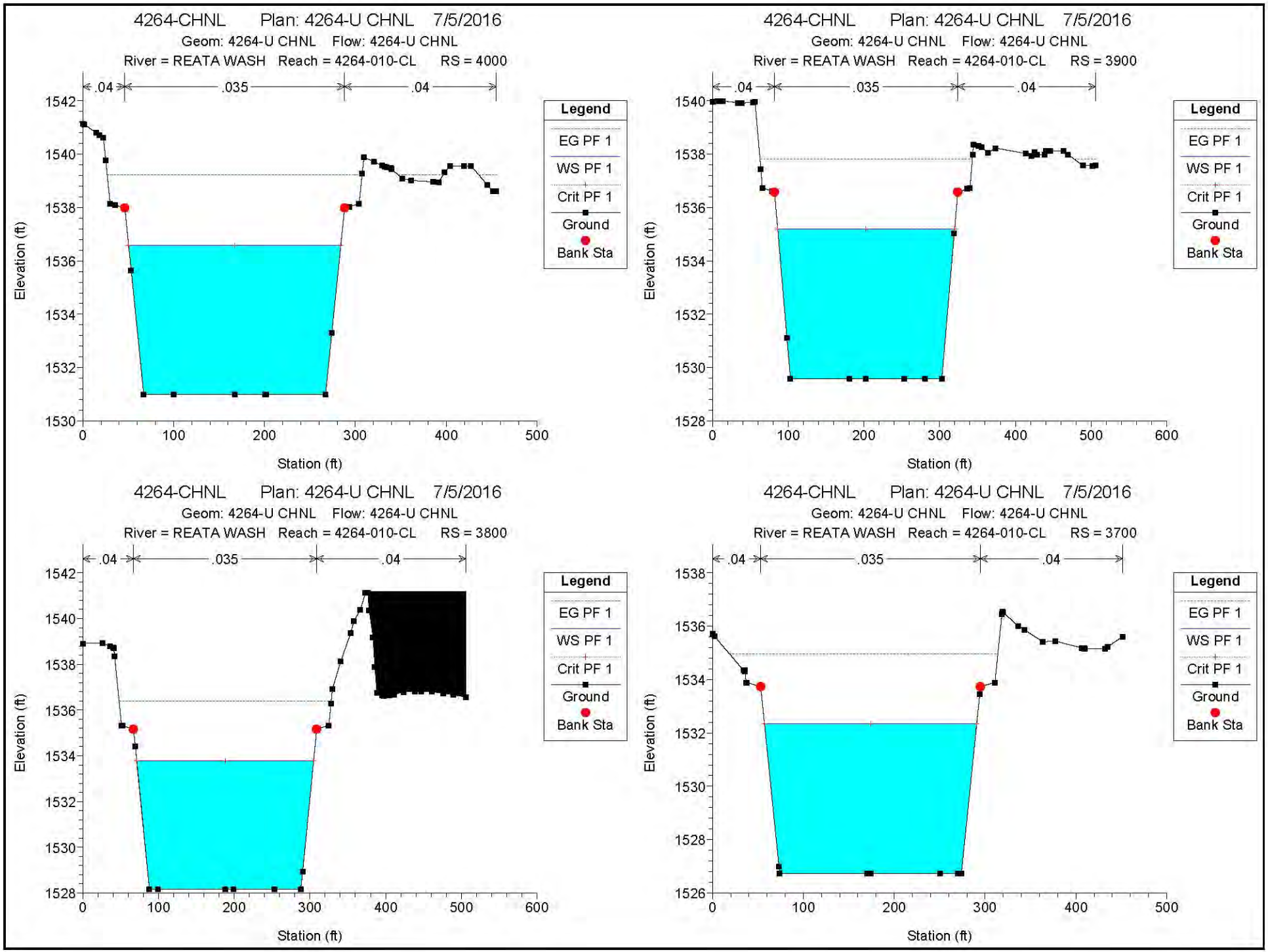

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5981.62 CS 959 From Bell Rd 052406_Final.prj
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5900
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5800
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5700
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

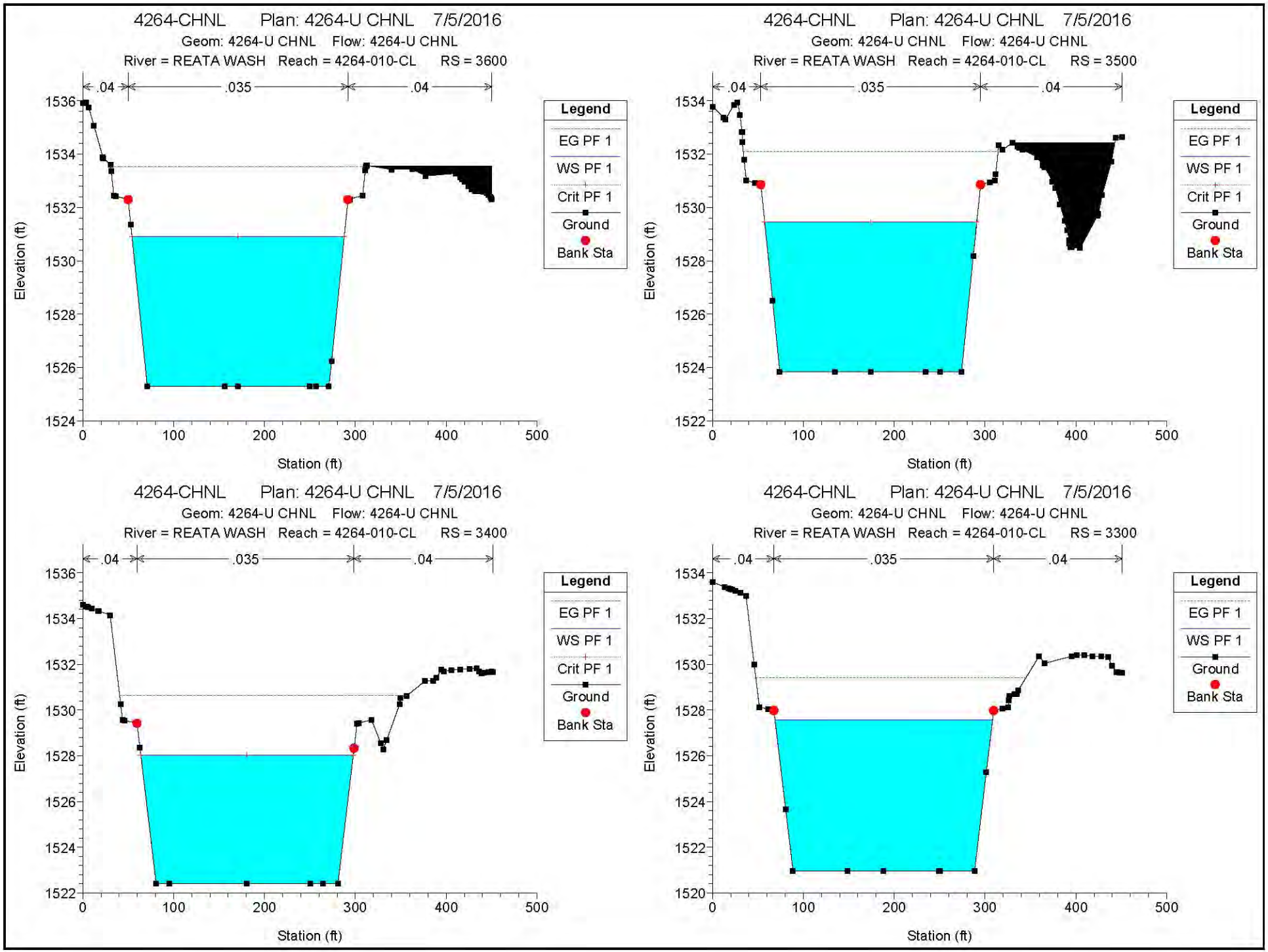

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5600
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5500
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5400
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5300
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

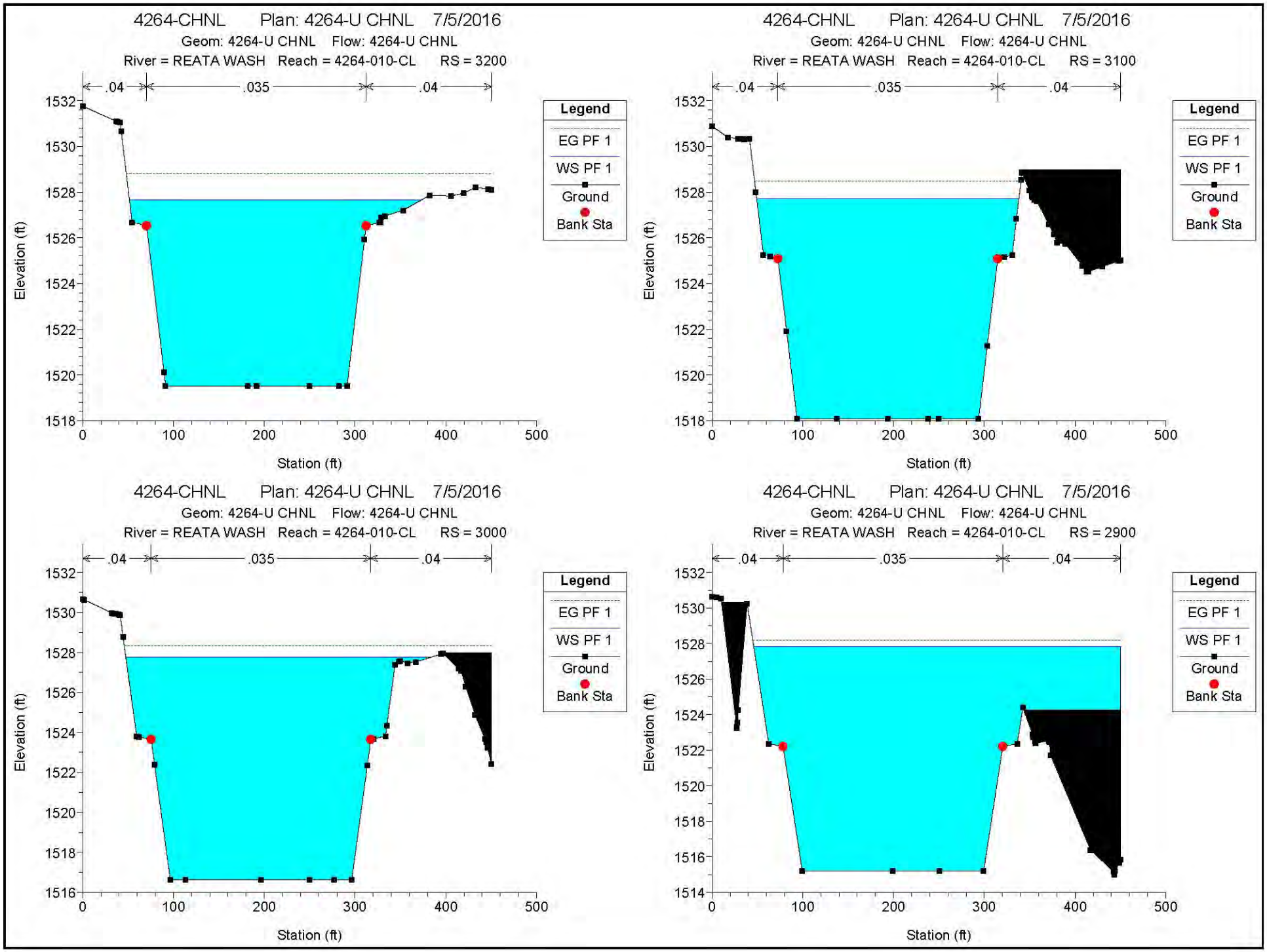

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5200
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5100
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 5000
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4900
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

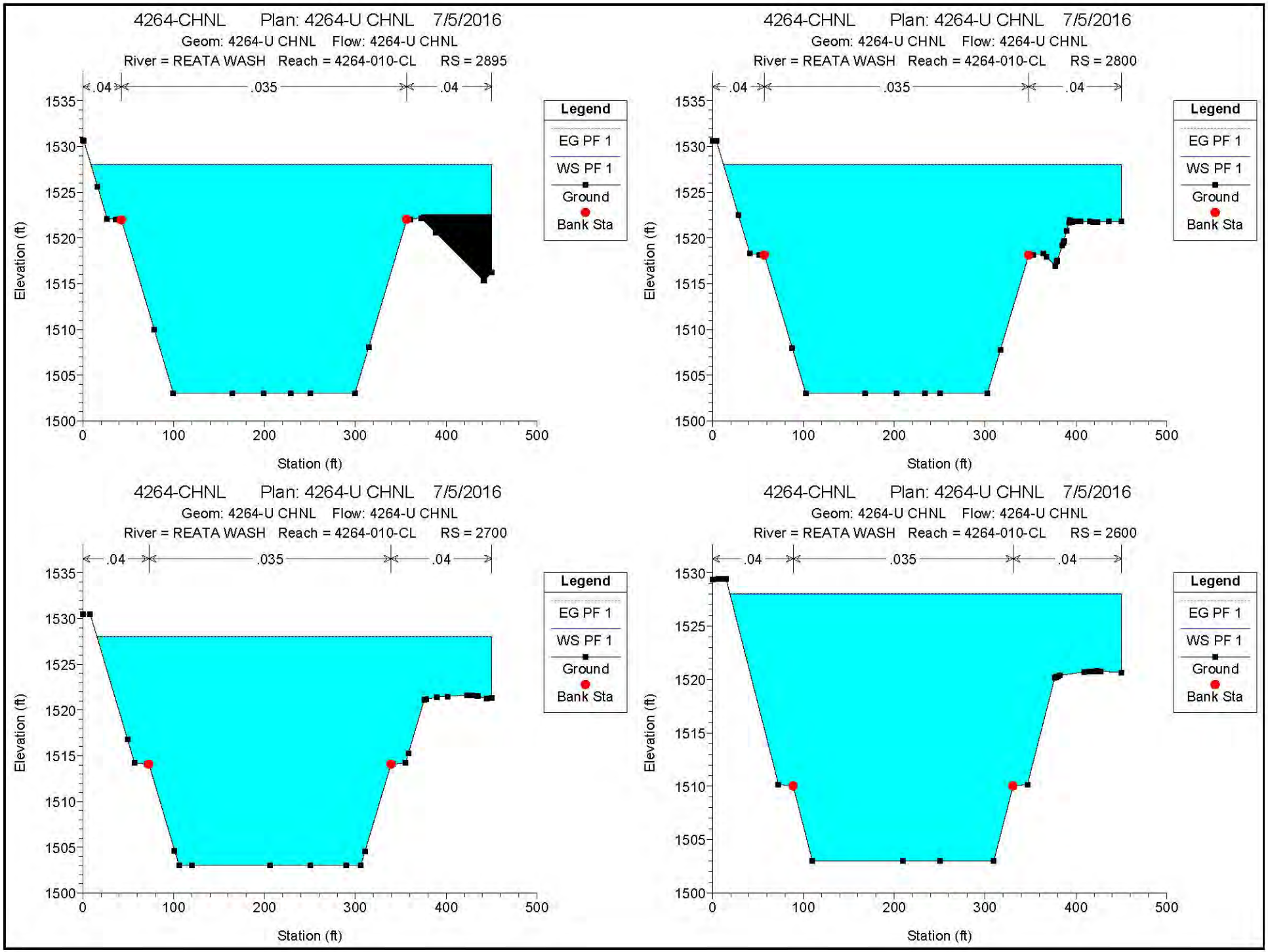

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4800
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4700
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4600
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4500
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

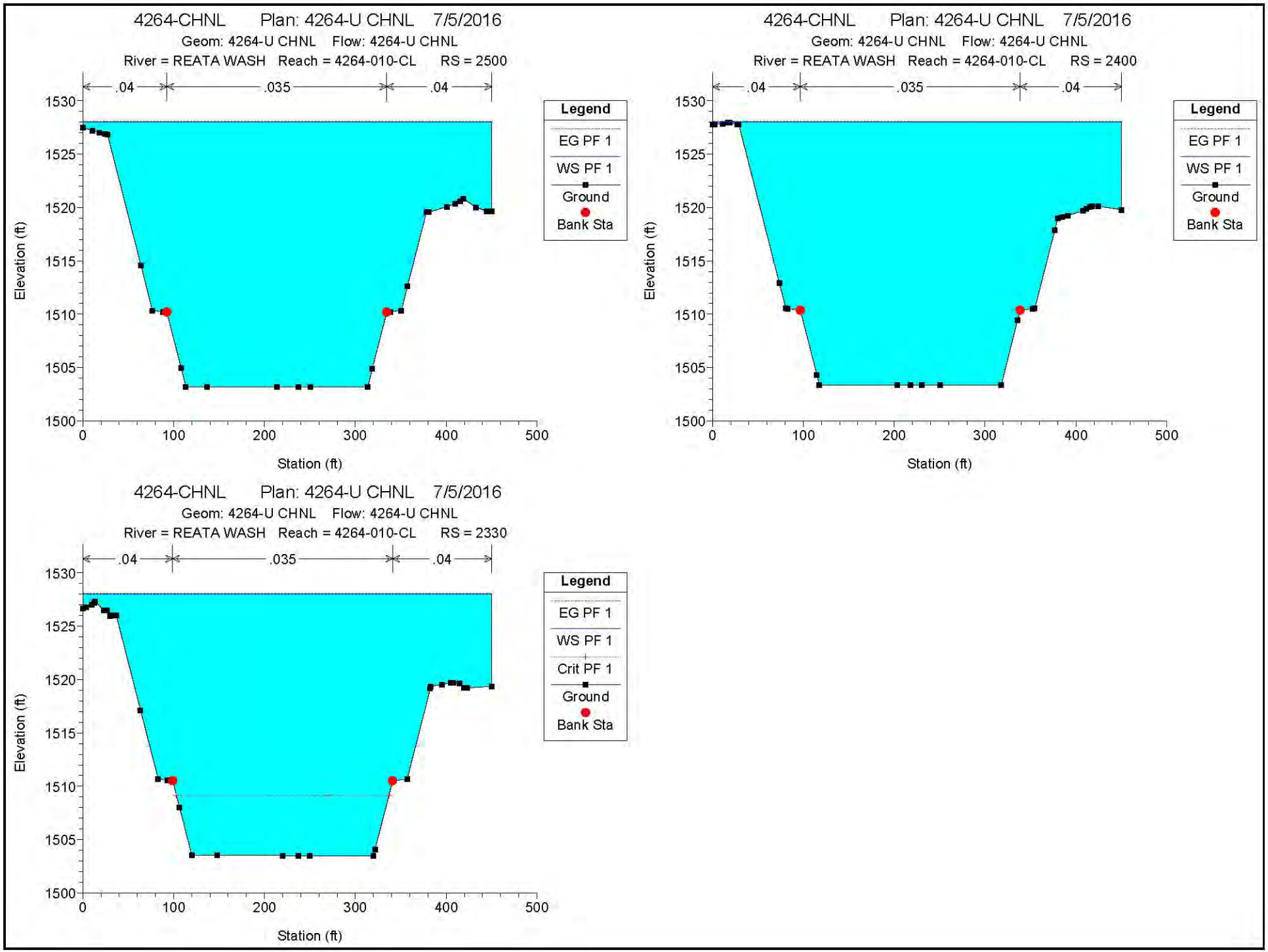

4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4400
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4300
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4200
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4100
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 4000
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3900
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3800
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3700
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3600
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3500
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3400
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3300
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3200
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3100
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 3000
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2900
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2895
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2800
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2700
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2600
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2500
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2400
.04
.035
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
4264-CHNL Plan: 4264-U CHNL 7/5/2016
Geom: 4264-U CHNL Flow: 4264-U CHNL
River = REATA WASH Reach = 4264-010-CL RS = 2330
.04
.035
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX C
Hydraulic Digital Files (CD)

APPENDIX Q

MEMORANDUM: RIGHT-OF-WAY

Reata Wash
Flood Control Improvement Study

Contract No. 2014-168-COS

Memorandum: Right-of-Way

August 31, 2016

Prepared for:

Capital Project Management
7447 E. Indian School Rd. Suite 205
Scottsdale, AZ. 85251

EXPIRES 12-31-16

Prepared By:

WOOD/PATEL
MISSION: CLIENT SERVICE™

Wood, Patel & Associates, Inc.
2051 West Northern Avenue
Suite 100
Phoenix, Arizona 85021

In Association with:

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

LOGAN SIMPSON

FLOOR associates firm

Gannett Fleming

Technical Solutions

gci

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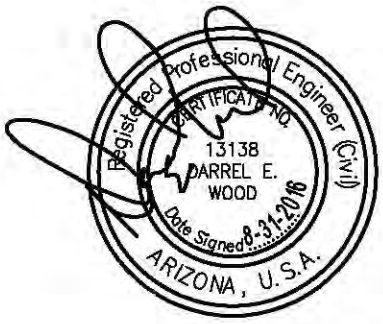
EXHIBITS



EXPIRES 12-31-16

1. EXECUTIVE SUMMARY

This Right-of-Way Memorandum documents the right-of-way analysis that was performed for the Reata Wash Flood Control Improvement Study (Reata Wash Study). The Right-of-Way Memorandum is based on the recommended solution for improvements within the Reata Wash corridor as presented in the *Proposed Condition Hydraulic Capacity Memorandum* (Reference 1). The purpose of this analysis is to determine City of Scottsdale's (City) current land rights and approximate anticipated additional land requirements to support the study's recommended drainage corridor solution. Based on the recommended solution, the City would need to acquire property rights from nine property owners, comprising approximately 13 acres. It is noted that additional easements may be required as the design is advanced beyond the study stage and may include temporary construction easements, drainage easements and access easements. The Maricopa County Recorder's website was used to identify the property owner's names and addresses, assessor parcel numbers, and to support *Exhibit 1 - Land Ownership Exhibit* and *Exhibit 2 - Property Ownership List.*

2. INTRODUCTION

This Right-Of-Way Memorandum documents the anticipated land rights required to support the recommended solution for improvements as presented in the Proposed Condition Hydraulic Capacity Memo. As a part of the Reata Wash Study, a 5.3 mile segment of wash was analyzed for capacity in a 100- year storm event. Currently, the City owns land or has land rights via drainage easements to approximately 85% of the proposed drainage corridor. Based on the recommended solution, the City would need to acquire property rights from nine property owners, comprising approximately 13 acres. *It is noted that additional easements may be required as the design is advanced beyond the study stage and may include temporary construction easements, drainage easements and access easements.* The Maricopa County Recorder's website (References 2 & 3) was used to identify the property owner's names and addresses, assessor parcel numbers, and to support *Exhibit 1 - Land Ownership Exhibit* and *Exhibit 2 - Property Ownership List*.

3. RESULTS AND RECOMMENDATIONS

The results of the proposed right-of-way analysis are based on the recommended solution presented in the *Proposed Condition Hydraulic Capacity Memorandum* (Reference 1). The recommended solution is sensitive to making use of the land that the City owns or has rights to, and minimizing potential additional land requirements. The results of the right-of-way analysis are provided on a per reach basis below:

- **Reach 1:** Reach 1 extends from Pinnacle Peak Road to approximately 1,000 feet north. Based on the recommended solution, the City would need to acquire land rights to a private drainage easement in which the recommended improvements are proposed from the Pinnacle Peak Heights Home Owners Association. (See Sheet 11 of Exhibit 1)

- **Reach 2:** Reach 2 extends from Pinnacle Peak Road to Cross Canyon Way and is approximately 6,000 feet in length. The City has land rights throughout the reach, but they are not contiguous. Based on the recommended solution the City would need to acquire property rights from nine property owners, comprising approximately 13 acres. (See Sheets 9 and 10 of Exhibit 1)

- **Reach 3:** Reach 3 extends from Cross Canyon Way to Thompson Peak Parkway and is approximately 4,700 feet in length. The City has contiguous land rights throughout the reach. No additional rights-of-way or land rights are anticipated within this reach. (See Sheets 8 and 9 of Exhibit 1)

- **Reach 4:** Reach 4 extends from Thompson Peak Parkway to Bell Road and is approximately 12,300 feet in length. The City has contiguous land rights throughout the reach. No additional rights-of-way or land rights are anticipated within this reach. (See Sheets 3,4,5,6, and 7 of Exhibit 1)

- **Reach 5:** Reach 5 extends from Bell Road to McDowell Mountain Ranch Road and is approximately 3,650 feet in length. The City has land rights of the northern portion of the reach, the southern portion of the reach is located on Bureau of Reclamation land which the City (WestWorld) has rights to via a land lease. No additional right-of-way or land rights are anticipated within this reach. (See Sheets 2 and 3 of Exhibit 1)

4. REFERENCES

1. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix P: Wood, Patel & Associates, Inc., *Reata Wash Flood Control Improvement Study, Proposed Condition Hydraulic Memorandum, August 31, 2016.*
2. Maricopa County Assessor, Website: www.mcassessor.maricopa.gov , Maricopa County, AZ
3. Maricopa County Recorder, Website: www.recorder.maricopa.gov , Maricopa County, AZ

EXHIBIT 1
Land Rights

REACH 5

REACH 4

REACH 3

REACH 2

REACH 1

PROJECT

CANAL

LOOP 101

PIMA ROAD

CENTRAL

ARIZONA

BOR REACH 11 BASIN 4

16+00

BELL ROAD

60+00

LEGACY BOULEVARD

184+00

THOMPSON PEAK PARKWAY

231+00

CROSS CANYON WAY

292+00

PINNACLE PEAK ROAD

SHEET 2

SHEET 3

SHEET 4

SHEET 5

SHEET 6

SHEET 7

SHEET 8

SHEET 9

SHEET 10

SHEET 11

REATA WASH

PROJECT CONTROL LINE

N

0 2000 4000

Horz. 1 in. = 2000 ft.

N:\2014\144264 Reata\Dwg\Exhibits\4264-EXHIBITS-LAND OWNERSHIP\4264-Ownership Index-001.dwg

CITY OF SCOTTSDALE ARIZONA

PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1

LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE™

DATE: August 2016

JOB NO: 144264

SHEET 1 OF 11

LEGEND

- City of Scottsdale (COS) Property
- HOA Property - With COS Rights
- HOA Property - No COS Rights
- Private Property - No COS Rights
- Bureau of Reclamation
- D.E. Drainage Easement
- 10 Wash Control Line

C.A.P.

WESTWORLD

E. WESTWORLD WAY

APN: 217-13-041B
CITY OF SCOTTSDALE

APN: 217-14-028A
CITY OF SCOTTSDALE

APN: 217-14-025A
CITY OF SCOTTSDALE

APN: 217-14-028D
CITY OF SCOTTSDALE

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46+00 47

MATCH LINE STA 46+00

APN: 217-14-036
USA BUREAU OF RECLAMATION
16514 N. THOMPSON PEAK PKWY
SCOTTSDALE, AZ 85260

APN: 217-14-089
NOTRE DAME PREPARATORY
CATHOLIC HIGH SCHOOL
9701 E. BELL RD
SCOTTSDALE, AZ 85260

APN: 217-13-160
CITY OF SCOTTSDALE

APN: 217-14-036
USA BUREAU OF RECLAMATION
16999 N. 98TH ST
SCOTTSDALE, AZ 85260

N

0 200 400

Horz. 1 in. = 200 ft.

N. 98th STREET

E. MCDOWELL MT. RANCH ROAD

THIS EXHIBIT REPRESENTS LAND OWNERSHIP INFORMATION FROM PUBLIC SOURCES THAT MAY OR MAY NOT BE CURRENT. THE PINK SHADING AND THE YELLOW BLACK STRIPED SHADING REPRESENT AREAS WHERE THE CITY HAS NO LAND RIGHTS.

CITY OF SCOTTSDALE ARIZONA

MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016
JOB NO: 144264

SHEET 2 OF 11

N:\2014\144264 Reata\Dwg\Exhibits\4264-EXHIBITS-LAND OWNERSHIP\4264-EX-002.dwg

LEGEND

- City of Scottsdale (COS) Property
- HOA Property - With COS Rights
- HOA Property - No COS Rights
- Private Property - No COS Rights
- Bureau of Reclamation
- D.E. — Drainage Easement
- 10 — Wash Control Line

APN: 217-13-158
CITY OF SCOTTSDALE

APN: 217-13-157
ARIZONA STATE LAND DEPT.
STATE PLAT NO. 45
WESTWORLD OF SCOTTSDALE

APN: 215-07-023C
CITY OF SCOTTSDALE

APN: 217-71-953
DC RANCH
ASSOCIATION INC

DC RANCH
PARCEL 1.11

BELL ROAD

MATCH LINE STA 75+ 00

MATCH LINE STA 46+ 00

APN: 217-14-024B
CITY OF SCOTTSDALE

APN: 217-14-023B
CITY OF SCOTTSDALE

APN: 217-14-009
CITY OF SCOTTSDALE

APN: 217-14-008A
CITY OF SCOTTSDALE/
SCOTTSDALE FIVE GENERAL PS

APN: 217-11-868
TOLL BROTHERS ARIZONA
CONSTRUCTION COMPANY

WINDGATE
RANCH

APN: 217-11-869
WINDGATE RANCH
COMMUNITY ASSOCIATION

APN: 217-14-008B
CITY OF SCOTTSDALE

APN: 217-14-010B
CITY OF SCOTTSDALE

COS
DE

COS
63 DE

COS
DE
30' EASEMENT

APN: 217-11-870
TOLL BROTHERS ARIZONA
CONSTRUCTION COMPANY

APN: 217-11-969
WINDGATE RANCH
COMMUNITY ASSOCIATION

APN: 217-14-989
NOTRE DAME PREPARATORY
CATHOLIC HIGH SCHOOL
9701 E. BELL RD
SCOTTSDALE, AZ 85260

WINDGATE
RANCH
PH2

WINDGATE
RANCH
PH1

WINDGATE
RANCH
PH1

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77

N

0 200 400

Horz. 1 in. = 200 ft.

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MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1
LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016
JOB NO: 144264
SHEET 3 OF 11

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LEGEND

- City of Scottsdale (COS) Property
- HOA Property - With COS Rights
- HOA Property - No COS Rights
- Private Property - No COS Rights
- Bureau of Reclamation
- D.E. Drainage Easement
- 10 Wash Control Line

APN: 215-07-023C
CITY OF SCOTTSDALE

DC RANCH
PARCEL 1.11

N. 95TH STEET

N. 96TH STREET

SERA BRISA

COS DE

APN: 217-63-149
SERA BRISA
COMMUNITY ASSOCIATION

PRIVATE DE

APN: 217-12-009F
CITY OF SCOTTSDALE

APN: 217-12-009J
CITY OF SCOTTSDALE

APN: 217-71-953
DC RANCH
ASSOCIATION INC

APN: 217-12-006C
CITY OF SCOTTSDALE

APN: 217-12-008C
CITY OF SCOTTSDALE

MATCH LINE

STA 75+00

STA 102+00

APN: 217-11-869
WINDGATE RANCH
COMMUNITY ASSOCIATION

APN: 217-11-823
WINDGATE RANCH
COMMUNITY ASSOCIATION

APN: 217-11-822A
WINDGATE RANCH
COMMUNITY ASSOCIATION

N. 96TH WAY

E. PUERTA DEL YIENTO RD.

WINDGATE RANCH PH2

N

0 200 400

Horz. 1 in. = 200 ft.

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MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

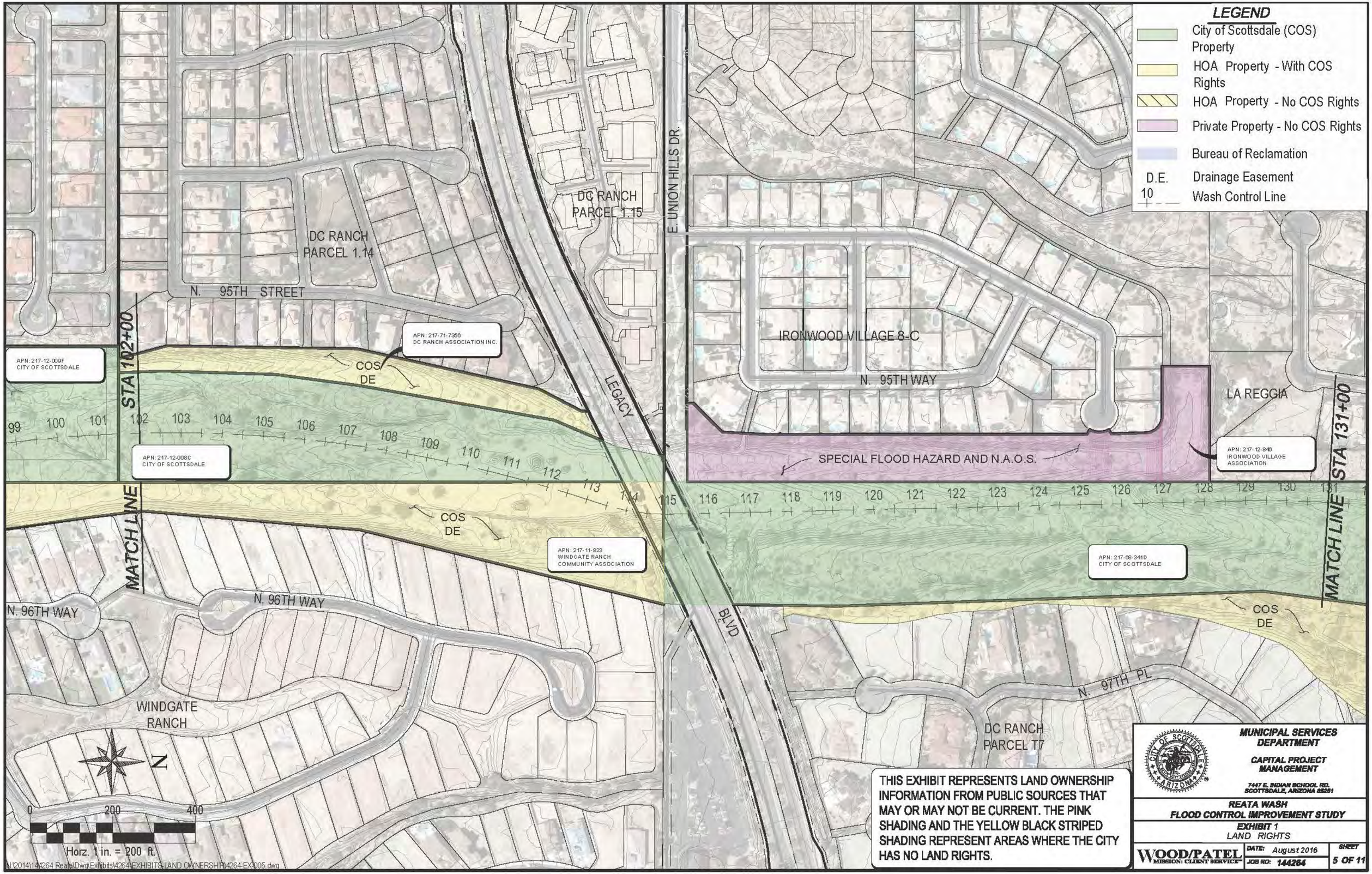
REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016
JOB NO: 144264

SHEET 4 OF 11



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CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

WOOD/PATEL MISSION: CLIENT SERVICE

DATE: August 2016

JOB NO: 144264

SHEET 5 OF 11

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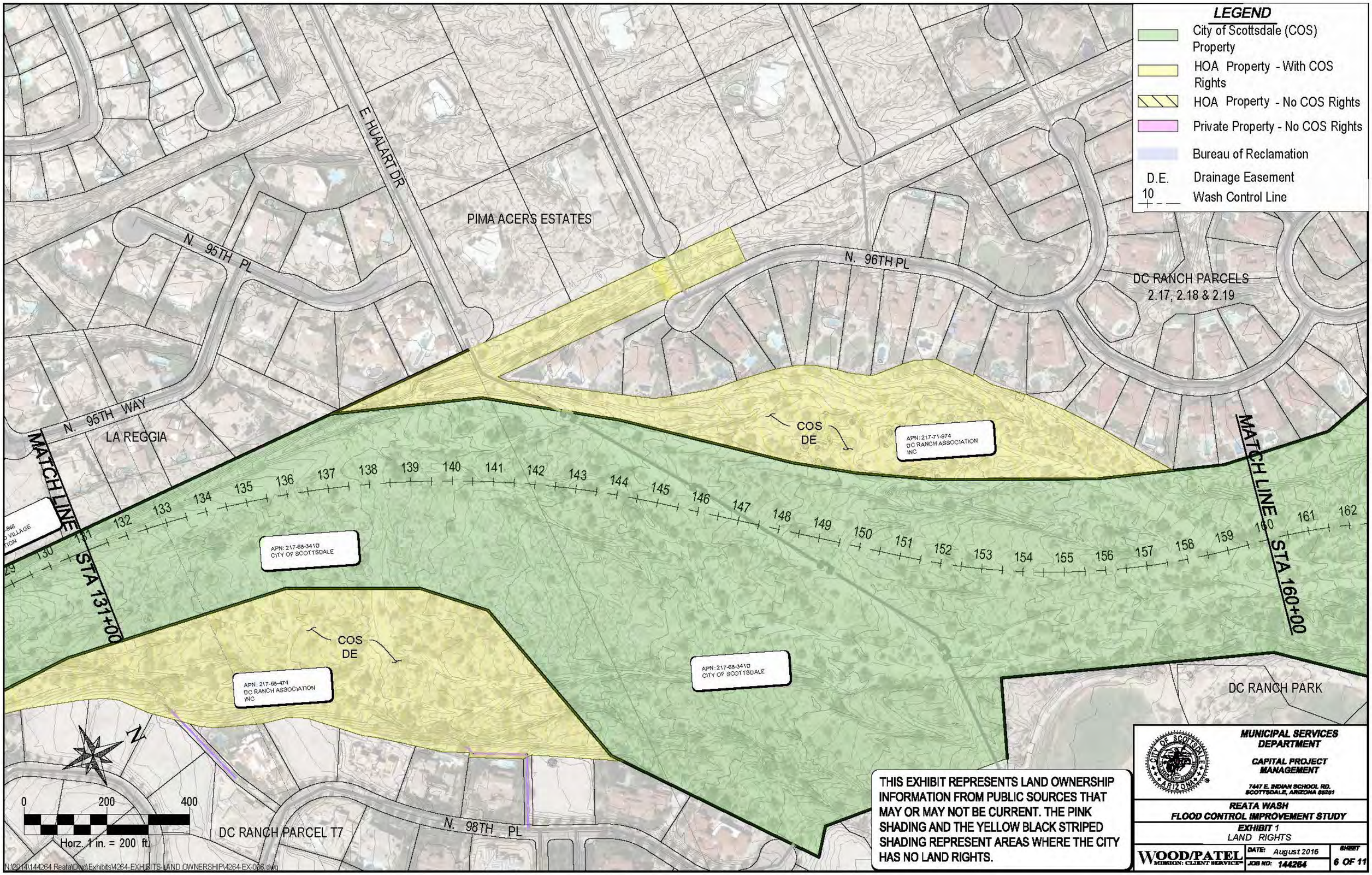

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CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE®

DATE: August 2016
JOB NO: 144264
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CITY OF SCOTTSDALE ARIZONA

MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
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DATE: August 2016

JOB NO: 144264

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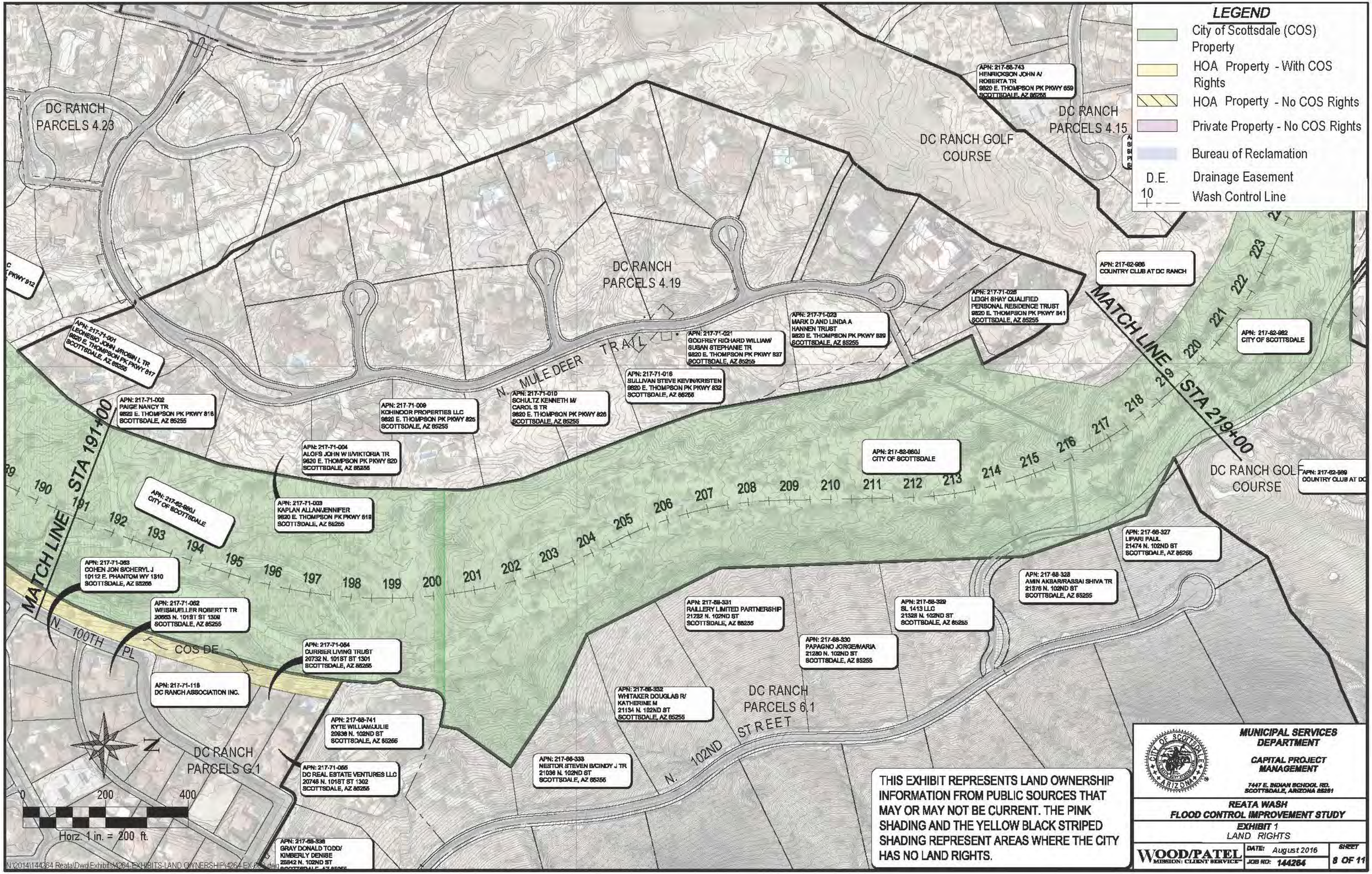

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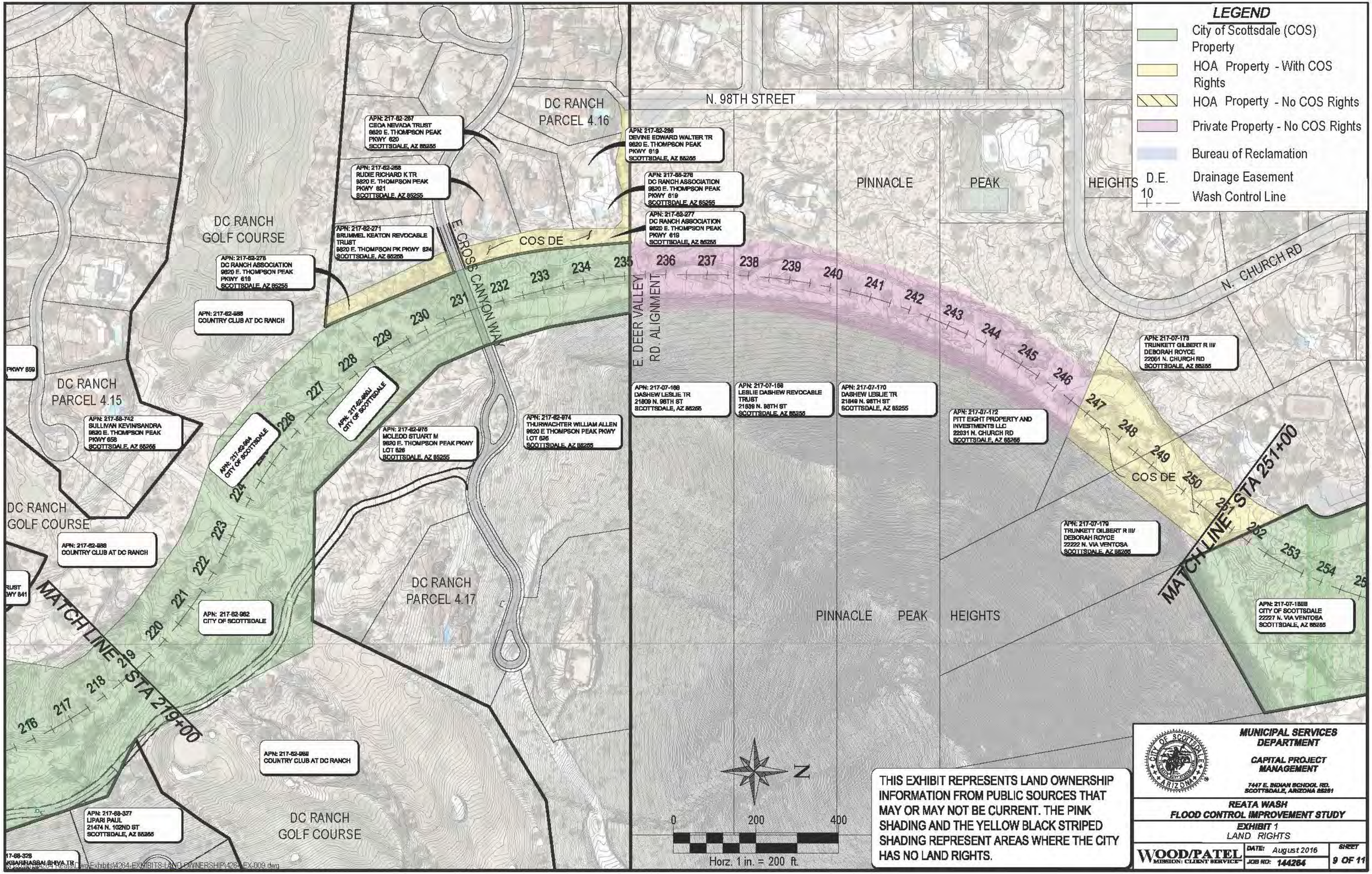

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REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

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DATE: August 2016

JOB NO: 144264

SHEET 9 OF 11

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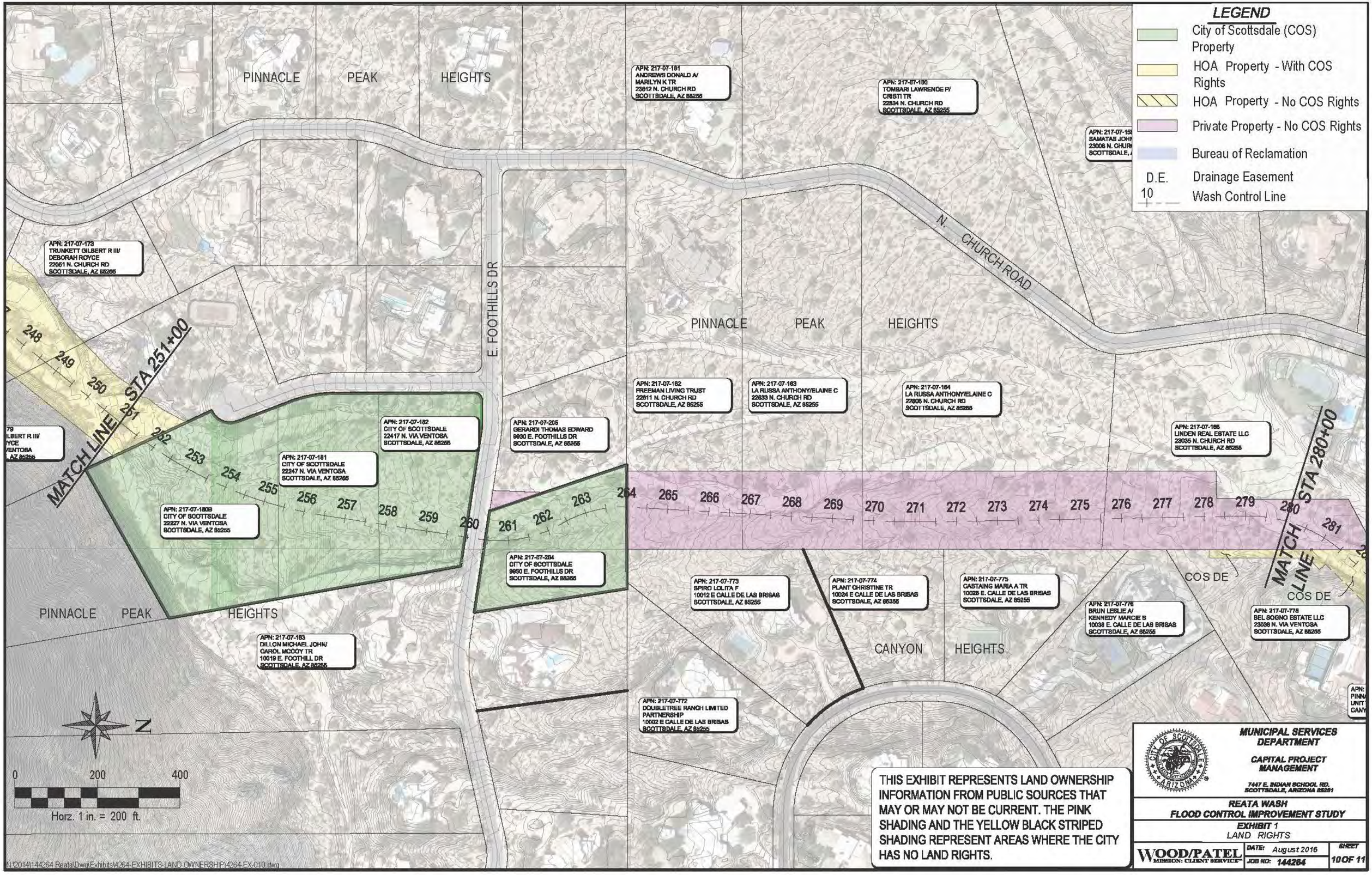
LEGEND
City of Scottsdale (COS) Property
HOA Property - With COS Rights
HOA Property - No COS Rights
Private Property - No COS Rights
Bureau of Reclamation
D.E. Drainage Easement
10 Wash Control Line
PINNACLE PEAK HEIGHTS
N. CHURCH ROAD
E. FOOTHILLS DR
MATCH LINE STA 251+00
MATCH LINE STA 280+00
APN: 217-07-181 ANDREWS DONALD A/ MARILYN K TR 22612 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-180 TOMBARI LAWRENCE P/ CRISTI TR 22534 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-173 TRUNKETT GILBERT R III/ DEBORAH ROYCE 22061 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-182 FREEMAN LIVING TRUST 22511 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-163 LA RUSSA ANTHONY/ELAINE C 22633 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-164 LA RUSSA ANTHONY/ELAINE C 22905 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-165 LINDEN REAL ESTATE LLC 23035 N. CHURCH RD SCOTTSDALE, AZ 85255
APN: 217-07-182 CITY OF SCOTTSDALE 22417 N. VIA VENTOSA SCOTTSDALE, AZ 85255
APN: 217-07-205 GERARDI THOMAS EDWARD 9930 E. FOOTHILLS DR SCOTTSDALE, AZ 85255
APN: 217-07-181 CITY OF SCOTTSDALE 22247 N. VIA VENTOSA SCOTTSDALE, AZ 85255
APN: 217-07-1808 CITY OF SCOTTSDALE 22227 N. VIA VENTOSA SCOTTSDALE, AZ 85255
APN: 217-07-204 CITY OF SCOTTSDALE 9950 E. FOOTHILLS DR SCOTTSDALE, AZ 85255
APN: 217-07-183 DILLON MICHAEL JOHN/ CAROL MCCOY TR 10019 E. FOOTHILL DR SCOTTSDALE, AZ 85255
APN: 217-07-773 SPIRO LOLITA F 10012 E CALLE DE LAS BRISAS SCOTTSDALE, AZ 85255
APN: 217-07-774 PLANT CHRISTINE TR 10024 E CALLE DE LAS BRISAS SCOTTSDALE, AZ 85255
APN: 217-07-775 CASTAING MARIA A TR 10035 E. CALLE DE LAS BRISAS SCOTTSDALE, AZ 85255
APN: 217-07-776 BRUN LESLIE A/ KENNEDY MARCIE S 10038 E. CALLE DE LAS BRISAS SCOTTSDALE, AZ 85255
APN: 217-07-778 BEL SOGNO ESTATE LLC 23038 N. VIA VENTOSA SCOTTSDALE, AZ 85255
APN: 217-07-772 DOUBLETREE RANCH LIMITED PARTNERSHIP 10002 E CALLE DE LAS BRISAS SCOTTSDALE, AZ 85255
CANYON HEIGHTS
COS DE
N
0 200 400
Horz. 1 in. = 200 ft.
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MUNICIPAL SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
7447 E. INDIAN SCHOOL RD. SCOTTSDALE, ARIZONA 85251
REATA WASH FLOOD CONTROL IMPROVEMENT STUDY
EXHIBIT 1
LAND RIGHTS
WOOD/PATEL MISSION: CLIENT SERVICE
DATE: August 2016
JOB NO: 144264
SHEET 10 OF 11
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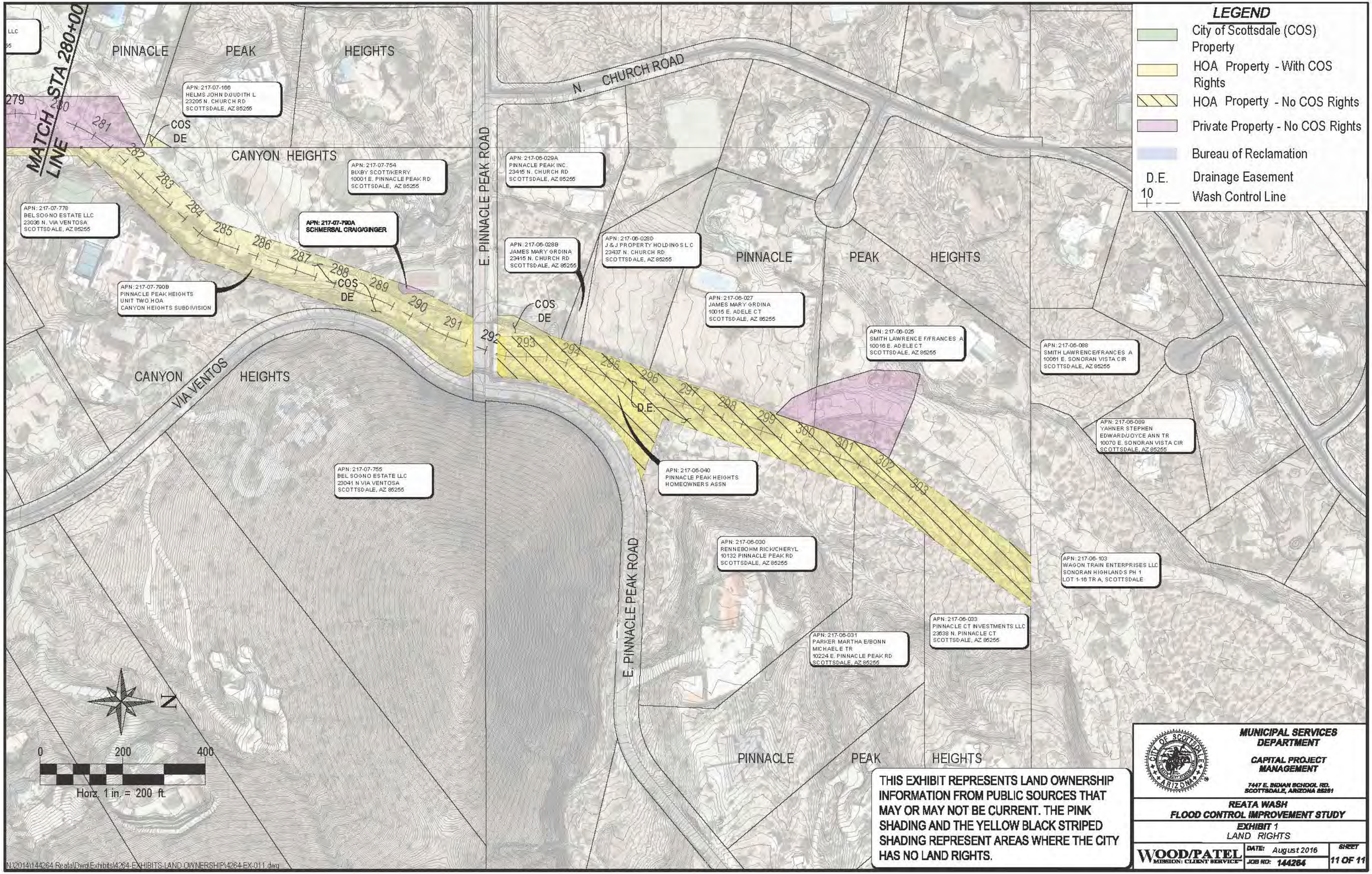

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CITY OF SCOTTSDALE ARIZONA

MUNICIPAL SERVICES DEPARTMENT

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH
FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1
LAND RIGHTS

WOOD/PATEL
MISSION: CLIENT SERVICE

DATE: August 2016
JOB NO: 144264
SHEET 11 OF 11

N:\2014\144264\Reata\Dwg\Exhibits\4264-EXHIBITS-LAND OWNERSHIP\4264-EX-011.dwg

EXHIBIT 2
Property Ownership List

Reata Wash Flood Control Improvement Study

Contract No. 2014-168-COS

Exhibit: Property Ownership List

Private Property Along the Reata Wash Study Corridor

Owners	Assessor Parcel Number	Mailing Address	City	Zip
Notre Dame Prepartory Catholic High School	217-14-989	400 E. Monroe	Phoenix	85004
Schwab Jonathan P/Amelia L	217-71-041	9830 E. Thompson Peak Pkwy 911	Scottsdale	85255
Leonesio John J/Robin L TR	217-71-001	9830 E. Thompson Peak Pkwy 817	Scottsdale	85255
Maureen M Cromling Tr/Bill Cromling II TR	217-71-002	150 Innovation Dr	Elyria, Oh	440351672
Kaplin Allan/Jennifer	217-71-003	9830 E. Thompson Peak Pkwy	Scottsdale	85255
Alofs John W II/Viktoria TR	217-71-004	9830 E. Thompson Peak Pkwy	Scottsdale	85255
Cohen Jon S/Cherryl J	217-71-063	10112 E. Phantom Wy	Scottsdale	85255
Dollens Ronald W?Susan S	217-71-062	20653 N 101st Street	Scottsdale	85255
Kyte William/Julie	217-68-741	426 Main Street #D	El segundo Ca	90245
Gary Donald Todd/Kimberly Denise	217-68-336	209 Pinnacle Ridge Pl	Calgary AB, Canada	T3Z 3N8
Nestor StevenB/ Cindy J TR	217-68-333	21036 N. 102nd Street	Scottsdale	85255
Schultz Kenneth M/Carol S TR	217-71-010	P.O. Box 675820	Ranch Santa Fe, Ca.	92067
Schultz Kenneth M/Carol S TR	217-71-011	P.O. Box 675820	Ranch Santa Fe, Ca.	92067
Sullivan Steve Kevin/Kristen	217-71-016	9830 E. Thompson Peak Pkwy 832	Scottsdale	85255
Sullivan Steve Kevin/Kristen	217-71-021	9830 E. Thompson Peak Pkwy 837	Scottsdale	85255
Mark D and Linda A Hannen Trust	217-41-023	9221 E. Sierra Pinta Dr	Scottsdale	85255
Whitaker Douglas R/Katherine M	217-68-332	52 Dellwood Ave	White Lake Mn.	55110
Papagno Jorge/Maria	217-68-330	15716 N. 76th Street	Scottsdale	85260
Amin Akbar/Rassai Shiva TR	217-68-328	6210 Jolla Mesa Dr	La Jolla Ca	92037
Lipari Paul	217-68-327	93 Worth Street Ap t904	New York, N.Y	10013
Leigh Shay Qualified Personal Residence Trust	217-71-025	9830 E. Thompson Peak Pkwy 841	Scottsdale	85255
Hendrickson John A/Robberta A TR	217-68-743	9830 E. Thompson Peak Pkwy 659	Scottsdale	85255
Sullivan Kevin/Sandra	217-68-742	254 Golfdale Rd	Toronto On. Canada	M4N2B9
McCleod Stuart/M	217-62-975	1990 St Johns Ave	Highland Park, Il.	60035
Brummel Keaton Revocable Trust	217-62-271	14330 160th Ave NE	Woodinville Wa	98072
Rudie Richard K TR	217-62-268	10510 Misty Hill Rd	Orland Park Il.	60462
Devine Edward Walter TR	217-62-266	9830 E. Thompson Peak Pkwy 619	Scottsdale	85255
Thurwachter William Allen	217-62-974	144 Chisholm Tr.	Santa Fe, NM	87506
Dashew Leslie	217-07-168	21839 N. 98th Street	Scottsdale	85255
Leslie Dashew Revocable Trust	217-07-169	21839 N. 98th Street	Scottsdale	85255
Dashew Leslie TR	217-07-170	21839 N. 98th Street	Scottsdale	85255
Trunkett Gilbert R III/Deborah Royce	217-07-179	2222 N. Via Ventosa	Scottsdale	85256
Trunkett Gilbert R III/Deborah Royce	217-07-173	2222 N. Via Ventosa	Scottsdale	85256
Dillion Michael John/Carol McCoy TR	217-07-183	10019 E. Foothills Dr	Scottsdale	85255
Gerardi Thomas Edward	217-07-205	9930 E. Foothills Dr	Scottsdale	85255
Chantler Edmundo/Jamel	217-07-457	22475 N. 97th Street	Scottsdale	85255
Pardi Edward L/Marlene TR	217-07-458	22500 N. 97th Street	Scottsdale	85255
Hacking Jim/Theresa	217-07-152	999 Blair Rd.	Cambridge ON, Canada	N3H 4R8
Marklow Edward J III	217-07-151	9709 E. Calle De Valle	Scottsdale	85255
Andrews Donald A/Marilyn K TR	217-07-161	22612 N. Church Rd	Scottsdale	85255
Freeman Living Trust	217-07-162	9650 E. Vantage Point	Scottsdale	85262
Spiro Lolita F	217-07-773	10012 E. Calle De Las Brisas	Scottsdale	85255
Plant Christine TR	217-07-774	4361 Spruce Hills	Bloomfield Mi	48301
Castaing Maria A TR	217-07-775	6394 Muilfield Ct	Bloomfield Mi	48301
Brum Leslie A/Kennedy Marcie S	217-07-776	360 Penn Rd	Wynnewood Pa	19096
La Russa Anthoiney/Elanie C	217-07-163	338 Golden Medows Pl	Alamo Ca	94507
La Russa Anthoiney/Elanie C	21707-164	338 Golden Medows Pl	Alamo Ca	94507
Tombari LawrenceP/Cristi TR	217-07-151	8420 Ohare Rd.	Las Vegas	89143
Nicholas Revocable Living Trust	217-07-150	9715 E. Calle De Valle Dr	Scottsdale	85255
Samatas John	217-07-159	23008 N. Church Rd	Scottsdale	85255
Helms John D/Judith L	217-07-166	23205 N. Church Rd.	Scottsdale	85255
Bixby Scott/Kerry	207-07-754	1219 E. 190th Rd.	Eudoka Ks	66025
James Mary Grdina	217-06-029B	3845 E. Greenway Rd #209	Phoenix	85032
Rennebohn Rick/Cheryl	217-06-030	1582 Senic Heights Rd	Oak Harbor Wa.	98277
James Mary Grdina	217-06-027	3845 E. Greenway Rd #209	Phoenix	85032
Smith Lawrence F/Frances A	217-06-025	10016 E. Adele Court	Scottsdale	85055
Parker Martha E/Bonn Michael E TR	217-06-031	2201 Waukegan Ste 260	Bannockburn Il	60015
Smith Lawrence F/Frances A	217-06-088	1660 Apple Ln	Bloomfield Mi	48341
Yahnier Stephen Edward/Joyce AnnTR	217-06-089	10070 e. Sonoran Vista Circle	Scottsdale	85255

Reata Wash Flood Control Improvement Study

Contract No. 2014-168-COS

Exhibit: Property Ownership List

Private Business Property Along the Reata Wash Study Corridor

Owners	Assessor Parcel Number	Mailing Address	City	Zip
Towne Development of Bell Road INC	217-13-295	706 E. Bell Rd. #209	Phoenix	85022
Toll Brothers Arizona Construction Company	217-11-870	14350 N. 87th Street #340	Scottsdale	85260
Toll Brothers Arizona Construction Company	217-11-868	14350 N. 87th Street #340	Scottsdale	85260
Bordx Holdings LLC	217-71-042	9830 E. Thompson Peak Pkwy 912	Scottsdale	85255
Kohinoor Properties LLC	217-71-009	9830 E. Thompson Peak Pkwy 825	Scottsdale	85255
Currier Living Trust	217-71-054	20732 N. 101st Street	Scottsdale	85255
DC Real Estates Ventures LLC	217-71-055	20748 N. 101st Street	Scottsdale	85255
Rallery Limited Patnership	217-68-331	P.O Box 14166	Scottsdale	85267
SIFI 1413 LLC	217-68-329	15018 n. tatum Blvd.	Phoenix	85032
Country Club at DC Ranch	217-62-988	9290 E. Thompson Peak Pkwy Unit 1		
CSOA Nevada Trust	217-62-267	1930 Village Center Cir. Unit 3-258	Las Vegas, Nv	89134
Pitt Eight Property and Investments LLC	217-07-172	P.O. Box 1034 Harbour Pl. 4Th Fl. 103 S. Church Street	Grand Cayman KY1 1102	Cayman Island
Ted/Wayne LLC	217-07-505	P.O. Box 202141	Bloomington Mn.	55420
Doubletree Ranch Limited Patnership	217-07-772	P.O Box 25610	Scottsdale	85255
Linden Ral Estate LLC	217-07-165	15 Linden Ave	Wilmette Il.	60091
Bel sognio Estate LLC	217-07-778	23036 N. Via Ventosa	Scottsdale	85255
Bel Sogno Estate LLC	217-07-755	23041 N. Via Ventosa	Scottsdale	85255
Pinnacle Peak Inc	217-06-029A	P.O Box 357 Mill Court La	Charroterie St Peter Port Guernsey	GYI 3XH Channel Island
J and J Property Holdings LC	217-06-028D	240 N. Center St	Mesa	85201
Pnnacle Court Investment LLC	217-06-033	P.O. Box 5608	Carefree	85255
Wagon Train Enterprises LLC	217-06-103	P.O Box 8835	Surprise	85374

Reata Wash Flood Control Improvement Study

Contract No. 2014-168-COS

Exhibit: Property Ownership List

Home Owner's Association Property Along the Reata Wash Study Corridor

Owners	Assessor Parcel Number	Mailing Address	City	Zip
DC Ranch Association INC	217-71-953	20555 N. Pima Rd. #140	Scottsdale	85255
Windgate Ranch Community Association	217-11-377	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85258
Windgate Ranch Community Association	217-11-869	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85258
Windgate Ranch Community Association	217-11-823	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85258
Windgate Ranch Community Association	217-11-822A	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85258
Sera Brisa Community Association	217-63-149	1600 W. Broadway Rd #200	Tempe	85282
Ironwood Village Association	217-12-846	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85282
DC Ranch Association INC	217-68-474	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-71-974	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-71-226	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-71-227	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-71-119	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-71-049	6720 N. Scottsdale Rd #261	Scottsdale	85253
DC Ranch Association INC	217-71-048	6720 N. Scottsdale Rd #261	Scottsdale	85253
DC Ranch Association INC	217-71-118	20555 N. Pima Rd. #140	Scottsdale	85255
DC Ranch Association INC	217-62-278	20555 N. Pima Rd. #140	Scottsdale	85255
Pinnacle Peak Vistas III Homeowners Assoc	217-07-527	9000 E. Pima Ctr. Pkwy #300	Scottsdale	85258
Pinnacle Peak Heights Unit Two HOA	217-07-790B	P.O Box 39242	Phoenix	85069
Pinnacle Peak Heights Homeowners Assoc	217-06-040	10319 E. Pinnacle Peak Rd	Scottsdale	85255

Reata Wash Flood Control Improvement Study

Contract No. 2014-168-COS

Exhibit: Property Ownership List

City of Scottsdale Property Along the Reata Wash Study Corridor

Owners	Assessor Parcel Number	Mailing Address	City	Zip
Scottsdale City of	217-13-041B	7447 E. Indian School Rd. #100	Scottsdale	85251
Scottsdale City of	217-13-160	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-14-026D	7447 E. Indian School Rd. #205	Scottsdale	85251
Scottsdale City of	217-14-026A	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-14-025A	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-14-024B	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-14-023B	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-13-162	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-14-025A	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-13-159	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-13-158	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-14-009	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-14-010B	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-14-008B	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of/Scottsdale Five General PS	217-14-008A	3939 N. Drinkwater Blvd.	Scottsdale	85251
Scottsdale City of	215-07-023C	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-12-006C	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-12-009J	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-12-009F	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-12-008C	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-68-341D	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-62-980H	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-62-980J	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-07-010F	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-12-001D	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-62-980J	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-62-984	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-62-982	7447 E. Indian School Rd #100	Scottsdale	85251
Scottsdale City of	217-07-180B	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-07-151	7447 E. Indian School Rd #205	Scottsdale	85251
Scottsdale City of	217-07-182	3939 Civic Center Plaza	Scottsdale	85251
Scottsdale City of	217-07-204	7447 E. Indian School Rd #205	Scottsdale	85251

Reata Wash Flood Control Improvement Study

Contract No. 2014-168-COS

Exhibit: Property Ownership List

State and Federal Property Along the Reata Wash Study Corridor

Owners	Assessor Parcel Number	Mailing Address	City	Zip
Arizona State Land Depatment	217-13-157	1150 W. Grove Pkwy #110	Tempe	85283
USA-Bureau of Reclamation	217-13-041A	23636 N. 7th Street	Phoenix	85024
USA-Bureau of Reclamation	217-14-040	23636 N. 7th Street	Phoenix	85024
USA-Bureau of Reclamation	217-14-036	23636 N. 7th Street	Phoenix	85024

APPENDIX R

MEMORANDUM: CONSTRUCTION COST AND QUANTITIES

Reata Wash

Flood Control Improvement Study

Contract No. 2014-168-COS

Memorandum: Construction Cost and Quantities

September 1, 2016

Prepared for:

Capital Project Management
7447 East Indian School Road, Suite 205
Scottsdale, AZ. 85251

EXPIRES 12-31-16

Prepared By:

WOOD/PATEL
MISSION: CLIENT SERVICE™

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021
In Association with:

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

LOGANSIMPSON

FLOOR
associates
firm

Gannett Fleming

Technical Solutions

gci

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EXHIBIT

EXPIRES 12-31-16

1. EXECUTIVE SUMMARY

This Construction Cost and Quantities Memorandum documents an opinion of probable construction cost (construction cost) and estimated quantities based on a 15% level of design for the Reata Wash Flood Control Improvement Study (Reata Wash Study). The construction cost for the recommended solution is based on the proposed improvements as presented in the Proposed Condition Hydraulic Capacity Memorandum (Ref. 1) and Design Concept Plan (Ref. 2).

The Reata Wash Study developed three alternatives using various flood control options. All options meet technical requirements identified for the Reata Wash Study. One alternative was selected and is referred to as the Recommended Solution. The construction costs for the Recommended Solution and the two alternatives are presented in Section 6. It is noted that the costs for the City to acquire land ownership and land rights are not included in this analysis.

The construction cost for of the recommended solution is estimated to be $43,000,000. Alternative B construction cost is $46,500,000 and Alternative C construction cost is $68,000,000.

2. INTRODUCTION

One key element of the Reata Wash Study is to provide construction cost and quantities based upon the Recommended Solution as proposed in the Proposed Condition Hydraulic Capacity Memorandum (Ref. 1) and Design Concept Plan (Ref. 2). The Design Concept Plan was prepared at a 15% design. The study is divided into five distinct hydraulic reaches as shown on *Exhibit 1 – Study Location Reach Map*. The Reata Wash Study developed three alternatives which were evaluated using several key considerations and factors including:

- being Federal Emergency Management Agency (FEMA) compliant,
- best use of existing city land rights,
- minimal foot print - less disturbed area,
- context sensitivity,
- public acceptance,
- and potential construction and maintenance costs.

Considering these factors, three alternative solutions were identified and evaluated based upon opportunities and constraints. To account for different geographical areas or built conditions, five separate reaches were considered as depicted on Exhibit 1. Accordingly, each reach was analyzed for specific flood control options as listed below:

Reach 1:	Grouted Rock Channel, "U" Shaped channel with retaining walls
Reach 2:	North Segment: "U" Shaped Channel with retaining walls, Reinforced Concrete Box Culvert
	South Segment: Grouted Rock Channel
Reach 3:	North Segment: "U" Shaped Channel with retaining walls, Reinforced Concrete Box Culvert
	South Segment: Earthen Channel with bank protection
Reach 4:	Earthen Channel with bank protection
Reach 5:	Earthen Channel with bank protection

A construction cost was developed for the three identified alternative solutions and is presented in Section 6. It is noted that the costs for the City to acquire land ownership and/or land rights are not included in this memorandum but are included in the Benefit Cost Analysis Memorandum.

3. RECOMMENDED SOLTUION

The Recommended Solution consists of a designated drainage conveyance corridor for Reata Wash which starts 1,000 feet north of Pinnacle Peak Road Bridge and continues south to McDowell Mountain Ranch Road, for a total linear length of 27,900 Feet. The Reata Wash Study's drainage conveyance corridor is divided in to five distinct reaches as described below:

Reach 1 – Pinnacle Peak Road to 1,000 feet north: In order to collect and convey the 100-year peak discharge to the existing Pinnacle Peak Road Bridge, proposed improvements include channelization from the bridge to approximately 1,000 feet upstream. A hard lined "U" shaped channel with grouted rock bottom is proposed within this reach, along with a floodwall. The floodwall will prevent flow from breaking out to the southwest and will allow the peak discharge to be effectively collected and conveyed via the proposed downstream channel and to the Pinnacle Peak Road Bridge.

Reach 2 North Segment – Pinnacle Peak Road to Dobson Wash and then to Station 278+00: A concrete "U" Shaped Channel is proposed downstream of Pinnacle Peak Road Bridge to approximately 1,350 feet south. A concrete channel transition structure is required immediately downstream of the Pinnacle Peak Road Bridge which will allow the flow to transition from the bridge outlet to the "U" shaped channel. A diversion wall is introduced at station 283+00 to allow a portion of the flow from the Reata Wash corridor to flow into Dobson Wash up to a discharge split flow rate of 2,000 cubic feet per second (cfs) as quantified in this project's *Hydrologic Memorandum* (Ref. 3). At the Dobson Wash outlet, a transition outlet structure is proposed to dissipate energy from fast moving storm flow. In addition, at the end of the outlet structure, a grader channel is proposed to facilitate a positive slope for the Dobson Wash outflow.

Reach 2 Middle Segment – Station 278+00 to Foothills Drive Station 260+00: This reach proposes a grouted rock trapezoidal channel from Station 278+00 to Foothills Drive. A culvert crossing is proposed at Foothills Drive where a water line will also require relocation.

Reach 2 South Segment – Station 260+00 to Station 233+70 and Reach 3 North Segment Station 233+70 to Station 209+00: Within this reach, a grouted rock trapezoidal channel is proposed from Station 260+00 to Station 209+00. A culvert crossing is proposed at Cross Canyon Way.

Reach 3 South Segment – South of Cross Canyon Way (Station 230+00) to Thompson Peak Parkway: New buried bank protection measures are recommended for this segment along the west bank where they do not exist. The new bank protection will serve to contain the floodplain and eliminate floodplain encroachments into private property. In addition, additional improvements at the toe of the existing buried bank protection along some portions of the east bank may be required to address anticipated scour depths.

Reach 4 – Thompson Peak Parkway to Bell Road: Drainage improvements, consisting of levees, embankments, and buried bank protection, have been constructed along a majority of this reach. There are some locations where the existing improvements may require enhancements to meet anticipated FEMA freeboard and scour requirements. In addition, new buried bank protection is proposed along both the east and west banks immediately south of Thompson Peak Parkway.

Reach 5 – Bell Road to McDowell Mountain Ranch Road: This reach does not have the existing conveyance capacity to contain the design peak discharge. An incised earthen channel corridor with buried bank protection is proposed from Bell Road to the McDowell Mountain Ranch Road Bridge. A drop structure is proposed to allow channel flow to be discharged into a sediment basin. The sediment basin is required to collect sediment from the entire channel conveyance system. Both water and wastewater lines will require relocation.

3.1 Recommended Solution Cost

For the Recommended Solution, a construction cost opinion is estimated to be $43,000,000.00 and is detailed in Section 6.1.

4. ALTERNATIVE B

The Alternative B consists of options used in the Recommended Solution and use of a box culvert option in lieu of the U channel option, as follows:

Reach 1 – Pinnacle Peak Road to 1,000 feet north: Reach 1 uses the same option as identified for the Recommended Solution.

Reach 2 North Segment – Pinnacle Peak Road to Dobson Wash and then to Station 278+00: Alternative B incorporates a reinforced box culvert starting just downstream of Pinnacle Peak Road Bridge to approximately 1,350 feet south. A concrete channel transition structure is required immediately downstream of the Pinnacle Peak Road Bridge which will allow the flow to transition from the bridge outlet to the box culvert inlet. Initial low flows will be directed within this transition into the westernmost cell (dedicated for Dobson Wash flow) of a multi-cell box culvert. This cell will allow a portion of the flow from the Reata Wash corridor into Dobson Wash up to the peak discharge split flow rate of 2,000 cfs as quantified in this project's *Hydrologic Memorandum* (Ref. 3). At the Dobson Wash outlet, a transition outlet structure is proposed to dissipate energy from fast moving storm flow. In addition, at the end of the outlet structure, a grader channel is proposed to facilitate a positive slope for the Dobson Wash outflow.

Reach 2 Middle Segment – Station 278+00 to Foothills Drive Station 260+00: Reach 2 Middle Segment uses the same option as identified for the Recommended Solution.

Reach 2 South Segment – Station 260+00 to Station 233+70 and Reach 3 North Segment Station 233+70 to Station 209+00: Reach 2 South Segment uses the same option as identified for the Recommended Solution.

Reach 3 South Segment – South of Cross Canyon Way (Station 230+00) to Thompson Peak Parkway: Reach 3 South Segment uses the same option as identified for the Recommended Solution.

Reach 4 – Thompson Peak Parkway to Bell Road: Reach 4 uses the same option as identified for the Recommended Solution.

Reach 5 – Bell Road to McDowell Mountain Ranch Road: Reach 5 uses the same option as identified for the Recommended Solution.

4.1 Alternative B Cost

For the Alternative B, a construction cost opinion is estimated to be $46,500,000.00 and is detailed in Section 6.2.

5. ALTERNATIVE C

The Alternative C consists of options used in the Recommended Solution and use of a box culvert option in lieu of the U channel and grouted rock channel, as follows:

Reach 1 – Pinnacle Peak Road to 1,000 feet north: Reach 1 uses the same option as identified for the Recommended Solution.

Reach 2 North Segment – Pinnacle Peak Road to Dobson Wash and then to Station 278+00: Reach 2 North Segment uses the same option as identified for Alternative B.

Reach 2 Middle and South Segment – Station 278+00 to Station 230+70 and Reach 3 North Segment Station 233+70 to Station 209+00: This reach incorporates a reinforced box culvert from Station 278+00 to Station 213+00. A concrete outlet structure is proposed because of the high velocities needing to transition to the natural channel corridor at Station 209+00. A water line relocation will also be required at Foothills Drive.

Reach 3 South Segment – South of Cross Canyon Way (Station 209+00) to Thompson Peak Parkway: Reach 3 South Segment uses the same option as identified for the Recommended Solution.

Reach 4 – Thompson Peak Parkway to Bell Road: Reach 4 uses the same option as identified for the Recommended Solution.

Reach 5 – Bell Road to McDowell Mountain Ranch Road: Reach 5 uses the same option as identified for the Recommended Solution.

4.1 Alternative C Cost

For the Alternative C, a construction cost opinion is estimated to be $68,000,000.00 and is detailed in Section 6.3.

6. CONSTRUCTION COST

6.1 Recommended Solution

Reata Wash Flood Control Improvement Study Contract No. 2014-168-COS

Recommended Solution

Page 1 of 8

The Reata Wash Flood Control Improvement Study recommends an alignment which is 27,800 feet in length. Various channel section improvements were selected as recommended options for satisfying technical drainage conveyance criteria. The Recommended Solution includes the following:

Reach 1 - 'U' Channel with concrete retaining walls and Grouted Rock invert from Station 300+00 to Pinnacle Peak Road
Reach 2 - Concrete 'U' Channel from Pinnacle Peak Road to Station 278+00 and Grouted Rock Channel from Station 278+00 to Reach 3
Reach 3 - Grouted Rock Channel from Reach 2 to Station 209+00, Bank Protection Enhancements from Station 209+00 to Thompson Peak Parkway
Reach 4 - Levee and Bank Protection Enhancements from Thompson Peak Parkway to Bell Road
Reach 5 - Earthen Trapezoidal Channel from Thompson Peak Parkway to McDowell Mountain Ranch Road

Preliminary Opinion of Probable Construction Cost (15% Design Level)

Study Reach	Amount
Reach 1	$2,319,627
Reach 2 North Segment	$6,251,201
Reach 2 Middle Segment	$5,393,183
Reach 2 South & Reach 3 North Segments	$13,826,003
Reach 3 South Segment	$2,103,788
Reach 4	$3,264,249
Reach 5	$9,823,685
Grand Total	**$42,981,734**

Reata Wash Flood Control Improvement Study Contract No. 2014-168-COS

Recommended Solution

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 1 (Sta 301+00 to Sta 290+00) Length: 1100 feet
"U" shaped Grouted Rock Channel North of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Haul off	16757.0	CY	$ 9	$ 150,813			
Grouted Rock Channel (D50 10", 2.5' thick) Sta 29210 to 30000	6860.0	CY	$ 95	$ 651,700			
Loose Rock (D50 10")	1037.0	CY	$ 75	$ 77,775			
Concrete Cutoff Wall	960.0	SF	$ 18	$ 17,280			
Flood Wall	180.0	CY	$ 500	$ 90,000			
Handrails	1580.0	LF	$ 35	$ 55,300			
Retaining Wall	957.5	CY	$ 500	$ 478,750			
Breakaway fence (within Channel)	120.0	LF	$ 20	$ 2,400			
Chain-link Fence (along Channel boundary)	200.0	LF	$ 32	$ 6,400			
Channel Access Ramps	1.0	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1.0	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	1100.0	LF	$ 1	$ 1,100			
Devegetation	2.0	AC	$ 5,000	$ 10,000			
Revegetation	0.2	AC	$ 10,000	$ 2,000			
				Subtotal	=	*$ 1,546,418*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 231,963			
Public Art	1.0%			$ 15,464			
City Fees	2.0%			$ 30,928			
CPM Salaries	4.0%			$ 61,857			
WO Credit	4.0%			$ 61,857			
CPM Aloocation	4.0%			$ 61,857			
Land Acquisition Rights	0.0%	SF	$ -	$ -			
				Subtotal	=	*$ 463,925*	
Construction Contingency	20%					$ 309,284	
				Total	=	**$ 2,319,627**	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

Recommended Solution

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 North Segment (Sta 291+50 to Sta 278+00) Length: 1350 feet
60' Wide "U" Channel South of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	23819.00	CY	$ 8	$ 190,552			
Earthwork Excavation & Haul off	48200.00	CY	$ 9	$ 433,800			
60 ft wide "U" Channel	3861.00	CY	$ 500	$ 1,930,500			
51.3 ft wide "U" Channel	1442.40	CY	$ 500	$ 721,200			
9.3 ft. wide "U" section for Dobson outlet including divider wall	98.64	CY	$ 500	$ 49,320			
Surface treatment to achive higher "n"	111902.00	SF	$ 3	$ 335,706			
Dobson Wash Grade to daylight	4409.00	CY	$ 9	$ 39,681			
Concrete Transition Structure South of Pinnacle Peak Bridge	289.00	CY	$ 500	$ 144,500			
Concrete Cutoff Wall @ Dobson Outlet	180.00	SF		$ -			
Retaining Walls at Pinnacle Peak inlet area	155.00	CY	$ 500	$ 77,500			
Outlet apron, Dobson outlet	100.80	CY	$ 500	$ 50,400			
Retaining Walls at Dobson Outlet	136.60	CY	$ 500	$ 68,300			
Hand railing (Chain-link) Pinnacle Peak Transition Structure	229.00	LF	$ 32	$ 7,328			
Hand railing (Chain-link) "U" Channel	2765.00	LF	$ 32	$ 88,480			
Hand railing (Chain-link) Dobson Outlet	167.00	LF	$ 32	$ 5,344			
Dobson Outlet blocks	240.00	SF	$ 25	$ 6,000			
Local Tributary Inlet at Sta 286+50	1.00	LS	$ 2,500	$ 2,500			
Aerial Mapping (1' Contour Interval)	1350.00	LF	$ 1	$ 1,350			
Devegetation	3.00	AC	$ 5,000	$ 15,000			
Land Acquistion Rights	1.00	SF	$ 3	$ 3			
Temporary Construction Easement	1.00	SF	$ 3	$ 3			
				Subtotal	=	$ *4,167,467*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 625,120			
Public Art	1.0%			$ 41,675			
City Fees	2.0%			$ 83,349			
CPM Salaries	4.0%			$ 166,699			
WO Credit	4.0%			$ 166,699			
CPM Aloocation	4.0%			$ 166,699			
Land Acquisition Rights	0.0%	SF	$ -	$ -			
				Subtotal	=	$ *1,250,240*	
Construction Contingency	20%					$ 833,493	
				Total	=	$ **6,251,201**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 Middle Segment (Sta 278+00 to Sta 260+00) Length: 1800 feet
Grouted Rock South of Dobson Wash Release to South of Foothills Drive

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul off	108,813	CY	$ 9	$ 979,317			
Foothills Drive improvements	569	SY	$ 28	$ 15,932			
Foothills Drive Bridge	540	CY	$ 500	$ 270,000			
Miscellaneous Removals	10,000	LS	$ 1	$ 10,000			
Grouted Rock (D50 10") for Channel	21,960	CY	$ 95	$ 2,086,200			
Loose Rock (D50 10")	0	CY	$ 75	$ -			
Concrete Cutoff Wall	0	SF	$ 18	$ -			
Retaining Walls	0	CY	$ 500	$ -			
Handrails	3,600	LF	$ 35	$ 126,000			
Guardrail	300	LF	$ 14	$ 4,200			
12" Water Relocation	1	EA	$ 34,400	$ 34,400			
O&M Path (ABC at Wheelpaths)	0	LF	$ 4	$ -			
Channel Access Ramps	4	EA	$ 1,400	$ 5,600			
Gates at Channel Access Ramps	4	EA	$ 1,500	$ 6,000			
Aerial Mapping (1' Contour Interval)	1,800	LF	$ 1	$ 1,800			
Devegetation	7	AC	$ 5,000	$ 36,000			
Revegetation	2	AC	$ 10,000	$ 20,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 3,595,455*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 539,318			
Public Art	1.0%			$ 35,955			
City Fees	2.0%			$ 71,909			
CPM Salaries	4.0%			$ 143,818			
WO Credit	4.0%			$ 143,818			
CPM Aloocation	4.0%			$ 143,818			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 1,078,637*	
Construction Contingency	20%					$ 719,091	
				Total	=	$ 5,393,183	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 South Segment (Sta 260+00 to 233+70) Length: 2630 feet
Reach 3 North Segment (Sta 233+70 to 209+00) Length: 2470 feet
Grouted Riprap from Station 260+00 to 209+00

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul off	255,121	CY	$ 9	$ 2,296,089			
Grouted Riprap (D_{50} 10") for Channel	64,770	CY	$ 95	$ 6,153,150			
Loose Riprap (D_{50} 10")	0	CY	$ 75	$ -			
Concrete Cutoff Wall	0	SF	$ 18	$ -			
Handrails (260+00 to 213+00)	9,400	LF	$ 35	$ 329,000			
Cross Canyon Way improvements	3,520	SF	$ 18	$ 63,360			
Miscellaneous Removals	15,000	LS	$ 1	$ 15,000			
Cross Canyon Way Bridge	371	CY	$ 500	$ 185,450			
Retaining Walls	40	CY	$ 500	$ 20,000			
Guardrail	320	LF	$ 14	$ 4,480			
Outlet Structure (not needed)	0	LS	$ 1	$ -			
O&M Path (ABC at Wheelpaths)	0	LF	$ 4	$ -			
8' Wide Concrete Golf Cart Path	2,000	SF	$ 6	$ 12,000			
Channel Access Ramps	3	EA	$ 1,400	$ 4,200			
Gates at Channel Access Ramps	3	EA	$ 1,500	$ 4,500			
Aerial Mapping (1' Contour Interval)	5,100	LF	$ 1	$ 5,100			
Devegetation	17	AC	$ 5,000	$ 85,000			
Revegetation	4	AC	$ 10,000	$ 40,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 9,217,335*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 1,382,600			
Public Art	1.0%			$ 92,173			
City Fees	2.0%			$ 184,347			
CPM Salaries	4.0%			$ 368,693			
WO Credit	4.0%			$ 368,693			
CPM Alocation	4.0%			$ 368,693			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 2,765,201*	
Construction Contingency	20%					$ 1,843,467	
				Total	=	$ 13,826,003	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 3 South Segment (Sta 210+00 to 182+00) Length: 2800 feet
Earthen Channel from Sta 210+00 to Thompson Peak Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	36,818	CY	$ 8	$ 294,544			
Bank protection (Gabion Mattress or Gunite)	117,475	SF	$ 9	$ 1,057,275			
Channel Access Ramps	1	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	2,800	LF	$ 1	$ 2,800			
Devegetation	3	AC	$ 5,000	$ 15,000			
Revegetation	3	AC	$ 10,000	$ 30,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 1,402,525***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 210,379			
Public Art	1.0%			$ 14,025			
City Fees	2.0%			$ 28,051			
CPM Salaries	4.0%			$ 56,101			
WO Credit	4.0%			$ 56,101			
CPM Aloocation	4.0%			$ 56,101			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 420,758***	
Construction Contingency	20%					$ 280,505	
				Total	=	**$ 2,103,788**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 4 (Sta 182+00 to Sta 60+00) Length: 12,200 feet
Earthen Channel Thompson Peak Road to Bell Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill (new banks, North))	22,270	CY	$ 8	$ 178,160			
New Bank Protection (North)	0	SF	$ 8	$ -			
Bank protection upgrade	6,673	LF	$ 200	$ 1,334,600			
Bank protection upgrade (NE Corner Bell Road & Reata Wash)	978	LF	$ 400	$ 391,200			
Freeboard Upgrade	6,256	CY	$ 25	$ 156,400			
8" Water Relocation	1	EA	$ 88,600	$ 88,600			
Aerial Mapping (1' Contour Interval)	12,200	LF	$ 1	$ 12,200			
Devegetation	1	AC	$ 5,000	$ 5,000			
Revegetation	1	AC	$ 10,000	$ 10,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 2,176,166*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 326,425			
Public Art	1.0%			$ 21,762			
City Fees	2.0%			$ 43,523			
CPM Salaries	4.0%			$ 87,047			
WO Credit	4.0%			$ 87,047			
CPM Aloocation	4.0%			$ 87,047			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 652,850*	
Construction Contingency	20%					$ 435,233	
				Total	=	**$ 3,264,249**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 5 (Sta 60+00 to Sta 23+00) Length: 3700 feet
Earthen Channel South of Bell Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul Off (60+00 to 32+00)	205,508	CY	$ 9	$ 1,849,572			
Earthwork Excavation & Haul Off (32+00 to 23+00)	95,721	CY	$ 9	$ 861,489			
Bank protection (Gabion Mattress or Gunite)	237,856	SF	$ 8	$ 1,902,848			
Drop Structure at Sediment Pool Area	1	LS	$350,000	$ 350,000			
Retaining Wall (Parapet) within Sediment Pool Area	32	CY	$ 500	$ 16,175			
Loose Riprap (D_{50}=12") at parapet wall	670	CY	$ 90	$ 60,300			
Bank Protection within Sediment Pool	27,384	SF	$ 8	$ 219,072			
Access Ramp		LF	$ -	$ -			
Hand Rail	7,400	LF	$ 35	$ 259,000			
Chain-link Fence for Sediment Pool Area	1,202	LF	$ 32	$ 38,464			
24" Sewer Relocation	1	EA	$162,600	$ 162,600			
8" Water Relocation	1	EA	$112,200	$ 112,200			
O&M Path (ABC at Wheelpaths)	0	LF	$ 4	$ -			
Channel Access Ramps	3	EA	$ 1,400	$ 4,200			
Gates at Channel Access Ramps	3	EA	$ 1,500	$ 4,500			
Aerial Mapping (1' Contour Interval)	3,700	LF	$ 1	$ 3,700			
Devegetation	27	AC	$ 5,000	$ 135,000			
Revegetation	27	AC	$ 10,000	$ 270,000			
Dewatering Allowance	1	LS	$300,000	$ 300,000			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	$ *6,549,123*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 982,368			
Public Art	1.0%			$ 65,491			
City Fees	2.0%			$ 130,982			
CPM Salaries	4.0%			$ 261,965			
WO Credit	4.0%			$ 261,965			
CPM Alocation	4.0%			$ 261,965			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	$ *1,964,737*	
Construction Contingency	20%					$ 1,309,825	
				Total	=	$ **9,823,685**	

6.2 Alternative B

Reata Wash Flood Control Improvement Study

Alternative B

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The Reata Wash Flood Control Improvement Study recommends an alignment which is 27,800 feet in length. Various channel section improvements were selected as recommended options for satisfying technical drainage conveyance criteria.
The Grouted Rock Channel Option includes the following:

Reach 1 - 'U' Channel with concrete retaining walls and Grouted Rock invert from Station 300+00 to Pinnacle Peak Road
Reach 2 - Reinforced Concrete Box Culvert from Pinnacle Peak Road to Dobson Wash Release and Grouted Rock Channel from Dobson Wash Release to Reach 3
Reach 3 - Grouted Rock Channel from Reach 2 to Station 209+00, Bank Protection Enhancements from Station 209+00 to Thompson Peak Parkway
Reach 4 - Levee and Bank Protection Enhancements from Thompson Peak Parkway to Bell Road
Reach 5 - Earthen Trapezoidal Channel from Thompson Peak Parkway to McDowell Mountain Ranch Road

Preliminary Opinion of Probable Construction Cost (15% Design Level)

Study Reach	Amount
Reach 1	$2,319,627
Reach 2 North Segment	$9,035,314
Reach 2 Middle Segment	$5,403,983
Reach 2 South & Reach 3 North Segments	$13,856,615
Reach 3 South Segment	$2,103,788
Reach 4	$3,893,049
Reach 5	$9,845,885
Grand Total	**$46,458,259**

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 1 (Sta 301+00 to Sta 290+00) Length: 1100 feet
"U Shaped Grouted Riprap Channel North of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Haul off	16757.0	CY	$ 9	$ 150,813			
Grouted Riprap Channel (D_{50} 10", 2.5' thick) Sta 29600 to 30000	6860.0	CY	$ 95	$ 651,700			
Loose Riprap (D_{50} 10")	1037.0	CY	$ 75	$ 77,775			
Concrete Cutoff Wall	960.0	SF	$ 18	$ 17,280			
Flood Wall	180.0	CY	$ 500	$ 90,000			
Handrails	1580.0	LF	$ 35	$ 55,300			
Retaining Wall	957.5	CY	$ 500	$ 478,750			
Breakaway fence (within Channel)	120.0	LF	$ 20	$ 2,400			
Chain-link Fence (along Channel boundary)	200.0	LF	$ 32	$ 6,400			
Channel Access Ramps	1.0	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1.0	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	1100.0	LF	$ 1	$ 1,100			
Devegetation	2.0	AC	$ 5,000	$ 10,000			
Revegetation	0.2	AC	$ 10,000	$ 2,000			
				Subtotal	=	*$ 1,546,418*	
Engineering Design ; CLOMR, LOMR ; NEPA	0.2			$ 231,963			
Public Art	0.0			$ 15,464			
City Fees	0.0			$ 30,928			
CPM Salaries	0.0			$ 61,857			
WO Credit	0.0			$ 61,857			
CPM Aloocation	0.0			$ 61,857			
Land Acquisition Rights	0.0	SF	$ -	$ -			
				Subtotal	=	*$ 463,925*	
Construction Contingency	20%					$ 309,284	
				Total	=	$ 2,319,627	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 North Segment (Sta 291+50 to Sta 278+00) Length: 1350 feet
4-11x11 & 1-9x11 RCBC South of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	23,819	CY	$ 8	$ 190,552			
Earthwork Excavation & Haul off	48,200	CY	$ 9	$ 433,800			
4-12x11 RCBC	9,079	CY	$ 500	$ 4,539,500			
4-12x11 RCBC inlet head wall (covered by retaining walls)	0	CY	$ 500	$ -			
4-12x11 RCBC outlet head wall	42	CY	$ 501	$ 20,942			
1-9.5x11 RCBC	742	CY	$ 500	$ 371,150			
1-9.5x11 RCBC inlet head wall (covered by retaining walls)	0	CY	$ 500	$ -			
1-9.5x11 RCBC Dobson outlet	29	CY	$ 500	$ 14,290			
Dobson Wash Grade to daylight	4,409	CY	$ 9	$ 39,681			
Concrete Transition Structure South of Pinnacle Peak Bridge	289	CY	$ 500	$ 144,500			
Concrete Cutoff Wall @ Dobson Outlet	180	SF		$ -			
Retaining Walls at Pinnacle Peak inlet area	155	CY	$ 500	$ 77,500			
Outlet apron, Dobson outlet	101	CY	$ 500	$ 50,400			
Retaining Walls at Dobson Outlet	137	CY	$ 500	$ 68,300			
Hand railing (Chain-link) Pinnacle Peak Transition Structure	229	LF	$ 32	$ 7,328			
Hand railing (Chain-link) Dobson Outlet	167	LF	$ 32	$ 5,344			
Dobson Outlet blocks	240	SF	$ 25	$ 6,000			
Local Tributary Inlet at Sta 286+50	1	LS	$ 2,500	$ 2,500			
O&M Path (ABC at Wheelpaths)	1,350	LF	$ 4	$ 5,400			
Aerial Mapping (1' Contour Interval)	1,350	LF	$ 1	$ 1,350			
Devegetation	3	AC	$ 5,000	$ 15,000			
Revegetation	3	AC	$ 10,000	$ 30,000			
Land Acquistion Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 6,023,543***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 903,531			
Public Art	1.0%			$ 60,235			
City Fees	2.0%			$ 120,471			
CPM Salaries	4.0%			$ 240,942			
WO Credit	4.0%			$ 240,942			
CPM Alocation	4.0%			$ 240,942			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 1,807,063***	
Construction Contingency	20%					$ 1,204,709	
				Total	=	**$ 9,035,314**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 Middle Segment (Sta 278+00 to Sta 260+00) Length: 1800 feet
Grouted Riprap South of Dobson Wash confluence to South of Foothills Drive

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul off	108,813	CY	$ 9	$ 979,317			
Foothills Drive improvements	569	SY	$ 28	$ 15,932			
Foothills Drive Bridge	540	CY	$ 500	$ 270,000			
Miscellaneous Removals	10,000	LS	$ 1	$ 10,000			
Grouted Riprap (D_{50} 10") for Channel	21,960	CY	$ 95	$ 2,086,200			
Loose Riprap (D_{50} 10")	0	CY	$ 75	$ -			
Concrete Cutoff Wall	0	SF	$ 18	$ -			
Retaining Walls	0	CY	$ 500	$ -			
Handrails	3,600	LF	$ 35	$ 126,000			
Guardrail	300	LF	$ 14	$ 4,200			
12" Water Relocation	1	EA	$ 34,400	$ 34,400			
O&M Path (ABC at Wheelpaths)	1,800	LF	$ 4	$ 7,200			
Channel Access Ramps	4	EA	$ 1,400	$ 5,600			
Gates at Channel Access Ramps	4	EA	$ 1,500	$ 6,000			
Aerial Mapping (1' Contour Interval)	1,800	LF	$ 1	$ 1,800			
Devegetation	7	AC	$ 5,000	$ 36,000			
Revegetation	2	AC	$ 10,000	$ 20,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 3,602,655***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 540,398			
Public Art	1.0%			$ 36,027			
City Fees	2.0%			$ 72,053			
CPM Salaries	4.0%			$ 144,106			
WO Credit	4.0%			$ 144,106			
CPM Aloocation	4.0%			$ 144,106			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 1,080,797***	
Construction Contingency	20%					$ 720,531	
				Total	=	**$ 5,403,983**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 2 South Segment (Sta 260+00 to 233+70) Length: 2630 feet
Reach 3 North Segment (Sta 233+70 to 209+00) Length: 2470 feet
Grouted Riprap from Station 260+00 to 209+00

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	1	CY	$ 8	$ 8			
Earthwork Excavation & Haul off	255,121	CY	$ 9	$ 2,296,089			
Grouted Riprap (D_{50} 10") for Channel	64,770	CY	$ 95	$ 6,153,150			
Loose Riprap (D_{50} 10")	0	CY	$ 75	$ -			
Concrete Cutoff Wall	0	SF	$ 18	$ -			
Handrails (260+00 to 213+00)	9,400	LF	$ 35	$ 329,000			
Cross Canyon Way improvements	3,520	SF	$ 18	$ 63,360			
Miscellaneous Removals	15,000	LS	$ 1	$ 15,000			
Cross Canyon Way Bridge	371	CY	$ 500	$ 185,450			
Retaining Walls	40	CY	$ 500	$ 20,000			
Guardrail	320	LF	$ 14	$ 4,480			
Outlet Structure (not needed)	0	LS	$ 1	$ -			
O&M Path (ABC at Wheelpaths)	5,100	LF	$ 4	$ 20,400			
8' Wide Concrete Golf Cart Path	2,000	SF	$ 6	$ 12,000			
Channel Access Ramps	3	EA	$ 1,400	$ 4,200			
Gates at Channel Access Ramps	3	EA	$ 1,500	$ 4,500			
Aerial Mapping (1' Contour Interval)	5,100	LF	$ 1	$ 5,100			
Devegetation	17	AC	$ 5,000	$ 85,000			
Revegetation	4	AC	$ 10,000	$ 40,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 9,237,743***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 1,385,661			
Public Art	1.0%			$ 92,377			
City Fees	2.0%			$ 184,755			
CPM Salaries	4.0%			$ 369,510			
WO Credit	4.0%			$ 369,510			
CPM Aloocation	4.0%			$ 369,510			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 2,771,323***	
Construction Contingency	20%					$ 1,847,549	
				Total	=	**$ 13,856,615**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 3 South Segment (Sta 210+00 to 182+00) Length: 2800 feet
Earthen Channel from Sta 210+00 to Thompson Peak Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	36,818	CY	$ 8	$ 294,544			
Bank protection (Gabion Mattress or Gunite)	117,475	SF	$ 9	$ 1,057,275			
Channel Access Ramps	1	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	2,800	LF	$ 1	$ 2,800			
Devegetation	3	AC	$ 5,000	$ 15,000			
Revegetation	3	AC	$ 10,000	$ 30,000			
Land Acquisition ROW/Drainage Easement	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 1,402,525***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 210,379			
Public Art	1.0%			$ 14,025			
City Fees	2.0%			$ 28,051			
CPM Salaries	4.0%			$ 56,101			
WO Credit	4.0%			$ 56,101			
CPM Alocation	4.0%			$ 56,101			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 420,758***	
Construction Contingency	20%					$ 280,505	
				Total	=	**$ 2,103,788**	

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 4 (Sta 182+00 to Sta 60+00) Length: 12,200 feet
Earthen Channel Thompson Peak Road to Bell Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill (new banks, North))	22,270	CY	$ 8	$ 178,160			
New Bank Protection (North)	52,400	SF	$ 8	$ 419,200			
Bank protection upgrade	6,673	LF	$ 200	$ 1,334,600			
Bank protection upgrade (NE Corner Bell Road & Reata Wash)	978	LF	$ 400	$ 391,200			
Freeboard Upgrade	6,256	CY	$ 25	$ 156,400			
8" Water Relocation	1	EA	$ 88,600	$ 88,600			
Aerial Mapping (1' Contour Interval)	12,200	LF	$ 1	$ 12,200			
Devegetation	1	AC	$ 5,000	$ 5,000			
Revegetation	1	AC	$ 10,000	$ 10,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 2,595,366*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 389,305			
Public Art	1.0%			$ 25,954			
City Fees	2.0%			$ 51,907			
CPM Salaries	4.0%			$ 103,815			
WO Credit	4.0%			$ 103,815			
CPM Aloocation	4.0%			$ 103,815			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 778,610*	
Construction Contingency	20%					$ 519,073	
				Total	=	$ 3,893,049	

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Alternative B

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Preliminary Opinion of Probable Construction Cost (15% Design Level)
Reach 5 (Sta 60+00 to Sta 23+00) Length: 3700 feet
Earthen Channel South of Bell Road

Item	Quantity	Unit	Unit Price			Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul Off (60+00 to 32+00)	205,508	CY	$ 9	$ 1,849,572			
Earthwork Excavation & Haul Off (32+00 to 23+00)	95,721	CY	$ 9	$ 861,489			
Bank protection (Gabion Mattress or Gunite)	237,856	SF	$ 8	$ 1,902,848			
Drop Structure at Sediment Pool Area	1	LS	$350,000	$ 350,000			
Retaining Wall (Parapet) within Sediment Pool Area	32	CY	$ 500	$ 16,175			
Loose Riprap (D_{50}=12") at parapet wall	670	CY	$ 90	$ 60,300			
Bank Protection within Sediment Pool	27,384	SF	$ 8	$ 219,072			
Access Ramp		LF	$ -	$ -			
Hand Rail	7,400	LF	$ 35	$ 259,000			
Chain-link Fence for Sediment Pool Area	1,202	LF	$ 32	$ 38,464			
24" Sewer Relocation	1	EA	$162,600	$ 162,600			
8" Water Relocation	1	EA	$112,200	$ 112,200			
O&M Path (ABC at Wheelpaths)	3,700	LF	$ 4	$ 14,800			
Channel Access Ramps	3	EA	$ 1,400	$ 4,200			
Gates at Channel Access Ramps	3	EA	$ 1,500	$ 4,500			
Aerial Mapping (1' Contour Interval)	3,700	LF	$ 1	$ 3,700			
Devegetation	27	AC	$ 5,000	$ 135,000			
Revegetation	27	AC	$ 10,000	$ 270,000			
Dewatering Allowance	1	LS	$300,000	$ 300,000			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 6,563,923***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 984,588			
Public Art	1.0%			$ 65,639			
City Fees	2.0%			$ 131,278			
CPM Salaries	4.0%			$ 262,557			
WO Credit	4.0%			$ 262,557			
CPM Aloocation	4.0%			$ 262,557			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 1,969,177***	
Construction Contingency	20%					$ 1,312,785	
				Total	=	**$ 9,845,885**	

6.3 Alternative C

Reata Wash Flood Control Improvement Study

Alternative C

Page 1 of 8

The Reata Wash Flood Control Improvement Study recommends an alignment which is 27,800 feet in length. Various channel section improvements were selected as recommended options for satisfying technical drainage conveyance criteria. The Reinforced Concrete Box Culvert Option includes the following:

Reach 1 - 'U' Channel with concrete retaining walls and Grouted Rock invert from Station 300+00 to Pinnacle Peak Road
Reach 2 - Reinforced Concrete Box Culvert from Pinnacle Peak Road to Reach 3
Reach 3 - Reinforced Concrete Box Culvert from Reach 2 to Station 213+00
Reach 4 - Levee and Bank Protection Enhancements from Thompson Peak Parkway to Bell Road
Reach 5 - Earthen Trapezoidal Channel from Thompson Peak Parkway to McDowell Mountain Ranch Road

Preliminary Opinion of Probable Construction Cost (15% Design Level)

Study Reach	Amount
Reach 1	$2,319,627
Reach 2 North Segment	$9,040,174
Reach 2 Middle Segment	$10,462,971
Reach 2 South & Reach 3 North Segments	$30,253,905
Reach 3 South Segment	$2,103,788
Reach 4	$3,893,049
Reach 5	$9,845,885
Grand Total	**$67,919,398**

Reata Wash Flood Control Improvement Study Contract No. 2014-168-COS

Alternative C

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Preliminary Opinion of Probable Construction Cost (15% Design level)

Reach 1 (Sta 301+00 to Sta 290+00) Length: 1100 feet

"U" Shaped Grouted Riprap Channel North of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Haul off	16757.00	CY	$ 9	$ 150,813			
Grouted Riprap (D50 10") for Channel (Sta 29600 to 30000) 2.5' thick	6860.00	CY	$ 95	$ 651,700			
Grouted Riprap (D50 10") for Channel (sta 29500 to 29600) 2.5' thick	0.00	CY	$ 95	$ -			
Grouted Riprap (D50 10") for Channel (sta 29310 to 29500) 2.5' thick	0.00	CY	$ 95	$ -			
Grouted Riprap (D50 10") for Channel (sta 29250 to 29310) 2.5' thick	0.00	CY	$ 95	$ -			
Loose Riprap (D50 10")	1037.00	CY	$ 75	$ 77,775			
Concrete Cutoff Wall	960.00	SF	$ 18	$ 17,280			
Flood Wall	180.00	CY	$ 500	$ 90,000			
Handrails	1580.00	LF	$ 35	$ 55,300			
Retaining Wall	957.50	CY	$ 500	$ 478,750			
Breakaway fence (within Channel)	120.00	LF	$ 20	$ 2,400			
Chain-link Fence (along Channel boundary)	200.00	LF	$ 32	$ 6,400			
Channel Access Ramps	1.00	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1.00	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	1100.00	LF	$ 1	$ 1,100			
Devegetation	2.00	AC	$ 5,000	$ 10,000			
Revegetation	0.20	AC	$ 10,000	$ 2,000			
Land Acquisition Rights	0.00	SF	$ -	$ -			
				Subtotal	=	***$ 1,546,418***	
Engineering Design ; CLOMR, LOMR ; NEPA	0.15			$ 231,963			
Public Art	0.01			$ 15,464			
City Fees	0.02			$ 30,928			
CPM Salaries	0.04			$ 61,857			
WO Credit	0.04			$ 61,857			
CPM Alocation	0.04			$ 61,857			
Land Acquisition Rights	0.00	SF	$ -	$ -			
				Subtotal	=	***$ 463,925***	
Construction Contingency	20%					$ 309,284	
				Total	=	**$ 2,319,627**	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

Alternative C

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 2 North Segment (Sta 291+50 to Sta 278+00) Length: 1350 feet
4-11x11 & 1-9x11 RCBC South of Pinnacle Peak Road Bridge

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	23819.00	CY	$ 8	$ 190,552			
Earthwork Excavation & Haul off	48200.00	CY	$ 9	$ 433,800			
4-12x11 RCBC	9079.00	CY	$ 500	$ 4,539,500			
4-12x11 RCBC inlet head wall (covered by retaining walls)	0.00	CY	$ 500	$ -			
4-12x11 RCBC outlet head wall	41.80	CY	$ 501	$ 20,942			
1-9.5x11 RCBC	742.30	CY	$ 500	$ 371,150			
1-9.5x11 RCBC inlet head wall (covered by retaining walls)	0.00	CY	$ 500	$ -			
1-9.5x11 RCBC Dobson outlet	28.58	CY	$ 500	$ 14,290			
Dobson Wash Grade to daylight	4409.00	CY	$ 9	$ 39,681			
Concrete Transition Structure South of Pinnacle Peak Bridge	289.00	CY	$ 500	$ 144,500			
Concrete Cutoff Wall @ Dobson Outlet	180.00	SF	$ 18	$ 3,240			
Retaining Walls at Pinnacle Peak inlet area	155.00	CY	$ 500	$ 77,500			
Outlet apron, Dobson outlet	100.80	CY	$ 500	$ 50,400			
Retaining Walls at Dobson Outlet	136.60	CY	$ 500	$ 68,300			
Hand railing (Chain-link) Pinnacle Peak Transition Structure	229.00	LF	$ 32	$ 7,328			
Hand railing (Chain-link) Dobson Outlet	167.00	LF	$ 32	$ 5,344			
Dobson Outlet blocks	240.00	SF	$ 25	$ 6,000			
Local Tributary Inlet at Sta 286+50	1.00	LS	$ 2,500	$ 2,500			
O&M Path (ABC at Wheelpaths)	1,350	LF	$ 4	$ 5,400			
Aerial Mapping (1' Contour Interval)	1,350	LF	$ 1	$ 1,350			
Devegetation	3	AC	$ 5,000	$ 15,000			
Revegetation	3	AC	$ 10,000	$ 30,000			
Land Acquistion Rights	1.00	SF	$ 3	$ 3			
	1.00	SF	$ 3	$ 3			
				Subtotal	=	***$ 6,026,783***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 904,017			
Public Art	1.0%			$ 60,268			
City Fees	2.0%			$ 120,536			
CPM Salaries	4.0%			$ 241,071			
WO Credit	4.0%			$ 241,071			
CPM Aloocation	4.0%			$ 241,071			
Land Acquisition Rights	0	SF	$ -	0			
				Subtotal	=	***$ 1,808,035***	
Construction Contingency	20%					$ 1,205,357	
				Total	=	**$ 9,040,174**	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

Alternative C

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 2 Middle Segment (Sta 278+00 to Sta 260+00) Length: 1800 feet
4-12x11 RCBC South of Dobson Wash confluence to South of Foothills Drive

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	1	CY	$ 8	$ 8			
Earthwork Excavation & Haul off	94,000	CY	$ 9	$ 846,000			
Foothills Drive improvements	300	SY	$ 28	$ 8,400			
Foothills Drive Bridge (not needed)	0	CY	$ 500	$ -			
Miscellaneous Removals	10,000	LS	$ 1	$ 10,000			
4-12x11 RCBC	12,105	CY	$ 500	$ 6,052,500			
Loose Riprap (D50 10") (none)	0	CY	$ 75	$ -			
Concrete Cutoff Wall (none)	0	SF	$ 18	$ -			
Retaining Walls (none)	0	CY	$ 500	$ -			
Handrails (none)	0	LF	$ 35	$ -			
Guardrail (none)	0	LF	$ 14	$ -			
12" Water Relocation	1	EA	$ 34,400	$ 34,400			
O&M Path (ABC at Wheelpaths)	1,800	LF	$ 4	$ 7,200			
Aerial Mapping (1' Contour Interval)	1,800	LF	$ 1	$ 1,800			
Devegetation	1	AC	$ 5,000	$ 5,000			
Revegetation	1	AC	$ 10,000	$ 10,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 6,975,314*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 1,046,297			
Public Art	1.0%			$ 69,753			
City Fees	2.0%			$ 139,506			
CPM Salaries	4.0%			$ 279,013			
WO Credit	4.0%			$ 279,013			
CPM Aloocation	4.0%			$ 279,013			
Land Acquisition Rights	0	SF	$ -	0			
				Subtotal	=	*$ 2,092,594*	
Construction Contingency	20%					$ 1,395,063	
				Total	=	**$ 10,462,971**	

Reata Wash Flood Control Improvement Study Contract No. 2014-168-COS

Alternative C

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 2 South Segment (Sta 260+00 to 233+70) Length: 2630 feet
Reach 3 North Segment (Sta 233+70 to 209+00) Length: 2470 feet
4-12x11 RCBC South of Dobson Wash confluence to Sta 209+00

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	1	CY	$ 8	$ 8			
Earthwork Excavation & Haul off	358,274	CY	$ 9	$ 3,224,466			
4-12x11 RCBC	31,607	CY	$ 500	$ 15,803,500			
Loose Riprap (D50 10")	534	CY	$ 75	$ 40,050			
Concrete Cutoff Wall	37	CY	$ 500	$ 18,500			
Retaining Walls	40	CY	$ 500	$ 20,000			
Cross Canyon Way imrovements	1,980	SF	$ 18	$ 35,640			
Miscellaneous Removals	1	LS	$ 15,000	$ 15,000			
Cross canyon Way Bridge (not needed)	0	CY	$ 500	$ -			
Outlet Structure at 213+00	1,741	CY	$ 500	$ 870,500			
Guardrail (not needed)		LF	$ 14	$ -			
Tributary inlet at Sta 250+00	1	LS	$ 50,000	$ 50,000			
8" Water Relocation	1	EA	$ 39,100	$ 39,100			
O&M Path (ABC at Wheelpaths)	5,100	LF	$ 4	$ 20,400			
8' Wide Concrete Golf Cart Path	2,000	SF	$ 6	$ 12,000			
Aerial Mapping (1' Contour Interval)	5,100	LF	$ 1	$ 5,100			
Devegetation	1	AC	$ 5,000	$ 5,000			
Revegetation	1	AC	$ 10,000	$ 10,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	***$ 20,169,270***	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 3,025,391			
Public Art	1.0%			$ 201,693			
City Fees	2.0%			$ 403,385			
CPM Salaries	4.0%			$ 806,771			
WO Credit	4.0%			$ 806,771			
CPM Aloocation	4.0%			$ 806,771			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	***$ 6,050,781***	
Construction Contingency	20%					$ 4,033,854	
				Total	=	**$ 30,253,905**	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

Alternative C

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 3 South Segment (Sta 210+00 to 182+00) Length: 2800 feet
Earthen Channel

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	36,818	CY	$ 8	$ 294,544			
Bank protection (Gabion Mattress or Gunite)	117,475	SF	$ 9	$ 1,057,275			
Channel Access Ramps	1	EA	$ 1,400	$ 1,400			
Gates at Channel Access Ramps	1	EA	$ 1,500	$ 1,500			
Aerial Mapping (1' Contour Interval)	2,800	LF	$ 1	$ 2,800			
Devegetation	3	AC	$ 5,000	$ 15,000			
Revegetation	3	AC	$ 10,000	$ 30,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 1,402,525*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 210,379			
Public Art	1.0%			$ 14,025			
City Fees	2.0%			$ 28,051			
CPM Salaries	4.0%			$ 56,101			
WO Credit	4.0%			$ 56,101			
CPM Aloocation	4.0%			$ 56,101			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 420,758*	
Construction Contingency	20%					$ 280,505	
				Total	=	$ 2,103,788	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 4 (Sta 182+00 to Sta 60+00) Length: 12,200 feet
Earthen Channel Thompson Peak Road to Bell Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Backfill (new banks, North End)	22,270	CY	$ 8	$ 178,160			
New Bank Protection (North End)	52,400	SF	$ 8	$ 419,200			
Bank Protection Upgrade	6,673	LF	$ 200	$ 1,334,600			
Bank protection upgrade (NE Corner Bell Road & Reata Wash)	978	LF	$ 400	$ 391,200			
Freeboard Upgrade	6,256	CY	$ 25	$ 156,400			
8" Water Relocation	1	EA	$ 88,600	$ 88,600			
Aerial Mapping (1' Contour Interval)	12,200	LF	$ 1	$ 12,200			
Devegetation	1	AC	$ 5,000	$ 5,000			
Revegetation	1	AC	$ 10,000	$ 10,000			
Land Acquisition Rights	1	SF	$ 3	$ 3			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	$ *2,595,366*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 389,305			
Public Art	1.0%			$ 25,954			
City Fees	2.0%			$ 51,907			
CPM Salaries	4.0%			$ 103,815			
WO Credit	4.0%			$ 103,815			
CPM Aloocation	4.0%			$ 103,815			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	$ *778,610*	
Construction Contingency	20%					$ 519,073	
				Total	=	$ 3,893,049	

Reata Wash Flood Control Improvement Study — Contract No. 2014-168-COS

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Preliminary Opinion of Probable Construction Cost (15% Design level)
Reach 5 (Sta 60+00 to Sta 23+00) Length: 3700 feet
Earthen Channel South of Bell Road

Item	Quantity	Unit	Unit Price	Item Cost		Total Cost	Notes
Earthwork Excavation & Back fill	0	CY	$ 8	$ -			
Earthwork Excavation & Haul Off (60+00 to 32+00)	205,508	CY	$ 9	$ 1,849,572			
Earthwork Excavation & Haul Off (32+00 to 23+00)	95,721	CY	$ 9	$ 861,489			
Bank protection (Gabion Mattress or Gunite)	237,856	SF	$ 8	$ 1,902,848			
Drop Structure at Sediment Pool Area	1	LS	$350,000	$ 350,000			
Retaining Wall (Parapet) within Sediment Pool Area	32	CY	$ 500	$ 16,175			
Loose Riprap (d50=12") at parapet wall	670	CY	$ 90	$ 60,300			
Bank Protection within Sediment Pool	27,384	SF	$ 8	$ 219,072			
Access Ramp		LF	$ -	$ -			
Hand Rail	7,400	LF	$ 35	$ 259,000			
Chain-link Fence for Sediment Pool Area	1,202	LF	$ 32	$ 38,464			
24" Sewer Relocation	1	EA	$162,600	$ 162,600			
8" Water Relocation	1	EA	$112,200	$ 112,200			
O&M Path (ABC at Wheelpaths)	3,700	LF	$ 4	$ 14,800			
Channel Access Ramps	3	EA	$ 1,400	$ 4,200			
Gates at Channel Access Ramps	3	EA	$ 1,500	$ 4,500			
Aerial Mapping (1' Contour Interval)	3,700	LF	$ 1	$ 3,700			
Devegetation	27	AC	$ 5,000	$ 135,000			
Revegetation	27	AC	$ 10,000	$ 270,000			
Dewatering Allowance	1	LS	$300,000	$ 300,000			
Temporary Construction Easement	1	SF	$ 3	$ 3			
				Subtotal	=	*$ 6,563,923*	
Engineering Design ; CLOMR, LOMR ; NEPA	15.0%			$ 984,588			
Public Art	1.0%			$ 65,639			
City Fees	2.0%			$ 131,278			
CPM Salaries	4.0%			$ 262,557			
WO Credit	4.0%			$ 262,557			
CPM Aloocation	4.0%			$ 262,557			
Land Acquisition Rights	0	SF	$ -	$ -			
				Subtotal	=	*$ 1,969,177*	
Construction Contingency	20%					$ 1,312,785	
				Total	=	$ 9,845,885	

7. REFERENCES

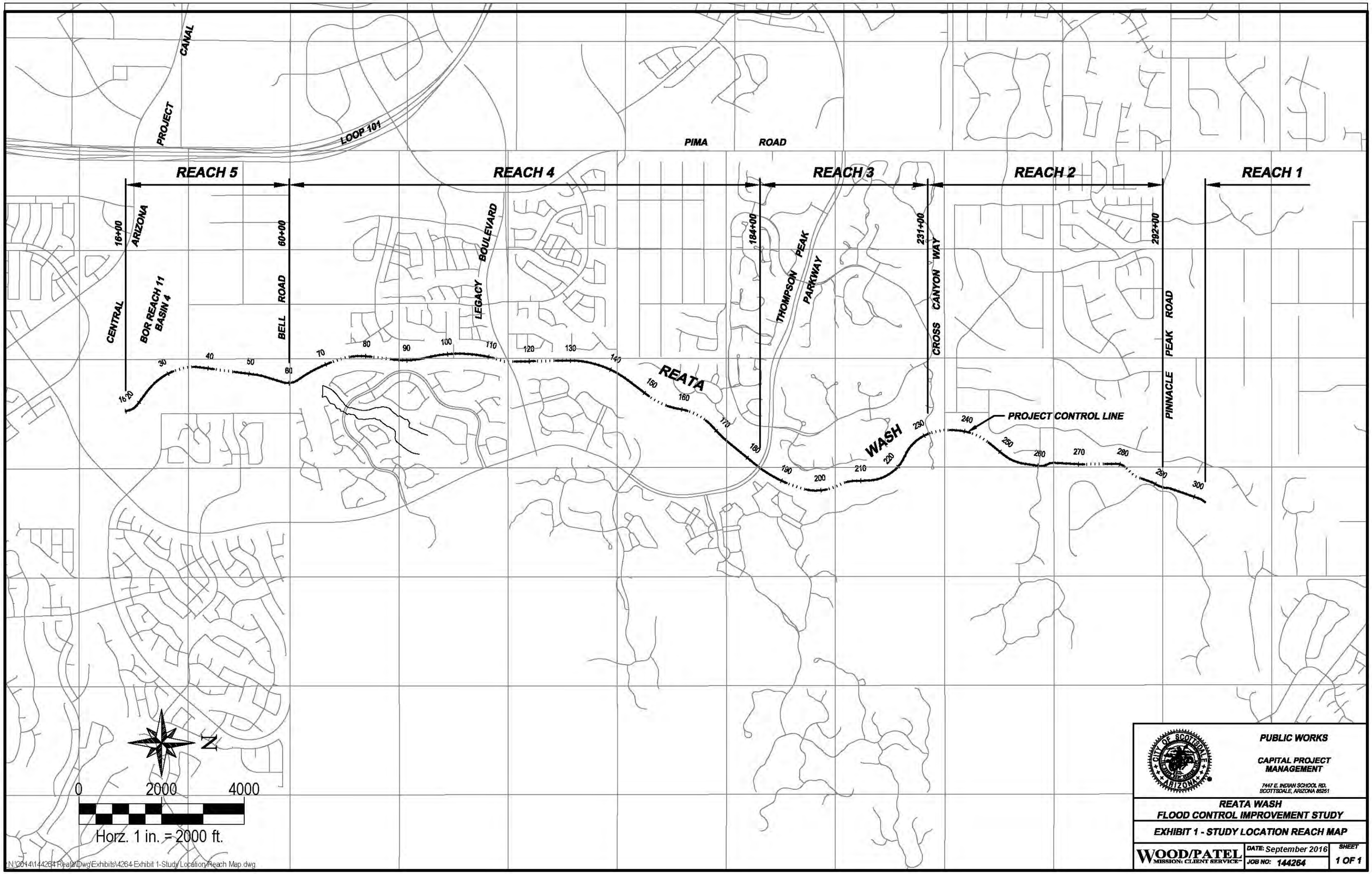
1. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix P: Wood, Patel & Associates, Inc., *Reata Wash Flood Control Improvement Study, Proposed Condition Hydraulic Capacity Memorandum,* August 31, 2016.

2. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume II, Exhibit 5: Wood, Patel & Associates, Inc., *Reata Wash Flood Control Improvement Study, Concept Design Plan,* August 2016.

3. Wood, Patel & Associates, Inc., Reata Wash Design Concept Report, Volume III, Appendix H: JE Fuller Hydrology and Geomorphology, Inc., *Reata Wash Flood Control Improvement Study, Hydrologic Memorandum,* August 31, 2016.

EXHIBIT 1

Study Location Reach Map



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CITY OF SCOTTSDALE ARIZONA

PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1 - STUDY LOCATION REACH MAP

WOOD/PATEL
MISSION: CLIENT SERVICE™

DATE: September 2016
JOB NO: 144264

SHEET
1 OF 1

APPENDIX S

MEMORANDUM: BENEFIT COST ANALYSIS

Reata Wash

Flood Control Improvement Study

Contract No. 2014-168-COS

Memorandum: Benefit Cost Analysis

September 1, 2016

Prepared for:

Capital Project Management
7447 East Indian School Road, Suite 205
Scottsdale, AZ. 85251

EXPIRES 12-31-16

Prepared By:

WOOD/PATEL
MISSION: CLIENT SERVICE™

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100
Phoenix, Arizona 85021
In Association with:

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

LOGANSIMPSON

FLOOR
associates
firm

Gannett Fleming

Technical Solutions

gci

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EXHIBIT

EXPIRES 12-31-16

1.0 EXECUTIVE SUMMARY

The Reata Wash Study utilized a benefit cost analysis to evaluate economic advantages (benefits) and disadvantages (costs) of a potential project. The end result is a benefit cost ratio, which is derived from a project's total net benefits annualized divided by its total project cost annualized. The benefit cost ratio is a numerical expression of the cost effectiveness of a project. A project is considered to be cost-effective when the benefit cost ratio is 1.0 or greater indicating the benefits of a potential hazard mitigation project are greater than the cost to complete the project. Reference 4 provides additional background and information for evaluating cost effectiveness of potential flood mitigation projects.

The benefit cost ratio for the Reata Wash Study was calculated using the estimated cost of construction, the CWA Section 404 Permit mitigation cost, land acquisition cost and maintenance cost of the recommended solution based on a 15% level design plan. The annualized estimated construction cost, the CWA Section 404 Permit mitigation cost and land acquisition cost were added together with the annual cost for maintenance, and then divided by the annualized costs associated with benefits of removing structures and content from flood hazards (See Table 1).

Based on the annualized benefit of $3,702,818 and annualized cost of $1,779,354 the benefit cost ratio was determined to be 2.08. This indicates the benefits of a potential flood hazard mitigation project are sufficient to justify consideration for a project.

2.0 INTRODUCTION

The Reata Wash Flood Control Improvement Study (Reata Wash Study) was authorized by Scottsdale City Council on November 12, 2014. One deliverable of the Reata Wash Study is a benefit cost analysis.

A benefit cost analysis is an evaluation of the economic advantages (benefits) and disadvantages (costs) of a potential project. A benefit cost analysis qualifies decisions associated with the implementation of hazard mitigation measures that are cost-effective and designed to substantially reduce injuries, loss of life, hardship, and the risk of future damage and destruction of property. To evaluate proposed flood hazard mitigation projects prior to funding, agencies generally require a benefit cost analysis to validate cost-effectiveness. A project is considered to be cost-effective when the benefit cost ratio is 1.0 or greater, indicating the benefits of a potential hazard mitigation project are sufficient to justify the costs (Reference 1 and 4, found at end of section).

The Reata Wash Study objectives are:

- Engage the public and stakeholders via public meetings, city web page and newsletter
- Reduce flood risks to approximately 4,600 residential, commercial or public structures located within the Reata Wash floodplain
- Reduce the size of the current Federal Emergency Management Agency (FEMA) floodplain thus removing the requirement for flood insurance for property owners with federally – backed mortgages requiring flood insurance
- Make best use of existing public infrastructure, including the bridge structures at Pinnacle Peak Road, Thompson Peak Parkway, Legacy Boulevard, and Bell Road
- Make best use of the existing drainage channel corridor (Deer Valley Road to Bell Road)
- Coordinate with Federal stakeholders: Bureau of Reclamation, Central Arizona Project, and US Army Corps of Engineers
- Coordinate with local and state agencies: Arizona State Land Department, and Flood Control of Maricopa County
- Make decisions to support minimizing additional land acquisitions
- Make design decisions supporting cost-effective construction
- Limit solutions to comprehensive flood control solutions that meet and satisfy FEMA regulations
- Make decisions compliant with anticipated environmental requirements
- Identify and recommend desert environment context-sensitive solutions
- Make decisions to support all weather access at Foothills Drive, Cross Canyon Way, and Pinnacle Peak Road at Reata Wash's drainage channel corridor
- Make decisions that minimize land disturbance

3.0 BENEFIT COST ANALYSIS FACTORS

Flood damage or losses can occur with:

- Structures (residential, commercial and public buildings)
- Private and public infrastructure (roads, bridges, water, sewer, electric, natural gas, cable)
- Social disruption
- Potential injury or loss of life
- Economic impact

Additionally, matters of public safety, health, and welfare are jeopardized. The following items were identified as being specific to the Reata Wash Study for matters that benefit and cost, as follows:

Matters That Benefit:

- Removal of the majority of 4,600 structures from flood hazards
- Removal of mandatory flood insurance requirements for structures
- Removal of approximately 5,200 acres from flood hazards
- Removal of roadways/ intersections from flood hazards (reduces the chance of disruption)
- Removal of wet and dry utility lines from flood hazards (reduces the chance of disruption)
- Removal of flood hazards increases the chance emergency vehicles, first responders are able to reach those in need
- Reduction in public maintenance costs associated with clean up
- Removal of flood hazards allows economic commerce to continue
- Removal of flood hazards diminishes risk of injury and loss of life, in a flood event

Matters That Cost:

- Construction cost
- Maintenance cost
- Permitting
- Land rights

4.0 BENEFIT COST ANALYSIS METHODOLOGY

The Reata Wash Study Benefit Cost Analysis was completed using the following references as a guide:

US Army Corps of Engineers (USACE)

www.usace.army.mil/Portals/2/docs/civilworks/budget/ec2012/fy12ecfinal.pdf

http://planning.usace.army.mil/toolbox/library/EGMs/EGM16-01.pdf

A base year of 2016 price levels and a 100-year time span were used. Damage and benefit costs are presented at year 2016 using a discount rate of 3.125%. The USACE generally limits its benefit cost analyses to the consequences of flooding damages.

FEMA

The estimated cost of flood damage to structures was calculated using:

https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/the_cost_of_flooding.jsp

The flood damage cost was estimated using FEMA's website for flood depths and the Draft Pinnacle Peak West Area Drainage Master Study.

For benefit cost analysis information, the following was also used as a guide:

http://www.fema.gov/benefit-cost-analysis

5.0 BENEFIT COST ANALYSIS SUMMARY

The Reata Wash Study utilized a benefit cost analysis to evaluate economic advantages (benefits) and disadvantages (costs) of a potential project. The end result is a benefit cost ratio, which is derived from a project's total net benefits annualized divided by its total project cost annualized. The benefit cost ratio is a numerical expression of the cost-effectiveness of a project.

Table 1 summarizes the benefit cost ratio:

Benefit Cost Ratio
100-year Flood

Category	Recommended Solution
Construction Cost	$43,000,000
Annualized Construction Cost (a)	$1,408,675
Annual OMRR&R Cost (b)	$200,000
Annualized CWA Section 404 mitigation Cost (a,c)	$56,019
Annualized Land Acquisition Cost (a,d)	$114,660
Total Annual Cost	**$1,779,354**
Annual Benefits (a,e)	**$3,702,818**
Net Benefits	$1,923,464
Benefit Cost Ratio	**2.08**

EXPLANATIONS

(a): 2016, Annualized Costs Based on 3.125 % over 100-year Time Span
(b): Operation, Maintenance, Remediation, Rehabilitation and Repair
(c): Annualized CWA Section 404 Mitigation Cost (based on $1,710,000)
(d): Annualized Land Acquisition Cost (based on 13 acres at $250,000 per acre and $250,000 allowance for Drainage Easements: $3,500,000)
(e): Flood Damage based on FEMA data and Draft Pinnacle Peak Area Drainage Master Study

Table 1 Benefit Cost Ratio

Based on the annualized benefit of $3,702,818 and annualized cost of $1,779,354 the benefit cost ratio was determined to be 2.08.

Annual Costs

The total annual cost was determined to be $1,779,354. The construction cost is based on the construction cost estimated from Reata Wash Study's Concept Design Plan prepared at a 15% design level. For the recommended solution, the costs are estimated to be $43,000,000. That cost was annualized and determined to be $1,408,675. The cost of the CWA Section 404 Permit mitigation was estimated at $1,710,000 and was annualized and determined to be $56,019. Annual maintenance costs were estimated at $200,000. The costs for land acquisition and drainage easements were estimated at $3,500,000 and was annualized and determined to be $114,660. The total annual cost of a potential project was determined to be $1,779,354. Per the USACE (Reference 1, found at end of section), the benefit cost analysis was performed using a base year of 2016 price levels, a discount rate of 3.125% and a 100-year time span (See Table 2).

Annual Benefits

The annual benefit was determined to be $3,702,818. The annual benefit value was determined by:

- Flood damage costs to structures (homes) from FEMA's website (Reference 2)
- Number of flooded structures and flood depths are from City of Scottsdale's Draft Pinnacle Peak West Area Drainage Master Study

The damages were estimated for the 100-year floods. The flood damages to the existing structures in the FEMA delineated floodplain are estimated to be $113,029,000. That value was annualized based on a discount rate of 3.125% over a 100-year time span and determined to be $3,702,818 (See Table 2). If the project is implemented, the potential damages are eliminated and that becomes a benefit to the project.

Using USACE (Reference 1) as a guide, damages were only estimated for structure and content damages. Clean-up costs, displacement costs, land damages and land costs are not included in the Reata Wash Study's benefit cost analysis.

Table 2 summarizes the annualized cost analysis.

Annualized Cost Analysis for Various Study Elements				
Study Element	**Construction Cost Analysis**	**CWA Section 404 Mitigation Cost**	**Land Acquisition Cost Analysis**	**Removal of Flood Damages to Structure Analysis**
Annual Interest Rate	3.125%	3.125%	3.125%	3.125%
Time Span in years	100	100	100	100
Number of Payments Per Year	1	1	1	1
Amount to be Analyzed	**$43,000,000**	**$1,710,000**	**$3,500,000**	**$113,029,000**
Number of Annual payments	1	1	1	1
Annual Interest Payment	$1,343,750	$53,438	$109,375	$3,532,156
Annual Principal Payment	$64,925	$2,582	$5,285	$170,662
Annual Payment	**$1,408,675**	**$56,019**	**$114,660**	**$3,702,818**

Table 2 Annualized Cost Analysis for Various Study Elements

The USACE's uses a discount rate formula established in the Water Resources Development Act of 1974. This formula bases the discount rate on the average yield of long-term government securities. The conversion process the USACE uses to convert future benefits and costs to present values is known as discounting and requires use of an interest rate known as the discount rate.

Table 3 summarizes FEMA procedures for calculating flood damage costs.

Cost of Flood Damage
Flood depth vs Damage Based on One Occurrence
Source: FEMA (a)

Flood depth (ft) Above Floor	1,000 SQ. FT. Home	2,000 SQ. FT. Home	3,500 SQ. FT. Home (b)
0.083	$10,600.00	$20,920.00	$36,610.00
0.166	$10,670.00	$21,000.00	$36,750.00
0.333	$15,150.00	$29,650.00	$51,887.50
0.5	$20,150.00	$39,150.00	$68,512.50
1	$27,150.00	$52,220.00	$91,385.00
1.5	$30,425.00	$57,550.00	$100,712.50
2	$33,700.00	$62,880.00	$110,040.00
2.5	$35,150.00	$65,490.00	$114,607.50
3	$36,600.00	$68,100.00	$119,175.00
3.5	$38,275.00	$71,340.00	$124,845.00
4	$39,950.00	$74,580.00	$130,515.00

Explanations
(a): https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/the_cost_of_flooding.jsp
(b): Values extrapolated from 1,000 SQ FT and 2,000 SQ FT Home columns

Table 3 Cost of Flood Damage

The prevention or avoidance of flood damage cost is a benefit. The flood damage cost was estimated based on the data available from FEMA's website (Reference 2, found at the end of this section). The website provides estimated flood damage for a 1,000 and 2,000 square foot home and variable flood depths (.083 feet to 4 feet) above floor elevations. Since most of the FEMA floodplain area homes in the Reata Wash floodplain have with larger foot prints, the cost of damage was adjusted based on 3,500 square foot home. The variable flood depths were obtained from City of Scottsdale Draft Pinnacle Peak South Area Master Drainage Study. Flood depths less than 0.5 feet are displayed within Table 3, but the Reata Wash Study did not account for damages until 0.5 foot depth was reached.

Table 4 summarizes the number of homes impacted and respective flooding depths above floor for the 100-year storm event. The number of homes impacted and their respective flood depths were interpreted from City of Scottsdale's Draft Pinnacle Peak South Area Drainage Master Study.

Damage Estimate for a 3,500 SQ. FT. Home

Flood Depth vs Structure Damage: 100-Year Flood

Flood Depth Above Floor (ft.)	Number of Structures Impacted	Structure Damage	Total Damage
0.51-1	611	$91,385	$55,836,235
1.01-1.5	307	$100,713	$30,918,738
1.51-2	125	$110,040	$13,755,000
2.01-2.5	72	$114,608	$8,251,740
2.51-3	22	$119,175	$2,621,850
3.01-3.5	9	$124,845	$1,123,605
3.51-4	4	$130,515	$522,060
TOTAL	**1150**		**$113,029,228**

Table 4 Damage Estimate for a 3500 SQ. FT. Home

The 100-year flood damage cost based on plotting data from Table 4. The data was plotted on logarithmic (log-log) paper and the 100-year flood damage was estimated to be $113,029,228.

Benefit Cost Analysis Clarifications

It is important to note that the Benefit Cost Ratio is based upon damages from the 100-year flood event occurring at one location within the approximate 5,200 acre FEMA floodplain. The 100-year flood event was modeled using the western portion of the alluvial fan FEMA floodplain, commonly referred to as the Dobson Wash area. The analysis uses the hydraulic modeling developed for the City of Scottsdale's Draft Pinnacle Peak South Area Drainage Master Study. The FEMA designated floodplain contains approximately 4,600 structures. The 100-year flood event was estimated to damage 1,150 homes within the floodplain.

The discount rate formula established in the Water Resources Development Act of 1974 was used to develop annualized costs. This formula bases the discount rate on the average yield of long-term government securities. The USACE uses a process known as "discounting" to convert future benefits and costs to present values. Discounting requires use of an interest rate known as the discount rate (see Table 4).

The following were not accounted for in the benefit cost analysis. If these matters were to be included in the benefit cost analysis, it would result in a more beneficial analytical result to support a future project:

1) FEMA flood damage tables start applying damage costs at 0.1 foot of flood depth above floor. However, damages are likely to occur at depths under 0.5 foot but the Reata Wash Study did not account for damage until 0.5 foot depth was reached.

2) A single 100 year flood event was used to estimate FEMA flood damages. It should be noted that more frequent flood events would statistically occur over a 100 year time period. These more frequent flood events would cause additional damage that is not accounted for in the benefit cost analysis. If additional (more frequent) events are accounted for within the 100 year period, the benefit cost ratio number would increase.

3) The owners of the structures in the study area pay an approximate annual burden of $1.8 million in FEMA flood insurance policy premiums (year 2016). Flood insurance costs were not included or accounted for in the analysis, if accounted for the benefit cost ratio would increase.

4) FEMA's flood damage tables only account for potential flood damage to homes. However, additional damages are likely to occur in the study area. Anticipated damages to both public and private infrastructure could include:

   - Water lines
   - Wastewater lines
   - Roadways and intersections
   - Culverts and drainage infrastructure
   - Utility owned electric, natural gas and cable lines
   - Privately owned yards, walls and driveways

   While damages to these facilities are likely to occur in a significant flood event, the associated costs were not included in the benefit cost analysis, if accounted for the benefit cost ratio would increase.

5) Although prevention of injury and loss of life are an essential aspect of a flood mitigation project, the benefit cost analysis did not include a benefit value. In addition, no costs were projected for loss of time, inconvenience and disruption of businesses. If the costs associated with injuries and losses of life were accounted for in the analysis, the benefit cost ratio number would increase.

The City would be pursuing funding partners should the Reata Wash Study project be approved by City Council for advancement. The FCDMC is a potential partner for future cost sharing. Funding from other agencies would reduce City's ultimate cost which would result in a more favorable funding scenario to support a future project.

6.0 BENEFIT COST ANALYSIS SUMMARY

Reference 1:
www.usace.army.mil/Portals/2/docs/civilworks/budget/ec2012/fy12ecfinal.pdf

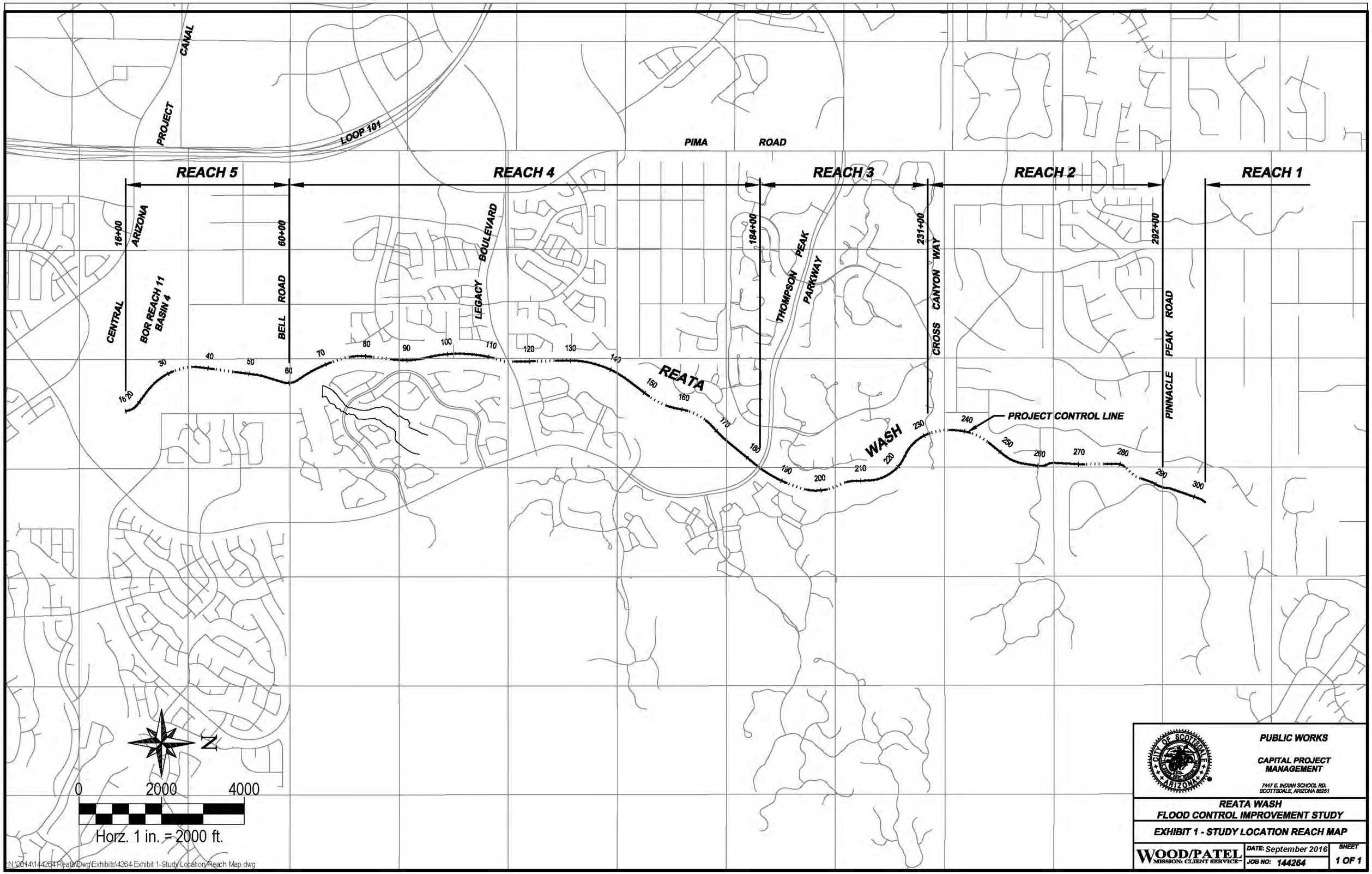
Reference 2:
https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/the_cost_of_flooding.jsp

Reference 3:
http://planning.usace.army.mil/toolbox/library/EGMs/EGM16-01.pdf

Reference 4:
http://www.fema.gov/benefit-cost-analysis

EXHIBIT 1

Study Location Reach Map



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CITY OF SCOTTSDALE ARIZONA

PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

7447 E. INDIAN SCHOOL RD.
SCOTTSDALE, ARIZONA 85251

REATA WASH FLOOD CONTROL IMPROVEMENT STUDY

EXHIBIT 1 - STUDY LOCATION REACH MAP

WOOD/PATEL
MISSION: CLIENT SERVICE™

DATE: September 2016
JOB NO: 144264

SHEET
1 OF 1